TENDER SPECIFICATIONS

POLYESTER NONWOVEN GEOTEXTILE BAG

1. GENERAL

This work intends to supply the geotextile bag made up of polyester (PET) yarn conforming to material specifications stated herein, as per the bill of quantity and schedule of supplies enclosed.

The contractor shall furnish all labour, materials, equipment, and incidentals as shown, specified and required in connection with deployment, anchorage and filling of the geotextile bag, in accordance with the lines, grades, design, and dimensions as required for the same.

2. MATERIAL PROPERTIES

2.1 General Requirements

Geotextile bags is a novel, sustainable, and three-dimensional protection system that deals in the field of river and coastal engineering. PET geotextile bags shall be made up of nonwoven polyester geotextiles which are filled with sand/ dredged material at the site. Geotextile bags are used at sea shores or bunds adjacent to rivers which are to be protected from erosion, especially during emergency situations. Geotextile bags have also been used as revetments, breakwaters etc. to build structural erosion protection.

Geotextile bag material shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. The specially engineered textile and factory-sewn seams (having a minimum of 80% efficiency i.e., a minimum of 80% of the parent fabric) utilized in the construction of the geotextile bags shall meet the requirements as specified in Table 2.

2.2 Stitching Requirements

The geotextile bags shall have a seam with double-line chain stitches along the edges on two sides. The sewing shall be done at a minimum distance of 10 mm from edges by using a ring-spun PET/PP thread of linear density 2500-3000 Denier for bags up to

400 g/m^2. The stitching shall be uniform without any loose thread or knot. The distance between the two rows of stitches shall be 5 to 10 mm. Stitch lines on both sides of the bags shall continue beyond the bag's open mouth and end in a loose loop of the thread of length 25 to 50 mm. The ring-spun polyester/polypropylene thread used for stitching.

2.3 Transportation, Storage and Handling

The geotextile bags shall be delivered at the site in the form of bundles of individual units with robust packing to avoid any damage during transportation. All the bundles shall have a protective cover with a label or tag specifying the name of the product, name of the manufacturer, roll number, roll dimension and date of manufacture. The material shall be protected from sunlight, mud, dirt, debris, and any other harmful substances or mechanical damage during transportation and storage.

The geotextile bags shall be stored in such locations where water shall not accumulate and the area shall be immune from conditions that may affect the properties or performance of the product. No hooks, tongs, or other sharp instruments should be used to handle geotextile bags. The supplied geotextile bags should not be dragged along the ground. Geotextile bags should be opened from bales and filled as recommended by the manufacturer.

Geotextile bags shall not be exposed to temperatures over 60° C and the duration of storage time shall not exceed the manufacturers' recommendation. Any material, which is damaged during transportation, handling or storage and does not meet the minimum requirements of the specifications is liable for rejection by the engineer.

2.4 Quality Control and Testing

- All products shall be the standard product of a manufacturer who has been regularly engaged in the design, manufacturing and fabrication of the geotextile, and whose geotextile has proven reliable in service for a minimum of 5 years.
- Manufacturer shall have ISO 9001:2015 certified quality systems with in-house testing facilities as per NABL accredited ISO/IEC 17025:2017 for carrying out the required tests on geotextiles used for manufacturing of Geotextile bags.
- The manufacturer shall submit CE Certification from one of the European agencies for nonwoven geotextile.

- The supplier shall be the manufacturer of specified geotextiles required for manufacturing the Geotextile bags. Manufacturers having manufacturing facilities within India for the last 5 years will only be approved.
- The manufacturer is required to submit the supply certificate for the supply of bags to government approved contractors.
- Geotextile bags shall be dimensionally stable and able to retain their geometry under manufacture, transport, and installation.
- The manufacturer shall submit a notarized certification indicating that the material used for manufacturing geotextile bags shall abide by the testing requirements as indicated in Table 1.
- Manufacturer should have in-house testing facilities having testing provisions for test methods as mentioned below-

Table 1: List of in-house testing facilities and testing provisions.

S.No	Standard No.	Title of Standard	Scope	Edition/ Year	Publication
1	ASTM D 4354-20	Sampling of geosynthetic	Testing procedure	2020	ASTM International
2	ASTM D-5261-18	Test Method for Measuring Mass per Unit Area of Geotextiles	Testing procedure	2018	
3	ASTM D-5199-19	Test Method for Measuring the Nominal Thickness of Geosynthetics	Testing procedure	2019	
4	ASTM D-4632-15	Test Method for Grab Breaking Load and Elongation of Geotextiles	Testing procedure	2015	
5	ASTM D-6241-14	Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe	Testing procedure	2014	
6	ASTM D-4751-21a	Test Method for Determining Apparent Opening Size of a Geotextile	Testing procedure	2021	
7	ASTM D-4355-18	Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus	Testing procedure	2018	
8	ASTM D-4491M-22	Test Methods for Water Permeability of Geotextiles by Permittivity	Testing procedure	2022	
9	ASTM D-4533-15	Test Method for Trapezoid Tearing Strength of Geotextiles	Testing procedure	2015	
10	ASTM D-4595-17	Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method	Testing procedure	2017	
11	ASTM D 4716 -20	Determination of Flow capacity	Testing procedure	2020	
12	ASTM D-4833-07	Test Method for Index Puncture Resistance of Geomembranes and Related Products	Testing procedure	2007	
13	EN ISO-9863-1-16	Test Method for Measuring the Nominal Thickness of Geosynthetics	Testing procedure	2016	EN ISO Publication
14	EN ISO-9864-05	Test Method for Measuring Mass per	Testing procedure	2005	

