Section 10

Table of Contents

List of Tables

10 STORM SEWERS

10.1 General Requirements

This manual has been prepared to provide Town staff, consulting engineers, contractors, developers and the general public with a common reference to ensure the consistent application of storm sewer drainage design in the Town.

The information provided is not intended to hinder innovation and is rooted on meeting performance requirements over the lifecycle of the infrastructure.

Detailed storm sewer design sheets are to be included in all subdivision and site plan development applications.

10.2 Other Reference Documents

All storm sewers and appurtenances shall be designed and constructed in accordance with the latest version of this manual as well as industry standards and best practices, including but not limited to:

- Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD) prepared by the Ministry of Transportation (MTO)
- Ministry of the Environment (MECP as amended) Design Guidelines for Sewage Works
- Ministry of the Environment (MECP) Stormwater Management Planning and Design Manual
- Ministry of Transportation (MTO) Highway Drainage Design Standards

10.3 Mainline Sewer Design

This section outlines the minimum requirements to aid the Proponents in the design of minor and major storm systems in the Town.

10.3.1 System Layout

All catch basin leads shall be placed at a minimum of 1% grade. All benching and pipe opening alternatives shall be designed in accordance with OPSD 701.0210. All changes in flow direction shall utilize a maintenance hole. Pipes 1050 mm and larger shall not exceed a maximum change in direction of 45°. Easements shall be avoided where feasible. Where an easement is deemed to be required, the width for the easement will be reviewed and approved by the Town.

10.3.1.1 New Development

Storm sewers shall be located in accordance with the Town's Standard Drawings and Typical Cross-Sections as part of Appendix A of this manual. Where this location cannot be provided, the Proponent shall submit a suitable alternative for the Town's approval.

Storm Sewers shall be terminated with a maintenance hole at the subdivision limits when external drainage areas are considered in the design.

10.3.1.2 Existing Infrastructure

Location of replacement storm sewers shall be determined specifically based on the location of existing utilities and other site conditions. All efforts shall be made to design in accordance with the Town's Standard Drawings and Typical Cross-Sections as part of Appendix A of this manual.

10.3.1.3 Horizontal and Vertical Separation

Clearances between watermains, sanitary and storm sewers shall be based on the MECP Procedure F-6-1: Procedures to Govern the Separation of Sewers and Watermains.

The Town prefers a minimum horizontal separation of 2.5 m from outer wall of adjacent sewers and a minimum vertical separation of 500mm. The Proponent shall ensure that the excavation of storm sewer utilizing an open cut method will not disturb the bedding of neighbouring infrastructure.

10.3.2 Drainage System Calculations

The urban stormwater drainage system consists of the minor system and the major system, as outlined in Table 1.

Table 1. Minor and Major System Design Components

	Minor System	Watercourse and Culverts	Major System
Objective	To convey minor events and prevent nuisance flooding.	To convey larger storm events and prevent road flooding.	To reduce risk to life and property damage.
Design Storm Frequency	1 in 5 year	1 in 25 year	1 in 100 year

Under special circumstances and at the discretion of the Town, a higher design storm frequency (e.g. 1 in 10 year) may be required for the minor. Consultants are therefore required to consult with Town staff prior to the commencement of detailed storm sewer design for any project.

Consultation with the Town will be required if a trunk sewer that drains multiple developments is being considered.

Town may request a Hydraulic Grade Line Design/Calculation when storm PDC's are connected to the storm sewer.

10.3.3 Design Flow

Storm sewers shall be designed to collect stormwater runoff from pervious and impervious surfaces both on private and public lands.

Storm sewers shall be designed to accommodate a minimum 5-year design flow (see Table 1 above) without surcharge. The capacity of the sewer shall be determined on the basis of the pipe at or below 80% full flow. Design flow rates shall be sized using the Rational Method as follows:

$$Q = \frac{CIA}{360}$$

where,

Q = peak flow (m^3/s)

C = runoff coefficient (dimensionless)

I = average rainfall intensity (mm/h)

A = contributing drainage area (hectares)

Design flows for storm sewer networks shall be calculated using the Rational Method for each maintenance hole reach and shall be submitted to the Town using the Storm Sewer Design Sheet provided in Appendix A of this manual.

