

**BUREAU OF INDIAN STANDARDS**

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*Draft Indian Standard*

**VARNISH, FINISHING, AND GENERAL PURPOSE – SPECIFICATION**

*(Third Revision)*

ICS 87.060

**Paints, Varnishes and Related**

**Last date of comments:** 12 December 2022

**Products Sectional Committee, CHD 20**

Paints, Varnishes and Related Products Sectional Committee, CHD 20

**FOREWORD**

(Formal Clause will be added later)

This standard was first issued as a tentative standard in 1954, due to non-availability of authentic technical data on durability of this material. The first revision was done in 1968. In the that revision, the requirements of JSS 3056 ‘Varnish, exterior, synthetic’ issued by Directorate of Standardization, Ministry of Defence, Government of India, had been considered and incorporated. In addition, modifications in evaluating performance test and their assessments were also introduced in the first revision. Stripping test was elaborated by stipulating definite time intervals after which the test is to be performed

The requirements for undercoating varnish were covered in IS 339 : 1952 but the concerned technical committee responsible for preparation of this standard was of the opinion that instead of using one coat of undercoating varnish conforming to this IS 339 : 1952’ and another coat of finishing varnish conforming to this specification, two coats of the latter may be used with improved performance and comparable cost. The committee, therefore, decided to withdraw IS 339 : 1952 and recommended to use two coats of the material conforming to this specification in place of one coat of undercoating and another coat of finishing. IS 339 : 1952 was, therefore, withdrawn.

The second revision was done in 1983. In that revision, a specific limit of the phthalic anhydride content is given as an additional requirement for railways.

This revision has been taken up in order to bring out the standard in the latest style and format of the Indian Standards. While reviewing this standard along with other Indian Standards on the same subject, the committee is of the opinion that IS 525 : 1968 “Specification for Varnish, Finishing, Exterior and General Purpose”, IS 337 : 1975 “ Specification for Varnish, Finishing, Interior”, IS 198 : 1978 “ Specification for Varnish Gold size” and this standard have almost similar requirements and applications. Therefore, the committee recommended that it is prudent to merge the scopes of all four standards into one single standard. Accordingly, the

**Superseded IS 198, IS 337, IS 525**

scope, title, and requirements of this standard have been modified in order to encompass scopes of other standards on the same subject. Some of the key changes are as follows:

- a) The maximum limit for lead has been specified considering its adverse impact on human health.
- b) The corresponding parts of IS 101 has been referred for the test methods procedure as earlier referred test method IS 197 has been withdrawn.
- c) A suitable precautionary note has been added in the marking clause in order to prevent unforeseen events.
- d) References of Indian Standards have been updated wherever required.

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 : 2022. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard.

*Draft Indian Standard***VARNISH, FINISHING, AND GENERAL PURPOSE- SPECIFICATION***(Third Revision)***1 SCOPE**

This standard prescribes the requirements and the methods of sampling and test for varnish, finishing and general purposes. The material generally used in protective coatings for wooden surface, paintings, and various decorative objects.

**2 REFERENCES**

The Indian standards listed below 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 agreements based on this Indian standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No</i>	<i>Title</i>
101 (Part 1/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 1 Tests on liquid paints (general and physical), Sec 1 Sampling ( <i>third revision</i> )
101 (Part 1/Sec 3) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 1 Tests on liquid paints (general and physical), Sec 3 Preparation of panels ( <i>third revision</i> )
101 (Part 1/Sec 5) : 1989	Methods of sampling and test for paints, varnishes and related products: Part 1 Tests on liquid paints (general and physical), Sec 5 Consistency ( <i>third revision</i> )
101 (Part 1/Sec 6) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 1 Tests on liquid paints (general and physical), Sec 6 Flash point ( <i>third revision</i> )

