भारतीय मानक
Indian Standard

IS 19104 : 2024

कच्चे नारियल के रेशों की पिथ ब्लाक — विशिष्टि भूकृत्रिम — तटीय और जलमार्ग संरक्षण के लिए भूवस्त्रादि नली — विशिष्टि

Geosynthetics — Geotextile Tubes for Coastal and Waterways Protection — Specification

ICS 59.080.70

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

December 2024 **Price Group 7**

Geosynthetics Sectional Committee, TXD 30

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Geosynthetics Sectional Committee had been approved by the Textiles Division Council.

Geotextile tubes find wide usage in riverbanks, beach protection, sludge dewatering and offshore breakwaters for coastal and waterways protection. These are made from polypropylene (PP) or polyester (PET) monofilament, multifilament or fibrillated woven geotextiles, and are used for protecting riverbanks and hydraulic structures from severe scouring and erosion. Geotextile tubes are also used as revetments, breakwaters to build structural erosion protection measures. Such tubes provide stability and prevent soil and coastal erosion. Geotextile tubes technology possesses minimal impacts on fish resources and facilitates fishing activities. It also facilitates the algal community to grow. The technology has been popular worldwide due to its easier installation, cost effectiveness, their technical efficiency and environmental friendliness in comparison to the conventional erosion protection work using cement concrete block, gravel, hard rock, etc.

Worldwide it has been seen that erosion protection work using geotextile tubes requires less installation and maintenance cost, light weight equipment, less space for construction work, much less transportation cost and less energy requirement. The constructing materials of geotextile tubes are locally available and cost-effective compared to importing boulders from other sites. The geotextile tubes are lighter in weight than the traditional materials and their manufacturing and quality control are easy as compared to the cement concrete blocks and boulders. Geotextile tubes are filled with dredged material and are generally used when sea shores or bunds adjacent to rivers are to be protected in case of an emergency.

For best performance, geotextile tubes have to be filled to maximum volume and density with dredged material based on design. These are installed in a pattern-placed arrangement that greatly improves their overall stability and performance. Filling task can be efficiently done by using water to compact the dredged material (hydraulically filling the dredged material into a tube). Filled density and volume are important from the view point of maximizing the stability, minimizing the effects of fill liquefaction and loss of shape of the geotextile tubes. To ensure that the contained fill is maintained in its dense state, the geotextile sheet shall have adequate tensile strength.

One major advantage of geotextile tubes is that these units can be used to construct hydraulic and marine structures that require adherence to designed geometrical shape accurately. Geotextile tubes have significantly larger dimensions and use higher strength woven geotextile. Sometimes nonwoven fabrics are used as inner lining of the tubes. The construction allows large amount of sludge and silt to be easily removed without having to constantly change or replace bags. Geotextile tubes sizes can be custom made to your required location and surface area.

This geotextile tubes can be used for a range of hydraulic and marine applications as given below:

a) Harbour and shoreline remediation
    1) Submerged breakwater
    2) Detached breakwater
    3) Groyne
    4) Harbor basin sludge dredging
    5) Channel sediment dredging

b) River/wetland remediation
    1) Riverbed protection
    2) River channel dredging
    3) Wetland remediation

(*Continued on third cover*)

Indian Standard

GEOSYNTHETICS — GEOTEXTILE TUBES FOR COASTAL AND WATERWAYS PROTECTION — SPECIFICATION

1 SCOPE

This standard specifies requirements for geotextile tubes made from polypropylene (PP) or polyester (PET) monofilament, multifilament or fibrillated woven geotextiles, used for sludge dewatering**,** coastal and waterways protection applications such as revetments, river training, construction of groynes and artificial reefs etc, in order to minimize soil erosion and control floods.

NOTES

1 The survivability/durability of geotextile tubes depends upon water pressure, soil condition, type of contents of geotextile tubes that is sand or gravels, *p*H of water and temperature etc.

2 This standard does not apply to other types of geosynthetic erosion control materials such as turf reinforcement mats.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 13321 (Part 1) and the followings shall apply:

3.1 Fill Port — Also called a fill spout or fill nozzle, fill ports are sleeves sewn into the top of the geotextile tube into which the discharge pipe is inserted. Ports are typically 300 mm to 450 mm in diameter and 1.0 m to 1.5 m length. Ports are spaced along the top of the tube to provide access to the contractor.

3.2 Minimum Average Value (MAV) — Average value minus two standard deviations. Statistically, it yields a 97.7 percent degree of confidence that any sample taken during quality assurance testing will exceed value reported.

