Standards and Specifications Manual
TOWN OF RICHMOND HILL
MATERIALS, STANDARDS AND SPECIFICATIONS MANUAL

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REVISION INFORMATION SHEET

Name of Publication: Town of Richmond Hill Standards & Specifications

The current and future revisions are numbered consecutively. If maintaining a hardcopy version of this electronic document, users are required to remove and replace the applicable pages in the manual to ensure that copies of the manual are always up to date.

All future updates and revisions to this manual will be posted to this page. It is the user’s responsibility to visit this page periodically to check for changes to the manual. Individual notifications will not be sent to Consultants advising them of new updates or revisions.

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<td>1</td>
<td>June 1998</td>
<td>Entire Hardcopy Manual reissued</td>
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<td>Division &quot;A&quot; Sewers Section A2 (Page 1)</td>
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<td>February 2001</td>
<td>Division &quot;C&quot; Transportation and Roadworks Section C3 - Added new Pedestrian Ramp drawings R-8B</td>
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<td>Division &quot;C&quot; Transportation and Roadworks Section C3 - Added new joint utility trench typical section standard drawings R-1B, R-2B and R-3B</td>
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<td>Division &quot;D&quot; Grading and Drainage Section D1 (Pages 1-5, Page 7, Page 9)</td>
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<td>Division &quot;D&quot; Grading and Drainage Section D2 - Page 14, Page 16</td>
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<td>Materials, Standards and Specifications Executive Committee and Subcommittee Member Listing (Entire Section)</td>
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<td>Division &quot;C&quot; Transportation and Works, Section C3 - Revised standard depth for storm sewers on typical section drawings R-1A, R-2A, R-1B, R-2B and R-3B</td>
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<td>Division “H” Stormwater Management Design Criteria, Section H1 - (Entire Section)</td>
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<td>Division “F” Section 9.2 O.L.S. Certificate</td>
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<td>16</td>
<td>August 2007</td>
<td>Division “B” Watermain Section B6 – Procedures for Cleaning, Disinfecting, Testing and Sampling (entire section is new and added) New Watermain Standard Drawings W-7A,8A,9A added</td>
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<td>Division “F” Development Submission Standards Section 9.9 Letter of Undertaking</td>
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| 17              | October 2007    | Division “F” Development Submission Standards  
Section F6.2 – Pre-grading Requirements  
(new sentence added - for obtaining insurance form from Town website)  
Section F6.3 Pre-servicing Requirements  
(new sentence added - for obtaining insurance form from Town website and one new page added)  
Section F9.8 – Certificate of Insurance  
(Entire document edited) |
| 18              | November 2007   | Division “E” Utilities  
Section E1 – Design Criteria – Utilities  
(Spelling mistake corrected see 1.2 re Traffic Analyst) |
| 19              | January 2008    | Division “F” Development Submission Standards  
Section 6.2 – Pre-grading Requirements  
(new requirement added – Site Alteration Permit, Letter of Credit edited - for Site Alteration, and requirement for Letter of Undertaking deleted)  
Section 6.3 – Pre-servicing Requirements  
(new requirement added – Site Alteration Permit, Letter of Credit edited - for Site Alteration, and requirement for Letter of Undertaking deleted) |
| 20              | February 2008   | Division “I” – Erosion and Sediment Control Criteria  
(New Division added) |
| 21              | March 2008      | Division “I” – Erosion and Sediment Control Criteria  
(whole Division corrected) |
| 22              | May 2008        | Division “F” Development Submission Standards  
Section F6.3 – Pre-servicing Requirements  
(add GST to Engineering Fees) |
| 23              | June 2008       | Division “F” Development Submission Standards  
Section F6.2 and F6.3 – Pre-grading and Pre-servicing Requirements  
(add one more liability item to Owner’s Certificate of Insurance) |
| 24              | August 2008     | Division “F” Development Submission Standards  
Section F9.7 and F9.9 – Overall Letter of Credit and Site Alteration Letter of Credit (third paragraph of section corrected) |
| 25              | September 2008  | Division “C” Section C1.1 Design Criteria Roadworks  
Section 1.1 Roads  
Section 1.3 Sidewalks and Walkways |
<p>| 26              | February 2009   | Division “C” – Multiple changes in entire division – please reprint in full. In Section C1, major changes relate to driveway design. In Section C2, major changes are on Page 5. In Section C4, major changes are on Pages 3-6 and Pages 10-11. In Section C3, drawings R-2A, R-2B and R-3B have been revised. In Section C3, drawings R-15A, R-15B and R-15C have been added in support of the new Driveway Apron By-Law |
| 27              | February 2009   | Division “F” – Section F8 Item 8.6 has been revised |</p>
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<td>Division “F” – Section F9.7 Letter of Credit – Subdivision Agreement and Section F9.9 Letter of Credit – Site Alteration</td>
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<td>30</td>
<td>November 2009</td>
<td>Division “B” Section B4.2 Watermains Adopted OPSDs – OPSD 1105.01 Hydrant Installation – revised Notes 1 &amp; 6. Division “B” Section B5 List of Approved Manufacturers and Products for Water Systems – Fire Hydrants – added AVK and removed CV Century. Division “C” Section C3 Standard Drawings – Revised Drawing R-11A. Division “C” Section C4 Adopted O.P.S.D. – revised Note 2 under 310.020 Concrete Sidewalk Adjacent to Curb and Gutter. Division “F” Index – revised Page 2 to remove Insurance Certificate Division “F” Section F6.2 Requirements for Pre-Grading and F6.3 Requirements for Pre-Servicing – removed references to insurance certificates being within document (can be found on website instead) and resulting changes to section numbers. Division “F” Section F9 Standard Documents – removed Insurance Certificate (formerly Section F9.8) and resulting changes to Letter of Credit (now Section F9.8) and Notice of Contractor (now Section F9.9).</td>
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<td>Division “C” Section C3 Standard Drawings – Revised Drawing R-8A and R-9A – see revision notes on drawings for changes.</td>
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<td>32</td>
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<td>Division “B” Section B6 Watermain – Procedures for Cleaning, Disinfecting, Testing and Sampling – Added Heading 1.6 Calculation of Water Consumption and revised Form 5.1 to include “Calculation for estimated volume of water”. Division “B” Section B4.2 Watermains Adopted OPSDs – OPSD 1105.01 Hydrant Installation – revised Note 6 to be “Greater than 5,675: light blue”.</td>
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<td>Division “B” Section B2 Watermain Specifications – added note to cover page regarding OPSS 701 Revisions and revised and added notes to Subsection No. 701.05.10.01 Division “F” Section F8.6 – changed requirements of asbuilt engineering submissions to two copies and changed requirements for PDF files Division “C” Section C3 Standard Drawings – Drawing R-13A has been updated Division “B” Section B6 – Chain of Custody Form 5.6 updated</td>
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<td>Division “F” Section F9.9 - Notice of Contractor Letter revised</td>
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<td>Division “B” Watermains – Index Page updated Section B3 Standard Drawings Watermains – New Drawings W-10A (Water Sampling Station) and W-11A (Automatic Flushing Device) added</td>
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<td>Division “B” Watermains Section B3 Standard Drawings Watermains – Updated Drawings W-1A, W-4A and W-5A</td>
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<td>Division “B” Watermains Section B6 Amend Form 5.4 to update MEMO TO: line information and to expand selections on activity picklist.</td>
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<td>Division “B” Watermains Section B6 Amend Form 5.6 to update contact information</td>
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<td>Division “C” Transportation and Roadworks, Section C3 Standard Drawings - added Drawing R-16, “Private Road – “T” Turnaround Minimum Standard” and updated Index Section C3 to add drawing R-16 to list of drawings</td>
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| 40              | February 2016 | 1. Division “C1” Transportation and Roadworks, Roadworks – added new section, C1.7 “Pedestrian and Cycling Facilities”  
2. Division “C3” Transportation and Roadworks, Standard Drawings – added 15 new drawings R17A to R22B which are related to Section C1.7  
3. Division “C” Transportation and Roadworks, Index – updated index to include #1 and 2 above  
4. Division “F” Development Submission Standards, Section F9 – updated Section F9.5 “Specifications for Digital Submission of Draft Approved M-Plan” – updates to Digital Plan Specifications and provided new contact information  
5. Appendix “1” Committee Members updated with more current contacts |
| 41              | April 2016   | 1. Street Lighting standards updated to reflect new LED requirements and moved to Division “E” Utilities, Section E4  
2. Pedestrian & Cycling Facilities, previously Section C1.7 in Division “C” changed to Section C1.6  
3. Division “C” Index modified to reflect above changes  
4. Parking Lot Lighting Standards added to Division “E Utilities as Section E5  
5. Parks and Sports Lighting Standards added to Division “E” Utilities as Section E6  
6. Division “E” Index modified to reflect above changes |
DIVISION "A"

SEWERS
# DIVISION "A"

## SEWERS

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#### SEWERS

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DIVISION "A"

SECTION A1

SEWERS

DESIGN CRITERIA

STORM SEWERS
DIVISION “A” SECTION A1

DESIGN CRITERIA STORM SEWERS

1. DESIGN FLOWS AND WATERSHED AREAS

The watershed area shall be determined from contour plans and will include all areas that naturally drain into the system and all external areas not provided for in adjacent storm drainage areas, as well as, other areas which may become tributary by reason of regrading. The former information may be obtained from the Town.

Maintenance holes will be the tributary points in design and areas tributary to each maintenance hole will be clearly outlined on the storm drainage area plan and the area in hectares (to the closest tenth) clearly shown, with the impervious coefficient as follows:

\[
\text{Thus} \quad \frac{4.6 \text{ ha}}{0.5}
\]

In cases where the areas of different impervious coefficients may be tributary to one maintenance hole, the areas tributary to the maintenance hole will be individually outlined with small arrows from boundary line of the area showing the direction to the maintenance hole.

In determining tributary areas to maintenance holes, the proposed grading of lots must be considered and taken into account in order to maintain consistency in design.

In the case of large areas under single ownership, such as a shopping centres, apartment developments, schools etc., the design will be prepared on the basis of the entire area being tributary to a maintenance hole in an abutting storm sewer unless more than one sewer connection will be necessary to serve the property in question, in which case, the appropriate area tributary to each sewer connection will be clearly shown and taken into account in the design of the storm sewer.

In lieu of precise information on development on the whole or any part of a watershed area, reference will be made to the latest zoning plan issued by the Planning Department in order to select the correct values of impervious coefficient to be used in the design and the areas to which they will be applied.
2. **DESIGN**

2.1 **Runoff Quantity**

The design of the storm sewers shall be computed on the Town's Standard Design Sheet ST-9A. All storm sewer minor system designs shall be based on a 5 year frequency unless otherwise directed by the Town.

a) All storm sewers shall be designed according to the rational formula where:

\[
Q = \frac{Ai}{360}
\]

Where

- \( Q \) = Runoff quantity in M³/Sec.
- \( A \) = Area in hectares (ha)
- \( i \) = Average rainfall intensity in mm/hr.
- \( R \) = Runoff coefficient

b) The value for rain fall intensity shall be calculated in accordance with the following:

<table>
<thead>
<tr>
<th>Return Frequency</th>
<th>Intensity</th>
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<tr>
<td>2 yr. :</td>
<td>( i = 641(T+4)^{-0.7821} )</td>
</tr>
<tr>
<td>5 yr. :</td>
<td>( i = 991(T+4)^{-0.8080} )</td>
</tr>
<tr>
<td>10 yr. :</td>
<td>( i = 1129(T+4)^{-0.8191} )</td>
</tr>
<tr>
<td>25 yr. :</td>
<td>( i = 1530(T+4)^{-0.8287} )</td>
</tr>
<tr>
<td>50 yr. :</td>
<td>( i = 1752(T+4)^{-0.8337} )</td>
</tr>
<tr>
<td>100 yr. :</td>
<td>( i = 1977(T+4)^{-0.8382} )</td>
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The Commissioner will determine which storm sewers will be designated as trunk storm sewers. Values for the runoff coefficient "R" are as follows:

- Commercial areas 0.7 - 0.8
- Heavily developed areas 0.7
- Industrial areas 0.7 - 0.75
- Schools, churches, institutions 0.5 - 0.7
- Apartments and medium density 0.5
- Townhouses 0.65
- Semi detached residential 0.55
- Single family residential 0.45
- Parks, cemeteries, recreation 0.3

c) The design for minor water courses, associated culverts and structures will be designed to a twenty-five (25) year storm frequency unless otherwise directed by the Town of Richmond Hill or the Toronto and Region Conservation Authority.
2.2 **Pipe Capacity**

Manning's Formula will be used to compute the capacity of storm sewers. The capacity of the sewer will be calculated on a basis of the pipe flowing full. A 10 minute entry time will be allowed at the head of the system.

The sewers will be designed according to the Manning equation:

\[ Q = \frac{1.00 \times R^{2/3} \times S^{1/2} \times A}{n} \]

and

\[ V = \frac{1.00 \times R^{2/3} \times S^{1/2}}{n} \]

Where:
- \( Q \) = flow m³/sec.
- \( A \) = nominal cross-sectional area of the sewer (m²)
- \( R \) = hydraulic radius (m)
- \( S \) = slope of pipe (m/m)
- \( n \) = roughness coefficient as noted below

2.3 **Roughness Coefficients**

The roughness coefficients to be used for storm sewer pipes will be:

- a) concrete pipe: \( n = 0.013 \) for all sizes of pipes
- b) PVC pipe: \( n = 0.013 \) for all sizes of pipes
- c) corrugated metal (culvert use only): \( n = 0.024 \) for all sizes of pipes
- d) corrugated metal (culvert use only): \( n = 0.021 \) for all sizes of pipes (smooth flow)

2.4 **Velocity**

Minimum 0.8m per second
Maximum 5.0m per second

2.5 **Minimum Size of Pipe**

Sewer mains = 300 mm

- Catch basin connections: single catch basin = 200 mm
double catch basin = 250 mm
rear lot catch basin = 250 mm
2.6 **Minimum Depth**

The depth will be sufficient to provide a suitable outlet for the building foundation weeping tile. The minimum cover to the pipe obvert will be 1.5m, or to provide 1.0m clearance between the 25 year hydraulic grade line (H.G.L.) and foundation drains whichever is greater.

2.7 **Maintenance Holes**

a) Maintenance holes shall be provided at each change in alignment, grade, material and at all junctions, except where radius pipe is used in sizes 1050 mm diameter and over.

b) Maintenance holes shall be spaced at a maximum of:
   - 110m for 300 mm diameter to 750 mm diameter
   - 120m for 825 mm diameter to 1200 mm diameter
   - 150m for pipe sizes over 1200 mm diameter

c) Type and size of maintenance holes shall be specified on the profiles and a detail of the benching will be shown on the plan portion of the drawing for cases when the benching differs from the Town Standard.

d) All maintenance hole openings shall be located on the upstream side of the manhole.

e) The change in direction of flow in any maintenance hole shall not be more than 90°.

f) The maximum change in direction of flow in maintenance holes for sewer sizes greater than 525mm shall be 45°.

g) The minimum drop across a maintenance hole for all straight runs is 30 mm, all junctions up to 45° - 75 mm and from 45° to 90° - 150 mm.

h) Where the difference in elevation between the inlet and outlet pipes requires a drop structure, it shall be as designed in accordance with Standard Drawing ST-1A.

i) Obvert elevations shall be matched at locations where pipe sizes change.

j) All maintenance holes shall be benched to the crown of all pipes on a vertical projection from the spring line.

k) All benching inside maintenance holes shall be a minimum of 230 mm in width.

l) No maintenance holes shall be located closer than 1.5m from any curb face or other utility.

m) Although the Standard Drawings provide details for maintenance holes up to certain maximum depths; the Consulting Engineer will analyze individually each application of the standards, related to soil conditions, loading and other pertinent factors to determine structure suitability. In all cases where the standards are not applicable, maintenance holes must be individually designed and detailed.
n) When any horizontal dimension of a maintenance hole exceeds 2.4m, the structure must be designed and individually detailed.

o) A minimum vertical clearance of 300 mm will be provided between the outside of all pipe barrels at all points of pipe crossings. Where the minimum clearance cannot be obtained, the crossing is to be encased in 15 MPa concrete.

2.8 Catchbasins

a) Standard catchbasin designs are illustrated on the Standard Drawings.

b) Special catchbasins and inlet structures will be fully designed and detailed.

c) Catchbasins shall be selected, located and spaced in accordance with the conditions of the design. The recommended maximum spacing is as follows:

<table>
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<th>Pavement Width</th>
<th>&lt; 4% grade</th>
<th>&gt; 4% grade</th>
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<td>7.3 m to 8.5 m</td>
<td>90m</td>
<td>60m</td>
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<tr>
<td>8.5 m to 9.80m</td>
<td>82m</td>
<td>55m</td>
</tr>
<tr>
<td>9.80m to 12.20m</td>
<td>73m</td>
<td>50m</td>
</tr>
<tr>
<td>12.20m to 14.00m</td>
<td>60m</td>
<td>40m</td>
</tr>
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The spacing of catch basins may be altered for grades over 4% for special cases, by using side inlet catchbasins. Double catchbasins are required where drainage is received from more than one direction.

d) At street intersections, catchbasins shall be located immediately upstream of sidewalk or pedestrian crosswalks.

e) Catchbasins shall not to be located within driveways or sidewalks and walkway curb depressions.

f) Catchbasins and connections shall be designed to capture the expected maximum flow.

For Single Catchbasins, the connection shall not be less than 200 mm diameter pipe laid at 0.70% minimum grade.

For Double Catchbasins, the connection shall not be less than 250 mm diameter pipe laid at 0.70% minimum grade.

g) Where concrete pipe is used all catchbasins shall have "Extra Strength" leads and Tees.
2.9 Pipe

a) The class of pipe and type of pipe bedding will be shown on the profile of all lengths of sewer.

b) All storm sewers will be located as shown on the appropriate road cross-section standard.

c) All storm sewers will be laid in a straight line between manholes except where radius pipe is permitted.

d) The pipe size will not decrease from a larger size upstream to a smaller size downstream regardless of the increase in grade.

e) Radius pipe will be permitted in sizes 1050 mm and over. The minimum radius will be 15 times the pipe diameter.

f) Pipe bedding and class will be designed to suit loading conditions. The class, strength, size and bedding will be shown on the profiles.

g) Risers will be constructed when the invert of a sewer exceeds 4.5m in depth. No riser will exceed 3.0m in height unless approved by the Town.

3.1 MATERIALS

a) All concrete sewer pipe shall conform to OPSS latest revision.

b) All mainline concrete sewer pipe shall be reinforced as per OPSS minimum 65D (Class III).

c) Catchbasin concrete sewer pipe less than 300mm dia. shall be non-reinforced as per OPSS Class 3 (extra strength).

3.2 Maintenance holes shall be constructed as follows:

i) Precast concrete according to OPSD

ii) Poured in place structures shall be individually designed and detailed by a qualified Structural Professional Engineer.

3.3 All frames and grates shall be cast iron and North American made.
4. SPECIAL STRUCTURES

4.1 Inlet and outfall structures, including headwalls shall be designed and detailed by a Structural Engineer.

4.2 Grates will be provided on all inlet and outlet structures and shall be designed and detailed when standard drawings are not appropriate. In general, inlet grates will consist of inclined parallel bars or rods set in a plane slope approximately 45° away from and in the direction of the flow. Outlet grates will consist of horizontal bars or rods. Spacing of bars or rods shall not exceed 150 mm clear. All metal parts will be adequately protected against rusting.

4.3 All drainage works will require sediment control during construction periods, and permanent installations may be required. Facilities shall be located for easy access by maintenance vehicles, and sediment shall be removed whenever the storage volume is reduced to 40% of required volume.

4.4 All drainage works shall be designed to control erosion and the impairment of water quality on receiving streams as a result of urban storm water run-off.

4.5 Connection of roof leaders to the storm sewer system is not permitted.
DIVISION “A” SECTION A1.1
DESIGN CRITERIA - STORM SERVICE CONNECTIONS

1. GENERAL

1.1 Storm service connections shall be installed to service each lot, block and unit in the subdivision. The connections are to be constructed to the property line.

1.2 The services shall be installed in accordance with Standard Drawings.

2. STORM SERVICE CONNECTIONS

2.1 The connection to the main line sewer will be made with an approved manufacturer's tee for main sewer sizes up to and including 450 mm.

2.2 The type and size of pipe shall be:

   a) Single Family and Semidetached Units - minimum 150 mm extra strength concrete pipe (Class 3) with approved rubber gasket joints or white PVC DR-28 conforming to OPSS.

   b) Multiple Family and Other Blocks, Commercial, Industrial and Institutional areas to be sized individually according to the intended use.

2.3 A 150 mm x 150 mm cast iron or PVC fitting with a test plate marked "Storm" shall be installed by the owner on the street line. A plugged stub section will be installed within the private property.

2.4 The minimum depth at the street line will be 1.8m and the maximum depth 2.4m measured from the final centre line road elevation.

   Risers will be used when the invert depth of the sewer main exceeds 4.5m. Risers will not exceed 3.0m in height without approval of the Town.

2.5 Service connections shall not be connected to a catchbasin.

2.6 Parking lots, driveways and/or other hard surfaced areas servicing multiple family, commercial and other blocks, will be serviced by an internal drainage system (including catch basins, manholes and pipe) which will connect to the storm sewer system or other suitable out fall as determined by the Town.

2.7 A maintenance hole will be required for all connections to multiple family, industrial, commercial institutional and parks. The maintenance hole will be located at the street line. The connection obverts shall be matched with main sewer obvert wherever possible.

2.8 Minimum velocity - 0.75m/second
Maximum velocity - 3.65m/second
3. **LOCATIONS**

3.1 Residential storm sewer connections shall be located, as per Town Standard M-2A, (Section G) and S-2A.

3.2 Service connections shall not be constructed within driveways unless otherwise approved by the Town.
DIVISION "A"

SECTION A2

SEWERS

DESIGN CRITERIA

SANITARY SEWERS
DIVISION “A” SECTION A2

DESIGN CRITERIA - SANITARY SEWERS

1. DESIGN FLOW

The sanitary sewer flow shall be calculated in accordance with land use and population densities. This information may be obtained from the Town.

Maintenance holes will be the tributary points in design and areas tributary to each maintenance hole shall be clearly outlined on the sanitary sewer drainage area plan. In lieu of precise information on development on the whole or any part of a watershed area, reference will be made to the latest zoning plan issued by the Planning Department.

1.1 Residential

Sewage flows shall be calculated on the basis of:

Average Flow - 365 litres/person/day

Infiltration - 22,500 litres/gross/hectare/day

when foundation drains are connected to the storm sewer.

Calculated on the number of gross hectares contributory to the sanitary sewers including parks and valley land, if they are tributary. Design flows will be calculated on the Town of Richmond Hill Design Sheet. All design flows and design criteria are in cubic metres.

2.1 POPULATION DENSITY

Peaking Factor

\[ KH = 1 + \frac{14}{4 + \sqrt{P}} \]

KH - Maximum 3.8

Minimum 1.5

KH - Harmon peaking factor

P - Population in thousands
2.2 Pre-Draft Plan Lands

<table>
<thead>
<tr>
<th>Type of Housing</th>
<th>Persons/Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached, Semidetached and Townhouse Mix</td>
<td>52</td>
</tr>
<tr>
<td>Apartment</td>
<td>99</td>
</tr>
</tbody>
</table>

2.3 Post-Draft Plan Lands

<table>
<thead>
<tr>
<th>Type of Housing</th>
<th>Persons/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single &amp; Semi detached</td>
<td>3.8</td>
</tr>
<tr>
<td>Townhouses</td>
<td>3.4</td>
</tr>
<tr>
<td>Apartments</td>
<td>2.7</td>
</tr>
</tbody>
</table>

2.4 Pre-Secondary Plan Lands

Future land use and population will be based on official plans and secondary plans of the municipality.

When such information is not available for the land to be developed, the following standard will be used.

**Land Use for 100 Hectares of Developable Lands**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Persons/Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Open Space</td>
<td>10.3 gross residential hectare</td>
</tr>
<tr>
<td>Residential</td>
<td>74.3 gross residential hectare</td>
</tr>
<tr>
<td>Commercial</td>
<td>5.1 gross residential hectare</td>
</tr>
<tr>
<td>Schools and Institutions</td>
<td>10.3 gross residential hectare</td>
</tr>
</tbody>
</table>

3.1 Commercial

a) Average Flow: 180,000 litres/floor hectares/day including infiltration and peaking effect.

b) Floor space index: 0.50 of gross land area, unless designated otherwise in the secondary plan.
c) The area is calculated using the number of gross hectares of the commercial lot. The flow criteria will apply unless evidence exists which will require additional treatment or provide additional volume.

3.2 Industrial

Average Flow: 180,000 litres/floor hectares/day including infiltration and peaking effect.

The area is calculated using the number of gross hectares included in the industrial block or development.

The flow criteria will apply unless evidence exists which will require additional treatment or provide additional volume.

3.3 Schools and Institutions

Average Flow: 180,000 litres/gross hectare/day including infiltration and peaking effect.

Where the total floor area does not exceed the size of the lot, the area is calculated using the number of gross hectares included in the school or the institutional site.

This flow figure will apply unless evidence exists which will require additional treatment or the provision of additional volume.

4. SEWER DESIGN

4.1 Pipe Capacities

Sewer capacities will be computed by using Manning's Formula on a basis of sewer pipe flowing full.

4.2 Roughness Coefficients

For all sizes and pipe material, \( n = 0.013 \)

4.3 Velocity and Grade

Minimum velocity 0.75m/second
Maximum velocity 3.65m/second
Minimum grade 0.5% for all local sewers
Minimum grade of the first upstream leg 1.0%

Velocity change from one pipe to another in a manhole will not exceed 0.60m/second.
4.4 **Minimum Size**

The first leg of a sanitary sewer will be sized at 200 mm. All other lengths will be a minimum of 250 mm diameter.

Measured from the final centerline, finished road elevation to the sewer obvert will be:

- Residential areas - minimum 2.5m
- Industrial areas - minimum 2.5m
- Commercial areas - minimum 3.65m

4.5 **Maintenance Holes**

a) Maintenance holes will be provided at each change in alignment, grade, material and at all junctions, except where radius pipe is used in sizes 1050 mm diameter and over.

b) Maintenance holes will be spaced at a maximum of 110 m for 250 mm diameter to 750 mm diameter, a maximum of 120 m for 825 mm diameter to 1200 mm diameter and a maximum of 150 m for pipe sizes over 1200 mm diameter.

c) Type and size of maintenance holes will be specified on the profiles and a detail of the benching will be shown on the plan portion of the drawing for cases when the benching differs from the Town Standard.

d) All maintenance hole openings will be located on the upstream side of the chamber.

e) The maximum change in the direction of flow in any sanitary sewer maintenance hole shall be 90°.

f) A sufficient drop will be provided across the maintenance hole to compensate for energy losses due to changes in flow direction and velocity.

g) Where the difference in elevation between the maintenance hole inlet and outlet pipes exceed 600 mm, a drop structure shall be provided as per Standard Drawings. Where the drop is between 200 mm and 600 mm, the pipe grades shall be adjusted, such that the maximum drop is 200 mm. No internal drop structures will be permitted for main line sewer.

h) The obverts on the upstream side of a maintenance hole will in no case be lower than those on the downstream side.

i) All maintenance holes shall be benched to the spring line for pipe sizes up to 300 mm and to the obvert level for pipes over 300 mm in diameter.

j) All benching inside maintenance holes shall be a minimum of 225 mm in width.
k) No maintenance hole shall be located closer than 1.50m from any curb face or other service.

l) Although the Standard Drawings provide details for maintenance holes up to certain maximum depths, the Consulting Engineer will analyze, individually, each application of the standards related to soil conditions, loading and other pertinent factors to determine structure suitability. In all cases where the standards are not applicable, maintenance holes must be individually designed and detailed.

m) When any dimension of a maintenance hole exceeds those on Standard Drawings, the maintenance hole must be designed and individually detailed.

n) A minimum clearance of 300 mm shall be provided between the outside of all pipe barrels at all points of pipe crossings. Where the minimum clearance cannot be obtained, the crossing is to be encased in 15 MPa concrete.

o) A minimum clearance of 2.5m horizontally shall be provided between the outside pipe barrels of sanitary sewer pipes and watermain pipes, as per the M.O.E. requirements.

p) Maintenance holes shall be required at the street line for all sanitary service connections to commercial, industrial, institutional and multiple residential blocks.
1. **GENERAL**

1.1 Complete sanitary service connections shall be installed in accordance with Town Standards to service each lot, block and unit.

2 **SANITARY SEWER CONNECTION**

2.1 The connection to the main sewer will be made with an approved manufacturer's tee.

2.2 The type of pipe and size will be:

   a) Single Family units - minimum 125 mm PVC
   
   b) Semidetached units - minimum 125 mm individual PVC
   
   c) Multiple Family and Other Blocks, Commercial/Industrial and Institutional areas will be sized individually according to the intended use and the requirements of the Ontario Plumbing Code.
   
   d) PVC sanitary service connections shall be of any color other than white or blue.

2.3 A 125 mm x 100 mm Cast Iron or PVC test fitting shall be installed by the owner on the street line and a stub section with a plug will be installed within the private property. The test plate located on top of the fitting will be clearly marked Ss "Sanitary".

2.4 The minimum depth of services for residential units at street line shall be 2.4m and the maximum depth 3.0m, measured from the final centerline road elevation. Risers will be used when the invert depth of the sewer main exceeds 4.5m. and will not exceed 3.0m in height without approval of the Town.

2.5 Minimum low flow velocity - 0.75m/sec.
Maximum velocity - 3.0m/sec.

2.6 The grade for sanitary sewer connection shall be a minimum of 2%.

2.7 A maintenance hole will be required for all connections to a multiple family, industrial, institutional, commercial and other blocks. The maintenance hole will be located at the street line. The connection obverts shall be matched with the main sewer overt.
3. **LOCATIONS**

3.1 Residential sanitary sewer connection shall be located, as per Town Standards.

3.2 Services will not be permitted within driveways unless otherwise approved by the Town.
DIVISION "A"

SECTION A3

SEWERS

SPECIFICATIONS

STORM AND SANITARY SEWERS
DIVISION "A" SECTION A3.1  
(OPSS DIVISION 4)  
CONSTRUCTION SPECIFICATIONS - DRAINAGE AND TUNNELS

<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>405</td>
<td>PIPE SUBDRAINS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>407</td>
<td>CONSTRUCTION OF MAINTENANCE HOLES, DITCH INLETS AND</td>
<td>407.07.02</td>
<td>1. Delete references to C.S.P. as an alternative</td>
</tr>
<tr>
<td></td>
<td>VALVE CHAMBERS</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>407.07.14</td>
<td>1. Delete this section completely.</td>
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<tr>
<td></td>
<td></td>
<td>407.07.17</td>
<td>1. Delete all reference to brick adjustment units.</td>
</tr>
<tr>
<td>408</td>
<td>ADJUSTING OR REBUILDING MAINTENANCE HOLES,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CATCHBASINS, DITCH INLETS AND VALVE CHAMBERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>410</td>
<td>PIPE SEWER CONSTRUCTION BY OPEN CUT METHOD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>412</td>
<td>SEWAGE FORCEMAIN CONSTRUCTION BY OPEN CUT METHOD</td>
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<td></td>
</tr>
<tr>
<td>415</td>
<td>TUNNELLING</td>
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</tbody>
</table>
### DIVISION "A" SECTION A3.1
(OPSS DIVISION 4)
CONSTRUCTION SPECIFICATIONS - DRAINAGE AND TUNNELS

<table>
<thead>
<tr>
<th>OPSS</th>
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<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>416</td>
<td>JACKING AND BORING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>421</td>
<td>PIPE CULVERTS</td>
<td></td>
<td>1. Asbestos cement, Vitried Clay, PVC and P.E. pipe products shall not be used for culvert installations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. Concrete pipe shall not be used for driveway culvert installations.</td>
</tr>
</tbody>
</table>
**DIVISION "A" SECTION A3.2  
(OPSS DIVISION 5)  
CONSTRUCTION SPECIFICATIONS - MISCELLANEOUS**

<table>
<thead>
<tr>
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<th>DESCRIPTION</th>
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<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>501</td>
<td>COMPACTING</td>
<td></td>
<td>1. All earth materials placed within 1.0m of road sub-base and in all fill areas shall be compacted to 98% Standard Proctor Density.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>504</td>
<td>PRESERVATION, PROTECTION AND RECONSTRUCTION OF EXISTING FACILITIES</td>
<td></td>
<td>1. This specification shall be read in conjunction with the Town of Richmond Hill’s Works Department Manual of Construction Requirements for the Installation and Maintenance of Underground Utilities and Services.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>507</td>
<td>SITE RESTORATION FOR UNDERGROUND UTILITIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>510</td>
<td>THE DEMOLITION AND REMOVAL OF STRUCTURES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>511</td>
<td>RIP-RIP, ROCK PROTECTION AND GRAVEL SHEETING</td>
<td></td>
<td></td>
</tr>
<tr>
<td>512</td>
<td>INSTALLATION OF GABIONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>514</td>
<td>TRENCHING, BACKFILLING AND COMPACTING</td>
<td></td>
<td>1. All earth materials placed within 1.0m of a road sub-base and in all fill areas shall be compacted to 98% Standard Proctor Density.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2. All granular material placed shall be compacted to 100% Standard Proctor Density.</td>
</tr>
<tr>
<td>OPSS</td>
<td>DESCRIPTION</td>
<td>SUBSECTION NO.</td>
<td>COMMENT</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>----------------</td>
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</tr>
<tr>
<td>515</td>
<td>ROCK EXCAVATION FOR PIPELINES AND ASSOCIATED STRUCTURES IN OPEN CUT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>516</td>
<td>EXCAVATING, BACKFILLING AND COMPACTING FOR MAINTENANCE HOLES, CATCHBASINS, DITCHES AND VALVE CHAMBERS</td>
<td>516.05.04</td>
<td>Granular material Shall read: Granular &quot;B&quot; conforming to OPSS 1010 shall be used for backfill around all structures.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>516.07.08</td>
<td>Within travelled portion of roadways granular backfill placed within 600mm of sub-grade shall be compacted to 98% Standard Proctor Density.</td>
</tr>
</tbody>
</table>
|      |             | 516.07.11 | 1. Amend to read: "for all rigid pipe installation.  
2. Amend to read: "to be used as approved or as instructed by the Town's Engineer.  
3. Amend to read: "for all flexible pipe installations. |
<p>| 517  | DEWATERING |               |         |
| 518  | CONTROL OF WATER |               |         |
| 538  | SHORING AND BRACING |               |         |
| 539  | PROTECTION SCHEMES |               |         |</p>
<table>
<thead>
<tr>
<th>OPSS</th>
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<th>SUBSECTION NO.</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>1004</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES - MISCELLANEOUS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1010</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES - GRANULAR A, B, M AND SELECT SUBGRADE MATERIAL</td>
<td>1010.01</td>
<td>Reclaimed material shall not be used.</td>
</tr>
</tbody>
</table>
**DIVISION "A" - SECTION A3.4**  
(OPSS DIVISION 13)  
MATERIALS SPECIFICATIONS - CEMENT AND CONCRETE

<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1351</td>
<td>COMPONENTS FOR PRECAST CONCRETE CATCHBASINS, MAINTENANCE HOLES, DITCH INLETS AND VALVE CHAMBERS</td>
<td>1351.05.06</td>
<td>Amend to read: &quot;Steel steps plastic encased or not, shall not be used in the Town&quot;</td>
</tr>
<tr>
<td>1369</td>
<td>MATERIAL SPECIFICATION FOR UNSHRINKABLE BACKFILL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

April 1998
Page 6
### DIVISION "A" - SECTION A3.5  
(OPSS DIVISION 14)  
MATERIAL SPECIFICATIONS - METAL

<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>1430</td>
<td>MATERIAL SPECIFICATION FOR GABION BASKETS AND MATS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OPSS</td>
<td>DESCRIPTION</td>
<td>SUBSECTION NO.</td>
<td>COMMENT</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------</td>
<td>----------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>1810</td>
<td>CLAY PIPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1820</td>
<td>CIRCULAR CONCRETE PIPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1830</td>
<td>ASBESTOS - CEMENT PIPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1840</td>
<td>POLYETHYLENE PIPE PRODUCTS</td>
<td></td>
<td>This product may be used for road sub-drain installations only.</td>
</tr>
<tr>
<td>1841</td>
<td>POLYVINYL CHLORIDE (PVC) PIPE PRODUCTS</td>
<td></td>
<td>This product is not to be used for pipe culvert installations.</td>
</tr>
<tr>
<td>1842</td>
<td>POLYETHYLENE PRESSURE PIPE</td>
<td></td>
<td>This product is not to be used for watermain installations.</td>
</tr>
<tr>
<td>1850</td>
<td>FRAMES, GRATES, MAINTENANCE HOLES, COVERS AND WELDED AND RIVETED STEEL GRATINGS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1860</td>
<td>MATERIAL SPECIFICATION FOR GEOTEXTILES</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DIVISION "A"

SECTION A4

SEWERS

TOWN OF RICHMOND HILL
STANDARD DRAWINGS
STORM AND SANITARY
SEWERS
NOTES
1. DROP PIPE TO BE MINIMUM OF ONE SIZE SMALLER THAN INLET PIPE.
2. DROP PIPE TO BE CROWNS LEVEL WITH OUTLET PIPE AND BENCH TO CROWN.
3. DROP PIPE TO BLEND WITH FLOW.
4. DROP STRUCTURE TO BE ENCASE WITH A MINIMUM OF 150mm OF 20MPa CONCRETE & DOWELLED TO MANHOLE WITH 15m DOWELS 460mm LONG, EITHER SIDE OF DROP PIPE & AT 305mm C TO C HORIZONTALLY.
5. VELOCITY TO BE CALCULATED ON ACTUAL DEPTH OF FLOW IN MAIN LINE NOT ON PIPE CAPACITY.
6. WHEN USED ON STORM SEWERS OR SANITARY SEWERS 375mm DIA OR LARGER, A 15mm STOPPER MAY INSERT IN THE INVERT OF THE MAIN LINE AS INDICATED.
7. ADJUSTMENT IN 'D' & 'L' TO BE MADE WITH PLAIN END STRAIGHT PIPE.
8. WHERE 'Y' FITTING JOINS PIPE, A 300mm X 150mm THICK 20MPa COLLAR IS TO BE CONSTRUCTED.
9. ALL CONCRETE IN DROP STRUCTURE TO BE 20MPa AT 28 DAYS.
10. MINIMUM DIMENSIONS BASED ON USE OF STANDARD CONCRETE FITTINGS AS PER LATEST INFORMATION BY SUPPLIERS.
11. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURER'S PERMISSIBLE VARIATIONS ± 50mm PER FITTING.
12. FOR SANITARY SEWER INSTALLATION SEE OPSD 1003.01

TABLE OF MINIMUM DIMENSIONS & MAXIMUM VELOCITIES

<table>
<thead>
<tr>
<th>DROP PIPE (mm)</th>
<th>TYPE 'A'</th>
<th>TYPE 'B'</th>
<th>TYPE 'C'</th>
<th>MAX VELO. m/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>915</td>
<td>815</td>
<td>610</td>
<td>1220  1070 1.42</td>
</tr>
<tr>
<td>250</td>
<td>1015</td>
<td>840</td>
<td>645</td>
<td>1300  1070 1.55</td>
</tr>
<tr>
<td>300</td>
<td>1090</td>
<td>865</td>
<td>710</td>
<td>1450  1145 1.71</td>
</tr>
<tr>
<td>375</td>
<td>1170</td>
<td>915</td>
<td>915</td>
<td>1145  1220 1.92</td>
</tr>
<tr>
<td>450</td>
<td>1300</td>
<td>990</td>
<td>990</td>
<td>1220  1200 2.17</td>
</tr>
<tr>
<td>525</td>
<td>1425</td>
<td>1045</td>
<td>1065</td>
<td>1300  1200 2.36</td>
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<td>600</td>
<td>1525</td>
<td>1090</td>
<td>1145</td>
<td>1370  2440 1525 2.53</td>
</tr>
<tr>
<td>675</td>
<td>1625</td>
<td>1145</td>
<td>1220</td>
<td>1450  2515 1600 2.70</td>
</tr>
<tr>
<td>750</td>
<td>1730</td>
<td>1220</td>
<td>1300</td>
<td>1525  2670 1675 2.84</td>
</tr>
</tbody>
</table>

TOWN OF RICHMOND HILL
ENGINEERING DEPARTMENT

TYPICAL DROP STRUCTURES FOR STANDARD STORM MANHOLES

<table>
<thead>
<tr>
<th>STD. # CHANGED FROM ST-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUG94</td>
</tr>
</tbody>
</table>

STORM SEWER INSTALLATION ONLY

REVISION
DATE
AUTH
SECTION C-C

NOTES:
1. THIS FRAME AND GRATE IS NOT TO BE USED FOR YARD DRAINAGE ON RESIDENTIAL PROPERTIES.
2. THIS STD. IS NOT TO BE USED FOR BOULEVARD DRAINAGE

MCCOY FOUNDRY CO. LTD.,
STD. 5-A13 OR APPROVED EQUAL

HINGE PIN

TOWN OF RICHMOND HILL
ENGINEERING DEPARTMENT

PYRAMID TYPE
C.B. FRAME & COVER

SCALE: N.T.S.  DATE: FEB./80
DRAWN BY: R.M.  DWG. NO.: ST-3A
NOTES:

1. MATERIALS:
   Bearing bars - welding quality steel having the minimum tensile strength of 50 ksi.

2. FINISH:
   The grate shall be hot-dipped galvanized in accordance with CSA STD G164.

3. TOLERANCES:
   Tolerances shall be as shown in the Standard Specifications for Metal Grating and Metal Grating Treads of the Metal Grating Institute.

4. Standard Metal Grating Institute marking:
   RF - 37-5

5. WELDING:
   End bearing bars to be welded to angle bar along both legs with a 5 mm fillet weld.
   Other bearing bars to be spot welded on each end to the angle bar.

6. FASTENER:
   After manufacture, assembly (except bolt) shall be hot-dipped galvanized to CSA STD. G164.
   Bolt - only to receive a liberal coating of white non-staining grease.

<table>
<thead>
<tr>
<th>Grating Slope</th>
<th>Grating size</th>
<th>Ditch Inlet CB Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
<td>Width</td>
</tr>
<tr>
<td>2:1</td>
<td>770</td>
<td>770</td>
</tr>
<tr>
<td>3:1</td>
<td>770</td>
<td>770</td>
</tr>
<tr>
<td>4:1</td>
<td>770</td>
<td>770</td>
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<tr>
<td>2:1</td>
<td>1315</td>
<td>770</td>
</tr>
<tr>
<td>3:1</td>
<td>1315</td>
<td>770</td>
</tr>
<tr>
<td>4:1</td>
<td>770</td>
<td>770</td>
</tr>
</tbody>
</table>
LEGEND:

D - Diameter of pipe
W - Minimum width of bedding
  D + 760 for D ≤ 1065
  1.67 x D for D > 1065 and ≤ 1830
  D + 1200 for D > 1830

NOTES:

1. Bedding to be taken to spring line of pipe.
2. Pipe bed to be carefully shaped to receive the lowest segment of pipe to a depth equal to 10% of the pipe diameter.
3. For culverts, the upstream end of the pipe must be bedded in clay & properly compacted to prevent seepage.
4. Bedding material to be granular A, B, C or D. Stone size within 1 ft. of the surface of the pipe shall not exceed 75.
5. Compaction of bedding material - 95%.
NOTES:

1. FOR STD. SIDE INLET CATCH BASIN FRAME & GRATE SEE OPSD 400.08
2. USE 30MPa CONCRETE WITH 5%-7% AIR ENRAINTMENT.
3. LIFT HOLES IF REQ'D SHALL BE GROUTED WITH CEMENT MORTAR PRIOR TO PLACING GRANULAR BACKFILL.
4. REINFORCING 100 x 100 x 5/5mm WELDED WIRE MESH.
5. PRE-CAST CATCHBASIN EXCAVATION TO BE BACKFILLED WITH GRANULAR 'B'.
6. FOR SUBDRAIN DETAIL SEE ST-23.
7. SUBDRAIN IS TO BE LOCATED A MINIMUM OF 100mm BELOW THE ROAD SUBGRADE.
8. ADJUSTMENT UNITS TO BE MAX. 300mm
NOTES:
1. MATERIAL TO BE FIBERGLASS REINFORCED PLASTIC OR 3.6 STAINLESS STEEL UNLESS OTHERWISE DIRECTED.
2. ORIFICE OPENING TO BE DESIGN ON A SITE SPECIFIC BASES.

SECTION A-A

356mm x 381mm x 10mm THICK PLATE

419mm

TOWN OF RICHMOND HILL ENGINEERING DEPARTMENT
INLET CONTROL DEVICE (SLIDING TYPE)

SCALE: N.T.S. DATE: OCT. 1988
DRAWN BY: P.G. DWG NO.: ST-7 A

METRIC
NOTES:
1. Adjustment unit shall include ladder rungs to maintain the 300mm spacing between rungs as specified.
2. All dimensions are in millimetres unless otherwise shown.
<table>
<thead>
<tr>
<th>STREET</th>
<th>FROM</th>
<th>INVERT</th>
<th>TO</th>
<th>INVERT</th>
<th>AREA</th>
<th>ACCUM</th>
<th>I</th>
<th>Q</th>
<th>PIPES</th>
<th>GRADE</th>
<th>CAPACITY</th>
<th>VELOCITY</th>
<th>LENGTH</th>
<th>SECT_TIME</th>
<th>TOTAL_TIME</th>
<th>COMMENTS</th>
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</tbody>
</table>

RUNOFF COEFFICIENTS (R)

- 0.30: PARK - OPEN SPACE - CEMETARIES
- 0.7: HEAVILY DEVELOPED AREAS
- 0.45: SINGLE FAMILY RESIDENTIAL
- 0.65: TOWN HOUSES
- 0.70 - 0.75: INDUSTRIAL
- 0.50: APARTMENTS & MEDIUM DENSITY
- 0.7: COMMERCIAL

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPARTMENT

STORM SEWER DESIGN SHEET

DATE: APRIL 1999

DRAWN BY: PVG
FILE: ST-9A WK 4
DWG. NO.: ST-9A
NOTE:

1. SANITARY CONNECTION TO BE 125mm THROUGHOUT.

2. SERVICE CONNECTION IS NOT TO EXTEND INTO PRIVATE PROPERTY.

3. STORM CONNECTION TO BE 150mm THROUGHOUT UNLESS OTHERWISE DIRECTED.
NOTES:
1. CONNECTIONS TO BE DONE USING PREFABRICATED 'T' FOR NEW SEWER CAST IRON SADDLES FOR EXISTING SEWERS.
2. STORM & SANITARY CONNECTIONS TO BE ENGAGED IN 15 MPa CONCRETE AT MAIN SEWERS.
3. SEE OTHER APPLICABLE STANDARDS FOR ACCEPTABLE PIPE MATERIALS.
4. WHEN SERVICE LATERALS ARE INSTALLED AT DIFFERENT ELEVATIONS, GRANULAR 'B' BACKFILL TO BE PROVIDED FROM BOTTOM OF EXCAVATION TO SUPPORT UPPER LATERAL.
5. ALL TEST FITTINGS TO BE MARKED 'STORM' OR 'SANITARY'.
6. CONNECTIONS TO EXISTING SEWERS SHALL BE CORED.

ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED
NOTES

1. THIS STRUCTURE IS TO BE USED WHERE IT HAS BEEN SPECIFICALLY APPROVED BY THE TOWN OF R.H.
2. BENCHING AS PER STD. S-10.
3. ALL MANHOLE EXCAVATIONS TO BE BACKFILLED WITH GRANULAR B.
DIVISION "A"

SECTION A5

SEWERS

ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS
### DIVISION "A" SECTION A5.1  
(OPSD DIVISION 400)  
FRAMES AND GRATES

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
<th>REPLACES TOWN OF RICHMOND HILLS STD</th>
</tr>
</thead>
<tbody>
<tr>
<td>400.01</td>
<td>CATCHBASIN, CAST IRON, FRAME AND DISHED, SQUARE GRATE</td>
<td>1. Site specific approval for this frame and grate required.</td>
<td>ST-25</td>
</tr>
<tr>
<td>400.02</td>
<td>CATCHBASIN, CAST IRON, FRAME AND FLAT SQUARE GRATE</td>
<td>1. Site specific approval for this frame and grate required.</td>
<td>ST-13</td>
</tr>
<tr>
<td>400.08</td>
<td>CATCHBASIN, CAST IRON, SIDE INLET FRAME</td>
<td>1. Site specific approval for this frame and grate required.</td>
<td>ST-22</td>
</tr>
<tr>
<td>400.09</td>
<td>CATCHBASIN, CAST IRON, CURB INLET OVERFLOW PLATE</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>400.11</td>
<td>CATCHBASIN, CAST IRON, AND FLAT GRATE (PERFORATED) OVERFLOW TYPE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>401.01</td>
<td>MAINTENANCE HOLE, CAST IRON, COVER AND SQUARE FRAME</td>
<td>1. Type &quot;A&quot; cover to be stamped &quot;Sanitary Sewer&quot; or &quot;FDC Sewer&quot;.</td>
<td>ST-20, S-6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Type &quot;B&quot; cover to be used for Storm Sewer installations only.</td>
<td></td>
</tr>
<tr>
<td>401.03</td>
<td>MAINTENANCE HOLE, CAST IRON, WATERTIGHT COVER AND FRAME</td>
<td>1. To be used for all Storm and Sanitary Installations within Easements.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Covers shall be clearly stamped as to type of sewer installation.</td>
<td></td>
</tr>
</tbody>
</table>
**DIVISION "A" SECTION A5.1**  
(OPS D DIVISION 400)  
FRAMES AND GRATES

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<tbody>
<tr>
<td>402.01</td>
<td>CAST IRON CIRCULAR PLUG AND SQUARE FRAME FOR VALVE CHAMBERS</td>
<td>W-1</td>
<td></td>
</tr>
<tr>
<td>402.02</td>
<td>CAST IRON, RAISED FRAME WITH CIRCULAR COVER AND PLUG FOR VALVE CHAMBER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>402.03</td>
<td>THREE PIECE VALVE AND METER CHAMBER COVER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>404.020</td>
<td>SAFETY PLATFORMS ALUMINUM FOR CIRCULAR MAINTENANCE HOLES</td>
<td>1. Type &quot;B&quot; installations only are approved by Town.</td>
<td>ST-8</td>
</tr>
</tbody>
</table>
DIVISION "A" SECTION A5.2  
(OPSD DIVISION 700)  
CATCHBASINS AND MAINTENANCE HOLES

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
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</thead>
<tbody>
<tr>
<td>701.010</td>
<td>PRE-CAST MAINTENANCE HOLE 1200 mm DIAMETER</td>
<td>S-1</td>
</tr>
<tr>
<td></td>
<td>1. Backfill around manhole to be Granular &quot;B&quot;.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Adjustment units range to be 200mm minimum to 300mm maximum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. For flexible pipe type D or E, pipe support at manhole as per OPSD 1001.01 is to be used.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Benching, see OPSD 701.021; storm sewer benching to be to obvert of pipe.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. For sanitary sewers greater than 300mm dia. benching shall be to obvert of the pipe.</td>
<td></td>
</tr>
<tr>
<td>701.011</td>
<td>PRECAST MAINTENANCE HOLE 1500mm DIAMETER</td>
<td>S-13</td>
</tr>
<tr>
<td></td>
<td>1. Backfill around manhole to be Granular &quot;B&quot;.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Adjustment units range to be 200mm minimum to 300mm maximum.</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4. For sanitary sewers greater than 300mm dia. benching shall be extended to obvert of the pipe.</td>
<td></td>
</tr>
</tbody>
</table>
### DIVISION "A" SECTION A5.2  
(OPS D DIVISION 700)  
CATCHBASINS AND MAINTENANCE HOLES

<table>
<thead>
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<th>OPSD</th>
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</tr>
</thead>
<tbody>
<tr>
<td>701.012</td>
<td>PRE-CAST MAINTENANCE HOLE 1800 mm DIAMETER</td>
<td>1. Backfill around maintenance hole to be Granular &quot;B&quot;.</td>
<td>S-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Adjustment units range to be 200mm minimum to 300mm maximum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. For flexible pipe type D or E, pipe support at maintenance hole as per OPSD 1001.01 is to be used.</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>4. Benching, see OPSD 701.021; storm sewer benching to be to obvert of pipe.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. For sanitary sewers greater than 300mm dia. benching shall be extended to obvert of the pipe.</td>
<td></td>
</tr>
<tr>
<td>701.013</td>
<td>PRE-CAST MAINTENANCE HOLE 2400 mm DIAMETER</td>
<td>1. Backfill around maintenance hole to be Granular &quot;B&quot;.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Adjustment units range to be 200mm minimum to 300mm maximum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. For flexible pipe type D or E, pipe support at maintenance hole as per OPSD 1001.01 is to be used.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Benching, see OPSD 701.021; storm sewer benching to be to obvert of pipe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. For sanitary sewers greater than 300mm dia. benching shall be extended to obvert of the pipe.</td>
<td></td>
</tr>
</tbody>
</table>
**DIVISION "A" SECTION A5.2**  
(OPS D DIVISION 700)  
**CATCHBASINS AND MAINTENANCE HOLES**

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</tr>
</thead>
<tbody>
<tr>
<td>701.021</td>
<td>MAINTENANCE HOLE BENCHING DETAIL</td>
<td>1. Storm sewer maintenance holes shall be benched to crown of pipe.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Sanitary sewer maintenance holes shall be benched to springline of pipe for 300mm dia. and smaller and to obvert of pipe for 300mm dia. and larger.</td>
<td></td>
</tr>
<tr>
<td>701.030</td>
<td>PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 1200mm DIAMETER DEPTH TO 10.0m MAXIMUM</td>
<td>1. See 701.010</td>
<td>S-1</td>
</tr>
<tr>
<td>701.040</td>
<td>PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 1500mm DIAMETER DEPTH TO 10.0m MAXIMUM</td>
<td>1. See 701.011</td>
<td>S-13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Minimum 1.80m of head-room above spring line of sewer is required.</td>
<td></td>
</tr>
<tr>
<td>701.050</td>
<td>PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 1800mm DIAMETER DEPTH TO 10.0m MAXIMUM</td>
<td>1. See 701.012</td>
<td>S-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Minimum 1.80m of head-room above spring line of sewer is required.</td>
<td></td>
</tr>
<tr>
<td>701.060</td>
<td>PRECAST CONCRETE MAINTENANCE HOLE COMPONENTS 2400mm DIAMETER DEPTH TO 10.0m MAXIMUM</td>
<td>1. See 701.013</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Minimum 1.80m of head-room above spring line of sewer is required.</td>
<td>N/A</td>
</tr>
<tr>
<td>702.040</td>
<td>PRECAST CONCRETE DITCH INLET MAINTENANCE HOLE (TYPE A) 1200mm x 1200mm DIAMETER DEPTH TO 3.6m MAXIMUM</td>
<td>1. Cover to obvert of CB lead to be 760mm minimum.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Granular &quot;B&quot; backfill required around structure.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>3. OPSD 403.01 Grating is not approved for use in the Town. Use Town Std. ST-4A.</td>
<td></td>
</tr>
</tbody>
</table>
### DIVISION "A" SECTION A5.2
**(OPSD DIVISION 700)**
**CATCHBASINS AND MAINTENANCE HOLES**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>703.010</td>
<td>PRECAST CONCRETE SINGLE AND TWIN INLET FLAT CAP 1500mm DIAMETER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>703.020</td>
<td>PRECAST CONCRETE SINGLE INLET FLAT CAP 1800mm DIAMETER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>703.030</td>
<td>PRECAST CONCRETE SINGLE AND TWIN INLET FLAT CAP 2400mm DIAMETER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>705.010</td>
<td>PRECAST CONCRETE CATCHBASIN 600mm x</td>
<td>1. Min. 915mm cover (Type &quot;A&quot;) and min. 760mm 600mm cover (Type &quot;B&quot;) to obvert of catchbasin lead required. 2. Backfill to be Granular &quot;B&quot; around structure. 3. Weep holes are not be provided. 4. Perforated subdrains to be continuous from CB to CB (Type &quot;A&quot; only) and shall be 150mm diameter wrapped with filter fabric. 5. OPSD 403.01 Grating is not approved for use in the Town. Town Std. ST-4A shall be used instead.</td>
<td>ST-7, ST-8</td>
</tr>
<tr>
<td>705.020</td>
<td>PRECAST CONCRETE TWIN INLET CATCHBASIN 600MM X 1450MM</td>
<td>1. Min. 915mm cover to ST-9 2. Backfill to be Granular &quot;B&quot;. 3. Min. 250mm diameter lead required. 4. Weep holes are not to be provided. 5. Perforated sub-drain to be continuous from CB to CB (Type &quot;A&quot; only) and shall be 150mm dia. wrapped with filter fabric.</td>
<td></td>
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</tbody>
</table>
## DIVISION "A" SECTION A5.2
### (OPSD DIVISION 700)
#### CATCHBASINS AND MAINTENANCE HOLES

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</tr>
</thead>
<tbody>
<tr>
<td>705.030</td>
<td>PRECAST CONCRETE DITCH INLET 600mm x 600mm</td>
<td>1. Granular &quot;B&quot; backfill required around structure.</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Min. catchbasin lead size is 250mm dia.</td>
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<td></td>
<td>3. Min. 760mm cover to obvert of catchbasin lead is required.</td>
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<tr>
<td></td>
<td></td>
<td>4. OPSD 403.01 grating is not approved for use in the Town. Town Std. ST-4A shall be</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>used instead.</td>
<td></td>
</tr>
<tr>
<td>705.040</td>
<td>PRECAST CONCRETE DITCH INLETS 600mm x 1200mm</td>
<td>1. Min. 760mm cover to obvert of catchbasin lead required.</td>
<td>ST-10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Min. 250mm dia. lead required.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Backfill to be Granular &quot;B&quot; around structure.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. OPSD 403.01 grating is not approved for use in the Town. Town Std. ST-4A is to be</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>used instead.</td>
<td></td>
</tr>
<tr>
<td>706.010</td>
<td>PRECAST CONCRETE DITCH INLETS 600mm x 12mm WITH 1500mm DIAMETER FLAT CAP</td>
<td>1. OPSD 403.01 grating is not approved for use in the Town. Town Std. ST-4A shall be</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>used instead.</td>
<td></td>
</tr>
<tr>
<td>706.020</td>
<td>PRECAST CONCRETE DITCH INLETS 600mm x 12mm WITH 1800mm DIAMETER FLAT CAP</td>
<td>1. OPSD 403.01 grating is not approved for use in the Town. Town Std. ST-4A shall be</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>used instead.</td>
<td></td>
</tr>
</tbody>
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## DIVISION "A" SECTION A5.2
(OPS DIVISION 700)
CATCHBASINS AND MAINTENANCE HOLES

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<tbody>
<tr>
<td>706.030</td>
<td>PRECAST CONCRETE DITCH INLETS 600mm x 1200mm WITH 2400mm DIAMETER FLAT FLAT CAP</td>
<td>1. OPSD 403.01 grating is not approved for use in the Town. Town Std. ST-4A shall be used instead.</td>
<td>N/A</td>
</tr>
<tr>
<td>707.010</td>
<td>PRECAST CONCRETE MAINTENANCE HOLE TEE (DEPTH 10.0m MAXIMUM)</td>
<td>1. Granular &quot;B&quot; backfill required around structure.</td>
<td>N/A</td>
</tr>
<tr>
<td>708.01</td>
<td>CATCHBASIN CONNECTION RIGID PIPE SEWER</td>
<td>1. Mortar shall be 1:3 mortar mix</td>
<td>ST-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Main sewers &gt; 450mm diameter require approved saddle or &quot;Cut-in&quot; tee using Kor-N-Tee method or approved equal.</td>
<td></td>
</tr>
<tr>
<td>708.02</td>
<td>SUPPORT FOR RIGID PIPE AT CATCHBASIN OR MANHOLE</td>
<td>1. Class &quot;A&quot; bedding not required when flexible pipe is used.</td>
<td>N/A</td>
</tr>
<tr>
<td>708.03</td>
<td>CATCHBASIN CONNECTION - FLEXIBLE PIPE SEWER</td>
<td>1. Class &quot;A&quot; bedding not required.</td>
<td>ST-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Main sewers &gt; 450mm diameter require approved saddle or &quot;Cut-in&quot; tee using Kor-N-Tee method or approved equal.</td>
<td></td>
</tr>
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### DIVISION "A" SECTION A5.3
(OPSĐ DIVISION 800)
CULVERTS AND DRAINS

<table>
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<tr>
<th>OPSD</th>
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<th>ADDITION OR REVISION</th>
<th>REPLACES TOWN OF RICHMOND HILL STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.010</td>
<td>FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION</td>
<td>1. Embedment material shall be Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-19 W-12</td>
</tr>
<tr>
<td>802.013</td>
<td>FLEXIBLE PIPE EMBEDMENT AND BACKFILL ROCK EXCAVATION</td>
<td>1. Embedment material shall be Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-19 W-12</td>
</tr>
<tr>
<td>802.014</td>
<td>FLEXIBLE PIPE EMBEDMENT IN EMBANKMENT ORIGINAL GROUND: EARTH OF ROCK</td>
<td>1. Embedment material shall be Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-19 W-12</td>
</tr>
<tr>
<td>802.030</td>
<td>RIGID PIPE BEDDING COVER AND BACKFILL TYPE 1 OR 2 SOIL - EARTH EXCAVATION</td>
<td>1. Minimum bedding shall be Class &quot;B&quot; Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-11 W-13</td>
</tr>
<tr>
<td>802.031</td>
<td>RIGID PIPE BEDDING COVER AND BACKFILL TYPE 3 SOIL - EARTH EXCAVATION</td>
<td>1. Minimum bedding shall be Class &quot;B&quot; Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-11 W-13</td>
</tr>
<tr>
<td>802.032</td>
<td>RIGID PIPE BEDDING COVER AND BACKFILL TYPE 4 SOIL - EARTH EXCAVATION</td>
<td>1. Minimum bedding shall be Class &quot;B&quot; Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-11 W-13</td>
</tr>
<tr>
<td>802.033</td>
<td>RIGID PIPE BEDDING COVER AND BACKFILL ROCK EXCAVATION</td>
<td>1. Minimum bedding shall be Class &quot;B&quot; Granular &quot;A&quot; conforming to OPSS 1010 unless otherwise approved by the Town.</td>
<td>S-11 W-13</td>
</tr>
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</table>
## DIVISION "A" SECTION A5.3
(OPS D DIVISION 800)
CULVERTS AND DRAINS

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>803.01</td>
<td>GRANULAR BACKFILL FOR NON-RIGID FRAME OPEN OR BOX CONCRETE CULVERT</td>
<td>N/A</td>
</tr>
<tr>
<td>803.02</td>
<td>GRANULAR BACKFILL FOR RIGID FRAME BOX AND OPEN CONCRETE CULVERT</td>
<td>N/A</td>
</tr>
<tr>
<td>803.03</td>
<td>FROST TREATMENT - PIPE CULVERTS FROST PENETRATION LINE BELOW BEDDING GRADE</td>
<td>1. Plastic pipe shall not be used for culvert installations.</td>
</tr>
<tr>
<td>803.04</td>
<td>FROST TREATMENT - PIPE CULVERTS FROST PENETRATION LINE BETWEEN TOP OF PIPE AND BEDDING GRADE.</td>
<td>N/A</td>
</tr>
<tr>
<td>804.01</td>
<td>CONCRETE HEADWALL FOR SEWER OR CULVERT PIPE CSP 900mm DIA. AND GREATER</td>
<td>1. Where the finished grade difference between top of headwall and pipe invert $\geq$ 1.20m, a fence or safety railing shall be installed on the headwall.</td>
</tr>
<tr>
<td>OPSD</td>
<td>DESCRIPTION</td>
<td>ADDITION OR REVISION</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>804.02</td>
<td>CONCRETE HEADWALL FOR SEWER OR CULVERT PIPE 900mm DIAMETER AND GREATER</td>
<td>1. Where the finished grade difference between top of headwall and pipe invert $\geq 1.20m$, a fence or safety railing shall be installed on the headwall.</td>
</tr>
<tr>
<td>804.030</td>
<td>CONCRETE HEADWALL FOR SEWER OR CULVERT PIPE LESS THAN 900mm DIAMETER</td>
<td>1. Where the finished grade difference between top of headwall and pipe invert $\geq 1.20m$, a fence or safety railing shall be installed on the headwall.</td>
</tr>
<tr>
<td>804.04</td>
<td>CONCRETE HEADWALL FOR SEWER OR CULVERT PIPE</td>
<td>1. Where the finished grade difference between top of headwall and pipe invert $\geq 1.20m$, a fence or safety railing shall be installed on the headwall.</td>
</tr>
<tr>
<td>804.05</td>
<td>GRATING FOR CONCRETE ENDWALL</td>
<td>1. Type &quot;C&quot; grating shall not be used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. All components of gratings shall be hot-dip galvanized conforming to CAN2-138.1-M, CAN2-138.2-M and CAN2-138.4-M</td>
</tr>
<tr>
<td>805.01</td>
<td>SPECIFIED MINIMUM THICKNESS CORRUGATED STEEL PIPE AND STRUCTURAL PLATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CORRUGATED STEEL PIPE</td>
<td></td>
</tr>
</tbody>
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*(OPSD DIVISION 800)*  
CULVERTS AND DRAINS  

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<th>REPLACES TOWN OF RICHMOND HILL STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>805.02</td>
<td>SPECIFIED MINIMUM THICKNESS CORRUGATED STEEL PIPE ARCH AND STRUCTURAL PLATE</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CORRUGATED PIPE ARCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>806.06</td>
<td>MAXIMUM COVER TABLE PVC PIPE FOR DIFFERENT STANDARD DIMENSION RATIOS</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>807.01</td>
<td>SPECIFIED MINIMUM CLASS OF PIPE - REINFORCED CONCRETE PIPE CONFINED TRENCH</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CLASS: 50-D; 65-D; 100-D; 140-D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>808.01</td>
<td>PIPE PROTECTION AGAINST HEAVY CONSTRUCTION EQUIPMENT</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>810.01</td>
<td>RIP-RAP TREATMENT FOR SEWER AND CULVERT OUTLETS</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>810.02</td>
<td>RIP-RAP TREATMENT FOR DITCH INLETS</td>
<td>N/A</td>
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<th>REPLACES TOWN OF RICHMOND HILL STD.</th>
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</thead>
<tbody>
<tr>
<td>1001.02</td>
<td>PRECAST MAINTENANCE HOLE 1500mm - 1800mm Dia.</td>
<td>1. Backfill around manhole to be Granular &quot;B&quot;</td>
<td>S-13, S-14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Adjustment units range to be 200mm minimum to 300mm maximum.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. For flexible pipe type D or E, pipe support at manhole as per OPSD 1001.01 is to be used.</td>
<td></td>
</tr>
<tr>
<td>1003.01</td>
<td>MAINTENANCE HOLE DROP STRUCTURE TEE</td>
<td>1. OPSD 1003.01 to be used for sanitary sewer installations only.</td>
<td>ST-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Town Std. ST-1A to be used for storm sewer installations.</td>
<td></td>
</tr>
</tbody>
</table>
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(OPSD DIVISION 1000)
SANITARY SEWERS AND MANHOLES

REPLACES TOWN OF
RICHMOND HILL STD.

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<th>ADDITION OR REVISION</th>
<th>RICHMOND HILL STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1006.01</td>
<td>SEWER SERVICE CONNECTIONS - FOR RIGID PIPE</td>
<td>1. Cast iron test fittings (Crowle or approved equal) shall be installed at streetline for all sewer connections and clearly marked &quot;Storm&quot; or &quot;Sanitary&quot;. Fitting shall be as follows:</td>
<td>S-9, ST-2</td>
</tr>
</tbody>
</table>

   - Sanitary - 125 x 100mm
   - Storm    - 150 x 150mm

2. For vertical riser installations bedding and cover shall be HL8 graded limestone.

3. Maximum connection angle is 45° for both standard and vertical riser connections.

4. For sewer invert depths exceeding 4.5m, risers shall be used. Risers shall not exceed 3.0m in height without prior approval of the Town.

5. Bedding shall be as follows:

   - Storm - OPSD 802.03 Class "B"
   - Sanitary - OPSD 1005.01 Class "B"

   unless otherwise directed by the Engineer.
DIVISION "A" SECTION A5.4  
(OPSD DIVISION 1000)  
SANITARY SEWERS AND MANHOLES  

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
</tr>
</thead>
</table>
| 1006.02 | SEWER SERVICE CONNECTIONS - FOR FLEXIBLE PIPE    | 1. Cast iron test fittings (Crowle or approved equal) shall be installed at streetline for all sewer connections and clearly marked "Storm" or "Sanitary" fitting shall be as follows:  
   - Sanitary - 125 x 100mm  
   - Storm - 150 x 150mm  
   2. For vertical riser installations bedding and cover shall be HL8 graded limestone.  
   3. Maximum connection angle is 45° for both standard and vertical riser connections.  
   4. For sewer invert depths exceeding 4.5m, risers shall be used. Risers shall not exceed 1.0m in height for flexible pipe installations without prior approval by the Town.  
   5. Bedding shall be as per OPSD 1005.02.  
   6. Dual sanitary sewer connections are not permitted.  
 | S-9, S-17, ST-2                                      |
| 1007.01 | UTILITY SUPPORTS - UP TO 300mm DIAMETER           | N/A                                                                                   |
DIVISION "B"

WATERMAIN
# DIVISION "B"

## WATERMAINS

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<td>OPSS DIVISION 7 Construction Specifications Watermain</td>
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<td>Valve Box Installation (100 to 300 DIA Watermains)</td>
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<td>Precast 1800 and 2400 Valve Chamber for Valves 150mm DIA to 400mm DIA.</td>
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<tr>
<td>W-5A</td>
<td>Precast 1500mm single valve chamber for valves and drain valves 150mm to 400mm dia.</td>
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<td>Restrained Joint Detail for P.V.C. Pipe</td>
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<td>Typical Watermain Termination Loop for Residential Cul-de-Sacs</td>
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<td>Total Isolation of Existing and New Systems</td>
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<td>Freeze Proof Water Sampling Station Detail</td>
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<td>#9800 Automatic Flushing Device Markham</td>
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DIVISION "B"

SECTION B1

WATERMAIN

DESIGN CRITERIA
DIVISION "B" SECTION B.1

DESIGN CRITERIA WATERMAINS

1. GENERAL

The water distribution system shall be designed as a network system to meet the water demand for each area under consideration. Long dead-end mains and single supply systems are to be avoided.

The system analysis is to be conducted, by the owner, to ensure that the existing and proposed watermains are of sufficient size to service the proposed subdivision and possible future development.

Pressure district boundaries, as established by the Region of York, shall be used as service area boundaries. The use of pumping stations and pressure reducing valves shall be limited to temporary installations, unless required for the Region’s scheme.

2. DESIGN - WATER DEMAND

All water supply systems are to be designed to satisfy the following demand conditions:


b) The Peak Hour demand.

c) The Peak Daily demand.

1.1 Residential Consumption

The following minimum values are to be used when calculating water demands for residential areas:

a) Average Daily Demand - 365 litres/capita/day

b) Peak Daily Demand - 545 litres/capita/day

c) Peak Hourly Demand - 910 litres/capita/day
2.2 **Fire Flow Demand**

The following flows are to be used when determining Fire Flow requirements:

<table>
<thead>
<tr>
<th>Residential</th>
<th>Litres/Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single family, 30 metres separation</td>
<td>36</td>
</tr>
<tr>
<td>Single family, 15 metres separation</td>
<td>48</td>
</tr>
<tr>
<td>Single family, 6 metres separation</td>
<td>60</td>
</tr>
<tr>
<td>Single family or semi-detached, 3 metres separation</td>
<td>64</td>
</tr>
<tr>
<td>Townhouses, maximum 2-1/2 storey</td>
<td>68</td>
</tr>
<tr>
<td>Apartments, 3 storeys or with closed shafts, no exposure</td>
<td>72</td>
</tr>
<tr>
<td>Institutional, no exposure</td>
<td>120 - 190</td>
</tr>
<tr>
<td>Industrial, no exposure</td>
<td>72 - 190</td>
</tr>
<tr>
<td>Commercial, no exposure</td>
<td>185 - 480</td>
</tr>
</tbody>
</table>

2.3 **Commercial and Institutional Flows**

The water demands for commercial and institutional establishments may vary greatly, depending on the type of facilities present, and the type of population using the facilities. The following flows should be used in determining water consumption:

<table>
<thead>
<tr>
<th>Average Daily Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopping Centres</td>
</tr>
<tr>
<td>Hospitals</td>
</tr>
<tr>
<td>Schools</td>
</tr>
</tbody>
</table>

2.4 **Industrial Water Demands**

Industrial water demands are to be expressed in terms of water requirements per gross hectare of industrial development. Such demands are dependent upon the type of industry in the area being considered. The average flows to be used are as follows:

<table>
<thead>
<tr>
<th>Average Daily Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Industry</td>
</tr>
<tr>
<td>Heavy Industry</td>
</tr>
</tbody>
</table>
3.1 Selection of Watermain Sizes

The Hazen-Williams formula shall be used for computing the size of the watermains. The formula is:

\[ V = 0.85 \ C r^{0.63} S^{0.54} \]

where
\[ V = \text{velocity in the pipe (m/s)} \]
\[ C = \text{constant (pipe roughness)} \]
\[ r = \text{hydraulic radius of pipe (m)} \]
\[ S = \text{hydraulic gradient (m/m)} \]

For new watermains, the following values of “C” shall be used:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>“C”</th>
</tr>
</thead>
<tbody>
<tr>
<td>150mm</td>
<td>100</td>
</tr>
<tr>
<td>200 &amp; 250mm</td>
<td>110</td>
</tr>
<tr>
<td>300 to 600mm</td>
<td>120</td>
</tr>
<tr>
<td>over 600mm</td>
<td>130</td>
</tr>
</tbody>
</table>

The above values are to be used for all pipe materials (as indicated in the M.O.E. Guidelines for the Design of Water Distribution Systems).

All watermains in industrial areas are to be a minimum of 300mm in diameter and 150mm in residential areas except on cul-de-sacs where 50mm “K” type soft copper watermains will be permitted at the bulb.

The following minimum and maximum pressures shall apply to all watermains.

a) Minimum pressure during the peak hourly demand - 275 Kpa

b) Maximum pressure during the minimum hourly demand 690 Kpa

c) Minimum Fire Flow pressure when the system is tested for Fire Flow during peak daily flow - 275 KPa.

3.2 Locations

Watermains shall be offset as shown on the “Standard Drawing” and shall generally be located on the north and east sides.
3.3 **Depth**

Minimum cover over all watermains to be 1.7m from the obvert to the finished grade over the watermain.

At Watercourses, Creeks, Culverts, etc., 1.2m cover from the obvert to the finish grade will be permitted providing adequate frost protection is provided with 50mm high density SM Styro-foam insulation.

3.4 **Utility Crossings**

Where watermains cross over or under other utilities, 300mm minimum clearance respectively shall be provided. Where watermains cross under sewers, 500mm separation shall be required.

4. **LINE VALVE**

4.1 **Number, Location and Spacing**

Three valves are required on a cross-intersection and two valves are required on a tee intersection as M.O.E. minimum Guidelines with the valves being located on a line at a point where the streetline projected intersects the watermain.

Maximum spacing of line valves shall be 300m. Line valves shall be located such, that no more than 100 serviced residential units can be shut-off from another block and isolated from the system.

4.2 **Valve Boxes and Chambers**

All valves shall be installed in valve chambers. The top of chambers shall be set flush with finished grade.

4.3 **Water Services**

Water service connections for single and semi-detached dwellings will be individual service connections and will be constructed to the current requirements and standards of the Town of Richmond Hill, as per Town Standard M-2 and S-2A.

4.4 **Curb Stop Valve Boxes**

Curb stop valve boxes to be provided for each dwelling and will not be permitted within driveways unless specifically approved by the Commissioner.
5. **FIRE HYDRANTS**

5.1 **Location and Spacing**

Fire hydrants shall be installed in the location as detailed on the Town Standard drawings for typical street cross sections.

The maximum acceptable spacing in a residential area shall be 150m.

The maximum acceptable spacing in non-residential areas shall be 75m.
Note to users: The Town of Richmond Hill is currently revising this section of its document to reflect conformity with the OPSS 701 revisions dated 11/2009 as issued 11/2010. In the interim all references to OPSS 701 shall be deemed to mean the appropriate corresponding OPSS 441 specification.
<table>
<thead>
<tr>
<th>OPSS</th>
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<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>701</td>
<td>CONSTRUCTION SPECIFICATION FOR WATERMAIN CONSTRUCTION BY OPEN CUT METHOD</td>
<td>701.05.02</td>
<td>Asbestos Cement Pipe - is not an accepted material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.05</td>
<td>Polyvinyl Chloride (P.V.C) pipe may be used for watermains from 150mm to 300mm diameter only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.06</td>
<td>Polyethylene Pipe - is not an accepted material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.07</td>
<td>Polybutylene Pipe - is not an accepted material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.08</td>
<td>Steel Pipe - is not an accepted material</td>
</tr>
</tbody>
</table>
|      |             | 701.05.10.01 | 1. All valves installed within chambers shall be flanged joint type.  
2. Direct bury valve installations can be completed utilizing mechanical type joints.  
3. All valves shall open counter clockwise |
|      |             | 701.05.10.02 | 1. All reference to AWWA C500 shall be deleted  
2. Only resilient seat valves are permitted  
3. Item 1 solid wedge type double faced and seated valve is not accepted  
4. Item 2 double disc type double face and seated valve is not accepted |
## DIVISION "B" SECTION B2.1
(OPSS DIVISION 7)
CONSTRUCTION SPECIFICATIONS - WATERMAINS

<table>
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<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
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<tbody>
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<td>701</td>
<td>CONSTRUCTION SPECIFICATION (Continued)</td>
<td>701.05.11</td>
<td>Pumper port with Storz connection to be provided on all hydrants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.12.02</td>
<td>1. Service connections to watermains ( \leq 250\text{mm} ) shall be fitted with double bolt stainless steel saddles - see OPSD 1104.01 and 1104.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.14</td>
<td>2. All fittings to be compression type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.05.15</td>
<td>Pipe cover material shall be as follows:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- flexible - as per OPSD 1102.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- rigid - approved select native material</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.07.01.12</td>
<td>Dead-end mains with hydrants to have hydrant nozzles installed perpendicular to the roadway</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.07.04</td>
<td>Saddle bolts to be torqued to manufactures specifications.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.07.05</td>
<td>Revise Contract Administrator to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- “the direct supervision of the authority having ownership of same”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>701.07.06</td>
<td>Revise Contract Administrator to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- “the direct supervision of the authority having ownership of same”</td>
</tr>
</tbody>
</table>
## DIVISION "B" SECTION B2.1
(OPSS DIVISION 7)
CONSTRUCTION SPECIFICATIONS - WATERMAINS

<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>701</td>
<td>CONSTRUCTION SPECIFICATION (Continued)</td>
<td>701.07.08.01</td>
<td>Revise Contract Administrator to:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- “the direct supervision of the authority having ownership of same”</td>
</tr>
</tbody>
</table>

Foam swabbing shall only be performed by an experienced pipeline cleaning company to the satisfaction the municipality.

|      |             | 701.07.09     | Foam swabbing will be the responsibility of the contractor and shall be performed on all new watermains |

A sufficient quantity of dense foam swabs by at least 50mm greater than the inside diameter of the largest size pipe being cleaned shall be passed through the entire length of the completed pipeline at a rate not exceeding .45m per second and shall be run through until debris or contaminants are removed. One swab shall exit out each fire hydrant.

The foam swabs used are to be a minimum medium density in the range of 7.32 kilograms per square metre.
<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>701.09.01.04</td>
<td>Add “or as directed in the Contract”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>701.09.02.05</td>
<td>- Add “or as directed in the Contract”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>701.09.02.05</td>
<td>- Add “or as directed in the Contract”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>701.10.01</td>
<td>- Add “or as indicated otherwise in the Contract”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DIVISION "B"

SECTION B3

WATERMAIN

TOWN OF RICHMOND HILL
STANDARD DRAWINGS
WATERMAINS
NOTES:

1. VALVE CHAMBER EXCAVATION TO BE BACKFILLED WITH GRANULAR 'Q'.
2. CHAMBER NOT TO BE LOCATED IN DRIVEWAY.
3. CAP TO BE DRILLED FOR SLIDING VALVE BOX TO BE SET AT GROUND ELEVATION.
4. VALVE CHAMBER LOCATED ON PROPERTY LINE.
5. ALL PIPES PASSING THROUGH PRE-CAST CHAMBER WALLS TO BE SEALED WITH EMBECO NON SHRINKABLE MORTAR OR EQUAL.
6. ALL VALVES 150mm AND LARGER SHALL BE INSTALLED IN VALVE CHAMBERS. THE TOP OF VALVE BOXES, CHAMBERS SHALL BE SET FLUSH WITH FINISHED GRADE.
7. ALL VALVES TO BE FLANGE TYPE WITH UNI-FLANGE SERIES 900 ADAPTER FLANGES.
8. FITTINGS SHALL BE CATHODICALLY PROTECTED AS PER TOWN STANDARDS AND OPSD 1108.011.
9. SUMP SHALL BE PLACED ON OPPOSITE SIDE OF CHAMBER AND POSITIONED TO AVOID ASSOCIATED APPURtenances.
10. TEMPORARY BLOW-OFF REQUIRED OUTSIDE CHAMBER WITHIN PRIVATE PROPERTY.
11. EXTEND TRACER WIRE THROUGH STEPS TO TOP OF CHAMBER AND FASTEN SECURELY AS PER TOWN SPECIFICATIONS.
100, 150 200 WATERMAIN
GLAND RING
50 TAPPED TEE
300 MIN.
50 MALE IRON PIPE TO COPPER FLANGE ADAPTOR.
MECH. JOINT PLUG
THRUST BLOCK
300
1.0 m.
50 COPPER TO IRON PIPE CURB STOP & DRAIN.

PLAN VIEW

150 SERVICE BOX & STAINLESS STEEL ROD

50 COPPER PIPE TYPE "K"
DRAIN PORT
600 MIN.
CRUSHED STONE

CRUSHED 20 STONE
UNDISTURBED SOIL
MIN. 250 CONC. BUILDING BLOCK

ELEVATION

TOWN OF RICHMOND HILL
ENGINEERING DEPARTMENT

STANDARD 50mm BLOWOFF
FOR WATERMAIN

SCALE: N.T.S. DATE: FEB./80
DRAWN BY: S.P. W-2A
NOTES:
(1) VALVE BOX TO BE ADEQUATELY BRACED WHILE BACKFILLING AND MUST REMAIN PLUMB.
(2) VALVE BOX EXTENSION TO BE USED ONLY IF REQUIRED.
(3) VALVE WILL BE OF THE APPROVED TYPE WITH NON-RISING STEM & A 50mm METRO TYPE OPERATING NUT OPENING COUNTERCLOCKWISE.

TOWN OF RICHMOND HILL
ENGINEERING DEPARTMENT

VALVE BOX INSTALLATION
100 TO 300 DIA. WATERMAINS

SCALE: N.T.S
DATE: FEB/80
DRAWN BY: S.P
DWG. No. W-3A

MTREIC
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. REINFORCED CONCRETE PRECAST CHAMBER TO MEET ASTM C-476 SPECIFICATION.
3. STEPS: FIRST STEP TO BE 300mm BELOW FINISHED ROAD GRADE, LAST STEP TO BE 300mm ABOVE BASE.
4. VALVE TO BE FLANGED.
5. PARGING MIX ON ALL BRICKWORK AND ADJUSTMENT UNITS TO BE 1:3 MORTAR MIX AND TO BE APPLIED 15mm THICK.
6. ALL JOINTS AND LIFTING HOLES IN CHAMBER SECTIONS TO BE COMPLETELY FILLED WITH 1:3 MORTAR MIX BEFORE BACKFILLING.
7. ADJUSTMENT UNITS SHALL CONFORM TO THE FOLLOWING:
   - HEIGHT: 50mm UNITS 75mm UNITS
     - 200mm MIN.  MAX. 2  MIN. 3
     - 300mm MIN.  MAX. 2  MAX. 4
   - NO MORE THAN TWO 50mm UNITS SHALL BE USED FOR ANY STRUCTURE. ADJUSTMENTS GREATER THAN 100mm SHALL USE COMBINATIONS OF ADJUSTMENT UNITS LARGER THAN 50mm THICKNESS.
8. VALVES SHALL BE FITTED WITH A 50mm CONICAL SQUARE OPERATING NUT OPENING COUNTERCLOCKWISE.
9. STEPS AND FRAME & COVER TO BE LOCATED ON SIDE OF CHAMBER FURTHEST FROM ROAD.
10. SUMP SHALL BE PLACED ON OPPOSITE SIDE OF CHAMBER STEPS AND POSITIONED TO AVOID ASSOCIATED APPURTENANCES.
11. FITTINGS SHALL BE CATHOLICALLY PROTECTED AS PER TOWN SPECIFICATIONS AND OPSD 1109.11
12. EXTEND TRACER WIRE THROUGH STEPS TO TOP OF CHAMBER AND FASTEN SECURELY AS PER TOWN SPECIFICATIONS.

<table>
<thead>
<tr>
<th>No.</th>
<th>REVISIONS</th>
<th>DATE</th>
<th>APP'D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>REISSUED-MISC. REVISION</td>
<td>MAR. 12</td>
<td>SCF</td>
</tr>
</tbody>
</table>

TOWN OF RICHMOND HILL
ENVIRONMENT & INFRASTRUCTURE SERVICES

PRECAST 1500mm SINGLE VALVE CHAMBER FOR VALVES AND DRAIN VALVES
150mm DIA. TO 400mm DIA.


DRAWN: A.J.V DWG. No. W-5A
NOTES

1. ALL MECHANICALLY RESTRAINED JOINTS TO BE COATED WITH TAPECOAT SEALER OR EQUIVALENT TO PREVENT CORROSION.

2. RESTRainers TO BE USED IN UNSTABLE SOIL AND FILL CONDITIONS AND WITH THE APPROVAL OF THE COMMISSIONER OF WORKS.

TOWN OF RICHMOND HILL ENGINEERING DEPARTMENT

RESTRAINED JOINT DETAIL FOR PVC PIPE
NOTE:

1. ALL DIMENSIONS ARE GIVEN TO THE CENTRELINE OF THE WATERMAIN.
TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

CONNECTION AT EXISTING VALVE

DRAWN: W.B.W. DWG. No. W-8A
REDUCED PRESSURE ZONE ASSEMBLY
WATTS SERIES 009 OR APPROVED EQUIVALENT MEETING AWWA STD. C511 AND B64.4

50mm TEE AND BALL VALVE SOURCE TAP

GATE OR BALL TYPE VALVE (TYPICAL)

APPROVED SADDLE AND MAIN STOP

CAP

THRUSt BLOCK

EXISTING WATERMAIN

NEW WATERMAIN

BYPASS 50mm (Minimum)

25mm SAMPLE TAP (ALSO USED FOR CHLORINE INJECTION AND PRESSURE TESTING)

GATE OR BALL TYPE VALVE (TYPICAL)

APPROVED SADDLE AND MAIN STOP

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TOTAL ISOLATION OF EXISTING AND NEW SYSTEMS


DRAWN: W.B.W. DWG. No. W-9A
DIVISION "B"

SECTION B4

WATERMAIN

ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS
**DIVISION "B" SECTION B4.1**  
**OPSD DIVISION 400**  
**FRAMES AND GRATES**

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
<th>REPLACES TOWN RICHMOND HILL STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>401.01</td>
<td>MAINTENANCE HOLE</td>
<td>Type &quot;A' cover to be used for watermain installation only</td>
<td>ST-20,S-6</td>
</tr>
<tr>
<td></td>
<td>CAST IRON COVER</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AND SQUARE FRAME</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 402.03  | THREE PIECE VALVE               |                      |                                   |
|         | AND METER CHAMBER               |                      |                                   |
|         | COVER                           |                      |                                   |
DIVISION "B" SECTION B4.2
(OPSD DIVISION 1100)
WATERMAINS

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REPLACES TOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1101.01</td>
<td>CIRCULAR PRECAST CHAMBER FOR VALVES AND METERS</td>
<td>W-3</td>
</tr>
</tbody>
</table>

1. This standard not to be used for distribution main valves. Refer to Richmond Hill Standard W-4-A and W-6-A for distribution main valve chamber details.

2. Reference to 100 to 250mm watermain and 300 to 350mm watermain in table to be deleted.

3. Adjustment units shall follow the following:

<table>
<thead>
<tr>
<th>Height 50mm Units*</th>
<th>75mm Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>200mm min.</td>
<td>Max. 2</td>
</tr>
<tr>
<td>300mm max.</td>
<td>Max. 2</td>
</tr>
</tbody>
</table>

   *No more than two 50mm units shall be used for any structure. Adjustments greater than 100mm shall use combinations of adjustment units larger than 50mm thickness.

4. Chambers shall be backfilled with Granular “B” conforming to OPSS 1010.

5. Valve support shall consist of a single solid concrete block.

6. In all installations, the valve stem shall be extended to 1200mm below grade.

7. A 50mm diameter drain from the sump to a 600 x 600mm gravel absorption pit shall be installed at the direction of the Town, depending on existing ground conditions.
## Division "B" Section B4.2 (OPSD Division 1100) Watermain

<table>
<thead>
<tr>
<th>OPSD</th>
<th>Description</th>
<th>Addition or Revision</th>
<th>Replaces Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>1101.02</td>
<td>Valve Operator Detail</td>
<td>1. Auger or screw type valve box extension to be used for all installations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Valve shall be fitted with a 50mm conical square operating nut type, opening counter clockwise.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Steel extension stem with coupling to suit 50mm conical square operating nut type.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Valve to be approved type with iron rising stem.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Operating nut to be 1200mm from finished ground surface.</td>
<td></td>
</tr>
<tr>
<td>1101.03</td>
<td>Piping Layout for Butterfly and Gate Valves 350mm Diameter and Smaller in Circular Precast Chambers</td>
<td>Not accepted refer to Richmond Hill Standard W-4-A and W-6-A for piping layout.</td>
<td></td>
</tr>
<tr>
<td>1102.01</td>
<td>Trench Bedding for Pressurized Conduits up to 900mm Diameter - Rigid Pipe</td>
<td>W-13</td>
<td></td>
</tr>
<tr>
<td>1102.02</td>
<td>Bedding for Pressurized Conduits - Flexible Pipe</td>
<td>1. Embedment material shall be Granular “A” conforming to OPSS 701 unless otherwise approved by the Town.</td>
<td></td>
</tr>
<tr>
<td>1103.01</td>
<td>Concrete Thrust Blocks for Tees, Plugs and Horizontal Bends</td>
<td>W-9, W-10</td>
<td></td>
</tr>
<tr>
<td>1103.02</td>
<td>Concrete Thrust Blocks for Vertical Bends</td>
<td>1. Restraining rods and glands shall be installed from bend to bend as directed by the Engineer.</td>
<td></td>
</tr>
</tbody>
</table>
DIVISION "B" SECTION B4.2  
(OPSD DIVISION 1100)  
WATERMAINS

<table>
<thead>
<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
<th>REPLACES TOWN RICHMOND HILL STD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1105.01</td>
<td>HYDRANT INSTALLATION</td>
<td>1. Drain holes shall be plugged unless otherwise directed by the Town.</td>
<td>W-7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Mechanical Joint Anchor Type Tees shall be used on all hydrant installations.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Minimum cover shall be 1.70m.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Pumper port with Storz connection to be provided on all hydrants.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Hydrant identification signs to be provided in all subdivisions which are under construction the sign is to be 300mm x 300mm black on yellow complete with T-bars and installed when the system has potable water.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Hydrant upper body shall be painted fire hydrant Red. Ports and cap shall be painted based upon measured flow capacity at 20 psi. The colour scheme is as follows for capacities listed in liters per minute.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Greater than 5,675: light blue</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 3,785 to 5,675: green</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 1,900 to 3,784: orange</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Less than 1,900: red</td>
<td></td>
</tr>
<tr>
<td>1107.01</td>
<td>PIPING LAYOUT FOR WATER METERS 50mm AND SMALLER IN CHAMBERS</td>
<td>1. Chamber to be installed on private property within 1.5m of the streetline.</td>
<td>W-4</td>
</tr>
<tr>
<td>1107.02</td>
<td>PIPING LAYOUT FOR WATER METERS 75mm TO 250mm IN CHAMBERS</td>
<td>1. Chamber to be installed on private property within 1.5m of the streetline.</td>
<td>W-4</td>
</tr>
<tr>
<td>1107.03</td>
<td>INSTALLATION DETAILS FOR A COMPOUND WATER METER</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>1107.04</td>
<td>INSTALLATION DETAILS FOR DISC METER IN BUILDING</td>
<td>1. Meter to be installed 450mm above floor.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. All valves to be gate valves.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Concrete base support to be provided for meter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Eliminate all reference to screw end meter.</td>
<td></td>
</tr>
</tbody>
</table>
DIVISION "B"

SECTION B5

WATERMAIN

LIST OF APPROVED MANUFACTURERS AND PRODUCTS FOR WATER SYSTEMS
DIVISION "B" SECTION B5

LIST OF APPROVED MANUFACTURERS AND PRODUCTS FOR WATER SYSTEMS

SERVICE CONNECTIONS

Type “K” soft copper

MAINSTOPS

Mueller H15008
Ford FB1000 - 3G
EMCO Successor
Canadian Brass Series 102

The above are to be supplied with one (1) piece tails.

BALL CURB STOPS

Mueller H15209
Ford B44-3336
EMCO Successor
Century Ball Valve

The above are to be supplied with one (1) piece tails.

COUPLINGS

Mueller H15403
Ford C44-336
EMCO Successor
Canadian Brass Series 118

The above are to be supplied with one (1) piece tails.

CURB STOP VALVE BOXES

Mueller A726
Ford CB-7
EMCO Series 7960
Canadian Brass C161
DIVISION "B" SECTION B5

LIST OF APPROVED MANUFACTURERS AND PRODUCTS FOR WATER SYSTEMS

**FIRE HYDRANTS**

- Canada Valve Century
- McCavity
- Concord Diagle
- AVK

**SERVICE SADDLES**

- Robar: Double Bolt stainless steel saddle.
- Cambridge Brass: Double bolt stainless steel saddle.
DIVISION “B”

SECTION B6

WATERMAIN

PROCEDURES FOR CLEANING, DISINFECTING, TESTING AND SAMPLING
DIVISION “B” SECTION B.6
PROCEDURES FOR CLEANING, DISINFECTION, TESTING AND SAMPLING

1. GENERAL

1.2 Introduction
These procedures cover the cleaning, disinfection, hydrostatic testing and sampling of watermains. Unless specified otherwise this procedure applies to all new watermains and includes above ground by-pass watermains, cement relined watermains, commercial water connections, and private watermain systems.

Reference is made in this document to the Ontario Provincial Standard Specification 701 (OPSS 701), Ontario Regulation 403/97 (The Ontario Building Code (OBC)), and the American Waterworks Association (AWWA) standard procedures. These procedures are supplemental to OPSS 701 and supersede OPSS 701.

These procedures are to be used in conjunction with the Ontario Provincial Specifications (OPSS), the American Waterworks Association (AWWA).

Where there is a conflict of information this document governs and supersedes any other specification.

This document is to be used in conjunction with the forms entitled “New Watermain Disinfection, Hydrostatic Testing & Check List”, “Watermain Disinfection Report”, “Chlorine Residual Report”, “Operation of Isolation Valve” and “Opening of Isolation Valves”.

The chlorine residual is to be tested with an electronic tester such as a Hach® Pocket Colorimeter or equivalent.

1.3 Definitions

Owner – means the party to the contract for whom the work is being performed. This would generally refer to the registered owner constructing as part of a subdivision or development agreement, or the Town in the case of a system upgrade or replacement.

Project Engineer - shall be designated by the Owner, and could be the Consulting Engineer, or their designate.

Workforce - shall be a Specialized Watermain Disinfection Contractor whose personnel hold valid MOE licenses as Water Distribution Subsystem Class 1 Operator (minimum) under Ontario Regulation 128/04 or successors.

Contractor - the person or company, or their agent that is constructing the watermain system.

Town - refers to the Municipal Inspector, Plumbing Inspector, Maintenance and Operation Certified Operator, or their designate

Disinfectant - use only Calcium or Sodium Hypochlorite that meets or exceeds ANSI/AWWA Standard B300.

Neutralizing Agent - use only Sodium Thiosulfate that meets or exceeds AWWA Standard C651.
1.3 **References**

These procedures are based on, and should be used in conjunction with, the Ontario Provincial Standard Specifications (OPSS), Ontario Regulation 403/97 (The Ontario Building Code (OBC)), the American Waterworks Association (AWWA), and the American National Standards Institute (ANSI), O.Reg 169/03, O.Reg 170/03, Ontario Procedures for Disinfection, ANSI/AWWA C651-05

1.4 **Supervision, Testing, and Records**

The Project Engineer shall witness all cleaning, disinfection, hydrostatic testing and sampling activities. The Workforce carrying out the cleaning and disinfection in conjunction with the Project Engineer is to take and record measurements. All such records shall be submitted to the Town’s Municipal and/or Plumbing Inspector on the required forms.

1.5 **Isolation Valve Operation**

During swabbing, flushing, and removal of super chlorinated water procedures a Town’s Maintenance and Operations Certified Operator, certified under Ontario Regulation 128/04 will be on site to operate any isolation valve. The Project Engineer is to notify the Maintenance Operations Section 3 working days in advance to make arrangements for the operation of an isolation valve.

All valve operation requests shall be accompanied with an “**Operation of Isolation Valve**” form. The Project Engineer or his/her representative shall be on site to ensure that the proper valve is being operated.

1.6 **Calculation of Water Consumption**

The Workforce is to provide a final calculation of estimated water volume consumption during the commissioning process. This requirement is related to the Town’s annual water loss accounting, and has no associated costs. Estimates for flushing volumes will vary with each project.