101 (Part 2/Sec 2) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 2 Test on liquid paints (chemical examination), Sec 2 Volatile matter ( <i>third revision</i> )
101 (Part 3/Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 3 Tests on paint film formation, Sec 1 Drying time ( <i>third revision</i> )
101 (Part 3/Sec 4) : 1987	Methods of sampling and test for paints, varnishes and related products: Part 3 Tests on paint film formation, Sec 4 Finish ( <i>third revision</i> )
101 (Part 4/Sec 2) : 2021	Methods of sampling and test for paints varnishes and related products: Part 4 Optical tests, Sec 2 Colour-visual comparison of colour of paints ( <i>fourth revision</i> )
101 (Part 5/Sec 1) : 1988	Methods of sampling and test for paints, varnishes and related products: Part 5 Mechanical test on paint films, Sec 1 Hardness tests ( <i>third revision</i> )
101 (Part 5/Sec 2) : 1988	Methods of sampling and test for paints, varnishes and related products: Part 5 Mechanical tests, Sec 2 Flexibility and adhesion ( <i>third revision</i> )
101 (Part 6/Sec 2) : 1989	Methods of sampling and test for varnishes and related products: Part 6 Durability test on paint films, Sec 2 Keeping properties ( <i>third revision</i> )
101 (Part 8/Sec 4) : 2015	Methods of sampling and test for paints, varnishes and related products: Part 8 Tests for pigments and other solids, Sec 4 Phthalic anhydride ( <i>fourth revision</i> )
101 (Part 8/Sec 5) : 2022	Methods of sampling and test for paints varnishes and related products Part 8 Tests for pigments and other solids, Sec 5 Lead restriction test ( <i>first revision</i> )
101 (Part 9/Sec 2) : 1993	Methods of sampling and test for paints, varnishes and products: Part 9 Tests for lacquers and varnish, Sec 2 Rosin test ( <i>third revision</i> )
266 : 1993	Sulphuric acid - Specification ( <i>third revision</i> )
285 : 2021	Laundry soaps- Specification ( <i>fifth revision</i> )
296 : 1986	Specification for sodium carbonate, anhydrous ( <i>third revision</i> )
354 (Part 2) : 1986	Methods of sampling and test for resins for paints: Part 2 Special test methods for alkyd resins ( <i>second revision</i> )
1017 : 1983	Specification for chamois leather ( <i>second revision</i> )
1070 : 1992	Reagent grade water - Specification ( <i>third revision</i> )
1303 : 1983	Glossary of terms relating. to paints ( <i>second revision</i> )
1745 : 2018	Petroleum hydrocarbon solvents - Specification ( <i>third revision</i> )

### 3 TERMINOLOGY

**3.1** For the purpose of this standard, the definitions given in IS 1303 and the one given below shall apply.

**Superseded IS 198, IS 337, IS 525**

**3.2 Registered Sample** — Sample supplied in advance by a prospective supplier and registered by the approved testing authorities after testing it to all the requirements of this standard. A complete record of its performance shall be kept in respect of all tests.

**4 REQUIREMENTS**

**4.1 Composition** — The material shall be based on oil modified alkyd resin and shall be free from natural resins or their derivatives or their modifications, in any form, when tested in accordance with IS 101 (Part 9/Sec 2). It shall be of such a composition as to satisfy the requirements of this standard. The composition of the bulk supply shall be similar to that of the registered sample within the permissible limits specified in this standard.

**4.1.1 Additional Requirement for Railways** — The phthalic anhydride content of the non-volatile vehicle in the bulk supply shall not deviate by more than  $\pm 10$  percent by mass of the recorded data on the registered sample when estimated by the method prescribed in IS 101 (Part 8/Sec 4) Furthermore, in the material the phthalic anhydride content shall, in no case, be less than 20 percent by mass of the nonvolatile vehicle when tested as prescribed in IS 101 (Part 8/Sec 4).

NOTE — Due allowance may be given to the repeatability of the method for the determination of phthalic anhydride content as prescribed in IS 101 (Part 8/Sec 4).

