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उत्पाद मैनुअल
भूकृत्रिम - जिओसैल्स - विशिष्टि
भाग 2 ढलान कटाव संरक्षण अनुप्रयोग हेतु
IS 17483 (भाग 2): 2020 के अनुसार

PRODUCT MANUAL
FOR Geosynthetics — Geocells —
Part 2 – Slope Erosion Protection Application
ACCORDING TO IS 17483 (Part 2):2020

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो) अनुरूपता मूल्यांकन (विनियम, 2018 की योजना -I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification.

1.	मानक संख्या IS No.	:	IS 17483 (Part 2): 2020
	शीर्षक Title	:	Geosynthetics — Geocells — Specification Part 2 – Slope Erosion Protection Application
	संशोधनों की संख्या No. of amendments	:	03
2.	नमूना दिशानिर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	Material shall be HDPE and shall conform to the requirements given in Cl. 4 of IS 17483 Part 2. Conformity may be established through supplier's test certificate, or third party lab test report or NABL accredited lab test report or in house testing.
b)	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer Annex-A
c)	नमूने का परिमाण Sample Quantity	:	1 geocell Note: This section indicates the quantity of the sample of the product and/or the raw material (if applicable), required to be sent to the laboratory for testing, for the purpose of Grant of Licence/Change in Scope of Licence/ Factory Surveillance (in case of market surveillance, effort may be made to procure the required quantity of product sample, as far as possible since raw material sample may not be available in market)

d)	परीक्षण अनुरोध में घोषित किए जाने वाले पैरामीटर Parameters to be Declared in Test Request	Style Note: Apart from the above, any other requirements/parameters may also be declared as per the standard, as applicable.
3.	परीक्षण उपकरणों की सूची List of Test Equipment	: Please refer to Annex-B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	: Please refer to Annex-C
5.	एक दिन में संभावित परीक्षण Possible tests in a day	
	Construction and dimensions (Cl. 5.1 and 5.2), Texturing (Cl 5.3), Perforations (Cl. 5.4), Seam Weld (Cl 5.5), Dimensional Stability (Cl. 6.1), Density, Post texturing strip/cell wall thickness at a pressure of 2 ± 0.01 kPa (without conditioning or on preconditioned samples), Seam peel-strength per 25 mm of cell depth Note: This section is for the guidance of BIS Certification Officers/Technical Auditors of BIS Authorized Outside Surveillance Agencies (OSAs) during factory inspection to provide ready reference regarding the tests which can be witnessed during the inspection in the factory by the officer/auditor.	
6.	लाइसेंस का दायरा /Scope of the Licence:	
	"Licence is granted to use Standard Mark as per IS 17483 (Part 2): 2020 with the following scope:	
	Name of the product	Geosynthetics — Geocells for Slope Erosion Protection Application
	Style(s)	Weld Spacing x depth (in mm) e.g. 330 x150, 330 x 200 etc.

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ANNEX-A

GROUPING GUIDELINES

Following grouping guidelines shall apply in case of grant of licence or change in scope of licence.

Samples of geocells of any style i.e. any combination of weld spacing and depth (e.g. Style 330x150) may be tested to cover the required styles in the scope of licence. For example, if the firm is manufacturing geocell styles 330x150, 330x200, 445x200 one sample of any style say, 330x150 may be tested to cover all the styles

Scope of licence shall be restricted based on the manufacturing and testing capabilities

During operation of the licence, samples of all varieties covered in the licence shall be drawn in rotation, to the extent possible

ANNEX – B

LIST OF TEST EQUIPMENTS

(INDICATIVE LIST, FOR GUIDANCE ONLY)