10.3.4 Rainfall Intensity

The Rainfall Intensity ("I") shall be based on the Intensity-Duration-Frequency (IDF) curves provided below. It should be noted that IDF curves are subject to review and may be altered from time to time to more accurately represent local trends in rainfall patterns, including impacts due to climate change.

For most residential and industrial developments, the rainfall intensity shall be determined from the formula indicated on the IDF Curve chart for the respective storm for the 1 in 5-year storm.

Under special circumstances the Town may request a 1 in 10-year storm be used to determine rainfall intensity for major trunk sewers.

Table 2: IDF Design Parameters

Parameter	Rainfall Intensity (mm/h)					
	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
A	21.4	28.3	32.8	38.5	2.7	46.9
B	-0.675	-0.662	-0.656	-0.651	-0.647	-0.645

The rainfall intensity shall be determined using the formula as follows:

$$i = A \times t_c{}^B$$

where,

i = rainfall intensity (mm/h)

t_C = time of concentration (minutes)

A and B are IDF values (dimensionless)

10.3.5 Time of Concentration

The time of concentration (t_C) shall be 15 minutes for most low density residential, open spaces, industrial, commercial and medium to high density residential.

For undeveloped lands upstream or external rural drainage, the Consulting Engineer shall calculate the initial time of concentration for upstream, undeveloped land utilizing the Airport Method Equation or the Bransby Williams Formula as per the MTO Drainage Manual, and provide documentation supporting the calculations.

In watersheds with a runoff coefficient, C, greater than 0.40, the Bransby Williams formula a typically accepted method. The Bransby Williams Formula is as follows:

$$tc = \frac{0.057 \times L}{Sw^{0.2} \times A^{0.1}}$$

where,

t_C = time of concentration (minutes)

A = area (square metres)

L = watershed length (metres)

Sw = watershed slope (%)

For watersheds where the runoff coefficient, C, is less than 0.40, the Airport formula gives a better estimate of time of concentration. The Airport Method Equation is as follows:

$$t_c = \frac{3.26 \times (1.1 - C) \times L^{0.5}}{Sw^{0.33}}$$

where,

t_C = time of concentration (minutes)

C = runoff coefficient (dimensionless)

L = watershed length (metres)

Sw = watershed slope (%)

10.3.6 Contributing Drainage Area

The Drainage Area ("A") shall be determined based on the proposed general area grading plans (and using available contour mapping for upstream unplanned and undeveloped lands).

When the design abuts undeveloped areas, the Consulting Engineer shall review and confirm the external watershed limits.

Any deviations to the existing mapped areas shall be reviewed and approved by the Town and the Long Point Region Conservation Authority (LPRCA). Areas, coefficients and times of concentration shall be shown for all drainage areas within external watershed limits.

10.3.7 Runoff Coefficients

The runoff coefficient ("C") is based on the relative perviousness of the drainage area and varies based on the type of land use. Mixed land uses and reconstructions will require a composite (blended) runoff coefficient based on an area-weighted average of coefficients to represent specific land uses. The typical runoff coefficients are outlined in Table 3.

Table 3. Recommended Runoff Coefficients

Land Use	Runoff Coefficient
Parks, open spaces, and grassed areas (greater than 2 hectares)	0.20
Parks, open spaces, and grassed areas (less than 2 hectares)	0.25 – 0.35
Single family/semi-detached	0.45 – 0.6
Townhouses/rowhouses	0.65 – 0.8
Apartments	0.65 – 0.8
Commercial/Industrial	0.80 - 0.90
Impervious	0.95
Roof top storage	1.00

10.3.8 Velocity

The flow velocity shall be determined using the following formula:

$$V = \frac{Q}{A}$$

where,

v = flow velocity (m/s)

Q = design flow (m^3/s)

A = cross-sectional area of flow (m^2)

Flow velocities for storm sewers shall meet the following requirements, in accordance with MOE Guidelines:

Minimum full flow velocity = 1.0 m/s (transport solids and avoid deposition)

Maximum full flow velocity = 4.5 m/s for 300mm to 825mm diameter sewers

6.0 m/s for 900mm diameter or larger sewers

To determine velocities based on actual flow, the Consulting Engineer shall refer to the Town's Storm Sewer Design Sheet that includes the roughness coefficient required for Manning's Equation calculations.

