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उत्पाद मैन्युअल
वस्त्रादि— सीमेंट आधारित मैट्रिक्स में उपयोग के लिए सिंथेटीक सूक्ष्म तन्तु— विशिष्टि
IS 16481: 2022 के अनुसार

PRODUCT MANUAL FOR
TEXTILES — SYNTHETIC MICRO FIBRES FOR USE IN CEMENT BASED MATRIX — SPECIFICATION ACCORDING to IS 16481: 2022

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 16481: 2022
	शीर्षक **Title**	:	Textiles — Synthetic Micro Fibres for Use in Cement Based Matrix —Specification
	संशोधनों की संख्या **No. of amendments**	:	03
2.	**नमूना दिशानिर्देश** **Sampling Guidelines**		
a)	**कच्चा माल** **Raw material**	:	No specific requirement. 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 to Annex-A
c)	**नमूने का परिमाण** **Sample Size**	:	02 kg approx. 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**	:	Fibre type and class 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
6.	**एक दिन में संभावित परीक्षण** **Possible tests in a day**		
	Following tests are possible to be carried out in a day, provided that the conditioned samples are available (where applicable): a) IPA Content; and Polymer Content (Cl. 4.3.1, 4.3.2) b) Monofilament/Multi Filament (Cl.4.3) c) Cut Length (Cl 4.3 and Table 2 Sl.No.ii) d) Identification of Fibre by Dissolution Tests (see IS 667), (Cl 4.3, 4.3.1) e) Routine Differentiation Test for Virgin and Recycled Fibres – Examination under UV Light (Cl.4.3.1) f) Secant Modulus (Cl 4.3.3) g) Cross Section of Fibre (Table 1- Sl. No. I, Cl 4.2) h) Tensile Strength of Fibre (Table 1- Sl. No. ii, Cl. 4.2) i) Specific Gravity (Table 1- Sl. No. iii, Cl. 4.2) j) Ultimate Elongation, Percent (Table 1- Sl. No. iv, Cl. 4.2) k) Melting Temperature (Table 1-Sl. No. v, Cl. 4.2) l) Glass Transition Temperature (Table 1-Sl. No. vi, Cl. 4.2) m) Equivalent Fibre Diameter (Table 2-Sl. No. i, Cl. 4.2) n) Aspect Ratio (Table 2-Sl.No. iii,Cl. 4.2) 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.	
7.	**लाइसेंस का दायरा/Scope of the Licence:**	
	"Licence is granted to use Standard Mark as per IS 16481: 2022 with the following scope:	
	Name of the product	Textiles — Synthetic Micro Fibres for Use in Cement Based Matrix
	Fibre type and class	Polyester - Class I/II/III Polypropylene - Class I/II/III Nylon 6
	Optional requirements	With/Without Resistance to Ultraviolet Light

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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.

I. Samples of synthetic micro fibres of each fibre type intended to be covered in the scope of licence (Polyester, Polypropylene, Nylon 6) shall be tested. However, for Polyester & Polypropylene Fibres, in case sample of higher class (Class III being the highest and Class I being the lowest) is tested, lower classes may also be covered in the scope of licence.

II. If sample with optional requirement of Resistance to Ultraviolet Light is drawn and tested, then product without Resistance to Ultraviolet Light may also be included in the scope of licence.

III. Scope of licence shall be restricted based on the manufacturing and testing facilities available.

IV. 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 EQUIPMENT
(INDICATIVE LIST, FOR GUIDANCE ONLY)

Sl. No.	Tests Used In With Clause Reference	Test Equipment/Chemical
1.	Cross section, Cl. 4.2	Compound Microscope (100X-500X), Dissecting Needles, glass slides, cover glasses, and cross sectioning device and laboratory reagents as per IS 667
2.	Tensile strength, Ultimate elongation, Cl. 4.2	Tensile Strength Testing Machine either of CRT, CRL or CRE type, with clamps to grip the sample and means for adjusting the distance between the clamps And for application of pre-tension
3.	Specific gravity, Cl. 4.2	– Suitable equipment from the following depending upon test method: – Balance, accurate to 0.1 mg. – Pan straddle or other stationary support. – Pyknometer, of, for example, 50 ml capacity, with side-arm overflow – Capillary and equipped with a thermometer graduated in 0.l ^0C from – 0 to 30 ^{0}C. – Liquid bath, thermostatically controlled to within 0.l ^{0}C. – Immersion liquids: Freshly distilled water or other suitable liquid – containing not more than 0.l % of a wetting agent to help in removing air – bubbles. – Glass cylinder, of capacity 250 ml. – Thermometer, graduated in 0.1 ^{0}C divisions Measuring flask, of capacity 100 ml. – Draw glass stirrers. – Automatic burette, of capacity 25 ml, graduated in0.l ml and kept in the – thermostatically controlled bath – Density gradient column – Calibrated glass floats – Set of suitable hydrometers – Siphon or pipette assembly – Cathetometer (optional)
4.	Melting Temperature, Cl. 4.2	Differential Scanning Colorimeter (DSC) and Balance capable of weighing to ± 10 µg. as per Annex H
5.	Glass Transition Temperature, Cl. 4.2	Differential Scanning Colorimeter (DSC) and Balance capable of weighing to ± 10 µg. as per Annex H

