

**Construction Specification for
Inlets in Green Infrastructure**

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TS 857.01 SCOPE

This specification covers the requirements for the installation of curb cut inlets, curb cut outlets, trench drains, and channel drains.

TS 857.02 REFERENCES

This specification refers to the following standards, specifications or publications:

City of Toronto Standard Specifications

TS 2.10	Construction Specification for General Excavation
TS 3.50	Construction Specification for Concrete Curb and Concrete Curb and Gutter
TS 407	Amendment to OPSS.MUNI 407 – Construction Specification for New Maintenance Hole, Catch Basin, Ditch Inlet, and Valve Chamber Installation
TS 410	Amendment to OPSS.MUNI 410 – Construction Specification for Pipe Sewer Installation in Open Cut
TS 856	Construction Specification for Pipes in Green Infrastructure
TS 1010	Amendment to OPSS.MUNI 1010 – Material Specification for Aggregates – Base, Subbase, Select Subgrade and Backfill Material
TS 1350	Amendment to OPSS.MUNI 1350 – Material Specification for Concrete – Material and Production

Ontario Provincial Standard Drawings

OPSD 400.080	Cast Iron, Side Inlet for Catch Basins
OPSD 401.080	Cast Iron, Curb Inlet, Fish Type Cover for Catch Basins Out of Roadway

Ontario Provincial Standard Specifications

OPSS.MUNI 180	Management of Excess Materials
OPSS.MUNI 1004	Aggregates – Miscellaneous
OPSS.MUNI 1430	Gabion Baskets and Mats
OPSS.MUNI 1440	Steel Reinforcement for Concrete

American Society for Testing and Materials

A48	Standard Specification for Gray Iron Castings
A536	Standard Specification for Ductile Iron Castings

American Association of State Highway and Transportation Officials

M105	Standard Specification for Gray Iron Castings
M306	Standard Specification for Drainage, Sewer, Utility and Related Castings

TS 857.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Concrete Trench Drain means a depressed curb section that connects to a concrete channel with a trench cover and metal inlet guard to convey stormwater from the roadway into a green infrastructure facility.

Curb Cut Inlet means a depressed curb section that is poured with one or more sides tapered down to an opening that allows stormwater runoff from the street to enter.

Curb Cut Outlet means a depressed curb section that is poured with one or more sides tapered down to an opening that allows stormwater runoff from the green infrastructure system to exit.

Gabion means an open-graded stone reservoir in a wire mesh to provide structural support.

Pitch means the change in slope across the curb.

Side Inlet means a depression in the gutter covered by an inlet covering that connects directly to a green infrastructure system or to a trench drain. Sump is optional.

Sediment Pad means a concrete basin attached to the curb cut inlet to allow for sediment and debris to collect prior to runoff entering the green infrastructure system.

Modular Trench Drain System means a shallow trench with a grate over the top that allows stormwater from the street or sidewalk to enter a green infrastructure system.

TS 857.04 DESIGN AND SUBMISSION REQUIREMENTS

TS 857.04.01 General

Any required submissions shall be submitted in digital form to the Contract Administrator at least three weeks prior to beginning of the work.

TS 857.04.02 Materials

For concrete material submissions, refer to the Materials clause in TS 3.50.

TS 857.05 MATERIALS

TS 857.05.01 Concrete for Curb Cuts

The concrete for curb cuts inlet and outlet shall be according to Concrete clause in TS 3.50.

TS 857.05.02 Reinforcement

Reinforcement shall be according to OPSS.MUNI 1440. All reinforcing shall be 15M bars.

TS 857.05.03 Concrete Sediment Pad

The materials for and the production of concrete sediment pad shall be according to TS 1350 and the following:

- | | |
|--|--|
| 1) Cement type | Normal Portland GU /
Portland limestone GUL |
| 2) Minimum 28 day cylinder compressive strength | 32 MPa |
| 3) Class of exposure | C-2 |
| 4) Nominal maximum size of coarse aggregate | 19 mm |
| 5) Slump at point of discharge (formed concrete) | 80 ± 30 mm |
| 6) Total air content | 6.5 ± 1.5% |
| 7) Maximum water/cementing materials ratio | 0.45 |

TS 857.05.04 Leveling Course

Leveling course shall be 19 mm Type II, according to OPSS.MUNI 1004 and meet the following physical properties.