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

Q = design flow (m^3/s)

n = Manning's roughness coefficient

A = cross-sectional area of flow (m^2)

R = hydraulic radius (area of flow / wetted perimeter)

S = slope of pipe (m/m)

10.3.9 Manning's Roughness Coefficient

The Consulting Engineer shall use values for Manning's Roughness Coefficients from Table 4.

Table 4. Manning's Roughness Coefficients

Pipe Type	Manning's Roughness Coefficient
Smooth walled pipe, all sizes and materials	0.013
Corrugated culvert pipe, all sizes and materials	0.024

10.3.10 Pipe Size

Pipe size shall be determined using Manning's Formula. The capacity of the storm sewer shall be determined on the basis of the pipe at or below 93% full flow of the pipe during the selected design storm event. Percentage of pipe full shall be displayed on Storm design sheet. The minimum size for a mainline storm sewer shall be 300mm, regardless of the type of land use. The minimum size for a catch basin lead shall be 250mm.

No decrease of pipe size from a larger upstream pipe to a smaller downstream pipe will be permitted regardless of increase in grade.

10.3.11 Pipe Grade

The minimum pipe grade shall be 1% on the first leg of the sewer wherever possible to achieve a self-cleaning velocity of 1.0 m/s within the storm sewer wherever feasible. The remaining system shall not be less than 0.5% and as required to achieve the minimum velocity as stated above unless specifically approved by the Director of Operations and Development and Development.

10.3.12 Pipe Requirements

The pipe and appurtenances identified in this manual refer to conventional, open cut installation methods.

Alternative infrastructure installation methods will be submitted to the Town for review prior to design completion.

10.3.13 Minimum Pipe Cover

The minimum depth of cover shall be 1.5m from the finished grade to the top of the pipe. Additional depth may be required in areas where there is potential for conflict with other underground infrastructure.

Where the minimum specified cover of 1.5m on storm sewer cannot be achieved, sufficient insulation to prevent freezing of such sections of storm sewer shall be provided as specified in Table 5.

Table 5. Insulation of Storm Sewer and Services

Depth of Cover (m)	Thickness of Insulation (R5) (mm)	Width of Insulation (m)
1.20 to 1.50	50	1.2
1.05 to 1.19	65	1.2
0.90 to 1.04	75	1.5

10.3.14 Bedding and Backfill

Bedding material (and embedment for flexible pipes) shall consist of Granular 'A' unless saturated trench conditions are encountered and then bedding shall be 19mm clear stone and entirely wrapped in geotextile as per the Town's Standard Drawings in Appendix A.

Trenches, bedding, embedment / cover and backfill to be in general conformance with applicable OPS drawings (OPSD 802.010 – 802.034).

Bedding, cover and embedment materials shall meet OPSS and be placed and compacted in accordance with Town's Standard Drawings.

Bedding, embedment and cover materials shall be placed for the full width of the trench and mechanically compacted to 98% SPMDD, as determined by ASTM.

Backfill shall be considered as starting at 300mm above the storm sewer.

10.3.15 Pipe Material

Both rigid and flexible pipe complete with bell and spigot connections shall be permitted in the construction of storm sewer systems including private drain connections and catch basin leads. These materials include concrete, PVC and double walled HDPE.

On Private property, material for storm building sewers and private sewer shall comply with Part 7 of the OBC.

Circular concrete pipe and fittings shall conform to OPSS 1920. Non-reinforced concrete pipe shall be according to CSA A267.1. Reinforced Concrete pipe shall be according to CSA A257.2. Joint and gaskets shall be according to CSA A257.3.

PVC pipe and fittings complete with bell and spigot joints, rubber gasket, lubricant and all necessary appurtenances shall be manufactured in conformance with OPSS 1841 and shall be certified to either CSA B182.2 for PVC sewer Pipe and Fittings or B182.4 for Profile PVC Sewer Pipe and Fittings. PVC pipe shall have a minimum pipe stiffness of 320kPa. The maximum size of PVC pipe shall be 450mm diameter; anything greater shall be concrete pipe.

No Ultra-Rib pipe shall be installed within the Town right-of-way unless with Town approval.

