CONSTRUCTION SPECIFICATION FOR PIPE SUBDRAINS

TABLE OF CONTENTS

405.01 SCOPE

This specification covers the requirements for the installation of pipe subdrains.

405.02 REFERENCES

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

Ontario Provincial Standard Specifications, Construction

OPSS 320 Open Graded Drainage Layer
OPSS 404 Support Systems
OPSS 408 Adjusting or Rebuilding Maintenance Holes, Catch Basins, Ditch Inlets, and Valve Chambers
OPSS 409 Closed-Circuit Television (CCTV) Inspection of Pipelines
OPSS 421 Pipe Culvert Installation in Open Cut
OPSS 501 Compacting

Ontario Provincial Standard Specifications, Material

OPSS 1004 Aggregates - Miscellaneous
OPSS 1010 Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1801 Corrugated Steel Pipe (CSP) Products
OPSS 1840 Non-Pressure Polyethylene Plastic Pipe Products

OPSS 1841 Non-Pressure Polyvinyl Chloride Pipe Products
OPSS 1860 Geotextiles

Canadian Standards Association (CSA)

G164-18 (R2023) Hot Dip Galvanizing of Irregularly Shaped Articles

Water Research Centre (WRc) Publication

MSCC Manual of Sewer Condition Classification, 5th Edition, 2013

405.03 DEFINITIONS

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

Backfilling means the operation of filling the trench with embedment and backfill material.

Backfill Material means the material used to fill the trench above the embedment material and below the lower of the subgrade or finished grade or the original ground.

Bedding means the specified granular material placed in a trench on which the subdrain and/or outlet pipes are seated.

Embedment Material means the granular material specified to fill the trench from the bottom of the bedding to the dimension(s) specified in the Contract Documents.

Knitted Sock Geotextile means a textile fabric produced by knitting in a continuous tube intended to cover subdrain pipes.

OGDL means as defined in OPSS 320.

Outlet means the terminal 2.5 m of the outlet pipe.

Outlet Pipe means a non-perforated 100 mm or 150 mm diameter pipe that is placed for the purpose of conveying subsurface water from a subdrain to a proper outlet.

Subdrain means a perforated 100 mm or 150 mm diameter pipe that is placed for the purpose of collecting subsurface water and conveying it to a proper outlet pipe.

405.04 DESIGN AND SUBMISSION REQUIREMENTS

405.04.01 Submission Requirements

405.04.01.01 Manufacturer's Documentation

Documentation from the manufacturer verifying that the material supplied is as specified in the Contract Documents shall be submitted to the Contract Administrator a minimum of 10 Business Days, prior to the placement of the subdrain or outlet pipe.

405.05 MATERIALS

405.05.01 General

Subdrains shall be a perforated:

a) Polyvinyl chloride pipe;

b) Polyethylene pipe; or

c) Corrugated steel pipe.

Outlet pipes shall be a non-perforated corrugated steel pipe or a non-perforated smooth inside wall pipe constructed of high-density polyethylene or polyvinyl chloride.

Outlets shall be constructed of non-perforated corrugated steel pipe or double-walled polyethylene or polyvinyl chloride pipe having a minimum stiffness of 300 kPa.

405.05.02 Corrugated Steel Pipe Products

Corrugated steel pipe products shall be according to OPSS 1801 and as specified in the Contract Documents.

405.05.03 Embedment Material

405.05.03.01 Clear Stone

Clear stone shall be 19 mm, Type I or Type II, according to OPSS 1004.

405.05.03.02 Granular

Granular material shall be as specified in the Contract Documents and according to OPSS 1010

405.05.03.03 Open Graded Drainage Layer Aggregate

Open graded drainage layer (OGDL) aggregate shall be according to OPSS 320.

405.05.04 Fittings

Fittings shall be suitable for and compatible with the class and type of pipe with which they will be used.

Caps shall be polyethylene.

Galvanizing of rodent gates shall be according to CSA G164.

405.05.05 Geotextiles

Geotextiles and knitted sock geotextiles shall be according to OPSS 1860 and as specified in the Contract Documents.

405.05.06 Polyethylene Pipe Products

Polyethylene pipe products shall be according to OPSS 1840 and as specified in the Contract Documents.