6.	Equivalent fibre diameter, Cl. 4.2	optical microscope, micrometer with precision of 0.001 mm
7.	Length, Cl. 4.2	– Oiled plate method – Transparent glass plate, liquid paraffin, piece of velvet, tweezers, scale – Cello plate method – transparent cello-tape, scissors/blade, table, scale – Array method – Stape fiber sorter and accessories, velvet push, pair of tweezers
8.	Aspect ratio, Cl. 4.2	– Oiled plate method – Transparent glass plate, liquid paraffin, piece of velvet, tweezers, scale – Cello plate method – transparent cello-tape, scissors/blade, table, scale – Array method – Stape fibre sorter and accessories, velvet push, pair of tweezers
9.	Drying shrinkage for concrete only, Cl. 4.2	Apparatus for drying shrinkage test, drying oven, matured specimens as per IS 1199 and Annex-L of IS 16481
10.	Isophthalic Acid (IPA) content, Cl. 4.3.1/Routine Differentiation of Material under UV Light	– PPE's like safety goggles, apron – surgical hand gloves – Gas chromatograph – capillary column – Dispensette or pipette – Volumetric Flask – Beaker – Funnel – 50ml flask, – Heating Mental -AR grade – Dimethyl Isophthalate Benzyl – Alcohol, – Chloroform, – Isopropyl Titnate, – Dimethyl Sub urate, – UV lamp/UV Cabinet
11.	Resistance to Alkalis, Cl. 4.4.	– Calcium Hydroxide Solution (pH 12-13), – Weighing Balance with accuracy of 1 mg, – Gass Container (Volumetric Flasks or Beakers 500 - 1000 ml capacity), Thermometer with – accuracy of 10oC, – Tensile Testing Machine of CRT or CRE type
12.	Resistance to Acids, Cl. 4.5	– Hydrochloric Acid Solution (pH 4-5), – Weighing Balance with accuracy of 1 mg, – Gass Container (Volumetric Flasks or Beakers of 500 - 1000 ml capacity), – Thermometer with accuracy of 10C, – Tensile Testing Machine of CRT or CRE type
13.	Resistance to Ageing, Cl. 4.6	**Oven Method** – Hot air oven – steel scale – Thermometer **Oxygen Pressure Method** – Oxygen Pressure chamber with a safety valve and a pressure gauge, oxygen cylinder – Tensile Testing Machine of CRT or CRE type
14.	Resistance to Ultraviolet Light, Cl. 4.7 (Optional)	Fluorescent UV Lamp-B with arrangement of condensation at 50±3°C, Tensile Testing Machine (see IS 235)

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: the quantity of the Synthetic Micro Fibres for Use in Cement Based Matrix produced using same raw material & under similar conditions of manufacturing 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**.

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 each bag or pouch, 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 bag or pouch:

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

4. 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**			**No. of Sample**	**Frequency**	**Remarks**
		Clause	**Reference**				
4.2	Cross section		IS 667	R	One	Each control unit	
4.2	Tensile strength, Ultimate elongation,		IS 235	R	One	Each control unit	
4.2	Specific gravity	Annex G	IS 16481	R	One	Each control unit	
4.2	Melting Temperature	Annex H	IS 16481	S	One	Once in six months	
4.2	Glass Transition Temperature	Annex H	IS 16481	S	One	Once in six months	
4.2	Equivalent fibre diameter	Annex J	IS 16481	R	One	Each control unit	
4.2	Length		IS 10014 (Part 1)	R	One	Each control unit	
4.2	Aspect ratio	Annex K	IS 16481	R	One	Each control unit	
4.2	Drying shrinkage for concrete only		IS 1199	S	One	Once in a year	
4.3	Material identification, cut length	4.3	IS 16481	S	One	Each consignment of fibre supplied	The user shall be provided with a test certificate for every lot of fibre supplied by the fibre manufacturer along with a test report indicating that the fibre supplied is virgin

							fibre (tested as per dissolution tests of IS 667)
4.3.1	Test for checking polyester virgin fibres/IPA content	4.3.1	IS 16481	S	One	Each consignment of fibre supplied	The user shall be provided with a test certificate for every lot of fibre supplied by the fibre manufacturer along with a test report indicating the result of the UV examination test or IPA content test (As required by purchaser)
4.3.2	Test for polymer content of all virgin polymers and other additives	4.3.2	IS 16481	S	One	Each consignment of fibre supplied	The user shall be provided with a test certificate for every lot of fibre supplied by the fibre manufacturer along with a test report indicating the polymer content of all virgin polymers of polyester, polyamide and polypropylene and other additives such as oxidation and UV stabilizers
4.3.3	Material (Secant Modulus)	4.3.3	IS 16481	S	One	Each consignment of fibre supplied	The user shall also be provided with a test certificate for every lot of fibre supplied by the fibre manufacturer along with a test report, indicating that the secant modulus values shall meet the requirements
4.4	Resistance to Alkalis	Annex D	IS 16481	S	One	Once in six months	
4.5	Resistance to Acids	Annex E	IS 16481	S	One	Once in six months	
4.6	Resistance to Ageing,	4.6	IS 16481	S	One	Once in six months	
4.7	Resistance to Ultraviolet Light (Optional)	Annex F	IS 16481	S	One	Once in six months	