In determining the suitable pipe class to be used, live load, dead load, soil type and trench conditions in accordance with OPSD 802 Series shall be considered in the calculation. The pipe manufacturer's recommendations shall be incorporated into the design.

10.3.16 Pipe Deflection

Maximum pipe deflection (for flexible pipes) from combined live and dead loading shall not exceed the more stringent of OPSS 410 or the pipe manufacturer's recommendations and shall be confirmed via mandrel testing, as per OPSS 410. The Town shall be notified regarding testing and results.

10.4 Maintenance Holes

Maintenance holes shall be in accordance with OPSS and OPSD 701 Series. Maintenance holes shall be located at changes in alignment, grade, pipe size, material, at pipe junctions. There is a maximum permitted spacing of maintenance holes for storm sewers based on the diameter of pipe as outlined in Table 6 - Maximum Spacing for Storm Maintenance Holes. Wherever possible, maintenance holes placed in the travel portion of roadways shall not be placed in vehicle wheel paths.

10.4.1 Type and Size

Maintenance holes shall be precast concrete structures. Under special circumstances, designs using cast-in-place concrete will be considered.

Maintenance holes shall be provided with monolithic bases and watertight joints. Adjustment units shall be provided where grade adjustments are necessary and shall be in accordance with OPSS.

10.4.2 Spacing

The maximum spacing distance between each storm maintenance hole shall be in accordance with the spacing requirements specified in Table 6.

Table 6. Maximum Spacing for Storm Maintenance Holes

Pipe Size (mm)	Maximum Spacing (m)
300 to 975	90
1050 to 1200	120
Greater than 1200	As approved by the Town

10.4.3 Maintenance Hole Frame, Cover and Grate Requirements

Maintenance hole frame and covers are required for all maintenance holes and shall be in accordance with OPSD 401.01 and applicable OPSS.

10.4.4 Connections to Maintenance Structure

Flexible storm sewers shall be connected to maintenance holes using Town approved adaptors. Connections for rigid pipe shall be fixed in place.

10.4.5 Adjustment Units

Maintenance holes shall be designed to include precast concrete adjustment units and shall be in accordance with OPSD 704.010.

10.4.6 Benching and Pipe Opening Requirements

Maintenance hole benching and pipe opening alternatives shall be designed in accordance with OPSD 701.021.

A Benching detail is required should the design deviate from OPSS.

10.4.7 Drop Across Maintenance Hole

The minimum drop across a maintenance hole shall be based on the change in direction of the inlet and outlet pipes as outlined in Table 7.

Table 7. Minimum Drop Across Maintenance Hole

Change in Direction, Θ	Minimum Drop Across Maintenance Hole (mm)
0°	25
Less than or equal to 45°	50
Greater than 45°	90

10.4.8 Drop Structures

Drop structures shall be provided in maintenance holes when the difference in elevation between the invert of the inlet and the bottom of the maintenance hole is greater than 0.9 m. Drop structures shall be external and designed in accordance with OPSD 1003.010. Internal drop structures may be considered on a case-by-case basis and shall be designed to OPSD1003.030 and accommodate person access.

10.4.9 Access Requirements

10.4.9.1 Steps

Design of steps shall be in accordance with OPSD 405.020.

10.4.9.2 Safety Landings

Safety landings shall be in accordance with OPSD 404 Series.

10.4.10 Joints

All joints below the groundwater level shall be sealed using a bituminous sealant tape.

10.5 Catch Basins

Catch basins shall be in accordance with OPSS and OPSD 400 Series. Catch basins shall generally be located upstream of all pedestrian crossings and upstream of intersections where the road grade falls towards the intersection. Catch basins shall not be located on walkways or driveway entrances/aprons, if possible.

Double catch basins shall be required at low points where drainage is received from more than one direction.

The design of the catch basin location and type shall take into consideration the drainage areas, road grades and intersection locations.

The maximum spacing distance between each catch basin shall be 90m in two (2) lane roads and 60m in four (4) lane roads. The location and layout of storm maintenance holes and catch basins shall be reviewed and approved by the Town. The Consultant shall ensure that the catch basin spacing is adequate to collect the storm water.