3.3 Scour Apron — An apron of geotextile designed to protect the foundation of the main geotextile tube from the undermining effects of scour. In coastal and riverbed applications, scour can occur at the base of the tube due to wave and current action. Scour aprons may be on both sides of the main tube, or on only on the water front side. Scour aprons also reduce local erosion and scour caused during the hydraulic filling process of the main tube. Scour aprons are typically anchored by a small tube at the water's edge or by sandbags attached to the apron.

4 REQUIREMENTS

4.1 Material of Geotextile Tube

4.1.1 Geotextile tubes shall be made from monofilament, multifilament or fibrillated woven fabric manufactured from ultraviolet stabilized polypropylene or polyester, depending upon the end use requirements and shall conform to requirements as specified in Table 1. The geotextile tubes shall be inert to commonly encountered chemicals, resistant to rot and mildew and shall have no tear or defects which adversely affect or alter its physical properties.

4.1.2 The geotextile tube shall be made of soil tight, permeable and high strength woven geotextile sheets sewn along the edges with inlets sewn at regular intervals. If required, the tubes may be designed as inner and outer tube. The inner tube (if required) may be of nonwoven fabric that acts as a filter to retain the fine-grained material and shall conform to requirements as specified in Table 2. The outer layer shall be made from high-strength woven fabric to withstand the weight of the fill material and the pumping pressure necessary to fill the tube to the required height.

4.2 Geotextile tubes shall be dimensionally stable and able to retain their geometry under manufacture, transport, and installation.

Table 1 Requirements for Polypropylene and Polyester Geotextile Tubes

(*Clauses* 4.1.1 *and* 8.3.2)

Sl No.	Characteristic	Requirements					Method of Test, Ref to
		Type 1	Type 2	Type 3	Type 4	Type 5	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A.	Mechanical Properties:						
i)	Polymer type	Polypropylene or Polyester					IS 667
ii)	Wide width tensile strength, kN/m, *Min*:						IS 16635
	a) Machine direction	75	125	175	200	250	
	b) Cross machine direction	75	125	175	200	250	
iii)	Elongation at designated tensile strength, percent, *Max*						IS 16635
	a) Machine direction	25	25	20	20	20	
	b) Cross machine direction	25	25	20	20	20	
iv)	Seam strength, percent of actual fabric strength, *Min*	70	70	70	70	70	IS 15060
v)	Trapezoidal tear strength, kN, *Min*						IS 14293
	a) Machine direction	1.0	1.5	2.5	3	3.2	
	b) Cross machine direction	1.0	1.5	2.5	3	3.2	
vi)	CBR puncture resistance, kN, *Min*	7	10	12	15	20	IS 16078
B.	Hydraulic Properties:						
i)	Water permeability at 50 mm water head, $l/m^2/s$, *Min*	5	5	5	3	3	IS 14324
ii)	Apparent opening size (AOS), mm, 0_{95}, *Max*	0.30	0.25	0.25	0.20	0.20	IS 14294
iii)	UV resistance after 500 h, retained tensile strength in machine and cross direction, percent, *Min*	70	70	70	70	70	IS 13162 (Part 2)
iv)	Chemical resistance after 72 h immersion in chemicals, retained tensile strength, percent, *Min*	70	70	70	70	70	IS 16351
v)	Abrasion resistance by sliding block method, retained tensile strength in machine and cross direction after 250 cycles, percent	70	70	70	70	70	IS 14714

Table 2 Requirements for Nonwoven Inner Layer of Geotextile Tubes

(*Clause* 4.1.2)

Sl No.	Characteristic	Requirements	Method of Test, Ref. to
(1)	(2)	(3)	(4)
i)	Material	Polypropylene or Polyester	IS 667
ii)	Mass, g/m^2, *Min*	150	IS 14716
iii)	Ultimate tensile strength, kN/m, *Min*		IS 16635
	a) Machine direction	6.0	
	b) Cross machine direction	7.5	
iv)	Grab tensile strength, N, *Min*		
	a) Machine direction	500	IS 16342
	b) Cross machine direction	500	
v)	Trapezoidal tear strength, N, *Min*		IS 14293
	a) Machine direction	200	
	b) Cross machine direction	200	
vi)	Apparent opening size, $O_{95,}$ Micron, *Max*	250	IS 14294
vii)	Water permeability at 50 mm waterhead, l/m^2/s, *Min*	90	IS 14324
viii)	UV resistance, retained strength after 500 h of UV exposure, percent, *Min*	70	IS 13162 (Part 2)

