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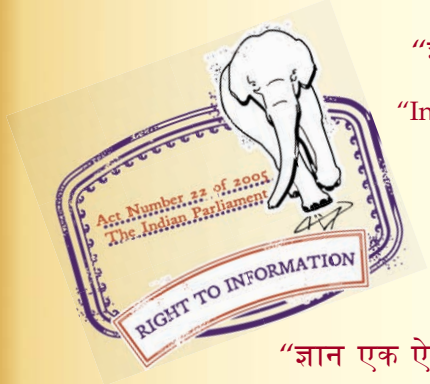

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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

SPECIFICATION FOR EXTENDERS FOR USE IN SYNTHETIC RESIN ADHESIVES (UREA-FORMALDEHYDE) FOR PLYWOOD

(First Revision)

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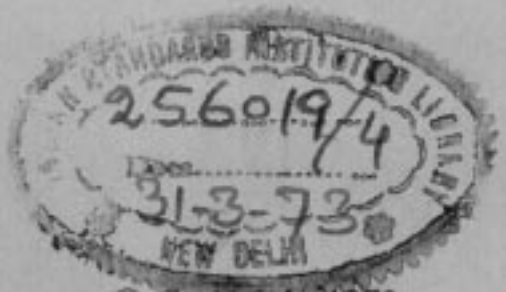

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

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Indian Standard

SPECIFICATION FOR EXTENDERS FOR USE IN SYNTHETIC RESIN ADHESIVES (UREA-FORMALDEHYDE) FOR PLYWOOD

(First Revision)

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Indian Standard

SPECIFICATION FOR EXTENDERS FOR USE IN SYNTHETIC RESIN ADHESIVES (UREA-FORMALDEHYDE) FOR PLYWOOD

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 31 July 1972, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Extenders are largely used along with adhesives as diluents with a view to lessening the cost of adhesives and also to obtain certain desirable properties in the glue-mix facilitating spreading of the glue. The extenders have to be such as not to affect glue adhesion adversely both in regard to its strength as well as its durability and resistance to attack by micro-organisms. The effectiveness of the glue-mix will depend largely on a proper selection of the extender to be used with the glue and its method of use.

0.3 This Indian Standard was first published in 1960. The main modifications made in this revision relate to the requirements for ash content and acidity.

0.4 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

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

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

1. SCOPE

1.1 This standard covers materials used as extenders in the plywood industry, like wheat flour, rice flour, tamarind kernel powder, tapioca flour, *sunn* hemp, seed powder and various starches and other vegetable starch and protein based materials.

2. MATERIAL

2.1 Extenders shall consist solely of starch- and protein-based materials and shall be supplied in powder form finely ground, of uniform appearance and free from foreign and extraneous matter. They shall be free from disagreeable odour, such as odour of decaying vegetable and proteinous matter.

2.2 Colour — The material shall be uniform in colour.

2.3 Freedom from Weevil, Other Insects and Mould — The material on visual examination shall be free from weevil or other insects and from mould or fungus.

3. SAMPLING

3.1 Scale of Sampling

3.1.1 *Lot* — In any consignment, all the bags containing material from the same batch of manufacture shall constitute a lot.

3.1.2 The number of bags to be selected for the purpose of sampling from each lot shall be in accordance with Table 1.

TABLE 1 NUMBER OF BAGS TO BE SELECTED FOR SAMPLING FROM VARIOUS SIZES OF LOTS

Lot Size	No. of Bags to be Selected in Sample
Up to 50	3
51 to 150	4
151 to 300	5
301 to 500	7
501 to 1 000	10

3.2 Preparation of Test Specimen

3.2.1 *Individual Test Specimen* — In drawing a specimen from bags selected for this purpose (*see* **3.1.2**), three scoop-fulls of the material, one from the top, one from the middle and one from the bottom of every bag, shall be taken till about 2 kg or more of the powder is collected. If necessary, the process shall be repeated. The powder so obtained shall be mixed thoroughly

and placed in a moisture-proof container. This specimen shall constitute the individual test specimen.

3.2.2 *Composite Specimen* — Equal quantities of the powder shall be drawn from each bag selected in the sample (*see* **3.1.2**) and shall be thoroughly mixed together to form a composite specimen. This specimen shall then be transferred to a moisture-proof container.

3.3 Number of Test

3.3.1 Every individual specimen shall be first visually examined for odour (*see* **2.1**), colour (*see* **2.2**), and freedom from weevil, other insects and mould (*see* **2.3**).

3.3.2 The individual specimens shall then be separately tested for fineness of granules (*see* **4.1**), moisture content (*see* **4.2**), ash content (*see* **4.3**) and fat content (*see* **4.4**).

3.3.3 The composite specimen shall be tested for nitrogen content (*see* **4.5**) and acidity (*see* **4.6**).

3.4 Criterion for Conformity

3.4.1 A lot shall be considered as conforming to this specification if the specimen tested satisfy the requirements of **3.4.2** to **3.4.4**.

3.4.2 Every individual specimen shall satisfy the requirements of **2.1** to **2.3**. If one or more is found to be defective then every bag in the lot may be inspected for that characteristic and only those conforming may be accepted.

3.4.3 The test results for moisture, ash and fat contents shall be recorded as shown in Table 2. The mean and range of the test results shall be calculated as follows:

$$\text{Mean } (\bar{X}) = \frac{\text{The sum of the test results}}{\text{Number of tests}}$$

Range (R) = The difference between the maximum and the minimum values of the test results.

TABLE 2 CRITERION FOR CONFORMITY

(*Clauses* 3.4.3 *and* 3.4.3.1)

Sl No.	Characteristic	Test Results	Mean ($\bar{X}$)	Range (R)	Corrected Mean	Criterion for Conformity
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Moisture content		$\bar{X}_1$	R_1	$\bar{X}_1+0{\cdot}6R_1$	Corrected mean $\leqslant$14 percent
ii)	Ash content		$\bar{X}_2$	R_2	$\bar{X}_2+0{\cdot}6R_2$	Corrected mean $\leqslant$6 percent
iii)	Fat content		$\bar{X}_3$	R_3	$\bar{X}_3+0{\cdot}6R_3$	Corrected mean $\leqslant$ specified value

3.4.3.1 The corrected mean shall be calculated as shown in col 6 of Table 2 and the lot shall be declared as conforming to the requirement of the characteristics if the corrected mean is less than the specified limits.

3.4.4 *Nitrogen Content and Acidity* — The composite specimen when tested shall satisfy the requirements of these characteristics.

4. TESTS

4.1 Fineness of Granules — The powder shall completely pass through IS Sieve 100 and a minimum of 80 percent by weight through IS Sieve 80 when tested by the method specified in Appendix A.

4.2 Moisture Content — The amount of moisture present in the extender shall not exceed 14 percent by weight when determined in the manner described in Appendix B.

4.3 Ash Content — The ash content shall be not more than 4 percent of the even dry weight of the sample when determined by the method specified in Appendix C.

4.4 Fat Content — The limits of fat content in the extender shall be as agreed to between the purchaser and the supplier and shall be determined by the method specified in Appendix D.

4.5 Nitrogen Content — The nitrogen content shall be as agreed to between the purchaser and the supplier and shall be determined in the manner prescribed in Appendix E.

4.6 Acidity — The titrable acidity of the material shall not exceed 12 ml of 0·1 N sodium hydroxide solution per 1 g of moisture, ash and fat-free material when determined in the manner described in Appendix F.

5. COMMON DEFECTS

5.1 General information regarding common defects in vegetable based starchy extenders is given in Appendix G.

6. PACKING

6.1 The material shall ordinarily be packed in jute bags of suitable size, unless otherwise agreed to between the purchaser and the supplier.

7. MARKING

7.1 All bags and packages containing extenders for synthetic resin adhesives shall be legibly and indelibly marked with the following:

a) Name of the material contained;
b) Manufacturer's name or trade mark, if any;
c) Net weight of contents; and
d) Year and month of manufacture.

7.1.1 Each bag and package containing extenders for synthetic resin adhesives may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions under which a licence for the use of ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Clause* 4.1)

DETERMINATION OF FINENESS OF GRANULES

A-1. PROCEDURE

A-1.1 Pass 150 g of the sample, dried to a constant weight in an air oven maintained at 100 to 105°C, successively through IS Sieve 100 and IS Sieve 80.

A-1.2 Weigh each powder, dried to a constant weight, separately after passing through the respective sieves.

A-2. CALCULATION

A-2.1 Calculate the percentage of the sample which has passed through each sieve, using the following formula:

$$\text{Percentage of sample passing through a particular sieve} = \frac{100\,b}{a}$$

where

b = weight in g of that part of the oven dry sample which passes through the particular sieve, and

a = weight in g of the oven dry sample.

APPENDIX B

(*Clause* 4.2)

DETERMINATION OF MOISTURE CONTENT

B-1. PROCEDURE

B-1.1 Weigh accurately 3 g of the sample in a tared, flat weighing bottle of glass, aluminium, nickle or stainless steel. Dry the material at a tem-

perature of 100 to 105°C and cool in a desiccator and determine the correct weight of the material. Repeat drying, cooling and weighing till the weight is constant.

B-2. CALCULATION

B-2.1 Calculate as follows:

$$\text{Moisture, percent by weight} = \frac{\text{Loss in weight}}{\text{Oven-dry weight of sample}} \times 100$$

APPENDIX C

(Clause 4.3)

DETERMINATION OF ASH CONTENT

C-1. PROCEDURE

C-1.1 Take about 5 g of the sample in a weighed porcelain or silica crucible. Place it in an air-oven maintained at 100 to 105°C, till a constant weight is attained. Then put the crucible on a clay-pipe triangle over a tripod stand and incinerate the substance at a low heat with a low Bunsen flame. After the initial decomposition is over, gradually raise the flame to its full capacity and heat till a carbon-free ash is left in the crucible. Finally, heat the crucible along with the ash for 20 min over a blowpipe or in a muffle furnace maintained at 750°C, cool in a desiccator, and weigh.

C-2. CALCULATION

C-2.1 Calculate the percentage of ash by using the following formula:

$$\text{Ash, percent by weight} = \frac{100\,b}{a}$$

where

b = weight in g of the ash, and

a = weight in g of the oven-dry sample taken.

APPENDIX D

(Clause 4.4)

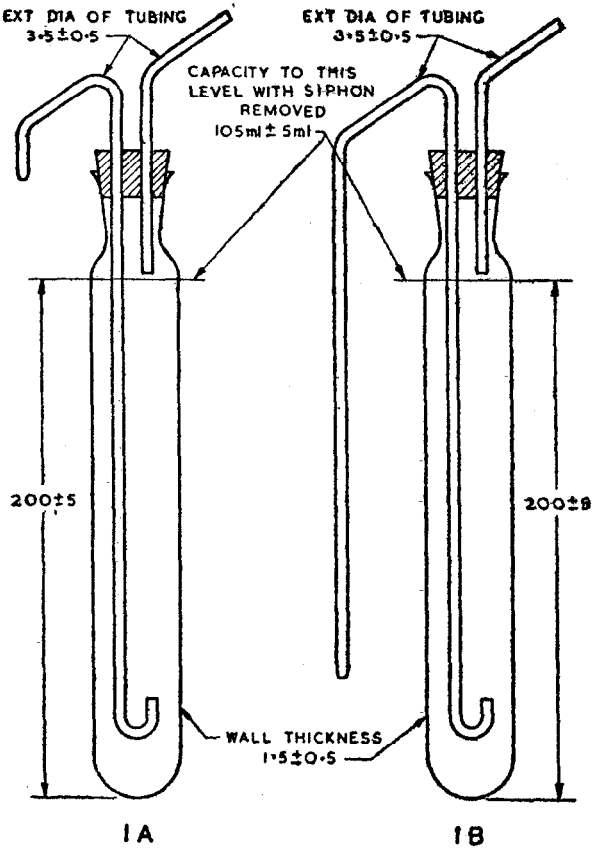
DETERMINATION OF FAT CONTENT

D-1. APPARATUS

D-1.1 The apparatus consists of a fat-extraction tube made of heat-resisting glass, conforming to the details given in Fig. 1 fitted either with a two-hole

bark cork as shown in Fig. 1A or a siphon as shown in Fig. 1B and provided also with a solid bark cork or ground glass stopper. The top of the neck is flared as shown in Fig. 1A and 1B to form a channel between the cork or stopper and the top of the neck. The narrow tube terminating in a hook shape at its lower end is a sliding-fit in the cork and long enough for opening at its lower end to be situated, if necessary, at a distance of 25 mm from the bottom of the tube in which it is enclosed.

NOTE — The length of the tube from the base to the bottom of the shoulder given as 200±5 mm in Fig. 1 may be varied, if desired, for example, to obtain a tube of less over-all length to fit a centrifugal machine. If this is done, the diameter of the tube should be such that the volume of the liquid required to fill the tube to the base of the shoulder is still 105±5 ml.



All dimensions in millimetres.

FIG. 1 FAT-EXTRACTION TUBES

D-2. REAGENTS

D-2.0 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water shall be used (*see* IS : 1070 - 1960*) where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of the analysis.

D-2.1 The following reagents are required:

a) *Hydrochloric Acid* — density 1·122 g/ml at 20°C (sp gr 1·125, conforming to IS : 265-1962†).

b) *Ether* — density 0·718 g/ml at 20°C (sp gr 0·720, conforming to IS : 336-1964‡).

c) *Light Petroleum* — boiling range 40 to 60°C.

d) *Ethyl Alcohol* — 96 percent (conforming to IS : 323-1959§).

D-2.1.1 The alcohol, ether and light petroleum shall leave no residue when 100 ml are evaporated and dried at 101 to 102°C.

D-3. PROCEDURE

D-3.1 Place 15 ml of hydrochloric acid in the fat-extraction tube. Weigh accurately about 5 g of the sample and carefully transfer to the extraction tube. Shake the tube so as to wet and wash down any particles that might have adhered to the sides. Cautiously heat the contents of the tube over a Bunsen flame, taking care to avoid frothing and making sure that all particles are dissolved in the acid. Finally boil for 10 min.

D-3.2 Cool the tube and contents in running water until a temperature of 27 ± 2°C is reached. Add 10 ml of alcohol and mix thoroughly. Add 25 ml of ether, close the tube with water-wetted cork (extracted with ether before use) or stopper of good quality and shake vigorously for 30 s. Remove the cork and wash the cork and neck of the tube with 25 ml of light petroleum, so that the washings run back into the tube. Replace the cork, again water-wetted, and shake for 30 s. Complete extraction of the fat is dependent upon the satisfactory mixing at each stage. Allow to stand until the upper layer is clear and completely separated from the aqueous layer (usually not less than 30 minutes), or whirl in a centrifugal machine at 1 000 rev/min for 30 s. Remove the cork, wash the cork and the neck of the tube with ether, return the washings to the tube and blow off the ethereal layer into a clean, dry, 200-ml wide-mouthed flask, removing as much ether as possible. Wash the inside of the tube twice with 10 ml of ether, adding these washings to the ether previously blown off. Make three further extractions.

*Specification for water, distilled quality (*revised*).
†Specification for hydrochloric acid (*revised*).
‡Specification for ether (*revised*).
§Specification for rectified spirit (*revised*).

It is essential that the cork (or stopper) be wetted with water before each insertion and washed with ether during each removal. Rubber stoppers shall not be used.

D-3.3 Cautiously distil off ether as it is collected in portions during the extraction process, clean the outside of the flask, then dry in an oven at 98 to 100°C to constant weight (approximately one hour), blowing out the ether vapour from the flask from time to time by means of a current of dust-free air. Add 20 ml of light petroleum. Allow to stand for 5 to 10 min, then pour off the light petroleum so as to retain any insoluble sediment in the flask and remove all traces of fat from the inside and the neck of the flask by means of a stream of light petroleum directed from a wash-bottle.

D-3.4 Carefully clean the outside of the flask and dry with precautions to remove vapour of the solvent as before, to a constant weight at 98 to 100°C.

D-4. CALCULATION

D-4.1 Calculate as follows:

$$\text{Fat, percent by weight} = \frac{100\,(W_2 - W_3)}{W_1}$$

where

W_2 = weight in g of the flask and fat,

W_3 = weight in g of the flask after light petroleum extraction, and

W_1 = weight in g of the oven dry sample taken.

APPENDIX E

(Clause 4.5)

DETERMINATION OF NITROGEN CONTENT

E-1. REAGENTS

E-1.0 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS : 1070 - 1960*) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

*Specification for water, distilled quality (*revised*).

E-1.1 The following reagents are required:

a) *Potassium Sulphate* — crystallized, nitrogen-free powdered.
b) *Sodium Hydroxide Solution* — 50 percent by weight, prepared from sodium hydroxide conforming to IS : 376-1959*.
c) *Standard Sodium Hydroxide Solution* — 0·2 N.
d) *Concentrated Sulphuric Acid* — concentrated, nitrogen-free (sp gr 1·84, conforming to IS : 266-1961†).
e) *Copper Sulphate*
f) *Standard Sulphuric Acid* — 0·2 N.
g) *Methyl Red Indicator* — 0·02 percent solution in neutral alcohol.

E-2. PROCEDURE

E-2.1 Weigh accurately 1·0 g of the sample and approximately 10 g of potassium sulphate and transfer completely to a 300-ml Kjeldahl flask. Add 20 ml of concentrated sulphuric acid and 0·2 g of copper sulphate. Gently rotate the flask so that all the solids are well wetted.

E-2.2 Place the flask on metal frame so that the neck is inclined at 45° to the horizontal and the bulb rests on an asbestos sheet with a hole of such size that the flame does not touch the flask above the level of the liquid, and heat to gentle boiling for 10 min. At the end of this time, boil the contents of the flask briskly until the yellowish colour has disappeared and subsequently for 15 min.

E-2.3 Allow the liquid to cool, dilute with approximately 200 ml of neutral distilled water or de-ionized water conforming to IS : 1070-1960‡, transfer to a 1 000 ml round-bottomed flask and add a few pieces of granulated zinc or a small amount of powdered pumice to prevent bumping. Fit the flask with splash head and tap funnel. Connect it to a condenser, pipette out 40 ml of sulphuric-acid into a 600-ml conical flask and place under the outlet of the condenser so that the outlet of the condenser is below the level of the acid. An absorption bulb trap shall be provided on the conical flask to avoid flask splashings.

E-2.4 Run into the round-bottomed flask 100 ml of sodium hydroxide solution through the tap funnel. Heat by means of a steady flame so that boiling is maintained at a uniform rate. Collect about 100 ml of the distillate in the conical flask. After 30 min, lower the conical flask so that the end of the condenser is above the level of the liquid. Continue distillation for another 3 min and then remove the flame from under the round-bottomed flask. Allow the condenser to drain for 2 to 3 minutes and finally wash it with distilled water or de-ionized water allowing the wash water to drain out of the condenser.

*Specification for sodium hydroxide, analytical reagent (*first revision*).
†Specification for suphuric acid (*revised*).
‡Specification for water, distilled quality (*revised*).

E-2.5 Titrate the excess acid with 0·2 N sodium hydroxide solution, using methyl red as indicator.

E-2.6 Carry out a blank determination by taking 1·0 g of sucrose in place of the sample under test, using the same quantities of reagents and the same conditions of test.

E-2.7 Deduct the quantity of acid required in the original test from that required in the blank test (one millilitre of 0·2 N standard sulphuric acid = 0·002 8 g of nitrogen).

E-3. CALCULATION

E-3.1 Calculate the percentage of nitrogen on a moisture, fat- and ash-free basis by the following formula:

$$\text{Nitrogen, percent by weight} = \frac{10\,000\,N}{W\,(100-M-A-F)}$$

where

N = calculated weight of nitrogen (*see* **E-2.7**);
W = weight in g of the sample taken for the test (*see* **E-2.1**);
M = moisture, percent by weight;
A = ash, percent by weight; and
F = fat, percent by weight.

APPENDIX F

(*Clause* 4.6)

DETERMINATION OF ACIDITY

F-1. PROCEDURE

F-1.1 Weigh accurately about one gram of the sample into a 250-ml graduated flask and run in 50 ml of 0·1 N standard sodium hydroxide solution from a pipette, constantly agitating the flask. Stopper the flask and continue the agitation for 15 min. Make up the volume to 250 ml with distilled water or de-ionized water (neutral to phenolphthalein) conforming to IS: 1070-1960*. Shake the flask vigorously and allow any solid matter to settle. From the clear supernatant liquid, pipette out 50 ml and titrate with 0·05 N acid, using alcoholic phenolphthalein (one gram per 100 ml) as indicator. The acid shall be run in with vigorous shaking to prevent any local precipitation of curd in the case of proteinaceous samples. The number of ml 0·1 N

*Specification for water, distilled quality (*revised*).

alkali used up by one gram of moisture, fat- and ash-free materials is termed the acidity of the sample.

F-2. CALCULATION

F-2.1 Calculate the acidity of the material on moisture, fat- and ash-free basis by the following formula:

$$\text{Titrable acidity in ml of 0·1 N sodium hydroxide solution per 100 g of the sample} = \frac{10\,000\ (500\ N_1 - 50\ VN_2)}{W\ (100 - M - A - F)}$$

where

N_1 = normality of standard sodium hydroxide solution;
V = volume in ml of standard sulphuric acid required to neutralize 50 ml of the clear supernatant liquid;
N_2 = normality of standard sulphuric acid;
W = weight in g of the sample taken for the test;
M = moisture, percent by weight;
A = ash, percent by weight; and
F = fat, percent by weight.

APPENDIX G

(*Clause* 5.1)

COMMON DEFECTS IN VEGETABLE BASED STARCHY EXTENDERS

G-1. Materials like wheat flour, rice flour, starches, etc, being food materials also, it is usually customary to use lower quality of these materials for the purpose of preparing extenders, for instance, deteriorated flours and mill sweepings are often marketed as extenders either alone or in admixture with good flour. Such deteriorated and inferior stuffs shall not be used beyond a certain limit. Mixing of mill sweeping will result in higher ash content and colour on visual examination. Deteriorated and inferior flour may impart bad odour or mouldy appearance to the extender.

G-2. In materials like tapioca powder, sometimes sand and clay matter occur as impurities. These also, if found in larger quantities, are undesirable and are shown up in higher ash content and colour in visual examination.

G-3. Coarse granules of the powder require considerably longer period to swell, and do not give a 'smooth' size. Fine powder yields uniformly viscous solutions. Hence, the powder should be ground fine.

INDIAN STANDARDS

ON

PLYWOOD AND ALLIED PRODUCTS

IS :

10-1970 Plywood tea-chests (*third revision*)
303-1960 Plywood for general purposes (*revised*)
652-1960 Wooden separators for lead-acid storage batteries (*revised*)
709-1957 Medium strength aircraft plywood
710-1957 Marine plywood
848-1957 Synthetic resin adhesives for plywood (phenolic and amino-plastic)
849-1957 Cold setting casein glue for wood
850-1957 Natural sour (lactic) casein for glue manufacture
851-1957 Synthetic resin adhesives for construction work in wood
852-1969 Animal glue for general working purposes (*revised*)
1328-1970 Veneered decorative plywood (*first revision*)
1508-1972 Extenders for use in synthetic resin adhesives (urea-formaldehyde) for plywood (*first revision*)
1658-1966 Fibre hardboards
1659-1969 Blockboards (*first revision*)
1707-1960 Wood wool for general packaging purposes
1734-1960 Methods of test for plywood
2380-1963 Methods of test for wood particle boards and boards from other lignocellulosic materials
3087-1965 Wood particle boards (medium density) for general purposes
3097-1965 Veneered particle boards
3129-1965 Particle boards for insulation purposes
3308-1969 Wood wool building slabs
3348-1965 Fibre insulation boards
3478-1966 High density wood particle boards
3513 (Part I)-1966 High and medium density wood-based laminates (compreg) : Part I Electrical purposes
3513 (Part II)-1966 High and medium density wood-based laminates (compreg) : Part II Chemical purposes
3513 (Part III)-1966 High and medium density wood-based laminates (compreg) : Part III General purposes
3513 (Part IV)-1966 High and medium density wood-based laminates (compreg) : Part IV Sampling and Tests
4834-1968 Veneered wood boards for packing cases
4835-1968 Polyvinyl acetates dispersion based adhesives for wood
4859-1969 High strength aircraft plywood
4990-1969 Concrete shuttering work
5509-1969 Fire retardant plywood
5539-1969 Preservative treated plywood

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