Calculations can be made using the following guidelines, in cubic meters (m³):

- **i. Volume of water required to initially load main**
  \[
  = \text{(length of main)} \times \text{(cross-sectional area)}
  \]

- **ii. Volume of water required to swab, flush to remove turbidity and for removal of superchlorinated water (provide separate calculation for each instance of flushing)**
  \[
  = (\text{flushing velocity} - \text{assume minimum flushing velocity of 0.75m/s}) \times \text{(cross-sectional area of blow off)} \times \text{(number of hours flushed)} \times 3600
  \]

Final consumption totals are recorded on Form 5.1 – *New Watermain Disinfection, Hydrostatic Testing & Check List*, under item 13 (W8-A) or item 10 (W9-A).
2. **PROCEDURE FOR CONNECTION AT EXISTING VALVE**

2.1 **General**

The following procedures are to be applied in conjunction with the use of Standard Drawing W-8A.

2.2 **Loading of Watermain**

(AWWA C651.05 Section 4.3.9 Modified)

a) The new watermain is to be loaded via a bypass. The bypass with approved backflow device is to be installed around the isolation valve. The bypass is to be used for all water supply issues unless otherwise noted. Minimum size of the bypass shall be 50mm diameter around the isolation valve. All materials for the bypass shall conform to the Town’s approved material list. For details on the installation of the bypass see Town Standard drawing “Connection at Existing Valve, Standard (W-8A)”.

The bypass shall be removed once all testing is completed and accepted. For direct bury bypass installations outside the valve chamber, all appurtenances are to be removed and saddles shall be replaced with repair clamps. Bypass installations inside the chamber are to be removed by closing the main stops and removing all tubing and fittings between the main stops.

All site plan agreement applications which propose service connections 100 millimeters in diameter or larger shall have test point(s) installed at the isolation valve(s). The watermain shall be loaded from the isolation valve. The Town’s Maintenance and Operations Certified Operator shall operate the isolation valve once they have ensured there is a flow to the discharge. All direct bury test points within the Municipal Right-of-Way are to be removed and a repair clamp installed in its place once all testing has been completed and accepted.

2.3 **Sample Request Drawings**

Three (3) copies of sample request drawings are required to be submitted to the Municipal Inspections Section (Public Works) or to the Building Inspections Section (Private Works) a minimum of five (5) working days prior to disinfection, with consideration given to sectioning off areas as required. Full size copies of general servicing plans are acceptable for this purpose.

All proposed watermains shall be highlighted including all stubs and commercial services. Water supply source points and water sample points are to be indicated.

One copy of the sample request drawing will be returned to the Project Engineer subject to the approval of the Town’s Municipal and/or Plumbing Inspector.

Hydrostatic test boundaries are to be the same as any sectioned off areas identified on the sample request drawings unless otherwise directed.

All sample points are to be brought to the surface complete with a valve.
2.4 **Swabbing**

(AWWA C651-05 Sec. 4.3.6)

Request for Isolation Valve Operation is required for the swabbing procedure. The Town’s Maintenance and Operations Certified Operator will operate the isolation valve once they have ensured there is flow, via the bypass, to an open discharge.

All other work is to be performed by the designated Workforce.

All swabs shall be new and sized a minimum of one size larger than the watermain pipe diameter. All stub ends shall be provided with a temporary flushing hydrant to allow for the removal of the swabs. Open risers will be permitted only when watermain sizing is such that the appropriate sized swab cannot be physically extracted through a hydrant branch line.

All swabs inserted into the watermain shall be marked with an identification number and witnessed by the Project Engineer.

The Project Engineer shall maintain records of the swabs inserted and ensure that all swabs are retrieved. The watermain swabbing procedure shall be carried out such that all pipes within the system, including all hydrant leads, are swabbed.

Swabbing of site plans will be at the discretion of the Building Inspections Section.

2.5 **Flush to Remove Turbidity**

(OPSS 701.07.23 Modified; AWWA C651-05 Sec. 4.4.3.2)

Request for Isolation Valve Operation is required for the flushing procedure. The Town’s Maintenance and Operations Certified Operator will operate the isolation valve once they have ensured there is flow, via the bypass, to an open discharge.

All other work is to be performed by the designated Workforce.

The watermain shall be flushed to remove any remaining air pockets and foreign matter from the watermain.

The watermain is to be flushed through each hydrant for 5 to 10 minutes until the watermain achieves and sustains a turbidity of less than 1 NTU or no higher than that of the existing distribution system. The turbidity testing will be performed by the Workforce and recorded by the Project Engineer on the Watermain Disinfection Report Form. The locations where the turbidity samples are taken will be recorded by the Project Engineer and indicated on the sample request drawing.

2.6 **Disinfection Procedure**

(OPSS 701.07.23; OBC Appendix A – 7.6.2.2)

The method of disinfection to be used is the “continuous feed” method such that water from the existing distribution system shall be allowed to flow at a controlled rate into the new pipeline through the bypass. The isolation valve shall remain closed throughout this procedure.

The chlorine solution shall be prepared in a mixing tank as a super chlorinated disinfectant and water solution and shall be thoroughly mixed prior to pumping it into the
system. This solution shall be introduced into the system through the bypass sample tap continuously so that the required concentration of chlorine is distributed throughout the section being disinfected.

The solution shall be applied so that the chlorine concentration is a minimum of 50mg/l throughout the system and does not exceed 100mg/l. The chlorine solution is to be flowed through each hydrant, sample location and blow-off. The high chlorine residual is to be measured by the Workforce at each sample location and recorded by the Project Engineer on the Watermain Disinfection Report Form. The high chlorine will be isolated in the system for 24 hours.

Once the introduction of the disinfectant is complete, any residual solution in the mixing tank shall be treated with neutralizing agent and disposed of.

After the required contact time the chlorine residual is to be taken at each sample location by the Workforce and recorded by the Project Engineer on the Watermain Disinfection Report Form. Flow required to take the residuals shall be provided through the bypass. If the residual is above 50% of the original concentration the chlorine is ready to be discharged.

In the event that the residual is less than 50% the chlorine in the system is to be removed and disposed. The watermain is then required to be flushed, swabbed, and the disinfection procedure repeated.

2.7 Discharge Procedure: Removal and Disposal of Super Chlorinated Water

(AWWA C651.05 Sec. 4.5; OPSS 701.07.25)

Request for Isolation Valve Operation is required for the discharge procedure. The Town’s Maintenance and Operations Certified Operator will operate the isolation valve once they have ensured there is flow, via the bypass, to an open discharge.

All other work is to be performed by the designated Workforce.

The watermain is to be flushed to remove super chlorinated water. The watermain to be controlled to assure that the direction of the flow is known to promote the expedient and complete removal and neutralization of the chlorinated water. Water is to be flushed from the watermain through all hydrants and sample points with the chlorine residual being checked at each sample point by the workforce, and recorded by the Project Engineer on the Watermain Disinfection Report Form, until the chlorine residual matches that of the existing distribution system (supply location). Once this is achieved the system is to be flushed for an additional 30 minutes.

The Project Engineer is to ensure throughout the disposal process that residual chlorine in the neutralized water does not exceed 0.5mg/l. De-chlorinated water is normally disposed of into a sanitary sewer. Super chlorinated water may not be disposed of to a storm sewer or watercourse unless the residual is reduced to 0.0 mg/l.

Methods of disposal include flushing through a neutralizing dam, ensuring 0.5 mg/l being achieved, or flushing to a neutralizing tank. Neutralizing agents shall conform to AWWA C651.99, Appendix C.
2.8 **Initial Bacteriological Sampling**

(AWWA C651-05 Sec. 5.1 Modified)

**The fresh supply water shall be left isolated within the system for a minimum of 24hrs.**  
For above ground by-pass watermains the isolation period can be shortened to 16 hours.

The Municipal and/or Plumbing Inspection staff will ensure the bypass is open and take a bacteriological sample at each sample location and have it delivered to the York Durham lab.  
The isolation valve shall remain closed throughout this procedure.

The cost of all bacteriological sampling will be charged back to the Owner unless otherwise specified.

2.9 **Bacteriological Sample Results**

(OPSS 701.07.23 Modified; AWWA C651-05 Sec. 5.1 Modified; OBC Appendix A – 7.6.2.2 Modified)

The Municipal and/or Plumbing Inspection Section will receive the sample results from the approved laboratory 48 hours after the samples are delivered.  
The Town will notify the Project Engineer of the sample results.  
If sample results meet the Town’s requirements set out in **Table 4.1** (New Watermain Acceptance Criteria – Microbiological Testing), the Workforce may proceed with Flushing and Hydrostatic Testing.

If sample results do not meet the Town’s requirements set out in **Table 4.1** (New Watermain Acceptance Criteria – Microbiological Testing), the disinfection procedure must be repeated, and the watermain re-sampled at the predetermined sample locations.

2.10 **Hydrostatic Testing**

(OPSS 701.07.22; AWWA C600-99 Sec 5.2 Modified; C605-94 Sec 7.3 Modified)

All work is to be performed by the designated Workforce.

The watermain is to be pressurized to a minimum of 1035 kPa.  
The test pressure is to be maintained for 2 hours. The test section is not to exceed any of the isolated sections as indicated on the sample drawing. If the test pressure drops significantly the test section is to be isolated to a manageable area. At the end of the two-hour test period the volume of water used to maintain the 1035 kPa is to be recorded and compared against the allowable leakage.

The allowable leakage is 0.082 litres per millimetre of pipe diameter per kilometre of pipe for the 2-hour test period.

For High Density Polyethylene (H.D.P.E.) pipe the test section is not to include any other materials. A 3-4 hour deformation period, maintaining 1035kPa, will be required immediately prior to the hydrostatic testing. Acceptance of HDPE pipe is as per the acceptable leakage indicated in OPSS 701.07.22.02.

If the test fails, all leaks shall be located and repaired and the test section shall be retested until a satisfactory result is obtained.

The Project Engineer is required to provide a Hydrostatic Testing summary report to the Municipal or Plumbing Inspector.

**Note:** This item is not required for above ground by-pass watermains and cement relined watermains.
2.11 **Flushing Procedure to Introduce Fresh Water**

Request for Isolation Valve Operation is required for the discharge procedure. The Town’s Maintenance and Operations Certified Operator will operate the isolation valve once they have ensured there is flow, via the bypass, to an open discharge.

All other work is to be performed by the designated Workforce. The Project Engineer shall witness completion of this procedure.

The Watermain is to be flushed to introduce fresh water. Flushing of the watermain is to be controlled to assure that the direction of the flow is known to promote the expedient and complete removal of the stale water. Once the existing water has been removed from within the system and replaced with fresh water the system shall be isolated for a minimum of 24hrs.

2.12 **Final Bacteriological Sampling and Acceptance**

(OPSS 701.07.23 Modified; AWWA C651-05 Sec. 5.1 Modified; OBC Appendix A – 7.6.2.2 Modified)

Prior to sampling, the Project Engineer shall confirm to the Municipal Inspector that the proposed flushing and sampling program has described in section 2.14 has been reviewed and accepted by the Water and Wastewater Supervisor.

The Municipal and/or Plumbing Inspection Section will ensure the bypass is open and take a bacteriological sample at each sample location and have it delivered to the York Durham lab. The cost of all bacteriological sampling will be charged back to the owner unless otherwise specified.

The Municipal and/or Plumbing Inspection Section will receive the sample results, via fax, 48 hours after the samples are delivered. The Town will notify the Project Engineer, via fax and phone, of the sample results.

The testing laboratory will mail a hard copy of the sample results to the Town and the Project Engineer. If sample results meet the Town’s requirements set out in Table 4.1 (New Watermain Acceptance Criteria – Microbiological Testing), the system will be put into service once a certified copy of the form entitled “New Watermain Disinfection, Hydrostatic Testing & Check List”, (Form 5.1) has been received and approved by the Town’s Municipal and/or Plumbing Inspector.

If sample results do not meet the Town’s requirements set out in Table 4.1 (New Watermain Acceptance Criteria – Microbiological Testing) the disinfection procedure must be repeated, and the watermain re-sampled at the predetermined sample locations.

**Note:** This item is not required for above ground by-pass watermains and cement relined watermains.

2.13 **Potable Water**

Once the Owner has satisfied the requirements indicated on the “New Watermain Disinfection, Hydrostatic Testing & Check List” (Form 5.1), the Municipal Inspector will provide the “Opening of Isolation Valves” form to the Maintenance and Operations section together with plans highlighting the section of watermain or water service that will be put in service (providing potable water) and the location of the valves to be opened.
Note: In the event that the watermain is not put in service within 10 days from the date that the Final Bacteriological Sample had been taken, the Project Engineer or his/her representative shall take combined chlorine residuals tests from the predetermined sample locations indicated in Item 2.3.

Full compliance to Ontario Regulations 169/03 specifically combined chlorine residuals of 0.25 mg/L and greater must be achieved. Otherwise, the Watermain is to be flushed to introduce fresh water. A discharge is to be set up for the removal of the stale water prior to the Town’s Maintenance and Operations Certified Operator opening the isolation valve.

The watermain is to be controlled to assure that the direction of the flow is known to promote the expedient and complete removal of the stale water. Once the existing water has been removed from within the system and replaced with fresh water and the combined chlorine residual is greater than 0.25 mg/L, the Town’s Maintenance and Operations Certified Operator will fully open the isolation valves as requested by the “Opening of Isolation Valves” form.

The owner shall undertake to ensure the watermain system remains potable until such time as the Town has accepted the system and the Maintenance Period has begun.

The owner is to provide a flushing and sampling program to be performed by the Workforce until such time as 50% occupancy has been achieved along each street. Such that flushing and chlorine residuals are to be performed bi-weekly and Chlorine Residual results submitted to the Water and Wastewater Supervisor.

2.14 Sampling and Flushing Program

This program is required for municipal watermain infrastructure. This program is not required for private watermain infrastructure.

The Project Engineer shall prepare and submit to the Water and Wastewater Supervisor or their designate a proposed flushing and sampling program. The Water and Wastewater Supervisor will review and assign a Water Trax sampling number to each sampling point. Once established the assigned Water Trax number and corresponding sampling location will not change and the same numbers and locations are to be used for all future reporting of Chlorine Residual and Bacteriological Sample results.

The Owner shall undertake to ensure the watermain system remains potable until such time as the Town has assumed the system and the Maintenance Period has begun.

The Owner is to provide a flushing and bacteriological sampling program to be performed by the Workforce until such time as 50% occupancy has been achieved along each street.

Flushing and chlorine residuals are to be performed bi-weekly and Chlorine Residual results submitted on the Chlorine Residual Report Form to the Water and Wastewater Supervisor. Samples to be submitted in accordance with the York Durham Regional Environmental Laboratory Chain of Custody (Form 5.6) provided herein shall be taken every four weeks.

Failure to execute this program on a predetermined schedule will result in the program being carried out by Town forces at the expense of the Owner.
2.15 Disinfection of By-pass Service Hoses

- All by-pass services hoses to be used will be of potable water grade.
- Service hoses to be chlorinated at 25mg/l continuous feed method.
- Service hoses to be isolated for a maximum 24hr contact time.
- Service hoses de-chlorinated, and residual to match that of existing water supply.
- Service hoses to be isolated for minimum 24hr incubation period.
- Bacteriological sample will be taken from each hose bundle.
- Service hoses to be capped on both ends with brass caps.
- Service hoses will not be installed on by-pass piping until the day of the change over from distribution watermain to the above ground by-pass watermain.

Note: This item is not required for above ground by-pass watermain and cement relined watermain.
3. **PROCEDURE FOR TOTAL ISOLATION OF EXISTING AND NEW SYSTEMS**

3.1 **General**

The following procedures are to be applied in conjunction with the use of Standard Drawing W-9A.

3.2 **Loading of Watermain**

(AWWA C651.05 Section 4.3.9 Modified)

a) The new watermain is to be loaded via a bypass. The bypass with approved backflow device is to be installed around the separation between the existing and new watermains. The bypass is to be used for all water supply issues and shall remain closed when not supplying water specific to these procedures. Minimum size of the bypass should be **50mm** diameter and the size of the bypass installed shall be determined in reference to Table 4.2 (Bypass Requirements for Swabbing and Flushing of New Watermains). All materials for the bypass shall conform to the Town’s approved material list. For details on the installation of the bypass see Town Standard drawing W-9A “Total Isolation of Existing and New Systems”.

The bypass is to be removed once all testing is completed and accepted. For direct bury installations the saddles are to be removed and a repair clamp installed in their place.

3.3 **Sample Request Drawings**

Three (3) copies of sample request drawings are required to be submitted to the Municipal Inspections Section (Public Works) or to the Building Inspections Section (Private Works) a minimum of five (5) working days prior to disinfection, with consideration given to sectioning off areas as required. Full size copies of general servicing plans are acceptable for this purpose.

All proposed watermains shall be highlighted including all stubs and commercial services. Water supply source points and water sample points are to be indicated.

One copy of the sample request drawing will be returned to the Project Engineer subject to the approval of the Town’s Municipal and/or Plumbing Inspector.

Hydrostatic test boundaries are to be the same as any sectioned off areas identified on the sample request drawings unless otherwise directed.

All sample points are to be brought to the surface complete with a valve.

3.4 **Swabbing**

(AWWA C651-05 Sec. 4.3.6)

All work is to be performed by the designated Workforce.

All swabs shall be new and sized a minimum of one size larger than the watermain pipe diameter. All stub ends shall be provided with a temporary flushing hydrant to allow for the removal of the swabs. Open risers will be permitted only when watermain sizing is such that the appropriate sized swab cannot be physically extracted through a hydrant branch line.

All swabs inserted into the watermain shall be marked with an identification number and witnessed by the Project Engineer.
The Project Engineer shall maintain records of the swabs inserted and ensure that all swabs are retrieved. The watermain swabbing procedure shall be carried out such that all pipes within the system, including all hydrant leads, are swabbed.

3.5 **Hydrostatic Testing**

(OPSS 701.07.22; AWWA C600-99 Sec 5.2 Modified; C605-94 Sec 7.3 Modified)

All work is to be performed by the designated Workforce.

The watermain is to be pressurized to a minimum of 1035 kPa. The test pressure is to be maintained for 2 hours. The test section is not to exceed any of the isolated sections as indicated on the sample drawing. If the test pressure drops significantly the test section is to be isolated to a manageable area. At the end of the two-hour test period the volume of water used to maintain the 1035 kPa is to be recorded and compared against the allowable leakage.

The allowable leakage is 0.082 litres per millimetre of pipe diameter per kilometre of pipe for the 2-hour test period.

For High Density Polyethylene (H.D.P.E.) pipe the test section is not to include any other materials. A 3-4 hour deformation period, maintaining 1035kPa, will be required immediately prior to the hydrostatic testing. Acceptance of HDPE pipe is as per the acceptable leakage indicated in OPSS 701.07.22.02.

If the measured leakage exceeds the allowable leakage, all leaks shall be located and repaired and the test section shall be retested until a satisfactory result is obtained.

The Project Engineer is required to provide a Hydrostatic Testing summary report to the Municipal or Plumbing Inspector.

3.6 **Flush to Remove Turbidity**

(OPSS 701.07.23 Modified; AWWA C651-05 Sec. 4.4.3.2)

All work is to be performed by the designated Workforce.

The watermain shall be flushed to remove any remaining air pockets and foreign matter from the watermain.

The watermain is to be flushed through each hydrant for 5 to 10 minutes until the watermain achieves and sustains a turbidity of less than 1 NTU or no higher than that of the existing distribution system. The turbidity testing will be performed by the Workforce and recorded by the Project Engineer on the Watermain Disinfection Report Form. The locations where the turbidity samples are taken will be recorded by the Project Engineer and indicated on the sample request drawing.

3.7 **Disinfection Procedure**

(OPSS 701.07.23; OBC Appendix A – 7.6.2.2)

The method of disinfection to be used is the “continuous feed” method such that water from the existing distribution system shall be allowed to flow at a controlled rate into the new pipeline through the bypass.
The chlorine solution shall be prepared in a mixing tank as a super chlorinated disinfectant and water solution and shall be thoroughly mixed prior to pumping it into the system. This solution shall be introduced into the system through the bypass sample tap continuously so that the required concentration of chlorine is distributed throughout the section being disinfected.

The solution shall be applied so that the chlorine concentration is a minimum of 50mg/l throughout the system and does not exceed 100mg/l. The chlorine solution is to be flowed through each hydrant, sample location and blow-off.

The high chlorine residual is to be measured by the Workforce at each sample location and recorded by the Project Engineer on the Watermain Disinfection Report Form. The high chlorine will be isolated in the system for 24 hours.

Once the introduction of the disinfectant is complete, any residual solution in the mixing tank shall be treated with neutralizing agent and disposed of.

After the required contact time the chlorine residual is to be taken at each sample location by the Workforce and recorded by the Project Engineer on the Watermain Disinfection Report Form. Flow required to take the residuals shall be provided through the bypass. If the residual is above 50% of the original concentration the chlorine is ready to be discharged.

In the event that the residual is less than 50% the chlorine in the system is to be removed and disposed. The watermain is then required to be flushed, swabbed, and the disinfection procedure repeated.

3.8 Discharge Procedure: Removal and Disposal of Super Chlorinated Water

(AWWA C651.05 Sec. 4.5; OPSS 701.07.25)

All work is to be performed by the designated Workforce.

The watermain is to be flushed to remove super chlorinated water. The watermain to be controlled to assure that the direction of the flow is known to promote the expedient and complete removal and neutralization of the chlorinated water. Water is to be flushed from the watermain through all hydrants and sample points with the chlorine residual being checked at each sample point by the workforce, and recorded by the Project Engineer on the Watermain Disinfection Report Form, until the chlorine residual matches that of the existing distribution system (supply location). Once this is achieved the system is to be flushed for an additional 30 minutes.

The Project Engineer is to ensure throughout the disposal process that residual chlorine in the neutralized water does not exceed 0.5mg/l. De-chlorinated water is normally disposed of into a sanitary sewer. Super chlorinated water may not be disposed of to a storm sewer or watercourse unless the residual is reduced to 0.0 mg/l.

Methods of disposal include flushing through a neutralizing dam, ensuring 0.5 mg/l being achieved, or flushing to a neutralizing tank. Neutralizing agents shall conform to AWWA C651.05, Appendix C.

Note: The fresh water shall be left isolated within the system for a minimum of 24hrs. For above ground by-pass watermains the isolation period can be shortened to 16 hours.
3.9 Final Bacteriological Sampling and Acceptance

(OPSS 701.07.23 Modified; AWWA C651-05 Sec. 5.1 Modified; OBC Appendix A – 7.6.2.2 Modified)

Prior to sampling, the Project Engineer shall confirm to the Municipal Inspector that the proposed flushing and sampling program has as described in section 3.11 has been reviewed and accepted by the Water and Wastewater Supervisor.

The Municipal and/or Plumbing Inspection Section will ensure the bypass is open and take a bacteriological sample at each sample location and have it delivered to the York Durham lab. The cost of all bacteriological sampling will be charged back to the owner unless otherwise specified.

The Municipal and/or Plumbing Inspection Section will receive the sample results, via fax, 48 hours after the samples are delivered. The Town will notify the Project Engineer, via fax and phone, of the sample results.

The testing laboratory will mail a hard copy of the sample results to the Town and the Project Engineer. If sample results meet the Town’s requirements set out in Table 4.1 (New Watermain Acceptance Criteria – Microbiological Testing), the system will be put into service once a certified copy of the form entitled “New Watermain Disinfection, Hydrostatic Testing & Check List” (Form 5.1) has been received and approved by the Town’s Municipal and/or Plumbing Inspector.

If sample results do not meet the Town’s requirements set out in Table 4.1 (New Watermain Acceptance Criteria – Microbiological Testing) the disinfection procedure must be repeated, and the watermain re-sampled at the predetermined sample locations.

Note: This item is not required for above ground by-pass watermains and cement relined watermains.

3.10 Potable Water

Once the Owner has satisfied the requirements indicated on the “New Watermain Disinfection, Hydrostatic Testing & Check List” (Form 5.1), the Municipal Inspector will provide the “Opening of Isolation Valves” form to the Maintenance and Operations section together with plans highlighting the section of watermain or water service that will be put in service (providing potable water) and the location of the valves to be opened.

Note: In the event that the watermain is not put in service within 10 days from the date that the Final Bacteriological Sample had been taken, the Project Engineer or his/her representative shall take combined chlorine residuals tests from the predetermined sample locations indicated in Item 2.3.

Full compliance to Ontario Regulations 169/03 specifically combined chlorine residuals of 0.25 mg/L and greater must be achieved. Otherwise, the Watermain is to be flushed to introduce fresh water. A discharge is to be set up for the removal of the stale water prior to the Town’s Maintenance and Operations Certified Operator opening the isolation valve.

The watermain is to be controlled to assure that the direction of the flow is known to promote the expedient and complete removal of the stale water. Once the existing water has been removed from within the system and replaced with fresh water and the combined chlorine residual is greater than 0.25 mg/L, the Town’s Maintenance and
Operations Certified Operator will fully open the isolation valves as requested by the “Opening of Isolation Valves” form.

The owner shall undertake to ensure the watermain system remains potable until such time as the Town has accepted the system and the Maintenance Period has begun.

The owner is to provide a flushing and sampling program to be performed by the Workforce until such time as 50% occupancy as been achieved along each street. Such that flushing and chlorine residuals are to be performed bi-weekly and Chlorine Residual results submitted to the Water and Wastewater Supervisor.

3.11 Sampling and Flushing Program

This program is required for municipal watermain infrastructure. This program is not required for private watermain infrastructure.

The Project Engineer shall prepare and submit to the Water and Wastewater Supervisor or their designate a proposed flushing and sampling program. The Water and Wastewater Supervisor will review and assign a Water Trax sampling number to each sampling point. Once established the assigned Water Trax number and corresponding sampling location will not change and the same numbers and locations are to be used for all future reporting of Chlorine Residual and Bacteriological Sample results.

The Owner shall undertake to ensure the watermain system remains potable until such time as the Town has assumed the system and the Maintenance Period has begun.

The Owner is to provide a flushing and bacteriological sampling program to be performed by the Workforce until such time as 50% occupancy has been achieved along each street.

Flushing and chlorine residuals are to be performed bi-weekly and Chlorine Residual results submitted on the Chlorine Residual Report Form to the Water and Wastewater Supervisor. Samples to be submitted in accordance with the York Durham Regional Environmental Laboratory Chain of Custody (Form 5.6) provided herein shall be taken every four weeks.

Failure to execute this program on a predetermined schedule will result in the program being carried out by Town forces at the expense of the Owner.

Note: This item is not required for above ground by-pass watermain and cement relined watermain.

3.12 Disinfection of By-pass Service Hoses

- All by-pass services hoses to be used will be of potable water grade.
- Service hoses to be chlorinated at 25mg/l continuous feed method.
- Service hoses to be isolated for a maximum 24hr contact time.
- Service hoses to be de-chlorinated, and residual to match that of existing water supply.
- Service hoses to be isolated for minimum 24hr incubation period.
- Bacteriological sample will be taken from each hose bundle.
- Service hoses to be capped on both ends with brass caps.
Service hoses will not be installed on by-pass piping until the day of the change over from distribution watermain to the above ground by-pass watermain.

4. Tables

The following tables are to be used in conjunction with these procedures:

4.1 New Watermain Acceptance Criteria – Microbiological Testing

<table>
<thead>
<tr>
<th>Test Procedure</th>
<th>Acceptance Value¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Coliforms</td>
<td>&lt;1 CFU / 100 millilitre</td>
</tr>
<tr>
<td>E.coli (escherichia coli)</td>
<td>&lt;1 CFU / 100 millilitre</td>
</tr>
<tr>
<td>Fecal coliforms</td>
<td>&lt;1 CFU / 100 millilitre</td>
</tr>
<tr>
<td>Background Bacteria¹</td>
<td>≤ 5 CFU /100 millilitre</td>
</tr>
<tr>
<td>Heterotrophic Plate Count¹</td>
<td>≤ 10 CFU/ milliliter</td>
</tr>
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</table>

Notes:

1. At Town’s discretion, the acceptance value for Background Bacteria and Heterotrophic Plate Count shall be equal to or lower than the sample result from the municipal source.

   CFU = colony forming unit

   Interpret <1 as equal to “zero”

   Background Bacteria: general bacteria population expressed as background colony counts on the total coli form membrane filter.

   Heterotrophic Plate Count: general bacteria population expressed as colony counts on a heterotrophic plate count.

4.2 Bypass Requirements for Swabbing and Flushing of New Watermains

<table>
<thead>
<tr>
<th>PIPE DIAMETER</th>
<th>FLOW REQUIRED TO PRODUCE 0.76 m/s (APPROX) VELOCITY IN MAIN</th>
<th>SIZE OF TAP (mm)</th>
<th>NUMBER OF OPEN 64 mm HYDRANT OUTLETS</th>
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<td>mm</td>
<td>Litres per second</td>
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<td>100</td>
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<td>One 50 mm Ø minimum for bypass</td>
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<td>12.6</td>
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<tr>
<td>400</td>
<td>109.9</td>
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</table>

REQUIRED FLOW AND OPENINGS TO FLUSH PIPELINES (276 kPa – 40 psi RESIDUAL PRESSURE IN WATERMAIN)
5. **FORMS**

The following forms are attached to this document:

5.1 New Watermain Disinfection, Hydrostatic Testing & Check List
5.2 Watermain Disinfection Report
5.3 Chlorine Residual Report
5.4 Operation of Isolation Valve
5.5 Opening of Isolation Valves
5.6 York Durham Regional Environmental Laboratory Chain of Custody

Notes:

- Revisions to forms 5.1 – 5.5 must be approved by the designated approved for Section B6.
- Form 5.6 is controlled by the York-Durham Regional Environmental Laboratory.
New Watermain Disinfection, Hydrostatic Testing & Check List

<table>
<thead>
<tr>
<th>Standard</th>
<th>Procedure</th>
<th>Action By</th>
<th>Completion Date</th>
<th>Witnessed or Received by (Initial)*</th>
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<tr>
<td>W-8A</td>
<td>Loading of Watermain</td>
<td>Contractor or Workforce</td>
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<td></td>
</tr>
<tr>
<td>W-9A</td>
<td>Sample Request Drawings</td>
<td>Project Engineer</td>
<td></td>
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<tr>
<td>1. 1.</td>
<td>Swabbing</td>
<td>Workforce</td>
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<tr>
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<td>Project Engineer</td>
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<td>2. 2.</td>
<td>Flush to Remove Turbidity</td>
<td>Workforce</td>
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<td>3. 3.</td>
<td>Disinfection Procedure</td>
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<td>4. 5.</td>
<td>Discharge Procedure: Removal and Disposal of Super Chlorinated Water</td>
<td>Workforce</td>
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<td>5. 6.</td>
<td>Initial Bacteriological Sampling</td>
<td>Town/Workforce</td>
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<td>6. 7.</td>
<td>Bacteriological Sample Results</td>
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<td>7. N/A</td>
<td>Hydrostatic Testing and Summary Report</td>
<td>Workforce</td>
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<td>8. N/A</td>
<td>Flushing Procedure to Introduce Fresh Water</td>
<td>Workforce</td>
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<td>9. 4.</td>
<td>Final Bacteriological Sampling and Acceptance</td>
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<td>Workforce</td>
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<td>10. N/A</td>
<td>Potable Water</td>
<td>Workforce</td>
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<td>11. 8.</td>
<td>Calculations for estimated volume of water consumed in the commissioning of watermain (signed by Workforce)</td>
<td>Workforce</td>
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<td>12. 9.</td>
<td>Sampling and Flushing Program Proposal Acceptance</td>
<td>Workforce</td>
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</table>

Please Note: This form is to be accompanied by Form 5.2 Hydrostatic Testing Summary, and all Bacteriological sample reports.

Project Engineer’s Certification: We hereby certify that the workforce carrying out the above noted works is licensed, by the MOE as an Operator, and that these works have been completed in accordance with the Town of Richmond Hill Procedures for New Watermains.

*Project Engineer and/or Representative’s Signature  cc: (Town Municipal or Plumbing Inspector)
**Watermain Disinfection Report**  
(Form 5.2)

Date: ________________

Project Name: ___________________________  Town File No.: ___________________________

Contractor/Workforce: ___________________________  Project Engineer: ___________________________

Watermain Location (Supply): ___________________________

The chlorine residuals are to be confirmed with a testing device; litmus paper is not acceptable.

<table>
<thead>
<tr>
<th>Location or Sample Number</th>
<th>Turbidity Count</th>
<th>High Count</th>
<th>24 hr. Count</th>
<th>Low Count</th>
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<tbody>
<tr>
<td>Town Supply</td>
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__________________________

Project Engineer and/or Representative’s Signature
Chlorine Residual Report

Date: _______________________
Project Name: ______________________ Town File No.: ______________________
Contractor/Workforce: ______________________ Project Engineer: ______________________
Watermain Location (Supply): ______________________

The chlorine residuals are to be confirmed with a testing device; litmus paper is not acceptable.

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<tr>
<th>Location or WaterTrax Sample Number</th>
<th>Free Chlorine Residual (mg/L)</th>
<th>Total Chlorine Residual (mg/L)</th>
<th>Combined Chlorine Residual (mg/L)</th>
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</table>

______________________________
Project Engineer and/or Representative’s Signature
Date:

MEMO TO: Supervisor of Water and Waste Water, Public Works Operations Division

FROM: _____________ Project Engineer or his/her Representative
       _____________ Contact Phone Number & FAX number
       _____________ Municipal Inspector

SUBJECT: OPERATION OF ISOLATION VALVE
DO3# / DO6 #
PROJECT NAME

This is to notify the Maintenance and Operations, Water and Wastewater Section, that the isolation valves for the watermain and/or water service system as noted above need to be operated to perform the following activity:

☐ Swabbing Date Requested: ________________
☐ Flushing & Turbidity Date Requested: ________________
☐ Disinfection Date Requested: ________________
☐ Removal of Super Chlorinated Water Date Requested: ________________
☐ Initial Sampling Date Requested: ________________
☐ Hydrostatic Testing Date Requested: ________________
☐ Final Sampling Date Requested: ________________
☐ Other __________________________ Date Requested: ________________

Confirmation as to when the opening of the isolation valves by Certified Maintenance and Operations staff will be scheduled will be faxed to the party making the request.

The appropriate Project Engineer or his/her representative will be on site to verify the isolation valves to be operated.

________________________________________  ______________________________________
Signature of Project Eng. or Representative  Plumbing / Municipal Inspector
Date:

MEMO TO: Water and Wastewater Supervisor, Maintenance and Operations Section

FROM: Municipal Inspector or Plumbing Inspector

SUBJECT: OPENING OF ISOLATION VALVES
Town File No. (DO3# or DO6 #)

PROJECT NAME

This is to notify the Maintenance and Operations, Water and Wastewater section, that the watermain and/or water service system as noted above has been successfully disinfected and passed sampling as per Ministry guidelines and that the requirements of the “New Watermain Disinfection, Hydrostatic Testing & Check List” have been completed.

New Watermain Disinfection, Hydrostatic Testing & Check List, Form 5.1
Date Received: ________________

Date Requested For Opening Isolation Valves: _______________________

Location of Isolation Valves:
(Plan Highlighting valves to open and section of watermain or water service to be put on line is attached)

__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________

Signature of Municipal Inspector or Plumbing Inspector
<table>
<thead>
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<th>Field Sample #</th>
<th>Laboratory Sample ID</th>
<th>Location/Description/Comments</th>
<th>Regulated Y/N</th>
<th>Test Groups</th>
<th>Sample Type</th>
<th>Sample Date/Time</th>
<th>Bottles</th>
<th>Chlorine</th>
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<td></td>
<td></td>
<td></td>
<td>RW/TW/DS</td>
<td>mm-dd-yy</td>
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**LAB Use Only**

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<thead>
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<th>Received by:</th>
<th>WO#:</th>
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<td>mm-dd-yy hh:mm</td>
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DIVISION "C"

TRANSPORTATION
AND
ROAD WORKS
## DIVISION "C"

**TRANSPORTATION AND ROADWORKS**

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**TRANSPORTATION AND ROADWORKS**

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<tr>
<td>R-1B</td>
<td>Typical Cross Section with Joint Utility Trench 20m R.O.W. and greater</td>
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<td>R-2A</td>
<td>Typical Street Cross-Section 18.0m R.O.W.</td>
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<td>Typical Cross Section with Joint Utility Trench 18m R.O.W.</td>
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<td>R-3A</td>
<td>Typical Cul-de-sac</td>
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**TRANSPORTATION AND ROADWORKS**

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<td>Residential Driveway Aprons Town Highway with Curb</td>
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<td>Multi-Use Trail Transition to On-Road Bicycle Lane at Intersection</td>
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<td>R-18A</td>
<td>Multi-Use Trail Carried Through an Intersection</td>
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<td>R-18B</td>
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<td>R-22A</td>
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TRANSPORTATION AND ROADWORKS

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DIVISION "C"

SECTION C1

TRANSPORTATION AND ROAD WORKS

DESIGN CRITERIA ROAD WORKS
DIVISION "C" SECTION C1.1

DESIGN CRITERIA ROADWORKS

1. GENERAL REQUIREMENTS

1.1 ROADS

All roads shall be designed to maximize safe usage by vehicles and pedestrians.

Roads shall be designed to:

a) facilitate projected traffic conveyance
b) satisfy their functional classification, see Table "Alignment Standards"
c) facilitate public transit

In order to ensure acceptable and safe winter maintenance on all Town roads, the Town will not permit any raised or ramped structures (manhole lids, catch basin lids, or valve chamber lids etc.) within the roadway pavement surface between the dates of November 1\textsuperscript{st} and March 31\textsuperscript{st}, unless specifically authorized by the Town.

1.2 BUS BAYS

Bus bays, landing pads and shelters shall be provided as directed by the Commissioner of Environment and Infrastructure Services.

1.3 SIDEWALKS AND WALKWAYS

Sidewalks are required on at least one side of all local roads and on both sides of all collector and arterial roads.

Sidewalks may not be required on cul-de-sacs as determined by the Commissioner of Environment and Infrastructure Services.

In subdivision developments sidewalks shall only be constructed when they can be installed continuous from intersection to intersection. Boulevards shall be graded to match the installed sidewalk immediately following sidewalk installation.

The maximum desirable sidewalk or walkway gradient shall be 5.0% with an allowable 1.0% variance subject to site specific approval of the Commissioner of Environment and Infrastructure Services.

All sidewalks and walkways shall be designed to accommodate the needs of physically and/or sensory impaired individuals.

Sidewalks shall not be constructed through commercial or industrial driveways.
1. GENERAL REQUIREMENTS CON’T.

1.4 STREET LIGHTING

Street lighting shall be provided on all roadways as directed by the Town.

1.5 DRAINAGE

All roadways shall be designed to convey major storm events.
DIVISION "C" SECTION C1.2  
DESIGN CRITERIA ROADWORKS  

2. GEOMETRICS  

2.1 ALIGNMENT & ROAD ALLOWANCE REQUIREMENTS  

2.1.1 General  

The criteria provided in this section may not cover all potential types of roadways. Where this is the case, the designer is directed to follow the requirements outlined by the Ministry of Transportation of Ontario Publication "Geometric Design Standards for Ontario Highways and Streets" (latest revision).  

2.1.2 Alignment - Horizontal  

All roads shall be designed to conform to table "Alignment Standards". 

Minimum tangent length between horizontal curves shall be 60m.  

2.1.3 Alignment - Vertical  

All roads shall be designed to conform to table "Alignment Standards". 

The minimum gradient on any roadway shall be 0.5%. The maximum desirable gradient shall be 5.0% with an allowable variance of 1.0% subject to site specific approval by the Commissioner of Environment and Infrastructure Services. For maximum gradient at intersections see (Section C1.3).  

The minimum gutter grades for cul-de-sacs and elbows shall be 1.0%. The cul-de-sac bulb shall drain away from the end to catchbasins located at the junction of the bulb and the normal road cross-section. Where the aforementioned condition is unattainable, a double catchbasin shall be installed at the low point and a suitable overland flow outlet shall be provided in an easement if necessary. 

All grade changes in excess of 1.5% shall be designed with vertical curves. 

Boulevards from property line to the roadway will be graded to provide a minimum of 2% and a maximum of 4% gradient towards the roadway, irrespective of whether a sidewalk is required or not.  

2.1.4 Road Allowance Requirements  

Road allowances shall be designed to conform to table "Alignment Standards".
DIVISION "C" SECTION C1.2
DESIGN CRITERIA ROADWORKS

<table>
<thead>
<tr>
<th>ROAD CLASSIFICATION</th>
<th>ROAD TYPE</th>
<th>ROAD ALLOWANCE (m)</th>
<th>NO. OF LANES</th>
<th>DESIGN SPEED (km/hr)</th>
<th>MINIMUM PAVEMENT WIDTH (m)</th>
<th>PARKING NO. OF SIDES</th>
<th>MINIMUM CENTRELINE RADIUS (m)</th>
<th>MINIMUM STOPPING SIGHT DISTANCE (m)</th>
<th>MINIMUM SAG K</th>
<th>MINIMUM CREST K</th>
<th>MINIMUM ILLUMINATION SAG K</th>
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<tr>
<td>LOCAL</td>
<td>ULU</td>
<td>18-20 *2</td>
<td>2</td>
<td>50</td>
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<td>12</td>
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<td></td>
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<td>340</td>
<td>160</td>
<td>40</td>
<td>50</td>
<td>20</td>
</tr>
</tbody>
</table>

Additional road allowance width may be required at intersections to accommodate turning lanes.

2 For ULU streets – 18m road allowances are permitted for:
   a) Cul-de-sacs servicing no more than 20 dwelling units
   b) Crescents with two access points and no more than 40 dwelling units
   c) 'P' type road alignments with one access point are to be treated as cul-de-sacs
3 For RLU cul-de-sac streets the ROW can be reduced to 20.0m
4 Minimum island width of 2.0m is required to accommodate landscaping
5 Minimum island width of 1.5m is required and shall be finished with asphalt or concrete
6 All lane widths shall be 3.5m minimum except for industrial roads where lane widths shall be 3.75m minimum

Legend (Road Type)

U Urban
R Rural
L Local
C Collector
I Industrial
A Arterial
U Undivided
D Divided
DIVISION "C" SECTION C1.2

DESIGN CRITERIA ROADWORKS

2 GEOMETRICS

2.1 ALIGNMENT & ROAD ALLOWANCE REQUIREMENTS

2.1.4 Road Allowance Requirements - (Cont'd)

The typical road allowance cross-section shall be as detailed on the Standard Drawings. Details shall be provided for any approved special provisions required due to unique physical conditions on site or for existing or future design conditions, such as; retaining walls, slope protection, culverts, bridges or special cross fall conditions.

Temporary turn-a-rounds as per Standard R-9A are required where a road will be continued in the future and shall have complete services to the street line. Land easements within the subdivision must be deeded to the Town to facilitate this installation, if necessary.
3 INTERSECTION DESIGN

Definitions

Daylighting or Sight Triangle: means a triangular area of land on or abutting a corner lot formed by measuring from the point of intersection of the street boundaries (street lines) the distance required by Table C1.3A "Intersection Geometry".

3.1 General

Intersection designs, including lane configuration and vehicle storage details shall be determined by an Intersection Analysis prepared by a Traffic Engineer using the following:

"Geometric Design Standards for Ontario Highways" (Latest Revision)

3.2 INTERSECTION GEOMETRY AND GRADING

Daylighting triangles and curb radii shall conform to Table C1.3A "Intersection Geometry".

The minimum horizontal angle between street centre lines shall be 80° - 100°.

At the intersection of two roads, the transition of the minor classification road, shall not interfere with the normal cross-fall of the major road.

In all cases, the minor road shall have a minimum 20.0m transition grade equivalent to the cross-fall of the higher order road. This distance shall be measured from the edge of pavement of the higher order road.

Where the major road is super-elevated, the transition grade shall not exceed 2.0%.
DIVISION "C" SECTION C1.3

DESIGN CRITERIA ROADWORKS

TABLE C1.3A – INTERSECTION GEOMETRY

<table>
<thead>
<tr>
<th>ROAD CLASSIFICATION</th>
<th>INTERSECTING ROAD CLASS</th>
<th>DAYLIGHTING DIMENSION (m)</th>
<th>CURB RADII (m)</th>
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<td>7.5</td>
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<td>15</td>
</tr>
</tbody>
</table>
DIVISION "C" SECTION C1.4

DESIGN CRITERIA ROADWORKS

4 DRIVEWAY DESIGN

Definitions:

Driveway Apron: The driveway apron is that portion of a driveway contained within the municipal road allowance.

4.1 General

All driveways shall be finished with a permanent stable surface material such as asphalt or paving stone from the edge of the road to the garage.

Driveway aprons and curb depressions shall not encroach onto the projection of any side lot line except in the case of driveways deemed in the opinion of the Commissioner of Environment and Infrastructure Services, to be mutual or common.

In the case of a corner lot, no portion of a driveway shall be located within a daylighting or sight triangle.

Maximum residential driveway apron and curb depression widths shall conform to Table C1.4A "Residential Driveway Apron Standard Table".

The minimum driveway gradient is 2.0% and the maximum desirable driveway gradient is 5%. The absolute maximum gradient change permissible at the street line or back of sidewalk shall be 3.0% subject to the site specific approval of the Commissioner of Environment and Infrastructure Services. This maximum gradient change is not recommended and shall be employed only in exceptional cases where physical conditions prohibit the use of a less severe change in gradient.

Commercial and High Density underground garage driveway ramps shall have a maximum 10% grade (unheated) and a maximum 15% grade (heated). All entrances shall have a maximum 6.0m level approach to the ramp.
## C1.4A: Residential Driveway Apron Standard Table

<table>
<thead>
<tr>
<th>Lot Frontage</th>
<th>Town Highway with Curb</th>
<th>Town Highway without Curb</th>
<th>Any Town Highway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width measured along Front Lot line</td>
<td>First Curb Depression</td>
<td>Second Curb Depression</td>
<td>First Driveway Apron</td>
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<tr>
<td>Dimension &quot;A&quot;</td>
<td>Maximum width</td>
<td>Maximum width</td>
<td>Maximum width at Edge of Traveled Road</td>
</tr>
<tr>
<td>Dimension &quot;B&quot;</td>
<td>Dimension &quot;D&quot;</td>
<td>Dimension &quot;B&quot;</td>
<td>Dimension &quot;D&quot;</td>
</tr>
</tbody>
</table>

### Less than 9.0 meters
- One driveway apron is permitted.

**First Curb Depression**
- 4.25 meters
- Not Permitted

**Second Curb Depression**
- 4.25 meters
- Not Permitted

**First Driveway Apron**
- 3.0 meters
- Not Permitted

**Second Driveway Apron**
- Not Applicable

### Greater than or equal to 9.0 meters but less than 18.0 meters
- One driveway apron is permitted.

**First Curb Depression**
- 6.0 meters
- Not Permitted

**Second Curb Depression**
- 6.0 meters
- Not Permitted

**First Driveway Apron**
- 6.0 meters
- Not Permitted

**Second Driveway Apron**
- 6.0 meters
- Not Permitted

### Greater than or equal to 18.0 meters but less than 30.0 meters
- Where one driveway apron is permitted.

**First Curb Depression**
- 9.0 meters
- Not Applicable

**Second Curb Depression**
- 9.0 meters
- Not Applicable

**First Driveway Apron**
- 9.0 meters
- Not Applicable

**Second Driveway Apron**
- 9.0 meters
- Not Applicable

### Greater than or equal to 30.0 meters
- Where one driveway apron is permitted.

**First Curb Depression**
- 9.0 meters
- Not Applicable

**Second Curb Depression**
- 9.0 meters
- Not Applicable

**First Driveway Apron**
- 9.0 meters
- Not Applicable

**Second Driveway Apron**
- 9.0 meters
- Not Applicable

### Greater than or equal to 30.0 meters
- Where two driveway aprons are permitted.

**First Curb Depression**
- 9.0 meters
- 6.0 meters

**Second Curb Depression**
- 4.25 meters
- 4.25 meters

**First Driveway Apron**
- 9.0 meters
- 6.0 meters

**Second Driveway Apron**
- 9.0 meters
- 6.0 meters

### Any Town Highway

**First Curb Depression**
- 9.0 meters
- 6.0 meters

**Second Curb Depression**
- 4.25 meters
- 4.25 meters

**First Driveway Apron**
- 9.0 meters
- 6.0 meters

**Second Driveway Apron**
- 9.0 meters
- 6.0 meters

**First Driveway Apron**
- 9.0 meters
- Not Applicable

**Second Driveway Apron**
- 9.0 meters
- Not Applicable
4.1 **DRIVEWAY DESIGN GENERAL** - Cont’d

Mutual or common driveways may receive a continuous curb depression at the sole discretion of the Commissioner of Environment and Infrastructure Services.

All apartment, commercial and industrial driveways shall be provided with curb and gutter constructed in accordance with details as outlined on the Standard Drawings contained herein.

For Commercial, Industrial and High/Medium Residential Development driveway entrances, the curb radii shall be 7.5m minimum and the entrance width shall be a minimum 7.5m. The minimum driveway entrance curb radii and width shall be increased were determined necessary and required by the Commissioner of Environment and Infrastructure Services.