4.3 Prefabrication of Geotextile Tubes

4.3.1 Geotextile tubes shall be prefabricated using white or black colour UV stabilized high strength polyester or polypropylene multifilament yarn. The geotextile tubes shall have seam with six lines parallel chain stitch along the edges on the two sides with a minimum stitch density of 12 stitches/dm. Number of stitches is chosen in such a way that seam strength is achieved at least 70 percent of its original strength. The stitching yarn shall be UV resistance such that, retained tensile strength after 500 h exposure shall not be less than 50 percent of its original value. The sewing shall be done by using a UV stabilized high strength polyester or polypropylene multifilament yarn in circumferential or longitudinal stich pattern, as the case may be of minimum linear density 2 000 Denier. The distance between the two rows of stitches shall be 10 mm. Stitch on both lines of the geotextile tube shall continue beyond the tube's open mouth and end in a loose loop of thread of length 25 mm to 50 mm. The stitching shall be uniform without any loose thread or knot.

4.3.2 The fill port shall be made of the same geotextile as of the main geotextile tube. The spacing between the fill ports shall usually be no closer than 5 m to accommodate sand slurry but can be as far apart as 30 m for some viscous fill materials. The end filling ports shall be maximum 2.50 m away from the edge of the tube. There shall be another safety pocket outer to spout/port so that it can be kept safely inside this cover/sack after filling to avoid floating/laying in the geotextile tube.

NOTES

1 A scour apron may be provided at the base of geotextile tube to protect the foundation of the main geotextile tube from the undermining effects of scouring, and to reduce local erosion and scour caused during the hydraulic filling process. The requirements for scour apron shall be as per agreement between buyer and seller.

2 All property values except elongation and apparent opening size in this standard represent minimum values. Average of test results from any sampled tube in a lot shall meet or exceed the minimum values specified in this standard. The values for elongation and apparent opening size, represent the maximum values.

4.4 Dimensions

Geotextile tube may be either longitudinal or circumferential in shape as shown in Fig. 1 and Fig. 2 respectively. The typical dimensions of the geotextile tube, spout/filling port and loop are given

in Table 3, Table 4 and Table 5 respectively. The geotextile tubes may be made to other shapes and dimensions as per agreement between buyer and seller.

5 MARKING AND LABELLING

5.1 The geotextile tubes shall be marked with the following by attaching the printed labels:

a) Manufacturer's name, initials or trade-mark;

b) Identification of the geotextile tubes material as per manufacturer's recommendation, for example, polypropylene woven geotextile tubes for coastal/waterways protection;

c) Type of geotextile tubes that is Type 1, Type 2, Type 3, Type 4 or Type 5;

d) Dimensions (length and width) of geotextile tubes;

e) Batch number, lot number and date of manufacture;

f) The country of origin; and

g) Any other information/instruction provided by the manufacturer/required under law.

5.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

6 PACKING

Each bundle of geotextile tubes shall be labeled or tagged to provide sufficient information for field identification as well inventory and quality control purpose.

Bundles shall be stored in a manner which protects them from adverse impact of weather. If stored outdoors, they shall be elevated and protected with a waterproof cover. Geotextile tubes are laid flat in a high density polyethylene tube or wrapped in a high density polyethylene film of minimum thickness of 60 microns and tied with a high density polyethylene or polypropylene tape so as to remove excess air and to prevent it from the adverse impact of heat and moisture, oil, grease, dirt, dust and other stains as well as to extended ultra-violet exposure during shipment and storage prior to deployment and placement.

7 IDENTIFICATION, DELIVERY, STORAGE AND HANDLING

7.1 The finished geotextile tube and its associated scour apron shall be rolled on a stable core or accordion, folded into a bundle for handling, storage and shipment. The geotextile tube and/or scour apron is to be protected by an outer wrapping or plastic bag. The manufacturer's identification label shall be clearly visible on the outer wrapping and in a manner consistent with the established policy of the manufacturer.

7.2 Geotextile tubes and scour aprons shall be labeled, shipped, stored, and handled in accordance with IS 17421 and as specified herein. Each segment of geotextile tube and scour apron shall be wrapped in an opaque layer of plastic during shipment and storage. The plastic wrapping shall be placed around the unit in the manufacturing facility and shall not be removed until deployment. Each packaged segment of geotextile tube and/or scour apron shall be labeled with the manufacturers name, geotextile type, lot numbers, roll numbers, and dimensions (length, width, gross weight). For the purposes of inventory and shipping, bar code system may be followed.

