

This specification outlines the requirements for supply and installation of synthetic ~~geotextiles~~ (filter fabric) ~~(Geotextiles)~~ to be used for separation purposes to prevent mixing granular materials of different grading membranes, reinforcing membranes, and hydraulic filters permitting passage of water while retaining soil strength of a granular structure.

PART 1 REFERENCES

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

ASTM International

A123/A123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
D1777	Standard Test Method for Thickness of Textile Materials
D3776/D3776M	Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
<u>D4533</u>	<u>Standard Test Method for Trapezoid Tearing Strength of Geotextiles</u>
<u>D4632</u>	<u>Standard Test Method for Grab Breaking Load and Elongation of Geotextiles</u>
<u>D4751</u>	<u>Standard Test Methods for Determining Apparent Opening Size of a Geotextile</u>
<u>D4355</u>	<u>Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat (Note: UV Degradation)</u>
<u>D4491</u>	<u>Standard Test Methods for Water Permeability of Geotextiles by Permittivity</u>
<u>D6241</u>	<u>Standard Test Method for Static Puncture Strength of Geotextiles</u>

Canadian General Standard Board (CGSB)

Methods of Testing

148.1	Methods of Testing Geotextiles and Complete Geomembranes
	<u>1. No.2, Methods of Testing Geosynthetics - Mass per Unit Area.</u>
	<u>2. No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.</u>

- 3. No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
- 4. No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
- 4.5. No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

CSA Group

G40.20/G40.21

General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

PART 2 GENERAL

2.1 SUBMITTALS

- .1 Provide in accordance with Section 01340 – Shop Drawings, Samples and Submissions.
- .2 Product Data:
 - .1 Prior to the use of a geotextile in the Work, a certificate from the manufacturer stating the name of the manufacturer, product name, style number, chemical composition, manufacturer's handling and installation instructions, printed product literature, data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish, limitations and other pertinent information required to fully describe the geotextile
 - .2 Upon request, documentation describing the manufacturer's QC program shall be made available to the Owner.
- .3 The following shall be submitted to indicated material selection:
 - .1 Geotextile dimensions (Length and Width)
 - .2 Geotextile material composition.
 - .3 Physical properties:
 - .1 Minimum Thickness as per CAN/CGSB-148.1.
 - .2 Mass per unit area as per CAN/CGSB-148.1.
 - .3 Tensile strength and elongation (in any principal direction) as per ASTM D4595. Including but not limited to:
 - .1 Minimum Tensile strength during wet condition.
 - .2 Elongation at break (minimum or maximum %).

- .3 Minimum Seam strength:
 - .4 Grab tensile strength and elongation as per CAN/CGSB-148.1 including minimum Breaking force and % elongation at failure.
 - .5 Minimum Ball burst strength as per CAN/CGSB-4.2 in wet condition.
 - .6 Minimum Bursting strength as per CAN/CGSB-148.1 in wet condition.
 - .7 Hydraulic properties:
 - .1 Apparent opening size (AOS) as per ASTM D4751.
 - .2 Filtration opening size (FOS) as per CAN/CGSB-148.1.
 - .3 Minimum Transmissivity as per ASTM D4716 and the conditions of testing.
 - .4 Permittivity as per ASTM D4491.
- .4 Samples:
 - .1 Provide following samples ~~two (2)~~ weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.
- .5 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least two (2) weeks prior to start of Work.

2.2 APPROVAL

- .1 Obtain written approval of the Owner for filter fabric before installation of material in work.

2.3 DELIVERY, STORAGE AND HANDLING~~SHIPPING AND STORAGE~~

- .1 Deliver, store and handle materials in accordance with Section 01600 – Materials and Equipment and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 The bales or rolls of geotextile shall be wrapped in a protective covering.
 - .4 The material shall be protected from temperatures higher than 60 °C.

- .5 Replace defective or damaged materials with new.

PART 3 PRODUCTS

3.1 MATERIALS

- .1 Fibres (threads and yarns) used in the manufacture of geotextile must consist of synthetic polymers composed of a minimum of 85 percent by mass polypropylene, polyester, polyethylene, or polyvinylidene chloride. The fibre must be formed into a stable network of filaments retaining dimensional stability relative to each other. The geotextile must be free of defects, such as holes, tears, and abrasions. The geotextile must be free of any chemical treatment or coating that significantly reduces its porosity. Fibres must contain stabilizers, inhibitors, or both to enhance resistance to ultraviolet light.

- .2 Synthetic fibre: rot proof, unaffected by action of oil or salt water and not subject to attack by insects or rodents. Geotextile materials shall be resistant to acid and alkali action and shall be unaffected by micro-organisms, insects, rodents and animals.

~~— The plastic fibre or yarn shall be composed of at least 85 % by mass of polypropylene, polyethylene, polyester, polyamide, or vinylidene chloride or other synthetic polymers, and shall contain stabilizers or inhibitors added to the base plastic, if necessary, to make the filaments resistant to deterioration by ultra-violet and heat exposure.~~

.3 Non-Woven Geotextiles

- .1 Pervious sheet of non-woven plastic yarn of type N1, N2, N3, or N4 conforming to the physical property requirements as indicated in Table 1 of this Section.

- .2 A manufactured sheet, web, or batt of directionally or randomly oriented fibres, filaments, or other elements, bonded by friction, cohesion, or adhesion. This bonding may be accomplished by mechanical, chemical, thermal, or solvent means.

.4 Woven Geotextiles

- .1 Sheet of woven plastic yarn of type W1, W2, or W3 conforming to the physical property requirements as indicated in Table 1 of this Section.

- .2 A planar textile structure produced by interlacing two or more sets of yarns, fibres, filaments, tapes, or other elements, usually at right angles. ~~Filtration geotextiles~~

- .3 Shall be made from fabric that is formed by the uniform and regular interweaving of the threads or yarns in two directions. Woven

fabrics must be manufactured from monofilament yarn formed into a uniform pattern with distinct and measurable openings, retaining their position relative to each other. The fabric must have a selvage edge or otherwise be finished to prevent unravelling. ~~shall be fixed so that the fibres or yarns will retain their respective position with respect to each other. The edge of the geotextile shall be finished to prevent the outer yarn from pulling away from the geotextile.~~

.5 Knitted Sock Geotextiles

- .1 Conforming to the physical property requirements as indicated in Table 2 of this Section.
- .2 Produced by interloping one or more yarns, fibres, or filaments in a continuous tube.
- .3 Suitable only for wrapping of subdrainage pipe.

.6 Temporary Silt Fence

- .1 Woven material conforming to the physical property requirements as indicated in Table 3 of this Section.
- ~~.3 Geotextiles meeting the requirements of Class I are suitable for application where the main stresses imposed on the geotextile are a result of hydrostatic pressures. Geotextiles that meet the requirements of Class II are suitable, where the stresses governing the design are the result of earth pressures.~~
- ~~.4 When the Contract specifies a particular thickness, the geotextile shall be evaluated using the standard test procedure in CAN/CGSB-148.1 No. 3-M85. Alternatively, the standard test procedure in ASTM D-1777 may be used.~~
- ~~When the Contract specifies a particular mass, the geotextile shall be evaluated using the standard test procedure in CAN/CGSB-148.1.2. Alternatively, the standard test procedure in Option C of ASTM D3776/D3776M may be used.~~

- .5.7 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.

.8 Seams:

- .1 sSewn in accordance with manufacturer's recommendations.
- .2 When fabric sections are factory joined, Sseam strength shall not be less than 90 % of the tensile strength of the unaged geotextile in any principal direction.

4.3 Seams joining two sections of geotextile shall be sewn with thread meeting the material requirements for the geotextile or shall be bonded by thermal or chemical means.

Table 1: Physical Property Requirements for Woven and Non-Woven Geotextiles

<u>Property*</u>	<u>Unit</u>	<u>Test Method</u>	<u>Non-Woven</u>				<u>Woven</u>		
			<u>N1</u>	<u>N2</u>	<u>N3</u>	<u>N4</u>	<u>W1</u>	<u>W2</u>	<u>W3</u>
<u>Tearing Strength (Trapezoid Method)</u>	<u>N</u>	<u>ASTM D4533</u>	<u>160</u>	<u>250</u>	<u>310</u>	<u>500</u>	<u>200</u>	<u>500</u>	<u>625</u>
<u>Grab Tensile Strength (Both Directions)</u>	<u>N</u>	<u>ASTM D4632</u>	<u>400</u>	<u>600</u>	<u>790</u>	<u>1200</u>	<u>400</u>	<u>1200</u>	<u>1500</u>
<u>Apparent Opening Size</u>	<u>µm</u>	<u>ASTM D4751</u>	<u>50 to 250</u>	<u>50 to 250</u>	<u>50 to 250</u>	<u>50 to 250</u>	<u>840 max</u>	<u>**</u>	<u>**</u>
<u>UV Degradation</u>	<u>% retained</u>	<u>ASTM D4355</u>	<u>50%</u>	<u>50%</u>	<u>50%</u>	<u>50%</u>	<u>50%</u>	<u>**</u>	<u>**</u>
<u>Permittivity</u>	<u>s⁻¹</u>	<u>ASTM D4491</u>	<u>1.75 to 3.50</u>	<u>1.25 to 2.75</u>	<u>1.00 to 2.50</u>	<u>1.00 to 2.50</u>	<u>0.01 min</u>	<u>**</u>	<u>**</u>
<u>Elongation at Break</u>	<u>%</u>	<u>ASTM D4632</u>	<u><50</u>	<u><50</u>	<u><50</u>	<u><50</u>	<u>50 min</u>	<u>50 min</u>	<u>50 min</u>

* Minimum requirement unless otherwise noted.

** Special requirement defined in the Contract Documents.

Table 2: Physical Property Requirements for Knitted Sock Geotextiles

<u>Property</u>	<u>Unit</u>	<u>Test Method</u>	<u>Acceptance Requirements</u>
<u>Puncture resistance</u>	<u>N</u>	<u>ASTM D6241</u>	<u>800</u>
<u>FOS, maximum</u>	<u>µm</u>	<u>CGSB 148.1, Method No. 10</u>	<u>As specified in the Contract Documents</u>
<u>Permittivity, minimum</u>	<u>s⁻¹</u>	<u>ASTM D4491/D4491M</u>	<u>1.0</u>

Table 3: Physical Property Requirements for Temporary Silt Fence Geotextiles

<u>Property</u>	<u>Unit</u>	<u>Test Method</u>	<u>Minimum</u>
<u>Grab tensile strength</u>	<u>N</u>	<u>ASTM D4632</u>	<u>400</u>
<u>Apparent Opening Size</u>	<u>µm</u>	<u>ASTM D4751</u>	<u>480</u>
<u>UV Degradation</u>	<u>% retained</u>	<u>ASTM D4355</u>	<u>50</u>
<u>Permittivity</u>	<u>s⁻¹</u>	<u>ASTM D4491</u>	<u>0.230</u>
<u>Elongation at Break</u>	<u>%</u>	<u>ASTM D4632</u>	<u>50 min</u>

PART 4 EXECUTION

4.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of the Owner.
- .2 Inform the Owner of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Owner.

4.14.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with securing pins or fine sand.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place fabric on sloping surfaces in one continuous length from toe of slope to upper extent of fabric-geotextile.
- .4 Overlap each successive strip of fabric 600 mm over previously laid strip.
- .5 Join successive strips of geotextile by sewing or pinning as indicated.
- .4.6 Pin successive strips of geotextile with securing pins as indicated at mid points of lap.

~~.7~~ Protect ~~installed geotextile material~~ ~~fabric~~ from displacement, ~~or~~ damage ~~or~~ deterioration before, ~~until and~~ during ~~and after~~ placement of ~~overlaid~~ material layers.

~~.5.8~~ After installation, cover with overlying layer within four (4) hours of placement.

~~.9~~ Remove and replace fabric damaged or deteriorated as directed by the Owner.

~~.10~~ Place and compact soil layers in accordance with related Section.

~~.6.11~~ Temporary silt fences are to be installed as per the Standard Drawing Form 1238 of the TI, Highway Specifications Book.

4.3 PROTECTION

~~.1~~ Vehicular traffic not permitted directly on geotextile. ~~Do not permit passage of any vehicle directly on filter fabric at any time.~~

~~.7.2~~ Do not overload soil or aggregate covering on geotextile.

PART 5 PAYMENT

5.1 MEASUREMENT FOR PAYMENT

~~.1~~ ~~Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps. Filter fabric will be measured in square metres of each geotextile material incorporated into work.~~

5.2 BASIS OF PAYMENT

~~.1~~ Payment at the contract unit price shall be full compensation for all ~~materials~~, labour, and use of equipment, ~~and materials~~ necessary to supply and install the geotextile to locations specified in the Contract Documents.

~~.2~~ All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted as outlined in Measurement for Payment subsection of this section and as included in the MERX Schedule of Quantities and Prices.

~~.2.3~~ Silt fence will be paid for in accordance with Section 01560 Environmental Requirements.