15	EN ISO-10319-15	Geosynthetics Wide width Tensile Test	Testing procedure	2015	
16	EN ISO-12236-06	Static puncture Test (CBR)	Testing procedure	2006	
17	EN ISO-11058-19	Water Permeability of Geotextiles	Testing procedure	2019	
18	EN ISO 12956-10	Apparent Opening Size of a Geotextile	Testing procedure	2010	
19	EN ISO 12958	Determination of Flow capacity	Testing procedure	2010[E]	
20	EN ISO 13433-06	Cone Drop Test	Testing procedure	2006	
21	EN ISO 12224	Determination of the resistance to weathering	Testing procedure	2000	
22	ISO-17025:2017	General Requirements for Competence of Testing	For ISO	2017	ISO

2.5 Physical Properties

Technical Specifications

Table 2: Technical Requirements of Polyester Nonwoven Geotextile Bags used for Coastal/ Waterways Protection-

S.No.	Properties	Test method	Unit	Value
1	Wide width Tensile Strength, Min. (MD/CD)	IS 13162 (Part 5)	kN/m	9 (-1) 9 (-1)
2	Elongation, Min.MD/CD	IS 13162 (Part 5)	%	50
3	Seam Strength, Percent of Original Fabric Strength, Min.	IS 15060/ ISO 10321	%	≥65
4	Trapezoidal tear strength, Min. MD/CD	IS 14293/ ISO10321	N	240
5	CBR Puncture Resistance, Min.	IS 12236	N	1400
6	Water Permeability at 100 mm Water head, Min.	IS 14324	($1/m^2/s$)	60
7	Apparent Opening Size (AOS), Max.	IS 14294	μm	100 (+30)
8	Permittivity, Min.	IS 14324	1/s	1.2
9	Thickness under 2kPa, Min.	IS 13162 (Part 3)	mm	1.8
10	Polymer Type, Polyester (PES) or Polypropylene (PP)	IS 667		Polyester Fiber
11	Mass, Average	IS 14716	g/m^2	280
12	Stitch Yarn			2500-3000
13	Stitch type			Double line chain stitchwith Overlap
14	Geobag weight (Average)			420 grams
15	Bag Size, OD i.e, Outer to Outer Dimension			1.0m x 0.7m

2.6 Infill Material

The infill material utilized to fill the geotextile bags shall be locally available sand or dredged material. The infill sand shall be such that the Apparent Opening Size (AOS) of the geotextile material is lesser than the D_{15} of the infill material. It shall be ensured that the bags are not damaged or excessively distorted during filling. The geotextile bags shall be filled up to the design weight /capacity and excess filling shall be checked. Once the geotextile bags have been filled to the required capacity, the mouth/ Filling side shall be closed by two lines of chain stitching. The geotextile bags shall be stitched at the mouth using a bag closing machine. Stitching shall continue beyond the bag's end in a loose loop of the thread of length 25 to 50 mm. Only 2500-3000 denier Polypropylene Multifilament threads shall be used for the mouth closing of Geotextile bags.

3. INSTALLATION

3.1 Site Preparation

The surface upon which the geotextile bags are to be placed shall be prepared by clearing, grubbing, and excavating or filling the area to the design grade along with the removal of topsoil and vegetation. The backfill soil shall be well compacted and free from surface undulations. However, prior to beginning the execution at the site, the contractor shall submit a detailed plan of construction describing the sequence of operations for the installation of the geotextile bags at the site.

3.2 Laying of geotextile bag at site

The geotextile bags shall be filled with suitable river sand or dredged material before being laid along the river profile on the slopes and bed. The geotextile bag shall be filled up to the required height considering that the induced seam and fabric tensile stresses should not exceed the tensile strength of the material.

4. APPROVED MANUFACTURERS

4.1 Approved Manufacturers

Techfab (India) Industries Ltd.
712, Embassy Centre,
Nariman Point, Mumbai – 400021
Phone: 022 – 2287 6224/6225
Fax: 022 – 2287 6218

5. DELIVERY

Delivery of the PET nonwoven geotextile bag shall be done according to the delivery schedule.

6. PAYMENT

6.1 Method of Measurement

The quantity shall be measured by the number of geotextile bags received at the customer's / contractor's store.

6.2 Basis of Payment

Payment for the supply of geotextile bags shall be made at the contract price per unit bag, which shall be full compensation for the cost of materials, transportation, duties and taxes.