APPENDIX 'E' – GEOSYNTHETIC FIELD STUDY

FIELD STUDY TO INVESTIGATE THE PERFORMANCE OF WICKING GEOSYNTHETICS ON PAVEMENTS IN COLD REGIONS

Table-1: Geosynthetics to be used in the field study.

Geosynthetics type	Source
Non-woven geotextile (non-wicking) with geogrid	City of Winnipeg approved products
Woven wicking geotextile	Mirafi H2Ri
Wicking nonwoven geotextile – geogrid composite	Titan WickGrid
High-performance warp-knitted geotextile	TerraTex® DriBase™

Table-2: Geosynthetic test section locations.

Geosynthetics Type	Start (Station)	End (Station)	Total Length
MIRAFI H2Ri	St. 1+00.00	St. 1+88.00	88.0
TerraTex® DriBase™	St. 1+88.00	St. 2+93.00	105.0
TITAN WickGrid™	St. 2+93.00	St. 4+12.00	119.0
Conventional Geotextile	St. 4+20.00	St. 6+75.50	263.5
No Geotextile	St. 6+75.50	St. 7+29.30	53.80

Table-3: Material-1 (Woven wicking geotextile) – MIRAFI H2Ri

Mechanical Properties	**Test Method**	**Unit**	**Minimum Average Roll Value**	
			MD	**CD**
Wide width tensile strength	ASTM D4595	kN/m	77.0	77.0
Wide Width Tensile Strength @ 2% strain	ASTM D4595	kN/m	7.0	15.8
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	40 (0.425)	
Permittivity	ASTM D4491	sec^{-1}	0.4	
Flow Rate	ASTM D4491	$l/min/m^2$	1222	
Pore Size (050)	ASTM D6767	microns	180	
Pore Size (060)	ASTM D6767	microns	234	
Pore Size (095)	ASTM D6767	microns	391	
Wet Front Movement (Vertical direction)	ASTM C1559	inches	6.0	
Wet Front Movement (Horizontal direction)	ASTM C1559	inches	73.3	
Physical Properties				
Roll dimensions	-	m	4.59 x 91.44 (W x L)	

Table-4: Material-2 (Wicking nonwoven geotextile – geogrid composite) – Titan WickGrid.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
HIGH STIFFNESS BI-AXIAL GEOGRID				
Carbon Black Content	ASTM D4218	%	2.0	2.0
Radial Stiffness @ 0.5% strain	ASTM D6637	kN/m	550.0	550.0
Secant Stiffness EA at 0.5% strain	ASTM D6637	kN/m	440.0	440.0
Junction Efficiency	GRI-GG2 ASTM D7737	%	>95	
Flexural Rigidity	ASTM D7748	mg-cm	2,000,000	
Aperture Stability	US. COE	kg-cm/deg	11.0	
Minimum Rib Thickness	-	mm	2.5	1.5
Aperture Size	Nominal	mm	34.0	34.0
NON-WOVEN WICKING GEOTEXTILE				
Grab strength	ASTM D4632	N	740	740
Trapezoidal Tear	ASTM D4533	N	320	320
CBR Puncture Strength	ASTM D6241	kN	2.6	
Permittivity	ASTM D4491	sec^{-1}	1.59	
Apparent Opening Size (AOS)	ASTM D4751	mm	0.194	
Flow Rate	ASTM D4491	$l/min/m^2$	4500	
Wet Front Movement (Horizontal direction)	ASTM C1559	inches	90.6	
Physical Properties				
Roll dimensions	-	m	(3.95 or 5.95) x 50 (W x L)	

Table-5: Material-3 (Warp-Knitted) – Terrafix, TerraTex® DriBase™.

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Wide width tensile strength	ASTM D4595	kN/m	77.6	77.6
Wide Width Tensile Strength @ 2% strain	ASTM D4595	kN/m	7.3	16.1
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	0.425	
Permittivity	ASTM D4491	sec^{-1}	0.5	
Flow Rate	ASTM D4491	$l/min/m^2$	2037	
Wet Front Movement (Vertical direction)	ASTM C1559	inches	6	
Wet Front Movement (Horizontal direction)	ASTM C1559	inches	75	
Physical Properties				
Roll dimensions	-	m	4.57 x 91.4 (W x L)	

Subdrain installation with Geosynthetics

Please note that the subdrains will be wrapped using conventional geotextile. The wicking geotextiles (MIRAFI H2Ri and TerraTex® DriBase™) will terminate with a 200 mm extension at the top of the subdrain as shown in Figure 6. A sketch of this installation process is provided in Appendix B. Due to the rigidity of TITAN WickGrid which is a geogrid-composite material, the material can't be draped into the subdrain and is instead terminated above the centreline of the subdrain as shown in Figure 7.

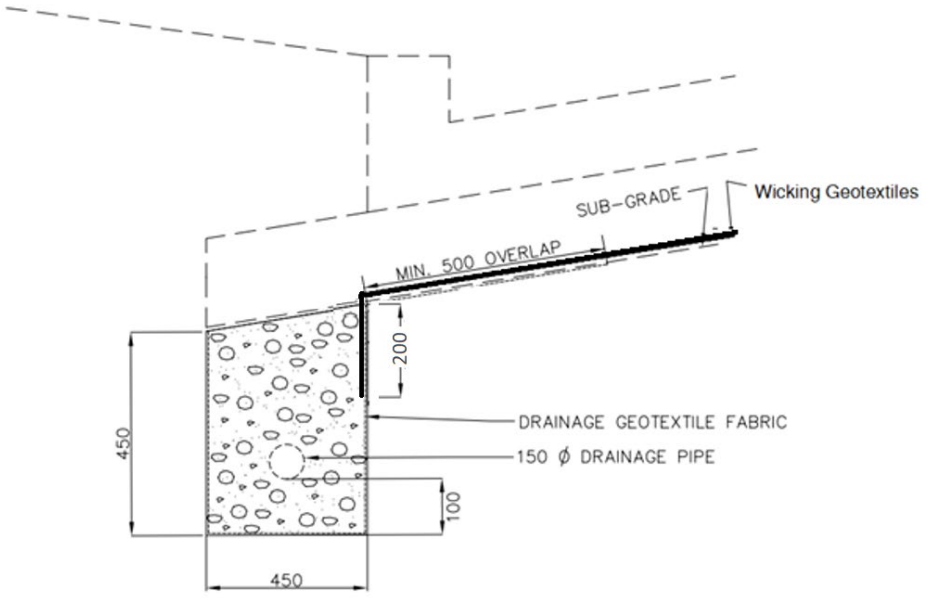


Figure-6: Typical City of Winnipeg subdrain with details for MIRAFI H2Ri and TerraTex® DriBase™ products.

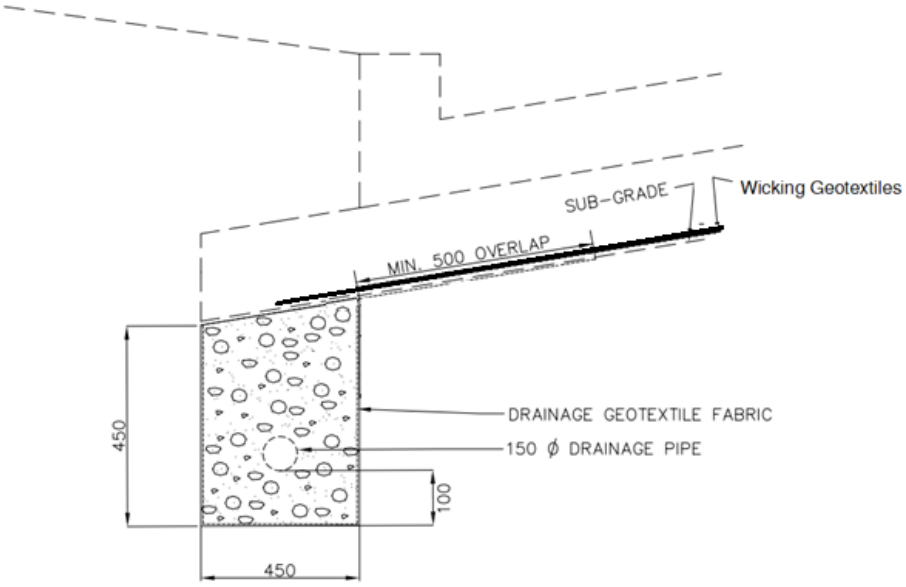
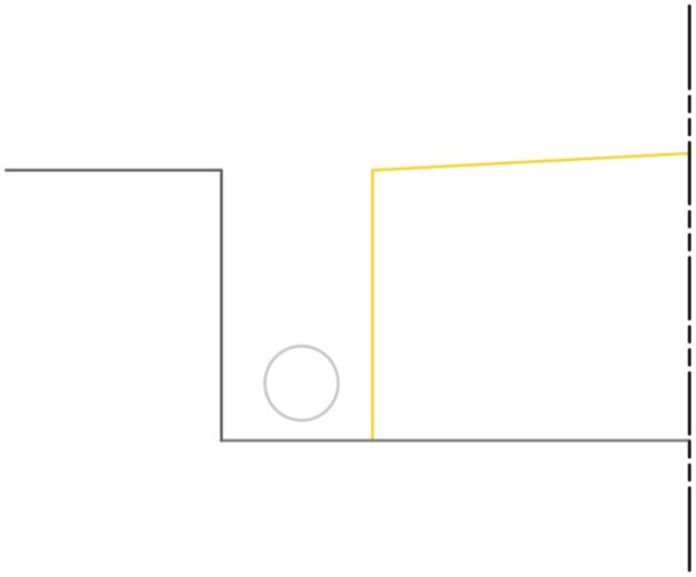
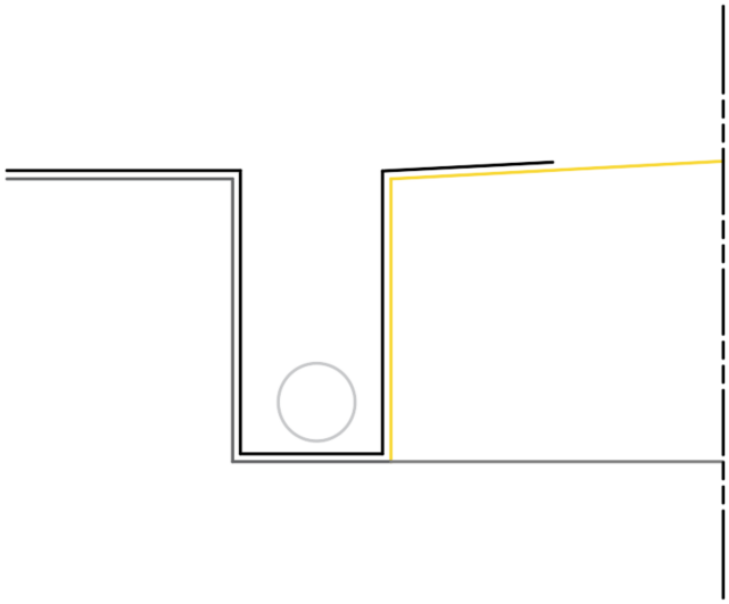


Figure-7: Typical City of Winnipeg subdrain with details for TITAN WickGrid™ product.

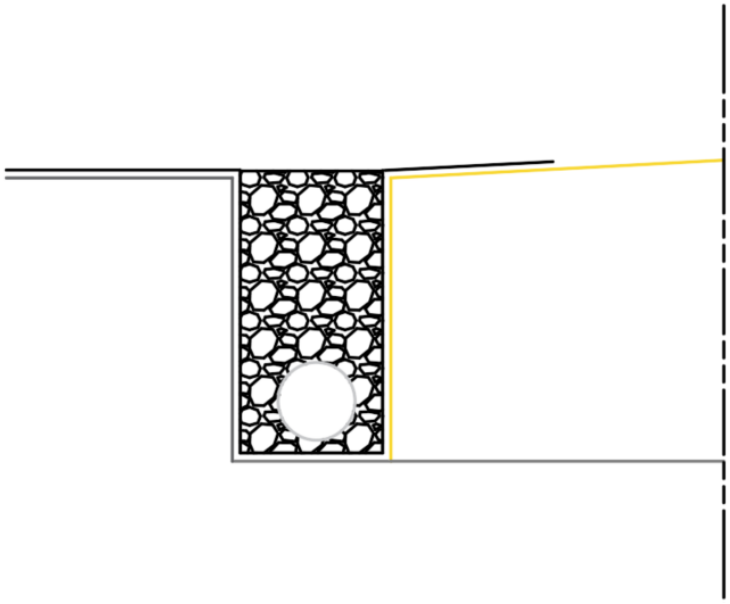


Step-1: Excavate for subdrain construction.

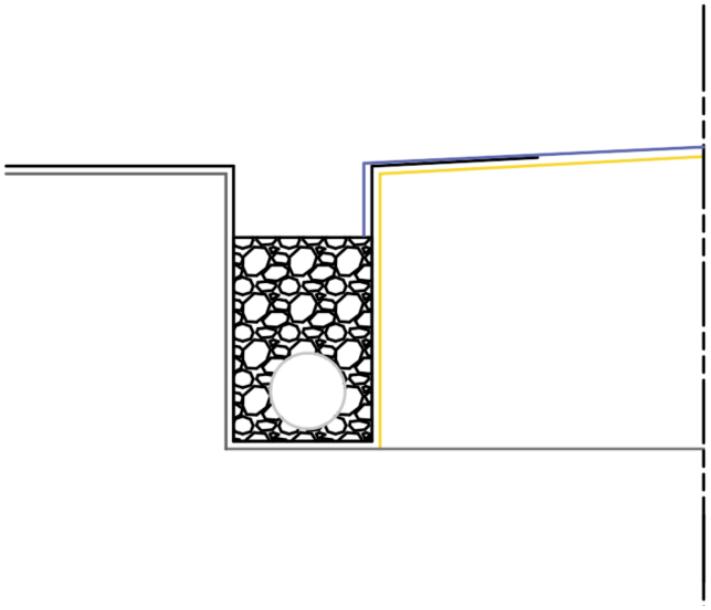


Step-2: Wrap the subdrain with nonwoven geotextile and install the drainage components.

Figure-B.1: Installation Process of the Woven Wicking Geotextile.

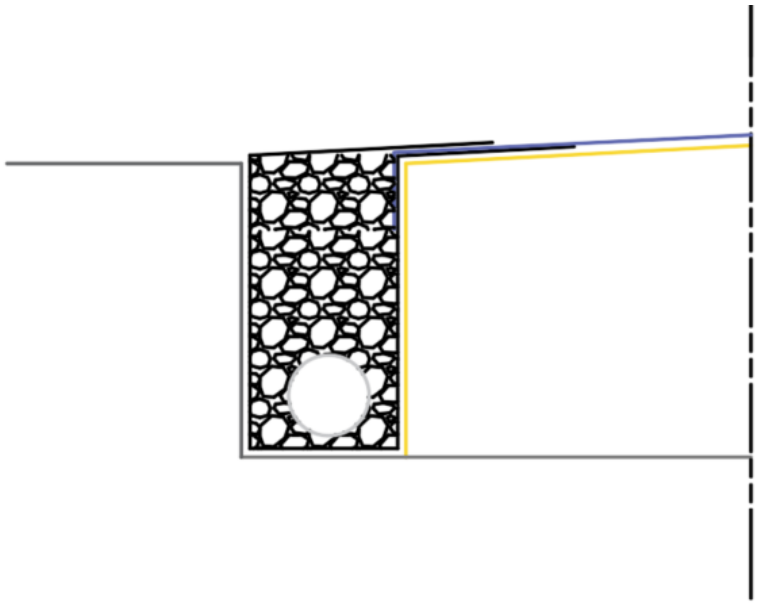


Step-3: Backfill with aggregate.



Step-4: Shovel the top aggregate, lay the woven wicking geotextile, and extend its end to the subdrain.

Figure- B.1 (cont.): Installation Process of the Woven Wicking Geotextile.



Step-5: Pull the nonwoven geotextile flap back over the subdrain.

Figure- B.1 (cont.): Installation Process of the Woven Wicking Geotextile.