Sl. No.	Tests Used In With Clause Reference	Test Equipment/Chemical
1.	Dimensions, Cl. 5.2, Perforations, Cl 5.4, Seam Weld, Cl 5.5	Vernier Calipers Cell Expansion gauge (for measurement of d1, d2) Measuring tape
2.	Surface density of indentation, Cl 5.3	Profile Projector or Magnifying glass of suitable magnification, means for cutting specimen of 1 sq. cm.
3.	Asperity height, Cl 5.3	Depth gauge (with dial indicator, setting block and contact point with extension) capable of measuring to a depth of at least 2.5 mm with an accuracy of ± 0.01 mm.
4.	Density, Cl 6.2	<u>As per Method A of IS 13360 (Part 3/Sec 10)</u> - Analytical balance or instrument specifically designed for measurement of density, accurate to ± 0.1 mg, - Immersion vessel, - Stationary support, - Thermometer, graduated at 0.1 °C intervals, covering the range 0 °C to 30 °C, - Wire (if required), corrosion-resistant, of diameter not greater than 0.5 mm, - Sinker, - Pycnometer, with a side-arm overflow capillary, for determining the density of the immersion liquid when this liquid is not water, equipped with a thermometer graduated at 0.1 °C intervals from 0 °C to 30 °C. - Liquid bath, capable of being thermostatically controlled to within ± 0.5 °C, <u>As per Method B of IS 13360 (Part 3/Sec 10)</u> - Balance, accurate to ± 0.1 mg. - Stationary support - Pycnometer - Liquid bath - Dessicator, connected to a vacuum system. - Immersion liquid <u>As per Method C of IS 13360 (Part 3/Sec 10)</u> - Liquid bath - Glass cylinder, capacity 250 ml - Thermometer, graduated at 0.1 °C intervals - Volumetric flask, capacity 100 ml - Flat-tipped glass rod stirrer

		• Burette, capacity 25 ml, of a design which enables it to be kept in the liquid bath, capable of dispensing 0,1 ml portions of liquid • Immersion liquids <u>As per IS 13360 (Part 3/Sec 11)</u> • Density gradient column, • Liquid bath, capable of being thermostatically controlled to within $\pm 0,1$ °C or $\pm 0,5$ °C • Calibrated glass floats, covering the density range in which measurements are to be made and • approximately evenly distributed throughout this range • Balance, accurate to $\pm 0,1$ mg. • Siphon or pipette assembly, • Immersion liquids: two miscible liquids of different densities <u>As per IS 13360 (Part 3/Sec 12)</u> • Analytical balance, accurate to 0,1 mg • Gas pycnometer, of suitable cell volume, accurate to 0,01 % of the cell volume • Measurement gas, preferably helium with a purity of 99,99 % • Thermostatically controlled bath or enclosure, capable of maintaining the desired test temperature (preferably 23 °C) to the nearest 1 °C. Alternatively, a gas pycnometer with a suitable built-in temperature control
5.	Environmental stress crack resistance - Notched constant tensile load (ESCR - NCTL), 400 h	• Blanking Die • Notching Device — A device or machine that can produce a consistent notch depth. • Blade — A single-edged razor made of carbon steel. • Stress Cracking Apparatus — Equipment suitable for subjecting test specimens to a tensile stress of up to 13.8 MPa and such that the specimens shall be maintained at a constant temperature of 50 ± 1 °C while being • totally immersed in a surface-active agent. The solution shall be constantly agitated to provide a uniform concentration throughout the bath. Reagent shall consist of 10 percent surface-active agent with 90 percent water
6.	Environmental stress crack resistance (ESCR), 5000 h	<u>Apparatus as per Annex C incorporating</u> • Blanking Die – A rectangular die for cutting specimen 38 ± 2.5 mm by 13 ± 0.8 mm • Specimen Holder