New Commercial, Industrial and Residential Development driveways constructed on existing urban roadways shall have the existing curb removed and replaced with depressed, reinforced curb as per the standards contained herein. Sawcutting of curbs will not be permitted.

Where a driveway apron crosses the municipal storm ditch drainage system the installation of culvert headwalls or wing-walls will not be permitted.

A minimum clear distance of 1.20 m shall be maintained between the edge of any portion of a driveway and any above ground municipal or utilities infrastructure.
DIVISION "C" SECTION C1.5

DESIGN CRITERIA ROADWORKS

5 STRUCTURAL REQUIREMENTS FOR ROADWORKS AND DRIVEWAYS

5.1 General

All pavement designs shall be supported by a Geotechnical report prepared by a Professional Engineer which recommends a minimum pavement structure design required to support the anticipated traffic loading. The pavement design shall consider whether the street is a Transit route.

Table "Structural Requirements for Roads" provides the Town's minimum pavement structure requirements by road classification. Where the Geotechnical report and pavement design noted above exceed the minimum requirements in Table "Structural Requirements for Roads", the designer shall specify the higher strength pavement structure.

The Town will not accept increased base or sub-base granular equivalence's in lieu of thinner asphalt.

All construction practices and materials shall conform to the Ontario Provincial Standard Specifications adopted (as amended) contained herein.

Table "Structural Requirements for Driveway Aprons" provides the Town's minimum structural requirements.

The top course asphalt for residential driveways shall not be placed until the base course asphalt has been in place for one winter season, unless otherwise specifically approved by the Commissioner of Environment and Infrastructure Services.
**DIVISION "C" SECTION C1.5**

**DESIGN CRITERIA ROADWORKS**

**TABLE STRUCTURAL REQUIREMENTS FOR ROADS**

<table>
<thead>
<tr>
<th>ROAD CLASSIFICATION</th>
<th>GRANULAR ‘A’ SUBBASE (mm DEPTH)</th>
<th>20mm CRUSHER RUN LIMESTONE BASE (mm DEPTH)</th>
<th>HL8 ASPHALT BASE COARSE (mm DEPTH)</th>
<th>HL3 ASPHALT SURFACE COARSE (mm DEPTH)</th>
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<td>LOCAL</td>
<td>300</td>
<td>150</td>
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<td>40</td>
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<td>LOCAL – BUS ROUTE</td>
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**TABLE – STRUCTURAL REQUIREMENTS FOR DRIVEWAY APRONS**

<table>
<thead>
<tr>
<th>DRIVEWAY CLASS</th>
<th>GRANULAR ‘A’ SUBBASE (mm DEPTH)</th>
<th>200mm CRUSHER RUN LIMESTONE BASE (mm DEPTH)</th>
<th>HL8 ASPHALT BASE COARSE (mm DEPTH)</th>
<th>HL3F ASPHALT SURFACE COARSE (mm DEPTH)</th>
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</thead>
<tbody>
<tr>
<td>RESIDENTIAL *1</td>
<td>N/A</td>
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<td>25</td>
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<tr>
<td>LIGHT INDUSTRIAL COMMERCIAL APARTMENT RESIDENT/CONDO</td>
<td>200</td>
<td>200</td>
<td>75</td>
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<tr>
<td>HEAVY INDUSTRIAL</td>
<td>300</td>
<td>300</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>

*1) Paving stone driveway aprons shall be constructed in accordance with standard R-7A.
DIVISION "C" SECTION C1.6

ON ROAD BICYCLE FACILITIES

1. ON ROAD BICYCLE FACILITIES

1.1 DEFINITION

All roadways, unless cycling is specifically restricted, are considered to be shared roadways regardless of the presence specific signage. For the purpose of this document, an On Road Bicycle Facility shall be defined as a roadway or a section of roadway that has been designated for shared or exclusive use by cyclist with means of signage, pavement marking or both. The facilities are intended for one-way travel typically in the same direction as the adjacent traffic lane.

1.2 TYPES OF ON ROAD BICYCLE FACILITIES

- Shared Roadways
- Designated Bicycle Lanes
- Paved Shoulders – this facility shall be implemented only as directed by the Town

1.3 SHARED ROADWAYS

Shared roadways including signed routes and sharrows (pavement marking) are preferred routes for cycling, but no physical changes are made to the roadway

Shared roadways shall be implemented where a road design speed is less than or equal to 50km/hr. and where a designated bicycle lane cannot be provided. Shared roadways typically apply to local and minor collector roads.

1.3.1 General Requirements for Shared Roadways Signage

Shared Roadways signage shall be in accordance with the TAC Bikeway Traffic Control Guidelines for Canada, 2012 (or latest version), Sections 2.4.2 Standard Sign Placement and 4.0 Warning Signs or equivalents in accordance to Ontario Traffic Manual (OTM) Book 18:

- Bicycle Route Signs (M511)

![Bicycle Route Signs](M511_OTM)

(Source: OTM Book 18: Cycling Facilities, December 2013, Figure 4.3, page 45)

Bicycle Route Signs M511 shall be installed at all designated bicycle routes as a minimum.
DIVISION "C" SECTION C1.6
ON ROAD BICYCLE FACILITIES

1.3  SHARED ROADWAYS

1.3.1  General Requirements for Shared Roadways Signage - (Cont’d)

Any shared roadway signage shall be installed where road configuration or road classification changes. Signs shall be installed between each intersection and a minimum 15m distance from the end of the curb radius return. Maximum signage spacing shall be 200m where distance between intersections is greater than 200m. Additional signage may be installed as required.

- Share the Road Signs (WC-19 and WC-19t)

  ![Share the Road Signs](image)

  (Source: OTM Book 18: Cycling Facilities, December 2013, Figure 4.4, page 46)

  Share the road signs WC-19 and WC-19t are the required signage.

- Shared Use Lane Single File Signs (WC-24 and WC-24t)

  ![Shared Use Lane Single File Signs](image)

  (Source: OTM Book 18: Cycling Facilities, December 2013, Figure 4.4, page 46)

  Shared use lane single file signs WC-24 and WC-24t shall be used where the travelled roadway width is less than 8.0m wide.
DIVISION "C" SECTION C1.6
ON ROAD BICYCLE FACILITIES

1.4 DESIGNATED BICYCLE LANE

Designated bicycle lanes are a dedicated space for cyclists located in the travelled portion of the roadway for one-way cyclist traffic.

Designated bicycle lanes shall be implemented where a road design speed is greater than or equal to 60km/hr. and where a designated bicycle lane can be provided. Designated bicycle lanes apply to collector road and arterial road.

The designated bicycle facility width shall provide an operating space of 1.5m as shown in the figure below.

(Open: OTM Book 18: Cycling Facilities, December 2013, Figure 2.2, Page 15)

1.4.1 General Requirements for Designated Bicycle Lane Signage

Designated Bicycle Lane signage shall be in accordance with the TAC Bikeway Traffic Control Guidelines for Canada, 2012 (or latest version), Sections 2.4.2 Standard Sign Placement, 3.0 Regulatory Signs and Section 4.0 Warning Signs or equivalents in accordance with Ontario Traffic Manual (OTM) Book 18.
DIVISION "C" SECTION C1.6

ON ROAD BICYCLE FACILITIES

1.4 DESIGNATED BICYCLE LANE

1.4.1 General Requirements for Designated Bicycle Lane Signage – (Cont’d)

- **Reserved Bicycle Lane Signs (RB-84A, RB-85t, WB-10)**

  - **RB-84A** shall be installed between each intersection, a minimum 15m distance from the end of the curb radius return. Maximum signage spacing shall be 200m where the distance between intersections is greater than 200m. Additional signage may be required as directed by the Town.

  End sign **RB-85t** shall be installed with **RB-84A** at the end of a designated bicycle lane.

  **WB-10** shall be installed where a designated bicycle lane is introduced on the far side of an intersection. The sign shall be installed at a minimum 30m distance prior to the curb radius return.

  Reserved Bicycle Lane Signs shall be installed as illustrated in Figures under Section 1.5 and Standard Drawings R-16, R-17A and R-17B.

- **Turning Vehicles Yield to Bicycles Sign (RB-37)**

  (Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012, Section 3.2.3, Pages 15)

  Turning Vehicles Yield to Bicycles Sign shall be installed at intersections where motorists are required to cross a designated bicycle lane. The sign shall be installed a minimum distance of 30m prior to the curb radius return, adjacent to the start of the dashed designated bicycle lane lines, or at the introduction of the right turn lane taper.

  Turning Vehicles Yield to Bicycles Sign shall be installed as shown in Figures in Section 1.5.
DIVISION "C" SECTION C1.6

ON ROAD BICYCLE FACILITIES

1.5 DESIGNATED BICYCLE LANE FIGURES

1.5.1 Bicycle Lane Adjacent to a Combined Through/Right Turn Lane

(Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012, Figure 11, Page 72)

1.5.2 Bicycle Lane Adjacent to Introduced Right Turn Lane

(Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012, Figure 12, Page 73)
1.5 DESIGNATED BICYCLE LANE FIGURES – (Cont’d)

1.5.3 Bicycle Lane Adjacent to Merge Lane with Island

1.5.4 Bicycle Lane Passing a Transit Stop

(Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012, Figure 15, Page 74)

(Source: OTM Book 18: Cycling Facilities, Figure 5.19, Page 145)
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2. DESIGNATED MULTI-USE FACILITIES

A Multi-Use Facility is a shared active transportation facility designed and specifically designated through signage or pavement marking or both for shared users by a variety of users including pedestrians, cyclists and in-line skaters.

Multi-Use Facilities shall conform to the requirements of the Accessibility Standard for the Design of Public Spaces, part of Ontario Regulation 191/11 under the Accessibility for Ontarians with Disabilities Act (AODA). If there are any discrepancies between the following Town of Richmond Hill Design Standards, the Design of Public Spaces Standards and the AODA, the Accessibility Standard for the Design of Public Spaces and the AODA shall take precedence.

2.1 TYPE OF MULTI-USE FACILITIES

- In-Boulevard Multi-Use Trails: Bi-directional trail located within the boulevard and parallel to the adjacent roadway. Use is restricted to the boulevards of collector and arterial classification roads.

- Off Road Multi-Use Trails: Bi-directional trail located in open space, valley land and parkland.

2.2 MULTI-USE FACILITIES – DESIGN CRITERIA

2.2.1 General

A multi-use facility shall require a minimum 1.0m horizontal clear zone and 2.5m vertical clear zone either side of the trail to provide an unobstructed safety buffer to trail users.

Minimum signage shall be provided to promote bi-directional trail and safety for users.

At the time of construction, a multi-use facility shall not be constructed within the minimum protection zone (MPZ) of a tree. A multi-use facility shall maintain a minimum 1.0m clearance from the MPZ where possible. If this is not achievable, the minimum clear zone shall be reviewed and approved by the Town prior to construction.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.2 MULTI-USE FACILITIES – DESIGN CRITERIA – (Cont’d)

2.2.2 In-Boulevard Multi-Use Trails

The width of in-boulevard multi-use trail is 4.0m with a minimum 1.5m separation from the face of curb of the adjacent roadway. Where the 4.0m width cannot be achieved, a minimum width for in-boulevard multi-use trail is 3.0m. A minimum 1.0m horizontal clear zone, 2.5m vertical clear zone and 2.1m to 2.5m signage height shall be provided on either side of the multi-use trail to provide an unobstructed safety buffer as shown in the figure below:

2.2.3 Off Road Multi-Use Trails

The minimum desirable width for off road multi-use facilities is 3.0m. A minimum 1.0m horizontal clear zone and 2.5m vertical clear zone shall be provided on either side of the multi-use trail to provide an unobstructed safety buffer as shown in the figure below:
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.3 GENERAL REQUIREMENTS FOR MULTI-USE FACILITY SIGNAGE

Multi-Use Facility signage shall be in accordance with the TAC Bikeway Traffic Control Guidelines for Canada, 2012 (or latest version), Sections 2.4.2 Standard Sign Placement, 3.0 Regulatory Signs and Section 4.0 Warning Signs or equivalents in accordance with Ontario Traffic Manual (OTM) Book 18.

- Shared Pathway Signage (RB-93)

![Shared Pathway Signage (RB-93)](image)

(Source: OTM Book 18: Cycling Facilities, December 2013, Fig. 4.90, Page 117)

Shared pathway sign RB-71 shall be installed to inform users to share the multi-use trails. This sign shall be installed after road intersections, a minimum 15m distance from the end of the curb radius return, and other road connection points where cyclists and pedestrians can access the multi-use facility as illustrated on Standard Drawings R-17A, R-17B, R-18A, R-18B, R-19A, R-19B, and R-19C.
2.3 GENERAL REQUIREMENTS FOR MULTI-USE FACILITY SIGNAGE – Cont’d

- Pedestrian and Cyclist Crossing Ahead Signs (WC-15 and WC-32t)

The pedestrian and cycling crossing ahead sign shall be installed to inform motorists of a multi-use facility crossing ahead.

Crossing sign WC-32t shall be installed with WC-15 to convey the meaning of the sign. The signs shall be installed at a minimum 95m distance prior to the curb radius return as illustrated on Standard Drawings R-17A, R-17B, R-18A and R-18B.

For uncontrolled mid-block multi-use facility crossings, the signs shall be installed at a minimum 95m distance prior to the crossing or where visibility and sight lines permit as illustrated on Standard Drawings R-19A and R-19C.

- Pedestrian and Cyclist Crossing Side Street Sign (WC-44L and WC-44R)

Pedestrian and cyclist crossing side street signs shall be installed to warn motorists where cyclists may be crossing the side street at the approaching intersection.

Crossing signs shall be installed at a minimum 15m distance prior to the curb radius return as illustrated on Standard Drawings R-17A, R-18A, R-18B and R-18C.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.3 GENERAL REQUIREMENTS FOR MULTI-USE FACILITY SIGNAGE – Cont’d

- Cyclists Yield to Pedestrians Sign (RB-73)

(Cycle to Pedestrians)

(Source: OTM Book 18: Cycling Facilities, December 2013, Figs. 4.92, Page 118)

Cyclists yield to Pedestrians sign shall be installed where the multi-use trail intersects with a pedestrian sidewalk or pedestrian crossing to warn cyclists to yield to other trail users, for example, at bus stops and at trailhead connections. The sign shall also be installed on off road multi-use trails at trailhead and as directed by the Town where sight lines are limited to 25 metres or less as a result of sharp vertical or horizontal curves and areas of thick woodlands, shrubs and tall meadow grasses.

The signs shall be installed at a minimum 15m distance prior to bus stop.

- Dismount and Walk Sign (RB-70)

(Rb-70 (OTM))

(Source: OTM Book 18: Cycling Facilities, December 2013, Figs. 4.93, Page 118)

Cyclists dismount and walk signs shall be installed where the cyclists are required to dismount and walk their bicycle at bridge crossings, boardwalk crossings and uncontrolled midblock crossings.

Dismount and Walk sign RB-70 shall be installed at a minimum 15m distance prior to bridge crossings and boardwalk crossings.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.4 GRADING AND DRAINAGE REQUIREMENTS

2.4.1 In-Boulevard Multi-use Trails

The minimum longitudinal gradient on multi-use trail shall be 0.6%. The maximum desirable gradient shall be 5.0%. Multi-use trail where the adjacent roadways gradient is greater than 5.0% must be no steeper than the roadways gradient.

In-boulevard multi-use trail shall have positive grade towards the adjacent roadway with a minimum cross slope of 2.0% and a maximum of 5.0%.

Grading alignment and drainage requirements shall be in accordance with the Town of Richmond Hill Standards and Specifications Manual, Division “C” – Transportation and Roadworks.

2.4.2 Off Road Multi-use Trails

The minimum longitudinal gradient on off road multi-use trail shall be 0.6%. The maximum desirable gradient shall be 5.0%. Multi-use trails where existing gradient is greater than 5% must be no steeper than 8.0% slope for relatively short sections of trail.

The existing surrounding area drainage patterns shall be maintained and surface run-off shall not be channeled to cross or flow along multi-use trail surface. Trails shall have a minimum cross slope of 2.0% and a maximum of 5.0%.

Where site conditions dictate, multi-use trails may include subdrains to prevent saturation of the granular base material. Subdrains shall be 100mm diameter perforated PVC pipe completed with filter sock.

2.5 HANDRAIL

Handrails shall be incorporated in multi-use trails design where the longitudinal slope is greater than 5.0%.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.6 SAFETY BARRICADE

Safety barricades shall be incorporated in multi-use trail design where specified as follows:

- Equal to or flatter than 3:1 slope with vertical height greater than 0.60m from adjacent ground and less than a minimum 1.0m clearance unobstructed buffer zone
- Steeper than 3:1 slope with vertical height greater than 0.60m from adjacent ground
- All slopes where vertical height is greater than 1.20m from the adjacent ground
- On the edge of a retaining wall or boardwalk with a vertical height greater than 0.60m from the adjacent ground.
- To separate the multi-use facility user from environmentally sensitive areas.
- To prevent multi-use facility users from taking short-cuts down steep slopes.
- As a barrier between the multi-use facility and adjacent watercourses and ponds.

2.7 ACCESS BARRIER GATE

Multi-use facilities shall be constructed to allow access to maintenance and operation and emergency services vehicles. Access must be controlled to restrict other vehicular entry but allow pedestrians and cyclists access. The barrier gate must be easily opened and closed in all seasons.

Access Barrier Gate shall be placed as close to the facility trailhead as possible without encroaching onto the road allowance or impeding in order to provide visual awareness to users that they are approaching the roadway.

The Standard Drawing R-20A and R-20B detail a “P-Type” access barrier gate installation that shall be installed at all multi-use facility trailheads.

The staggered formation of the gates shall allow access for wheelchairs and other mobility aids but restrict access of other vehicles including, but not limited to snowmobiles, recreational vehicles and small cars.

The gate shall overlap one another in the staggered configuration by 150mm regardless of the facility width.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.8 RETAINING WALL

Retaining walls shall be incorporated in multi-use trail design where:
- side slope is steeper than 2:1 slope and can’t be stabilized with vegetation
- to save and protect existing trees
- to reduce the possibility of erosion

Where the height of a retaining wall exceeds 1.5m, the wall shall be structurally designed by a Professional Engineer.

Where the height of a retaining wall exceeds 1.5m, the railing is required.

Where possible, retaining walls shall not be constructed within required 1.0m horizontal clearance zone. Where it is not possible to achieve, requirements for safety barricades specified under Section Safety Barricades must be implemented.

2.9 EDGE PROTECTION

Edge protection shall be incorporated in multi-use trail design where safety barricades are not required, but where the facility runs adjacent to a watercourse or adjacent to a drop in elevation.

Edge protection is site specific and it will be incorporated in the design as directed by the Town.

2.10 BRIDGE AND BOARDWALK

Bridge, Boardwalk or both shall be incorporated in multi-use trail design at all watercourse crossings.

Bridge and boardwalk shall be incorporated in multi-use trail as directed and approved by the Town.

2.11 OFF ROAD MULTI-USE TRAIL TRAILHEAD ELEMENTS

A trailhead facilitates access to a multi-use facility. Trailheads shall be where a facility intersects a road and any other significant or appropriate locations as directed. Standard Drawings R-21A, R-21B and R-21C represent the basic requirements for a typical multi-use facility trailhead adjacent local, minor/major collector and arterial roads. The final layout and elements of a trailhead design shall be determined on a site specific basis.

Site specific design landscape features shall be constructed in conjunction with access barrier gates to deter facility users from circumventing the gates.
DIVISION "C" SECTION C1.6

DESIGNATED MULTI-USE FACILITIES

2.11 OFF ROAD MULTI-USE FACILITY TRAILHEAD ELEMENTS – (Cont’d)

2.11.1 Trailhead Entrance Feature Signage

Trailhead entrance feature signage shall be provided at each trailhead and shall identify as minimum following information:

- Trail length
- Surface type, construction material
- Average and minimum trail width
- Average and maximum running slope and cross slope
- Location of amenities

2.11.2 Bicycle Racks

Bicycle racks shall be provided at each trailhead with following standards:

- To be made of stainless steel
- To have an eight (8) bike capacity
- Constructed with heave duty high quality steel
- Mainframe C.R.W. outside diameter: 1 3/8” H.S.: ¾ round bar
- Pin to Pin width approximately 48 inches
- Triangle Hangers 5/8 inch solid hot rolled rod
- Racks to have Town Logos which will be provided by the Town

2.11.3 Bicycle Lockers

Bicycle Lockers shall be installed as directed by the Town with following standards:

- To be made of durable fiberglass reinforced plastic, each to hold a single bike
- Approximate overall dimensions 74 ½”L x 30”W x 48”H
- Each is to have a 16”W x 18”H steel mesh front
- Supply “C-struct” channels, 2”x4” to be used as risers for installation
- Doors to have swing handles to permit cyclist to lock with cyclist owned padlock
- Colour of locker to be Green
- Lockers to have Town and Cycling Logos which will be provided by the Town

2.11.4 Bicycle Pedestals

Bicycle Pedestals shall be installed as directed by the Town with following standards:

- To be made of galvanized dipped steel
- Approximate overall dimensions 19”L x 6”W x 42”H
- To be mounted on ground with plate
- Mainframe outside diameter: 2 3/8” and rounder outside diameter: 1.9”
3. PAVEMENT STRUCTURE AND MARKINGS

3.1 PAVEMENT STRUCTURE

3.1.1 Multi-Use Facility Structural Requirements

The intent of a multi-use facility is that it be well used by cyclists, pedestrians and other users. Facilities shall be designed for a durable life span and low maintenance and operation costs. Multi-use facilities shall be constructed to permit accessibility to vehicles for routine maintenance and inspections.

The “Multi-Use Facility Structural Requirements Table” provides the Town’s minimum pavement structure requirements by multi-use facility functions and locations.

The Town will not accept increased base or sub-base granular equivalents in lieu of reduced asphalt thicknesses.

The edges of the multi-use facility shall be hand tamped to 45° at edges.

- In-Boulevard Multi-Use Trail and Off Road Multi-Use Trail with Winter Maintenance

Medium duty asphalt surfacing shall be used for in-boulevard multi-use trails and off road multi-use trail where winter maintenance is required. Refer to Standard Drawing R-22A for the construction details.

- Off Road Multi-Use Trail without winter maintenance

Light duty asphalt pavement structure shall be used for off-road multi-use trails where winter maintenance is not required. Refer to Standard Drawing R-22A for the construction details.

- Multi-Use Trail Crossing Industrial/Commercial/Institutional Entrances

The pavement structure of a multi-use trail carried through industrial/commercial/institutional entrances shall be in accordance with the Structural Requirement for Driveway Aprons under Section C1.4.
DIVISION "C" SECTION C1.6

PAVEMENT STRUCTURE AND MARKINGS

3.1 PAVEMENT STRUCTURE

3.1.1 Multi-Use Facility Structural Requirements – (Cont’d)

MULTI-USE FACILITY STRUCTURAL REQUIREMENTS TABLE

<table>
<thead>
<tr>
<th>Location</th>
<th>Granular ‘A’ Sub-base (mm Depth)</th>
<th>20mm Crusher Run Limestone Base (mm Depth)</th>
<th>HL 8 Asphalt Base Course (mm Depth)</th>
<th>HL 3 Asphalt Surface Course (mm Depth)</th>
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<tbody>
<tr>
<td>In-Boulevard and Designated Off Road</td>
<td>150</td>
<td>150</td>
<td>50</td>
<td>40</td>
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<tr>
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<tr>
<td>Designated Off Road</td>
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<td>150</td>
<td>-</td>
<td>75</td>
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<tr>
<td>(winter maintenance is not required)*1</td>
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</table>

*1) Terrafix 270R Filter Fabric (or approved equivalent) shall be placed to separate the undisturbed or compacted subgrade from the granular base.

3.1.2 Trailhead Structural Requirement

- **Concrete Pad: Light Duty**

Concrete pad Light duty on a granular base shall be used for multi-use facility trailheads as directed by the Town. The Standards R-22C illustrates the construction details and the thickness of the required materials including:

- 150mm compacted depth Granular ‘A’
- 125mm compacted concrete

- **Concrete Pad: Medium Duty**

Concrete pad Medium duty on a granular base shall be used for multi-use facility trailhead as directed by the Town. The Standards R-22C illustrates the construction details and the thickness of the required materials including:

- 200mm compacted depth Granular ‘A’
- 180mm compacted concrete
3.2 PAVEMENT MARKINGS

The use of pavement marking shall be minimized. Signage is the desired means of communicating with bicycle facility and multi-use facility users.

Pavement markings shall be white thermoplastic material in accordance with OPSS 1713.

3.2.1 On Road Bicycle Facility Pavement Markings

- **Solid/Dashed White Lines**

  Solid White Line:

  Dashed White Line:

  (Source: OTM Book 18: Cycling Facilities, December 2013, Fig. 4.24 and 4.25, Page 65)

  Solid white pavement markings shall be used to delineate designated bicycle lane.

  Dashed white pavement markings shall be used to delineate a section of a designated bicycle lane where a vehicle may cross over. Refer to SECTION C1.6.1.5 for reference where a dashed line shall be used.

- **Shared Use “Sharrow” Pavement Markings**

  (Source: OTM Book 18: Cycling Facilities, December 2013, Fig. 4.6, Page 47)
DIVISION "C" SECTION C1.6

PAVEMENT STRUCTURE AND MARKINGS

3.2.1 **On Road Bicycle Facility Pavement Markings** – (Cont’d)

- **Shared Use “Sharrow” Pavement Markings** – (Cont’d)

Shared use “sharrow” pavement markings include two white chevron markings and a white bicycle marking constructed to the dimensions shown above. Sharrow pavement markings shall be used in conjunction with shared roadway signage on collector roads. Shared use “sharrow” pavement marking shall be placed immediately before and following an intersection and/or designated bicycle facility transition to shared roadway. Sharrows shall be placed at 75m intervals.

Where on-street parking is not permitted, the centre of the sharrow marking shall be laterally placed a minimum 0.75m and a maximum 1.0m from the face of curb.

Where on-street parking is permitted, the centre of the sharrow marking shall be laterally placed 1.3m from the edge of the parking lane.

- **Designated Bicycle Lane Pavement Markings**

Designated bicycle lane pavement markings shall include a bicycle symbol and a diamond symbol constructed to the dimensions shown. The markings shall be used in conjunction with designated bicycle lane signage, as described in SECTION C1.6.1.4.

The markings shall be placed immediately following intersections and segments of designated bicycle lane delineated with dashed lines where vehicles may cross over. Refer to SECTION C1.6.1.5 for reference where pavement markings shall be used.

Designated bicycle lane pavement markings shall be placed at minimum 200m distance where intersections are spaced more than 400m apart. Site specific factors shall apply where the markings may be placed more frequently to identify the presence of cyclist.

(Source: OTM Book 18: Cycling Facilities, December 2013, Fig. 4.26, Page 65)
DIVISION "C" SECTION C1.6

PAVEMENT STRUCTURE AND MARKINGS

3.2.2 In-Boulevard Multi-Use Trail Pavement Markings

- Elephant’s Feet Pavement Markings at Intersection/Road Crossings

![Elephant’s Feet Pavement Markings](image)

(Source: OTM Book 18: Cycling Facilities, December 2013, Fig. 4.100, Page 120)

Elephant’s Feet pavement markings shall be used to delineate the cyclist section of a multi-use facility intersection and roadway crossing, as illustrated on Standard Drawings R-17A, R-17B, R-18A and R-18B.

- Zebra Crosswalk Pavement Markings at Intersection/Road Crossings

![Zebra Crosswalk Pavement Markings](image)

(Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012 (Table 7-1, Page 55)

Zebra Crosswalk pavement markings shall be used to delineate the pedestrian section of a multi-use facility intersection and roadway crossing, as illustrated on Standard Drawings R-17A, R-17B, R-18A and R-18B.)
DIVISION "C"

SECTION C2

TRANSPORTATION AND ROAD WORKS

SPECIFICATIONS

ROADWORKS
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(OPSS DIVISION 2)  
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(OPSS DIVISION 3)  
CONSTRUCTION SPECIFICATIONS  
PAVEMENT (FLEXIBLE AND RIGID)

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<td>310</td>
<td>CONSTRUCTION SPECIFICATION FOR HOT MIXED, HOT LAID ASPHALTIC CONCRETE PAVING</td>
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<td>AND HOT MIX PATCHING</td>
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<td>311</td>
<td>CONSTRUCTION SPECIFICATION FOR ASPHALT SIDEWALK, DRIVEWAY BOULEVARD AND</td>
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<td>SIDEWALK RESURFACING</td>
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DIVISION "C" SECTION C2.2  
(OPSS DIVISION 3)  
CONSTRUCTION SPECIFICATIONS  
Pavement (Flexible and Rigid)  

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<th>Description</th>
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<td>312</td>
<td>Construction specification for asphalt curb and gutter systems and asphalt surfacing of gutters</td>
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<td>313</td>
<td>Construction specification for hot mixed, hot laid asphaltic concrete paving and hot mix patching, including recycled and specialty mixes</td>
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## Division "C" Section C2.2
**(OPSS Division 3)**

**Construction Specifications**

**Pavement (Flexible and Rigid)**

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<td>Construction Specification for untreated granular, subbase, base, surface, shoulder and stockpiling</td>
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<tr>
<td>315</td>
<td>Construction Specification for untreated granular, subbase, base, surface, shoulder and stockpiling</td>
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<td>316</td>
<td>Construction Specification for extruded expanded polystyrene frost heave treatment</td>
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<td>Construction Specification for in-place full depth reclamation of bituminous pavement and underlying granular</td>
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<td>Construction Specification for concrete pavement, concrete base and lean concrete base</td>
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<td>351</td>
<td>Construction Specification for concrete sidewalk</td>
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(OPSS DIVISION 4 and 5)
CONSTRUCTION SPECIFICATIONS
MISCELLANEOUS

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<td>405</td>
<td>CONSTRUCTION SPECIFICATION FOR PIPE SUBDRAINS</td>
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<td>Shall be 150 mm dia. Polyethylene Pipe with Geotextile pre-wrap.</td>
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<tr>
<td>501</td>
<td>CONSTRUCTION SPECIFICATION FOR COMPACTING</td>
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<td>Earth materials to be compacted 98% Standard Proctor Density to 600mm below road subbase and 95% Standard Proctor density at depths in excess of 600mm below the road subbase.</td>
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<tr>
<td>502</td>
<td>CONSTRUCTION SPECIFICATION FOR WEIGHING OF MATERIALS</td>
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<td>510</td>
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(OPSS DIVISION 10)
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<td>1001</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES - GENERAL</td>
<td>1001</td>
<td>Reclaim of concrete shall not be used</td>
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<tr>
<td>1002</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES - CONCRETE</td>
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<td>1003</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES - HOT MIXED, HOT LAID, ASPHALTIC CONCRETE</td>
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<td>1010</td>
<td>MATERIAL SPECIFICATION FOR AGGREGATES, GRANULAR A, B, M AND SELECT SUBGRADE MATERIAL</td>
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<td>Reclaim of concrete shall not be used.</td>
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## (OPSS DIVISION 11)
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<tr>
<td>1101</td>
<td>MATERIAL SPECIFICATION FOR ASPHALT CEMENT</td>
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<tr>
<td>1102</td>
<td>MATERIAL SPECIFICATION FOR LIQUID ASPHALT</td>
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<td>1103</td>
<td>MATERIAL SPECIFICATION FOR EMULSIFIED ASPHALT</td>
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<tr>
<td>1149</td>
<td>MATERIAL SPECIFICATION FOR HOT MIX, HOT LAID AND ASPHALTIC CONCRETE,</td>
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<td>INCLUDING RECYCLED AND SPECIALTY MIXES</td>
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<td>MATERIAL SPECIFICATION FOR HOT MIXED, HOT LAID ASPHALTIC CONCRETE</td>
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<td>1151</td>
<td>MATERIAL SPECIFICATION FOR DENSE GRADED THIN BITUMINOUS HOT MIX</td>
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<td>1152</td>
<td>MATERIAL SPECIFICATION FOR SC-800 PATCHING MATERIAL</td>
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<td>1153</td>
<td>MATERIAL SPECIFICATION FOR EMULSIFIED ASPHALT PATCHING MATERIAL</td>
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<tr>
<td>1154</td>
<td>MATERIAL SPECIFICATION FOR HOT MIXED, HOT LAID, ASPHALTIC CONCRETE CONTAINING RECLAIMED ASPHALT PAVEMENT</td>
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<td>a) Max. use of re-claimed asphalt shall be 25% in binder courses.</td>
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<td>1155</td>
<td>MATERIAL SPECIFICATION FOR MEDIUM DUTY BINDER COURSE ASPHALTIC CONCRETE</td>
<td></td>
<td>b) Re-claimed asphalt is not permitted in surface course asphalt.</td>
</tr>
</tbody>
</table>
DIVISION "C" SECTION C2.6  
(OPSS DIVISION 13)  
MATERIAL SPECIFICATIONS - CEMENT AND CONCRETE

<table>
<thead>
<tr>
<th>OPSS</th>
<th>DESCRIPTION</th>
<th>SUBSECTION NO.</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1303</td>
<td>MATERIAL SPECIFICATION FOR AIR ENTRAINING AND CHEMICAL ADMIXTURES</td>
<td></td>
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<tr>
<td></td>
<td>FOR PORTLAND CEMENT CONCRETE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1305</td>
<td>MATERIAL SPECIFICATION FOR MOISTURE VAPOUR BARRIERS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1306</td>
<td>MATERIAL SPECIFICATION FOR BURLAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1308</td>
<td>MATERIAL SPECIFICATION FOR JOINT FILLER (CONCRETE)</td>
<td>Section 1308.05.01</td>
<td>Type &quot;C&quot; wood is not approved</td>
</tr>
<tr>
<td>1312</td>
<td>MATERIAL SPECIFICATION FOR LATEX MODIFIERS</td>
<td></td>
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<tr>
<td></td>
<td>FOR USE IN PORTLAND CEMENT CONCRETE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1315</td>
<td>MATERIAL SPECIFICATION FOR WHITE PIGMENTED MEMBRANE CURING COMPOUNDS FOR CONCRETE</td>
<td></td>
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<tr>
<td>1350</td>
<td>MATERIAL SPECIFICATION FOR CONCRETE - MATERIALS AND PRODUCTION</td>
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<tr>
<td>1440</td>
<td>MATERIAL SPECIFICATION FOR STEEL REINFORCEMENT FOR CONCRETE</td>
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### DIVISION "C" SECTION C2.8
**OPSS DIVISION 15**
MATERIAL SPECIFICATIONS - SAFETY RELATED

<table>
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<tr>
<th>OPSS</th>
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<tbody>
<tr>
<td>1504</td>
<td>MATERIAL SPECIFICATION FOR STEEL BEAM GUIDE RAIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1505</td>
<td>MATERIAL SPECIFICATION FOR CHANNEL COMPONENTS (STEEL BEAM GUIDE RAIL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1506</td>
<td>MATERIAL SPECIFICATION FOR TIMBER POSTS AND BLOCKS (STEEL BEAM GUIDE RAIL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1508</td>
<td>MATERIAL SPECIFICATION FOR ROUND WOOD POSTS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOTES:
1) THIS STANDARD TO BE USED FOR CUL-DE-SAC'S OR CRESTS WITH TWO ACCESS POINTS ON THE SAME STREET.

2) THIS STANDARD TO BE USED IN CONJUNCTION WITH "CONSTRUCTION REQUIREMENTS FOR THE INSTALLATION AND MAINTENANCE OF UNDERGROUND UTILITIES AND SERVICES POLICY."

CONSTRUCTION DETAIL @ DRIVEWAY

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TYPICAL
STREET CROSS - SECTION
18.0m R.O.W.

SCALE: N.T.S.
DATE: NOV. 1996

DRAWN: A.J.V.
DWG. No. R-2A
NOTES:

1) FOR DIMENSIONS "R" AND "W" SEE DESIGN CRITERIA ALIGNMENT STANDARDS.
2) THIS STANDARD TO BE USED IN CONJUNCTION WITH "CONSTRUCTION REQUIREMENTS FOR THE INSTALLATION AND MAINTENANCE OF UNDERGROUND UTILITIES AND SERVICES POLICY".
3) MAX. WIDTH OF JOINT UTILITY TRENCH IS 16m. IF TRENCH WIDTH IS LESS THAN 16m, THIS OFFSET FROM PROPERTY LINE SHALL BE INCREASED ACCORDINGLY. THE OFFSET TO THE OPPOSITE EDGE OF TRENCH SHALL REMAIN FIXED AT 2.8m.

CONSTRUCTION DETAIL @ DRIVEWAY

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TYPICAL CROSS - SECTION WITH JOINT UTILITY TRENCH 20.0m R.O.W AND GREATER

SCALE: N.T.S.
DATE: JUN. 2002
DRAWN: J.P.
DWG. No. R-1B
NOTES:

1. THIS STANDARD TO BE USED FOR CUL-DE-SACS OR CRESCENTS WITH TWO ACCESS POINTS ON THE SAME STREET.

2. THIS STANDARD TO BE USED IN CONJUNCTION WITH "CONSTRUCTION REQUIREMENTS FOR THE INSTALLATION AND MAINTENANCE OF UNDERGROUND UTILITIES AND SERVICES POLICY."

3. MAX. WIDTH OF JOINT UTILITY TRENCH IS 1.6m. IF TRENCH WIDTH IS LESS THAN 1.6m, THIS OFFSET FROM PROPERTY LINE SHALL BE INCREASED ACCORDINGLY. THE OFFSET TO THE OPPOSITE EDGE OF TRENCH SHALL REMAIN FIXED AT 2.1m.
BOULEVARD WIDTH VARIES AROUND BULB.

<table>
<thead>
<tr>
<th>R.O.W.</th>
<th>R1</th>
<th>R2</th>
<th>X</th>
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<tr>
<td>RESIDENTIAL</td>
<td>18m</td>
<td>19.75m</td>
<td>3.75m</td>
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<td></td>
<td>20m</td>
<td>20.75m</td>
<td>30.75m</td>
<td>5.75m</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>23m</td>
<td>21m</td>
<td>40m</td>
<td>6.5m</td>
</tr>
</tbody>
</table>

NOTE:
GUTTER ELEVATIONS AND GRADES AROUND CUL-DE-SAC SHALL BE DETAILED ON THE ENGINEERING DWG’S.

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TYPICAL CUL-DE-SAC

SCALE: N.T.S.  DATE: NOV. 1996
DRAWN: A.J.V.  DWG. No. R-3A
TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TYPICAL 90° CRESCENT

SCALE: N.T.S.  DATE: NOV. 1996
DRAWN: A.J.V.  DWG. No. R-4A
BUILDING DIMENSIONS TO BE
2.5m WITH SIDEWALK
OR 1.5m WITHOUT SIDEWALK

NOTE:
1 MINIMUM ROADWAY WIDTH,
   NO PARKING - ONE WAY =4.0m
   NO PARKING - TWO WAY =6.0m
   ONE SIDE PARKING - ONE WAY=6.0m
   ONE SIDE PARKING - TWO WAY=8.5m

2 GRADE ON ROADWAY 5.0% max, 0.5% min.

3 THE REQUIREMENTS FOR SIDEWALK WILL BE
   DETERMINED BY THE TOWN.

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TYPICAL VEHICULAR ACCESS FOR
CONDOMINIUMS AND PRIVATE
DEVELOPMENTS.

SCALE: N.T.S.       DATE: NOV. 1996
DRAWN: A.J.V.       DWG. No. R-5A
TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

PEDESTRIAN WALKWAYS

SCALE: N.T.S.  DATE: NOV. 1996
DRAWN: A.J.V.  DWG. No. R-6A

NOTES:
1. SODDED SWALES SHALL FLOW INTO ROADSIDE DITCH, OR INTO CURB & GUTTER, WITH A MINIMUM GRADE OF 2.00%
2. FENCING SHALL BE AS PER OPSD 900.01 AS AMENDED BY THE TOWN

50mm H.L.3A ASPHALT OR CONC. AS PER OPSD 310.010 OR INTERLOCKING PAVING STONE (STD R-7A)

150mm COMPACTED THICKNESS GRANULAR "A"

6.0m WALKWAY

3.0m WALKWAY
NOTES:
1. USE STANDARD, EDGING AND ½ EDGING STONES AS REQUIRED.
2. ALL CUT PAVING STONES SHALL HAVE TRUE EVEN EDGES.
3. PAVER EDGE RESTRAINTS AS PER MANUFACTURERS SPECIFICATION OR AS APPROVED BY THE TOWN.

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

PAVING STONE SIDEWALK

SCALE: N.T.S.  DATE: NOV. 1996
DRAWN: A.J.V.  DWG. No. R-7A
CURB CUT AND SIDEWALK RAMP AT LOCAL STREETS

NOTES:

1. RAMPS SHALL HAVE A COURSE TEXTURED BROOM FINISH.
2. SIDEWALK RAMP SHALL BE PROVIDED AT ALL INTERSECTIONS AND PEDESTRIAN CROSSINGS.
3. RAMP GRADIENT IN EXCESS OF 5% SUBJECT TO APPROVAL AND IN NO CASE SHALL EXCEED 6%.
4. THIS STANDARD TO BE USED IN CONJUNCTION WITH STD R - 8A.

TYPICAL LAYOUT FOR INTERSECTIONS WITH SIDEWALKS IN VARYING (NON-STANDARD) LOCATIONS

DETAIL OF GROOVES
NOTES:

1. ALL CURB AND GUTTER SHALL BE CONCRETE BARRIER TYPE AS PER OPSD-600.04
2. CURB STANDARD AT SIDEWALK SHALL CONFORM TO TOWN STD. R-8A
3. PROPOSED DRIVEWAYS SHALL BE LOCATED AS INDICATED ON THIS STANDARD. CONSIDERATION WILL NOT BE GIVEN TO ALTERNATIVE LAYOUTS
4. SERVICE CONNECTIONS SHALL BE LOCATED IN ACCORDANCE WITH TOWN STD. M-2A

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

TEMPORARY TURN AROUND

SCALE: N.T.S. DATE: JUNE 21/91
DRAWN: J.D.T DWG. No. R-9A
NOTES

1. BUS SHELTER BASE AND LANDING PADS SHALL CONFORM TO SIDEWALK STD OPSD 310.010.

2. BUS SHELTER SHALL BE LOCATED BEYOND THE PROJECTION OF DAYLIGHTING TRIANGLE AT INTERSECTIONS.

3. BUS STOPS SHALL BE LOCATED ON NEAR SIDE OF INTER SECTIONS.

4. MID BLOCK BUS STOPS TO HAVE LANDING PAD CONSTRUCTED AS PER THIS DETAIL.
1. MINIMUM INTENSITY OF NUMERALS IS:
   ASTM D 4956–90 TYPE 1
2. PLATES AND NUMBERS AVAILABLE AT:
   ALPINE GRAPHICS 34 MAGNUM DRIVE, SCHOMBERG, ON
1. USE COMPRESSION TYPE CONNECTORS THROUGHOUT.
2. POLE HOLE TO BE 600mm DIA. BY AUGER METHOD ONLY.
3. BACKFILL POLE HOLE TO BASE OF CABLE PORTS WITH LIMESTONE SCREENINGS IN 100mm WELL COMPACTED LAYERS 150mm OF SAND AROUND S/L CONDUCTOR AND FINISH WITH LIMESTONE SCREENINGS IN 100mm WELL COMPACTED LAYERS UP TO 100mm OF FINISHED GRADE.

63.5mm I.P.S [73mm O.D.] TENON X 127mm LONG

C.S.A. CLASS "A"
TAPERED HEXAGONAL CONCRETE POLE [POLISHED BLACK FINISH]

POLE NUMBERING AS PER R-IIA.

MANUFACTURERS NAMEPLATE

66.66mm X 203.2mm RECESSED H.H BOX C/W GROUND WIRE AND S.S. TAMPERPROOF SCREWS AND BLACK COVERPLATE C/W WARNING LABEL.

GRADE

63.5mm X 127mm WIRING APERTURE BOTH SIDES.

SEE NOTE 3

MANUFACTURERS NAMEPLATE, H.H.BOX AND APERTURE

TOP VIEW
NOTES:

1. USE COMPRESSION TYPE CONNECTORS THROUGHOUT.

2. POLE HOLE TO BE 607mm DIA. BY AUGER METHOD ONLY.

3. BACKFILL POLE HOLE TO BASE OF CABLE PORTS WITH LIMESTONE SCREENING IN 102mm WELL COMPACTED LAYERS: 150mm OF SAND AROUND S/L CONDUCTOR AND FINISH WITH LIMESTONE SCREENING IN 100mm WELL COMPACTED LAYERS UP TO 100mm OF FINISHED GRADE.

4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.

<table>
<thead>
<tr>
<th></th>
<th>REVISED &quot;X&quot; AND &quot;Y&quot; DIMENSIONS</th>
<th>JAN 17/11</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>REVISIONS</td>
<td>DATE</td>
</tr>
</tbody>
</table>

TOWN OF RICHMOND HILL
ENVIRONMENT & INFRASTRUCTURE SERVICES

"COBRA HEAD"
STREET LIGHT POLE INSTALLATION

SCALE: N.T.S.
DATE: MARCH 1998
DRAWN: J.P.
DWG. No. R-13A
NOTES

1. BUS SHELTER BASE, BENCH BASE AND LANDING PADS SHALL CONFORM TO SIDEWALK STD OPSD 310.010.

2. BUS SHELTER SHALL BE LOCATED BEYOND THE PROJECTION OF DAYLIGHTING TRIANGLE AT INTERSECTIONS.

3. BUS STOP SHALL BE LOCATED ON NEAR SIDE OF INTERSECTIONS.

4. MID BLOCK BUS STOPS TO HAVE LANDING PAD CONSTRUCTED AS PER THIS DETAIL.
NOTES:

1) To be read in conjunction with Table C1.4A - "Allowable Driveway Apron Widths", Division 'C', Section 1.4 of the Roadworks Design Criteria.

2) All dimensions are in meters unless otherwise noted

1) \( \Delta' = 60' \) Minimum \( \Delta' = 120' \) Maximum
NOTES:

1) To be read in conjunction with Table C1.4A - "Allowable Driveway Apron Widths", Division 'C', Section 1.4 of the Roadworks Design Criteria.

2) All dimensions are in meters unless otherwise noted

1) $\Delta' = 60^\circ$ Minimum $\Delta = 120^\circ$ Maximum
NOTES:

1) **POINT "X"**: Intersection point of the projected lateral highway property lines

2) **LINE "Y"**: A straight line joining the two points established using dimension "z"

3) **DIMENSION "Z"**: To be Determined in accordance with Table C1.3A - Intersection Geometry, Division 'C', Section C1.3, Design Criteria Roadworks

4) No portion of a driveway apron shall be located within a sight triangle or situated in such a way that a vehicle parked on any portion of a driveway impedes the line of sight across a sight triangle.

5) All dimensions are in meters unless otherwise noted
Notes:
1. Transition radius less than 12.0m may be used to smooth out to complete curve.
2. Arrows and numbers on drawing indicates sequence and direction of vehicle movement.
3. Private road and turnaround minimum pavement width shall be 6.0m.
4. Walkway shall be provided along any portion of the private road and the turnaround which has units front on to it or as directed by the Town.
5. Dedicated snow storage area must be provided separately as snow storage area is not included in turnaround area.
6. Playground area shall not be located at either end of turnaround area.
7. Minimum dedicated area provided for waste set out shall be 2.5m/unit and adjacent to curb. Set out area configuration to be approved by Town.
NOTES:

1. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE, TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.

2. PAVEMENT MARKINGS TO BE WHITE THERMOPLASTIC MATERIAL IN ACCORDANCE WITH OPSS 1713.

3. FOR PAVEMENT MARKING DETAILS, REFER TO SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

4. FOR DESIGNATED BICYCLE LANE SIGNAGE DETAILS, REFER TO SECTION C1.7.1 - ON ROAD BICYCLE FACILITIES.

5. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.

6. WC-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRAIN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:

1. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE, TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.

2. PAVEMENT MARKINGS TO BE WHITE THERMOPLASTIC MATERIAL IN ACCORDANCE WITH OPSS 1713.

3. FOR PAVEMENT MARKING DETAILS, REFER TO SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

4. FOR DESIGNATED BICYCLE LANE SIGNAGE DETAILS, REFER TO SECTION C1.7.1 - ON ROAD BICYCLE FACILITIES.

5. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.

6. Wc-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADSIDE CONFIGURATION MAY CONSTRIN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
MIN. 95m IN ADVANCE OF CROSSING

Wc-15

Wc-321

SEE NOTE 1.

MULTI-USE TRAIL

SEE NOTE 1.

MULTI-USE TRAIL

Rb-71

Rb-71

NOTES:

1. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.

2. PAVEMENT MARKINGS TO BE WHITE THERMOPLASTIC MATERIAL IN ACCORDANCE WITH OPSS 1713.

3. FOR PAVEMENT MARKING DETAILS, REFER TO SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

4. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.

5. Wc-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRIN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:

1. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.

2. PAVEMENT MARKINGS TO BE WHITE THERMOPLASTIC MATERIAL IN ACCORDANCE WITH OPSS 1713.

3. FOR PAVEMENT MARKING DETAILS, REFER TO SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

4. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.

5. Wc-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRAN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:

1. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.