7.3 During storage, Geotextile tubes shall be elevated off the ground and adequately protected from the following:

a) Site construction damage;

b) Excessive precipitation;

c) Extended exposure to sunlight;

d) Aggressive chemicals;

e) Flames or temperatures in excess of 60 °C;

f) Excessive mud, wet concrete, epoxy, or other deleterious materials coming in contact with and affixing to the geotextile material; and

g) Any other environmental condition that may damage the physical property values.

7.4 The geotextile tubes shall be stored at temperatures above 10 °C and below 40 °C.

7.5 The geotextile tubes shall be laid flat.

7.6 The geotextile tubes shall not be directly exposed to sunlight for a period longer than the period recommended by the manufacturer.

7.7 The geotextile tubes shall be kept dry until installation, and shall not be stored directly on the ground.

8 SAMPLING AND CRITERIA FOR CONFORMITY

8.1 Lot

The number of geotextile tubes of the same size, type and quality delivered to a buyer against one dispatch note shall constitute a lot.

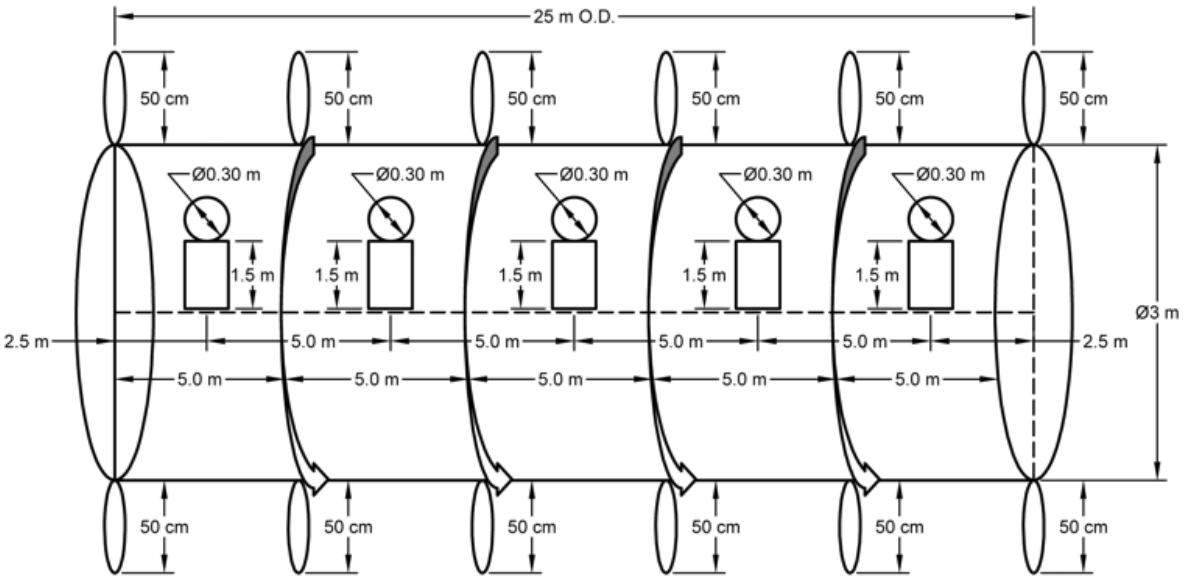
8.2 The number of geotextile tubes to be selected at random shall be according to col (3) and col (5) of Table 6. To ensure the randomness of selection, IS 4905 may be followed.

8.3 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

8.3.1 The number of geotextile tubes to be selected for length, width, and mass of sand to be filled and prefabrication requirements shall be in accordance with col (3) of Table 6. For tensile strength, elongation, seam strength and water permeability, the number of geotextile tubes selected shall be in accordance with col (6) of Table 6.

NOTE — If agreed to between buyer and seller, the sampling at the consumer/user end at site shall be carried out for deciding the conformity of the lot.

8.3.2 All the geotextile tubes selected from the lot shall be tested for various requirements as per methods specified in relevant standards as specified in Table 1 and in **4.1.1**, **4.1.2**, **4.2** and **4.3**. A geotextile tubes shall be declared defective, if it does not meet any of the requirements specified in Table 1 and in **4.1.1**, **4.1.2**, **4.2** and **4.3**. The lot shall be declared conforming to this standard, if the average of test results from sampled bags in a lot shall meet or exceed the minimum values specified in this standard against each requirement; except in case of elongation and apparent opening size where the average value of test results shall not be more than the value specified in Table 1. The lot shall also be declared as conforming to this standard, if the number of defective geotextile tubes does not exceed the values specified in col (4) of Table 6. In addition to above the lot shall meet the requirements of marking and labelling (*see* **5**), packing (*see* **6**) and storage and handling (*see* **7.1** to **7.7**).



