IS 3513-4 (1966): Resin Treated Compressed Wood Laminates (Compregs) - Specification, Part 4: Sampling and tests [CED 20: Wood and other Lignocellulosic products]

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IS : 3513 (Part IV) - 1966
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Indian Standard

SPECIFICATION FOR HIGH AND MEDIUM DENSITY WOOD-BASED LAMINATES (COMPREG)

PART IV SAMPLING AND TESTS

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
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SPECIFICATION FOR HIGH AND MEDIUM DENSITY WOOD-BASED LAMINATES (COMPREG)

PART IV SAMPLING AND TESTS

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Indian Standard

SPECIFICATION FOR HIGH AND MEDIUM DENSITY WOOD-BASED LAMINATES (COMPREG)

PART IV SAMPLING AND TESTS

0. FOREWORD

0.1 This Indian Standard (Part IV) was adopted by the Indian Standards Institution on 3 May 1966, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 High and medium density wood-based laminates, also known as compreg, are laminates made from thin wood veneers and thermo-setting phenol or cresol formaldehyde resins. It combines within itself the mechanical strength and resilience of natural timber with the stabilizing and moisture-proof qualities of thermosetting resins; besides, it has good machining properties, electrical insulation, and resistance to corrosive agents and termite attack. Because of its favourable dielectric properties and high strength, it is specially suitable for electrical insulating components which encounter severe mechanical stresses.

0.3 The requirement for compreg is covered in four parts as follows:

IS : 3513 (Part I)-1966 Specification for high and medium density wood-based laminates (compreg) : Part I Electrical purposes

IS : 3513 (Part II)-1966 Specification for high and medium density wood-based laminates (compreg) : Part II Chemical purposes

IS : 3513 (Part III)-1966 Specification for high and medium density wood-based laminates (compreg) : Part III General purposes

IS : 3513 (Part IV)-1966 Specification for high and medium density wood-based laminates (compreg) : Part IV Sampling and tests

0.4 In the preparation of this standard, the following standards issued by the British Standards Institution have been consulted:

B.S. 1137 : 1949 Synthetic resin-bonded paper sheets for use at power frequencies

B.S. 2572 : 1955 Phenolic laminated sheets

B.S. 2574 : 1955 Component parts of temporary unjointed orthopaedic calipers.

0.5 The Forest Research Institute and Colleges, Dehra Dun, has carried out extensive research on the development of compreg from indigenous sources, and its help and experience have been generously drawn upon. The experience of the Directorate General of Technical Development and the Ministry of Defence has also been drawn upon.

0.6 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part IV) covers methods of sampling and testing for compreg used for electrical, chemical and general purposes.

2. SAMPLING

2.1 Test Samples — Samples for tests shall be drawn at random from a batch as given in Table 1.

2.2 When testing boards for tensile strength according to IS : 1734-1960†, care shall be taken that the sample represents full board. In case of board thickness being less than the maximum thickness the gripping jaw of the machine is capable of holding the sample shall be cut incorporating the whole thickness of the board. In case the thickness of board is more than the maximum thickness the machine jaw is capable of holding, three sets of samples shall be cut, one incorporating one side surface, another incorporating the other side surface, and the third from the middle thickness of the board. The average of results obtained with the three sets shall be taken as the strength value for the board. Similar consideration shall apply to other tests regarding sample representation.

*Rules for rounding off numerical values (*revised*).

†Methods of test for plywood.

TABLE 1 NUMBER OF PIECES TO BE SAMPLED FROM DIFFERENT BATCHES

(*Clause* 2.1)

SIZE OF BATCH (NO. OF COMPREG PIECES OF ANY SIZE)	NUMBER OF SAMPLES TO BE SELECTED AT RANDOM
Less than 50	2
51 to 100	4
101 ,, 200	5
201 ,, 250	6
251 ,, 500	7
501 and above	10

3. TESTS

3.1 Water Absorption Test

3.1.1 *Test Specimen* — Dimensions of the test specimen shall be 40 × 40 × 12 mm. The specimen shall be cut so that it represents the whole cross-section of the board. In case of boards thinner than 12 mm the full thickness of boards shall be taken. In case of boards more than 12 mm thickness equal number of specimen shall be cut from either of the two surfaces. In case of boards thicker than 20 mm, three sets of samples shall be cut, one 12 mm from one surface, second 12 mm from the other surface and third 12 mm at the middle of the thickness.

3.1.2 *Procedure* — The test specimen shall be weighed and shall be submerged in water at 27° ± 2°C for a period of 24 hours. The specimen shall then be removed, surface dried in folds of two blotting papers and weighed. The increase in weight expressed as percentage of the original weight shall give the water absorption. The accuracy of weighing and general conditions shall be in conformity with IS : 1708-1960*.

3.2 Maximum Working Temperature Test

3.2.1 *Test Specimen* — Each test specimen shall be of full thickness of the material and approximately 300 × 100 mm or the actual width of the board whichever is less.

3.2.2 *Procedure* — The test specimen shall be kept in air at the specified temperature for a period of 72 hours and thereafter it shall be

*Methods of testing small clear specimens of timber.

removed, allowed to be cooled at room temperature and then examined for:

a) signs of delamination at the edges or blister formation, and
b) tensile strength.

3.2.3 *Interpretation of Test Results* — The test specimen shall be considered to have failed the test if it shows signs of delamination or blister formation or the tensile strength is less than 70 percent of the prescribed minimum value.

3.3 Resistance to Chemicals

3.3.1 *Test Specimen* — Three sets of test specimen shall be prepared for impact test, bending test and compression test as prescribed in IS : 1708-1960*. The specimen for compression test shall be kept 25 mm longer on either side and shall be cut down to correct size before compression test. Each set would consist of 12 specimens, 3 to be treated as blanks for control values and the rest 9 divided into 3 groups each of 3 specimens. Thus there would be 4 groups of specimens in each set. One set is for impact, one for bending test and one for compression test.

3.3.2 *Procedure* — The blank for each test shall be tested for control values for the following:

a) Impact strength,
b) Bending strength, and
c) Compression strength.

Other three groups shall be subjected to action of the following acids, one group for one acid, as follows:

Group 1 Subjected to 20 percent sulphuric acid for a period of 12 weeks at room temperature. The test pieces shall be kept fully immersed with all the six surfaces freely exposed to the action of the acid.

Group 2 Subjected to 20 percent nitric acid for a period of 12 weeks at room temperature. The test pieces shall be kept fully immersed with all the six surfaces freely exposed to the action of the acid.

Group 3 Subjected to 20 percent hydrochloric acid for a period of 12 weeks at room temperature. The test pieces shall be kept fully immersed with all the six surfaces freely exposed to the action of the acid.

3.3.3 After the action of the acid on the specimens in each group, one set, comprising one specimen from each group, shall be tested

*Methods of testing small clear specimens of timber.

for impact strength; second similar set tested for bending strength; and third set tested for compression strength in accordance with IS : 1708-1960*. The values so obtained shall be compared with those obtained for the blanks and change expressed as percentage of the original value.

3.4 Air Flash Test

3.4.1 *Object* — This test is envisaged to detect primarily that no faulty material is used for high voltage applications and also to ensure that the material is capable of withstanding electrical stress of 4 kV per centimetre.

3.4.2 *Test Specimen* — Since this is a non-destructive test, it is desirable that at least 50 percent components of electrical grade are subjected to this test.

3.4.3 *Equipment* — A suitable test transformer, voltage regulator, flash test jig, with electrodes spaced 10 cm apart, are the essential apparatus to perform the test.

3.4.4 *Procedure* — Normally finished components before assembly are placed on the electrodes of air flash test jig and are subjected to stress voltage not less than 4 kV per centimetre.

3.4.4.1 In case of long components, these should be placed on a number of electrodes of the jig. A 30-cm long component will be resting on three electrodes and will be subjected to 120 kV stress voltage along the length. It is desirable that the components on the ends should be supported by the conductors and the same will be connected to the power supplied from the High Voltage side of the test transformer.

3.4.5 *Interpretation of Test Results* — Components shall be considered to fit for electrical application if no breakdown takes place. In the case of failure, the pieces where stress voltage has exposed the flaws in the material, should be rejected.

3.5 Determination of Tracking Time for Varnish Finish Electrical purposes Compreg

3.5.1 *Object* — Object of this test is to measure the effect of surface contamination on the formation of carbon tracks under electrical stress by dropping electrolytic solution in between electrodes.

3.5.1.1 The method covered in **3.5.2** will be the standard method for test and shall preferably be followed. However, the requirements of compreg with regard to these shall be specially specified by the

*Methods of testing small clear specimens of timber.

purchaser. Another method for determination of tracking time which is in use is given as an alternate method of test in **3.5.3**.

3.5.2 *Standard Method* — The method for determination of tracking time for varnish-finish electrical purposes compreg shall be as laid down in IS : 2824-1964*.

3.5.3 *Alternate Method*

3.5.3.1 *Test specimen* — A small size of 7·5 × 7·5 cm after varnishing should be taken for the said test.

3.5.3.2 *Apparatus* — Any suitable tracking test apparatus, such as Yarsley and Ives apparatus or AEI comparator may be used.

3.5.3.3 *Procedure* — To carry out the test by Yarsley and Ives method following procedure shall be adopted:

a) The electrolyte solution used shall be 0·1 ± 0·002 percent ammonium chloride or 0·25 percent sodium chloride solution in distilled water.

b) Weight of drops shall be between 0·241 to 0·242 g. The approximate size of the drops should be 20 ± 5 mm diameter.

c) The apparatus shall be so adjusted that the frequency of drops should be one in every 8 seconds.

d) The electrodes could be manufactured from brass or tungsten.

e) The distance between the electrodes shall be 4 ± 0·1 mm.

f) Firstly, 3 drops of electrolyte solution should be dropped in the ring electrodes and a current of 1 A should be passed and electrolytic solution dropped at the rate of one drop per 8 seconds. This procedure should be continued till there is a continuous sparking, indicating that track is formed. The criterion for the end point is the tripping of 0·2 A, overload relay in use with the sample. Varnish should be reported to have passed the test if it takes minimum of 20 minutes to form the carbon track.

*Method for determination of the comperative tracking index of solid insulating materials.

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