2. PAVEMENT MARKINGS TO BE WHITE THERMOPLASTIC MATERIAL IN ACCORDANCE WITH OPSS 1713.

3. FOR PAVEMENT MARKING DETAILS, REFER TO SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

4. PAVEMENT STRUCTURE FOR A MULTI-USE TRAIL THROUGH A INDUSTRIAL/COMMERCIAL/INSTITUTIONAL ENTRANCE SHALL BE IN ACCORDANCE WITH SECTION C1.7.3 - PAVEMENT STRUCTURE AND MARKINGS.

5. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.

6. WC-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRAN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:
1. UNCONTROLLED MID-BLOCK MULTI-USE TRAIL CROSSINGS SHALL CONFORM TO THE REQUIREMENTS DETAILED IN OTM BOOK 15 - PEDESTRIAN CROSSING FACILITIES.
2. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.
3. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
4. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
6. Wo-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRAIN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:
1. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
2. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.
3. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
4. FOR SHARED ROADWAY SIGNAGE DETAILS, REFER TO SECTION C1.7.1 - ON ROAD BICYCLE FACILITIES.
5. TRAILHEAD ELEMENTS AT LOCAL ROADS SHALL BE IN ACCORDANCE WITH R-21A.
NOTES:

1. UNCONTROLLED MID-BLOCK MULTI-USE TRAIL CROSSINGS SHALL CONFORM TO THE REQUIREMENTS DETAILED IN OTM BOOK 15 - PEDESTRIAN CROSSING FACILITIES.
2. TACTILE WALKING SURFACE INDICATORS (TWI) TO BE A MINIMUM 610mm DEPTH AND EXTEND THE FULL WIDTH OF THE CURB RAMP. TWI TO BE SET BACK 150mm - 200mm FROM THE CURB EDGE. TWI BASE TO BE LEVEL WITH ADJACENT SURFACE WITH TACTILE PROFILES RAISED ABOVE THE GROUND SURFACE. TWI TO BE COLOUR CONTRASTED WITH ADJACENT SURFACES.
3. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
4. FOR MULTI-USE TRAIL SIGNAGE DETAILS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
5. FOR SHARED ROADWAY SIGNAGE DETAILS, REFER TO SECTION C1.7.1 - ON ROAD BICYCLE FACILITIES.
6. TRAILHEAD ELEMENTS AT LOCAL ROADS SHALL BE IN ACCORDANCE WITH R-21A.
7. Wc-15 TO BE INSTALLED IN ACCORDANCE WITH OTM BOOK 6, TABLE 4. ROADWAY CONFIGURATION MAY CONSTRAIN THE DISTANCE FROM THE CROSSING TO A NON-STANDARD DISTANCE.
NOTES:
1. ACCESS GATES TO BE MANUFACTURED BY:
   a.) MAGLIN SITE FURNITURE
   b.) PARIS EQUIPMENT MANUFACTURING LTD.
   OR APPROVED EQUIVALENT.
2. ACCESS GATES COLOUR SHALL BE BLACK AND MATTE FINISH.
3. ALL DIMENSIONS SHOWN IN MILLIMETRES
4. CONCRETE TO BE 32 MPa @ 28 DAYS
5. REFER TO R-20B FOR ACCESS BARRIER GATE LAYOUT.

TOWN OF RICHMOND HILL
ENVIRONMENT & INFRASTRUCTURE SERVICES

ACCESS BARRIER GATE

DRAWN: A&A  DWG. No. R-20A
TOWN OF RICHMOND HILL
ENVIRONMENT & INFRASTRUCTURE SERVICES

ACCESS BARRIER GATE LAYOUT

NOTES:
1. ACCESS GATES TO BE MANUFACTURED BY:
   a) PARIS EQUIPMENT MANUFACTURING LTD.
   b) MAGLIN SITE FURNITURE
   OR APPROVED EQUIVALENT.
2. ALL DIMENSIONS SHOWN IN MILLIMETRES
3. CONCRETE TO BE 32 MPa @ 28 DAYS
4. REFER TO R-20A FOR ACCESS BARRIER GATE DETAIL.

SCALE: N.T.S.
DATE: JAN 2016
DRAWN: A&A
DWG. No. R-20B
NOTES:
1. TOWN OF RICHMOND HILL REGULATORY AND SAFETY SIGNAGE IS SITE SPECIFIC.
2. FOR TRAILHEAD ELEMENT DETAILS, INCLUDING SIGNAGE REQUIREMENTS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
3. FOR MULTI-USE TRAIL ALIGNMENT, REFER TO R-19A, R-19B, AND R-19C.
4. THE LAYOUT OF TRAILHEAD ELEMENTS IS SITE SPECIFIC.
5. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
### NOTES:

1. **TOWN OF RICHMOND HILL REGULATORY AND SAFETY SIGNAGE IS SITE SPECIFIC.**
2. FOR TRAILHEAD ELEMENT DETAILS, INCLUDING SIGNAGE REQUIREMENTS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
3. FOR MULTI-USE TRAIL ALIGNMENT, REFER TO R-19A, R-19B, AND R-19C.
4. TRAILHEAD WIDTH TO BE NO LESS THAN TWICE THE WIDTH OF THE TRAIL.
5. THE LAYOUT OF TRAILHEAD ELEMENTS IS SITE SPECIFIC.
6. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
NOTES:
1. TOWN OF RICHMOND HILL REGULATORY AND SAFETY SIGNAGE IS SITE SPECIFIC.
2. FOR TRAILHEAD ELEMENT DETAILS, INCLUDING SIGNAGE REQUIREMENTS, REFER TO SECTION C1.7.2 - DESIGNATED MULTI-USE FACILITIES.
3. FOR MULTI-USE TRAIL ALIGNMENT, REFER TO R-19A, R-19B, AND R-19C.
4. THE LAYOUT OF TRAILHEAD ELEMENTS IS SITE SPECIFIC.
5. FOR ACCESS BARRIER GATE DETAILS, REFER TO R-20A AND R-20B.
LIGHT DUTY ASPHALT SURFACING

MEDIUM DUTY ASPHALT SURFACING

NOTES:

1. CONSTRUCTION SPECIFICATIONS FOR HOT MIX ASPHALT SHALL BE IN ACCORDANCE WITH OPSS 310.

2. CONSTRUCTION SPECIFICATIONS FOR GRANULAR MATERIAL SHALL BE IN ACCORDANCE WITH OPSS 314.

3. MULTI-USE TRAIL SHOULD BE CONSTRUCTED A MINIMUM OF 1.0m FROM THE MINIMUM PROTECTION ZONE OF A TREE.

4. A MULTI-USE TRAIL CROSSING THROUGH A INDUSTRIAL/COMMERCIAL/INSTITUTIONAL ENTRANCE SHALL HAVE 200mm COMPACTED DEPTH GRANULAR ‘A’ SUB-BASE, 200mm COMPACTED DEPTH 20mm CRUSHER RUN LIMESTONE BASE, 75mm DEPTH HL8 BASE COURSE ASPHALT AND 40mm DEPTH HL3 SURFACE COURSE ASPHALT.
CONCRETE JOINTS DETAIL

25mm TOOLED JOINT WITH 10mm RADIUS

CONTROL JOINT - TOOLED JOINT 1/4 DEPTH OF CONCRETE THICKNESS
EXPANSION JOINT - BITUMINOUS FIBRE TO BOTTOM OF CONCRETE

NOTES:
1. EXPANSION JOINT SPACING @ 6000mm O.C., UNLESS OTHERWISE SHOWN ON DRAWINGS.
2. CONTROL JOINT SPACING @ 2000mm O.C., UNLESS OTHERWISE SHOWN ON DRAWINGS.

LIGHT DUTY CONCRETE PAVING

TOOLED EDGE
POURED CONCRETE - CONTINUOUS BROOM FINISH PATTERN ACROSS PATH
REFER TO INSET FOR JOINTS DETAIL
150mm COMPACTED DEPTH
20mm CRUSHER RUN LIMESTONE
UNDISTURBED OR COMPACTED SUBGRADE
MIN. 2%

MEDIUM DUTY CONCRETE PAVING

TOOLED EDGE
POURED CONCRETE - CONTINUOUS BROOM FINISH PATTERN ACROSS PATH
REFER TO INSET FOR JOINTS DETAIL
200mm COMPACTED DEPTH
20mm CRUSHER RUN LIMESTONE
UNDISTURBED OR COMPACTED SUBGRADE
MIN. 2%
DIVISION "C"

SECTION C4

TRANSPORTATION AND ROADWORKS

ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS
DIVISION "C" SECTION C4.1
(OPSD DIVISION 200)
GRADING SECTIONS

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<td>1. Sidewalks are not to be constructed through commercial or industrial driveways.</td>
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<td></td>
<td></td>
<td>2. Note 2 shall be revised to as follows &quot;sidewalk widths shall be increased at schools, bus stops and any other high pedestrian traffic areas as directed&quot;.</td>
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<td></td>
<td></td>
<td>3. Sidewalk bays shall be 1.5m to 2.0m maximum in length. Contraction joints shall be constructed on either side of residential driveways.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Granular base under sidewalks shall be 75mm minimum - Granular &quot;A&quot; material and shall be increased to 150mm minimum under driveways.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Sidewalk concrete depth shall be increased to 250mm for 1st panel from curb returns at all commercial and industrial driveways.</td>
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<tr>
<td></td>
<td></td>
<td>6. Polyethylene membrane shall be used on sub-grade unless otherwise directed.</td>
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SIDE ENTRANCES

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<td>310.020</td>
<td>CONCRETE SIDEWALK ADJACENT TO CURB AND GUTTER</td>
<td>1. Sidewalks are not to be constructed through commercial or industrial driveways.</td>
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<tr>
<td></td>
<td></td>
<td>2. Note 2 shall be revised to as follows &quot;sidewalk width shall be increased to a minimum of 1.80 m.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Sidewalk bays shall be 1.5m to 2.0m maximum in length. Contraction joints shall be constructed on either side of residential driveways.</td>
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<td></td>
<td>4. Granular base under sidewalks shall be 75mm minimum - Granular &quot;A&quot; material and shall be increased to 150mm minimum under driveways.</td>
</tr>
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<td></td>
<td></td>
<td>5. Sidewalk concrete depth shall be increased to 250mm for 1st panel from curb returns at all commercial and industrial driveways.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Sidewalks constructed adjacent to an existing curb shall be set in to a 50mm x 100mm key cut in to the back of the curb as directed.</td>
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<td></td>
<td>7. Polyethylene membrane shall be used on sub-grade unless otherwise directed.</td>
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(OPS DIVISION 300)
SIDE ENTRANCES

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<td>310.050</td>
<td>SIDEWALK DRIVEWAY ENTRANCE DETAILS</td>
<td>1. Remove note 1 - no sidewalk shall be constructed through commercial or industrial driveways.</td>
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<td>350.01</td>
<td>URBAN INDUSTRIAL, COMMERCIAL AND APARTMENT ENTRANCES</td>
<td>1. Remove all reference to driveway widths.</td>
<td>R-14</td>
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<td></td>
<td>2. Sidewalks to terminate at curb returns.</td>
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<tr>
<td></td>
<td></td>
<td>3. Curb return depression to terminate 0.45m either side of sidewalk.</td>
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<tr>
<td></td>
<td></td>
<td>4. All entrance radii to be 7.5m minimum</td>
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<tr>
<td>352.01</td>
<td>ROAD ACCESS DETAILS FOR RESIDENTIAL DEVELOPMENTS</td>
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PAVING

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<td>BUS BAYS</td>
<td>1. &quot;Bus bays shall be constructed on the far side of intersection&quot;.</td>
<td>R-10</td>
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<td>504.01</td>
<td>RAISED TRAFFIC ISLAND</td>
<td>1. Note 2 to be removed</td>
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<td>2. Sod is not permitted</td>
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<tr>
<td>507.01</td>
<td>END TREATMENT FOR PAVEMENT PATCHING</td>
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<td>509.010</td>
<td>PAVEMENT REIN-STATEMENT FOR UTILITY CUTS</td>
<td>1. This standard is adopted mix asphalt pavement only.</td>
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**DIVISION "C" SECTION C4.4**  
**OPSD DIVISION 600**  
**CURBS AND GUTTERS**

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<td><strong>CONCRETE BARRIER CURB WITH STANDARD GUTTER FOR FLEXIBLE PAVEMENT</strong></td>
<td>1. 2-15m bars to be placed in industrial and commercial driveways and extend 600mm beyond each side of driveway.</td>
<td>R-19</td>
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<td></td>
<td>2. Dropped curb to be maximum 75mm.</td>
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<tr>
<td>600.06</td>
<td><strong>CONCRETE SEMI-MOUNTABLE WITH GUTTER</strong></td>
<td>1. 2-15m bars to be placed in industrial and commercial driveways and extend 600mm beyond each side of driveway.</td>
<td>R-21</td>
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<td></td>
<td>2. Dropped curb to be maximum 75mm.</td>
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<td><strong>CONCRETE BARRIER CURB WITH STANDARD GUTTER - TWO STAGE CONSTRUCTION</strong></td>
<td>1. Dropped curb to be maximum 75mm.</td>
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<td><strong>CONCRETE MOUNTABLE CURB WITH NARROW GUTTER</strong></td>
<td>1. 2-15m bars to be placed in industrial and commercial driveways and extend 600mm beyond each side of driveway.</td>
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<td>2. Dropped curb to be maximum 75mm.</td>
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<td>600.11</td>
<td><strong>CONCRETE BARRIER CURB</strong></td>
<td>1. 2-15m bars to be placed in industrial and commercial driveways and extend 600mm beyond each side of driveway.</td>
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<td></td>
<td>2. Dropped curb to be maximum 75mm.</td>
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(OPS DIVISION 600)
CURBS AND GUTTERS

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GRADING
AND
DRAINAGE
# DIVISION "D"
## GRADING AND DRAINAGE
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DIVISION "D"

SECTION D1

GRADING
AND
DRAINAGE

DESIGN CRITERIA
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.1 Objectives

- That the area grading and resulting drainage patterns shall not adversely affect adjacent lands.

- That all areas shall be graded in such a manner as to ensure compliance with Town Standards, facilitate ease of maintenance and maximize use of the land.

- All existing perimeter ground elevations of the subject property shall remain undisturbed.

- All existing drainage run-off entering the subject property from adjacent lands shall be accommodated by the grading and drainage proposal presented for review to the Commissioner of Engineering and Public Works.

- That storm drainage shall be self contained within the subject property until it can be discharged to an existing municipal drainage system or natural watercourse in a manner acceptable to the Town of Richmond Hill.

- To minimize the use of rear lot catchbasins.

- To minimize the use of retaining walls and/or terracing.

- To preserve existing trees wherever practicable.
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.2 General Requirements

- Minimum acceptable gradient = 2.0%
- Maximum acceptable gradient = 5.0%
- Maximum acceptable slope = 3 parts horizontal to 1 part vertical.
- The average gradient of rear yard surfaces shall not exceed 10.0% and shall be measured by dividing the elevation difference by the measured distance using the following methods:
  
i) From the rear of the house to the rear lot line.
  
ii) Or, from the rear of the house to the lowest invert elevation of the rear swale.
  
iii) And, from side lot line to side lot line over the full width of the lot.

Should the average gradient exceed 10.0%, the Town shall require construction of a retaining wall to reduce the average gradient to an acceptable amount.

- No alterations to existing boundary elevations or adjacent lands shall be undertaken unless written agreement with the adjacent property owner is obtained and submitted in a format acceptable to the Town.

- All semi-detached lots shall utilize split lot drainage patterns only. Reference Town Standards G-3A and G-4A.

- Through draining lots are only permitted where lots backing onto each other have common rear lot corners and there is no change in direction of the matching side lot lines.

1.3 Swales

- Swales shall have a minimum gradient of 2.0%.

- Swale depths shall conform to the following requirements:
  
i) Minimum depth = 150mm
  
ii) Maximum side yard depth = 300mm
  
iii) Maximum rear yard depth = 400mm
  
iv) Maximum side slopes 3 parts horizontal to 1 part vertical
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.3 Swales (Cont'd)

- All swales or ditches having a velocity in excess of 1.5m/sec. shall be designed to incorporate erosion protection.

- Maximum Swale Flows
  
i) The maximum flow allowable in a sideyard swale shall be that volume contributed from a drainage area of 0.05ha.

  ii) The maximum flow allowable in a rear yard swale shall be that volume contributed from a drainage area of 0.36 ha.

  iii) The maximum flow in any swale, which may be discharged directly onto any road allowance shall be that from a maximum area of 0.05ha of contributory area. Areas in excess of 0.05ha necessitate installation of an inlet structure to intercept run-off prior to its entering the road allowance.

- In no case shall any rear yard swale exceed 90m in length.

- The maximum distance from any rear lot line to the centre of any rear lot swale shall be 1.2m.

1.4 Driveways

- The minimum gradient on any driveway shall be 2.0%.

- The recommended maximum gradient on any driveway is 5.0%.

- The maximum gradient on any driveway shall be 7.5%. Proposed driveway gradients in excess of 5.0% will only be considered upon receipt of written justification from the owner's consultant.

- Driveway gradients shall be calculated based upon the back edge of a sidewalk constructed at the Town's Standard location and elevation regardless of whether or not the sidewalk actually in fact exists.

1.5 Transition Slopes

- Transition slopes located adjacent to property lines shall be constructed such that the top of slope is adjacent to the property line.

- Transition slopes between 5.0% and 3:1 shall not be used to maximize usable land.
DIVISION "D" SECTION D1  
DESIGN CRITERIA  
GRADING AND DRAINAGE

• Transition slopes shall not be located within the side yard area between dwellings, except for walkouts. Within the rear yard area, transition slopes shall be offset 0.6m from the property line to maintain common side yard or rear yard swales.

• The maximum vertical grade transition across a front or rear yard shall be 1.2m. For walkout lots, the maximum vertical grade transition within the side yard between dwellings shall be 2.5m.

• 3:1 slopes shall not exceed a maximum height of 0.6m within the rear yard area. Two transition slopes may be used, one offset from each property line, to accommodate grade transitions exceeding 0.6m within the rear yard area.

1.6 Retaining Walls

• Retaining walls shall be constructed entirely on the upper property so that tiebacks (if required) do not cross property boundaries.

• Wood used in retain wall construction shall conform to OPSS 1601 latest amendment.

• The applicant shall contact the Town of Richmond Hill, Building Services Division, regarding any proposed retaining wall(s) in order to determine the review, certification, permit issuance, and inspection process required for "Designated Structures”

• The proposed wall location (ties to lot lines), length, height (complete with sufficient top of wall and footing elevations) type, and material shall be specified on plans submitted to the Town for review.

• Upon completion of the construction of a retaining wall, a signed and sealed certification (see Schedule "F") of the wall is required by the Town prior to the release of any grading securities.

  Note: Schedule "F" is not to be used for retaining walls deemed to be "Designated Structures" by the Building Services Division.

• The Town of Richmond Hill, Building Services Division, shall be notified at least 48 hours prior to the start of construction of any "Designated Structure" in order to arrange for any site inspection that may be required. Any inspection carried out by a member of Town staff does not relieve the applicant or his consultant of the obligation to provide Schedule "F".
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.7 Catchbasins

- Front yard catchbasins are not permitted and shall not be specified.
- All rear lot catchbasins and leads shall be constructed in easement.
- Rear lot catchbasins and leads shall be constructed entirely within a single property wherever possible.
- The maximum offset from the centreline of any catchbasin to any rear lot line shall be 1.50m. The minimum offset shall be 0.9m.
- The offset from the centreline of any catchbasin lead to any side lot line shall be 0.60m.
- Easements shall be 3.0m in width, centred on side lot lines. Where zoning by-laws permit less than 1.5m sideyard setbacks, the easement width shall be reduced to comply with the zoning by-laws for the depth of the "as-constructed" building footprint only.

Reference Town standard G-7A.

- In cases where a catchbasin is constructed on one property and its lead is constructed passing through another or other properties a 1.2m (min) maintenance access easement from the municipal road allowance to the catchbasin is required over the property containing the catchbasin. Reference Town Standard G-7A.

- Residential lots requiring rear lot catchbasins and that abut park lands shall be allowed free draining rear yards into the park where the drainage shall be collected by means of swale construction and catchbasin installations within the park lands.

1.8 Fencing

- Fencing constructed adjacent to municipal and regional road allowances shall be constructed on private property and not within the road allowance.
- Gate installations allowing direct access from private property to public lands (parks, open space etc.) are not permitted.
- Fencing installed on school blocks shall be galvanized in accordance with the current Town Standards and Specifications.
- Park fencing shall have a fabric width of 1200mm facing "in" (fabric on park side of post installations).
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

• Separate school fencing shall have a fabric width of 1500mm facing "in" (fabric on private side of post installations).

• Public School fencing shall have a fabric width of 1800mm facing "in".

• Fencing shall be installed completely within the property of the ultimate owner. The minimum acceptable offset from property line to centreline of fence post shall be one half the footing diameter plus 25mm.

• All chain link fencing construction shall conform to the amended Ontario Provincial Standards and Specifications listed in Sections D3 and D5 of this manual.
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.9 Park and Private Block Grading and Drainage - Subdivisions

- All dead trees and other obstructions which the Town deems to pose a potential hazard or do not conform to the end use of the lands, shall be removed and disposed of to the satisfaction of the Commissioner of Engineering and Public Works and where required, the Commissioner of Parks, Recreation & Culture.

- The Developer/Owner shall be responsible for the maintenance of all blocks in accordance with the terms of his agreement with the Town and the current Property Standards By-law(s).

- Grading shall be completed in accordance with the overall grading plan(s) as reviewed by the Commissioner of Engineering and Public Works and where required by the Commissioner of Parks, Recreation & Culture.

- When compliance with the originally reviewed overall grading and drainage plan(s) cannot be achieved until the block is fully developed, an "interim" grading and drainage plan shall be prepared for review by the Commissioner of Engineering and Public Works. Upon completion of the review process, said plan shall be incorporated as an amendment to the developer/owners original agreement with the Town.

- Any and all areas of a block that have been disturbed as a result of construction activity, shall be topsoiled and seeded in accordance with current Town Standards immediately upon completion of said activity.

- Park blocks are to be topsoiled and seeded to the satisfaction of the Commissioner of Parks, Recreation & Culture with the exception of the following areas which shall be topsoiled and sodded:
  
i) all swales
  ii) all slopes in excess of 4 parts horizontal to 1 part vertical

- The Developer/Owner shall provide, in a format satisfactory to the Commissioner of Parks, Recreation & Culture, documentation confirming that the Park soils are free of contaminates and have soil stability suitable for development.
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.10 Subdivision Building Permit Applications

- A siting, servicing and grading plan conforming to current Town Standards and design criterion shall be prepared by the applicants consultant for each lot at a scale of not less than 1:250 (metric). Reference STD G-6A as a "sample format".

- The plan shall first be submitted for review directly to the developers consulting engineer.

- The following executed certification for each lot submitted shall be included on any plan(s) prior to submission to the Town's Building Services Division.

- "I hereby certify that the building type, appurtenant grading, drainage and servicing works proposed for Lot ______, Plan 65M-______ complies with sound engineering design and that the proposed grading is in conformity with the overall grading plans reviewed as schedules to the subdivision agreement and with adjacent lands for both drainage and relative elevations.

  Date: ________________  Reviewed: ________________

  Developers Consultant Company Name and Engineers Stamp.

- Upon receipt of the above, the plan shall be submitted to the Building Services Division of the Town of Richmond Hill as part of the Building Permit Application package. The applicant is advised to consult with the Building Services Division in order to determine the requirements of a complete submission package.
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.11 Committee of Adjustment - Severance Applications

- The objectives outlined in Section D1.1 of the Grading and Drainage Design Criterion shall apply.

- Submission of a general concept grading and servicing plan conforming to current Town Standards and Design Criterion, detailing the overall grading, drainage and servicing proposal for a property under severance application may be required by the Engineering and Public Works Department as a condition of severance that must be satisfied by the applicant prior to clearance of said condition.

- The required plan(s) must be prepared and certified by a Registered Professional Engineer of Ontario Land Surveyor on behalf of the applicant.

- The minimum drawing detail requirements are outlined in Schedule "C". In the event that the actual proposed building footprints are not known, the building envelopes as dictated by the appropriate zoning by-laws shall be indicated.

- The following certification, signed and sealed by the applicants consultant, shall appear on each plan submitted for review by the Town.

"I have prepared this plan to indicate the compatibility of the proposal with all adjacent properties and existing municipal services. It is my belief that adherence to the proposed elevations and gradients as shown will produce adequate surface drainage and proper facility of the municipal services without detrimental effect to the existing drainage patterns or adjacent properties".

SIGNATURE AND SEAL OF REGISTERED PROFESSIONAL ENGINEER OR ONTARIO LAND SURVEYOR IS REQUIRED.

The applicant shall submit the required plan for review to the Engineering and Public Works Department, Development Section to the Attention of the Grading and Fill Technologist.

- As determined by the Town during the review process, the applicant may be required to enter into one of the following types of agreements.

  i) Grading and Drainage
  ii) Grading and Servicing

The general concept Grading and Servicing Plan shall be attached as a schedule to the appropriate agreement. Said agreement, if required, shall be Registered against Title of both the retained and severed portions of the subject lands.
1.11 **Committee of Adjustment - Severance Applications** (Cont'd)

- Approval from other "external" agencies may be required as part of the review package submitted to the Town.

NOTE: It is the applicant's responsibility to obtain approval from these authorities.

Some examples of areas requiring external agency approvals are:

i) Lands adjacent to or within the flood plains of watercourses or within valleylands.

ii) Areas within Schedule "B" of Fill Regulation By-Law No. 66-91.

iii) Areas within the Oak Ridges Moraine.

iv) Areas identified as environmentally sensitive or of specific natural interest in any of the Town's Zoning By-Laws, Official Plan etc.
1.12 **Infill Construction - Building Permit Applications**

- The objectives outlined in Section D1.1 of the Grading and Drainage Design Criterion and the current Town grading policy shall apply.

- A site servicing and grading plan conforming to current Town Standards and Design Criterion shall be prepared and certified by a Registered Professional Engineer of Ontario Land Surveyor at a scale of not less than 1:250 (metric).

- The minimum drawing detail requirements and standard notes are outlined on Schedules "B" and "D" to this document. Reference Standard G-5A as a sample "format".

- The following certification, signed and sealed by the applicants consultant, shall appear on each plan submitted for review:

  "I have reviewed the plans for the construction of (type of building) located at (municipal address) and have prepared this plan to indicate the compatibility of the proposal with all adjacent properties and existing municipal services. It is my belief that adherence to the proposed elevations and gradients as shown will produce adequate surface drainage and proper facility of the municipal services without detrimental effect to the existing drainage patterns or adjacent properties".

  SIGNATURE AND SEAL OF A REGISTERED PROFESSIONAL ENGINEER OR ONTARIO LAND SURVEYOR IS REQUIRED.

- Said plan shall be submitted for review to the Building Services Division of the Town of Richmond Hill and forms part of the applicants Building Permit Application.

- The applicant is advised to contact the Building Services Division in advance in order to determine the exact requirement of a complete submission package.

- Approval from other "external" agencies may be required as part of the review package submitted to the Town.

NOTE: It is the applicant's responsibility to obtain approvals from these authorities. Some examples of areas requiring external agency approvals are:

i) Lands adjacent to or within the flood plains of watercourses or within valleylands.

ii) Areas within Schedule "B" of Fill Regulation By-Law No. 66-91.

iii) Areas within the Oak Ridges Moraine.

iv) Areas identified as environmentally sensitive or of specific natural interest in any of the Town's Zoning By-Laws, Official Plan etc.
DIVISION "D" SECTION D1
DESIGN CRITERIA
GRADING AND DRAINAGE

1.13 Fill Permit Applications

- Council for the Town of Richmond Hill has adopted a by-law to regulate the placing or dumping of fill (By-Law No. 66-97 and amendment(s)).

- The intent of the By-Law is to provide an additional tool to the municipality to protect the environment, existing drainage patterns, and natural topography in areas not regulated by other agencies.

- In the By-Law, fill is defined as, "any type of material deposited or placed on lands and includes, soil, stone, concrete, asphalt, sod or turf, either singly or in combination".

- By-Law No. 66-91 prohibits or regulates through permit approval, the placing or dumping of fill on lands to establish a finished grade, difference from the existing grade or the deposit of fill in a location other than where the fill was obtained.

- Any person or company applying for a permit to place or dump fill must complete and submit an application, along with the appropriate application fee to the Town's Grading and Fill Technologist.

- Specific requirements may include, but are not necessarily limited to following:

  i) Submission of a detailed plan conforming to current Town Standards and Design Criterion showing existing elevations on the subject and abutting properties, watercourses, buildings and trees, etc.
  ii) Details of proposed retaining walls.
  iii) Proposed final elevations and drainage systems, including erosion and siltation control measures to be implemented.
  iv) The above items may require certification from a Professional Engineer or Ontario Land Surveyor.
  v) Description of proposed fill, including source and quantity.
  vi) Testing of the proposed fill to ensure that same is clean and free of contaminants may be required.
  vii) Approval of external agencies may be required prior to issuance of the permit, such as, the M.N.R., M.T.R.C.A., M.O.E.E., M.T.O., and the Region of York and C.N.R., etc.

A complete Fill Permit Information Package can be obtained from the Engineering & Public Works Department, Development and Technical Services Division.
DIVISION "D"

SECTION D2

GRADING AND DRAINAGE

SCHEDULES "A" THROUGH "F"
DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "A"

SUBDIVISION BUILDING PERMIT APPLICATION
ENGINEERING & PUBLIC WORKS DEPARTMENT
LOT GRADING PLAN MINIMUM REQUIREMENT CHECKLIST

With reference to Town Standard G-6A as a sample "Format"

GENERAL PLAN REQUIREMENTS

Title Block        Consultant's Stamp
North Arrow        Signature & Date
Scale 1:250 (MIN)  Certification

BASE / LOT INFORMATION

Lot Dimensions / Boundary  Existing elevations
Easements             Proposed Elevations
Set Backs indicated    Driveway Location
Adjoining lot information Service Connections (Inverts)
House footprint        Utilities - St. Hardware
Entrances and no. of risers Adjoining House FFE's
Catchbasin & Grate invert elev. Existing Swales, elevations

DRAINAGE PATTERN

Existing drainage indicated Are perimeter lands effected?
Lot corner elevations (Exist / Prop) Swale gradients 2 to 5 %
High point Elevations    Slopes @ 3H to 1V
Drainage direction indicated Non-walkout slopes 1.5 m high MAX
Intercepting / crescent swales Driveway grades 2 to 5 %

HOUSE ELEVATIONS

Finished floor Elevation (FFE) Underside of footing elev. (USF)
Top of Foundation Wall (TFW) (1.2 m minimum cover to footing)
Finished Basement Slab (FBS) Opening Elevations (where specified)
Walk-out elevations         House Types

RETAINING WALLS (if applicable)

Top and Bottom of wall elevations Wall type / material specified
Ties to lot line                Maximum wall height detailed
ID Mastfile/Stdsmn/Division D Grading/Design Criteria Grading/GradeDrain

June 2002
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DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "B"

INFILL CONSTRUCTION BUILDING PERMIT APPLICATION
ENGINEERING & PUBLIC WORKS DEPARTMENT
LOT GRADING PLAN MINIMUM REQUIREMENT CHECKLIST

With reference to Town Standard G-5A as a sample "Format"

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<td>Location of Sidewalk, Ditch, Culverts, Streetlights</td>
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<td>Retaining Wall Top and Bottom Elevations</td>
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DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "C"

COMMITTEE OF ADJUSTMENT SEVERANCE APPLICATION
ENGINEERING & WORKS DEPARTMENT
CONCEPT GRADING PLAN MINIMUM REQUIREMENT CHECKLIST

GENERAL PLAN REQUIREMENTS

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory General Notes &amp; scale</td>
<td>☐</td>
</tr>
<tr>
<td>North Arrow</td>
<td>☐</td>
</tr>
<tr>
<td>Lot and Registered Plan No's.</td>
<td>☐</td>
</tr>
<tr>
<td>Geodetic Benchmark Reference</td>
<td>☐</td>
</tr>
<tr>
<td>Consultants Certification</td>
<td>☐</td>
</tr>
<tr>
<td>Municipal Address</td>
<td>☐</td>
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</table>

BASE / LOT INFORMATION

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>All lotting Fabric and dimensions</td>
<td>☐</td>
</tr>
<tr>
<td>Easements</td>
<td>☐</td>
</tr>
<tr>
<td>Adjacent lot elevations</td>
<td>☐</td>
</tr>
<tr>
<td>Existing vegetation, fencing, walls...etc</td>
<td>☐</td>
</tr>
<tr>
<td>Proposed CB stds &amp; elevations</td>
<td>☐</td>
</tr>
<tr>
<td>Existing wells / septic systems</td>
<td>☐</td>
</tr>
<tr>
<td>Sufficient existing spot elevations</td>
<td>☐</td>
</tr>
<tr>
<td>Existing swales and invert elevations</td>
<td>☐</td>
</tr>
<tr>
<td>All existing Street Hardware</td>
<td>☐</td>
</tr>
<tr>
<td>Adjacent property buildings &amp; FFE's</td>
<td>☐</td>
</tr>
<tr>
<td>Existing municipal infrastructure</td>
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</table>

DRAINAGE PATTERN

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing drainage patterns indicated</td>
<td>☐</td>
</tr>
<tr>
<td>Lot corner elevations (Exist / Prop)</td>
<td>☐</td>
</tr>
<tr>
<td>Gradient change point Elevations</td>
<td>☐</td>
</tr>
<tr>
<td>Length /gradient / inverts all swales</td>
<td>☐</td>
</tr>
<tr>
<td>Perimeter of lands remain undisturbed.</td>
<td>☐</td>
</tr>
<tr>
<td>Subject property drainage self contained</td>
<td>☐</td>
</tr>
<tr>
<td>Downspout locations shown</td>
<td>☐</td>
</tr>
<tr>
<td>Slopes @ 3H to 1V (1.5m max height)</td>
<td>☐</td>
</tr>
</tbody>
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BUILDING ENVELOPE or FOOTPRINT

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommended future FFE</td>
<td>☐</td>
</tr>
<tr>
<td>Recommended future TFW</td>
<td>☐</td>
</tr>
<tr>
<td>Walk-out elevations (if applicable)</td>
<td>☐</td>
</tr>
<tr>
<td>Recommended future USF</td>
<td>☐</td>
</tr>
<tr>
<td>Minimum zoning setbacks indicated</td>
<td>☐</td>
</tr>
<tr>
<td>House Types indicated</td>
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</tr>
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RETAINING WALLS (if applicable)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Checklist</th>
</tr>
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<tbody>
<tr>
<td>Top and Bottom of wall elevations</td>
<td>☐</td>
</tr>
<tr>
<td>Ties to lot line detailed</td>
<td>☐</td>
</tr>
<tr>
<td>Wall type / materials specified.</td>
<td>☐</td>
</tr>
<tr>
<td>Maximum wall height detailed</td>
<td>☐</td>
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</tbody>
</table>

Note: Plans submitted for review that do not satisfy the above noted minimum requirements will be returned to the applicant stamped "Revise and Resubmit" without benefit of any in-depth review or further comment.
DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "D"

Mandatory Standard Notes for Infill Building Permit Grading Plans

1. All footing formwork elevations and setbacks are to be confirmed by a registered Professional Engineer or registered Ontario Land Surveyor prior to the placing of any concrete.

2. Prior to the superstructure works proceeding and the release of the Completion Stage Permit, the Owner's consultant must certify that the top of foundations are in conformity with the grading plan reviewed by the Town.

3. All rainwater leaders shall discharge onto splash pads at ground level at the locations indicated on this plan.

4. Existing boundary elevations along the site perimeter shall remain undisturbed. Drainage received from adjacent properties shall be accommodated and drainage from the subject lands shall be self contained.

5. No trees are to be removed without prior receipt of written consent from the Town Arborist.

6. The applicant shall contact the Operations Section of the Engineering & Public Works Department and make all arrangements necessary for driveway access and site service connections.

7. All yard areas shall receive a minimum of 100mm of topsoil plus sod.

8. The applicant shall contact the Towns Building Services Division a minimum of 48hrs in advance of construction of any retaining wall deemed to be a “designated structure” in order to arrange for any necessary inspections.

9. CERTIFICATION

"I have reviewed the plans for the construction of (type of building) located at (municipal address) and have prepared this plan to indicate the compatibility of the proposal with all adjacent properties and existing municipal services. It is my belief that adherence to the proposed elevations and gradients as shown will produce adequate surface drainage and proper facility of the municipal services without detrimental effect to the existing drainage patterns or adjacent properties."

10. Existing sewers and watermains shown on this plan have been field verified as to the location and elevation.

SIGNATURE AND SEAL OF A REGISTERED PROFESSIONAL ENGINEER OR ONTARIO LAND SURVEYOR IS REQUIRED.
DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "E"

SAMPLE

Final Grading Certification for Lot Grading

Note: Additional Certificates are required for properties containing retaining walls.

Date:

The Town of Richmond Hill
Planning & Development Department
Building Services Division
P.O. Box 300
Richmond Hill, ON
L4C 4Y5

Attention: Chief Building Official

Dear Sirs:

Re: (Property Description as per proposed grading)
(Certification and Deposit Receipt), (Deposit Number)
Certification of Building and Final Grading

I have determined the field elevations with respect to the final grading on the above lands, viewed the finished building thereon, and do hereby certify that the building constructed and the grading of the lands are in conformity with the previously submitted and reviewed grading plan and "Certification of Proposed Building and Grading."

Yours truly,

(Signature and Stamp of Professional Engineer
or Ontario Land Surveyor)

for (Name of Certifying Firm)

cc: Grading & Fill Technologist
DIVISION "D" SECTION D2
DESIGN CRITERIA GRADING AND DRAINAGE

SCHEDULE "F"

Not to be used for certification of "Designated Structures."
Contact Building Services Division

Date:

Town of Richmond Hill
Engineering & Public Works Department
P.O. Box 300
225 East Beaver Creek Road
Richmond Hill, Ontario
L4C 4Y5

Attention: Commissioner of Engineering and Public Works

RE: Retaining Wall Construction

Lot___________, R.P. ____________________

Municipal Address:________________________

Retaining Wall Constructed of _______________

Maximum Height _______ m _______________

This serves to certify that the above retaining wall has been designed and constructed in accordance with sound engineering principals, to support the dead and live loads applied upon the structure, in conformance with all applicable Town standards, regulations and to "as-built" elevations in conformance with the certified building and grading plan previously reviewed by the Town.

Sincerely,

Company Name

Engineer's Signature and Stamp

cc: Director of Building Services
Grading & Fill Technologist
DIVISION "D"

SECTION D3

GRADING AND DRAINAGE

SPECIFICATIONS
# DIVISION "D" SECTION D3.1
# OPSS DIVISION 2
# CONSTRUCTION SPECIFICATIONS - GENERAL GRADING

<table>
<thead>
<tr>
<th>OPSS</th>
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<th>SUBSECTION NO.</th>
<th>COMMENT</th>
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<tbody>
<tr>
<td>201</td>
<td>CONSTRUCTION SPECIFICATION FOR CLEARING, CLOSE CUT CLEARING</td>
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<td></td>
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<tr>
<td>206</td>
<td>CONSTRUCTION SPECIFICATION GRADING</td>
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### DIVISION "D" SECTION D3.2
### OPSS DIVISION 5
### CONSTRUCTION SPECIFICATIONS
### MISCELLANEOUS

<table>
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<tr>
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<td>CONSTRUCTION SPECIFICATION HIGHWAY FENCE</td>
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<tr>
<td>541</td>
<td>CONSTRUCTION SPECIFICATION CHAIN LINK FENCE</td>
<td></td>
<td></td>
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<tr>
<td>565</td>
<td>CONSTRUCTION SPECIFICATION FOR THE PROTECTION OF TREES</td>
<td></td>
<td></td>
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<tr>
<td>570</td>
<td>CONSTRUCTION SPECIFICATION TOPSOIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>571</td>
<td>CONSTRUCTION SPECIFICATION SODDING</td>
<td>570.07.03</td>
<td>Uniform topsoil depth shall read 100mm</td>
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<tr>
<td>572</td>
<td>CONSTRUCTION SPECIFICATION SEEDING, MULCHING, TEMPORARY COVER AND EROSION CONTROL BLANKET</td>
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<td>OPSS</td>
<td>DESCRIPTION</td>
<td>SUBSECTION NO.</td>
<td>COMMENT</td>
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<tr>
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<td>------------------------------------------------------------------</td>
<td>----------------</td>
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<tr>
<td>1508</td>
<td>MATERIAL SPECIFICATION ROUND WOOD POSTS</td>
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<td>1540</td>
<td>MATERIAL SPECIFICATION STANDARD HIGHWAY FENCE COMPONENTS</td>
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## DIVISION "D" SECTION D3.4

OPSS DIVISION 16
MATERIAL SPECIFICATIONS
FOR WOOD

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<tr>
<td>1601</td>
<td>MATERIAL SPECIFICATION FOR WOOD</td>
<td>N/A</td>
<td>NIL</td>
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</table>
DIVISION "D"

SECTION D4

GRADING AND DRAINAGE

TOWN OF RICHMOND HILL
STANDARD DRAWINGS
NOTES:
1. USE CONSTRUCTION GRADE CEDAR OR APPROVED PRESSURE TREATED WOOD.
2. ZINC COATED ARDOX STEEL NAILS 4mm x 75mm SHALL BE USED.
3. FOR INSTALLATIONS ADJACENT TO REGIONAL AND MUNICIPAL ROADS FENCING SHALL BE WITHIN PRIVATE PROPERTY.
4. PRESERVATIVE TREATMENTS SHALL CONFORM TO OPSS.1601.06 TYPES C & D AND AWPA STD.P5.

ALL DIMENSIONS IN mm UNLESS NOTED OTHERWISE.
NOTES

1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS: A SWALE GRADIENT OF 2.0% MIN. TO 5.0% MAX. FROM THE FRONT HIGH LOT CORNER AT THE STREETLINE TO THE SWALE HIGH POINT ELEVATION "A". THE SPECIFIED LOT ELEVATION SHALL THEN BE SET A MINIMUM OF 0.150m HIGHER THAN SWALE ELEVATION "A".

2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

FRONT LOT DRAINAGE
NOT TO BE USED FOR SEMI-DETACHED UNITS

SCALE: N.T.S.
DATE: NOVEMBER 1997
DRAWN: J.P.
DWG. No. G-2A
NOTES

1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS:
   A SWALE GRADIENT OF 2.0% MIN. TO 5.0% MAX. FROM THE FRONT
   HIGH LOT CORNER AT THE STREETLINE TO THE SWALE HIGH POINT
   ELEVATION "A". THE SPECIFIED LOT ELEVATION SHALL THEN BE SET
   A MINIMUM OF 0.15m HIGHER THAN SWALE ELEVATION "A"

2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.
NOTES

1. THE SPECIFIED LOT ELEVATION SHALL BE CALCULATED AS FOLLOWS: A SWALE GRADIENT OF 2.0% MIN. TO 5.0% MAX. FROM THE FRONT HIGH LOT CORNER AT THE STREETLINE TO THE SWALE HIGH POINT ELEVATION "A". THE SPECIFIED LOT ELEVATION SHALL THEN BE SET A MINIMUM OF 0.150m HIGHER THAN SWALE ELEVATION "A"

2. DRIVEWAYS ARE NOT TO BE USED AS AN OUTLET FOR SIDEYARD SWALES.
"I hereby certify that the building type, and appurtenant grading and drainage works proposed for Lot____ Plan 85M comply with sound engineering design and that the proposed grading is in conformity with the overall grading plans for the subdivision and with those of adjacent lands for drainage and relative elevations."

Date: ____________________ Reviewed By: ____________________

Company name and Engineers Stamp: (Developers Consultant)

QUALITY HOMES
NAME OF SUBDIVISION, 19T-12345
LOT 185 REG. PLAN No: 85M-0000

BUILDERS CONSULTANT

<table>
<thead>
<tr>
<th>ADDRESS</th>
<th>(PROFESSIONAL SEAL)</th>
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<table>
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<tr>
<th>DRAWN</th>
<th>CHECKED</th>
<th>REVISIONS</th>
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<tbody>
<tr>
<td>J.D.T.</td>
<td>T.D.J.</td>
<td>1. LOT 185 GRADING AS PER TOWN COMMENTS.</td>
</tr>
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<tr>
<th>SCALE</th>
<th>DATE</th>
<th>NOV/97</th>
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<tbody>
<tr>
<td>1:250</td>
<td>MIN</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. THIS SAMPLE DRAWING IS NOT TO SCALE
2. PAPER FORMAT SHALL BE LEGAL SIZE (8.5" x 14")

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

GRADING PLAN FORMAT
SUBDIVISION
BUILDING PERMIT

DRAWN: J.D.T. DWG. No: G-6A
DIVISION "D"

SECTION D5

GRADING AND DRAINAGE

ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS
DIVISION "D" SECTION D5.1
OPSD DIVISION 200
GRADING SECTIONS

<table>
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<tr>
<th>OPSD</th>
<th>DESCRIPTION</th>
<th>ADDITION OR REVISION</th>
<th>REPLACES TOWN OF RICHMOND HILL STD.</th>
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<tbody>
<tr>
<td>218.01</td>
<td>SODDING OF SIDE SLOPES</td>
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<td>M-3</td>
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<tr>
<td>220.01</td>
<td>BARRIER FOR TREE PROTECTION</td>
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DIVISION "D" SECTION D5.2
OPSD DIVISION 900
FENCING, GUIDE RAILS

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<th>REPLACES TOWN OF RICHMOND HILL STD.</th>
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<tbody>
<tr>
<td>900.01</td>
<td>CHAIN LINK FENCE</td>
<td>i) Top wire installation is not approved for use in the Town.</td>
<td>F-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) This standard shall be used for both 1.2m and 1.8m installations without change to post and rail detailing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) For fabric width of less than 1.8m install knuckled edge at top of fence.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv) All fabric shall be black vinyl coated in accordance with OPSS 541.05.01, Class B, Style 2.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>v) All posts, rails and braces shall be black vinyl coated for Town owned installations.</td>
<td></td>
</tr>
<tr>
<td>901.01</td>
<td>HIGHWAY FENCE</td>
<td>Site specific use only as directed by the Commissioner of Transportation and Works.</td>
<td></td>
</tr>
<tr>
<td>900.02</td>
<td>INSTALLATION OF BARBED WIRE</td>
<td>Site specific use only at the direction of the Commissioner of Transportation and Works</td>
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</tr>
<tr>
<td>900.03</td>
<td>CHAIN LINK FENCE GATES</td>
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DIVISION "E"

UTILITIES
<table>
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<tr>
<th>SECTION</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>E1</td>
<td>DESIGN CRITERIA - UTILITIES</td>
</tr>
<tr>
<td>E2</td>
<td>TOWN OF RICHMOND HILL STANDARD DRAWINGS - UTILITIES</td>
</tr>
<tr>
<td></td>
<td>UT-1A UTILITY CO-ORDINATION DRAWING</td>
</tr>
<tr>
<td>E3</td>
<td>ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS</td>
</tr>
<tr>
<td>E3.1</td>
<td>OPSD SERIES 200 GRADING SECTIONS</td>
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<tr>
<td>E4</td>
<td>STREET LIGHTING STANDARDS</td>
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<td>E5</td>
<td>PARKING LOT LIGHTING STANDARDS</td>
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<tr>
<td>E6</td>
<td>PARKS AND SPORTS LIGHTING STANDARDS</td>
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</table>
DIVISION "E"

SECTION E1

UTILITIES

DESIGN CRITERIA
UTILITIES
DIVISION "E" SECTION E1

DESIGN CRITERIA - UTILITIES

1. General

- The developer and/or his consultants are required to submit to the Town, for its approval, a complete set of Utility Coordination drawings which are to be included as a schedule to the agreement between the Town and the owner. All Utility Coordination drawings shall be to a scale of 1:500 minimum.

- At the second submission stage for the Municipal drawings, two copies of the Utility Coordination plan and all engineering drawings are to be forwarded to Bell Canada. Bell Canada will then identify whether or not duct structures are required and, if so, indicate the location and nature of same on one copy of the drawings. Upon return of the drawings to the consultant, the consultant shall incorporate the duct structure design on the originals.

- The drawings are to be circulated to and approved by each right-of-way user prior to submission to the Town for review. Each approval is to be indicated on a stamp that is to be included on each drawing.

- Approved drawings to be circulated to all signing Right-of-way users. Once the drawings have final approval, a Molar copy of each is to be provided to all right-of-way users for their use.

1.1 Utility Hierarchy

- The following hierarchy of utilities and municipal servicing will apply when determining plant locations (in descending order):

  i) Municipal watermains, sewers and appurtenances

  ii) Hydro

  iii) Bell Telephone

  iv) Consumers Gas

  v) Cable TV

  vi) Other
1.2 **Information Required**

- The following information is to be shown on the drawings:
  - Valve chambers - Hydro transformers
  - Hydrants - Street light poles
  - Water service boxes - Bell pedestals
  - Blowoffs, etc. - Cable TV pedestals
  - Sewer maintenance hole - Consumers Gas valves
  - Catchbasins - All utility road crossings
  - Driveways - Street name and regulatory signs
  - Easements - Underground plant locations
  - Walkways - Supermail boxes
  - Sidewalks - Other features as may be directed

- In addition to the above information, each utility coordination drawing shall have a signature block provided for approval of each of the utilities listed.

