MATERIAL SPECIFICATION FOR GEOTEXTILES

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1860.01 SCOPE

This specification covers the requirements for geotextiles.

1860.02 REFERENCES

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

ASTM International

D 4354-12	Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing
D 4355/D 4355M-14	Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
D 4491/D 4491M-17	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
D 4533/D 4533M-15	Standard Test Method for Trapezoid Tearing Strength of Geotextiles
D 4873-16	Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples
D 4632/D 4632M-15a	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

D 6241-14	Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50 mm Probe

Canadian General Standards Board (CGSB)

148.1 No. 10-94	Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size

Bureau de normalisation du Québec (BNQ)

BNQ 7009-910	Geotextiles - Quality of Geotextiles Used in Road Engineering - Certification Protocol

1860.03 DEFINITIONS

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

Duplicate Samples means two samples taken at the same time and location, one to be used for quality assurance testing and the other for referee testing.

Filtration Opening Size (FOS) means the opening size of a geotextile in microns corresponding to 95% by mass particle diameter passing through the geotextile in the hydrodynamic sieving test CGSB 148.1, Method No. 10.

Geosynthetic means a synthetic material used in geotechnical engineering applications. Geosynthetics may include such items as geotextiles, geomembranes, geocells, geogrids, geonets, and geocomposites.

Geotextile means a permeable synthetic textile material that is used in association with foundation, soil, rock, earth, or other geotechnical related material for one or more of the following functions: separation, filtration, drainage, or protection. They may be woven, non-woven, or knitted.

Lat means a length equal to the circumference of a full geotextile roll provided by the manufacturer.

Minimum Average Roll Value (MARV) means the average value minus two standard deviations of a given property established by the manufacturer during production. The average roll value for a given property must meet or exceed this value.

Quality Assurance (QA) means a system or series of activities carried out by the Owner to ensure that materials received from the Contractor meet the specified requirements.

Quality Control (QC) means a system or series of activities carried out by the Contractor, Subcontractor, supplier, and manufacturer to ensure that materials supplied to the Owner meet the specified requirements.

Referee Testing means testing of a material attribute for the purpose of resolving acceptance issues at the request of the Contractor or the Owner.

1860.04 DESIGN AND SUBMISSION REQUIREMENTS

1860.04.01 Submission Requirements

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, and other pertinent information required to fully describe the geotextile as evaluated under the manufacturer's QC program, shall be submitted to the Contract Administrator. The certificate shall identify the name of the supplier of the geotextile covered pipe or tubing. A person having legal authority to bind the manufacturer or supplier shall attest to this certificate.

Upon request, documentation describing the manufacturer's QC program shall be made available to the Contract Administrator.

The requirements stated above shall be waived for geotextiles certified according to BNQ 7009-910.

1860.05 MATERIALS

Geotextile fibre or yarn shall be composed of at least 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers, excluding polyamides.

Geotextiles shall contain stabilizers or inhibitors if necessary, to make the filaments resistant to deterioration by excessive ultraviolet (UV) light and heat exposure. Geotextiles shall be resistant to acid and alkali action and shall be unaffected by micro-organisms and insects.

1860.07 PRODUCTION

1860.07.01 Woven Geotextiles

Woven geotextiles shall be produced by interlacing two or more sets of filaments, yarns, fibres, film, tape, or other elements in such a way that the elements pass each other, essentially at right angles and with one set of elements parallel to the fabric axis. The edge of woven geotextiles shall be finished to prevent the outer yarn from pulling away.

1860.07.02 Non-Woven Geotextiles

Non-woven geotextiles shall consist of a manufactured sheet, web, or batt of directionally or randomly-oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.

1860.07.03 Knitted Sock Geotextiles

Knitted sock geotextiles shall be produced by interlooping one or more yarns, fibres, or filaments in a continuous tube. Knitted sock geotextiles are suitable only for wrapping of subdrain pipe.

1860.07.04 Seams

When sections of geotextile are joined by sewing, the seam strength shall be at least 90% of the minimum grab tensile strength requirement for the class of geotextile specified in the Contract Documents.

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.

