PUBLIC WORKS DEPARTMENT • SERVICE DES TRAVAUX PUBLICS Engineering Division • Division de l'ingénierie	**Effective Date:** January 28, 2020 **DIVISION 4**
CW 3130 – R5	**SUPPLY AND INSTALLATION OF GEOTEXTILE FABRICS**

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1. DESCRIPTION

1.1 General

1.1.1. This specification covers the supply and installation of Separation (slit-tape or slit-film woven), Separation/Filtration (nonwoven), and Subgrade Stabilization fabrics relating to Surface Works construction.

1.1.2. All property values, with the exception of apparent opening size, represent minimum average roll values (MARV) in the weakest principle direction. Values for apparent opening size represent maximum roll values.

1.2 Definitions

Nonwoven Geotextile:	A planar geosynthetic made of randomly orientated yarns produced by bonding fibres, or interlocking fibres, or both bonding and interlocking fibres by mechanical, chemical, or thermal means.
Slit-Tape / Slit-Film Woven Geotextile:	A planar geosynthetic made from flat, tape-like yarns that are produced by slitting and extruded film. Unsuitable for applications in which high groundwater or moderate to high moisture contents are present.
Multi-Filament Fibrillated Yarn High Strength Woven Geotextile:	A planar woven geotextile made from high-tenacity long-chain synthetic polymers composed of at least 95 percent by weight polyolefins. They shall form a stable network such that the filaments or yarns retain their dimensional stability relative to each other, including selvages.
Minimum Average Roll Value (MARV):	Property value calculated as typical minus two standard deviations. It shall yield a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.
Typical Value (TV):	The mean value calculated from documented manufacturing quality control test results for a defined population obtained from one test method associated with one specific property.
Minimum Value (MV):	The lowest sample value from documented manufacturing quality control test results for a defined population from one test method associated with one specific property.
Separation:	A geosynthetic function in which a geotextile is used to prevent mixing of two dissimilar materials to maintain their engineering properties such as a subgrade soil and an aggregate cover.
Filtration:	A geosynthetic function in which a geotextile is placed between two dissimilar soils to allow for long-term passage of water into a subsurface drainage system and retain the in-situ soil.

Reinforcement:	A geosynthetic function in which a geotextile acts as a tensile member in the surface structure of a pavement.
Confinement:	A geosynthetic function in which a geosynthetic prevents the lateral movement (rutting) of aggregate.
Stabilization:	The use of a geosynthetic or combination of geosynthetics and geogrid on weak to very weak subgrade conditions (CBR ≤ 3.0%) to provide the coincident functions of separation, filtration, reinforcement, and confinement.
California bearing ratio (CBR)	Standard test method for evaluation the potential strength of sub-grade, sub-base, base course materials in accordance with ASTM Standard D1883.

1.3 Referenced Standard Construction Specifications

1.3.1. CW 3110 – Sub-Grade, Sub-Base and Base Course Construction.
1.3.2. CW 3120 – Installation of Subdrains
1.3.3. CW 3135 – Supply and Installation of Geogrid.
1.3.4. Approved Products for Surface Works.

2. MATERIALS

2.1 Approved Products

2.1.1. Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at: https://www.winnipeg.ca/finance/findata/matmgt/std_const_spec/current/Docs/Approved_Products_Surface_Works.pdf

2.2 Material Identification

2.2.1. Geotextile fabric is to be labelled in accordance with ASTM D4873/D4873M, and must clearly show the manufacturer name and supplier, product style number and roll number and and date of manufacture.

2.2.2. Products without proper identification or labelling, mislabelling, or misrepresentation of materials shall be rejected.

2.3 Shipment, Storage and Handling

2.3.1. Geotextile rolls shall be wrapped with a material that will protect the geosynthetic, including the ends of the roll, from damage due to shipment, water, sunlight, and contaminants.

2.3.2. Protective wrapping shall be maintained during shipment and storage and shall remain on the geotextile fabric until installation.

2.3.3. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from site construction damage, precipitation, contamination of dirt or dust, extended ultraviolet radiation, and any other environmental condition that may damage the physical property values of the geosynthetic.