Section details of circumferential geotextile tube:

Tube size : 25 m × 3 m Ø (OD)

Spout : 1.50 m × 0.30 m Ø × 5 nos. with 1 meter length tie each

Loop : 0.50 m (height) × 12 nos. (6 + 6)

FIG. 1 INDICATIVE SECTION OF CIRCUMFERENTIAL GEOTEXTILE TUBE OF SIZE, 25 m × 3 m

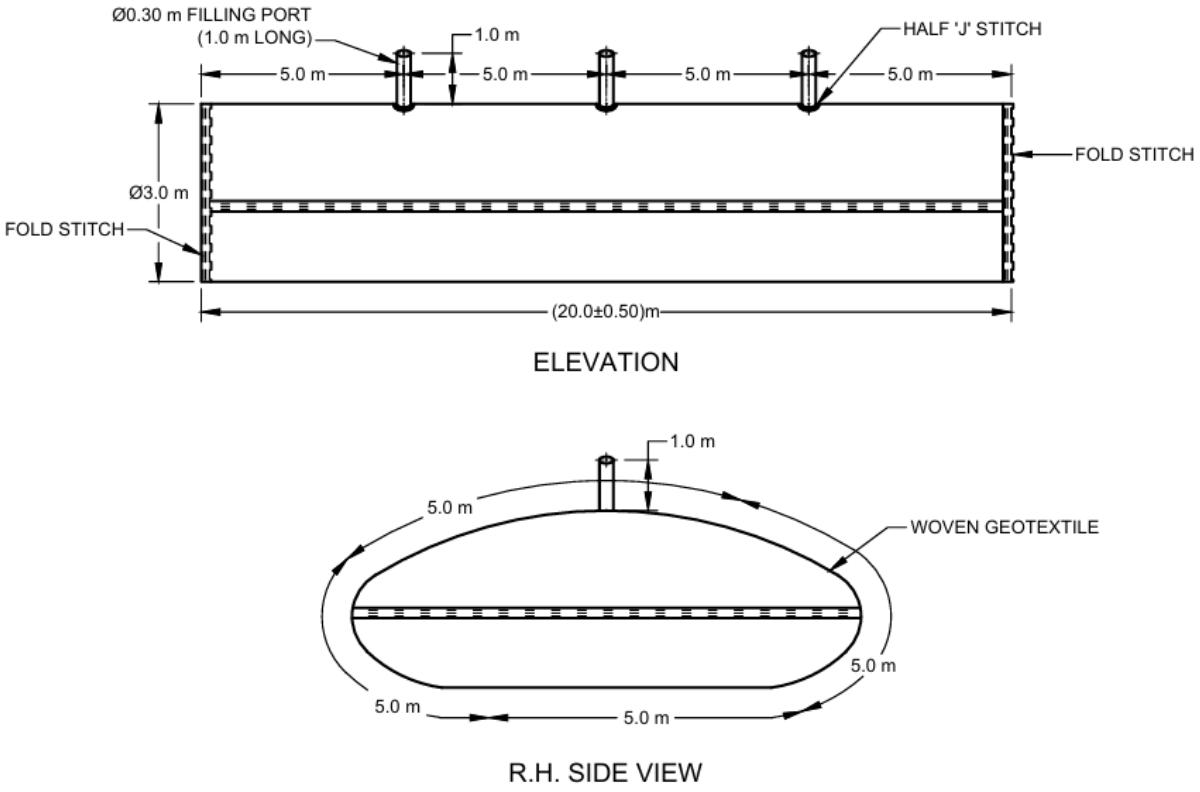


FIG. 2 INDICATIVE SECTION OF LONGITUDINAL GEOTEXTILE TUBE OF SIZE, 20 m × 3 m

Table 3 Typical Dimensions for Geotextile Tubes

(*Clause* 4.4)

Sl No.	Geotextile Tube Type	Length (m)	Diameter (m)	Tolerance on Length and Diameter, Percent
(1)	(2)	(3)	(4)	(5)
i)	20 m × 2 m	20.00	2.00	+ 5 percent with no negative tolerance
ii)	20 m × 3 m	20.00	3.00	
iii)	20 m × 5 m	20.00	5.00	
iv)	25 m × 2 m	25.00	2.00	
v)	25 m × 3 m	25.00	3.00	
vi)	25 m × 5 m	25.00	5.00	
vii)	30 m × 2 m	30.00	2.00	
viii)	30 m × 3 m	30.00	3.00	
ix)	30 m × 5 m	30.00	5.00	

