SPECIFICATION FOR NON-WOVEN GEOTEXTILES

1. General

1.1 Scope

This specification covers the technical and general requirements for the supply and installation of Non-Woven Geotextile as described herein. All materials used shall meet the requirements of this specification and all works shall be executed in accordance with the details shown on the drawings and the procedures described herein.

1.2 Contractor to Provide

The Contractor shall provide all necessary resources including materials, skilled workers, and plants/equipment to execute and complete the works related to supply and laying of non-woven geotextile as shown on the drawings.

1.3 Setting-Out

The Contractor shall be responsible for the true and proper setting-out of the areas to which the Non-Woven Geotextile is to be placed and for the correctness of the lines, widths, levels and slopes.

2. Material Properties

2.1 Products

All non-woven geotextile shall be from an approved manufacturer and shall be manufactured from polypropylene, polyester or polyethylene as shown in the Drawings. Non-Woven Geotextiles shall be durable and resistant to naturally occurring chemical, fungi and bacteria when installed in contact with the materials to be separated. Non-Woven Geotextiles shall be free of any flaws that may have an adverse effect on the physical and mechanical properties of the non-woven geotextiles.

Unless otherwise approved by the Engineer, non-woven geotextile fabrics shall be needle punched staple fiber geotextile in accordance with the Specification and shall be used as shown and described on the Drawings or as directed by the Engineer.

Non-Woven Geotextiles shall be stabilized against ultra-violet radiation to the degree that one month’s exposure of the geotextile to sunlight shall not reduce its strength to less than 80% of the specified strength rating in the Specification.

The width of each roll of non-woven geotextile shall be 4m.

2.2 Technical Properties

The type of non-woven geotextile fabrics as shown or as described on the Drawings shall comply with the following properties as listed in Tables 1a, 1b and 1c below:

Table 1a: Properties of Non-Woven Geotextile

ITEM	PROPERTIES	TEST METHOD	UNIT	Non Woven Geotextile Type A
1	Mass per unit area	ISO 9864	g/m²	>210
2	Thickness	ISO 9863	mm	>1.9
3a	Wide width tensile strength	ISO 10319	kN/m	>15
3b	Wide width elongation at break	ISO 10319	%	>50
4	Trapezoidal tear strength	ISO 9073/4	N	>360
5	CBR Puncture Resistance	ISO 12236	N	>2350
6	Permeability at 50mm head	ISO 11058	l/m²/sec	>70
7a	Grab tensile strength (md/cd)	ASTM D 4632	N	>900
7b	Grab elongation (md/cd)	ASTM D 4632	%	>60
8	Rod puncture resistance	ASTM D 4833	N	>450
9	Cone drop	BS 6906/6	mm	<21
10	Permeability at 100mm head	BS 6906/3	l/m²/sec	>120
11	Apapent Pore size O_{95}	ASTM D4751	micron	<106
12	Composition			100% Polypropylene, UV Stabilised Non-woven Needle Punched
13	Chemical Resistance			No influence between pH 2 to 13

2.3 Locally Produced Products

The Non-Woven Geotextile to be used in this contract must be fully of Malaysian origin. The non-woven geotextile shall be produced by local factory with ISO certification and equipped with testing laboratory, where sampling and testing can be readily carried out.

2.3 Product Quality Assurance

The contractor must provide a Certificate Of Approval from the Manufacturer to confirm that their Local Manufacturing Factory's production and management system are certified to be operating under a Quality Management System consistent with at least the Quality Standards BS EN ISO 9002 : 2000 or equivalent.

3. Testing

3.1 General

Prior to the procurement of materials, the contractor shall provide a sample and the Manufacturer's Independent Test Report (ITR), showing full compliance of the proposed Non-Woven Geotextile to all the above-specified property values corresponding to their respective test methods, for the approval of the Engineer.

All tests shall be carried out in accordance with the codes of Practices and Standards as provided within this specification, unless otherwise approved by the Engineer. The independent test report and tests shall be prepared and carried out at reputable institution or laboratory such as SIRIM, IKRAM, UTM, UKM, UPM, UM or other accredited laboratories approved by the Engineer.

Routine sample testing, when requested and specified, shall be carried out at factory or at an independent laboratory witnessed by the Engineer's representative. The Contractor shall submit test report showing compliance of the specification by independent testing authority or laboratory such as listed above or an accredited laboratory approved by the Engineer.