		• Test Tubes and Closure • Constant Temperature Bath (capable of being maintained at 50 ± 0.5 °C) • reagent - nonylphenoxy poly (ethylene-oxy) ethanol • Aluminium Foil – Approximately 0.8 to 0.13 mm thick • Jig
7.	Carbon black content	• Combustion boat – made of porcelain or silica having minimum dimensions of 75 mm length, 9 mm width, and 8 mm height • Combustion tube – made of hard glass, approximately 30 mm diameter and 400±50 mm length • Gas Flow meter – for measuring and controlling the rate of flow of nitrogen within 1.7 ± 0.3 litres per minute • Thermometer – in the range 250 to 550°C • Furnace – to accommodate the combustion tube and give temperatures up to at least 500 °C • Nitrogen gas and trichloroethylene Note: Automated instruments incorporating these elements and operating as per specified test method are acceptable.
8.	Post texturing strip/cell wall thickness at a pressure of 2 ± 0.01 kPa	Thickness tester, incorporating the following elements (as per 5.1. of IS 13162 (Part 3)) • Removable presser-foot, • Reference plate • Gauge, for indicating the distance between the reference plate and the presser-foot to an accuracy of 0,01 mm. • Means of measuring time, with an accuracy of ± 1s.
9.	Seam peel-strength per 25 mm of cell depth	• Tensile testing machine • Clamps
10.	Seam weld hang strength for 100 mm of seam weld under constant dead weight of 72.5 kg for 7 days at 54 ± 2 °C	• Clamps • Tension Testing Machine • Circulating Air Oven <i>(The apparatus should be such that the specimen can be clamped and subjected to specified load while maintaining the specified test temperature 54 ± 2 °C for 7 days, see Annex D of IS 17483 Part 1)</i>
11.	Resistance to oxidation, Retained tensile strength,	Thermostatically regulated oven with an internal volume of sufficient size, capable of exposing test specimens to a temperature of (100 ± 1) °C as per IS 17360
12.	Retention of breaking strength after UV exposure of 500 h,	• Xenon arc apparatus capable of subjecting specimen to UV light (level of irradiation - 0.5 W/m², 1nm bandpass at 340 nm) in 120 min cycles at 65 ± 5 °C, consisting of 102 minutes of light only, followed by 18 min of water spray and

		light
		• Clamps • Tension Testing Machine
13.	Friction efficiency	Shear Box Apparatus, see Annex F of IS 17483 Part 1
14.	Standard oxidative induction time, High pressure oxidative induction time	• DSC instrument (capable of maximum temperature of at least 500 °C, maintaining an isothermal stability of $\pm 0,3$ K at the test temperature over the duration of the test, typically 60 min) • Crucibles • Flowmeter • Oxygen - 99,5 % purity grade or better, pressurized air, Nitrogen - 99,99 % purity grade or better • Gas-selector switch and regulators
15.	Conditioning	Laboratory with temperature and humidity control and indicators

Annex C

SCHEME OF INSPECTION AND TESTING

1. QUALITY ASSURANCE PLAN

1.1 It is expected that during operation of BIS licence, manufacturers will implement a Quality Assurance Plan (QAP) i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan (QAP) defining the control unit (i.e. lot/batch etc.), the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and declare the arrangement for testing i.e. whether in-house or subcontracting/sharing for each applicable test and submit the same to BIS Branch Office for information. The manufacturer shall comply with the QAP and maintain test records in accordance with para 2.1.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is: entire quantity of geocells of the same style (i.e. same combination of Weld Spacing x depth (in mm) e.g. 330 x150, 330 x 200 etc.) made from the same consignment of raw material under similar conditions in a day.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**. Manufacturer has the discretion of declaring their own levels of control or accept the levels of control given in this document.

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan.

2. ENSURING COMPLIANCE THROUGH TESTING- manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard for which they may have in-house test facilities. However, there is no obligation to maintain in-house laboratory. Licensee may use alternative arrangements for tests of the production as per the declared QAP. Various alternatives are available for operation of BIS certification as given below and the relevant guidelines for availing such relaxations by the manufacturers, as amended from time to time, are to be referred:

- i) Shared testing resources like common facility,
- ii) Cluster based testing facility,
- iii) Sub-contracting to outside laboratories which may either be:
 - a) BIS recognised/empanelled laboratories, or
 - b) Any accredited laboratory as per ISO/IEC 17025

2.1 TEST RECORDS- The manufacturers shall maintain test records for the tests carried out (either in-house or at a sub-contracted or at shared test facility) to establish conformity of the product to the Standard for operation of licence. For the tests being subcontracted or conducted at a shared test facility,

test results issued by the laboratories or test facilities, shall be made available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on the label affixed to each geocell and/or each package of geocells, provided always that the material so marked conforms to each requirement of the specification.