Table 1: Physical property requirements for clear stone – 19 mm Type II

Laboratory test	MTO test number	Nominal Maximum Size
loss by washing, pass 75µm sieve, % maximum	LS-601	2.0
percent crushed particles, % minimum	LS-607	60
micro-deval abrasion Loss, % maximum loss	LS-618	25

Clear stone shall be 19 mm Type II, according to OPSS.MUNI 1004 and meet the following gradation requirements.

Table 2: Clear stone – 19 mm Type II

Sieve sizes	Percent Passing
63 mm	-
53 mm	-
26.5 mm	100
19.0 mm	90-100
16.0 mm	65-90
13.2 mm	-
9.5 mm	20-55
6.7 mm	-
4.75 mm	0-10
75 µm	0-2.0

TS 857.05.05 Gabion Wall

Gabion wall basket for the sediment pad shall be according to OPSS.MUNI 1430.

TS 857.05.06 Open-Graded Stone

Open-graded stone in gabion wall shall be Granular O according to TS 1010.

TS 857.05.07 Expansion Joints

Expansion joint material shall be bituminous fiberboard having minimum thickness of 12 mm.

TS 857.05.08 Granular Base and Backfill

Granular base and curb backfill, if required, shall be Granular A Native according to TS 1010.

TS 857.05.09 Catch Basin

For the catch basin inlet to green infrastructure system, the catch basin shall be according to TS 407.

TS 857.05.10 Pipe

Pipes in green infrastructure shall be according to TS 856.

TS 857.05.11 Modular Trench Drain System

Trench drain shall be polyester polymer concrete with minimum compressive strength of 100 MPa and flexural strength of 28 MPa and water absorption of 0.07 percent. Trench drains shall be frost proof, salt proof, and dilute acid and alkali resistant. Pre-cast units shall be manufactured with an invert slope of 0.5 percent or as specified on the Contract Drawings.

The trench drain grate shall be load rated to AASHTO H-20 loading. Grates shall be accessibility compliant and be slip resistant, heel proof, bike tire penetration resistant. Grates shall be ductile iron to ASTM A536 with epoxy coating for slip resistance. Grates shall be lockable. Patterning as specified on the Contract Drawings.

TS 857.05.12 Concrete Trench Drain Cover

Trench drain shall be gray iron or ductile iron designed to withstand AASHTO H-20 loading tested according to AASHTO M306 and conform to ASTM A536 Ductile Iron and ASTM A48 Class 35B or AASHTO M105 Class 35B for grey iron. Covers shall be accessibility compliant and be slip resistant, heel proof, bike tire penetration resistant. Covers shall have epoxy coating for slip resistance. Covers shall be lockable. Patterning shall be as specified in the Contract Drawings.

Concrete for the channel section shall be according to TS 3.50. All reinforcing shall be 15M bars or as specified on the Contract Drawings or by the manufacturer.

TS 857.05.13 Side Inlet

Side inlet catch basins shall have cast iron frame and grate according to OPSD 400.080 with cover according to OPSD 401.080.

TS 857.06 EQUIPMENT

Formwork, slipform and finishing shall be according to the Equipment section in TS 3.50.

TS 857.07 CONSTRUCTION

TS 857.07.01 Excavation

Prior to any excavation, the Contractor shall have all utilities located and clearly marked, including an areaway locate to mark all underground walkways, rooms, coal chutes and so on.

The excavation shall be to the lines and grades shown on the Contract Drawings. All surplus or unsuitable material is to be disposed of, off the site, according to OPSS.MUNI 180.

The subgrade shall be prepared according to TS 2.10.

The Contractor shall be required to make good all damage caused during the course of the construction to any part of the roadway, boulevard and private property and to restore the same, to as good or better condition as existed prior to commencement of work.