Due to maintenance issues rear yard catch basins are typically not permitted by the Town except when other options are not feasible. Wherever possible, site grading shall be designed in such a way that rear yard catch basins are not required.

10.5.1 Type and Size

Catch basins shall be precast concrete structures. Under special circumstances, designs using cast-in-place concrete will be considered. No curb inlet catch basins or set back catch basin are allowed.

Adjustment units shall be provided where grade adjustments are necessary and shall be in accordance with OPSS.

10.5.2 Catch Basin Leads

The minimum size and slope of catch basin leads for single, double and rear lot catch basins shall be in accordance with Table 8 - Catch Basin Leads.

Table 8. Catch Basin Leads

Catch basin Type	Minimum Connection Size (mm)	Minimum Grade (%)	Minimum Velocity (m/s)
Single	250	1.0	1.0
Rear Lot	300	0.8	1.0
Double	300	1.0	1.0

10.5.3 Frame, Cover and Grate Requirements

Frames, covers and grates shall be constructed in accordance with OPSD 400.02 and applicable OPSS. Catch basin grates shall be bicycle-proof.

10.5.4 Connections to Mainline Sewer

Catch basins located in close proximity to a manhole (< 10m) shall have their leads connected to the manholes. The Town's preference is to have connections directly into the manhole wherever possible in accordance with OPSS 410.

10.5.5 Adjustment Units

Catch basins shall be designed to include precast concrete adjustment units and shall be in accordance with OPSD.

Alternative materials on collector and arterials roads may be accepted on a case by case basis as approved by the Town.

10.6 Private Drain Connections (PDCs)

10.6.1 Foundation Drain Connections

The Town requires that all single family, semi and townhouse residential development applications include a foundation drain connection to the local storm sewer lateral via a sump pump with a gooseneck and air break. The foundation drains shall not be connected by gravity to the PDC.

If no local storm sewer lateral is available, then the sump pump shall discharge via a concrete splash pad to a grassed area away from the house avoiding driveways, walkways and adjacent properties.

10.6.2 Connection Types

Connections to storm sewers shall be made using pre-manufactured tee fittings.

Storm sewer PDCs shall not be connected directly to maintenance holes or catch basins. Connections shall be made using long sweep elbows and tees or wyes.

Connections shall not be made by breaking through the pipe wall on site, unless approved by the Town in existing infrastructure in accordance with OPSS 410.

10.6.3 Minimum Pipe Size

Storm PDCs shall have a minimum pipe size of 125mm.

One storm sewer lateral is permitted per dwelling unit for semis and townhome complex.

PDCs for multi residential applications larger than townhome complex shall be minimum 300mm shall be white PVC DR 35

10.6.4 Service Location

The location of the storm lateral is shown in the Town's Standard Drawings in this manual.

Cross connection of storm PDCs to any sanitary or combined sewer will not be accepted.

10.6.5 Minimum Service Cover

Storm sewer PDCs shall have a minimum cover of 1.2m at the property line from finished grade to the top of the pipe.

The minimum clearance to a watermain shall be 0.5m vertically

10.6.6 Service Material

PDCs shall be white PVC DR 35.

10.6.7 Service Grade

The grade of the storm sewer lateral shall range between a minimum and maximum of 2% and 8%, respectively.

Connections to mainline storm sewers consisting or rigid or flexible pipe shall be made at 10 and 2 o'clock (along the top of the pipe) using long sweep elbows.

10.6.8 Inspection Manhole/Cleanout

For institutional, commercial and industrial properties an inspection maintenance hole shall be located on the property line for access to the public side service lateral. The maintenance hole shall be installed flush to grade and equipped with a metal lid. For residential lots, the storm PDC shall be equipped with a cleanout at the property line. The cleanout shall be installed flush to grade with hard surfaces and equipped with a screw down metal lid. For soft surfaces, the cleanout shall be buried in topsoil to a depth of 150mm and shall be equipped with a metal lid for locating purposes.

10.6.9 Marking and Plugging Requirements

Plugged or capped service laterals shall be provided with an end cap and be marked with white paint and with adhesive tape labeled “CAUTION STORM SEWER”. The location of the PDC shall be stake at the surface.

The service lateral shall be capped 0.3m inside of property line.