3.1 Packing and Marking shall be done as per the Indian Standard.

3.2 **Additional Marking requirements:** The material shall also be marked with the following additional requirement on each geocell and/or each package of geocells.

a) "For BIS certification details please visit www.bis.gov.in"

4. IDENTIFICATION, DELIVERY, STORAGE AND HANDLING – of geocells, shall be done as specified under Cl. 9 of the IS 17483 (Part 2): 2020.

5. REJECTION - The production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016

TABLE 1
(Recommended Levels of Control By BIS- For Guidance Only)

(1)				(2)		
Test Details				Levels of Control		
Cl.	Requirement	Test Methods Clause Reference		No. of Sample	Frequency	Remarks
4	MATERIALS	4	IS 17483 (Part 2)	One	Each consignment	No testing is required if material is received with supplier's test certificate
5.	MANUFACTURE					
5.1	Construction	5.1	IS 17483 (Part 2)	Firm shall exercise adequate in-process controls to ensure that the material is manufactured in accordance with the specification		
5.2	Dimensions (depth and Weld Spacing)	5.2	-do-	5	Each control unit	
5.2.1	h/Deq ratio	5.2	-do-	5	Each control unit	
5.3	Texturing	5.3	-do-	1	Each control unit	
5.4	Perforations	5.4	-do-	5	Each control unit	
5.5	Seam Weld	5.5	-do-	5	Each control unit	
6.1	Dimensional stability	6.1	-do-	Firm shall exercise adequate in-process controls to ensure that the material is manufactured in accordance with the specification		
6.2	Requirements of Geocells for Slope Erosion Protection Application					
i.	Density	-	IS 13360 (Part 3)/Sec 10 or IS 13360 (Part 3)/Sec 11 or IS 13360 (Part 3)/Sec 12	5	Each control unit	

ii.	Environmental stress crack resistance - Notched constant tensile load (ESCR - NCTL), 400 h,	-	IS 16346	1	Once in three years	Also whenever the raw material supply, the production technology and the process and stabilization of the product changes
iii.	Environmental stress crack resistance (ESCR), 5000 h	-	Condition B of Annex C	1	Once in three years	Also whenever the raw material supply, the production technology and the process and stabilization of the product changes
iv.	Carbon black content	-	IS 2530	1	Once in a month	For each consignment of raw material used
v.	Post texturing strip/cell wall thickness at a pressure of 2 ± 0.01 kPa,	-	IS 13162 (Part 3)	1	Once in a week	
vi.	Seam peel-strength per 25 mm of cell depth,	-	Method B of IS 17369 (Part 1)	1	Each control unit	
vii.	Seam weld hang strength for 100 mm of seam weld under constant dead weight of 72.5 kg for 7 days at 54 ± 2 °C	Annex D	IS 17483 (Part 2)	1	Once in three months	
viii.	Resistance to oxidation, Retained tensile strength	-	IS 17360	1	Once in five years	Also whenever the raw material supply, the production technology and the process and stabilization of the product changes
ix.	Retention of breaking strength after UV exposure of 500 h	Annex E	IS 17483 (Part 2)	1	Once in five years	Also whenever the raw material supply, the production technology and the process and stabilization of the product changes
x.	Friction efficiency	Annex F	IS 17483 (Part 2)	1	Once in six months	

xi.	Standard oxidative induction time	-	ISO 11357-6	1	Once in a year	
xii.	High pressure oxidative induction time	-	ASTM D 5885	1	Once in a year	