1.0 GENERAL

1.1 Description

.1 This section specifies requirements for constructing perforated subdrain pipe with filtration/separation geotextile, bedding material to lines, grades and dimensions indicated or directed.

1.2 Related Work Specified Elsewhere

.1	Trenching, Backfilling, and Compaction	Section 02315
.2	Storm Drainage Pipe and Fittings	Section 02635
.3	Manholes	Section 02536
.4	Catch Basins, Grates and Frames	Section 02631
.5	Building Services	Section 02539
.6	Subgrade Construction	Section 02705
.7	Geosynthetics for Roadways	Section 02706

1.3 Schedule of Work

.1 Schedule work to minimize interruptions to existing services.

1.4 Measurement and Payment

.1 Measurements will be made in lineal metres.

.2 The unit price tendered shall cover the cost of trenching, supply and install of filtration/separation geotextile, supplying, hauling, laying and jointing all pipe, together with the necessary crushed rock bedding, backfilling, and all other work required to install the weeping tile.

.3 Connections to manholes or catch basins shall be paid for at the unit price tendered and shall cover the cost of coring, capping, and all other work required to connect the weeping tile to the manhole or catch basin as specified.

1.5 References

.1 AASHTO M252-18 Standard Specification for Corrugated Polyethylene Drainage Pipe

.2 ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

.3 AASHTO M288-17 Geosynthetic Specification for Highway Applications

.4 FHWA Geosynthetic Design and Construction Guidelines, FHWA NHI-07-092 Chapter 2 Subsurface Drainage

2.0 PRODUCTS

2.1 Perforated Subdrain Pipe

.1 The Contractor will supply 150 mm diameter HDPE perforated subdrain pipe which shall meet AASHTO M252, Type C.

.2 Minimum pipe stiffness shall be 210 kPa at 5% deflection when tested in accordance to ASTM D2412.

2.2 Filtration/Separation Geotextile

.1 The Contractor will supply a geotextile for wrapping the granular drainage media and perforated pipe. The geotextile is to be nonwoven composed of polypropylene fibres which are needle-punched into a stable network such that they retain their relative position. The geotextile shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

.2 Geotextile filtration properties are a function of the in-situ soil gradation, plasticity, and hydraulic conditions. The Engineer may specify alternative geotextile properties based on site specific analyses.

.3 The default nonwoven geotextile shall meet the requirements of AASHTO M288-17 Class 3 for subsurface drainage applications. The strength and filtration properties shall meet the following Minimum Average Roll Properties (MARV):

Properties	ASTM Test Method	Marv Requirements
PHYSICAL		
Grab Tensile Strength	D4632	500 N
Grab Tensile Elongation	D4632	≥ 50%
Trapezoidal Tear	D4533	180 N
CBR Puncture	D6241	990 N
UV Resistance	D4355	50% after 500 hours exposure

Hydraulic		
Apparent Opening Size (Max. Average Roll Value)	D4751	0.3 mm
Permittivity	D4491	0.1 sec^{-1}

2.3 Drainage Aggregate

.1 The Contractor shall supply drainage aggregate composed of hard, durable mineral particles free from organics, clay, silt, and other deleterious materials and meeting the following gradation requirements:

Sieve Designation	Percent by Weight Passing
50 mm	100
19 mm	0-80
12.5 mm	0-18
5 mm	0-12
71 µm	0-5

3.0 EXECUTION

3.1 Delivery and Stockpiling Materials

.1 The Contractor shall be responsible for arranging, stockpiling, and protecting the materials from damage and theft.

.2 The Contractor shall be responsible for the delivery of material and the Owner will not pay for materials ordered by the Contractor and not used in the work, nor pay for shipping charges on the return of such material to the supplier.

3.2 Trench Excavation

.1 Confirm trench line, grade and depth meet design requirements prior to placing geotextile, drainage gravel, and pipe.

.2 Do not backfill trenches until pipe grade and alignment have been reviewed by the Engineer.

.3 In all instances, excavation shall be done in such a way so as to prevent large voids from occurring in the sides and bottom of the trench.