**4.1.2** The material shall be capable of being thinned with petroleum hydrocarbon solvent, 145/205 low aromatic grade (*see* IS 1745).

**4.2 Durability****4.2.1 Registered Sample**

**4.2.1.1** When prepared and tested for normal outdoor exposure as prescribed under **A-3**, a general breakdown of the film prepared from the sample for registration shall not occur in less than 9 months.

**4.2.1.2** A film of the material for registration shall be prepared and tested as prescribed under **A-4**, in an accelerated weathering apparatus for a period of 15 days and a complete record of its performance maintained.

NOTE — As a precaution against inadvertent accidents, the outdoor exposure test (**A-3**) and the accelerated weathering test (**A-4**) shall be carried out in duplicate.

**4.2.2 Sample from Bulk Supply** — A film of the material prepared from a representative sample of bulk supply as described in Annex A and tested in the accelerated weathering apparatus (**A-4**) shall be not materially different in performance as compared with the record of the film of the registered sample. The film shall be examined daily for a period of 15 days.

**4.3 Resistance to Acid** — The material, when tested as prescribed in Annex B, shall be not inferior in performance as compared with the record of the film of the registered sample.

**4.4 Resistance to Alkali** — The material, when tested as prescribed in Annex C, shall be not inferior in performance as compared with the record of the film of the registered sample.

**4.5 Resistance to Water** — The material, when tested as prescribed in Annex D, shall be not inferior in performance as compared with the record of the film of the registered sample.

**4.6 Lead Restriction**

**Superseded IS 198, IS 337, IS 525**

The material shall not contain lead or compounds of lead or mixtures of both, as metallic lead more than 90 ppm, when tested for restriction from lead in accordance with IS 101(Part 8/Sec 5).

**4.7** The material shall also comply with the requirements given in Table 1.

**TABLE 1 REQUIREMENTS FOR VARNISH, FINISHING, EXTERIOR,  
 SYNTHETIC, AIR-DRYING**

(Clause 4.7)

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, RFF TO
(1)	(2)	(3)	(4)
i)	Drying time, h, <i>Max</i> a) Surface dry b) Hard dry	1 4	IS 101 (Part 3/Sec 1)
ii)	Finish	Smooth and glossy	IS 101 (Part 3/Sec 4)
iii)	Colour	Not darker than a combination of 39 yellow units and 3.3 red units	IS 101 (Part 4/Sec 2)
iv)	Flexibility and adhesion, after 96 h air-drying a) Scratch hardness (at load 1,000 g) b) Bent test with 6.25 mm dia. Mandrel	No such scratch as to show the bare metal No visible damage or detachment of film	IS 101(Part 5/Sec 2)
v)	Stripping test after 96 hours air-drying	Scratches free from jagged edges	Annex E
vi)	Flash point, °C	Not below 30	IS 101 (Part 1/Sec 6)
vii)	Volatile matter content, percent by weight, <i>Max</i>	60.0	IS 101 (Part 2/Sec 2)
viii)	Viscosity at 30°C, seconds	40 to 80	IS 101 (Part 1/Sec 5)
ix)	Keeping properties	Not less than one year from date of manufacture	Annex F

**5 PACKING AND MARKING**

**5.1 Packing** - The material shall be packed as agreed to between the purchaser and the supplier.

**5.2 Marking** — Each container shall be marked with the following particulars:

- a) Name and type of the material;
- b) Name of the manufacturer or his recognized trade-mark, if any;
- c) Volume of the material;

- d) Batch No. or lot No. in code or otherwise; and
- e) Month and year of manufacture.
- f) A cautionary note as below:
  - 1. Keep out of reach of children.
  - 2. Dried film of this paint may be harmful if eaten or chewed.
  - 3. This product may be harmful if swallowed or inhaled.