10.7 Downspout Discharge

Downspouts shall discharge into side yard swales via concrete splash pads. Downspouts shall not discharge onto driveways or walkways.

Commercial, industrial and high-density residential building sites may not have the ability to discharge to landscaped areas, therefore, the storm water roof drainage may be discharged directly into a storm sewer system given that flow control shall be applied where deemed necessary.

10.8 Culverts

Culverts shall be in accordance with MTO’s Highway Drainage Design Standards, OPSS and OPSD.

The minimum culvert size shall be 450mm dia.

Approved pipe materials for culverts are as follows:

- Corrugated Steel Pipe (Aluminized)
- Concrete

10.9 Storm Sewer Inlet, Outlet and Special Structures

10.9.1 General

Inlet and outlet structures shall be designed and included on the engineering drawings. The details provided shall include the existing topography, proposed grading and the work necessaryto protect against erosion.

10.9.2 Storm Sewer Inlet

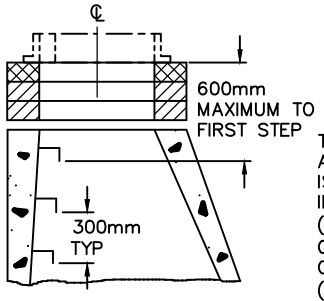
For other than minor swales, the grates on inlet structures generally consist of inclined parallel bars or rods set in a plane at between 4:1 and 2:1 with the top furthest away from the direction of flow. Appropriately sized rip rap shall be provided at all inlets to protect against erosion and to channel the flow to the inlet structure.

10.9.3 Storm Sewer Outlet

The OPSD 800 Series Standard Headwalls shall be used for all storm sewers up to 1800mm. For sewers over 1800mm in diameter, the headwalls shall be individually designed. All headwalls shall be equipped with OPSD 804.05 grating over the outlet end of the pipe. Handrails shall also be installed at the top of all headwalls with grade differences greater than 0.6m from top of headwall to pipe invert. Alternate outlet designs will be considered on a specific basis.

All outlets shall bend in the direction of flow of the watercourse with the directional change being taken up in the sewer rather than the channel.

Erosion protection shall be provided at all outlets to prevent erosion of the watercourse and to the area adjacent to the outlet. Typically rip rap has been utilized but innovation is encouraged to create a naturalized appearance. The extent of the erosion protection shall be indicated on the engineering drawings and shall be dependent upon the velocity of flow in the storm sewer outlet, soil conditions, flow in the existing watercourse, site conditions and the requirements of the Long Point Region Conservation Authority, if applicable.



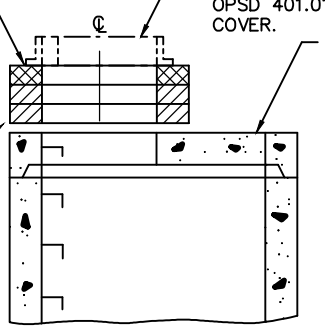
SECTION THROUGH
TAPER TOP

ALL JOINTS BETWEEN UNITS ARE TO BE IN ACCORDANCE WITH MANUFACTURERS SPECIFICATIONS AND GUIDELINES WITH APPROPRIATE CAULKING.

MANHOLE FRAMES AND GRATES FOR BOTH STORM AND SANITARY SHALL BE OPSD 401.01 – CLOSED COVER.

IF LESS THAN 1200mm COVER FROM PIPE OBVERT TO FINISHED ASPHALT GRADE USE SHALLOW MH WITH FLAT CAP.

THE FIRST ADJUSTMENT UNIT IS TO BE PLACED IN MORTAR (CONFORMING WITH OPS 407.05.06) OR CONCRETE (CONFORMING WITH OPS 407.05.01) (TYPICAL)



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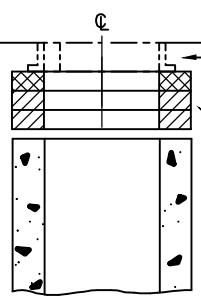
FLAT CAP

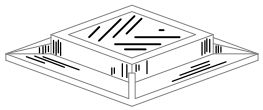


FINISHED ASPHALT GRADE

STANDARD FRAME AND GRATE

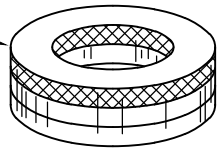
ADJUSTMENT UNITS: MINIMUM OF ONE, MAXIMUM OF THREE, MUST BE CERTIFIED TO MEET ALL PERTINENT OPS, CSA, ASTM AND MTO–DSM LIST, OR OTHER INDUSTRY GUIDELINES FOR MATERIALS, PERFORMANCE AND USE AS APPLICABLE.