405.05.07 Polyvinyl Chloride Pipe Products

Polyvinyl chloride (PVC) pipe products shall be according to OPSS 1841 and as specified in the Contract Documents.

405.07 CONSTRUCTION

405.07.01 General

Geotextile, subdrains, or outlet pipes damaged by exposure to sunlight or damaged by any other means shall be replaced.

The stability of the subdrain and outlet pipe trenches shall be maintained at all times during excavation, and backfilling.

405.07.02 Excavation

Trenches shall be excavated to the lines, grades, and dimensions specified in the Contract Documents.

The excavation shall be inspected with grade checks and certified by the Contractor prior to placement of the pipe bedding.

405.07.03 Unstable Foundations

When unstable foundation conditions are encountered, the Contractor shall take the necessary steps to ensure a stable foundation as directed by the Contract Administrator. An inspection report to verify the foundation stability shall be submitted to the Contract Administrator upon request.

405.07.04 Support Systems

When specified in Contract Documents support systems shall be according to OPSS 404.

405.07.05 Geotextile

Subdrain shall be wrapped with a knitted sock geotextile.

When a geotextile wrapped trench is specified in the Contract Documents, wrapping of the subdrain with a knitted sock geotextile shall not be required, and the geotextile shall be installed as specified in the Contract Documents.

When OGDL aggregate or 19 mm clear stone embedment are specified in the Contract Documents, the subdrain trench and outlet pipe trench shall be wrapped with geotextile.

When granular embedment and backfill material are specified for an outlet pipe connection to a catch basin, the outlet pipe trench shall not require geotextile wrap.

405.07.06 Bedding

Bedding shall be placed in the trench to the depth specified in the Contract Documents prior to laying the subdrain or outlet pipe.

The pipe bedding grade shall be inspected with grade checks and certified by the Contractor prior to laying the subdrain or outlet pipe.

405.07.07 Laying Subdrain and Outlet Pipe

405.07.07.01 General

Pipe installation shall be according to the Pipe Culvert Installation subsection of OPSS 421 with the following additional requirements:

a) The pipe shall be placed firmly on the bedding and secured in place to prevent any movement or disturbance during backfilling. Pipe with perforations on only one side shall be installed with perforations facing down. The pipe shall not be laid in water or on saturated bedding. Pipes shall not be used as a drain for the Contractor's operation;

b) Connections between the subdrain and outlet pipe shall be made with prefabricated 45° elbows or pre-manufactured pipe curves as required; and

c) Outlet pipes shall be installed at all low-lying areas, at the end of subdrain, and at a uniform spacing of 100 m along the length of the subdrain.

Subdrain and outlet pipe installation shall be inspected prior to backfilling.

405.07.07.02 Outlets

405.07.07.02.01 General

The outlet shall have an internal diameter that is slightly larger than the outlet pipe diameter so that the outlet pipe can be inserted into the outlet a minimum distance of 300 mm.

Outlets shall extend beyond the front of the ditch or fill slope for a distance of 300 mm.

The ends of all outlets shall be fitted with galvanized rodent gates.

The joint between the outlet pipe and the outlet shall be wrapped with a 0.5 m width of geotextile.

405.07.07.02.02 Marking of Outlets

Each outlet location shall be marked with a 25 mm × 25 mm square galvanized steel bar. The steel bar shall meet the following requirements:

a) 2.2 m in length;

b) Embedded from 0.6 m to 1.0 m into the ground;

c) Adjacent to the outlet; and

d) Clearly visible from the driving portion of the Roadway.

405.07.07.03 Connection to Drainage Structures

Subdrains shall be connected to maintenance holes, catch basins, and ditch inlets by a 1 m section of non-perforated pipe. The subdrain and outlet pipe connections to concrete maintenance holes, catch basins, and ditch inlets shall be according to OPSS 408 and as specified in the Contract Documents.

405.07.08 Embedment and Backfill

405.07.08.01 General

Embedment material shall be clear stone, granular, or OGDL aggregate as specified in the Contract Documents.

Backfill material shall be as specified in the Contract Documents.

Subdrain and outlet pipes shall not be damaged or dislodged during the placement and compaction of embedment and backfill material. Damaged or dislodged subdrain and outlet pipes shall be removed and replaced.

Any earth from cave-ins and/or any other unsuitable material shall be removed from embedment and backfill material.

Compaction of embedment and backfill material shall be according to OPSS 501.

Backfilling shall be completed over all subdrain and outlet pipes installed by the end of each Day.

The Contractor shall demonstrate that the outlet pipe is on grade and unobstructed for its full length after backfilling.

405.07.08.02 Winter Grading of Material

All ice and snow shall be removed from all portions of the work area. Frozen material shall not be incorporated into the work. Embedment and backfill material shall not be placed over frozen ground, ice, or snow.

405.07.09 Construction Inspection Report

At each outlet pipe connection and at the midpoint between outlets, a construction inspection report shall confirm the following:

a) Trench alignment, grade, and width;

b) Grade of bedding material;

c) Condition of subdrain, outlet pipe, and geotextile;

d) Compaction; and

e) Foundation stability.

The construction inspection report shall be submitted to the Contract Administrator upon request.

405.07.10 Closed-Circuit Television Inspection

405.07.10.01 General

When specified in the Contract Documents, the drainage system shall be inspected using closed-circuit television (CCTV) inspection to ensure that the subdrain and outlet pipes are intact and are not crushed or damaged during construction.

CCTV inspection shall be based on selected sampling at locations identified by the Contract Administrator. A minimum of 5% of the entire length of subdrain pipe and 100% of the outlet pipes shall be video inspected and recorded. Where defective, damaged, or improperly installed pipes are encountered, the Contract Administrator

may request additional CCTV inspection. The inspection shall be conducted following the placement of the granular course and prior to the placement of the pavement surface.

The CCTV inspection and equipment used for the drainage system shall be according to OPSS 409.

405.07.10.02 CCTV Inspection Report

The final documentation of the CCTV inspection of the subdrain and outlet pipes shall be according to OPSS 409.

The Contract Administrator shall be notified when the CCTV inspection report shows any one of the following defects, as defined by the MSCC manual:

a) Fracture;

b) Broken;

c) Large joint displacement;

d) Large open joint;

e) Deformed pipe such that the camera is not able to navigate through the pipe; or

f) Ponding water.

405.07.11 Remedial Work

Defective, damaged, or improperly installed subdrain and outlet pipe sections shall be removed and replaced.

405.07.12 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

405.08 QUALITY ASSURANCE

405.08.01 Acceptance Criteria

Acceptance of the subdrain and outlet pipe installation shall be according to the requirements of this specification and the Contract Documents.

The Contract Administrator shall inspect the subdrain and outlet pipes for any damage or defects and to ensure installation is according to the Contract Documents. Any damaged, defective or improperly installed subdrain and outlet pipes shall be removed and replaced by the Contractor at no additional cost to the Owner.

405.09 MEASUREMENT FOR PAYMENT

405.09.01 Actual Measurement

405.09.01.01 Pipe Subdrain

Measurement of pipe subdrain shall be by length in metres horizontally along the centreline of the pipe between the ends of the pipe subdrain, including outlets, or between the upstream end of the pipe subdrain and the centre of a maintenance hole, catch basin, or ditch inlet.

405.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

405.10 BASIS OF PAYMENT

405.10.01 Pipe Subdrain - 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.

When excavation and backfilling of subdrain and outlet pipe overlaps the excavation and backfilling required for other work, payment for overlapping excavation and backfilling shall be made according to the specifications for such other work as though no excavation and backfilling were required for pipe subdrain.

When subdrain and outlet pipe are placed below subgrade and the embedment and backfill material are the same material used in the road base or subbase, the embedment and backfill material shall be paid for with the road base or subbase item. When embedment or backfill material or both are different than the material used for the road base or subbase, payment for the embedment and backfill material shall be included in the Contract price for the pipe subdrain.

When unstable foundations are encountered, payment for stabilization shall be administered as a Change in the Work.

Maintenance of the stability of the trench shall be at no extra cost to the Owner.

Correction of any defective workmanship and defective or damaged material shall be at no extra cost to the Owner.

405.10.02 Closed-Circuit Television Inspection

Payment for CCTV inspection shall be according to OPSS 409.

Re-inspection by CCTV to verify the installation of the replaced subdrain or outlet pipe sections due to defective, damaged, or improper installation shall be at no extra cost to the Owner.