उत्पाद मानुयल
पॉलीकार्बोनेट शीटें
14443 : 1997 के अनुसार

PRODUCT MANUAL FOR
POLYCARBONATE SHEETS
ACCORDING TO IS 14443 : 1997

भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम 2018 की स्कीम-I के तहत यह उत्पाद मानुयल प्रमाणीकरणके प्रचलन मे रीति और पारदर्शिता के सुसंगता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों एवं लाइसेन्स धारियों द्वारा संदर्भ सामग्री के रूप मे उपयोग किया जाएगा। बीआईएस लाइसेन्स/प्रमाण पत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज़ का उपयोग किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence 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 licence/certificate.

1.	**उत्पाद** **Product**	:	IS 14443 :1997
	शीर्षक **Title**	:	**पॉलीकार्बोनेट शीटें- विशिष्टि** Polycarbonate Sheets - Specification
	संशोधन संख्या **No. of Amendments**	:	NIL
2.	**नमुनाकरण दिशा निर्देश** **Sampling Guidelines:**		
a)	**कच्चा माल** Raw material	:	Not Specified
b)	**समूहिकरण दिशा निर्देश** Grouping guidelines	:	कृपया Annex-ए देखें Please refer ANNEX – A
c)	**नमूनेका परिमाण** Sample Size	:	पूर्ण परीक्षण के लिए 15 शीट। 15 Sheets for complete testing.
3.	**परीक्षण उपकरणो की सूची** **List of Test Equipment**	:	कृपया Annex-Bदेखें Please see Annex – B

4.	**निरीक्षण व परीक्षण स्कीम** **Scheme of Inspection and Testing**	:	कृपया Annex-सी देखें Please see Annex – C
5.	**एक दिन में संभावित परीक्षण** **Possible tests in a day :**		
	All test specimens are to be conditioned for a minimum period of 48 h at 27 ± 2°C under 65 ± 5 percent relative humidity.		
	i) No. of layers/walls (Clause 3.2.2 and Table 1) ii) Profile (Clause 3.2.2 and Table 1) iii) Texture (Clause 3.2.2 and Table 1) iv) Light stabilization (Clause 3.2.3 Table 2) v) Coating (Clause 3.2.3 Table 2) vi) Transparency (Clause 3.2.3 Table 2) vii) Colour (Clause 3.2.3 Table 2) viii) Weight/sq. Meter (kg/m2) (Clause 3.2.4, Table 3) ix) Dart drop impact (Clause 3.2.4, Table 3) x) Light transmission (Clause 3.2.4, Table 3) xi) Flame retardancy (Clause 3.2.4, Table 3)		
6.	**लाइसेन्स का कार्यक्षेत्र/Scope of the Licence**:		
	IS 14443 : 1997 के अनुसार मानक मुहर का उपयोग करने के लिए लाइसेन्स निम्नलिखित कार्यक्षेत्रके लिए प्रदान किया जाता है "Licence is granted to use Standard Mark as per 14443 : 1997 with the following scope:		
	उत्पाद का नाम Name of the product	**पॉलीकार्बोनेट शीटें- विशिष्टि** Polycarbonate Sheets - Specification	
	पदनाम/वर्गीकरण Designation/Classification	Block 1 * Block 2 * Block 3 * Block 4 * Block 5	

ANNEX – A
TO THE PRODUCT MANUAL FOR POLYCARBONATE SHEETS AS PER IS 14443 : 1997

GROUPING GUIDELINES

The following relaxation may be given when a variety is tested for all the requirements:

Variety Tested	**Additional Variety that may be covered**	**Comments**
No. of Layers-1	No. of Layers- 2, 3 and 4	Can be covered if 2nd, 3rd and 4th layers are manufactured from same or lower MFR polycarbonate.
No. of Layers-2	No. of Layers- 3 and 4	Can be covered if 3rd and 4th layers are manufactured from same or lower MFR polycarbonate.
No. of Layers-3	No. of Layers- 4	Can be covered if 4th layer is manufactured from same or lower MFR polycarbonate.
Solid section	Hollow N profile, Hollow rectangular profile, Hollow Tunnel Profile	
Light Stabilization-Yes	Light Stabilization-No	
Coating-Hard	Coating-UV	
Transparent	Translucent, Opaque	
Colored	Natural	
Weight/sq. Meter (kg/m2) - Above 15.0	All up to 15.0	
Dart Drop Impact - Above 150 (J)	All up to 150 (J)	
Light Transmission - Above 85 %	All up to 85 %	
Flame Retardancy - UL 94 5V	UL 94 HB, UL 94 V2, UL 94 V1 and UL 94 V0	
Resistance to vandalism - Energy per level 1149 J	Energy per level - 423 J & 786 J	
Resistance to forced entry- Total Kinetic Energy per level (J)-21000 (Min)	Total Kinetic Energy per level (J)-9000 & 15000	
Resistance to bullet - Striking Energy - 3231 (J)	Striking Energy - 540(J), 935 (J), 1550 (J) and 3018 (J)	
Resistance to explosion - Level of resistance - 3	Level of resistance - 1 & 2	

Note: During the operation of the Licence, BO shall ensure that all the Designation/Classification, types and sizes covered in the Licence are tested in rotation, to the extent possible.

ANNEX – B
TO THE PRODUCT MANUAL FOR
POLYCARBONATE SHEETS
AS PER IS 14443 : 1997
List of test equipment

Major test equipment required to test as per the Indian Standard

Sr. No.	Tests used in with Clause Reference		Test equipment
	Clause	Test	
1.	Cl 3.2.3, Table 2, IS 14443	Light stabilization	Digital/Axio microscope
2.	Cl 3.2.3, Table 2, IS 14443	Coating	Digital/Axio microscope
3.	Cl 3.2.3, Table 2, IS 14443	Transparency	Opacity Tester/Haze meter
4.	Cl 3.2.3, Table 2, IS 14443	Colour	Visual
5.	Cl 3.2.4, Table 3, IS 14443	Weight/sq. Meter (kg/m2)	Weighing Balance/ Weighing machine
6.	Cl 3.2.4, Table 3, Annex B, IS 14443	Dart drop impact	Gardner Impact Tester Round nosed dart- 12.7 mm dia Variable mass of up to 15.0 kg Measuring Tape
7.	Cl 3.2.4, Table 3, IS 14443 and Annex D of IS 14434	Light Transmission	Opacity Tester/Haze Meter, Recording Spectrophotometer.
8.	Cl 3.2.4, Table 3, IS 14443 & Annex C of IS 14434	Flame Retardancy	Test Chamber Laboratory Burner Wire Gauze Gas Supply Ring Stand Stopwatch Conditioning room or chamber A metal support fixture
9.	Cl 3.2.5, Table 4, Annex C, IS 14443	Resistance to vandalism	Steel ball of Dia 100 mm (with a mass of about 4 110 g). Ball holder Test Piece Holder Conditioning Chamber
10.	Cl 3.2.5, Table 4, Annex D, IS	Resistance to forced entry	Device for testing the rupture resistant quality of rupture resistant glazings.

	14443		Supporting Device as per Annex- D-3.1.1 Testing arrangement as per Annex- D-3.1.2 & clause 3.1.3 Impact Velocity tester for Axe V-Impact Conditioning Chamber
11.	Cl 3.2.5, Table 4, Annex E, IS 14443	Resistance to bullet	Frame Firearms or other ballistic testing equipment Ammunition which permits compliance with the test conditions specified in Table 14 A suitable system for measuring the bullet velocity A 500 + *5* mm cube-shaped splinter collector Conditioning Chamber
12.	Cl 3.2.5, Table 4, Annex F, IS 14443	Resistance to explosion	Specimen Holder as per Annex-F-3.1 Device for the Demonstration of the Explosive Effect as per Annex-F-3.2 Measuring Device as per Annex-F-3.3 Conditioning Chamber

The above list is indicative only and may not be treated as exhaustive

ANNEX B

TO THE PRODUCT MANUAL FOR
POLYCARBONATE SHEETS
AS PER IS 14443 : 1997

Scheme of Inspection And Testing

1. **LABORATORY -** A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. **TEST RECORDS** – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. **PACKING AND MARKING** – The Standard mark as given in the schedule of the licence shall be legibly and indelibly marked on the label applied to each masked sheet as well as on its packaged, provided always that the material in each package to which this mark is thus applied conforms to every requirement of the specification.

3.1 **MARKING** – Each masked sheet shall be legibly and indelibly marked with the information provided under clause 7.2.1 of IS 14443. In addition, the following shall be incorporated on each container:

i. BIS Licence Number CM/Land

ii. BIS website details i.e. “For details of BIS certification please visit www.bis.gov.in”.

4. **CONTROL UNIT** – For the purpose of this scheme, all polycarbonate sheets of the same size and designation manufactured from the same consignment of raw materials under similar conditions in a shift shall constitute a control unit.

5. **LEVELS OF CONTROL** - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

6. **REJECTIONS** – 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 LEVELS OF CONTROL
(Para 6 of the Scheme of Testing and Inspection)

(1)				(2)	(3)		
Test Details				Test equipment requirement R: Required (or) S: Sub-Contracting Permitted	Levels of Control		
Clause	Requirements	Test method Cl. Ref.	Test Method IS		No. of Sample	Frequency	Remarks
Cl 3.2.2, Table 1,	No. of layers/walls	Table 1	IS 14443	**R**	Two	Each Control unit	Please see Note 3
Cl 3.2.2, Table 1	Profile	-do-	-do-	**R**	Two	-do-	-do-
3.2.2, Table 1	Texture	-do-	-do-	**R**	Two	-do-	-do-
3.2.3, Table 2	Light stabilization	Table 2	-do-	**R**	Two	-do-	-do-
3.2.3, Table 2	Coating	-do-	-do-	**R**	Two	-do-	-do-
3.2.3, Table 2	Transparency	-do-	-do-	**R**	Two	-do-	-do-
3.2.3, Table 2	Colour	-do-	-do-	**R**	Two	-do-	-do-
3.2.4, Table 3	Weight/sq. Meter (kg/m2)	Table 3	-do-	**R**	One	-do-	-do-
3.2.4, Table 3	Dart drop impact	Annex B	-do-	**R**	One	-do-	-do-
3.2.4, Table 3	Light Transmission	Annex D	IS 14434	**R**	One	-do-	-do-
3.2.4, Table 3	Flame Retardancy	Annex C	-do-	**R**	One	-do-	-do-
3.2.5, Table 4	Resistance to vandalism	Table 4 Annex - C	IS 14443	**S**	Three	Once in a Year	-do-
	i. Drop height						-do-
	ii. Striking energy per drop (j)						-do-
	iii. Total striking energy per level (j)						-do-

3.2.5, Table 4	Resistance to forced entry	Table 4 & Annex-D	IS 14443	**S**	Three	Once in a Year	-do-
	i. Kinetic energy per stroke (j)						-do-
	ii. Total kinetic energy per level						-do-
3.2.5, Table 4	Resistance to bullet	Table 4 & Annex-E	IS 14443	**S**	Three	Once in a Year	-do-
	i. Weapons/calibre						-do-
	ii. Ammunition/mass						-do-
	iii. Striking velocity (m/s)						-do-
	iv. Striking energy (j)						-do-
3.2.5, Table 4	Resistance to explosion	Table 4 & Annex-F	IS 14443	**S**	Three	Once in a Year	-do-
	i. Positive max. Pressure of the reflected pressure wave (Bar)						-do-
	ii. Time duration of the positive pressure phase (m/s) Dimensions A) Width B) Length C) Thickness						-do- -do-

Note-1: Whether test equipment is required, or sub-contracting is permitted in column 2 shall be decided by the Bureau and shall be mandatory. Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empaneled by the Bureau.

Note-2: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head

Note – 3: All test specimens are to be conditioned for a minimum period of 48h at 27$\pm$ 2°C under 65 $\pm$ 5 percent relative humidity and the tests are also to be carried under same conditions as per clause 6 of IS 14443.