3.2 Consignment Certificate

For the purpose of ascertaining that each consignment of Non-Woven Geotextile supplied to site is to the approved type and quality and are fully from the same Manufacturer and batch as indicated, the contractor must furnish with every consignment, an original Consignment Certificate from the Manufacturer giving the following information:-

- Name and Address of the Manufacturer
- Contact telephone/fax/email address of the Manufacturer
- Consignment Certificate Reference Number and Date
- Title of the Contract and Name of Project Owner
- Name and Address of the Purchaser
- Product Types and Quantities, corresponding to each consignment

3.3 Details of Test Certificates

The test certificate shall include the following:

- Wide Width Tensile Strength (longitudinal/transverse)
- Elongation (longitudinal/transverse)
- Trapezoidal Tear Strength
- CBR Puncture Resistance
- Apparent Pore Size (O_{95})
- Permeability

3.4 Routine Testing

Prior to installation and at the discretion of the Engineer samples of each 50,000m2 of non-woven geotextile fabric shall be selected for routine test at the testing laboratory located in the factory or other approved laboratories.

The properties to be tested shall comprise index properties including unit mass, mechanical properties including tensile strength, trapezoidal tear, Puncture Resistance and hydraulic properties including pore size and permeability. Where the individual samples fail to satisfy the requirements of this Specification on the geotextile fabric the roll from which the sample is obtained shall be rejected. Two additional samples shall then be selected from two other rolls of the same batch of non-woven geotextile fabric. If either of these two additional samples fails to comply with the requirements, the entire batch represented by the samples shall be rejected.

4. Packaging and Storage

4.1 Product Labeling

The Non-Woven Geotextile shall be supplied with the Manufacturer's Label on each roll showing the following identifications:-

- Product Brand Name
- Product Type
- Roll Width and Length
- Batch Serial Number

4.2 Product Packaging

The Non-Woven Geotextiles shall be supplied in rolls, labeled and wrapped in packaging materials to protect against water and photo-degradation by ultraviolet light.

4.3. Storage at Site

The Contractor shall ensure that the Non-Woven Geotextile is properly stored in a covered area at the worksite. If no covered area is available, the Non-Woven Geotextile may be stored on raised platform and covered with a waterproof canvas.

The Contractor is solely responsible for the good condition of the Non-Woven Geotextile stored at the worksite and in the event of damages or deteriorations of the non-woven geotextile due to improper storage, he shall be liable to replace the affected materials at his own cost when directed to do so by the Engineer..

5. Installation

5.1. General

Installation of non-woven geotextile shall be carried out by qualified and experienced workers under the supervision of a qualified Engineer.

5.2 Non-Woven Geotextile Exposure following Placement

Exposure of non-woven geotextile to natural elements between placement and cover shall be an aggregated period to a maximum of seven (7) days to minimize damage.

5.3 Site Preparation

Prior to the installation of the non-woven geotextile fabric, site clearance shall be carried out in accordance with the Specification and Drawings or as directed by the Engineer. All voids shall be filled with suitable material and the area cleared of large stones and exposed tree root systems or other such like protrusions.

5.4 Installation of Non-Woven Geotextile

Non-Woven Geotextile fabric shall be installed to the shape and requirements as specified herein or as shown and described on the Drawings. The non-woven geotextile shall be unrolled smoothly on the prepared ground as approved by the Engineer and generally in a direction perpendicular to the edge of the platform, embankment or area of fill as approved by the Engineer. Adjacent non-woven geotextile rolls shall be overlapped and sewn in accordance with this Specification. Overlapping of non-woven geotextiles without sewn connections shall only be allowed with the approval of the Engineer.

5.5 Sewn Seams

The non-woven geotextile fabric shall be joined using an approved portable industrial sewing machine and by sewing a double chain stitch with ‘J’ or ‘prayer’ seam (minimum lap of 50mm) with high tenacity polyester thread and a minimum of 3 stitches per 25mm shall be required. The thread shall have a breaking load of not less than 200N. The expected seam strength shall be more than 70% of the original strength of separator non-woven geotextiles. Samples of such sewn seam assembly shall be tested in accordance with ASTM D4884 as deemed necessary by the Engineer.

5.6 Fill placement

The specified overlying fill material on the non-woven geotextile fabric, shall be placed in accordance with the requirements shown and described on the Drawings or as directed by the Engineer. These fill materials shall be deposited in layers not exceeding 500mm loose depth or at a thickness controlled by the compaction effort requirement and shall be spread simultaneously with the dumping in a manner to prevent any localized distress or failure of the ground.

5.7 No traffic shall travel directly on the non-woven geotextile and there shall be no sudden stops, starts or turns on the fill materials by the construction equipment or other such actions that may cause damage to the non-woven geotextile.