1860.07.05 Physical Requirements

1860.07.05.01 Woven and Non-Woven Geotextiles

Woven and non-woven geotextiles are classified as either Class I or Class II and shall meet the physical property requirements shown in Table 1.

1860.07.05.02 Knitted Sock Geotextiles

Knitted sock geotextiles shall meet the physical property requirements shown in Table 2.

1860.07.05.03 Temporary Silt Fence

Geotextiles for temporary silt fence shall be woven or non-woven and shall meet the physical property requirements shown in Table 3.

1860.07.06 Protection during Shipment and Storage

Geotextiles shall be protected against excessive UV exposure and contamination from dirt, dust, moisture, and any other deleterious materials, until they are installed. All geotextiles shall be wrapped in an opaque protective covering from the time of manufacture to the time of installation. The geotextiles and protective wrapping shall be free of tears and punctures, upon delivery to the work.

Geotextiles intended to be covered by soil, rock, earth, or other materials shall not be exposed to direct sunlight for more than 72 hours following the removal of the protective wrap.

Geotextiles shall be protected from temperatures greater than 60 °C.

1860.07.07 Identification

Each roll of geotextile or geotextile-covered pipe or tubing shall be clearly marked according to ASTM D 4873 with a permanent, legible identification tag or label either on the protective wrap or the inner core as applicable, or affixed to a geotextile-covered pipe or tubing. Product labels shall show the name of the manufacturer or supplier, product number, type, Class, roll number, and date of manufacture.

For Class I and Class II geotextiles, the product label requirements stated in the paragraph above, shall be waived for geotextiles certified by the BNQ according to BNQ 7009-910 for the requirements specified in the Materials and Production sections. BNQ-certified geotextiles shall bear the “BNQ” mark of conformity, the BNQ Product Designation, as specified in Table 1, as well as all other identification marks specified by BNQ.

1860.08 QUALITY ASSURANCE

1860.08.01 General

When the Owner has elected to carry out QA testing to ensure that material used in the Work is according to the requirements of this specification, applicable geotextiles shall be sampled and tested according to the methods identified in Tables 1, 2, or 3, at the following rates:

a) For Class I or II geotextile, one sample per 10,000 m^2 of installed product.

b) For knitted sock geotextile, one sample per 10,000 m of installed subdrain pipe wrapped with knitted sock geotextile.

c) For temporary silt fence geotextile, one sample per 10,000 m of silt fence barrier installed.

When the quantity of a geotextile is less than the lot size specified above, a minimum of one QA sample per each geotextile type shall be tested to verify that the material meets the requirements of this specification.

Testing shall be carried out at a laboratory designated by the Owner. The Owner shall be responsible for all costs associated with QA testing.

1860.08.02 Sampling

1860.08.02.01 General

QA sampling shall be carried out by the Contractor, in the presence of the Contract Administrator.

Sampling shall be according to ASTM D4354 and as specified in the Contract Documents.

All QA samples shall be duplicate samples with both samples taken side-by-side.

Each sample shall be rolled and placed into separate UV-protective containers (e.g., sealed cardboard box or opaque plastic bag). If a rolled sample is too large to fit within a UV-protective container, it may be folded in a manner that minimizes the number of folds required to fit the sample into the container.

Each sample shall be accompanied with a copy of the roll label or identification tag, as well as the appropriate contract-related information and testing requirements, as specified in the Contract Documents. All such information shall be placed in a moisture-proof envelope directly attached to each UV-protective container.

1860.08.02.02 Sample Size, Preparation, and Marking

Samples of Class I and Class II geotextiles shall be the full width of the roll and at least 2.0 meters in length in the machine direction.

Samples of temporary silt fence geotextile and knitted socks shall be a minimum of 3.0 m^2 in area.

When samples are taken from a roll of material for testing, at least one full lat of the material from that roll shall be discarded prior to sampling.

All samples shall be completely dry, free of damage, dust, or other contamination, at all times. Any samples that have been allowed to become moist or wet shall be air-dried in a protected place, away from direct sunlight until they are completely dry prior to packaging.

All samples shall be permanently marked with the machine direction.

