Wide Circulation Draft

भारतीय मानक ब्यूरो

BUREAU OF INDIAN STANDRADS

Draft For Comments Only Doc: TXD 25 (27648) **WC**

June 2025

भारतीय मानक मसौदा

वस्त्रादि – नारियल के रेशों से बने हुए हरित छत मॉड्यूल- विशिष्टि

Draft *Indian Standard*

TEXTILES — COIR BASED GREEN ROOF MODULE — SPECIFICATION

ICS 59.060.10

Coir and Coir products Sectional Committee	Last Date of Receipt of Comments
TXD 25	**August 2025**

FOREWORD

(*Formal clauses will be added later*)

Green roof module is a coir based product manufactured by layering non-woven coir felt of required mass and overlaid with HDPE scrim and compressed vegetation support mixture. All of this consolidated together laid upon the drainage element. The green roof module is a soilless module for developing a green habitat. The soilless and lightweight nature of the product makes it easy for installation on the rooftops of buildings.

Through implementation of the green roof module roof tops, podiums and terraces are converted into thriving green habitats. This in-turn performs as an insulator and reduces temperatures of the confined building and thereby reducing energy requirements. green roof module also help with reducing storm water run-off and improving air quality.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final values, observed or calculated, expressing the results of tests, 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 values should be the same as that of the specified values in this standard.

Draft Indian Standard

TEXTILES — COIR BASED GREEN ROOF MODULE — SPECIFICATION

1 SCOPE

This standard covers the requirements of the coir based green roof module for general purpose use in rooftops.

2 REFERENCE

The standards listed in Annex A contain provisions, which through reference in this text constitute provisions 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 editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Green Roof Module — Green roof modules are pre-grown vegetation modules designed for green roof installation. These modules consist of a vegetation support layer and non woven separation felt mat supported by a base layer of drainage element made of materials such as perforated coir hardboard or PE dimple drainage board.

3.2 Drainage Element — Drainage elements are used for draining of excessive water from the green roof module. Drainage elements are PE dimple drainage boards or perforated hardboards of coir manufactured by compressing layers of coir felt.

3.3 Protection Mat — Protection mat is a non-woven needle felt fabric made up of either 100 percent coir or a combination of coir and synthetic fibers. These mats are sandwiched with HDPE scrim fabric to provide reinforcement and also act as a barrier layer between drainage element and vegetation support layer.

3.4 HDPE Scrims — HDPE Scrims are lightweight woven open mesh structure fabrics used for providing strength, durability and resistance against tearing of the protection mat.

3.5 Vegetation Support Layer — Vegetation support layer is a soilless substrate layer that is designed to support plant growth on the module. The main component in the layer is a natural super absorbent mixture.

3.6 Natural Super Absorbent Mixture — The mixture is generally prepared by mixing raw coir pith, coir fibers along with powdered neem cake and other organic materials. This mixture essentially provides nutrients to the growing media.

3.7 Roof Mat Tile — Roof Mat Tiles are modular, pre-vegetated tiles designed for green roofing systems. Roof mat tiles are a combination of non-woven separation felt mat manufactured by using needle punch or stich blanket technology sandwiched with HDPE scrim along with compressed vegetation support layer supporting a growing medium as topmost layer.

4 MATERIAL

4.1 Drainage Element

Drainage element shall be manufactured from coir hard board and shall conform to medium coir hardboard type of IS 15878.

4.2 Non-woven Separation Felt Mat

Non-woven separation felt mat shall be manufactured by using needle punch or stich blanket technology on the coir fibre or a blend of synthetic fibers and coir fibers web of required mass with HDPE scrim. The uniformity of felt made up of 100 percent coir fibers shall conform to IS 15340.

4.3 Vegetation Support Layer

4.3.1 Vegetation support layer shall be manufacture by mixing raw coir pith confirming to IS 17739, coir fibres pretreated with neem cake, Trichoderma powder, Pseudomonas fluorescens or any other substance as agreed between the buyer and the seller.

4.3.2 The vegetation support layer shall be compressed in the ratio 5:1 from its original volume to a slab. The dimensions of the slab shall correspond to the dimensions of the drainage elements as given in Table 2. Any other compression value for the layer shall be selected as per the agreement between buyer and seller.