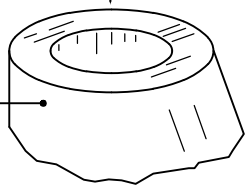
SECTION THROUGH
CATCH BASIN



FRAME AND GRATE, OR COVER

ADJUSTMENT UNITS FOR MAINTENANCE HOLES WITH ROUND OPENINGS. AVAILABLE IN SECTIONS OR CONTINUOUS UNITS.





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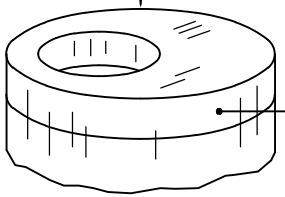

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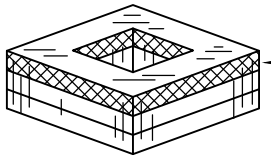
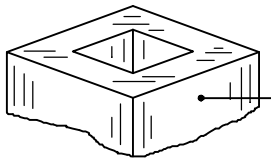


ADJUSTMENT UNITS FOR CATCH BASINS WITH SQUARE OPENINGS. AVAILABLE IN SECTIONS OR CONTINUOUS UNITS.



CATCH BASIN

NOTES:

1. ADJUSTMENT UNITS SHALL NOT EXTEND BEYOND THE OUTSIDE EDGE OF THE STRUCTURE.
2. NON–COMPRESSIBLE BACK FILL WILL BE USED DURING REBUILDING, ADJUSTING, OR ANY OTHER APPLICABLE CATCH BASIN OR MAINTENANCE HOLE WORKS. GRANULAR MATERIAL SHALL BE PLACED TO A MIN. WIDTH OF 300MM ALL AROUND IN 300mm MAX, LIFTS COMPACTED TO 95% STANDARD PROCTOR.
3. MAINTENANCE HOLE TOPS (FRAMES) ARE TO BE SET TO BASE COURSE ASPHALT GRADE AND THEN ADJUSTED TO FINAL GRADE WHEN THE TOP LIFT OF ASPHALT IS PLACED. ALL ADJUSTMENT WILL BE ACCORDANCE WITH BSD–N2.
4. IF A STEP IS REQUIRED IN AN ADJUSTMENT UNIT, THEN THE ADJUSTMENT UNIT SHALL BE OF THE TYPE MANUFACTURED WITH A STEP IN PLACE.
5. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
6. ADJUSTMENTS GREATER THAN 300mm REQUIRE INSTALLATION OF A CONTINUOUS UNIT.
7. PRECAST SECTIONS SHALL COMPLY WITH OPSD 701.030, 701.031, & 701.032.
8. TOP LADDER RUNGS SHALL BE 600mm OR LESS BELOW DESIGN PROFILE GRADE. STEPS ARE NOT PERMITTED IN THE ADJUSTMENT UNITS.
9. BENCHING ON END MANHOLES TO EXTEND TO FAR INSIDE WALL. BENCHING ON LATERAL INLETS SHALL BE 500mm C/L RADIUS.
10. MANHOLES EXCEEDING 5.0m IN DEPTH SHALL INCLUDE A SAFETY GRATE LANDING AS PER OPSD 404.020.
11. MANHOLES COVERRS SHALL BE SET ON GEOTEXTILE F.O.S 250 µm CL II OPSS 1860 UNTIL THE STREET IS PAVED.
12. MANHOLE BENCHING SHALL COMPLY WITH OPSD 701.021.

Tillsonburg
CONNECTED. ENRICHED. INSPIRED.

STANDARD DETAIL

MAINTENANCE HOLE AND CATCH BASIN ADJUSTMENT UNITS

APPROVED

MANAGER OF ENGINEERING DATE

DIRECTOR OF OPERATIONS DATE

REVISION No.

DATE: MARCH 2020

SCALE: N.T.S.

TSD-1010