<table>
<thead>
<tr>
<th>REVIEWED</th>
<th>BY</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOWN PLANNING</td>
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<td>TRAFFIC ANALYST</td>
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<tr>
<td>BELL CANADA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RICHMOND HILL HYDRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONSUMERS GAS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SHAW CABLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CANADA POST</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.3 **Location Limitations**

1.3.1 **Driveways**

- Clearance between driveway and lot lines to be a minimum of 1.2m.
- Driveways are not to encroach the projected property lines.
- Driveways are to be differentiated as being single or double driveways.
- Driveways on corner lots are to be located on front lot line farthest from intersecting street.
- Waterboxes are not to be located within driveways. Where a conflict between the water service box and driveway exists, the water box is to be relocated.
DIVISION "E" SECTION E1

DESIGN CRITERIA - UTILITIES

1.3.2 Utility Hardware

- Utility hardware, etc., are to be located one per lot. Where circumstances do not permit, then one item of hardware opposite each lot line will be considered.

- Where possible, all hardware is to be located on opposite side of lot to driveway location. Under no circumstances is any hardware to be located within 1.0m of any driveway.

- Hardware is not to be located within projected limits of easements.

- Hardware within Cul-de-Sacs and street Knuckles are to be avoided where possible.

1.3.3 Road Crossings

- Road crossings are to be placed 90 degrees to road allowance and opposite lot lines where possible.

- A minimum of 1.0m clearance is to be maintained between road crossings and manholes or catchbasins.
DIVISION "E"

SECTION E2

UTILITIES

TOWN OF RICHMOND HILL

STANDARD DRAWINGS
NOTES

1. ALL UTILITY CO-ORDINATION DRAWINGS ARE TO BE APPROVED AND SIGNED BY ALL UTILITY COMPANIES PRIOR TO APPROVAL BY THE TOWN.

2. MINIMUM 1.0m CLEARANCE BETWEEN DRIVEWAYS AND ANY ABOVE GROUND FIXTURES.

3. DRIVEWAYS ARE NOT TO ENCROACH PROJECTED PROPERTY LINES.

4. ABOVE GROUND FIXTURES TO BE LOCATED ONE PER LOT AND/OR ONE OPPOSITE ANY LOT LINE WHERE POSSIBLE.

5. WATERBOXES ARE NOT TO BE LOCATED WITHIN DRIVEWAYS.

6. DRIVEWAYS ON CORNER LOTS ARE TO BE LOCATED ON LOT LINE FARthest FROM INTERSECTING STREET.

7. ALL EASEMENTS ARE TO BE SHOWN ON UTILITY CO-ORDINATION DRAWINGS.

8. THIS DRAWING IDENTIFIES DETAIL REQUIRED FOR A TYPICAL UTILITY CO-ORDINATION PLAN BUT DOES NOT REPRESENT A STANDARD DESIGN.

9. FOR STANDARD DIMENSIONS REFER TO DRAWINGS R-1A, R-2A, AND M-2A.

10. LOCATION OF SUPER MAILBOXES TO BE SHOWN.

LEGEND

SUPERMAIL BOX
BELL PEDESTAL
BELL O.P.1.-CONC BASE
HYDRO TRANSFORMER
HYDRO SWITCH CUBICLE
GAS VALVE
CABLE TV PEDESTAL
LIGHT STANDARD
FIRE HYDRANT
VALVE CHAMBER
SANITARY MAINTENANCE HOLE
STORM MAINTENANCE HOLE
CATCHBASIN

EXISTING U/G HYDRO
EXISTING U/G BELL
EXISTING GAS MAIN
EXISTING U/G CABLE TELEVISION
SANITARY SEWER
STORM SEWER
WATERMAIN
STORM SERVICE
SANITARY SERVICE
WATER SERVICE
DRIVEWAY
TRAFFIC SIGN

TOWN OF RICHMOND HILL
ENGINEERING AND PUBLIC WORKS DEPT.

UTILITY CO-ORDINATION DRAWING

SCALE: N.T.S.
DATE: APRIL 1998
DRAWN: P.V.G.

No. REVISIONS DATE APP'D
DIVISION "E"

SECTION E3

ADOPTED ONTARIO PROVINCIAL STANDARD DRAWINGS
DIVISION "E" SECTION E3.1  
(OPSD DIVISION 200)  
GRADING SECTIONS

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<th>OPSD</th>
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<th>ADDITION OR REVISION</th>
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<tbody>
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SECTION E4

UTILITIES

DESIGN CRITERIA FOR STREET LIGHTING
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DESIGN CRITERIA FOR STREET LIGHTING

4.0 GENERAL REQUIREMENTS

4.0.1 Introduction

The purpose of these guidelines is to outline general design criteria and best practices for design, construction, and inspection of Municipal Street Lighting Systems within the Town of Richmond Hill. The guidelines provide direction and outline expectations to the Design Engineers and Contractors and are based on existing and recommended practices for roadway lighting published by the Illuminating Engineering Society of North America (IESNA) and the Transportation Association of Canada (TAC). These guidelines are not to be considered absolute and following these guidelines shall not relieve the Owner/Design Engineer of the responsibility of the design, constructing, and completing the municipal street lighting system as a finished product of competent engineering design, construction, and good engineering practices. This document is not intended to be a complete instruction manual for the design of lighting. The Design Engineers are encouraged to refer to the referenced publications for additional information.

The Town of Richmond Hill reserves the right to require different lighting levels for certain areas of the Town based on intended future use.

4.0.2 References

The following published documents have been used as the basis for establishing lighting design criteria:

- ANSI/IES RP-08-14: Recommended Practice for Roadway Lighting.
- ANSI/IES RP-33-14: Recommended Practice for Lighting for Exterior Environments.
- IES LM-80-08: Approved Method for Measuring Lumen Maintenance of LED Light Sources.
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- IES LM-82-12: Approved method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
- IESNA TM-10-00: Addressing Obtrusive Light (Urban Sky Glow and Light Trespass) in Conjunction with Roadway Lighting
- IESNA TM-11-00: Light Trespass; Research, Results and Recommendations.
- IES TM-21-11: Projecting Long Term Lumen Maintenance of LED Light Sources.
- IES / IDA MLO: Model Lighting Ordinance with user’s guide.
- Town of Richmond Hill Light Pollution By-law, as amended.

Contractor shall be responsible to ensure that latest version of each standards is utilized.

4.0.3 Professional Certification

Street and walkway lighting system designs shall be completed by a Professional Engineer in good standing with the Professional Engineering Society of Ontario (PEO) who is licensed to practice professional engineering in the Province of Ontario with expertise in this field.

All drawings submitted to the Town for acceptance shall be signed and sealed by a Professional Engineer of a Design Engineering Firm. The Town shall be accepting the drawings “As to form in reliance upon the professional skill and ability of the Design Engineering firm, as to design and specification.”

4.0.4 Definitions

4.0.4.1 Roadway Classifications and Definitions (per ANSI/IES RP-08-14)

Arterial (Major)

That part of the roadway system that serves as the principal network for through-traffic flow. The routes connect areas of principal traffic generation and important rural roadways entering and leaving the city. These routes primarily serve through traffic and secondarily provide access to abutting property.
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Collector

Roadways servicing traffic between arterial and local streets. These are streets used mainly for traffic movements within residential, commercial and industrial areas. They do not handle long, through trips. Collector streets may be used for truck or bus movements and give direct service to abutting properties.

Local

Local streets are used primarily for direct access to residential, commercial, industrial, or other abutting property. They make up a large percentage of the total street system, but carry a small proportion of vehicular traffic.

Sidewalk

A paved or otherwise improved area for pedestrian use, located within public street rights-of-way, which also contain roadways for vehicular traffic.

Pedestrian Walkway and Bikeway

A facility intended for pedestrian traffic and/or cyclists, not within the right-of-way of a vehicular traffic roadway or detached from the roadway (distance greater than 5.0 metres). Included are skywalks (pedestrian overpasses), sub-walks (pedestrian tunnels), and walkways giving access to parks or through block interiors.

4.0.5.2 Pedestrian Conflict Area Classifications (per ANSI/IES RP-08-14)

The Arterial, Collector and Local Street classifications appropriately describe general conditions of vehicular traffic conflict in urban areas. A second type of conflict, which is responsible for a disproportionate number of nighttime fatalities, is the vehicle/pedestrian interaction. The magnitude of pedestrian flow is nearly always related to the abutting land use. The criteria used in selecting an appropriate amount of lighting is based on the total number of nighttime pedestrians present on both sides of the roadway in a typical block (or 200m section) over a given one-hour period (during the first hour of darkness (typically 18:00 to 19:00 hours), the actual hour considered, however, may vary). There are three classifications of pedestrian night activity levels and the types of land use with which they are typically associated:

High

Areas with significant numbers of pedestrians expected to be on the sidewalks, pedestrian walkways or crossing the streets during darkness. Examples are downtown retail areas, near theaters, concert halls, stadiums, and transit terminals.

As a guideline the number of pedestrians expected on sidewalks or crossing the street during darkness, in a typical block or 200 metre section, for a high pedestrian conflict area is over 100 pedestrians/hour.
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Medium

Areas where lesser numbers of pedestrians utilize the streets at night. Typical are downtown office areas, blocks with libraries, apartments, neighborhood shopping, industrial parks, and streets with transit lines.

As a guideline, the number of pedestrians expected on sidewalks or crossing the street during darkness, in a typical block or 200 metre section, for a medium pedestrian conflict area is 1 to 100 pedestrians/hour.

Low

Areas with very low volumes of night pedestrian usage. These can occur in any of the cited roadway classifications but may be typified by suburban streets with single family dwellings, very low density residential developments, and rural or semirural areas.

As a guideline, the number of pedestrians expected on sidewalks or crossing the street during darkness, in a typical block or 200 metre section, for a low pedestrian conflict area is 10 or fewer pedestrians/hour.

The choice of the appropriate pedestrian activity level for a street will be determined through pedestrian forecast as determined by the design engineer subject to the Town’s approval.

4.1 SOURCE TYPE

All light sources shall be of the Light Emitting Diode (LED).

4.2 LED LUMINAIRES

4.2.1 Wattages of LED luminaires will be selected based on lighting design criteria and site conditions (this to be confirmed after the implementation phase of the project). LED luminaires shall have a minimum service life of 100,000 hours (including the driver and light source life). The LED Luminaire should have the following specification:

- 0-10Volt Dimming LED Driver with optional Field Adjustable Switch that allows users to select at least 5 available drive currents (from 350mA to 700mA).
- Operating voltages as a minimum 120V, 347V.
- Equipped with Surge protective device (SPD) in case of lightning or electrical storms. Surge protective devices shall be in compliance with ANSI/IEEE C62.41, category C (outdoor applications) - High levels of 10KV/10KA.
- Durable finish and IP66 rated protection gasket against water and dust particles.
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- Tool-less entry feature for quick and easy maintenance.
- 7-PIN NEMA twist lock photo control receptacle.
- Flat glass lenses to be provided for cobra head style luminaires.
- Correlated Colour Temperature (CCT): 4000K.
- Colour Rendering Index (CRI): 70 or greater.
- Operate at an ambient temperature range of \(-40 \, ^\circ C\) to \(+45 \, ^\circ C\).
- Approved by an ESA-approved certified organization, such as CSA or ULC for street lights as per ESA Technical Guidelines Document.

4.2.2 Manufacturers’ Product Warranty

4.2.2.1 Provide a 10 year manufactures’ warranty certificate, in the Town’s name, for LED luminaires and components confirming that the luminaire housing and all of its internal components, including but not limited to LED drivers and light engines shall be covered against defective workmanship, material, and premature lamp failures;

4.2.2.2 Warranty period shall begin on date of receipt of material from the supplier. The supplier/manufacturer shall provide the Town with appropriate warranty certificates and shipping documents as proof of date of shipment.

4.2.3 Provide a manufacturer’s certificate indicating that the service life of the LED luminaires is 100,000 hours of operation or greater.

4.2.4 Selection of LED Luminaires

BUG ratings (Backlight, Up light & Glare) must be addressed during the selection of luminaires. Ensure that up light from luminaires is zero (U=0), backlight (B) and glare light (G) shall be reviewed and selected in accordance with design criteria and site conditions.

Ensure compliance with all Town’s applicable By-Laws, especially the Light Pollution Bylaw.

4.3 MATERIALS SPECIFICATIONS

Refer to the Materials Specifications Section (Division “E” Section E2.4).
4.4 **STANDARD DRAWINGS**

Refer to Standard Drawings Section (Division “E” Section E3).

4.5 **LIGHTING DESIGN**

The design criteria are based on various roadway and pedestrian classification types within the Town’s jurisdiction. The minimum required lighting levels are based on the IESNA and TAC recommendations for drivers’ visual needs while travelling on these various classes of roadways. The visual need or task changes with the classification of the roadway and the level of pedestrian usage - higher lighting levels required for higher classification of the roadways and/or pedestrian usage and lower lighting levels required for the lower classification of roadways and/or pedestrian usage.

Please be advised that the requirements based on IESNA and TAC recommendations are periodically revised and updated. All lighting design criteria shall be in accordance with latest American National Standards Institute/Illuminating Engineering Society standards ANSI/IES, the latest Standard Recommended Practices for Roadway Lighting (RP-08) and TAC.

4.5.1 **Straight Roadways and Streets**

Luminance is the recommended method for roadway lighting calculations. The luminance levels, uniformity and veiling luminance ratios are provided in Table 1 below.

<table>
<thead>
<tr>
<th>Road Classification</th>
<th>Pedestrian Area Classification</th>
<th>Avg. Luminance Lavg ((\text{Cd/m}^2))</th>
<th>Avg. Uniformity Ratio Lavg/Lmin</th>
<th>Max. Uniformity Ratio Lmax/Lmin</th>
<th>Max. Veiling Luminance Ratio Lveilmax/Lavg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>High</td>
<td>1.2</td>
<td>3.0</td>
<td>5.0</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>0.9</td>
<td>3.0</td>
<td>5.0</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>0.6</td>
<td>3.5</td>
<td>6.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Collector</td>
<td>High</td>
<td>0.8</td>
<td>3.0</td>
<td>5.0</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>0.6</td>
<td>3.5</td>
<td>6.0</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>0.4</td>
<td>4.0</td>
<td>8.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Local</td>
<td>High</td>
<td>0.6</td>
<td>6.0</td>
<td>10.0</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>0.5</td>
<td>6.0</td>
<td>10.0</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>0.3</td>
<td>6.0</td>
<td>10.0</td>
<td>0.4</td>
</tr>
</tbody>
</table>

(This table is extracted from IESNA RP-08-14)

Where:
Lavg - minimum maintained average pavement luminance
Lmin - minimum pavement luminance
LVmax - maximum veiling luminance (which measures the disability glare produced by the lighting system)
4.5.2 Intersections

The primary method of design for intersections is illuminance. The values included in Table 2 are the recommended minimum average maintained illuminance levels for fully lighted intersections based on road classification and pedestrian volumes. The values for full intersection lighting represent the sum of the recommended values for the intersecting streets.

**TABLE 2**

<table>
<thead>
<tr>
<th>Street Functional Classification</th>
<th>Average Maintained Illumination at Pavement by Pedestrian Area Classification in [Lux/FC]</th>
<th>Uniformity Ratio Eavg/Emin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Arterial/Arterial</td>
<td>34/3.4</td>
<td>26/2.6</td>
</tr>
<tr>
<td>Arterial/Collector</td>
<td>29/2.9</td>
<td>22/2.2</td>
</tr>
<tr>
<td>Arterial/Local</td>
<td>26/2.6</td>
<td>20/2.0</td>
</tr>
<tr>
<td>Collector/Collector</td>
<td>24/2.4</td>
<td>18/1.8</td>
</tr>
<tr>
<td>Collector/Local</td>
<td>21/2.1</td>
<td>16/1.6</td>
</tr>
<tr>
<td>Local/Local</td>
<td>18/1.8</td>
<td>14/1.4</td>
</tr>
</tbody>
</table>

(This table is extracted from IESNA RP-08-14)

4.5.3 Curves and cul-de-Sacs:

- Cul-de-sac (Dead-end Street)

Due to the irregular shape and terminal nature of cul-de-sacs, it is impractical to apply the luminance design method to those roadway areas. Illuminance is therefore the required method of design for a cul-de-sac. The area of a cul-de-sac begins at the start of the cul-de-sac curb return radius. The requirements for cul-de-sac lighting are determined by targeting the illuminance values for the approach roadway. The illuminance table in the Appendix of TAC: Guide for the Design of Roadway Lighting (as amended) will be used to establish the target values for the roadway on which the cul-de-sac is located.

- Curves

Lighting systems along streets with gradual curves shall have luminaires positioned so that they are aimed 90 degrees to the tangent of the curve. This assures a balanced light distribution on the pavement. Luminaires may require closer spacing in order to achieve the required lighting levels/uniformities and should be adjusted. The design criteria shall be according to the road classification and pavement classification.

In cases where there are abrupt curves on a high speed traffic roadway, the designer shall provide an analysis of the lighting and assess the site condition. Higher light levels may be required in some cases. Designers undertaking luminance calculations on curved roads must have appropriate software capable of doing pavement luminance and veiling luminance for complex layouts.
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4.5.4 Sidewalks

The primary method of calculation for lighting of sidewalks is illuminance. Illuminance is used for design for lighting of sidewalks because it applies to both sidewalk users and motorists. Luminance is not used for sidewalk lighting as it only calculates visibility for motorists and would not address visibility for those using the sidewalk.

Many roadways have adjacent sidewalks within the road allowance. Table 3 includes recommended maintained average horizontal illumination levels and uniformity ratios as well as maintained average vertical illuminance levels for high, medium and low pedestrian activity.

<table>
<thead>
<tr>
<th>Pedestrian Area Classification</th>
<th>Sub-category</th>
<th>Eavg [Lux/FC]</th>
<th>EVmin [Lux/FC]</th>
<th>Eavg/Emin *</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>N/A</td>
<td>20.0/2.0</td>
<td>10.0/1.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Medium</td>
<td>N/A</td>
<td>5.0/0.5</td>
<td>2.0/0.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Low</td>
<td>Rural/Semi-Rural Areas</td>
<td>2.0/0.2</td>
<td>0.6/0.06</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Low Density Residential</td>
<td>3.0/0.3</td>
<td>0.8/0.08</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>(2 or fewer dwelling units per acre)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Medium Density Residential</td>
<td>4.0/0.4</td>
<td>1.0/0.1</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>(2.1 to 6.0 dwelling units per acre)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(This table is based on IESNA RP-08-14)

Where:
Rural/Semi-Rural: Areas with very low residential density away from urban areas; cities or large towns or areas that are partly rural; between rural and urban.

4.5.5 Pedestrian Walkways and Bikeways

Lighting design criteria for pedestrian walkways and bikeways shall be as per Table 4 below.

Note: For pedestrian walkways and bikeways within municipal parks please refer to the Design Criteria for Municipal Parks and Sport Facilities Lighting” located in the Towns Standards and Specifications Manual.
TABLE 4

<table>
<thead>
<tr>
<th>Pedestrian Area Classification</th>
<th>Sub-category</th>
<th>Eavg [Lux/FC]</th>
<th>EVmin [Lux/FC]</th>
<th>Eavg/Emin *</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>N/A</td>
<td>10.0/1.0</td>
<td>5.0/0.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Medium</td>
<td>N/A</td>
<td>5.0/0.5</td>
<td>2.0/0.2</td>
<td>4.0</td>
</tr>
<tr>
<td>Low</td>
<td>Rural/Semi-Rural Areas</td>
<td>2.0/0.2</td>
<td>0.6/0.06</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>Low Density Residential (2 or fewer dwelling units per acre)</td>
<td>3.0/0.3</td>
<td>0.8/0.08</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>Medium Density Residential (2.1 to 6.0 dwelling units per acre)</td>
<td>4.0/0.4</td>
<td>1.0/0.1</td>
<td>4.0</td>
</tr>
</tbody>
</table>

(This table is based on IESNA RP-08-14)

Where:
Eavg - minimum maintained average horizontal illuminance at pavement
Emin - minimum horizontal illuminance at pavement
EVmin - minimum vertical illuminance at 1.5m above pavement
*Horizontal illuminance only

Notwithstanding the requirements of Table 4 above, where security of pedestrians and cyclists may be of concern, illumination levels should be at least 10.0 Lux (1.0 FC) at ground level, with an average-to-minimum uniformity ratio no greater than 4 to 1.

4.5.6 Pedestrian/Vehicular Underpass Areas

Lighting design criteria for pedestrian/vehicular underpass areas shall be as per Table 5 below.

TABLE 5

<table>
<thead>
<tr>
<th>Description</th>
<th>Eavg [Lux/FC]</th>
<th>EVmin [Lux/FC]</th>
<th>Eavg/Emin *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daytime</td>
<td>100.0/10.0</td>
<td>50.0/5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Night time</td>
<td>40.0/4.0</td>
<td>20.0/2.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

(This table is extracted from IESNA RP-08-14)

Where:
Eavg - minimum maintained average horizontal illuminance at pavement
Emin - minimum horizontal illuminance at pavement
EVmin - minimum vertical illuminance at 1.5m above pavement
*Horizontal illuminance only
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4.6 POLE LOCATIONS

Both one-sided and staggered pole arrangements will be permitted. At locations with wider pavement widths, especially at intersections, opposite arrangements will be permitted to achieve the Luminance / Illuminance design levels. Poles shall be installed as per Town of Richmond Hill Standard Drawings R-1A and R-4A. For the erection of poles, construction shall be as OPSS 615 - unless otherwise specified in the contract, concrete encasement is not a requirement. Pole hand hole locations as per OPSD 2220.01.

On roadways with residential frontages, poles are to be placed at lot lines and at ends of walkways where possible. A minimum separation of 1.2 m shall be required from driveways and municipal services.

4.7 UNDERGROUND SERVICES

All wiring to be underground, the lighting completed and energized prior to Occupancy.

All electrical Contractors/Subcontractors must meet Electrical Safety Authority and local electricity utility company requirements and are subject to their approval.

For electrical work in general, construction shall be as per OPSS 601. For the installation of ducts, construction shall be as per OPSS 603. For the installation of cable, construction shall be as per OPSS 604.

For the installation of a grounding system, construction shall be as per OPSS 609. For the removal of electrical equipment, construction shall be as per OPSS 610. For the installation of roadway luminaires, construction shall be as per OPSS 617.

All trench restoration shall be compacted to a minimum of 100% standard proctor density and is subject to the approval of the Town of Richmond Hill's Contract Administrator.

Contractor shall construct a complete circuit to include all electrical connections in accordance with local electricity utility company, O.P.S.S., C.S.A. and Ontario Electrical Safety Code requirements to the supply points.

Streetlight Cables from Pedestal or disconnect to hand hole in pole shall be 2 # 6 Copper RWU-90 complete with 1 # 6 stranded copper green jacketed ground wire [NOTE: Jacket colours shall be Black (Line), White (Neutral), and Green (Ground)]. Streetlight cable to be installed in 50mm Rigid PVC Conduit (CSA 22.2#211.2) with solvent weld fittings. The direct buried conduit system shall be as per OPSD 2100.01 at 900mm (minimum) below finished grade and protected by red plastic warning tape buried at 300mm below finished grade.
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Streetlight Cables from hand hole in pole to fixture shall be 2 # 12 Copper RWU-90 complete with 1 # 12 stranded copper green jacketed ground wire [NOTE: Jacket colours shall be Black (Line), White (Neutral), and Green (Ground)] such that the entire circuit has an acceptable voltage drop. Compression type connectors shall be used throughout. All wiring connections shall be made in the hand holes of streetlight poles. A waterproof C.S.A. fused connector kit complete with a 10 Amp ceramic midget fuse shall separate the line end from the load end.

Contractor is required to provide adequate surplus cable to allow the local electrical utility company to make connections to the existing supply. All other connections are to be complete.

Final Installation shall be inspected by and subject to Electrical Safety Authority and Town of Richmond Hill approval.

4.8 POLE NUMBERING

All poles to be numbered as per Town of Richmond Hill Standard Drawing R-11A.

4.9 STANDARD DESIGN

4.9.1 Local & Collector Road

Luminaires: Shall be of the "Cobra Head" type. Distribution Type II.

Colour shall be grey, polyester urethane powder coat compatible with pole.

Luminaire Mounting Height: 9.14m minimum

Mast Arm: Shall be tapered elliptical aluminum. Mast Arms shall be bolted directly to the pole with 16 mm galvanized steel through bolts, nuts, and 50 x 50 mm square washers (banding is prohibited). Mast Arm lengths shall be as required to position the luminaire within ± 0.6m beyond the near edge of the traveled portion of the road.

Pole: Shall be 9.9m (32.5ft) direct bury, Class “B” spun concrete. Hand hole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole height, date of manufacturer and a C.S.A. stamp.

Cross Section: Tapered round
Finish: Smooth Mould
Colour: Natural concrete grey
Pole shall be Stresscrete Model # E325-BPR-G-MOO S/F 120 C/W Capseal or approved equal.
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4.9.2 Arterial Road

Luminaires: Shall be of the "Cobra Head" type. Distribution Type III.

Colour shall be grey, polyester urethane powder coat compatible with pole.

Luminaire Mounting Height: 11m minimum

Mast Arm: 3.7m (12ft) tapered elliptical aluminum with a rise of 1524mm (5 ft). Mast Arms shall be bolted directly to the pole with 16 mm galvanized steel through bolts, nuts and 50 x 50mm square washers (banding is prohibited).

Mast arm shall be manufactured to ANSI C136.13, and be of the “TER" series as supplied by USS Manufacturing Inc.

Pole: Shall be 12.2m (40 ft) direct bury, C.S.A. Class "B" spun concrete. Hand hole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole height, date of manufacture and a C.S.A. stamp.

Cross Section: Tapered round
Finish: Smooth Mold
Colour: Natural Concrete grey

Pole shall be Stresscrete Model #E38-BPR-G-MOO S/F 120 C/W Capseal or approved equal.

4.9.3 Pedestrian Walkway and Bikeway

Luminaires: Shall be of the "Shoebox" type. Distribution Type II.

Colour shall be bronze powder coat thermoset acrylic enamel compatible with pole.

Luminaire Mounting Height: 4.6m minimum

Pole: Shall be 6.4m (21 Ft.) direct buried decorative, tapered, octagonal, spun concrete pole. Hand hole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole length, date of manufacture and a C.S.A. stamp.

Cross Section: Tapered octagonal
Finish: Etched
Colour: Saluki Bronze

Stresscrete Model #E21-APO-G-E90 c/w 140-25/35
4.10 DECORATIVE DESIGN

4.10.1 Contemporary

Luminaire: Shall be of the "Square Pack" type, side mounted at an angle of 10 degrees above the horizontal using a 20cm (8in) arm, distribution Type II.

Colour shall be bronze, compatible with pole

Luminaire Mounting Height: 6.7m (22ft) minimum

Pole: Shall be 7.62m (25ft) direct bury C.S.A. Class “A” spun tapered hexagonal concrete pole c/w solid bronze polished finish. Hand hole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole height, date of manufacturer and a C.S.A. stamp.

Cross Section: Tapered hexagonal
Finish: Polished exposed aggregate type
Colour: Saluki Bronze

4.10.2 Traditional

- Top Mount

Luminaire: Shall be of the "Traditional Lantern" Type, top mounted, distribution type III.

Colour shall be black, compatible with pole

Pole: Shall be 7.16m (23.5ft) direct bury C.S.A. Class “A” spun concrete hexagonal pole c/w solid black polished finish for use with top mounted luminaire. Top tenon to be 2 7/8” O.D. X 5” long. Handhole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole height, date of manufacturer and a C.S.A. stamp.

Cross Section: Tapered hexagonal
Finish: Polished exposed aggregate type
Colour: Solid Black

- Side Mount

Luminaire: Shall be of the "Traditional Lantern" Type, side mounted, distribution type III.

Colour shall be black, compatible with pole
DIVISION "E" SECTION E4

DESIGN CRITERIA FOR STREET LIGHTING

Pole: Shall be 8.23m (27ft) direct bury, spun concrete tapered octagonal pole, black polished finish, with 1/2" threaded inserts at 4" and 20" from top of pole for single side mount bracket, and 4 fin cap on pole top painted black to match pole. Hand hole cover plates shall have tamper proof screws and be affixed with a warning label. Pole shall be affixed with an identification plate containing manufacturer's name, class, pole height, date of manufacturer and a C.S.A. stamp.

Cross Section: Tapered octagonal
Finish: Polished exposed aggregate type
Colour: Solid Black

4.11 LIGHTING CONTROLS

Smart lighting controls to be provided (by installing 7-PIN NEMA twist lock photo control receptacles- see clause 4.2.1) to achieve the Richmond Hill Town’s needs and requirements as follows; but not limited to:

- Tracks and reports of energy savings.
- Reduce operating costs.
- Two ways communication to enhance maintenance capability.
- Communication among luminaires and connected devices.
- Metering capability.
- Flexibility and up to several lighting levels can be programmed per night.
- Tracks and reports luminaire outages.
- Dimming capability for additional energy saving.
- Photo cell controls (on/off).

4.12 ACCEPTED MANUFACTURERS (TBD)

4.13 SUBMISSION REQUIREMENTS

4.13.1 Street Lighting Design Submission Requirements

Street lighting design submissions requirements to the Town shall include two hard copies and one electronic copy of the following:
DIVISION "E" SECTION E4

DESIGN CRITERIA FOR STREET LIGHTING

a) A Design Engineer Certification Letter confirming that the Streetlight design has been completed in accordance with ANSI/IESNA Recommended Practice RP-8-14, TAC: Guide for the Design of Roadway Lighting – 2006, and the Electrical Safety Authority (ESA) requirements.

b) Details of proposed luminaires, poles, and arms including Manufacturers’ technical data sheets, photometric file and TM-21 data.

c) Pole setback from curb and maximum pole spacing based on Roadway Optimizer calculation. Actual pole spacing not to exceed 95% of the optimized value.

d) Calculations and distribution diagrams as per the Town’s Standards including photometric analysis (AGI32 or Visual 2012) in electronic format for all streets and intersections.

e) Street lighting layout and electrical drawings in AUTOCAD and PDF format showing streetlight design results compared to the Town criteria and showing location and full description of poles, luminaires, standard drawings and specifications used.

f) Photometric files in electronic IES format from the luminaire manufacturer.

g) Load Summary.

4.13.2 Certification and Documentation Requirements

The following documents shall be submitted to the Town at various stages:

4.13.2.1 Stage 1: Building Permit/Occupancy Stage

The following documents shall be submitted to the Town at the Building Permit/Occupancy Stage:

1) The Design Engineer Certification Letter confirming that:

   a) The street lighting system has been installed in accordance with the approved street lighting drawings, specifications, and the Town Standards, Electrical Safety Authority (ESA) requirements and all applicable electrical code
   b) All street lighting poles have the appropriate buried depth.
   c) All streetlights are functional and operational on all streets, lanes, and walkways.

2) If the actual pole location deviates more than one (1) metre from the proposed design location, the Design Engineer shall carry out the photometric analysis again to confirm that the required lighting levels are met as per the Town ANSI/IES RP-08 Standards latest version.

4.13.2.2 Stage 2: Assumption Stage

The following documents shall be submitted to the Town at the Assumption Stage:

1) As-Constructed drawings - 1 hard copy + electronic files in AUTOCAD and PDF format:
DIVISION "E" SECTION E4

DESIGN CRITERIA FOR STREET LIGHTING

a) As-Constructed drawings shall be in accordance with the Town’s Design Criteria
b) Global Position System (GPS) X, Y Co-ordinates of newly installed poles in a tabular format
c) Include offsets, if streetlight cables are not installed in joint utility trench

2) The Design Engineer Certification Letter confirming that:
   a) All street lighting poles are plumb / straight
   b) All pole identification tags are installed
   c) All street lighting luminaries are washed and provision of date of wash
   d) All street lighting luminaries are re-lamped (HPS luminaries only) and provision of date of re-lamping
   e) All pedestals have been locked
   f) Grades around poles and pedestals have not settled
   g) All hand hole cover plates are secured
   h) All poles, mounting hardware, and streetlights are visually inspected
   i) All deficiencies are corrected

4.13.2.3 Stage 3: End of Maintenance Stage

The following documents shall be submitted to the Town at the End of Maintenance Stage:

1) A Design Engineer Certification Letter certifying the following:
   a) The street lighting system has been installed in accordance with the approved street lighting drawings, specifications, and the Town Standards, Electrical Safety Authority (ESA) requirements and all applicable electrical code
   b) All streetlights are functional and operational on all streets, lanes, and walkways
   c) All street lighting poles are plumb / straight
   d) All pole identification tags are installed
   e) All pedestals have been locked
   f) Grades around poles and pedestals have not settled
   g) All hand hole cover plates are secured
   h) All poles, mounting hardware, and streetlights are visually inspected
   i) All deficiencies are corrected
DIVISION "E"

SECTION E5

UTILITIES

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS LIGHTING
DIVISION "E" SECTION E5

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING

5.0 GENERAL REQUIREMENTS

5.0.1 Introduction

The purpose of these guidelines is to outline general design criteria and best practices for design, construction, and inspection of Municipal Parking Lot Lighting Systems within the Town of Richmond Hill. The guidelines provide direction and outline expectations to the Design Engineers and Contractors and are based on existing and recommended practices for roadway lighting published by the Illuminating Engineering Society of North America (IESNA). These guidelines are not to be considered absolute and following these guidelines shall not relieve the Owner/Design Engineer of the responsibility of the design, constructing, and completing the municipal street lighting system as a finished product of competent engineering design, construction, and good engineering practices.

This document is not intended to be a complete instruction manual for the design of lighting. The Design Engineers are encouraged to refer to the referenced publications for additional information.

The Town of Richmond Hill reserves the right to require different lighting levels for certain areas of the Town based on intended future use.

5.0.2 References

- The following published documents have been used as the basis for establishing lighting design criteria:
  - ANSI/IES RP-20-14: Recommended Practice for Lighting for Parking Facilities.
  - ANSI/IES RP-33-14: Recommended Practice for Lighting for Exterior Environments.
  - IESNA TM-15-11: Luminaire Classification System for Outdoor Luminaires
DIVISION "E" SECTION E5

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING

- IES LM-80-08: Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- IES LM-82-12: Approved method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
- IES TM-21-11: Projecting Long Term Lumen Maintenance of LED Light Sources.
- IES / IDA MLO: Model Lighting Ordinance with user’s guide.
- Town of Richmond Hill Light Pollution By-law, as amended.

Contractor shall be responsible to ensure that latest version of each standard is utilized.

5.0.3 Professional Certification

Municipal parking lot lighting system designs shall be completed by a Professional Engineer in good standing with the Professional Engineering Society of Ontario (PEO) who is licensed to practice professional engineering in the Province of Ontario with expertise in this field.

All drawings submitted to the Town for acceptance shall be signed and sealed by a Professional Engineer of a Design Engineering Firm. The Town shall be accepting the drawings “As to form in reliance upon the professional skill and ability of the Design Engineering firm, as to design and specification.”

5.1 SOURCE TYPE

All light sources shall be of the Light Emitting Diode (LED).
5.2 LED LUMINAIRES

5.2.1 Wattages of LED luminaires will be selected based on lighting design criteria and site conditions (this to be confirmed after the implementation phase of the project). LED luminaires shall have a minimum service life of 100,000 hours (including the driver and light source life). In addition, the LED Luminaire should have the following specification:

- 0-10Volt Dimming LED Driver with optional Field Adjustable Switch that allows users to select at least 5 available drive currents (350mA to 700mA).
- Operating voltages as a minimum 120V, 347V.
- Equipped with Surge protective device (SPD) in case of lightning or electrical storms. Surge protective devices shall be in compliance with ANSI/IEEE C62.41, category C (outdoor applications) - High levels of 10kV/10kA.
- Durable finish and IP66 rated protection gasket against water and dust particles.
- Tool-less entry feature for quick and easy maintenance.
- 7-PIN NEMA twist lock photo control receptacle.
- For custom luminaires (if required), drawings shall be stamped by a Professional Engineer and approved by ESA.
- Correlated Colour Temperature (CCT): 4000K.
- Colour Rendering Index (CRI): 70 or greater.
- Operate at an ambient temperature range of – 40 °C to + 45 °C.
- Approved by an ESA-approved certified organization, such as CSA or ULC as per ESA Technical Guidelines Document.

5.2.2 Manufacturers’ Product Warranty

5.2.2.1 Provide a 10 year manufactures’ warranty certificate, in the Town’s name, for LED luminaires and components confirming that the luminaire housing and all of its internal components, including but not limited to LED drivers and light engines shall be covered against defective workmanship, material, and premature lamp failures;
DIVISION "E" SECTION E5

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING

5.2.2.2 Warranty period shall begin on date of receipt of material from the supplier. The supplier/manufacturer shall provide the Town with appropriate warranty certificates and shipping documents as proof of date of shipment.

5.2.3 Provide a manufacturer’s certificate indicating that the service life of the LED luminaires is 100,000 hours of operation or greater.

5.2.4 Selection of LED Luminaires

BUG ratings (Backlight, Up light & Glare) must be addressed during the selection of luminaires. Ensure that up light from luminaires is zero (U=0), backlight (B) and glare light (G) shall be reviewed and selected in accordance with design criteria and site conditions.

Where parking lots and pedestrian ways are to be adjacent, the parking lot lighting and the pedestrian way lighting may be achieved by a single lighting system or multiple systems.

Ensure compliance with all Town’s applicable By-Laws; especially Light Pollution By-law.

5.3 MATERIALS SPECIFICATIONS (TBD)

- Refer to project specifications.

5.4 STANDARD DRAWINGS (TBD)

- Refer to project Drawings.

5.5 LIGHTING DESIGN

Lighting design criteria for municipal parking lots shall be as per Table 1 below. Please be advised that the requirements based on IESNA recommendations are periodically revised and updated. All lighting design criteria shall be in accordance with latest American National Standards Institute/Illuminating Engineering Society standards ANSI/IES, the latest Standard Recommended Practices (RP-20).
**DIVISION "E" SECTION E5**

**DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING**

**TABLE 1**

<table>
<thead>
<tr>
<th>Application and task</th>
<th>Surface classification</th>
<th>Time</th>
<th>Recommended maintained Illuminance for all ages [LUX]</th>
<th>Ave:Min Ratio (Max.)</th>
<th>Max:Min Ratio (Max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive aisles/parking areas-all activity levels</td>
<td>Asphalt</td>
<td>Pre-closing time</td>
<td>Eh (Min.) 2.5</td>
<td>4:1</td>
<td>15:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-closing time</td>
<td>Ev (Min.) 1</td>
<td>4:1</td>
<td>15:1</td>
</tr>
<tr>
<td></td>
<td>Concrete</td>
<td>Pre-closing time</td>
<td>Eh (Min.) 5</td>
<td>4:1</td>
<td>15:1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Post-closing time</td>
<td>Ev (Min.) 1</td>
<td>4:1</td>
<td>15:1</td>
</tr>
</tbody>
</table>

(This table is based on IESNA RP-20-14)

Where:
- Pre-closing time: Is from dusk until ‘closing time’ (time to be determined by the Town), when the area being illuminated is more likely to be in use.
- Post-closing time: Is from ‘closing time’ (time to be determined by the Town) to dawn.

**5.6 POLE LOCATIONS**

Luminaires to be distributed to achieve the illumination design level to meet lighting design criteria. Poles shall be installed as per Town of Richmond Hill Standard.

**5.7 UNDERGROUND SERVICES**

All wiring to be underground, the lighting completed and energized prior to Occupancy.

All electrical Contractors/Subcontractors must meet local electricity distribution utility company requirements and are subject to their approval.

The Exterior Lighting Plan, as required under section 5.13 of this document, must be certified by an Electrical Engineer and include Underground Services. The Exterior Lighting Plan and associated documents will be reviewed and approved by the Town on a case by case basis.

**5.8 POLE NUMBERING**

All poles to be numbered as per Town of Richmond Hill Standard.
DIVISION "E" SECTION E5

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING

5.9 STANDARD DESIGN

5.9.1 Area Lighting Luminaires

- Architectural: A wide variety of architectural luminaires is available and because it is desirable to obscure the light source in normal applications, architectural luminaires may provide light distribution through optical systems. Efficiencies of this luminaire type can be comparable to other types. Along with possible reduction of veiling brightness and discomfort glare, to improve the overall visibility.

- Post top (direct, indirect) luminaires: They have many similarities to Architectural luminaires. Usually to be located within the parking area (away from the perimeter). Mounting heights for direct type are limited to 8 meters (26ft) or less. Indirect type may be used as an alternate mounting method to match the appearance of arm-mounted luminaires.

- Wall mounted (wall pack) luminaires: Narrow parking areas (that are between or adjacent to buildings) may be lighted by wall mounted luminaires. Mounting heights 8 meters (26ft) or less.

- Roadway luminaires: Refer to street lighting section “E4”.

Poles: Shall be as per the Town of Richmond Hill’s standards.

5.10 DECORATIVE DESIGN

- Refer to all requirements under the Street Lighting Section “E4” (clause 4.10).

5.11 LIGHTING CONTROLS

- Refer to street lighting section “E4” (clause 4.11).

5.12 ACCEPTED MANUFACTURERS

- Refer to street lighting section “E4” (clause 4.12).

5.13 SUBMISSION REQUIREMENTS

All Site Plan applications for institutional, recreational or athletic developments require the submission of an Exterior Lighting Plan as defined in the Town of Richmond Hill Site Plan and Site Plan Amendment Application Guide. The Exterior Lighting Plan must be certified by an Electrical Engineer confirming that the Parking Lot Lights design has been completed in accordance with ANSI/IESNA Recommended Practices RP-20 and Electrical Safety Authority
DIVISION "E" SECTION E5

DESIGN CRITERIA FOR MUNICIPAL PARKING LOTS (OUTDOOR NON-COVERED) LIGHTING

(ESA) requirements. All exterior lighting shall be designed in accordance with and in compliance with the Town of Richmond Hill Light Pollution By-law and this Standard.
DIVISION "E"

SECTION E6

UTILITIES

DESIGN CRITERIA FOR MUNICIPAL PARKS AND SPORT FACILITIES LIGHTING
DIVISION "E" SECTION E6

DESIGN CRITERIA FOR MUNICIPAL PARKS AND SPORT FACILITIES LIGHTING

6.0 GENERAL REQUIREMENTS

6.0.1 Introduction

The purpose of these guidelines is to outline general design criteria and best practices for design, construction, and inspection of Municipal Parks and Sport Facilities Lighting Systems within the Town of Richmond Hill. The guidelines provide direction and outline expectations to the Design Engineers and Contractors and are based on existing and recommended practices for roadway lighting published by the Illuminating Engineering Society of North America (IESNA). These guidelines are not to be considered absolute and following these guidelines shall not relieve the Owner/Design Engineer of the responsibility of the design, constructing, and completing the municipal street lighting system as a finished product of competent engineering design, construction, and good engineering practices.

This document is not intended to be a complete instruction manual for the design of lighting. The Design Engineers are encouraged to refer to the referenced publications for additional information.

The Town of Richmond Hill reserves the right to require different lighting levels for certain areas of the Town based on intended future use.

6.0.2 References

The following published documents have been used as the basis for establishing lighting design criteria:

- ANSI/IES RP-08-14: Recommended Practice for Roadway Lighting.
- ANSI/IES RP-20-14: Recommended Practice for Lighting for Parking Facilities.
- ANSI/IES RP-33-14: Recommended Practice for Lighting for Exterior Environments.
- IESNA TM-15-11: Luminaire Classification System for Outdoor Luminaires
- IESNA G-1-03 (Guideline for security lighting for people, properties and public spaces)
DIVISION "E" SECTION E6

DESIGN CRITERIA FOR MUNICIPAL PARKS AND SPORT FACILITIES LIGHTING

- IES LM-80-08: Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- IES LM-82-12: Approved method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
- IES TM-21-11: Projecting Long Term Lumen Maintenance of LED Light Sources.
- IES / IDA MLO: Model Lighting Ordinance with user’s guide.
- Town of Richmond Hill Light Pollution By-law, as amended.

Contractor shall be responsible to ensure that latest version of each standard is utilized.

6.0.3 Professional Certification

Municipal park and sport facility lighting system designs shall be completed by a Professional Engineer in good standing with the Professional Engineering Society of Ontario (PEO) who is licensed to practice professional engineering in the Province of Ontario with expertise in this field.

All drawings submitted to the Town for acceptance shall be signed and sealed by a Professional Engineer of a Design Engineering Firm. The Town shall be accepting the drawings “As to form in reliance upon the professional skill and ability of the Design Engineering firm, as to design and specification.”

6.1 SOURCE TYPE

a) Parks: All light sources shall be of the Light Emitting Diode (LED).

b) Sport Facilities: Light sources could be of the Light Emitting Diode (LED), or High Pressure Sodium (HPS) to match existing.
DIVISION "E" SECTION E6

DESIGN CRITERIA FOR MUNICIPAL PARKS AND SPORT FACILITIES LIGHTING

6.2 LED LUMINAIRES

6.2.1 Wattages of LED luminaires will be selected based on lighting design criteria and site conditions (this to be confirmed after the implementation phase of the project). LED luminaires shall have a minimum services life of 100,000 hours (for the driver and light source life). In addition, the LED Luminaire should have the following specification:

- 0-10 Volt Dimming LED Driver with optional Field Adjustable Switch that allows users to select at least 5 available drive currents (350mA to 700mA).
- Operating voltages as a minimum 120V, 347V.
- Equipped with Surge protective device (SPD) in case of lightning or electrical storms. Surge protective devices shall be in compliance with ANSI/IEEE C62.41, category C (outdoor applications) - High levels of 10kV/10kA.
- Durable finish and IP66 rated protection gasket against water and dust particles.
- Tool-less entry feature for quick and easy maintenance.
- 7-PIN NEMA twist lock photo control receptacle.
- Correlated Colour Temperature (CCT): 4000K.
- Colour Rendering Index (CRI): 70 or greater.
- Operate at an ambient temperature range of -40°C to +45°C.
- Approved by an ESA-approved certified organization, such as CSA or ULC as per ESA Technical Guidelines Document.

6.2.2 Manufacturers’ Product Warranty

6.2.2.1 Provide a 10 year manufactures’ warranty certificate, in the Town’s name, for LED luminaires and components confirming that the luminaire housing and all of its internal components, including but not limited to LED drivers and light engines shall be covered against defective workmanship, material, and premature lamp failures;

6.2.2.2 Warranty period shall begin on date of receipt of material from the supplier. The supplier/manufacturer shall provide the Town with appropriate warranty certificates and shipping documents as proof of date of shipment.

6.2.3.1 Provide a manufacturer’s certificate indicating that the service life of the LED luminaires is 100,000 hours of operation or greater.
6.2.4 Selection of Luminaires

Luminaires: LED luminaires to be selected to meet lighting design criteria.

BUG ratings (Backlight, Up light & Glare) must be addressed during the selection of luminaires. Ensure that up light from luminaires is zero (U=0), backlight (B) and glare light (G) shall be reviewed and selected in accordance with design criteria and site conditions. BUG rating system does not apply to sport facilities lighting.

Ensure compliance with all Town’s applicable By-Laws; especially Light Pollution By-law.

6.3 MATERIALS SPECIFICATIONS

- Refer to Project Specifications.

6.4 STANDARD DRAWINGS

- Refer to Project Drawings.

6.5 LIGHTING DESIGN

6.5.1 Parks Lighting

6.5.1.1 Lighting design level for Parks: Per IESNA G-1-03 (Guideline for security lighting for people, properties and public spaces)

- Locations where security concerns may exist should be illuminated to a level of at least 10 lux (1 fc) at ground level, with an average-to-minimum uniformity ratio not greater than 4:1.

- When lighting park trails and walkways, they should be illuminated to at least 6 lux (0.6 fc). The average-to-minimum uniformity ratio should be 4:1.

6.5.1.2 For parking lots lighting requirements within parks, refer to Section ‘E5’ Design Criteria for Parking Lots.

6.5.1.3 The lighting systems for parks should be reviewed and approved by the Town on a case by case basis and in accordance with site conditions.
### 6.5.2 Sport Facilities Lighting

The table below (Table 1) illustrates the recommended horizontal and vertical maintained illuminance targets taking into considerations the visual ages of observers (based on table 35.3 from IES Handbook 10th Ed.).

