



उत्पाद मैनुअल
भु कृत्रिम — जिओसैल्स
भाग 1 भार धारण अनुप्रयोग हेतु
IS 17483 (Part 1):2020 के अनुसार

PRODUCT MANUAL
FOR Geosynthetics — Geocells —
Part 1 – Load Bearing Application
ACCORDING TO IS 17483 (Part 1):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 1):2020
	शीर्षक Title	:	Geosynthetics — Geocells — Specification Part 1 – Load Bearing Application
	संशोधनों की संख्या No. of amendments	:	2
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 1. 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. Note: This section indicates the requirements for raw material (if specified in the IS) for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance
b)	समूहीकरण दिशानिर्देश Grouping Guidelines	:	Please refer Annex-A
c)	नमूने का परिमाण	:	1 geocell Note: This section indicates the quantity of the sample of the product

	Sample Quantity	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 (incase of market surveillance, effort may be made to procure therequired quantity of product sample, as far as possible since raw material sample may not be available in market)
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d)	Surveillance sampling guidelines	One Factory Sample shall be tested in a single operative year for all requirement except MATERIALS(CL.4) AND TYPE TESTS I.E. TABLE 1- SL NO- ii) Environmental stress crack resistance - Notched constant tensile load (ESCR - NCTL), 400 h, iii) Environmental stress crack resistance (ESCR), 5000 h,, viii) Resistance to oxidation, Retained tensile strength and ix) Retention of breaking strength after UV exposure of 500 h, One Market Sample shall be tested in a single operative year for all requirements except MATERIALS(CL.4) AND TYPE TESTS I.E. TABLE 1- SL NO- ii) Environmental stress crack resistance - Notched constant tensile load (ESCR - NCTL), 400 h, iii) Environmental stress crack resistance (ESCR), 5000 h,, viii) Resistance to oxidation, Retained tensile strength and ix)Retention of breaking strength after UV exposure of 500 h, and tests for Friction Efficiency, Standard oxidative induction time and High pressure oxidative induction time
3.	परीक्षण उपकरणों की सूची List of Test Equipment	: Please refer Annex-B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	: Please refer 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 1):2020 with the following scope:
	Name of the product	Geosynthetics — Geocells for Load Bearing Application
	Style Number(s)	Weld spacing x cell depth (in mm) e.g. 330 x150, 330 x 200 etc.

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 number i.e. weld spacing x cell depth (e.g. 330x150) may be tested to cover the required styles in the scope of licence. For example, if the firm is manufacturing geo cell 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 facilities available.

During operation of licence, samples of each variety covered in the scope of licence, shall be tested 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.	Pocket Size, cl.5.2.1, Annex G	Measuring tape, Ruler, Metallic Frames with Protruding Bars at Uniform Spacing to hold
3.	Surface density of indentation, Cl 5.3	Magnifying glass having minimum magnification of 10X, means for cutting specimen of 1 sq.cm.
4.	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.

5.	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 $\pm 0,1$ 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, • Sinkers, • 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 $\pm 0,5$ °C, <u>As per Method B of IS 13360 (Part 3/Sec 10)</u> • Balance, accurate to $\pm 0,1$ 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
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		• 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
6.	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
7.	Environmental stress crack resistance (ESCR), 5000 h	Apparatus as per Annex C incorporating • 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 $50 \pm 0.5^{\circ}\text{C}$) • reagent - nonylphenoxy poly (ethylene-oxy) ethanol • Aluminium Foil – Approximately 0.8 to 0.13 mm thick • Jig
8.	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.
9.	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 ± 1 s.
10.	Seam peel-strength per 25 mm of cell depth	• Tensile testing machine • Clamps
11.	Seam weld hang strength for 100 mm of seam weld under constant dead weight of 72.5 kg for 7 days at $54 \pm 2^{\circ}\text{C}$	• 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 $54 \pm 2^{\circ}\text{C}$ for 7 days, see Annex D of IS 17483 Part 1)</i>
12.	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 $(100 \pm 1)^{\circ}\text{C}$ as per IS 17360
13.	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/m^2, 1nm bandpass at 340 nm) in 120 min cycles at $65 \pm 5^{\circ}\text{C}$, consisting of 102 minutes of light only, followed by 18 min of water spray and light

		• Clamps • Tension Testing Machine
14	Friction efficiency	Shear Box Apparatus, see Annex F of IS 17483 Part 1
15	Standard 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
16	High pressure oxidative induction time	Setup for high pressure differential scanning calorimetry as per ASTM D 5885
17	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 manufacturers (licensees/applicants) will implement a Quality Assurance Plan 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 defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is : For the purpose of this scheme, 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, shall be taken as one control unit.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1**.

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. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates routine tests where test equipment is required in house as “R” or other tests which can be subcontracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as “R” in Column 2 of Table 1) is also optional.

2.2.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as “R” in Column 2 of Table 1), where different tests given in the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.4 TEST RECORDS- The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be 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 The geocells panels shall be packed either in pallets or in collapsed sheet form, as per the contract or order. Each pallet shall be protected by wrapping it in a film of minimum thickness of 50 microns to prevent it from the adverse impact of heat and moisture, oil, grease, dirt, dust and other stains. In case of geocell in collapsed sheet form, the packing shall be as per agreement between the buyer and the seller.

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

4. IDENTIFICATION, DELIVERY, STORAGE AND HANDLING – of geocells, shall be done as specified under Cl. 9 of the IS 17483 (Part 1):2021

5. REJECTION - All 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

(ONLY FOR GUIDANCE PURPOSE)

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or)S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods Clause Reference			No. of Sample	Frequency	Remarks
4	MATERIALS	4	IS 17483 (Pt. 1)	S	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 (Pt. 1)	R	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-	R	5	Each control unit	
5.2.1	h/Deq ratio Geocell Pocket Size	5.2 Annex G	-do-	R	5	Each control unit	
5.3	Texturing	5.3	-do-	R	1	Each control unit	
5.4	Perforations	5.4	-do-	R	5	Each control unit	

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5.5	Seam Weld	5.5	-do-	R	5	Each control unit	
6.1	Dimensional stability	6.1	-do-	R	Firm shall exercise adequate in-process controls to ensure that the material conforms to the requirements of the specification		
6.2	Requirements of Geocells for Load Bearing Application						
i.	Density		IS 13360 (Part 3)/Sec 10 or IS 13360 (Part 3)/Sec 11 or IS 13360 (Part 3)/Sec 12	R	5	Each control unit	
ii.	Environmental stress crack resistance - Notched constant tensile load (ESCR - NCTL), 400 h,		IS 16346	S	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	S	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	S	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)	R	1	Once in a week	

vi.	Seam peel-strength per 25 mm of cell depth,		Method B of IS 17369 (Part 1)	R	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 $54 \pm 2^{\circ} \text{C}$	Annex D	IS 17483 (Part 1)	S	1	Once in three months	
viii.	Resistance to oxidation, Retained tensile strength		IS 17360	S	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 1)	S	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 1)	S	1	Once in six months	
xi.	Standard oxidative induction time		ISO 11357-6	S	1	Once in a year	
xii.	High pressure oxidative induction time		ASTM D 5885	S	1	Once in a year	