Table 4 Typical Dimensions for Spout/Filling Port

(*Clause* 4.4)

Sl No.	Length (m)	Diameter (m)	Tolerance on Length and Diameter, Percent
(1)	(2)	(3)	(4)
i)	1.00	0.30	+ 5 percent with no negative tolerance
ii)	1.00	0.35	
iii)	1.50	0.30	
iv)	1.50	0.35	

Table 5 Typical Dimensions for Loop

(*Clause* 4.4)

Sl No.	Length (cm)	Width (cm)	Tolerance on Length and Width, Percent
(1)	(2)	(3)	(4)
i)	20.00	2.5	+ 5 percent with no negative tolerance
ii)	20.00	5.0	
iii)	50.00	2.5	
iv)	50.00	5.0	

Table 6 Sample Size

(*Clauses* 8.2, 8.3.1 *and* 8.3.2)

Sl No.	Lot Size (No. of bundles of 20 Geotextile Tubes)	Sample Size (No. of Geotextile Tubes)	Permissible Number of Non-conforming Geotextile Tubes	Sub-Sample Size (No. of Geotextile Tubes)	Sub-sub-Sample Size (No. of Geotextile Tubes)
(1)	(2)	(3)	(4)	(5)	(6)
i)	Up to 100	5	0	2	1
ii)	101 to 200	8	1	4	2
iii)	201 to 300	13	1	5	3
iv)	301 to 500	20	2	8	4
v)	501 to 1 000	32	3	10	5
vi)	1 001 and above	50	3	10	6

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 667 : 1981	Methods for identification of textile fibres (*first revision*)
IS 4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 13162 (Part 2) : 1991	Geotextiles — Methods of test: Part 2 Determination of resistance to the exposure of ultraviolet light and water (xenon-arc type apparatus)
IS 13321 (Part 1) : 2022/ISO 10318-1 : 2015	Geosynthetics: Part 1 Terms and definitions (*first revision*)
IS 14293 : 1995	Geotextiles — Method of test for trapezoid tearing strength
IS 14294 : 1995	Geotextiles — Method for determination of apparent opening size by dry sieving technique
IS 14324 : 1995	Geotextiles — Methods of test for determination of water permeability — Permittivity
IS 14714 : 1999	Geotextiles — Determination of abrasion resistance
IS 14716 : 2021	Geosynthetics — Test method for the determination of mass per unit area of geotextiles and geotextile-related products (*first revision*)
IS 15060 : 2018/ ISO 10321 : 2008	Geosynthetics — Tensile test for joint seams by wide-width strip method (*first revision*)
IS 16078 : 2013/ ISO 12236 : 2006	Geosynthetics — Static puncture test (CBR test)
IS 16635 : 2017/ ISO 10319 : 2015	Geosynthetics — Wide width tensile test
IS 16342 : 2015	Geosynthetics — Method of test for grab breaking load and elongation of geotextiles
IS 16351 : 2015	Geosynthetics — Standard practice for laboratory immersion procedures for evaluating the chemical resistance of geosynthetics to liquids
IS 17421 : 2020/ ISO 10320 : 2019	Geosynthetics — Identification on site

ANNEX B

(*Foreword*)

GUIDELINES FOR INSTALLATION OF GEOTEXTILE TUBES

B-1 PREAMBLE

Geotextile tubes are made up of high-strength polypropylene multifilament (PPMF) or polyester multifilament (PETMF) woven geotextile fabric with specially designed hydraulic properties which allow water to pass through it while entrapping the soil inside the tube. The tubes are stitched with six lines of UV stabilized high strength polyester or polypropylene multifilament stitching thread to get desired seam strength. Geotextile tubes are resistant to UV and other microbiological organisms found in soil. The geotextile tubes are usually filled by the hydraulic pumping method with soil slurry.

B-2 PRODUCT DELIVERY, STORAGE AND HANDLING

B-2.1 Geotextile tube and related components shall be delivered to the project site in a protective cover. Each geotextile tube shall be clearly labelled for easy identification.

B-2.2 No hooks, tongs or other sharp instruments etc. should be used for handling the geotextile tube. The supplied geotextile tube should not be dragged along the ground. The geotextile tube should be placed in position as recommended by the manufacturer.

B-2.3 Geotextile tube shall be stored over a platform constructed in areas where water cannot accumulate, elevated off of the ground and protected from conditions that will affect the properties or performance of the geotextile. Geotextile tubes should not be exposed to temperatures over 60 °C. The duration of storage time shall not exceed the manufacturer's recommendation.