**5.2.1** The containers may also be marked with the BIS Certification Mark.

The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 2016 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 manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 6 SAMPLING

### 6.1 Preparation of Test Samples

**6.1.1 For Registration** — The sample shall be submitted in three different containers, each containing not less than 500 ml of the material.

As testing to the requirements of material covered by this standard involves a period of more than 9 months, the supplier is advised to submit samples for registration sufficiently in advance.

**6.1.2 Tender Sample** — The supplier may dispense with sending a tender sample provided that he declares that the material for which the tender is given is of the same quality as the sample previously registered in his name.

**6.1.3 Bulk Supply Sample** — Representative samples of the material shall be drawn and treated as prescribed in IS 101 (Part 1/Sec 1).

## 7 TEST METHODS

**7.1** Tests shall be conducted as prescribed in 4.1 to 4.7. The test methods referred to are given in col 4 of Table 1 and Annex A to F.

**7.2 Quality of Reagents** — Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070 ) shall be employed in tests.

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

**7.3** Comparison with the performance of the registered sample shall be carried out on the basis of records maintained for the registered sample (*see* 4.2.1.2).

## ANNEX A

(Clause 4.2.2)

### DETERMINATION OF DURABILITY

#### A-0 GENERAL

**A-0.1 Outline of the Method** — The durability of the varnish is determined by ascertaining actual behaviour of suitably prepared test panels in normal outdoor exposure test for a specified period and evaluating the results of this exposure by a suitable method of rating for various characteristics of the varnish film. Apart from this, the varnish is also evaluated by an

**Superseded IS 198, IS 337, IS 525**

accelerated weathering test wherein a prepared panel is subjected to controlled exposure of heat, light and water in an artificial weathering apparatus.

**A-1 TEST PANELS**

**A-1.1** The panels shall be of seasoned teakwood conforming to the requirements given in IS 101 (Part 1/Sec 1). Panels for outdoor exposure shall be 300 mm × 150 mm × 25 mm in size, and for the accelerated weathering test 150 mm × 75 mm × 12 mm. The panels shall be levelled at the edges and shall be smoothened by rubbing down with fine emery paper, the back being protected with a suitable paint.

**A-2 PREPARATION OF TEST PANELS**

**A-2.1** In the painting procedure outlined under **A-2.2**, the air-drying shall be done at the room temperature and at a relative humidity of not more than 70 percent.

**A-2.2** The surface of the test panels to be exposed shall be prepared as follows:

- a) Apply one coat of liquid, transparent wood filler and remove the excess after it has dried to touch, by rubbing across the grains with jute fibres or hessian cloth, and allow it to air-dry for 24 hours.
- b) Rub down with emery paper No. 220/240 and wipe off the dust, apply one coat of varnish, gold size and allow to air-dry for 24 hours.
- c) Rub down with waterproof emery paper No. 220/240, wash and wipe off water, and when dry, apply one coat of the material, and allow to air-dry for 24 hours.
- d) Rub down with waterproof emery paper No. 320, wash and wipe off water, and when dry, apply second coat of the material, and allow to air-dry for 48 hours.
- e) Rub down with waterproof emery paper No. 320, wash and wipe off water, and when dry, apply a third coat of the finishing varnish and allow to air-dry for 7 days.

**A-3 NORMAL OUTDOOR EXPOSURE TEST**

**A-3.0** Subject the sample for registration and the tender samples, if supplied, to normal outdoor exposure test in the manner described under **A-3.1**.

**A-3.1** Expose in open the test panels, prepared in the manner prescribed under **A-1** and **A-2** in duplicate, in a vertical position facing South Commence the exposure not earlier than the last week of January and not later than the first week of March (*See Note*).

NOTE — The timeline of the exposure test specified to accommodate all weather conditions.

**A-3.1.1** Examine the condition of the exposed films at monthly intervals for gloss retention and at monthly intervals for other characteristics, as given below:

- a) Checking, and
- b) Blooming and spotting.

**A-3.1.2** For the above examinations, clean half the surface of the two test panels with a sponge dipped in water and wipe it dry with a piece of soft cotton cloth or chamois leather (*see IS : 1017*). Prior to examination examine the same half of the test panels at each examination. As an aid to the examination, a magnifying glass may be used, but the evaluation shall be based on an assessment with the unaided eye. At the end of the stipulated period for durability, examine both halves of the test panels and base the evaluation for rating (*see A-3.3*) on the

**Superseded IS 198, IS 337, IS 525**

condition of the unwiped half of the test panels, which shall be wiped before the visual examination.

**A-3.2 Method of Rating** — The film of an unexposed test panel shall be rated with the following basic values for the respective characteristics:

a) Possessing high gloss	40
b) Freedom from checking	45
c) Freedom from blooming and spotting	<u>15</u>
	100

NOTE — The initial rating of film may be 100 or less according to the condition of gloat and colour, the rating for freedom from checking, blooming, and spotting being always the maximum in the case of unexposed films.

**A-3.3 Evaluation of Exposed Films** — In recording the condition of exposed films at each examination, express the observed relative values of different characteristics in percentages of the basic value allotted to each characteristic under **A-3.2**. The allotment of performance value shall be multiples of 10. For arriving at an assessment, multiply the basic value for each characteristic (*see A-3.2*) by the percentage awarded for the performance in the test and divide the product so obtained by 100 to obtain the percentage award for the observed value of each characteristic. Take the sum total of these resulting values as the overall assessment.

**A-3.3.1** The following table is intended to serve as an example for the assessment of a varnish film after exposure:

<i>S. No.</i>	<i>Characteristic</i>	<i>Basic Value</i>	<i>Performance Value</i>	<i>Assessment Value</i>
	(1)	(2)	(3)	(4)
		Percent	Percent	Percent
a)	Possessing high gloss	40	100	40
b)	Freedom from checking	45	50	22.5
c)	Freedom from blooming and spotting	15	20	3
				65.5

**A-3.4 Results of Exposure** — Reckon the period for the general break-down of the exposed film from the date of commencement of exposure to the time when the overall assessment falls below 50 percent or when the performance value of any one characteristic, except for gloss which shall be 50 percent, falls below 25 percent of the basic value adopted for that characteristic. In the example given under **A-3.3.1**, although the overall assessment is 65.5 percent, yet the film is to be regarded as having generally broken down, because the performance value of blooming and spotting has fallen below 25 percent of its basic value.

**A-4 ACCELERATED WEATHERING TEST**

**A-4.1 Accelerated Weathering Apparatus** — An artificial weathering apparatus of the carbon arc type for uniform and controlled exposure to the effects of heat, light and water.



**Superseded IS 198, IS 337, IS 525**

**A-4.2** Samples for registration shall be tested in duplicate in a suitable accelerated weathering apparatus (*see A-4.1*) and samples drawn from bulk supply shall be tested in a similar manner. The test panels shall be prepared as described under **A-2.2**. The requirements of this test shall be taken to have been satisfied if the performance of the film is not materially different as compared with the record of the film of the registered sample.

**ANNEX B**

(*Clause 4.3*)

**DETERMINATION OF RESISTANCE TO ACID****B-0 GENERAL**

**B-0.1 Outline of the Method** — A test panel coated with the varnish, after specified drying period, is immersed in a definite concentration of sulphuric acid for 24 hours after which it is washed, dried and compared in performance with a panel prepared with the registered sample.

**B-1. PROCEDURE**

**B-1.1** Apply a coat of the varnish by brushing or spraying on a 150 mm × 50 mm clean glass panel to give a dry film weight commensurate with the weight in kg/10 litres of the material. Allow the panel to air-dry in a horizontal position for 48 hours at  $27 \pm 2$  °C and relative humidity of  $65 \pm 2$  percent. Protect the edges of the panel by applying a coat of wax. Immerse the panel in a 2 percent ( *w/v* ) solution of concentrated sulphuric acid (sp gr 1.84 conforming to IS 266 ) for 24 hours at room temperature. Remove the panel, wash in running fresh water and allow to dry for an hour.

**B-1.2** The film shall not show signs of disintegration and loss of gloss to a greater extent than those recorded for the registered sample.

**ANNEX C**

(*Clause 4.4*)

**DETERMINATION OF RESISTANCE TO ALKALI****C-0 GENERAL**

**C-0.1 Outline of the Method** — The film of the material is tested with a solution of laundry soap followed by a solution of sodium carbonate by the procedure specified under **C-1**.

**C-1 PROCEDURE**

**C-1.1** Immerse a panel prepared as described in Annex B in a one percent (*w/v*) solution of laundry soap, grade 1 (conforming to IS 285) for half an hour at a temperature of  $27 \pm 2$  °C. Remove, wash in running water, dry for an hour and examine the film and then subject to test as prescribed under **C-1.2**.

**C-1.2** Immerse the panel in a solution of sodium carbonate analytical reagent grade (conforming to IS 296) containing two. percent (*w/v*) of sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) for half an hour at a temperature of  $27 \pm 2$  °C. Remove, wash in running water, dry for an hour and

examine the film.

**C-1.3** After each of the tests described under **C-1.1** and **C-1.2**, the film shall not show signs of disintegration to a greater extent than those recorded for the registered sample.

## ANNEX D

(Clause 4.5)

### DETERMINATION OF RESISTANCE TO WATER

#### D-0 GENERAL

**D-0.1 Outline of the Method** — The varnish coated panel, after specified drying period, is immersed in distilled water for 48 hours at room temperature and examined for any signs of deterioration and change in gloss.

#### D-1 PROCEDURE

**D-1.1** Apply a coat of material to a glass panel prepared as prescribed in IS 101 (Part 1/Sec 3) to give a dry film weight commensurate with weight per 10 litres of the material as specified in Table 2. Allow the varnish to air-dry in a horizontal position for 48 hours. Immerse the panel in distilled water at room temperature for 48 hours. Remove it from water and examine after 4 hours.

**D-1.2** The film shall show no greater signs of deterioration than those recorded for the registered sample.

**Table 2**

(Clause D-1.1)

<i>Weight of the wet material</i> kg/10 l	<i>Limits of dry film weight</i> g/m <sup>2</sup>
Up to 12	27 to 34
Over 12 and up to 14	34 to 44
„ 14 „ „ „ 16	44 to 54
„ 16 „ „ „ 18	54 to 68
„ 18	68 to 80

## ANNEX E

### STRIPPING TEST

(Table 1 (v))

#### E-0 OUTLINE OF THE METHOD

The Minimum load required to produce a scratch showing the bare metal surface of the panel coated with the material is determined.

### **E-1 APPARATUS**

The apparatus used for determining the scratch hardness as prescribed in IS 101 (Part 5/ Sec 2) shall be used.

### **E-2 PROCEDURE**

Apply a coat of the material by either brushing or spraying, whichever is specified in the material specification, to a 150 mm× 50 mm× 0.315 mm tinned mild steel panel prepared as described in IS 101 (Part 1/Sec 3). Allow the panel to air-dry in a horizontal position for 96 hours under specified drying conditions or stove as specified in the material specification. Condition the test panels at standard atmospheric conditions for at least 26 hours before testing. Test the dried film in the apparatus under such a load that a scratch is produced showing the bare metal surface.

**E.3** The scratch so produced shall be free from jagged edges.

## **ANNEX F**

### **KEEPING PROPERTIES**

*(Table 1 (ix))*

When stored under cover in a dry place in the original sealed containers under normal temperature conditions, the material shall meet the requirement as specified in **5** for the specified period after the date of manufacture. Slight changes in viscosity may be allowed provided the material satisfies the other requirements prescribed in the material specification.