For temporary silt fence geotextile that is attached to wooden stakes, the wooden stakes shall be carefully removed to avoid any tearing of the geotextile and the stakes discarded. The area within 150 mm of each of the stakes that were removed, shall then be permanently marked by crosshatching, to ensure that such areas are not used for testing.

1860.08.03 Acceptance

When QA testing has been carried out, QA test results shall be used for acceptance purposes.

1860.08.04 Referee Testing

The Contractor may invoke referee testing for one or more attributes by submitting a written request to the Contract Administrator, within five Business Days following notification that a sample representing a lot of geotextile does not meet the requirements of this specification. The notification shall include the type and, where applicable, the class of geotextile, as well as the specific attribute or attributes for which the referee testing is being requested.

The retained duplicate QA samples shall be used for referee testing.

Referee testing shall be carried out, as specified herein and elsewhere in the Contract Documents.

All referee test results for a lot shall replace the respective QA tests for acceptance of the applicable lot and shall be binding on both the Owner and the Contractor.

When a referee test result shows that the materials are in accordance with the physical property requirements of this specification, then the material represented by that test result shall be accepted.

When a referee test result shows that the material does not meet the physical property requirements of this specification, then the material represented by that test result, including any material already in the Work, shall be considered rejectable. Rejected material shall be replaced at no additional cost to the Owner.

If a lot is considered rejectable based on the referee test results, then the Contractor shall also be responsible for the cost of the referee testing of that lot, including the cost of transporting the samples to the referee laboratory, at the rates specified in the Contract Documents. In all other cases, the Owner shall bear the cost of the referee testing and the cost of transporting the samples of that lot.

TABLE 1
Physical Property Requirements for Woven and Non-Woven Geotextiles

Property	Test Method	Unit	Geotextile Class			
			Class I		Class II*	
			Woven	Non-Woven	Woven	Non-Woven
			BNQ Product Designation			
			OPSS 1860-I-W	OPSS 1860-I-N	OPSS 1860-II-W	OPSS 1860-II-N
Tensile strength, MARV, minimum	ASTM D 4632/D 4632M	N	800	350	1100	700
Tear strength, MARV, minimum	ASTM D 4533/D 4533M	N	300	180	400	250
Puncture strength, MARV, minimum	ASTM D 6241	N	1650	990	2200	1375
Permittivity, minimum	ASTM D 4491/D 4491M, Method A	s^{-1}	0.05			
Filtration opening size (FOS), typical	CGSB 148.1, Method No. 10	µm	As specified in the Contract Documents			
Ultraviolet stability, minimum	ASTM D 4355/4355M	%	50% retained tensile strength at 500 hours			

**Note: A Class II Woven geotextile may be used to replace a Class I Woven geotextile or a Class II Non-Woven geotextile may be used to replace a Class I Non-Woven geotextile, as long as the geotextile being proposed for use meets the requirements for Filtration Opening Size (FOS), according to CGSB 148.1, Method No. 10, as specified in the Contract Documents.*

TABLE 2
Physical Property Requirements for Knitted Sock Geotextiles

Property	Test Method	Acceptance Requirements
Puncture resistance, N	ASTM D6241	800
FOS, maximum, µm	CGSB 148.1, Method No. 10	As specified in the Contract Documents
Permittivity, minimum, s^{-1}	ASTM D 4491/D 4491M, Method A	1.0

TABLE 3
Physical Property Requirements for Temporary Silt Fence Geotextiles

Property	Test Method	Unit	Supported Silt Fence	Unsupported Silt Fence	
				Woven	Non-Woven
Maximum post spacing	-	m	1.2	2.0	1.2
Tensile strength, MARV, minimum	ASTM D 4632/ D 4632M	N	400	550	
Permittivity, minimum	ASTM D 4491/ D 4491M	s^{-1}	0.05		
Filtration Opening Size (FOS), maximum	CGSB 148.1, Method No. 10	µm	As specified in the Contract Documents		
Ultraviolet stability, minimum	ASTM D 4355/ D 4355M	%	70% retained tensile strength at 500 hours		