4.3.3 The vegetation support layer shall have a minimum 50 percent of water holding capacity when testes as per Annex B.

4.3.4 Vegetation support layer shall also confirm to the requirements given in Table 1.

Table 1 Requirement for Vegetation Support Layer

(*Clause* 4.3.4)

Sl No.	Characteristics	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Moisture content, Percent	5 – 15	Annex C
ii)	*p*H value	5.0 – 8.0	Annex D
iii)	Electrical Conductivity, milliohms/cm	0.5 – 1.2	IS 14767
iv)	Nitrogen, Percent, *Min*	0.26	IS 6092 (Part2/Sec5)
v)	Phosphorous, Percent, *Min*	0.01	IS 5305
vi)	Potassium, Percent, *Min*	0.78	IS 6092 (Part 4)

5 MANUFACTURE

Green roof module is a combination of roof mat tile and drainage element.

5.1 The green roof module shall be manufactured as a two-part assembly. First part being roof mat tile manufactured by overlaying compressed vegetation support layer on top of non woven separation felt mat.

5.2 Second part of the assembly is drainage element, a natural coir hard board which is manufactured by compressing layers of coir felt having uniform minimum mass of 500 g/m².

5.3 The roof mat tile is overlaid on the drainage element of the required dimensions to form the green roof module. The schematic diagram of green roof module is given in Fig 1.

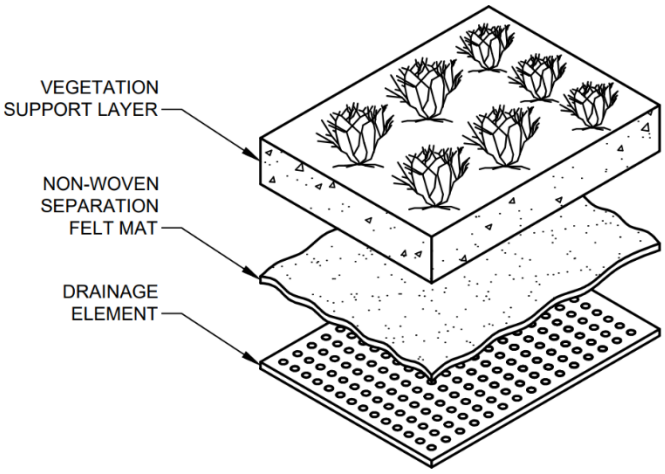

FIG. 1 GREEN ROOF MODULE

6 DIMENSIONS AND TOLERANCES

6.1 Roof Mat Tile and Drainage Element

6.1.1 The roof mat tiles and drainage element tiles shall be rectangular in shape of same length and width, unless otherwise specified. The length of the two diagonals of the tiles shall not differ by more than ± 10 mm per meter.

6.1.2 Unless otherwise specified the length, width and thickness of roof mat tile and drainage element tile shall be as given in Table 2.

Table 2 Dimensions of Roof Mat Tile and Drainage Element Tile

Sl No.	Dimensions (*See* Note 1)	Requirements		Tolerances (*See* Note 2)	Method of Test, Ref to
		Type I	Type II		

(1)	(2)	(3)	(4)	(5)	(6)
i)	Length, m	0.75	1	± 10 mm/meter	Annex E
ii)	Width, m	0.50	0.80	± 10 mm/meter	Annex E
iii)	Thickness i) Roof Mat Tile, mm, *Min* ii) Drainage Element Tile, mm, *Min*	25 12		—	Annex F

NOTES
1 Any other dimension of the tiles may be manufactured as per the agreement between the buyer and the seller subject to the tolerances as prescribed.
2 For each meter of increase in length or width of the tile, the tolerance increases by 10 mm
Example — if the length of a roof mat tile is 2m then the tolerance will be ± 20 mm.

7 PACKING

The components of the green roof module shall be packed and/or covered in materials such that they are protected physical damage during transport and storage.

8 MARKING

8.1 Each of the green roof module (roof mat tile & drainage element) shall be legibly labelled/ marked near any of its corners with the following:

a) Name of the Manufacture;
b) Dimensions and Thickness of the module;
c) Month and year of manufacture; and
d) Any other statutory requirement as required by the law in force or as agreed between buyer and purchaser

8.2 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.

9 SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Lot

All the green roof module having same dimensions and thickness delivered to a buyer against a dispatch note shall constitute a lot.

9.2 The conformity of the lot to the various requirements specified in the standard shall be determined on the basis of tests carried out on the sample selected from the lot.

9.3 Unless otherwise agreed to between the buyer and the seller, the carpets to be selected at random shall be as given in Table 4.

Table 4 Sample Size and Permissible Number of Non-conforming green roof modules
(*Clauses* 9.3)

Sl No.	Lot Size	Sample Size	Permissible Number of Non-Conforming Tiles
(1)	(2)	(3)	(4)
i)	Up to 90	5	0
ii)	91 to 150	8	0
iii)	151 to 500	13	1
iv)	501 to 1200	20	1
v)	1201 to 2500	32	2

9.4 Number of Samples and Criteria for Conformity

The number of green roof module in the sample and criteria for conformity for determining conformity of the lot requirements specified in this standard shall be as given in Table 5.

Table 5 Number of Samples and Criteria for Conformity of Green Roof Modules
(*Clause* 9.4)

Sl No.	Characteristics	Number of Samples	Criteria for Conformity
(1)	(2)	(3)	(4)
i)	Length, Width, Thickness	According to col 3 of Table 4	Number of nonconforming pieces shall not exceed the corresponding number given in col (4) of Table 4

ANNEX A

(*Clause* 2.1)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
IS 5305 : 1969	Method for Volumetric Determination of Phosphorus
IS 6092 (Part 2/Sec 5) : 2004	Methods of Sampling and Test for Fertilizers: Part 2 Determination of Nitrogen: Sec 5 Total Nitrogen Content — Titrimetric Method after Distillation
IS 6092 (Part 4) : 1985	Methods of Sampling and Test for Fertilizers: Part 4 Determination of Potassium (first revision)
IS 14767 : 2000	Determination of the Specific Electrical Conductivity of Soils — Method of Test
IS 15340 : 2003	Coir Felt — Specification (first revision)
IS 15878 : 2010	Coir Hardboard for General Purposes — Specification
IS 17739 : 2024	Raw Coir Pith —Specification (first revision)

ANNEX B

(*Clause* 4.3.3)

METHOD FOR DETERMINATION OF WATER HOLDING CAPACITY

B-1 OUTLINE OF THE METHOD

This method is intended for use in determining the water holding capacity of vegetation support layer.

B-2 DEFINITIONS

B-2.1 Water holding capacity

It is the ability of the material to physically retain the amount of water against the force of gravity per unit of material's dry mass.

B-3 TEST APPARATUS

B-3.1 Glass Funnel

A suitable glass funnel to accommodate 25 g of vegetation support mixture.

B-3.2 Measuring Cylinder

A suitable graduated measuring glass cylinder of capacity of 100 ml.

B-3.3 Glass Beaker

A glass beaker of capacity of 100 ml.

B-3.4 Filter paper

A suitable circular filter paper of minimum diameter of 9 cm.

B-3.5 Digital Weighing Scale

An electronic digital weighing scale with capability to weight vegetation support mixture with an accuracy of 0.1 g.

B-4 TEST SAMPLE

B-4.1 The test specimen shall consist of 25 g of finely crushed vegetation support mixture weight to the nearest 0.1 g for the estimation of the water holding capacity. Remove all the lumps and foreign objects present in the test specimen.

B-5 PROCEDURE

B-5.1 Take 25 g of finely crushed vegetation support mixture into a glass petri dish.

B-5.2 Take 25 ml of water into a glass beaker. Place a glass funnel over the measuring cylinder such that the stem of the funnel is inside the measuring cylinder.

B-5.3 Gently place the circular filter paper inside the cone of the glass funnel such that no edge of the filter paper protrudes outside the cone of the glass funnel.

B-5.4 Pour the complete test specimen onto the filter paper ensuring that the test specimen do not get dispersed outside the filter paper.

B-5.5 Slowly pour 25 ml water from the glass beaker onto the test specimen so than no seepage is observed between the filter paper and the glass funnel. Ensure that no spillage of water shall happen outside of the glass funnel.

B-5.6 Leave the apparatus for 30 min or till time no dripping is observed from the glass funnel in the measuring cylinder. Measure the amount of water collected in the measuring cylinder

B-5.7 Calculate the water holding capacity by the following formula:

$$\text{Water holding capacity, percent} = \frac{(W1 - W2)}{S} \times 100$$

Where

W_1 = Initial mass of water in beaker, in g;
W_2 = Mass of water in measuring cylinder, in g; and
S = Mass of vegetation support mixture taken as test specimen

ANNEX C

[*Table* 1, *Sl No.* (i)]

METHOD FOR DETERMINATION OF MOISTURE CONTENT

C-l APPARATUS

C-1.1 Conditioning oven with forced ventilation, provided with positive valve control and capable of maintaining a temperature of 100 °C to 110 °C.

C-2 PROCEDURE

C-2.1 Take about 50 g of vegetation support mixture as test specimen and weigh it correct to the nearest 0.5 g. Place the test specimen in the conditioning oven (maintained at 105 ˚C ± 2 ˚C) and dry for one hour and weigh to the nearest 0.5 g. Dry for another 30 min and weigh to the nearest 0.5 g, provided the loss in mass in drying of the test specimen, as disclosed by the first and second weighing's, does not exceed 0.25 percent of the first mass, take the second mass to be the dry mass of the test specimen. If the loss exceeds 0.25 percent, weigh the test specimen at 30 min intervals till the loss between two successive weighing is 0.25 percent or less.

C-2.2 Calculate the percentage of moisture content by the following:

$$\text{Moisture content, percent by mass} = \frac{m1 - m2}{m1} \times 100$$

where,

m_1 = mass of the original test specimen, in g; and

m_2 = mass of the oven-dried test specimen, in g.

ANNEX D

[*Table* 1, *Sl No.* (ii)]

METHOD FOR DETERMINATION OF *p*H VALUE

D-1 APPARATUS AND REAGENTS

D-1.1 *p*H Meter

Potentiometer equipped with a glass-calomel electrode system.

D-1.2 Analytical Balance

D-1.3 Carbon dioxide-free water Distilled water. Use water with a *p*H of not less than 6.5 nor more than 7.5 obtained by boiling distilled water for 15 min and cooling under CO_2 free conditions.

D-1.4 Standard Buffer Solution — *p*H of 4, 7, and 10.

D-2 CALIBRATION OF *p*H METER

Calibrate the *p*H meter using standard buffer solutions.

D-3 SAMPLE PREPARATION

Crush the vegetation support mixture to remove all the lumps. Take a portion of the crushed vegetation support mixture for the determination of *p*H.

D-4 PROCEDURE

D-4.1 Weigh 10 g air-dried finely vegetation support mixture and transfer it into or equivalent moist material into 500 ml beaker. Add 200 ml of water, so as to maintain a material to water ratio of 1 : 20. Mix the test sample thoroughly to ensure that it is homogeneous. Let soak for 60 min, with occasional stirring.

D-4.2 After soaking the vegetation support mixture for 60 min, measure the *p*H of the sample with *p*H meter and note down the reading.

D-4.3 Repeat the steps in C-4.1 and C-4.2 for two more samples.

D-5 EXPRESSION OF RESULTS

D-5.1 Calculate the mean of the three readings observed.

ANNEX E

[*Table* 2, *Sl No.* (i) *and* (ii)]

METHOD FOR DETERMINATION OF LENGTH AND WIDTH

E-1 PRINCIPLE

The length and width of the roof mat tiles and drainage element tiles shall be estimated by measuring both the dimensions through a measuring tape up to an accuracy of 1 mm.

E-2 APPARATUS

Measuring tape or steel ruler with graduation up to 1 mm and of length not less than the length of the tiles.

E-3 PROCEDURE

E-3.1 Select 3 sample tiles. Place each of the sample tile on a smooth and flat table of dimensions greater than the tile. Measure length of each tile with a measuring tape or steel ruler. Repeat this for all the 3 samples and the average shall be taken to calculate the length of the tile.

E-3.2 Repeat the process for the measurement of width.

E-3.3 A tolerance of ± 10 mm/meter on average values of length and width of tiles shall be permissible**.**

ANNEX F

[*Table* 2, *Sl No.* (iii)]

DETERMINATION OF THICKNESS

F-1 PRINCIPLE

The thickness of each of the test specimens of the roof mat tiles and drainage element tiles shall be estimated by measuring thickness at each of the vertices to an accuracy of 0.1 mm.

F-2 APPARATUS

Thickness gauge with an accuracy of 0.01 mm

F-3 PROCEDURE

F-3.1 Select 3 sample tiles. Place each of the sample tile on a smooth and flat table of dimensions greater than the tile. Measure thickness of the tile at each of the vertices with a thickness gauge. While taking measurement of thickness, care shall be taken that the surfaces of the tile are not deformed. Average of all the four values of thickness shall be reported.

F-3.2 Repeat this for all the 3 samples and the average shall be taken to calculate the thickness of the tile.