.4 The minimum width of the trench shall be the inside diameter of the pipe plus 0.2m.

.5 The bottom of the trench shall be stable to afford a firm and uniform bearing throughout the entire length of perforated subdrain pipe.

3.3 Filtration/Separation Geotextile Installation

.1 The geotextile shall be placed loosely with no wrinkles or folds, and with no void spaces between the geotextile and the ground surface. Successive sheets of geotextile shall be overlapped a minimum of 300mm with the upstream sheet overlapping the downstream sheet.

.2 In trenches equal to or greater than 300mm in width, after placing the drainage aggregate, the geotextile shall be folded over the top of the backfill material in a manner to produce a minimum overlap of 300mm. In trenches less than 300mm but greater than 100mm wide, the overlap shall be equal to the width of the trench

.3 Should the geotextile be damaged during installation or drainage aggregate placement, a geotextile patch shall be placed over the damaged area, extending beyond the damaged area a distance of 300mm.

.4 Placement of drainage aggregate and subdrain pipe should proceed immediately following the placement of the geotextile.

3.4 Perforated Subdrain Pipe Installation

.1 Installation shall be to manufacturer's specifications and comply with ASTM D2321-18.

.2 Perforated pipe shall be installed to the depth and grade as shown on the drawings or as directed by the Engineer. Perforations shall be oriented in directions as indicated by the Engineer, in accordance with the requirements for either collecting or carrying of water.

.3 The pipe shall normally be joined with external snap or split couplers. Couplers shall be of sufficient width to cover at least two outside crest corrugations on each end of the pipe to be joined.

.4 Perforated pipe shall be grouted into outfall locations such as manholes and catch basins.

.5 Perforated subdrain pipe connections to the storm sewer system shall be capped as required by the Engineer to prevent rapid flow back into the weeping tile during system surcharging. The cap shall be fastened to the end

of the pipe and have a 32 mm hole drilled at the invert to allow drainage to pass.

.6 At no time shall the perforated subdrain pipe be connected to the sanitary sewer system.

.7 The perforated subdrain pipe shall be bedded within crushed rock. 200 mm lift of crushed rock should be placed and compacted with maximum allowable tolerance of 35 mm from vertical grade. The weeping tile will be placed with a maximum allowable tolerance of 100 mm from horizontal alignment. The perforated subdrain pipe shall be covered with 200 mm of crushed rock.

.8 For new street construction without storm sewer or which the Engineer deems it necessary, perforated subdrain pipe shall be installed within the compacted subgrade.

.1 The perforated subdrain pipe shall be installed below and centered beneath the curb and gutter. There shall be a minimum of 200 mm between the top of the perforated subdrain pipe and the bottom of the curb and gutter compacted sand cushion.

.2 The perforated subdrain pipe shall be bedded with sub-drainage rock.

.3 Perforated subdrain pipe shall be installed prior to placement of granular base material.

.9 For existing street construction which the Engineer deems it necessary, there shall be perforated subdrain pipe installed within the compacted subgrade.

.1 Pipe shall be installed adjacent to the curb line at a distance that will not undermine and cause concrete curb and gutter instability. Any sections of curb and gutter which are damaged or settle from original grade during perforated subdrain pipe installation shall be replaced at the Contractor’s expense.

.2 Invert of perforated subdrain pipe shall be 350 mm below bottom of concrete gutter elevation. Where concrete gutter does not exist the perforated subdrain pipe invert shall be a minimum of 600 mm below the finished asphalt grade.

.3 The perforated subdrain pipe shall be bedded with sub-drainage rock

.4 Perforated subdrain pipe shall be installed prior to placement of granular base material.

3.5 Acceptance

.1 The location of all deficient work will be recorded and the Contractor will be required to repair, relay, restore or otherwise make good, to the satisfaction of the Engineer any deficient work including the repair of alignment problems, cracked or broken pipe, deformed pipe, leaks or any other faults not conforming with these specifications or the pipe manufacturers which the television inspection revealed.

.2 After the deficiencies are repaired and corrected and before final acceptance, the Owner reserves the right to have the faulty areas re-inspected at the Contractor's expense.

END OF SECTION