B-3 SITE PREPARATION

Location at which geotextile tubes are to be placed, shall be checked properly to confirm any obstructions, which could damage the geotextile tubes, such as roots, sharp objects, debris and any other material shall be removed.

B-4 PLACEMENT OF GEOTEXTILE TUBE

B-4.1 Lay nonwoven geotextile for scour protection covering the entire area before placing the geotextile tube.

B-4.2 No portion of the geotextile tube shall be filled until the entire tube segment has been fully anchored along the correct alignment.

B-5 INJECTION OF FILL MATERIAL

B-5.1 After the placement of the geotextile tube and scouring apron, the sand slurry shall be filled in the tube according to the approved plan of construction. The discharge line of the dredge shall be fitted with a valve to allow control of the rate of filling. The valve system shall be fitted with an internal mechanism such as a gate, butterfly valve, ball valve or pinch valve, to allow the contractor to regulate the discharge into the geotextile tube. Any excess discharge shall be directed away from the tube into a designated area.

B-5.2 Typically, the diameter of the dredge discharge pipe should be in the range of 150 mm to 250 mm to ensure the adequate filling of the geotextile tube. Injection ports are typically 300 mm to 350 mm in diameter and 1.0 m to 1.5 m in length. Care should be taken not to overfill or over-pressurize the "anchor tube" that is incorporated into the scour apron.

B-5.3 The dredge discharge pipe shall be free of protrusions that could tear the fill port. The dredge discharge pipe shall be supported above the fill port in a manner, which reduces stress on the fill port seams. Excessive movement of the dredge discharge pipe during filling can result in damage to the fill port. The pump may be installed 50 m to 100 m far from the geotextile tube in position.

B-5.4 Geotextile tubes used in coastal and river erosion control applications are most often filled hydraulically with a slurry of sand and water. Upon filling the geotextile tube, the fill port sleeves shall be closed and attached to the geotextile tube in a manner sufficient to prevent movement of the sleeve by subsequent wave action or other disturbances. Tie the mouth of the port and place the same inside the safety pocket of the geotextile tube so that the port material/spout does not escape/float after filling.

B-5.5 The geotextile tube should not be filled up to its capacity through the filling ports at once because

it may not allow the slurry to settle adequately. Therefore, the tube should be filled up to 40 percent to 50 percent of its capacity in the first step by allowing the water to drain out through the pores. In case there is any clogging at any of the ports before the tube is completely filled then water should be injected inside the port to remove the clogging allowing further space for filling.

B-5.6 The geotextile tube shall be completely filled to its design height as suggested by the engineer-in-charge and geotextile tube manufacturer.

B-6 POST INSTALLATION PRECAUTIONS

B-6.1 Immediately after installation, ensure the proper placement of geotextile tubes as per design and geometry of the site. If any abnormality is observed, correction or re-dumping shall be carried out.

B-6.2 Proper care shall be taken to avoid manual interference of civilians and animals which can cause damage to the material.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Geosynthetics Sectional Committee, TXD 30

Organization	*Representative(s)*
The South India Textile Research Association Council, Coimbatore	Dr A. N. DESAI **(*Chairperson*)**
Ahmedabad Textile Industry's Research Association, Ahmedabad	SHRIMATI DEEPALI PLAWAT SHRI JIGAR DAVE (*Alternate*)
Andhra University, Visakhapatnam	PROF K. RAJAGOPAL
Best Geotechnics Pvt Ltd, Mumbai	SHRI SATISH NAIK
Central Coir Research Institute, Alappuzha	DR SHANMUGASUNDARAM O. L. SHRIMATI SUMY SEBASTIAN (*Alternate*)
Central Road Research Institute, New Delhi	DR P. S. PRASAD DR PARVATI G. S. (*Alternate*)
Central Soil and Materials Research Station, New Delhi	DR R. CHITRA DR MANISH GUPTA (*Alternate*)
Charankattu Coir Mfg. Co. (Pvt) Ltd, Shertallai	SHRI C. R. DEVRAJ SHRI C. D. ATHUL RAJ (*Alternate*)
Department of Jute and Fibre Technology, Kolkata	DR SWAPAN GHOSH DR A. K. SINGHO (*Alternate*)
DKTE Centre of Excellence in Nonwovens, Ichalkaranji	DR SHIRISH KUMAR VHANBATTE
Ganga Flood Control Commission, Patna	SHRI S. K. RAJAN SHRI N. N. SHANKAR (*Alternate*)
Garware Technical Fibers Ltd, Pune	SHRI TIRUMAL KULKARNI SHRI RAJENDRA GHADGE (*Alternate*)
Geosynthetics Testing Services Pvt Ltd, Ahmedabad	SHRI RAVIKANT SHARMA
ICAR - National Institute of Natural Fibre Engineering & Technology, Kolkata	DR SANJOY DEBNATH DR KARTICK SAMANTA (*Alternate*)
Indian Geotechnical Society, New Delhi	DR BAPPADITYA MANNA DR DEBAYAN BHATTACHARYA (*Alternate*)
Indian Institute of Technology, Gandhinagar	PROF AMIT PRASHANT DR G. V. RAO (*Alternate*)
Indian Institute of Technology, Madras	PROF DALLI NAIDU ARNEPALLI
Indian Jute Industries' Research Association, Kolkata	DR MAHUYA GHOSH SHRI PALASH PAUL (*Alternate*)
Indian Jute Mills Association, Kolkata	SHRI S. K. CHANDRA SHRI J. K. BEHERA (*Alternate*)
Indian Technical Textile Association, Mumbai	DR ANUP RAKSHIT SHRIMATI RUCHITA GUPTA (*Alternate*)