2.4 Certification

2.4.1. The Contractor shall provide Manufacturer's Mill Certificate and MARV Roll Data to the Contract Administrator prior to installation. The Certification shall state that the furnished geotextile meets MARV requirements of the specification as evaluated under the Manufacturer's quality control program. The Certification shall be attested to by a person having legal authority to bind the Manufacturer.

2.4.2. The Contractor shall provide a letter to the Contract Administrator stating the product name, manufacturer, style number, chemical composition of the filaments or yarns and other pertinent information to fully describe the geotextile.

2.4.3. All testing and data to be in accordance with approved ASTM standards. Data reported in accordance with other standards will not be accepted.

2.5 Geotextile Property Requirements for Separation, Filtration, and Stabilization

2.5.1. Separation Geotextile Fabric

2.5.1.1. Separation geotextile fabric will be a slit-tape or slit-film woven fabric and will be used for unsaturated subgrade soils containing low fines (less than 15% passing the 0.075 mm sieve) with CBR ≥ 3.0% and not subject to seasonal increases in moisture content or fluctuating water table.

2.5.1.2. Separation geotextile fabric shall meet or exceed the following requirements:

Table CW 3130.1 – Separation Fabric Requirements

Physical Property	Statistical Reporting	Standard	Test Method
Grab Tensile Strength, minimum	MARV	1400 N	ASTM D4632
Elongation, maximum	MARV	50%	ASTM D4632
CBR Puncture, minimum	MARV	4000 N	ASTM D 6241
Trapezoid Tear, minimum	MARV	500 N	ASTM D4533
Apparent Opening Size, maximum	TV	0.43 mm	ASTM D4751
Permittivity, minimum	MV	0.05 sec^{-1}	ASTM D4491
Flow Rate, minimum	MV	160 $l/min/m^2$	ASTM D4491
U.V. Resistance, minimum	MV	70% after 500 hrs	ASTM D4355

2.5.1.3. All physical property requirements shall be provided using the appropriate statistical reporting method in Table CW 3130.1 and as defined by ASTM D4759.

2.5.2. Separation/Filtration Geotextile Fabric

2.5.2.1. Separation/Filtration geotextile fabric will be nonwoven and will be used for subgrade soils containing high fines (more than 15% passing the 0.075 mm sieve) with CBR ≥ 3.0% and subject to seasonal increases in moisture content or fluctuating water table.

2.5.2.2. Separation/Filtration geotextile fabric shall meet or exceed the following requirements:

Table CW 3130.2 – Separation/Filtration Fabric Requirements

Physical Property	Statistical Reporting	Standard	Test Method
Grab Tensile Strength, minimum	MARV	900 N	ASTM D4632
Elongation, minimum	MARV	50%	ASTM D4632
CBR Puncture, minimum	MARV	2200 N	ASTM D 6241
Trapezoid Tear, minimum	MARV	350 N	ASTM D4533
Apparent Opening Size, maximum	TV	0.18 mm	ASTM D4751
Permittivity, minimum	MV	1.4 sec^{-1}	ASTM D4491
Flow Rate, minimum	MV	3870 $l/min/m^2$	ASTM D4491
U.V. Resistance, minimum	MV	70% after 500 hrs	ASTM D4355

2.5.2.3. All physical property requirements shall be provided using the appropriate statistical reporting method in Table CW 3130.2 and as defined by ASTM D4759.

2.5.3. Stabilization Geotextile Fabric

2.5.3.1. Stabilization fabric will be either a multi-filament fibrillated yarn high strength woven geotextile or separation/filtration geotextile fabric (non-woven) and geogrid, and will be used for saturated fine-grained subgrade (more than 15% passing the 0.075 mm sieve) with CBR less than 3.0% and/or subject to thaw weakening, or erodible silt subgrades to provide the coincident functions of separation, filtration, confinement, and reinforcement.

2.5.3.2. The multi-filament fibrillated yarn high strength woven geotextile shall meet or exceed the following requirements:

Table CW 3130.3 – Subgrade Stabilization Geotextile Fabric Requirements

Physical Property	Statistical Reporting	Machine Direction	Cross-Machine Direction	Test Method
Ultimate Tensile Strength, minimum	MARV	70.0 kN/m	70.0 kN/m	ASTM D4595
Tensile Strength (at 5% Strain), minimum	MARV	35.0 kN/m	43.8 kN/m	ASTM D4595
Flow Rate, minimum	MV	1222 $l/min/m^2$		ASTM D4491
Apparent Opening Size, maximum	TV	0.60 mm – maximum		ASTM D4751
Permittivity, minimum	MV	0.5 sec^{-1}		ASTM D4491
U.V. Resistance, minimum	MV	>70% after 500 hrs		ASTM D4355

2.5.3.3. All physical property requirements shall be provided using the appropriate statistical reporting method in Table CW 3130.3 and as defined by ASTM D4759.

2.5.3.4. Separation/filtration geotextile fabric (non-woven) and geogrid must meet the requirements of both CW 3130 Section 2.5.2 and CW 3135 Section 2.5.

3. CONSTRUCTION METHODS

3.1. Geotextiles shall not be placed when weather conditions, in the opinion of the Contract Administrator, are not suitable for installation including heavy rainfall, extreme cold or frost conditions, or extreme heat.

3.2. Commence installation of geotextile fabric after material has been approved by the Contract Administrator and the preparation of the sub-grade has been completed and accepted in accordance with CW 3110.

3.3. The surface of the subgrade should be smooth and level. Depressions or humps greater than 50 mm should be removed.

3.4. The geotextile fabric shall be laid smooth without wrinkles or folds on the prepared sub-grade in the direction of the construction traffic. The geotextile fabric shall not be rolled out more than 20 m ahead of the placement of the fill material and shall be overlapped both side to side and end to end in the direction of the construction traffic. The geotextile fabric shall be free from any tension or stress.

3.5. Adjacent geotextile rolls should be overlapped along their sides and ends as a function of subgrade strength as follows:

CBR > 3%:	450 mm overlap
3% ≥ CBR > 1.5%:	750 mm overlap
1.5% ≥ CBR > 0.5%:	900 mm overlap or sewn
CBR ≤ 0.5%:	Sewn
All roll ends	1000 mm or sewn

For every 500 metres, the average CBR value shall be used to determine the overlap.

3.6. On curves, the geotextile may be cut or folded to conform to the curves.

3.7. Place piles of sub-base material as required to hold the geotextile fabric in place. Staples or steel pins with washers, or other means approved by the Contract Administrator may be used as necessary to temporarily anchor the geotextile.

3.8. Install geotextile fabric to the complete limits of the roadway sub-grade including intersections and turning lanes or as directed by the Contract Administrator.

3.9. Prior to covering, the geotextile shall be inspected by the Contract Administrator for damage (e.g. holes, tears, rips) during installation.

3.10. Cover the damaged area with a geotextile patch that extends an amount equal to the required overlap beyond the damaged area.

3.11. Remove and replace geotextile fabric that is improperly installed or damaged as directed by the Contract Administrator.

3.12. Construction vehicles are not permitted directly on the geotextile. Turning of vehicles shall not be permitted on the first lift above the geotextile.

3.13. Geotextile shall not remain uncovered for longer than 7 days after installation.

3.14. Install geotextile fabric in accordance with this specification and procedures recommended by the manufacturer.

3.15. Place and compact the sub-base over the geotextile fabric in accordance with CW3110.

4. MEASUREMENT AND PAYMENT

4.1. Supply and installation of "Geotextile Fabric" will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Geotextile Fabric". The area to be paid for will be the total number of square metres of "Geotextile Fabric" (*), supplied and installed in accordance with this specification, accepted and measured by the Contract Administrator.

(*) - Specify Separation, Separation/Filtration, or Stabilization.

4.2. Only material placed within the designated sub-grade limits will be included in the payment for "Geotextile Fabric".

4.3. No measurement or payment will be made for geotextile fabric removed and replaced due to improper installation or damaged materials.

4.4. No measurement or payment will be made for overlapped material described in this Specification.