TS 857.07.02 Curb Cut Inlet and Outlet

Curbs shall be placed according to TS 3.50. Depressions for inlets and outlets shall be formed in place to the dimensions as specified on the Contract Drawings. All bases and buildups shall be according to TS 3.50. Pitch of 10 percent or as specified on the Contract Drawings.

TS 857.07.03 Sediment Pad

Sediment pad shall be formed in place to the dimensions as specified in the Contract Drawings.

TS 857.07.04 Catch Basin Inlet to Green Infrastructure

Install catch basin and lead towards green infrastructure system according to TS 407 and TS 410.

TS 857.07.05 Modular Trench Drain System

Install trench drain according to manufacturer installation instructions and the Contract Drawings. Trench drain shall be surrounded by 100mm of 32 MPa concrete according to TS 1350, with edge screeded and finished flush to the top surface of the trench drain system.

TS 857.07.06 Concrete Trench Drain

Install concrete trench drain according to manufacturer installation instructions and the Contract Drawings.

TS 857.07.07 Side Inlet

Install side inlet catch basin and lead towards green infrastructure system according to TS 407 and TS 410.

TS 857.08 QUALITY ASSURANCE

The Contractor shall demonstrate that the inlets are installed to the correct dimensions and pitches as specified on the Contract Drawings.

TS 857.08.01 Acceptance

Acceptance of the inlet / outlet systems shall be based on the requirements of the Contract Drawings and no damage or defects are noted by the Contract Administrator. Inlets with damages or defects that were improperly installed or damaged due to other construction activity shall be repaired or removed and replaced.

TS 857.09 MEASUREMENT FOR PAYMENT

TS 857.09.01 Curb Cut Inlet, Outlet

Measurement of curb cuts shall be included in the linear installation of the curb for new construction. For retrofit conditions they shall be per cut and pour of new curb depression.

TS 857.09.02 Sediment Pad

For measurement purposes, a count shall be made of the number of sediment pads installed.

TS 857.09.03 Catch Basin Inlet

For measurement purposes, a count shall be made of the number of catch basin inlets installed.

TS 857.09.04 Modular Trench Drain System

Measurement of modular trench drain system shall be in metres (m) along the horizontal centerline length of the trench drain. Trench drain catch basins and connections to green infrastructure systems shall be included in the price per linear metre item. No separate payment shall be made.

TS 857.09.05 Concrete Trench Drain

Measurement of concrete trench drain shall be in metres (m) along the horizontal centerline length of the trench drain. Trench drain inlet and linear connections to green infrastructure systems shall be included in the price per linear metre item. No separate payment shall be made.

TS 857.09.06 Side Inlet

For measurement purposes, a count shall be made of the number of side inlets installed.

TS 857.10 BASIS OF PAYMENT

TS 857.10.01 Curb Cut Inlet, Outlet – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply, placing, levelling and compacting of all granular, the supply and placement of concrete formwork and reinforcement, concrete and finishing.

TS 857.10.02 Sediment Pad – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply and placement of gabion on prepared subgrade, the supply and placement of concrete formwork and reinforcement, concrete and finishing.

TS 857.10.03 Catch Basin Inlet – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply and placement of granular material, piping connection to the green infrastructure system and bedding, filter cloth, surround and backfill, and placement of the catch basin unit and backfill and finishing.

TS 857.10.04 Modular Trench Drain System – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply and placement of the trench drain, concrete formwork and reinforcing for the surround, and supply and placement of the trench drain catch basin and connection to green infrastructure system.

TS 857.10.05 Concrete Trench Drain – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply and placement of the concrete channel including all formwork and reinforcement, supply and placement of the trench cover and connection to green infrastructure system. Modifications to existing curb is included in the unit price.

TS 857.10.06 Side Inlet – Item

Payment at the Contract Price for the above tender item shall be full compensation for all labour, Equipment and Material to do the work. Payment shall include all excavation, the supply and placement of granular material, piping connection to the green infrastructure system and bedding, filter cloth, surround and backfill, and placement of the catch basin side inlet unit with backfill and finishing.