Organization	*Representative(s)*
International Geosynthetics Society, India Chapter, New Delhi	PROF G. L. SIVAKUMAR BABU SHRIMATI DOLA ROYCHOWDHURY (*Alternate*)
Kusumgar Corporates, Mumbai	SHRI Y. K. KUSUMGAR DR M. K. TALUKDAR (*Alternate*)
Landmark Material Testing and Research Laboratory Pvt Ltd, Jaipur	DR ANIL DIXIT SHRI HARSH KUMAR CHITTORA (*Alternate*)
Maccaferri Environmental Solutions Pvt Ltd, Navi Mumbai	DR RATNAKAR MAHAJAN SHRIMATI MINIMOL KORULLA (*Alternate*)
National Jute Board, Kolkata	SHRI M. DUTTA
Office of the Jute Commissioner, Kolkata	SHRI SOUMYADIPTA DATTA
Office of the Textile Commissioner, Mumbai	SHRI SIVAKUMAR S. SHRI SANJAY CHARAK (*Alternate*)
Premier Polyfilms Ltd, Ghaziabad	SHRI AMITAABH GOENKA SHRI PRAVEEN KUMAR (*Alternate*)
Rajadhani Institute of Engineering & Technology, Trivandrum	DR K. BALAN
RDSO, Lucknow	SHRI SANJAY KUMAR AWASTHI SHRI SANTOSH KUMAR OJHA (*Alternate*)
Reliance Industries Ltd, New Delhi	SHRI V. RAVIKANTH SHRI RAJENDREN SUBRAMANIAN (*Alternate*)
Sahastra Engineers Pvt Ltd, Noida	SHRI VENKATA MAYUR
Strata Geosystems (I) Pvt Ltd, Mumbai	SHRI NARENDRA DALMIA SHRI SHAHROKH BAGLI (*Alternate*)
Techfab India, Mumbai	SHRI ANANT KANOI SHRI SAURABH VYAS (*Alternate*)
The Bombay Textile Research Association, Mumbai	DR SREEKUMAR DR PRASANTA KUMAR PANDA (*Alternate*)
The Synthetics & Art Silk Mills Research, Association, Mumbai	DR MANISHA MATHUR SHRIMATI ASHWINI SUDAM (*Alternate*)
In Personal Capacity [37/1 *Satyen Park, Thakurpukur, Kolkata* - 700104]	SHRI P. K. CHOUDHARY
In Personal Capacity [104, *Kanchanban, A. W. Vartak Marg, Vile Parle (East), Mumbai* – 400057]	SHRI V. N. GORE
BIS Directorate General	SHRI J. K. GUPTA, SCIENTIST 'E'/DIRECTOR AND HEAD (TEXTILES) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI HIMANSHU SHUKLA
SCIENTIST 'B'/ASSISTANT DIRECTOR
(TEXTILES), BIS

(*Continued from second cover*)

c) Coastal infrastructure protection:

1) Cofferdam construction

2) Reclamation works

Guidelines for installation of geotextile tubes are given in Annex B for information only.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. ’The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard. .

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: TXD 30 (22876).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices: *Telephones*

Central : 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002 { 2323 7617

Eastern : 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091 { 2367 0012 2320 9474

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019 { 265 9930

Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113 { 2254 1442 2254 1216

Western : 5th Floor/MTNL CETTM, Technology Street, Hiranandani Gardens, Powai, Mumbai 400076 { 2570 0030 2570 2715

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYANA (CHANDIGARH), HUBLI, HYDERABAD, JAIPUR, JAMMU, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi