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IS 15972 (2012): Bamboo-Jute Composite Corrugated and Semi-Corrugated Sheets - Specification [CED 20: Wood and other Lignocellulosic products]



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Indian Standard

BAMBOO-JUTE COMPOSITE CORRUGATED AND
SEMI-CORRUGATED SHEETS — SPECIFICATION

ICS 79.060.99

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Wood and Other Lignocellulosic Products Sectional Committee had been approved by the Civil Engineering Division Council.

Corrugated and semi-corrugated sheets of various materials are presently in use for roofing of temporary and semi-permanent structures. Such materials include corrugated galvanized iron, aluminium and asbestos cement sheets. In addition to the above commonly used materials, in the recent years effective roofing sheets have been developed using alternate materials like bamboo/ bamboo-jute composite and have been successfully used.

Corrugated and semi-corrugated sheets from composite material of bamboo-mats and jute hessian impregnated with thermosetting resin, is being manufactured in the country. These sheets have also been successfully used in roofing of rehabilitation structures and in other semi-permanent structures. The standard has been formulated in order to provide guidance on manufacture and testing of bamboo-jute composite corrugated and semi-corrugated sheets.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard, is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BAMBOO-JUTE COMPOSITE CORRUGATED AND SEMI-CORRUGATED SHEETS — SPECIFICATION

1 SCOPE

This standard covers the requirement of bamboo-jute composite corrugated and semi-corrugated sheet for roofing purposes.

2 REFERENCES

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 agreement 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 definitions given in IS 707, IS 13958, IS 15476 and the following shall apply.

3.1 Bamboo-Jute Composite Corrugated and Semi-corrugated Sheet — A sheet made up of bamboo mats and mats made with fibres of jute, applied with polymer thermosetting resin, assembled and pressed (compression moulded for corrugation) under high temperature and pressure.

3.2 Bamboo Mat — A woven sheet in suitable geometric pattern using bamboo slivers.

3.3 Jute Hessian — Jute threads woven into a coarse cloth.

4 MATERIALS

4.1 Bamboo Mat

Bamboo mats required for the manufacture of bamboo jute composite corrugated and semi-corrugated sheets shall be compactly woven in suitable pattern from slivers of uniform thickness and width. Thickness of slivers shall be in the range of 0.6 mm to 0.8 mm and with a width of 5 mm to 25 mm. Care shall be taken to exclude the slivers with epidermal and endodermal layer. However, presence of epidermal layers up to a maximum of 10 percent of the width of the sliver and only on either edge shall be permitted

4.2 Jute Hessian

Jute hessian shall be minimum 220 gsm.

4.3 Adhesive

Resin used shall be of phenol formaldehyde type conforming to BWP type of IS 848, with or without fillers and/or other additives.

5 MANUFACTURE

Bamboo mat and jute hessian shall be impregnated with resin by suitable means, dried and assembled (number of layers and combination of materials shall be depending on thickness and end use) and hot pressed to get a final product having density of at least 1.1 kg/m². After hot pressing, the sheets shall be conditioned in ambient temperature for at least for 24 h.

6 DIMENSIONS AND TOLERANCES

6.1 Dimensions

Dimensions of the corrugated and semi-corrugated sheets (depth of corrugation, pitch, nominal thickness, length and width) shall conform to the values given in Table 1 and Fig. 1 and Fig. 2. Any other dimensions (length, width and thickness) as agreed to between the manufacturer and the purchaser may also be used.

6.2 Tolerances

The tolerances of the corrugated and semi-corrugated sheets for depth of corrugation, pitch, length and width shall conform to the values given in Table 1.

7 FINISH

7.1 The surface of the sheets shall be reasonably smooth and shall not have blisters or cracks.

7.2 The sheets shall not warp, split or delaminate.

8 TESTS AND REQUIREMENTS

8.1 Classification of Tests

8.1.1 Acceptance Tests

The following shall constitute acceptance tests:

- a) Density,
- b) Load bearing capacity,
- c) Water absorption,
- d) Resistance to impact,
- e) Resistance to boiling water, and
- f) Resistance to fire.

8.1.2 Type Tests

8.1.2.1 Type tests are intended to prove the suitability and performance of a new composition or a new type (corrugated or semi-corrugated) or size of sheet. Type tests shall be applied only when a change is made in resin composition or when a new type or size of sheet is to be introduced or at least once in a year.

8.1.2.2 The following shall constitute type tests:

- a) Density,
- b) Load bearing capacity,

- c) Water absorption,
- d) Impermeability,
- e) Resistance to impact,
- f) Resistance to boiling water,
- g) Resistance to frost,
- h) Cyclic test, and
- j) Resistance to fire.

8.2 Requirements

The bamboo-jute composite corrugated and semi-corrugated sheets shall conform to the requirements given in Table 2 when tested in accordance with the

Table 1 Dimensions and Tolerances
(Clauses 6.1 and 6.2)

All dimensions in millimetres.

Sl No.	Parameter	Dimension		Tolerance
		Corrugated	Semi-corrugated	
(1)	(2)	(3)	(4)	(5)
i)	Depth of corrugation	30	25	± 2
ii)	Pitch of corrugation	120	150	± 3
iii)	Nominal thickness, <i>Min</i>	2.5	2.5	—
iv)	Length of sheet	1 800	1 800	± 10
		2 400	2 400	
v)	Width of sheet	900	900	± 10
		1 000	1 000	

NOTES

1 The thickness of bamboo-jute composite corrugated/semi-corrugated sheet shall be taken as the mean of six measurements and shall be measured randomly along the width (except at the valleys) with a suitable measuring instrument.

2 For corrugated sheets, the depth of each of the six corrugations shall be measured randomly and the deviation in any of the cases measured shall not exceed the limits specified in this table. The depth shall be measured with suitable depth gauge. In case of semi-corrugated sheets the depth of two central corrugations shall be measured and the maximum deviation in any of the two cases measured shall not exceed the limits specified in this table.

3 Tolerances given for pitch relate to measurement over six pitches. For corrugated sheets the total length over six pitches shall be mentioned and it shall not vary from six times the specified pitch with tolerance. In the case of semi-corrugated sheets, the total length over three pitches shall be measured and the length measured over these three pitches shall not vary from three times the specified pitch by the tolerance given.

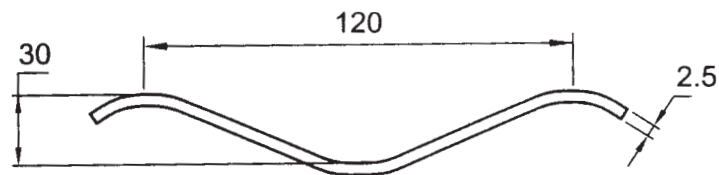


FIG. 1 CORRUGATED

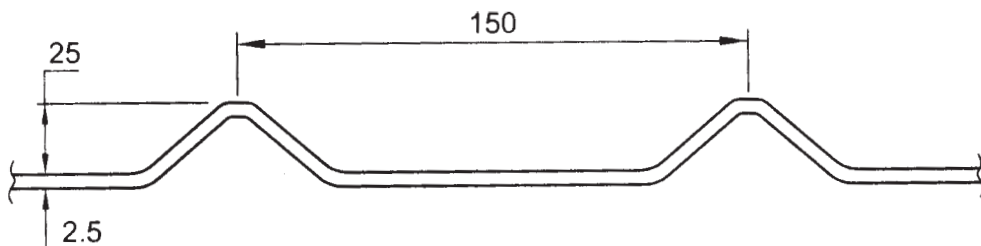


FIG. 2 SEMI-CORRUGATED

Table 2 Requirements of Bamboo Jute Composite Corrugated and Semi-corrugated Sheet
(Clauses 8.2, 9.1.2.2 and 9.2)

Sl No.	Property	Requirement	Methods of Test, Ref to	
			IS No.	Annex
(1)	(2)	(3)	(4)	(5)
i)	Density, <i>Min</i> , g/cm ³	1.1	—	B
ii)	Load bearing capacity, <i>Min</i> , N/mm:		IS 15476	—
	a) Dry state	2.5	—	—
	b) Wet state	2.3	—	—
iii)	Water absorption, percent, <i>Max</i>	3.0	IS 15476	—
iv)	Impermeability	The lower surface shall not show any formation of drops of water except for traces of moisture	IS 15476	—
v)	Resistance to impact	To pass the test	—	C
vi)	Resistance to boiling water, <i>Max</i> , percent:			
	a) Water absorption	6.0	—	D
	b) Increase in thickness	10.0	—	D
vii)	Resistance to frost	Shall not show signs of cracking	IS 5913	—
viii)	Cyclic test	No delamination	IS 15476	—
ix)	Resistance to fire:		IS 15476	
	a) Flame penetration	Not less than 10 min	—	—
	b) Rate of burning	Not less than 20 min	—	—
	c) Surface spread of flame, maximum area of char, mm	1 500	—	—

provision given in col 4 of Table 2 for the tests given in 8.1.1 and 8.1.2.

9 SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Acceptance Tests

9.1.1 Scale of Sampling

9.1.1.1 Lot

In any consignment, all sheets of the same type and size and manufactured under similar conditions of production shall be grouped together to constitute a lot.

9.1.1.2 All sheets in the lot shall be inspected for

finish as given in 7. The defective sheets shall be removed from the lot.

9.1.1.3 The lot shall then be examined for dimensional requirements. For this purpose, the number of sheets to be selected from the lot shall be in accordance with col 2 and col 3 of Table 3. These sheets shall be selected from the lot at random. In order to ensure the randomness of selection, the procedure given in IS 4905 may be followed.

9.1.2 Criteria for Conformity

9.1.2.1 All sheets selected in accordance with col 2 and col 3 of Table 3, shall be subjected to dimensional requirements. A sheet failing to satisfy this requirement shall be termed as defective. The lot shall

Table 3 Sample Size and Acceptance Number
(Clauses 9.1.1.3, 9.1.2.1 and 9.1.2.2)

Sl No.	Lot Size	Sample Size for Dimensional Requirement	Acceptance Number	Sample Size for Other Requirement
(1)	(2)	(3)	(4)	(5)
i)	Up to 500	20	1	3
ii)	501 to 1 000	32	2	5
iii)	1 001 to 3 000	50	3	7
iv)	3 001 and above	80	5	10

be considered as conforming to dimensional requirements, if the number of defectives found in the lot is less than or equal to the corresponding acceptance number given in col 4 of Table 3; otherwise the lot shall be rejected without further testing.

9.1.2.2 The lot which has been found as conforming to the dimensional requirements shall be tested for acceptance test requirements specified in **8.1.1** and as per Table 2. For this purpose, the sample size shall be in accordance with col 5 of Table 3. In case any sample drawn fails to satisfy the requirements, twice the number of samples shall be drawn and tested. If any of the retested samples also fail, the entire lot shall be rejected.

9.1.2.3 A lot shall be considered as conforming to the requirements of this standard, if **9.1.2.1** and **9.1.2.2** are satisfied.

9.2 Type Tests

For the purpose of type test, three samples of sheets shall be subjected to tests as specified in **8.1.2**. The samples shall be tested for compliance with requirements as per Table 2. All the samples shall conform to the requirements specified in Table 2.

10 MARKING

10.1 Each bamboo-jute composite corrugated or semi-corrugated sheet shall be legibly and indelibly marked or stamped with the following:

- a) Manufacturer's name or recognized trade mark, if any;
- b) Nominal dimensions;
- c) Year of manufacturer; and
- d) Batch number.

10.1.1 All markings shall be done on the rear side of the sheet near one edge.

10.2 BIS Certification Marking

The bamboo-jute composite corrugated and semi-corrugated sheet may also be marked with the Standard Mark.

10.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of the Standard Mark may be granted to the manufacturers or producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
707 : 1976	Glossary of terms applicable to timber technology and utilization (<i>second revision</i>)	4905 : 1968	Method of random sampling
848 : 2006	Synthetic resin adhesive for plywood (phenolic and aminoplastic) — Specification (<i>second revision</i>)	5913 : 2003	Asbestos cement sheets — Methods of test (<i>second revision</i>)
2553 (Part 1) : 1990	Safety glass — Specification: Part 1 General purposes (<i>third revision</i>)	13958 : 1994	Bamboo mat board for general purposes — Specification
		15476 : 2004	Bamboo mat corrugated sheets — Specification

ANNEX B

[Table 2, Sl No. (i)]

METHOD OF TEST AND CALCULATION OF DENSITY

B-1 Three specimens of size 300 mm × 300 mm shall be taken and pre-conditioned to a constant mass at a relative humidity of 65 ± 5 percent and a temperature of 27 ± 2 °C. Constant mass is considered to be reached when the results of two successive weighing operations at an interval of 2 h carried out after 24 h of conditioning do not differ by more than 0.1 percent of the mass of the test piece.

B-2 After conditioning each test specimen shall be weighed to an accuracy of 1 g. This is followed by determination of dimension of specimen with regard to:

- a) *Thickness* — Average of 6 readings randomly taken except in valley portion.
- b) *Length* — Average of 6 readings randomly taken.
- c) *Width* — Average of 6 readings randomly taken. The actual width is derived by multiplying with a factor of 1.1 in case of semi-corrugated sheet and 1.376 7 in case of corrugated sheet for sinusoidal corrugations and thereafter the density is calculated.

ANNEX C

[Table 2, Sl No.(v)]

RESISTANCE TO IMPACT

C-1 Specimen of size 300 mm × 300 mm which has been kept for at least 5 days in a controlled environment at a temperature of 27 ± 2°C and at a relative humidity of 65 ± 5 percent, is supported in a suitable square frame [see Fig. 3 of IS 2553 (Part 1)]. A steel ball of 0.5 kg for sheets of thickness less than 4 mm and of 1.0 kg for sheets of thickness

greater than or equal to 4 mm, is dropped from a height of 2 m by a suitable device (see Fig. 4 of IS 15476) to strike the sheet.

C-2 Three specimens shall be tested. The test piece shall not break or show any crack or tear.

ANNEX D

[Table 2, Sl No. (vi)]

RESISTANCE TO BOILING WATER

D-1 Specimen of size 100 mm × 100 mm with cut edges smoothed with fine emery paper shall be weighed and the thickness measured at three different places which shall be marked for identification later. The specimen shall be kept in boiling distilled water at 100 ± 1 °C for 8 h. The specimen shall then be transferred from boiling water and kept submerged in cold water at 27 ± 1 °C for 1 h. After wiping clean of water with tissue paper, the specimen shall be weighed and thickness measured at the same three places at which the thickness had initially been measured.

D-2 Three specimens shall be tested and average value of water absorption and thickness increase shall be determined. The amount of water absorbed shall be calculated from the increase in mass of the specimen and the water absorption shall be expressed as the percentage based on the initial mass. The test specimens shall not show any sign of delamination, deformation, deterioration of surface appearance.

ANNEX E*(Foreword)***COMMITTEE COMPOSITION**

Wood and Other Lignocellulosic Products Sectional Committee, CED 20

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Indian Plywood Industries Research & Training Institute, Bangalore	DR C. N. PANDEY (<i>Chairman</i>)
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Scientist 'E' (CED), BIS

Wood, Other Lignocellulosic Based Building Boards and Speciality Wood Products
Sub-committee, CED 20 : 6

In personal capacity (573, 23rd Cross, 13th Main, Banashankari 2nd Stage, Bangalore 560070)	DR H. N. JAGADEESH (<i>Convener</i>)
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The Western India Plywood Limited, Kannur	SHRI K. P. KAMALUDDIN SHRI C. A. GAFOOR (<i>Alternate</i>)
In personal capacity (5/6, 1st Floor, 13th Main, HAL, 2nd Stage, Indira Nagar, Bangalore 56008)	SHRI P. K. BAGCHI

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Amendments Issued Since Publication

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.org.in

Regional Offices:

Telephones

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14, C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: SCO 335-336, Sector 34-A, CHANDIGARH 160022	{ 260 3843 260 9285
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892

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