<table>
<thead>
<tr>
<th>Application and Tasks</th>
<th>Category</th>
<th>Gauge</th>
<th>Category</th>
<th>Gauge</th>
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<td><strong>Outdoor Sports</strong></td>
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<td></td>
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</tr>
<tr>
<td><strong>Baseball</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1 - Infield</td>
<td>1500</td>
<td>400</td>
<td>Avg</td>
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<td>1 - Outfield</td>
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<td>Avg</td>
<td>0.13</td>
</tr>
<tr>
<td>2 - Infield</td>
<td>1000</td>
<td>300</td>
<td>Avg</td>
<td>0.16</td>
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<tr>
<td>2 - Outfield</td>
<td>750</td>
<td>200</td>
<td>Avg</td>
<td>0.17</td>
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<td>3 - Infield</td>
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<td>Avg</td>
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<tr>
<td>3 - Outfield</td>
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<td>100</td>
<td>Avg</td>
<td>0.21</td>
</tr>
<tr>
<td>4 - Infield</td>
<td>300</td>
<td>100</td>
<td>Avg</td>
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<td>4 - Outfield</td>
<td>200</td>
<td>50</td>
<td>Avg</td>
<td>0.25</td>
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</tr>
<tr>
<td></td>
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<td>15</td>
<td>50</td>
<td>0.25</td>
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<td>Avg</td>
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<td>Avg</td>
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<td></td>
<td>See Sports/Outdoor/Baseball</td>
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<td><strong>TENNIS</strong></td>
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<td>Avg</td>
<td>0.21</td>
</tr>
</tbody>
</table>
DIVISION "E" SECTION E6

DESIGN CRITERIA FOR MUNICIPAL PARKS AND SPORT FACILITIES LIGHTING

6.6 POLE LOCATIONS

Luminaires to be distributed to achieve the illumination design level. Poles shall be installed as per Town of Richmond Hill Standard. Refer to all requirements under the Street Lighting Section.

6.7 UNDERGROUND SERVICES

All electrical Contractors/Subcontractors must meet local electricity distribution utility company requirements and are subject to their approval. Refer to all requirements under the Street Lighting Section “E4” (clause 4.7).

6.8 POLE NUMBERING

All poles to be numbered as per Town of Richmond Hill Standard.

Poles: Shall be as per the Town of Richmond Hill’s standards.

6.9 DECORATIVE DESIGN

- The lighting poles will be of metal or concrete. Their design should match with the style of the project. They should be reviewed and approved by the Town on a case by case basis.

6.10 LIGHTING CONTROLS

- Refer to street lighting section “E4” (clause 4.11).

6.11 ACCEPTED MANUFACTURERS

- Refer to street lighting section “E4” (clause 4.12).

6.12 SUBMISSION REQUIREMENTS

- Refer to all requirements under street lighting section “E4” (clause 4.13).
DIVISION "F"

DEVELOPMENT
SUBMISSION
STANDARDS
# DIVISION "F"
## DEVELOPMENT SUBMISSION STANDARDS

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DIVISION "F"

SECTION F1

DEVELOPMENT SUBMISSION STANDARDS

GUIDELINE FOR ENGINEERING AND SUBDIVISION AGREEMENT SUBMISSION REQUIREMENTS
1. GUIDELINE FOR ENGINEERING AND SUBDIVISION AGREEMENT SUBMISSION REQUIREMENTS

This section outlines in detail the first, second, and final submission requirements for Town review of plans and documents required to satisfy draft plan approval conditions and for preparation of the subdivision agreement. The submission requirements for execution of the subdivision agreement are also included in this document.

The submission requirements are structured to allow review of plans and documents in tandem with preparation of the subdivision agreement. The objective is to facilitate the agreement execution and availability of building permits in conjunction with preserving of developments. The Town has separate pre-servicing and pre-grading requirements as outlined in Section F6.

The Town’s digital submission standards are outlined in Sections F7, F8 and F9 of this document. Prior to commencing work on any submission the applicant and/or his agent must ensure that they have a complete understanding of the requirements.

Prior to first submission, a pre-submission meeting is required with the owner and consultant and Town staff to ensure an understanding of the requirements to satisfy and allow Town clearance of draft approval conditions and conformity to Master Environmental Servicing and/or Functional Servicing Plans. Please contact the Project Coordinator to arrange the pre-submission meeting. Please contact the Manager of Stormwater and Subdivisions if uncertain of the Project Coordinator assigned to the specific development.

All submissions must be directed to the Project Coordinator. Each submission will be reviewed to ensure conformity with Town requirements and the owner will be advised if the submission is incomplete and outstanding items will be identified. Processing of submissions will be delayed until all outstanding information is received. The Coordinator will circulate the submitted plans and documents to the various departments for review and will forward comments to the owner and consultant. The Coordinator will assist in identifying any outstanding issues to be addressed in subsequent submissions.

All inquiries with respect to the status of submission review and preparation of the subdivision agreement must be directed to the Project Coordinator.
After receipt of a complete second submission, the Town will be in a position to prepare the subdivision agreement. If the second submission is reviewed and accepted by the Town, an agreement should be issued within approximately 10 to 12 weeks from the date of receipt of the second submission. Issuance of the agreement may be delayed if any submission items are not acceptable and require resolution with the owner and potential resubmission of plans and documents. The agreement issued should be in a form that the Town will be able to execute if reviewed and found acceptable by the owner.

Any questions regarding the above should be directed to the Project Coordinator or the Manager of Stormwater and Subdivisions.
DIVISION "F"

SECTION F2

DEVELOPMENT SUBMISSION STANDARDS

FIRST SUBMISSION REQUIREMENTS
DIVISION "F" SECTION F2
DEVELOPMENT SUBMISSION STANDARDS
FIRST SUBMISSION REQUIREMENTS

2. FIRST SUBMISSION REQUIREMENTS

• Completed Engineering and Agreement Submission Checklist (Section F9.1).

• Two (2) complete sets of prints (bound and rolled) of the following plans for engineering design review (standard digital drawing templates are available from the Design Supervisor - Design and Construction Division):
  - Title Sheet
  - General Servicing Plans
  - Standard Notes Sheet (standard drawings available from Town)
  - Sanitary Drainage Area Plan (internal and external)
  - Storm Drainage Area Plan (internal and external)
  - Foundation Drain Collector Drainage Area Plans
  - Area Grading Plans (include Park Block grading)
  - Sediment and Erosion Control Plans
  - Plan and Profile Drawings for New or Reconstructed Streets and Easements
  - Storm Water Management Facility Plans (excluding landscaping)
  - Typical Sections and Details Plans

• Two (2) copies of sanitary, storm, and Foundation Drain Collector sewer design sheets (computerized flow spreadsheets required and standard digital format is available from Design and Construction Division).

• If the proposed development includes a Storm Water Management Facility, EPA lands, Valleylands/Open Space, or Park Block, provide two (2) additional complete sets of engineering plans (bound and rolled) for review by Environmental Services and the Parks Department.

• If the proposed development includes reconstruction of an existing street, provide one (1) set of folded general servicing plans for review by the Operations Department.

• One (1) set of folded general servicing plans for Project Coordinator.

• Owner to provide contact name, address, and telephone number for agent responsible for responding to issues raised by the Project Coordinator with respect to agreement preparation and review of plans and documentation.

• Four (4) copies of Draft M-Plan. Indicate area of park, open space or SWM blocks on M-Plan.

• Four (4) copies of O.L.S. Certificate (include one signed original) as per Town standard format in Section F9.2.
DIVISION "F" SECTION F2
DEVELOPMENT SUBMISSION STANDARDS
FIRST SUBMISSION REQUIREMENTS

2. FIRST SUBMISSION REQUIREMENTS (cont’d)

• Four (4) copies of Certification Letter (include one signed original) from consultant stating conformity between Draft Plan and M-Plan and explanation for any discrepancies.

• Two (2) copies of Storm Water Management Report and Maintenance/Operations Report (if required).

• Five (5) copies (only 3 copies are required if no Park Block) of Soils Report and Hydrogeological Report (if required).

• Two (2) copies of Water Distribution System Analysis Report.

• Three (3) copies of Noise Report (if required).

• Two (2) copies of Tree Preservation Report and Restoration/Landscaping Plans (if required).

• Three (3) copies of Environmental Impact Statement, Environmental Management Plan and Restoration Plans (if required).

• Three (3) copies of Archeological Report (if required).

• Three (3) copies of Phase 1 Environmental Site Assessment for all lands to be conveyed to the Town.

NOTE: For the items noted as only to be submitted “if required”, please refer to draft plan approval conditions to verify if the item is required for submission.

At final submission stage, digital copies of all submitted reports must be provided in pdf format.
DIVISION "F"

SECTION F3

DEVELOPMENT SUBMISSION STANDARDS

SECOND SUBMISSION REQUIREMENTS
DIVISION "F" SECTION F3
DEVELOPMENT SUBMISSION STANDARDS
SECOND SUBMISSION REQUIREMENTS

3. SECOND SUBMISSION REQUIREMENTS

- Completed Engineering and Agreement Submission Checklist.
- Return First Submission Red Line Town comment set of Engineering Plans and Design Sheets.
- Plans, reports and/or other documentation required under first submission, which have been revised or updated based on comments from the Town or other agencies, shall be resubmitted for review in accordance with Section F2.
- Four (4) copies of Utility Coordination Plans.
- Three (3) copies of Landscaping Plans for SWM Facilities, Buffer Areas, Entry Features, or Traffic Islands.
- Two (2) copies of Street Lighting Design Plans and Photometric Analysis Report (as per IESNA Guidelines).
- Four (4) copies of Draft M-Plan indicating proposed Street Names (plan view and in owner’s certificate) which must be approved by the Planning Department.
- Two (2) prints of Registered Boundary R-Plan for the subject lands.
- Two (2) copies of Owner’s Deed for the subject lands.
- Two (2) copies of Parcel Register or Abstract for the subject lands.
- Three (3) prints of Draft R-Plans for internal and external easements (in accordance with provincial electronic registration requirements).
- Three (3) copies of MOE Application Forms for Approval of Municipal and Private Sewage Works and for Municipal and Private Water Works, including fees payable to the Town, three (3) complete sets of engineering plans, design sheets and applicable reports and proof of name, all in accordance with MOE guidelines.
- Cash or Check deposit in the amount of $3,000.00 for engineering and legal fees. Deposit will be credited against fee payments outlined in the subdivision agreement.
- Owner to provide contact name, address and telephone number for lawyer or firm responsible for preparation of legal documents necessary for execution of agreements and registration of M-Plan.
- List of all Lots and/or Blocks within proposed M-Plan affected by the following:
  - Engineered Fill
  - Special Foundations
  - Noise Control/Attenuation
  - Retaining Walls
DIVISION "F" SECTION F3
DEVELOPMENT SUBMISSION STANDARDS
SECOND SUBMISSION REQUIREMENTS

3. SECOND SUBMISSION REQUIREMENTS (Cont’d)

- List of all Lots and/or Blocks within proposed M-Plan affected by the following: (cont’d)
  - Sump Pumps
  - Reduced Side Yards (in accordance with zoning by-law special provisions)

- One (1) draft copy of Schedule “D” to the subdivision agreement which is a municipal servicing (including street lighting) cost summary of works internal and external to the proposed M-Plan. Servicing costs shall be based on estimated or tendered costs if available. Schedule “D” shall be prepared using the Town standard form in Section F9.3 and supporting documentation in the form of a detailed breakdown of quantities and unit prices shall also be submitted.

- One (1) draft copy of Schedule “D-1” to the subdivision agreement which is a summary of Development Charge Credits for creditable services installed under the agreement. Schedule D-1 will not be required where creditable services are not being constructed. The Oversizing Cost identified in Schedule D-1 shall be based solely on the costs identified in the applicable Area Specific Development Charges By-law. A copy of the applicable Development Charge By-law and supporting documentation is available through the Project Coordinator. Schedule D-1 shall be prepared using the Town standard form in Section F9.4.

- The following information shall be submitted to assist the Town in preparing Schedule I to the subdivision agreement which outlines all payments and security requirements. Schedules D and D-1 must be finalized before Schedule “I” may be finalized by the Town.

  1. total length of road
  2. total length of sanitary sewer
  3. number of hydrants
  4. number of valve chambers
  5. number of tee intersections
  6. number of cross intersections
DIVISION "F"

SECTION F4

DEVELOPMENT SUBMISSION STANDARDS

FINAL SUBMISSION REQUIREMENTS
4. **FINAL SUBMISSION REQUIREMENTS**

- Digital copy of proposed M-Plan approved by Planning Department on diskette or via e-mail, as per Town’s specifications in Section F9.5.

- After MOE and other agency approvals have been obtained, the original engineering drawing mylars (diazobromo mylar 3 mil min. with surface on both sides or equivalent) shall be submitted for signature by the Commission of Engineering and Public Works. Mylars shall not be submitted for signature until so directed by the Project Coordinator.

- Digital graphic file for Engineering Plans in accordance with Section F8.4.

- Pdf files of all “final” reports and studies listed under sections F2.0 and F3.0 are to be provided on CD labeled and clearly referencing the subdivision 19T number, development name and the date submitted.
DIVISION "F"

SECTION F5

DEVELOPMENT SUBMISSION STANDARDS

AGREEMENT EXECUTION SUBMISSION REQUIREMENTS
DIVISION "F" SECTION F5  
DEVELOPMENT SUBMISSION STANDARDS  
AGREEMENT EXECUTION SUBMISSION REQUIREMENTS  

5. AGREEMENT EXECUTION SUBMISSION REQUIREMENTS  

- If the Subdivision Agreement is reviewed and accepted by the Owner and all plan mylars have been signed by the Town, the following information shall be submitted to allow the Town to prepare five (5) copies of the agreement for execution:  
  1. Fifteen (15) * A-1 size prints and three (3) reduced 8.5” x 14” size prints of the following plans:  
     a) Proposed M-Plan -- signed by owner(s) and surveyor  
     b) General Servicing Plan(s)  
     c) Area Grading Plan(s)  
     d) Utility Coordination Plan(s)  

* The A1 size prints shall be folded in accordance with our standard format in Section F9.6.

- After execution of the Subdivision Agreement by the Owner, the following documentation shall be provided along with the five copies of the agreement executed by the Owner:  
  1. Solicitor’s Certificate  
  2. Section 118 and 119 Restrictions  
  3. Postponements  
  4. Payments identified in Schedule I  
  5. Securities identified in Schedule I in the form of a Letter of Credit  
  6. Insurance Certificate  

The Letter of Credit and Insurance Certificate shall be prepared using the standard form in Sections F9.7 and F9.8.
DIVISION "F"

SECTION F6

DEVELOPMENT
SUBMISSION
STANDARDS

PRE-GRADING
AND
PRE-SERVICING
6.1 GENERAL

- Prior to the start of construction, the Owner and/or his Agent, the Contractor, and the Owner’s Engineering Consultant shall meet with the Town for a pre-construction meeting.

- Should the Owner wish to commence construction prior to the subdivision agreement being executed, the Owner will be required to satisfy all the pre-servicing requirements in Section F6.2. All of these requirements are to be satisfied before contacting the Project Coordinator to request a pre-servicing meeting with the Town.

- Should the Owner only wish to commence grading activities (i.e., site cleaning, topsoil removal, area grading) before execution of the subdivision agreement, the Owner will be required to satisfy all of the pre-grading requirements in Section F6.2. All of these requirements are to be satisfied before contacting the Project Coordinator to request a pre-grading meeting with the Town. If after pre-grading, the Owner wishes to commence municipal servicing construction before agreement execution, the Owner will then be required to satisfy the pre-servicing requirements in Section F6.3.

- If a road closure is required to facilitate municipal servicing construction, the Consultant shall make a written request to the Project Coordinator. The request shall identify the location and duration for the closure. The Consultant shall also submit a Traffic Management Plan, in accordance with Book 7 of the Ontario Traffic Manual, for review by the Town. To facilitate the closure, a staff report will be prepared for Council to establish a by-law.

- A minimum of 48 hours notice must be given to the Town of Richmond Hill’s Maintenance & Operations Section for any necessary utility stake-outs (i.e. Sanitary and storm sewers, watermains and service connections). All other utility companies must be contacted directly.

6.2 REQUIREMENTS FOR PRE-GRADING

-Letter of Credit -:
  Site Alteration Permit
  ($20,000  (Value of Servicing Works < $250,000))
  ($50,000  (Value of Servicing Works $250,000 to $500,000))
  ($100,000  (Value of Servicing Works > $500,000))
  (Town Format for Pregrading, see Section F9.8)
DIVISION "F" SECTION F6
DEVELOPMENT SUBMISSION STANDARDS
PRE-GRADING AND PRE-SERVICING

6.2 REQUIREMENTS FOR PRE-GRADING (cont d)

- Allocation (by Council) of water and sewer servicing

- Owner’s Certificate of Insurance
  -(10,000,000 Commercial General Liability)
  -(5,000,000 Motor Vehicle Liability)
  (Form can be obtained from website: http://www.richmondhill.ca/documents/fin_cert_insurance_construction.pdf)

- Contractor’s Insurance Certificate
  (Identify Town as additional insured)
  (Form can be obtained from website: http://www.richmondhill.ca/documents/fin_cert_insurance_construction.pdf)

- Notice of Contractor
  -(Town format, see Section F9.9)

- Archaeological Clearance

- Reviewed Tree Preservation/Restoration Plan(s) - 2 sets

- Reviewed EIS Report, Hydrogeological Report, and Phase 1 ESA

- Reviewed Area Grading Plan(s) - 2 sets

- Reviewed Erosion and Sediment Control Plan(s) - 2 sets

- Reviewed Adjacency Report

- Digital Copy of Proposed M-Plan Approved by Planning (as per Town specifications in Section F9.5)

- Pregrading Meeting with Project Coordinator

All recommendations from all the above documentation/reports must be incorporated into the applicable engineering plans prior to Pregrading. Generally, second Engineering Submission must be submitted and reviewed prior to Pregrading. Topsoil pile location and height must be identified on Erosion and Sediment Control Plans. A chemical analysis shall be submitted to the Town for any imported material to demonstrate that the material is clean fill.
6.3 REQUIREMENTS FOR PRE-SERVICING

- Site Alteration Permit
  (Application form can be obtained from Engineering and Public Works Department at 225 East Beaver Creek Road, 5th Floor, Richmond Hill, Ontario)

- Letter of Credit - :
  - Plan of subdivision (20% of Cost of Servicing Works)
  - Site Plan (30% of Cost of Servicing Works, $20,000 min.)

- Engineering Fees :
  - (4.2% of Cost of Servicing Works + GST - for Plan of Subdivision)
  - (3.5% of Cost of Servicing Works + GST - for Site Plan)

- Allocation (by Council) of water and sewer servicing

- Owner’s Certificate of Insurance
  - ($10,000,000 Commercial General Liability)
  - ($5,000,000 Motor Vehicle Liability)
  (Form can be obtained from website: http://www.richmondhill.ca/documents/fin_cert_insurance_construction.pdf)

- Contractor’s Insurance Certificate
  (identify Town as additional insured)
  (Form can be obtained from website: http://www.richmondhill.ca/documents/fin_cert_insurance_construction.pdf)

- Notice of Contractor
  - (Town format, see Section F9.9)

- Archaeological Clearance

- Reviewed Tree Preservation/Restoration Plan(s) - 2 sets

- Reviewed EIS Report, Hydrogeological Report and Phase 1 ESA

- Reviewed Adjacency Report
  - Engineering Plans signed by Commissioner - (4 sets - 3 bound and 1 unbound)
  - MOE Approvals

- Other Agency Approvals (TRCA, MNR, MTO, Region of York, etc.)

- Digital Copy of Proposed M-Plan Approved by Planning (as per Town specifications in Section F9.5)

- Pre-servicing Meeting with Project Coordinator
DIVISION "F" SECTION F6
DEVELOPMENT SUBMISSION STANDARDS
PRE-GRADING AND PRE-SERVICING

6.3 REQUIREMENTS FOR PRE-SERVICING (cont’d)

If the Developer had obtained a Pregrading Site Alteration Permit with the Town of Richmond Hill, and would like to proceed with Preservicing, they must apply for a Preservicing Site Alteration Permit and provide a new or amended Letter of Credit to reflect the new permit. The Developer must also ensure that the Insurance Certificate will not expire prior to completion of Preservicing works, or issue a new Insurance Certificate. All recommendations from all the above documentation/reports must be incorporated into the applicable engineering plans prior to Pregrading. Topsoil pile location and height must be identified on Erosion and Sediment Control Plans.
DIVISION "F"

SECTION F7

DEVELOPMENT
SUBMISSION
STANDARDS

ENGINEERING DRAWINGS
DIGITAL AND HARDCOPY
SPECIFICATIONS
DIVISION "F" SECTION F7
DEVELOPMENT SUBMISSION STANDARDS
ENGINEERING DRAWINGS
DIGITAL AND HARDCOPY SPECIFICATIONS

7.1 ENGINEERING DRAWINGS - GENERAL

- All Engineering drawings shall be prepared in AutoCad 2000 format or greater utilising the “Town of Richmond Hill Development Cad Standard Application.” See Section F8 of this document.

- The applicant is strongly advised not to begin preparation of any drawings prior to obtaining a copy of the above noted Development Submission Application Program and familiarising themselves with both the graphic and database component requirements. Strict adherence to the requirements is essential and non-conformance will ultimately result in extra work for the applicant’s consultants as a consequence of submission rejection.

- All drawings shall be neat, and must comply with the current Town of Richmond Hill Digital Standards.

- The original material used for final engineering drawings submitted for signature and for as-built record purposes shall be diazo mylar 3 mil (minimum) double matte or approved equivalent.

- Tapes and stick on labels shall not be used on drawing originals.

- Standard digital templates for engineering drawings are available from the Design Supervisor - Design and Construction Division of the Engineering and Public Works Department.

- All engineering plans submitted for approval shall be signed and sealed by a Professional Engineer licensed to practice in the Province of Ontario.

7.2 HARDCOPY ENGINEERING DRAWINGS

- Drawing size shall be A-1 (metric)

- Scale on plan and profile shall be 1:500 horizontal
  1:100 vertical

- The scale on lot grading plans and utility co-ordination plans shall be 1:500 maximum and on general servicing plans the scale shall be 1:1000 maximum

- The scale on all details shall be 1:50 minimum.
DIVISION "F" SECTION F7
DEVELOPMENT SUBMISSION STANDARDS
ENGINEERING DRAWINGS
DIGITAL AND HARDCOPY SPECIFICATIONS

7.2 HARDCOPY ENGINEERING DRAWINGS (cont’d)

- All datum shall be referred to a geodetic benchmark. All development submission plans are to be referenced to Town’s current vertical and horizontal Control Network. This information is available on the Design and Construction Division - Engineering and Public Works Department webpage through the Town’s website (www.richmondhill.ca).

- All plans and profiles shall be created, such, that each street in its entirety, including all intersections, may be separately filed. All drawing identification numbers shall ultimately be assigned by the Town.

- When streets require more than one (1) plan, match lines shall be provided.

- The lot numbering on all engineering drawings shall be the same as that on the subdivision M-Plan.

7.3 DIGITAL REQUIREMENTS

- Refer to Sections F7, F8 and F9 of this document for digital drawing and Infrastructure Management System (IMS) data requirement.

7.4 FINAL SUBMISSION

- Prior to submission for signature by the Commissioner of Engineering and Public Works, all drawings shall updated to reflect street names and lot numbering in accordance with the approved M-Plan.

- Prior to submission for signature, all drawings shall be updated to include the Town of Richmond Hill assigned drawing record number in the appropriate location reserved within the standard drawing title block.

- Upon receipt of all approvals, original mylar drawings shall be submitted to the Commissioner of Engineering and Public Works for signature.
DIVISION "F"

SECTION F8

DEVELOPMENT SUBMISSION STANDARDS

CAD STANDARD, DIGITAL SUBMISSION STANDARDS AND AS-BUILT REQUIREMENTS
DIVISION "F" SECTION F8
DEVELOPMENT SUBMISSION STANDARDS
CAD STANDARD,
DIGITAL SUBMISSION STANDARDS AND
AS-BUILT REQUIREMENTS

8.1 GENERAL

The Digital Submission requirements covered under this section are comprised of the following:

- A graphic file of the M-Plan prepared in accordance with the current CAD Standard as noted above (see Section F9.5 “Specifications for Submission of Draft Approved M-Plan).

- A graphic AutoCAD file of all the new sewer and water infrastructure that the Town will be ultimately assuming prepared in strict accordance with the current CAD Standard (see Section F8.3 “Infrastructure Management System Data Requirements”).

- An associated database populated with key fields of information about each asset that the Town will be assuming created and populated using the Town of Richmond Hill Development Submission Application (see Section F8.3 “Infrastructure Management System Data Requirements”).

The graphic and database file will be used by the Town to import into the Town’s Infrastructure Management System and property mapping cover.

8.2 DEVELOPMENT SUBMISSION CAD STANDARD

The CAD Standard has been implemented to provide standardised block and layer name conventions for drawings that are submitted to the Town of Richmond Hill. It is important to recognise that strict conformance to the CAD Standard is required. The CAD Standard was developed in conjunction with the Development Submission Application and it is important that the Consultant understands that the block and layering standard must be rigidly adhered to from the onset of each project for the Development Submission Application to work. Therefore, conformance to the standard is required or the submission will be rejected and returned for correction.
8.3 INFRASTRUCTURE MANAGEMENT SYSTEM DATA REQUIREMENTS - GENERAL

The digital submission requirements are comprised of a CAD file containing all of the existing and proposed sewer and water assets and an associated database file. The Development Submission CAD Standard has been developed by the Town of Richmond Hill in order to provide Consultants with the tools necessary to satisfy the I.M.S. submission requirement.

The Town of Richmond Hill Development Submission Application runs under AutoCAD version 2000i or later and provides a graphic user interface with the tools for the Consultant to create and populate the database component that is required under this section. The current version of the Development Submission Application and CAD Standard can be obtained from the Design Supervisor at the Engineering and Public Works Department. Detailed documentation describing the installation and operation of the application can be downloaded from the Town website at www.richmondhill.ca under Town Hall>Departments>Engineering and Public Works>Design and Construction Section.

It is critical that the Consultant's CAD operator review the documentation in advance of starting a new project so that they have a full understanding as to the reasons for rigidly adhering to the Development Submission CAD Standard. Failure to comply with this CAD Standard will ultimately result in a considerable amount of time spent during latter stages of the project correcting block and layering errors.

The Development Submission CAD Standard is a very simple standard that applies to the sewer and water infrastructure graphic entities that currently exist and are being extended or connected to and/or the proposed sewer and water infrastructure that will be assumed by the Town as a result of the development. For everything else, the Consultant may continue to use whatever block and layering conventions they choose.

The submitted graphic file must include the existing and proposed sewer and water infrastructure blocks and layering required in accordance with the current Development Submission Application CAD Standard. The street lines and lot fabric must also be included and the layer names must conform to those specified in this Section. No additional blocks or layers shall exist within the graphic file submitted.
DIVISION "F" SECTION F8
DEVELOPMENT SUBMISSION STANDARDS
CAD STANDARD,
DIGITAL SUBMISSION STANDARDS AND
AS-BUILT REQUIREMENTS

8.3 INFRASTRUCTURE MANAGEMENT SYSTEM DATA REQUIREMENTS - GENERAL (cont’d)

The graphic file shall encompass the entire servicing area of the Development and must contain no Xrefs (reference files). The graphic file must be tied and georeferenced to the Town’s horizontal and vertical control network. Information regarding available control monuments within the area can be obtained from the Design and Construction Section of the Town website.

8.4 INFRASTRUCTURE MANAGEMENT SYSTEM GRAPHIC & DATA REQUIREMENTS - FINAL ENGINEERING SUBMISSION

The final Engineering submission must include the graphic file prepared in accordance with Section F8.3 and the current Development Submission Application CAD Standard. The associated database file must be created using the Town’s Development Submission Application and must be partially populated. All attribute information related to pipe material, size and associated drawing number(s) must be populated (refer to the Development Submission Application Program documentation for complete details).

Upon receipt the graphic and database file will be quality assured by Town staff in order to confirm completeness and conformity with the standard. If a graphic or database component is found to be incomplete or contains errors it will be rejected and returned to the Consultant for correction and resubmission.

8.5 INFRASTRUCTURE MANAGEMENT SYSTEM - DIGITAL AS-BUILT DATA SUBMISSION

The as-built infrastructure submission must include the final as-built graphic file revised in accordance with the Development Submission Application documentation. If the difference between the proposed and as-built location of any sewer or water infrastructure exceeds the prescribed limits then the location in graphics must be revised to reflect the as-built location. (Max. deviation is 1.2m parallel to centreline alignment and 0.5m perpendicular to centreline alignment.)

The Development Submission Application database component must also be provided. ALL FIELDS MUST BE FULLY POPULATED WITH AS-BUILT DATA.

Upon receipt the graphic and database file will be quality assured by Town staff for completeness and conformity to the standard. If a graphic or database component is found to be incomplete or contains errors it will be rejected and returned to the Consultant for correction and resubmission.
DIVISION "F" SECTION F8
DEVELOPMENT SUBMISSION STANDARDS
CAD STANDARD,
DIGITAL SUBMISSION STANDARDS AND
AS-BUILT REQUIREMENTS

8.6 ENGINEERING DRAWINGS - HARD COPY AS-BUILT SUBMISSION REQUIREMENTS

The hard copy submission requirements under this section must also be received and approved by the Town of Richmond Hill Design and Construction Section prior to proceeding through to assumption.

Two complete hardcopy sets of as-built engineering drawings and design sheets must be submitted for review with the digital files outlined in Section F8.5. The hard copy drawings must be prepared in accordance with the checklist that is available for download on the Town website. All drawings and design sheets must be signed and sealed by a Professional Engineer.

The submission must include one hard copy supporting set of engineering plans and notes used in the preparation of the as-built drawings. This set shall have been maintained by the Consultant's inspector throughout construction in order to document by means of redline comment and revision, any field changes to the original design of the municipal services as a result of construction.

The submission will be reviewed to confirm that it is complete and accurate. If the package is not complete the applicant will be advised and further review or comment will be deferred until all of the outstanding information is received.

Upon acceptance of the hard copy “as-built” engineering drawings the Project Co-ordinator will notify the consultant and request that the final as-built mylars of the entire contract drawing set be forwarded. One CD containing all the “as-built” digital files for the entire drawing set (Autodesk 2006 format) must also be provided (all X-refs must be inserted to the parent drawings and purged) and a second CD containing pdf images of all drawings.

Pdf files must be:
- plotted to scale and in proper orientation (landscape/portrait)
- generated from AutoCad through Adobe Professional (300 dots/inch)
- file size less than two megabytes
- named as per the Town assigned drawing code.

NOTE: Both the digital and hard copy submissions must be received, quality assured, and accepted by the Town prior to a development proceeding to assumption.
DIVISION "F"

SECTION F9

STANDARD DOCUMENTS

Note: Please print the attached standard documents in legal size paper.
### Engineered Plan Submission

<table>
<thead>
<tr>
<th>Item</th>
<th>Initial Phase Copies</th>
<th>Enclosed</th>
<th>Subsequent Phase Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submission Checklist</td>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>Engineering - complete set of engineering plans</td>
<td>2</td>
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<td>2</td>
</tr>
<tr>
<td>Sanitary, Storm and Foundation Drain Collector Sewer Design Sheets</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Parks/Environmental Services - complete set of engineering plans</td>
<td>2</td>
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<tr>
<td>Operations - General Servicing Plans</td>
<td>1</td>
<td></td>
<td>1</td>
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<tr>
<td>Development Services - Project Coordinator - General Servicing Plans</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Developer/Owner Contact</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Draft M-Plan</td>
<td>4</td>
<td></td>
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</tr>
<tr>
<td>O.L.S. Certificate</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Stormwater Management &amp; Maintenance/Operations Report (if required)</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Soils/Hydrogeological Report (only 3 copies if no Park Block)</td>
<td>5</td>
<td></td>
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</tr>
<tr>
<td>Water Distribution System Analysis Report</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Noise Report (if required)</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Tree Preservation Report and Landscaping/Restoration Plans (if required)</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Environmental Impact Statement &amp; Management Plan (if required)</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Archeological Report (if required)</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Phase I Environmental Site Assessment (if required)</td>
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</table>

### Second Submission

<table>
<thead>
<tr>
<th>Item</th>
<th>Initial Phase Copies</th>
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<tr>
<td>First Submission Red Line Town Comments</td>
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<tr>
<td>Revised first Submission Reports, Plans and Documentation</td>
<td>see above</td>
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<tr>
<td>Utility Coordination Plans</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Landscaping Plans for SWM Facilities, Buffer Areas, Entry Features etc</td>
<td>3</td>
<td></td>
<td>3</td>
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<tr>
<td>Street Lighting Plans and Photometric Report</td>
<td>2</td>
<td></td>
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<tr>
<td>Draft M-Plan with Approved Street Names</td>
<td>4</td>
<td></td>
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<tr>
<td>Registered or Draft Boundary R-Plan</td>
<td>2</td>
<td></td>
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</tr>
<tr>
<td>Owner’s Deed for the Subject Lands</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Parcel Register of Abstract for the Subject Lands</td>
<td>2</td>
<td></td>
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<tr>
<td>Draft R-Plans for Internal and External Easements</td>
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<tr>
<td>MOE Application Forms (including 3 sets of plans and design sheets)</td>
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<tr>
<td>Cash or Cheque Deposit of $3,000 (engineering and legal fees)</td>
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<td></td>
<td>1</td>
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<tr>
<td>Legal Contact acting for Owner</td>
<td>1</td>
<td></td>
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<tr>
<td>List of Affected Lots/Blocks - Fill, Foundations, Noise, etc.</td>
<td>1</td>
<td></td>
<td>1</td>
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<tr>
<td>Draft Schedule D</td>
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<tr>
<td>Draft Schedule D-1 (if required)</td>
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<tr>
<td>Information for Schedule 1 - servicing quantities</td>
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### Final Submission Requirements

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<th>Initial Phase Copies</th>
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<th>Subsequent Phase Copies</th>
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</thead>
<tbody>
<tr>
<td>Digital Copy of proposed M-Plan approved by Planning</td>
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<tr>
<td>Complete Set of Engineering Drawing Mylars and Digital Graphic File</td>
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<tr>
<td>Pdf Files of Final Reports</td>
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### Agreement Execution Submission Requirements

<table>
<thead>
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<th>Item</th>
<th>Initial Phase Copies</th>
<th>Enclosed</th>
<th>Subsequent Phase Copies</th>
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</thead>
<tbody>
<tr>
<td>Folded A-1 size Proposed M-Plans - signed by owner and surveyor</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folded A-1 size General Servicing Plans</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folded A-1 size Area Grading Plans</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Folded A-1 size Utility Plans (only if in agreement)</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5”x14” legal size Proposed M-Plans - signed by owner and surveyor</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5”x14” legal size General Servicing Plans</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5”x14” legal size Area Grading Plans</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5”x14” legal size Utility Plans</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solicitors Certificate</td>
<td>1</td>
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<tr>
<td>Section 118 and 119 Restrictions</td>
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<td>Postponements</td>
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<tr>
<td>Payments identified in Schedule I</td>
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<tr>
<td>Securities identified in Schedule I</td>
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<tr>
<td>Insurance Certificate</td>
<td>1</td>
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</tr>
</tbody>
</table>

**NOTE:** Submission requirements for subsequent phases of development will be identified by the Project Coordinator. Please contact the Coordinator prior to the first submission for a subsequent phase of development.
SURVEYOR’S LETTERHEAD

DATE

Town of Richmond Hill
Engineering and Public Works Department
P.O. Box 300
RICHMOND HILL ON L4C 4Y5

Dear Sirs:

Re: Project Name/Owner
19T-Number
Part of Lots and , Concession ,
Town of Richmond Hill

CERTIFICATE OF AREAS AND FRONTAGES

LOT NO.  FRONTAGE (m)  AREA (m²)  UNIT TYPE (SFD/SD)  UNIT COUNT  FRONTAGE (m)  AREA (m²)  ZONE CATEGORY  SATISFIED (iii)
1.  18.000  774.4  SFD  1  15.000  502.0  R1  YES
2.  18.000  774.4  SFD  1  15.000  502.0  R1  YES
3.  18.000  777.5  SFD  1  15.000  502.0  R1  YES
4.  20.185  761.6  SFD  1  15.000  502.0  R1  YES
5.  18.179  780.5  SFD  1  15.000  502.0  R1  YES
6.  18.234  780.1  SFD  1  15.000  502.0  R1  YES
7.  24.150  1443.9  SD  2  18.000  702.0  R3  YES
8.  24.000  1445.7  SD  2  18.000  702.0  R3  YES
9.  24.000  1446.0  SD  2  18.000  702.0  R3  YES

TOTALS

B  GRAPHIC OF AREAS AND FRONTAGES

BLOC  NO.  FRONTAGE (m)  AREA (m²)  UNIT TYPE LAND USE  UNIT COUNT  FRONTAGE (m)  AREA (m²)  ZONE CATEGORY  SATISFIED (iii)
11.  9.5  332.5  TH  1  9.0  315.0  R4  YES
2.  7.0  245.0  TH  1  6.5  227.5  R4  YES
3.  7.0  245.0  TH  1  6.5  227.5  R4  YES
4.  9.5  332.5  TH  1  9.0  315.0  R4  YES
12.  23024.0  Parkland
13.  32450.6  Open Space
14.  18650.1  EPA 1
15.  24.2  0.3m Reserve

TOTALS

Total Area of Residential Lots and Residential Blocks = ____________ (m²)

Total Area of Roads = _______________ (m²)

Total Area of Subdivision = _______________ (m²) = _______________(ha)

I hereby certify that:

i) the areas and frontages of the above mentioned subdivision comply with the provisions of the applicable by-law;

ii) all existing buildings or structures on the subject lands or other lands abutting this Plan which are owned by the Owner are situated so as to comply with the applicable zoning by-laws after registration of the Plan (surveyed dimensions to be shown on M-Plan).

iii) the flankage setback requirement(s) for all proposed and future lots flanking an arterial road or for all proposed and future lots on corner lots and blocks comply with the applicable by-law.

SIGNATURE, O.L.S.
## ESTIMATED COST OF MUNICIPAL SERVICES

<table>
<thead>
<tr>
<th>Service</th>
<th>Within the Plan</th>
<th>External to the Plan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Public Highway Construction to base course asphalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Public Highway Construction to surface course asphalt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Sanitary Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Storm Drainage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Water Distribution Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Foundation Drain Collector Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Service Connections (if not included in C, D, E, F within the plan) (if not included in C, D, E, F external to the plan)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Stormwater Management Facilities (excluding landscaping)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Noise Attenuation Barrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Bus Shelter Pads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>Sewage Pumping Station</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Water Booster Pumping Station</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>Privacy Fencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Emergency Access Roads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>Street Lighting</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL ESTIMATED COST OF MUNICIPAL SERVICES</strong></td>
<td></td>
<td></td>
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</tbody>
</table>

E. & O.E. Date: 

## ESTIMATED COST OF PARKS SERVICES

<table>
<thead>
<tr>
<th>Services</th>
<th>Within the Plan</th>
<th>External to the Plan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Chain Link Fencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Landscaping for Stormwater Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Restoration Planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Entry Features</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Screening Planting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Walkways</td>
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<tr>
<td><strong>TOTAL ESTIMATED COST OF PARKS SERVICES</strong></td>
<td></td>
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E. & O.E. Date:
# SCHEDULE "D-1"

## CREDITABLE SERVICES

### Services within the Plan(s)

<table>
<thead>
<tr>
<th>Service</th>
<th>Oversizing Cost *</th>
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<tbody>
<tr>
<td>A Collector Road - Construction</td>
<td>$</td>
</tr>
<tr>
<td>B Collector Road - Land</td>
<td>$</td>
</tr>
<tr>
<td>C Watermains</td>
<td>$</td>
</tr>
<tr>
<td>D Sanitary Sewers</td>
<td>$</td>
</tr>
<tr>
<td>E Storm Sewers</td>
<td>$</td>
</tr>
<tr>
<td>F Stormwater Management Facility (Construction and Landscaping)</td>
<td>$</td>
</tr>
<tr>
<td>G Stormwater Management Facility - Land</td>
<td>$</td>
</tr>
<tr>
<td>H Sidewalks, Landscaping, Street Lighting - Boundary Roads</td>
<td>$</td>
</tr>
<tr>
<td><strong>SUB-TOTAL</strong></td>
<td>$</td>
</tr>
</tbody>
</table>

### Services External to the Plan(s)

<table>
<thead>
<tr>
<th>Services</th>
<th>Oversizing Cost *</th>
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<tbody>
<tr>
<td>A Collector Road - Construction</td>
<td>$</td>
</tr>
<tr>
<td>B Collector Road - Land</td>
<td>$</td>
</tr>
<tr>
<td>C Watermains</td>
<td>$</td>
</tr>
<tr>
<td>D Sanitary Sewers</td>
<td>$</td>
</tr>
<tr>
<td>E Storm Sewers</td>
<td>$</td>
</tr>
<tr>
<td>F Stormwater Management Facility (Construction and Landscaping)</td>
<td>$</td>
</tr>
<tr>
<td>G Stormwater Management Facility - Land</td>
<td>$</td>
</tr>
<tr>
<td>H Sidewalks, Landscaping, Street Lighting - Boundary Roads</td>
<td>$</td>
</tr>
<tr>
<td><strong>SUB-TOTAL</strong></td>
<td>$</td>
</tr>
</tbody>
</table>

**Note:** Oversizing Cost may include engineering fees, contingencies, G.S.T. and indexing as per the applicable Area Specific Development Charge Bylaw.
General

The intent of this specification is to facilitate the transfer of the digital data related to a draft approved M-Plan. The specifications have been created in an attempt to minimize any additional work required by both the proponent and the Town. We encourage suggestions on how to enhance the process and specifications.

Deliverables

The digital plan submission is comprised of two items:
• Digital plan data as per the specifications; and
• An ASCII file containing descriptive information (i.e. Metadata) related to the digital plan.

The deliverables may be provided on DVD media or may be delivered electronically by email if the files are less than 4.0 Mb. Only one digital submission will be requested and it is anticipated that it will typically be the second submission to Planning & Regulatory Services Department, Development Engineering Division. For the digital file naming convention, the use of the 19T number (and Phase, if applicable) will facilitate referencing for all parties.

Digital Plan Specifications

The digital plan submission is preferred in AutoCAD format (dwg format). The graphic data is required to be copied from your inhouse “layering” system into the following layers/levels of data for submission to the Town:
• Layer/Level 1: Survey Lines. This layer will contain boundary linework for all subdivision units;
• Layer/Level 2: Text. This layer will contain text indicating the number of the subdivision unit and road names (if available at time of submission).

NOTE: Linework must extend from the centre of each monument/survey bar, bend or intersection to ensure a closed polygon exists for each parcel or block.

ASCII Metadata File

A comma delimited ASCII file is requested with the following metadata: Town project reference number (i.e. 19T/Phase); Company Name; Project Contact name; Contact telephone number; your project reference number; digital data file name; date of last revision for submitted digital data; software/version used to create the data; coordinate system used for data; data format; and any comments/special notes of clarification required.

Data Distribution

The digital data provided will be integrated with the overall digital property mapping database for the Town and will be used for internal purposes including the use for public information. Any external requests for this data will be redirected to the developer of the property.

Contact Information

If you have any questions, you are asked to contact the Manager, Stormwater & Subdivisions, or Supervisor, Design & Construction Services at 905-771-8830.
Step #1

MARGIN MINIMUM

8 1/2"

Step #2

14"

Step #3

8 1/2"

Step #4

14"

Note: Title Block must remain visible

MARGIN Not < 2.5 cm

Paper to be removed

Drawings for insertion into Subdivision Agreement

SCALE: N.T.S.
DATE: JUNE 2005

DRAWN: N.P.
DWG. No. Section F9.6
“FORM OF A LETTER OF CREDIT WHICH WOULD BE ACCEPTABLE TO THE TOWN OF RICHMOND HILL”

NOTE: SCHEDULE “I” BANKS ONLY ACCEPTABLE

NAME OF BANK: Date Issued:
ADDRESS:
LETTER OF CREDIT No:__________________________ Amount:________________________

Issued Subject to The Uniform Customs and Practices for Documentary Credits, 2007 revision, ICC Publication number 600, implemented July 1, 2007

TO: The Corporation of the Town of Richmond Hill
P.O. Box 300
225 East Beaver Creek Road
Richmond Hill, ON L4B 3P4

We hereby authorize you to draw on ...NAME OF BANK, BRANCH, AND ADDRESS... for account of ...NAME OF APPLICANT...up to an aggregate amount of $.........................available on Demand.

Pursuant to the request of our Customer, the said ...NAME OF APPLICANT...WE, ...NAME OF BANK, BRANCH, ADDRESS...hereby establish and give you AN IRREVOCABLE LETTER OF CREDIT in your favour in the TOTAL AMOUNT OF $......CANADIAN DOLLARS which may be drawn on by you at any time and from time to time upon WRITTEN DEMAND for payment made upon us by you which demand we shall honour without enquiring whether you have a right as between yourself and our said customer to make such demand and without recognizing any claim of our said customer, or objection by it to payment by us.

Provided, however, that you are to deliver to ....NAME OF BANK, BRANCH, ADDRESS..., at such time as a WRITTEN DEMAND FOR PAYMENT is made upon us, a certificate signed by the TREASURER or the CLERK of The Corporation of the Town of Richmond Hill, confirming that monies drawn pursuant to this Letter of Credit are to guarantee obligations incurred or to be incurred in connection with an Agreement dated..date shown on agreement...between...Name(s) shown on the agreement... and The Corporation of the Town of Richmond Hill.

The amount of the Letter of Credit may be reduced from time to time in accordance with the terms of the Agreement as advised by notice in writing given to us from time to time by you.

Subject to the condition hereinafter set forth, this Letter of Credit shall expire on ..................................*. This Letter of Credit shall be automatically extended without amendment for one year from the present or any future expiration date hereof, unless ninety (90) days prior to such date we shall notify you, in writing, by registered mail, that we elect not to consider the Letter of Credit renewed for such additional period.

For...NAME OF BANK............

__________________________    ______________________
Countersigned       Authorized signature
“FORM OF A LETTER OF CREDIT WHICH WOULD BE ACCEPTABLE TO THE TOWN OF RICHMOND HILL”

NOTE: SCHEDULE “I” BANKS ONLY ACCEPTABLE

NAME OF BANK: Date Issued:
ADDRESS: 
LETTER OF CREDIT No:_____________Amount:______________________

Issued Subject to The Uniform Customs and Practices for Documentary Credits, 2007 revision, ICC Publication number 600, implemented July 1, 2007

TO: The Corporation of the Town of Richmond Hill
    P.O. Box 300
    225 East Beaver Creek Road
    Richmond Hill, ON L4B 3P4

We hereby authorize you to draw on ...NAME OF BANK, BRANCH, AND ADDRESS... for account of ...NAME OF APPLICANT... up to an aggregate amount of $........................... available on Demand.

Pursuant to the request of our Customer, the said ...NAME OF APPLICANT... WE, ...NAME OF BANK, BRANCH, ADDRESS... hereby establish and give you AN IRREVOCABLE LETTER OF CREDIT in your favour in the TOTAL AMOUNT OF $...... CANADIAN DOLLARS which may be drawn on by you at any time and from time to time upon WRITTEN DEMAND for payment made upon us by you which demand we shall honour without enquiring whether you have a right as between yourself and our said customer to make such demand and without recognizing any claim of our said customer, or objection by it to payment by us.

Provided, however, that you are to deliver to ....NAME OF BANK, BRANCH, ADDRESS..., at such time as a WRITTEN DEMAND FOR PAYMENT is made upon us, a certificate signed by the TREASURER or the CLERK of The Corporation of the Town of Richmond Hill, confirming that monies drawn pursuant to this Letter of Credit are to guarantee the performance of site alteration as provided for and authorized by Site Alteration Permit No. ............... and all conditions of granting such permit.

The amount of the Letter of Credit may be reduced from time to time in accordance with the terms of the Site Alteration Permit as advised by notice in writing given to us from time to time by you.

Subject to the condition hereinafter set forth, this Letter of Credit shall expire on .................................*. This Letter of Credit shall be automatically extended without amendment for one year from the present or any future expiration date hereof, unless ninety (90) days prior to such date we shall notify you, in writing, by registered mail, that we elect not to consider the Letter of Credit renewed for such additional period.

For...NAME OF BANK....

Countersigned  Authorized signature
Date

The Corporation of the Town of Richmond Hill
P.O. Box 300
Richmond Hill, Ontario
L4C 4Y5

Attention: Mrs. Ana Bassios, Commissioner of Planning and Regulatory Services

Dear Mrs. Bassios:

Re: 19T-[file number] - [name of development] - for Plan of Subdivision only
Re: D06-[file number] - [name of development] - for Site Plan only

Notification of Contractor

We hereby advise that we intend to retain the services of (name of contractor) who will act as the general contractor with respect to the installation of services within the captioned plan of subdivision or site plan.

Yours truly,

____________________________________________                       ________________
for Commissioner of Planning and Regulatory Services   Date

Approved in accordance with section A.8 of the subdivision agreement.
(exclude this provision for a Site Plan)
DIVISION "G"

MISCELLANEOUS

TOWN STANDARD
DRAWINGS
# DIVISION "G"
## MISCELLANEOUS
### TOWN STANDARD DRAWINGS

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NOTE: IF EXISTING WATERMAIN IS CAST IRON THE PIPE SHALL BE CUT OUT AND REPLACED WITH A SECTION OF DUCTILE IRON PIPE AS DIRECTED BY THE ENGINEER.

2. WATERMAIN BEDDED IN FILL GROUND:

IF, IN THE OPINION OF THE TOWN OF RICHMOND HILL, IT IS FEASIBLE AND IF DUCTILE IRON PIPE IS USED, CRUSHED 50mm LIMESTONE IS TO BE USED AS BEDDING FOR THE WATERMAIN PIPE ACROSS FILL GROUND. THICKNESS OF THE STONE BEDDING SHALL BE DETERMINED BY TOWN OF RICHMOND HILL.
NOTES:
1. SERVICES ARE NOT TO BE EXTENDED INSIDE PRIVATE PROPERTY.
2. SERVICES WILL NOT BE PERMITTED WITHIN DRIVEWAYS UNLESS OTHERWISE APPROVED BY THE TOWN OF RICHMOND HILL.

SECTION A-A

TOWN OF RICHMOND HILL
ENGINEERING DEPARTMENT

HOUSE SERVICE LOCATION STANDARDS
NOTES

1. LEVELLING SHOULD BE OF 2ND ORDER AND SHOULD BE CLOSED BETWEEN TWO EXISTING PERMANENT BENCH MARKS.

2. LEVELLING AND ADJUSTMENT SHEETS ARE TO BE SUBMITTED TO THE TOWN PRIOR TO ACCEPTANCE OF BENCH MARK. ALSO SUBMIT DRAWING SHOWING LOCATION OF BENCH MARK MONUMENT WITH TIES TO PERMANENT OBJECTS.

3. NOTIFY THE ENGINEERING DEPARTMENT FOR INSPECTION PRIOR TO POURING OF CONCRETE.

4. BENCH MARK NUMBER MUST BE PUNCHED ON THE TABLET PRIOR TO INSTALLATION.
DIVISION "H"

STORMWATER MANAGEMENT
DIVISION "H"

STORMWATER MANAGEMENT DESIGN CRITERIA

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## DIVISION "H"

### STORMWATER MANAGEMENT DESIGN CRITERIA

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DIVISION "H"

SECTION "H1"

STORMWATER MANAGEMENT
DESIGN CRITERIA

DESIGN OF QUALITY AND QUANTITY
CONTROL FACILITIES

DEVELOPMENTS 5 HA IN SIZE OR GREATER
DIVISION “H” - SECTION H1

STORMWATER MANAGEMENT DESIGN CRITERIA

DESIGN OF QUALITY AND QUANTITY CONTROL FACILITIES

DEVELOPMENTS  5 HA IN SIZE OR GREATER

These design criteria are considered supplemental to the latest revision of the MOE Stormwater Management Practices Planning and Design Manual. The purpose of these criteria is to provide specific direction to consultants on the conceptual and detailed design of stormwater management facilities proposed within the Town of Richmond Hill. These design criteria and the Facility Landscaping Design Criteria and Implementation Guidelines are considered to be supplementary to the MOE Manual. The type of stormwater management facility to be designed is normally determined through a Master Environmental Servicing Plan.

1. **Length/Width Ratio**

   The minimum length to width ratio is 3:1. Internal berming within the facility may be used to increase flow path to meet this criteria and will only be considered where physical constraints clearly limit the facility configuration.

2. **Sideslopes**

   **Planting Shelf**

   The planting shelf shall consist of 3m of 7:1 slope centered on the edge of the permanent pool. This width of shelf is considered a minimum requirement as a safety measure to limit the potential for public access to the permanent pool.

   **Above Planting Shelf**: 4:1 max. slope (5:1 preferred)

   **Below Planting Shelf**: 3:1 max. Slope
3. **Standard Water Depths**

Normal water level (N.W.L.) is considered the permanent pool water level within the facility.

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<th>Wetpond Facility</th>
<th>Wetland Facility</th>
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<td><strong>Permanent Pool:</strong></td>
<td>1.0 to 2.0 m</td>
<td>0.15 to 0.30 m (75% of surface area)</td>
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<td></td>
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<td>0.90 m max. for deep pools</td>
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<tr>
<td><strong>Permanent Pool at Outlet</strong></td>
<td>2.5 m max.</td>
<td>2.0 m max.</td>
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<tr>
<td><strong>Extended Detention Storage (above N.W.L.)</strong></td>
<td>1.5 m max.</td>
<td>1.0 m max.</td>
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<td><strong>Quantity Control Storage (above N.W.L.)</strong></td>
<td>2.5 m max.</td>
<td>2.0 m max.</td>
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<tr>
<td><strong>Overall Max. Depth</strong></td>
<td>5.0 m</td>
<td>4.0 m</td>
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Deeper permanent pool areas at outlet structures will be considered in situations where site specific conditions have been identified to warrant this design consideration. For wetlands, a localized deep pool shall be designed at the outlet structure to facilitate the use of a reverse pipe outlet as identified on Town Standard Drawing ST-12A. The use of extended detention storage for quantity control is considered acceptable to the Town.

4. **Permanent Pool and Facility Storage Requirements**

Permanent pool volume requirements shall be based on the MOE Manual or site specific requirements as recommended in Master Environmental Servicing Plans, Master Drainage Plans or Master Stormwater Management Plans.

Facility storage requirements for quality control, including extended detention, and quantity control shall be based on criteria established in Master Environmental Servicing Plans, Master Drainage Plans or Master Stormwater Management Plans. If no documentation exists to establish the level of quality and quantity control, the requirements will be as directed by the Town.
5. **Forebay**

A berm is to be provided to separate the forebay from the wetpond/wetland area. The top of berm is to be at the N.W.L. with erosion protection above the N.W.L., 1.0m in top width, with 3:1 max. sideslopes. The forebay length to width ratio shall be 2:1 or greater with length designed in accordance with MOE manual. The forebay bottom (not including sideslopes) shall be lined with 300 mm of 50mm diameter crusher run limestone (or as recommended by a geotechnical consultant) to support the use of equipment to remove sediments from the forebay. Unstable native soil conditions may warrant the use of geotextile lining under the limestone as per geotechnical recommendations. A geotechnical engineer shall certify that the forebay lining will provide adequate support for maintenance equipment. The use of maintenance equipment presumes that the forebay is dewatered prior to sediment removal. A dewatering sump shall be installed in each forebay to facilitate dewatering in accordance with Town Standard Drawing ST - 15A.

6. **Berming**

Berming around the perimeter of the facility shall be designed within a minimum top width of 2.0m (where trail or maintenance access is not located on berm) and the top of berm elevation shall be established at a minimum 0.3m above the 100 year water level or highest water level within the facility. Retaining walls within the stormwater block are not acceptable to the Town.

7. **Sediment Drying Area**

Where feasible, a sediment drying area shall be provided immediately adjacent to the maintenance access road and located as close as possible to the sediment forebay. The drying area shall have a surface area equivalent to the area of the bottom of the forebay. This area shall be graded at a 2.0 to 5.0% slope with surface drainage directed to the facility. Surface treatment of the drying area shall be consistent with the maintenance access roadway.

8. **Maintenance Access Roadway**

Maintenance access roadways shall be provided from municipal road allowances to outlet/inlet structures and to the bottom of sediment forebays. Where feasible, two access points shall be provided to each facility and access roads shall be looped to access points. Dead end access roads are not preferred, and shall be designed with a proper hammerhead turn around with a minimum hammerhead width of 17.0 m, roadway width of 5.0 m and 12.0 m centreline turning radius.

<table>
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<th>Min. Roadway Width</th>
<th>5.0 m</th>
<th>Max. Gradient</th>
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<tr>
<td>Max. Crossfall</td>
<td>2%</td>
<td>Min. Centreline Radius</td>
<td>12.0m</td>
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Blocks between residential lots for the purpose of maintenance access shall have a minimum width of 6.0m with a 4.0m wide road surface. Blocks to be used for maintenance access and as a walkway shall have a minimum width of 8.0m with a 4.0m wide road surface.

A suitable curb cut shall be provided at the street connection and removable bollards shall be installed at the edge of the R.O.W. to prohibit public vehicular access. Permanent swing gate bollards will be required where the access road will be used as a walkway. Concrete sidewalk across the access road shall be a min. 200 mm thick with wire mesh reinforcing.

Road base is to consist of a minimum 300mm of 50mm diameter crusher run limestone, supported by appropriate geotechnical recommendations. Surface treatment to consist of limestone screenings or approved equivalent. Where the access road will also be used as part of a walkway or trail system, the surface treatment shall be 50 mm of HL3 asphalt. Access roads on blocks between residential lots shall have a 100 mm concrete surface from curb to rear of lot. The road base on the forebay ramp below the N.W.L. shall be consistent with design of forebay lining with the addition of soil reinforcement based on geotechnical recommendations.

9. **Fencing**

Fencing will be required where residential lots or blocks abut the stormwater management block. Fencing will not be required where the stormwater block abuts open space, EPA lands, restoration lands or a municipal R.O.W. Fencing to be 1.2m high, black vinyl chain link fence in accordance with OPSD. Fencing to be offset 0.05m within stormwater block with chainlink mesh on the Town side of posts.

10. **Warning Signage**

Warning signs are to be installed near pedestrian traffic routes or walkways located within or adjacent to the stormwater management block. The number of signs required will be determined by the Town on a site specific basis. Signs are to conform to the Town’s standard and shall be supplied and installed by the developer. Signs shall be ordered and purchased from the Operations Division of the Engineering and Public works Department.
11. **Inlet Structures**

Storm sewer pipe inlets into the facility are to be designed so that the invert matches the N.W.L. and headwalls are to abut the edge of the permanent pool. Headwalls and grating shall conform to OPSD. Erosion protection shall be provided between the headwall and the bottom of the forebay to prevent localized scour at the inlet. The protection shall match the width of the headwall at the inlet and shall extend 1.5m on either side of the headwall at the forebay bottom. Protection material shall consist of rip rap or river stone underlain with geotextile with size and depth of stone based on consultant recommendations. Maintenance access roadways shall extend to the top of slope/berm above inlet structures. A geodetic monument shall be established on the top of the concrete headwall to assist in future water level monitoring. The monument shall have horizontal and vertical control in accordance with Town standards.

12. **Outlet Structures**

Reverse slope pipe outlet structures shall be used for both wetland and wetpond facilities designed in accordance with Town Standard Drawing ST-10A and ST-12A. Where site grading permits, maintenance pipes shall be installed to allow the facility to drain by gravity flow. Maintenance access roadways must extend to provide access to maintenance access covers on outlet structures. For temporary stormwater facilities proposed in lieu of ultimate facilities being in place, a temporary outfall structure shall be designed as per Town Standard Drawing ST-11A.

For large facilities, a weir outfall/spillway will be considered for discharge of less frequent events in lieu of or in combination with the ditch inlet type of structure. Erosion protection for spillways shall be consistent with Section 13.0. Erosion protection for outfalls shall generally consist of a combination of rip rap or river stone and vegetation as per Town Standard Drawing ST-14A. The size and depth of stone shall be based on consultant recommendations based on flow velocity calculations. Outfalls to environmentally sensitive areas may require site specific treatment based on direction from the Town and/or as identified in Master Environmental Servicing Plans, and/or Environmental Reports.

13. **Emergency Overflow Spillway**

Each facility shall be designed to provide an emergency overflow spillway to allow storm drainage to safely exit the facility in event that the outfall structure fails to function or the occurrence storm events greater than the 100 year or highest design return period. The spillway shall be designed to convey the 100 year or highest design post development peak flow, while maintaining a 0.10m freeboard to the top of slope around the perimeter of the facility. The invert of the spillway shall be at or above the 100 year or highest water level within the facility.
The design of the spillway shall be based on flow capacity calculations provided by the consultant. Erosion protection shall be provided on the top, downslope and base of the spillway. Because of aesthetics and infrequent use of the spillway, erosion protection consist of a soil re-inforcement system with a natural vegetated surface treatment. The type of surface treatment and soil re-inforcement shall be based on consultant recommendations based on flow velocity calculations. Where access roads traverse the top of the spillway, the surface treatment and base shall be consistent with the access road design. Sideslopes at the top of the spillway shall be 3:1 maximum and shall be 10% if used as an access roadway.

14. **Major System Overland Flow Routes**

Major system overland flow routes shall be designed to safely convey the 100 year peak overland flow into the facility. The major system overland flow shall not be directed into the sediment forebay area. Channels designed to convey overland flows shall be flat bottomed with 3:1 max. sideslopes. The maximum flow depth shall be 0.3m and the channel depth shall allow for 0.1m of freeboard. Because of aesthetics and the infrequent occurrence of major system flows, erosion protection shall consist of a soil re-inforcement system with a natural vegetated surface treatment. The type of surface treatment and soil re-inforcement shall be based on consultant recommendations based on flow velocity calculations.

15. **Existing Groundwater Elevation**

As part of the geotechnical investigation for the development, at least one borehole shall be located near the centre of the stormwater block to assess the nature of existing soils and the ground water elevation. The local ground water elevation shall be compared to the proposed permanent pool water level within the facility. Where soil conditions are very permeable and the ground water elevation is below the permanent pool water level, lining of the permanent pool area with an impermeable material may be required to ensure permanent pool levels are maintained. The type and thickness of lining material shall be based on geotechnical recommendations. Where the ground water elevation is above the permanent pool water level, an appropriate investigation shall be undertaken to assess the impacts of a localized reduction in groundwater levels, potential impacts to groundwater aquifer systems and flow regimes, and to assess potential slope stability and groundwater seepage concerns within the facility. The scope of this investigation will be determined based on site specific conditions. The consultant shall consider all feasible design alternatives to limit or negate any impact to local groundwater levels to the satisfaction of the Town.
16. **Landscaping**

Facility landscaping shall be designed in accordance with the latest version of the Facility Landscaping Design Criteria and Implementation Guidelines. Information on these guidelines may be obtained from the Environmental Services Division of the Parks, Recreation and Culture Department. This document provides guidance with respect to the configuration of the facility depending on its location within the community (e.g. adjacent to environmental corridor, community parkland, or trail system etc.). This guideline outlines strategies and criteria for plantings within the stormwater block. Where pedestrian access is expected within the stormwater block, the type and location of plantings shall be designed to discourage public access to the permanent pool area.

17. **Temporary Stormwater Facility**

In situations where the ultimate downstream facilities have not been constructed and/or where trunk sewers have not been completed to convey storm drainage to the ultimate facility, interim or temporary on-site facilities will be considered by the Town. Any temporary facility must provide an equivalent level of quality and quantity control provided in the ultimate facility to the satisfaction of the Town. Any temporary facility will be required to remain in place until the ultimate facilities or trunk sewers are constructed to the satisfaction of the Town. Site plan or subdivision agreements will be structured to require the owner to be solely responsible for maintenance and operation of temporary facilities as well as any demolition, removals and restoration associated with decommissioning of the temporary facility, including disposal of any contaminated sediments in accordance with applicable Provincial guidelines and regulations. The outlet structure for temporary facilities shall be designed in accordance with Town Standard Drawing ST-11A.

The design criteria may be modified as follows for temporary facilities:

- 3:1 max. side slopes from facility bottom to top of berm
- no sediment forebay or separation berm
- no maintenance access roadway to outlet structure or emergency overflow spillway
- facility perimeter to be fenced with 1.2m black vinyl chain link on all sides with lockable access gate in accordance with OPSD.
- no maintenance pipe or valve required as part of outfall structure
- provide access for emergency vehicles
18. **As-Constructed Requirements**

An as-constructed topographic survey and engineering plans of the stormwater facility will be required along with calculations to verify the following:

- permanent pool volume
- active storage volume
- location and height of berms
- location, invert elevations and size of pipes, inlets and orifices for outfall structure

The developer’s consultant shall certify that the as-constructed facility has been built and is performing in accordance with the engineering plans and design report.

19. **Performance Monitoring During Construction and for Assumption**

In order for the Town to assume the stormwater facility, the following requirements shall be undertaken and completed to the satisfaction of the Town.

**Quality Performance Monitoring and Sediment Removal**

After grading of the facility is completed, the consultant shall complete a topographic survey of the facility to determine the elevations prior to the facility being operational. The Town requires that the survey work be completed in a dry condition. The consultant shall submit a plan showing the results of the topographic survey prior to building permit release by the Town.

After the facility has been graded and inlet/outlet structures are in place, the consultant shall monitor forebay sediment levels on a monthly basis (April 1 to November 30) and main cell sediment levels on an annual basis until assumption by the Town. Sediments shall be removed from the forebay on an annual basis, unless the consultant demonstrates that the accumulated sediment volume is less than 25% of the forebay permanent pool volume. To estimate the volume of forebay sediments, at least five uniformly distributed measurements of sediment depth shall be taken within the forebay. Sediments shall be removed from the main cell when the accumulated sediment volume is greater than 25% of the main cell permanent pool volume. The consultant shall estimate the volume of main cell sediments using at least five measurements of sediment depth along a mid section along the length of the facility. A secchi disk shall be used the estimate the sediment levels in a wet condition.
A metric staff gauge shall be installed adjacent to the storm sewer inlet headwall so that the zero reading is at the permanent pool elevation. Outlet structures shall be inspected on a monthly basis to ensure that perforated riser inlets are not blocked due to sediments or debris. The consultant shall provide monthly inspection reports to the Town along with instructions to the site contractor for any remedial work. This inspection shall be undertaken in dry weather conditions, at least 72 hours after any rainfall event. The monthly reports shall include a staff gauge reading to determine any fluctuations in the permanent pool elevation. A sample spreadsheet format for the inspection report is included in Appendix A. A digital copy of this inspection spreadsheet will be provided to the consultant prior to construction.

At the time of assumption, the facility shall be drained and all sediments shall be removed from the forebay and main cell. A second topographic survey shall be completed after all sediment removal. This topographic survey shall be submitted to the Town, along with a comparative analysis to the survey taken after substantial completion. The results should verify that all sediments have been removed from the facility.

On a yearly basis between April 1 to November 30, at least five (5) water samples shall be taken at the outfall from the facility to assess the Total Suspended Solid (TSS) concentrations in mg/l. The samples shall be taken within 24 hours after a significant rainfall event. The samples shall be submitted to an accredited laboratory for analysis. The laboratory results for the TSS concentrations shall be submitted to the Town to assess if the facility is releasing excessive sediment levels. Samples shall be taken for the period from substantial completion to assumption of the facility.

**Quantity Performance Monitoring**

Prior to assumption, performance monitoring shall be undertaken to verify that the facility is functioning in accordance with the approved engineering design. Performance monitoring shall commence after at least 50% of the dwellings have been constructed within the contributing watershed. The facility shall be monitored for a minimum of two seasons immediately prior to assumption. One season is defined as continuous water level monitoring within the facility from early May 1 to October 31.

Water levels shall be measured using a data logger and pressure transducer. The data logger shall record water levels every 15 minutes and average hourly levels. The elevation of the transducer shall be referenced to a geodetic benchmark. The monitoring equipment shall be installed immediately after substantial completion of the facility. After each season, the data shall be reviewed in conjunction with rainfall data from Richmond Hill and Buttonville gauges. The rainfall and water level data for 5 to 8 significant events shall be processed in a graphical format to display the fluctuation in water levels over time.
The resulting data shall be analyzed by the consultant to assess the following in comparison to the approved engineering design:

- permanent pool or normal water level
- fluctuation in water levels in response to rainfall events
- facility drain down time after erosion control events

The expected design water levels for the permanent pool, erosion control, 2 year and 5 year events shall be included on the graphs for comparison to the actual levels. A sample graph is included in Appendix B. The consultant shall submit the results of the analysis to the Town including any recommendations for remedial works to be undertaken on the facility to ensure proper performance with respect to erosion and quantity control. If any remedial works are undertaken after the second season of monitoring, the Town will require additional seasonal monitoring until the facility is performing to the satisfaction of the Town. The Town reserves the right to require additional monitoring until the facility is performing to the satisfaction of the Town.

20. **Stormwater Management Facility Database**

The Town maintains a digital database for stormwater management facilities. This database is used to assist in maintenance and operation of these facilities. The consultant shall provide the following summary list of information in order for the Town to update our inventory of facilities. This list shall be provided in the final design report and shall be updated by the consultant at the time of assumption.

<table>
<thead>
<tr>
<th>Facility Type:</th>
<th>(wetland, wetpond or hybrid)</th>
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<tbody>
<tr>
<td>Quality Control Level:</td>
<td>(e.g.. Level 1 - 80% removal)</td>
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<tr>
<td>Erosion Control Level:</td>
<td>(e.g.. 25 mm event - 48 hr. detention)</td>
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<tr>
<td>Quantity Control Level:</td>
<td>(e.g.. 2 to 100 year post to pre)</td>
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<td>Pre Treatment:</td>
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<td>(e.g.. Limestone and Width)</td>
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<tr>
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<td>Water Table Elevation:</td>
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<td>Facility Liner:</td>
<td>(e.g. native or clay liner)</td>
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<td>Warning Signage</td>
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# APPENDIX A

TOWN OF RICHMOND HILL  
Engineering and Public Works Department

SWM Facility Inspection Spreadsheet

<table>
<thead>
<tr>
<th>Owner:</th>
<th>Forebay Permanent Pool Volume: m³</th>
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<tr>
<td>Consultant:</td>
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<th>Location</th>
<th>Inspection Date</th>
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<th>Sediment Depth 1 (m)</th>
<th>Sediment Depth 2 (m)</th>
<th>Sediment Depth 3 (m)</th>
<th>Sediment Depth 4 (m)</th>
<th>Sediment Depth 5 (m)</th>
<th>Average Depth (m)</th>
<th>Sediment Volume (m³)</th>
<th>% Perm.</th>
<th>Outlet Structure</th>
<th>Note Remedial Works Required</th>
<th>Note any debris or blockages</th>
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DIVISION "H"

SECTION "H2"

STORMWATER MANAGEMENT DESIGN CRITERIA

SITE PLAN DEVELOPMENTS

INFILL RESIDENTIAL DEVELOPMENTS (LESS THAN 5 HA IN SIZE)
DIVISION “H” - SECTION H2

STORMWATER MANAGEMENT DESIGN CRITERIA

SITE PLAN DEVELOPMENTS
INFILL RESIDENTIAL DEVELOPMENTS (LESS THAN 5 HA IN SIZE)

1. **Stormwater Management**

   Development has a direct impact to the quality and quantity of storm drainage runoff. Every applicant proposing development with the Town is responsible for the quality and quantity treatment of storm drainage runoff to mitigate the impacts of development, in accordance with the current Town of Richmond Hill Design Criteria and Provincial Stormwater Management Guidelines.

   These design criteria outline a general procedure to follow to determine the level of quality and quantity control required for a specific development. In consultation with the Town and TRCA, the Consultant shall determine if a Master Environmental Servicing Plan (MESP) or Master Drainage Plan (MDP) exists which specifies the level of quality or quantity control required, other treatment measures to be implemented for the proposed development site, and existing or proposed downstream stormwater management facilities. The Consultant shall then determine which of the following scenarios applies to the proposed development:

   **Scenario A**  
   Downstream quality and quantity control facilities are in place or proposed which service the proposed development area (proceed to Section 2)

   **B**  
   Only downstream quantity control facilities are in place. No downstream quality control in place (proceed to Section 3)

   **C**  
   No downstream quality or quantity treatment facilities in place or proposed to service the subject development (proceed to Section 4)

2. **Existing Downstream Quality/Quantity Control**

   For this case, downstream facilities are in place to provide the required quality and quantity treatment of storm drainage for the proposed development. Additional site quantity control may be required depending on the major and minor system design as outlined in Sections 2.1 and 2.2.
2.1 Minor System (5 Year Event)

The Consultant shall review existing storm drainage area plans and design sheets and compare original design parameters (contributing area, runoff efficient) to proposed design parameters. If the original 5 year design flows are not exceeded by more than 5% then no additional quantity control is required for the minor system. If proposed design flows exceed the original design by more than 5% then the Consultant shall follow either option indicated in Section 2.1.1 or 2.1.2:

2.1.1 Option 1 - Residual Capacity Analysis

The consultant shall demonstrate that existing downstream minor system has residual capacity to accommodate additional design flows from point of connection to an existing outfall or existing trunk sewer designed for the 25 year event. The consultant shall assess the ability of the existing downstream facility to accommodate any additional storm runoff and maintain the same level of quality and/or quantity treatment.

2.1.2 Option 2 - Additional Site Quantity Control

Consultant shall provide on-site quantity control to reduce post development 5 year peak design flows to the original design level. Roof top storage, oversized sewer pipe storage and paved area storage will be permitted and depth of ponding within a paved parking area shall not exceed 0.3m (greater depths will be permitted in loading dock areas). Orifice control plates shall be non-removable and bolted to structures. Pipe reducers may be used instead of orifice plates to control flow. All quantity control measures shall be located on private property. The Town prefers that control measures are not located within the property line storm sewer manhole. Storage within depressed landscaping or grassed areas will be permitted and depth of ponding shall not exceed 0.9m. At-source infiltration of roof drainage is encouraged as a method of quantity control where native soils are suitable based on geotechnical recommendations.

2.1.3 Contributing External Areas

The proposed minor system shall be designed to accommodate contributing external drainage from adjacent built up lands or to accommodate future development of external lands as identified within a MDP or MESP. The Town will identify any requirements for drainage easements within the development.

2.2 Major System (100 Year Event)

The Consultant shall confirm the original design intent for direction of major system flow and outfall to an existing R.O.W. or defined overland flow route within Town easement or ownership. Generally, no exceptions to the original design intent will be permitted. The site shall be graded, to ensure positive drainage to the intended major system outlet such that the depth of ponding under 100 year event does not exceed 0.3m.
In situations where site servicing or grading constraints do not permit conveyance of the major system flows to an existing R.O.W. or overland flow route within Town easement or ownership, as per the original design intent, the Consultant shall undertake the following procedure in Section 2.2.1

2.2.1 Alternate Major System Analysis

The consultant shall investigate and determine the direction and conveyance path of existing major system flows from the site through any adjacent properties to an existing watercourse, existing R.O.W., or overland flow route within Town lands/easement. The purpose of this investigation is to determine if a suitable overland flow route exists which is acceptable to the Town. If the flow route is accepted, then on-site quantity storage may be required to limit major peak flows to pre-development levels at the discretion of the Town.

In lieu of the above investigation, or if the overland flow route is not acceptable to the Town, or the Town is aware of historical drainage issues in the area, the consultant will be required to provide on-site storage to control 100 year post development flows to the capacity of the minor system (i.e. Major system flows will be contained within the site). Roof-top storage, oversized sewer pipe storage and paved area storage will be permitted and depth of ponding within a paved parking area shall not exceed 0.3m (greater depths will be permitted in loading dock areas). Storage within depressed landscaping/grassed areas will be permitted and depth of ponding shall not exceed 0.9m.

2.3 Contributing External Areas

The proposed major system shall be designed to accommodate contributing external drainage from adjacent built up lands or to accommodate future development of external lands as identified within a MDP or MESP. The Town will identify any requirements for drainage easements within the development.

2.4 Interim or Temporary Facilities

In situations where the ultimate downstream facilities have not been constructed and/or where trunk sewers have not been completed to convey storm drainage to the ultimate facility, interim or temporary on-site facilities will be considered by the Town. Any temporary facility must provide an equivalent level of quality and quantity control provided in the ultimate facility to the satisfaction of the Town. Any temporary facility will be required to remain in place until the ultimate facilities or trunk sewers are constructed to the satisfaction of the Town. Site plan or subdivision agreements will be structured to require the owner to be solely responsible for maintenance and operation of
temporary facilities as well as any demolition, removals and restoration associated with decommissioning of the temporary facility, including disposal of any contaminated sediments in accordance with applicable Provincial guidelines and regulations. Ponding depths within any temporary facility shall be in accordance with the Town guidelines for the design of quantity and quality control facilities.

3. **Only Existing Downstream Quantity Control, No Downstream Quality Control**

3.1 **Minor and Major System Design**

Follow same procedure outlined in Section 2.1 and 2.2 to address any additional on-site quantity control relating to design of major and minor system.

3.2 **Quality Treatment**

The Consultant shall propose quality treatment of stormwater in accordance with the latest version of the MOE Stormwater Management Practices Planning and Design Manual to achieve Level 1 quality treatment. The Consultant shall review and recommend lot level controls, conveyance controls and end-of-pipe stormwater controls to provide quality treatment of stormwater. For developments where there is a potential for spill contamination (i.e. gas station, chemical storage etc.), an appropriate end-of-pipe treatment such as an oil grit separator will be considered mandatory. Determination of the potential for spill contamination shall be at the discretion of the Town.

4. **No Downstream Quality or Quantity Controls**

4.1 **Major and Minor System Design**

Where the Town and TRCA have confirmed that no downstream quantity controls are in place and no generic on-site quantity control is required, the consultant shall follow the procedure outlined in Section 2.1 and 2.2 for design of the minor and major storm drainage systems. In this case, the original design intent or parameters are replaced by existing site conditions. The Town reserves the right to request site specific quantity controls based on historical drainage issues which may be impacted by the proposed development.

4.2 **Quality Treatment**

Follow the same procedure outlined in Section 3.2 to address quality treatment requirements.
DIVISION "H"

SECTION "H3"

STORMWATER MANAGEMENT DESIGN CRITERIA

SUBMISSION REQUIREMENTS

STORMWATER MANAGEMENT REPORTS
DIVISION “H” - SECTION H3

STORMWATER MANAGEMENT DESIGN CRITERIA

SUBMISSION REQUIREMENTS

STORMWATER MANAGEMENT REPORTS

1. Submission Requirements

The following is a list of documentation which should be included within stormwater management reports submitted to the Town of Richmond Hill for review. These reports are submitted to support the final design of quality and/or quantity control facilities located within the Town of Richmond Hill. These reports shall clearly identify how applicable recommendations from Master Environmental Servicing, Functional Servicing, Geotechnical, Environmental or Hydrogeological Reports have been incorporated into the final design of the facility.

- Site Location Plan.
- Existing and proposed catchment area plan which delineates internal/external drainage areas and labels areas and catchment reference numbers.
- Engineering plans for stormwater facility which should identify the following:
  a. permanent, extended detention, highest water levels on plan view and include all ponding levels for various return periods in tabular form,
  b. section/details of major overland flow routes,
  c. section/details of maintenance access roads,
  d. section/details of erosion protection at inlet/outlet structure and on spillways,
  e. fencing limits,
  f. location of facility signage,
  g. borehole location and existing groundwater elevation,
  h. existing and proposed grading elevations and transition slopes,
  i. sediment forebay details including lining and separation berm,
  j. details of sediment drying area, where implemented
  k. section/details of inlet/outlet structures.
- Landscaping/restoration plans and details.
• Erosion and sediment control plans and details.
• Excerpts from MESP/MDP which outline requirements for quantity/quality control and any facility design requirements.
• Identify design criteria for the facility.
• Identify any deviations from the Town Stormwater Management Guidelines including an explanation based on site specific conditions.
• Pre and post development hydrologic modeling schematic (pert chart format) to illustrate all components of each model.
• Table summarizing pre and post development catchment parameters (i.e. catchment number, area, percent impervious, CN value, etc.).
• Table summarizing stage, storage and discharge characteristics of the facility.
• Table summarizing pre and post development peak flows and storage volumes based on output from hydrologic modeling or comparison to volumes and target peak flows identified in MESP.
• Table to summarize and compare required permanent pool and extended detention storage requirements to volumes provided in the facility.
• Table to compare calculated 100 year hydraulic grade line elevations (plus specified freeboard) within storm sewer system to estimated underside of basement floor slab elevations.
• Sample or supporting calculations for the following:
  a. extended detention drain downtime (hours),
  b. stage/storage/discharge characteristics of the facility,
  c. major system overland flow and velocity to confirm conveyance within R.O.W. and/or defined flow routes,
  d. 100 year hydraulic grade line to confirm basements will be protected,
  e. erosion control sizing and flow velocity at inlet/outlet structures and spillways,
  f. sediment forebay length and width in conformance with MOE manual (use settling velocity of 0.0003 m/s or use particle size removal criteria if specified),
  g. major system inlet grating sizing (assuming 50% blockage).
• Hard and digital copies of input/output files from hydrologic modeling (digital files may be provided on diskette or via e-mail).
• Identify erosion and sediment control methods to be implemented before, during, and after municipal servicing construction up to the end of servicing maintenance period, including schedule for implementation/decommissioning and maintenance requirements.
Identify long and short term facility maintenance and operation requirements, including estimates of frequency of sediment removal, labour, equipment and material costs, alternative methods of removal based on the facility design, and estimates of associated annual and capital costs. Document maintenance and operations requirements as a separate section within the stormwater management report. The Sediment Maintenance Guide, dated August 1999 or latest version, provides information on sediment removal methods and potential costs. A copy of this document may be obtained from TRCA.

Identify facility monitoring requirements based on programs identified in MESP or Draft Plan Approval Conditions. Document monitoring requirements as a separate section within the stormwater management report. The following details shall typically be provided:

- monitoring equipment and specifications,
- quality/quantity parameters to be monitored,
- duration of monitoring,
- location and installation of field equipment,
- frequency of sampling or field measurements,
- laboratory testing or analysis requirements,
- baseline monitoring requirements,
- reporting frequency and methodology,
- computer hardware/software requirements,
- estimates of annual monitoring and reporting costs.

2. **Report Format**

Report shall be bound with front/back cover. The 19T file number shall be included on the front cover. A-1 size plans included within the report shall be folded and bound into the report. Once the report has been reviewed and accepted by the Town, a digital copy of the report shall be provided in one file in an adobe acrobat (v.5.0 or lower),pdf format.

3. **Site Plan and Infill Developments**

For site plan and smaller infill developments where conventional wetpond facilities are not feasible or recommended, the submission requirements should be modified to reflect the end-of-pipe quality treatment proposed and any on-site quantity storage utilized (i.e. parking lot, roof top etc.).
DIVISION "H"

SECTION "H4"

STORMWATER MANAGEMENT DESIGN CRITERIA

STANDARD DRAWINGS
DEWATERING SUMP TO BE LOCATED ADJACENT TO FOREBAY ACCESS RAMP.
DIVISION "I"

EROSION AND SEDIMENT CONTROL CRITERIA
# DIVISION “I”
## EROSION AND SEDIMENT CONTROL CRITERIA

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DIVISION "I"

SECTIONS “I1”

EROSION AND SEDIMENT CONTROL CRITERIA

GENERAL GUIDELINE
DIVISION “I” - SECTION I1 TO 13

EROSION AND SEDIMENT CONTROL CRITERIA

1.0 General

Erosion and Sediment Control (ESC) measures shall be implemented on all development applications, including site plans, plans of subdivision and infill applications. The ESC measures shall mitigate sediment loading from storm drainage systems during construction activity. ESC measures shall be adequate to mitigate any impacts to Town infrastructure, watercourses, wetlands, and other environmentally sensitive areas or features.

ESC plans shall be prepared by a professional consulting engineer and submitted to the Town for review in accordance with the Development Submission Standards in Division “F”. The design of ESC measures shall be completed in accordance with this Section and the most recent version of the TRCA Erosion & Sediment Control Guideline for Urban Construction. The proposed ESC measures, including design information and supporting calculations, shall be documented in the Stormwater Management Report required for the development application.
DIVISION "I"

SECTIONS “I2”

EROSION AND SEDIMENT CONTROL CRITERIA

EROSION AND SEDIMENT CONTROL MEASURES
DIVISION “I” SECTION I2
EROSION AND SEDIMENT CONTROL CRITERIA
EROSION AND SEDIMENT CONTROL MEASURES

2.0 Erosion and Sediment Control (ESC) Measures

2.1 Stockpiles

Any topsoil or earth material stockpiles to remain after area grading is completed shall not be located on any Town property or lands to be conveyed to the Town. The ESC plans shall indicate the proposed location, sideslopes and volume of material. The maximum height of any stockpile shall be 8.0 m and the maximum side slope shall be 2:1. The maximum height for a stockpile may be reduced depending on the proximity to existing residential dwellings. Stockpiles shall be located in a manner to maximize the separation distance to existing residences, municipal streets and environmental features. Temporary swales shall be utilized to direct runoff from stockpiles to appropriate ESC measures. After area grading is complete, stockpiles shall be stabilized with hydroseed to the satisfaction of the Commissioner.

2.2 Silt Fences

Silt Fences shall be installed along the limits of area grading activity where surface water drains toward adjacent property, infrastructure or environmental features. A double row of silt fence shall be constructed where area grading is adjacent a watercourse, wetland or other environmentally sensitive feature. The double row shall be separated by a minimum 5.0 m vegetated strip. Silt fence shall be constructed in accordance with OPSD 219.130. Silt fencing shall be maintained and remain in place until final lot or block grading and restoration. The ESC plans shall indicate the location of silt fencing and refer to Town standards.

2.3 Temporary Drainage Swales

Temporary drainage swales shall be used during area grading or after completion to direct surface runoff to sediment control facilities or other drainage outlets. Swales shall be sized to convey the post development, peak flow from the 5-year storm event. Swales shall have a minimum gradient of 1.0% with 3:1 sideslopes. Swales shall be maintained and remain in place until final grading and restoration. The location, gradient, direction of flow, and a typical cross-section of the drainage swale shall be provided on the ESC plans.
DIVISION “I” SECTION I2
EROSION AND SEDIMENT CONTROL CRITERIA
EROSION AND SEDIMENT CONTROL MEASURES

2.4 Rock Check Dams

Rock check dams shall be installed on all temporary drainage swales and at all concentrated flow points. At concentrated flow points, the check dams shall be installed with a sediment trap upstream of the dam as per OPSD 219.220. The maximum spacing for check dams shall be 30 metres. Rock check dams shall be constructed in accordance with OPSD 219.21 and 219.211. Rock check dams shall be maintained and remain in place until final grading and restoration. The ESC plans shall show the location of rock check dams and refer to Town standards.

2.5 Temporary Sediment Control Facilities

Temporary sediment control facilities shall be used for all area grading activities which exceed 2.0 ha in size. During area grading activities, temporary facilities shall be installed upstream of permanent stormwater management facilities. These facilities shall be sized with a permanent pool storage volume of 125 to 185 m$^3$ per hectare of contributing drainage area and an additional active storage volume of 125 m$^3$ per hectare (refer to TRCA guideline). Containment berms shall be constructed with at least 0.3 m of free board above the maximum water level, 3:1 sideslopes, 2.0m top width, and an emerging spillway. The maximum depth of flow in the spillway shall be 0.3m and the spillway shall be lined with riprap erosion protection sized for peak velocities from the 5 year storm event. The outlet pipe and the design of the facility shall conform to the typical drawings on pages C-58 and C-59 in Appendix C of the TRCA guideline. The outlet structure controls shall be sized to release the active storage volume over a minimum 48 hours period. Sediment control facilities shall be maintained and remain in place until final grading and restoration. A cross-section of the facility and outlet structure shall be indicated on the ESC plans, along with details of the flow controls and active and permanent water levels.

2.6 Restoration

Within two weeks after area grading is complete, the disturbed areas including topsoil stockpiles and temporary drainage swales shall be restored with grass vegetation using hydroseed or sodding. The only exception to this requirement will be lot or block areas which are under an active building permit application. All hydroseeding for restoration shall be completed prior to mid September or at the discretion of the Commissioner. The method of hydroseeding shall be approved by the Commissioner. The proposed seed mix shall be specified on the ESC plans. Areas which do not establish cover shall be hydroseeded again at the discretion of the Commissioner.
DIVISION “I” SECTION 12
EROSION AND SEDIMENT CONTROL CRITERIA
EROSION AND SEDIMENT CONTROL MEASURES

2.7 **Storm Drain Inlet Protection**

After the storm sewer system is installed, sediment control barriers shall be installed on all roadway, rear lot and ditch inlet catchbasins. Sediment barriers for inlets shall consist of a filter cover, filter barrier sox, sediment bag insert or approved equivalent. Bulkheads at storm sewer outfalls are acceptable as a sediment barrier provided the height does not exceed one third of the pipe diameter. Bulkheads must be removed prior to building occupancy. Sediment barriers for inlets shall be maintained and remain in place until contributing lot or block areas have been re-vegetated. The ESC plans shall indicate the type of inlet sediment barrier proposed, maintenance requirements and recommendations for removal or replacement during or after a winter season.

2.8 **Construction Access Mud Mats**

The location of temporary construction access roadways shall be shown on the ESC plans. Mud mats shall be installed on all access roadways at the point of connection to a municipal right-of-way. The mud mat shall be a minimum 6.0m in width, 30m in length and be constructed of a 0.5 m depth of 50mm diameter clear stone. The mud mats shall be maintained and stone replaced if deemed necessary by the Commissioner.

2.9. **Temporary Connections to Storm Sewer**

After installation of the municipal storm sewer system and road base, the lot or block areas are typically pre-graded to a lower elevation relative to the top of road. This situation may create areas of storm drainage ponding. To alleviate this situation, temporary connections to the storm sewer shall be provided to ensure all areas have a positive drainage outlet. These connections shall be sized to convey the 5-year storm event and the inlet structures shall be complete with sediment traps or facilities in accordance with the size of the contributing area. The inlet structure shall consist of an appropriately sized perforated riser pipe. The riser pipe shall be wrapped in filter fabric and surrounded with 50 mm dia. clear stone. The temporary connections shall be maintained until removal. The ESC plans shall indicate the location and details of each connection along with requirement for removal.
DIVISION “I” SECTION I2
EROSION AND SEDIMENT CONTROL CRITERIA
EROSION AND SEDIMENT CONTROL MEASURES

2.10 **Construction Dewatering**

Discharge from dewatering of excavations for construction of municipal services shall be safely directed to ESC measures. Temporary piping, swales or filter rings shall be constructed to ensure that erosion from pump hose discharge is minimized and to direct the discharge to ESC measures. Adequate erosion protection shall be provided at all concentrated discharge points and rock check dams shall be installed on all temporary swales. Sediment bags shall be used on the end of discharge hoses where the discharge from the dewatering area has a sediment load. Discharge from well point dewatering systems may be discharged directly to a storm sewer subject to approval of the Commissioner. Approval will require water quality laboratory testing and comparison to Regional and Town sewer use by-laws.
DIVISION "I"

SECTIONS “I3”

EROSION AND SEDIMENT CONTROL CRITERIA

EROSION AND SEDIMENT CONTROL PHASING
3.0 ESC Phasing

ESC measures shall be designed and implemented for the phases identified in Sections 3.1 to 3.3. ESC measures for each phase shall be clearly identified on the ESC plans. A summary of the ESC measures for each phase shall be provided in chart form on the ESC plans. The summary chart shall include information on timing for installation, inspection/maintenance requirements and timing for removal of ESC measures. A sample summary chart has been included in Section 3.4. The requirements for installation, inspection, maintenance, and removal are indicated for each phase in the following sections.

3.1 Phase 1: Topsoil Stripping and Area Grading

Phase 1 shall include all ESC measures that must be in place before or during topsoil stripping or area grading activity. ESC measures that must be in place prior commencing any topsoil stripping or area grading include silt fence, mud mat, temporary drainage swales, rock check dams and temporary sediment control facilities. The developer’s consultant shall arrange an inspection with Town staff once installation of Phase 1 measures is complete and prior to any grading or stripping activity. Any deficiencies noted during this inspection shall be repaired prior to starting grading or stripping. The developer’s consultant shall undertake weekly inspections of the Phase 1 ESC measures and after each rainfall event. The developer’s consultant shall provide weekly written inspection reports to the Town Inspector noting deficiencies and repairs to ESC measures. The developer shall arrange for regular maintenance of measures to remove accumulated sediment and undertake repairs to ensure proper function.

3.2 Phase 2: Municipal Servicing Construction

Phase 2 shall include all ESC measures that will be undertaken after area grading is completed and during or after construction of municipal servicing. ESC measures that must be in place after area grading and servicing construction include restoration of graded areas and topsoil stockpiles, temporary connections to storm sewer system, and sediment traps. Phase 2 measures shall also include the removal of identified Phase 1 measures and replacement with measures such as temporary drainage swales, rock check dams or others as required on the ESC plans. The developer’s consultant shall undertake weekly inspections of the Phase 2 ESC measures and after each rainfall event. The developer’s consultant shall provide weekly written inspection reports to the Town Inspector noting deficiencies and repairs to ESC measures. The developer shall arrange for regular maintenance of measures to remove accumulated sediment and undertake repairs to ensure proper function.
3.3 Phase 3: Building Construction

Phase 3 shall include the maintenance and repair of all Phase 1 or Phase 2 ESC measures that will remain in place until building construction is complete. Phase 3 shall also identify the removal of any ESC measures necessary to allow building construction to proceed. The timing for any such removals shall be just prior to building construction. The developer’s consultant shall arrange an inspection with the Town Inspector of all remaining measures prior to building construction. Any deficiencies noted during this inspection shall be repaired prior to building construction. The developer’s consultant shall undertake weekly inspections of the remaining measures and after each rainfall event. The developer’s consultant shall provide weekly written inspection reports to the Town Inspector noting deficiencies and repairs to ESC measures. The developer shall arrange for regular maintenance of measures to remove accumulated sediment and undertake repairs to ensure proper function.

3.4 Sample Summary Chart for ESC Phasing

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<th>Inspection/Maintenance Requirements</th>
<th>Timing for Removal</th>
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<tr>
<td>PHASE 1 – Topsoil Stripping and Area Grading</td>
<td>Prior to topsoil stripping.</td>
<td>Consultant to arrange inspection with Town staff once installation is complete. Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment and repair ESC measures.</td>
<td>Just prior to final grading, replacement with Phase 2 measures, or construction of municipal services.</td>
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<tr>
<td>• Silt Fence</td>
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<td>• Mud Mat</td>
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<td>• Drainage Swales</td>
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<td>• Check Dams</td>
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<tr>
<td>• Sediment Control Facility</td>
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<tr>
<td>• Topsoil Stockpile</td>
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<tr>
<td>• Others as required</td>
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<tr>
<td>PHASE 2 - Municipal Servicing Construction</td>
<td>After area grading and installation of storm drainage system is complete.</td>
<td>Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment and repair ESC measures.</td>
<td>Just prior to final grading or building construction.</td>
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<td>• Restoration Hydroseeding</td>
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<tr>
<td>• Sediment Traps</td>
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<td>• Drainage Swales</td>
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<td>• Temporary Connections to Storm Sewer</td>
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<td>• Others as required</td>
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DIVISION “I” SECTION I3
EROSION AND SEDIMENT CONTROL CRITERIA
EROSION AND SEDIMENT CONTROL PHASING

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<tr>
<td>Maintenance and repairs to all remaining ESC measures as per detailed inspection with Town Inspector.</td>
<td>Prior to building construction, ESC measures to be repaired as per Town deficiency list.</td>
<td>Detailed Inspection of all remaining ESC measures with Town Inspector. Consultant to undertake weekly inspections and after each rainfall event, including weekly reporting. Regular maintenance to remove accumulated sediment and repair ESC measures.</td>
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DIVISION "I"

SECTIONS “I4”

EROSION AND SEDIMENT CONTROL CRITERIA

STANDARD SPECIFICATIONS AND DRAWINGS
DIVISION “I” SECTION I4
EROSION AND SEDIMENT CONTROL CRITERIA
STANDARD SPECIFICATIONS AND DRAWINGS

4.0 Standard Specifications and Drawings

4.1 Standard Specifications

OPSS 577 Construction Specification for Temporary Erosion and Sediment Control Measures

4.2 Standard Drawings

OPSD 219.130 Heavy Duty Silt Barrier Fence
OPSD 219.210 Temporary Rock Flow Check (V-Ditch)
OPSD 219.211 Temporary Rock Flow Check (Flat Bottom Ditch or Channel)
OPSD 219.220 Excavated Sediment Trap
Appendix "1"

Materials, Standards and Specifications

Executive Committee Members and
Specialty Committee Chairpersons
### MATERIALS, STANDARDS AND SPECIFICATIONS

#### EXECUTIVE COMMITTEE MEMBERS

**JUNE 2015**

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<tr>
<td>S. Fick</td>
<td>Environment &amp; Infrastructure</td>
<td>Director, Design &amp; Construction Division</td>
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<tr>
<td>Chairperson</td>
<td>Services Department</td>
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<tr>
<td>T. Ricketts</td>
<td>Environment &amp; Infrastructure</td>
<td>Director, Environmental Services Division</td>
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<tr>
<td>G. Taylor</td>
<td>Community Services Department</td>
<td>Director, Public Works Operations Division</td>
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<tr>
<td>D. Terzievski</td>
<td>Planning &amp; Regulatory</td>
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| A & B    | Sewer and Watermain | Diogo Oliveira,  
Manager, Water & Wastewater 
Public Works Operations Division |
| C        | Transportation & Roadworks | Ahsun Lee,  
Manager, Transportation & Site Plans 
Development Engineering Division |
| D & F    | Grading and Drainage  
and Development Submission | Jeff Walters,  
Manager, Stormwater Management & 
Subdivisions 
Development Engineering Division |
| E        | Utilities            | Luigi Colangelo,  
Manager, Roads & Traffic Operations 
Public Works Operations Division |
| G        | Miscellaneous Drawings | Subject matter relevant Chairperson |
| H & I    | Storm Water Management and 
Erosion & Sedimentation Control | Jeremy Wychreschuk,  
Manager, Water Resources 
Environmental Services Division |
| J        | Parks and Open Space  
(Under development not published) | Geoff Hunt,  
Manager, Parks & Open Space Design, 
Design & Construction Division |

All requests for amendments or additions to the Materials, Standards and Specifications Manual are to be directed in writing to the applicable Specialty Committee Chairperson.