भारतीय मानक

Indian Standard

IS 168 : 2024

तैयार मिश्रित रंग रोगन, वायु शुष्क, सामान्य प्रयोजन हेतु — विशिष्टि

(पांचवां पुनरीक्षण)

Ready Mixed Paint, Air Drying, for General Purpose — Specification

(Fifth Revision)

ICS 87.040

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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July 2024 **Price Group 7**

Paints, Varnishes and Related Products Sectional Committee, CHD 20

FOREWORD

This Indian Standard (Fifth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

The standard was first published in 1950 and underwent its first revision in 1965, amalgamating IS 168 : 1950 and IS 169 : 1950, the two specifications for the brushing and spraying types respectively of ready mixed paint, quick drying, matt, for general purposes in various colours. The second revision was carried out in 1973. This was again revised in 1993 on the suggestion of Ministry of Defence in order to quantify the various requirements such as volume solids, gloss, fineness and mass in kg/l0 litres and to bring it at par with defence specifications.

In 2016, the fourth revision aimed to incorporate lead restriction limits due to concerns about health and environmental impacts. Different levels of lead restriction were introduced for paints used in household/decorative and industrial/commercial applications. The committee recognized the feasibility of manufacturing the product with low lead limits, prompting the introduction of a maximum permissible limit of lead of 300 ppm. Along with lead restrictions, a cautionary notice was added to raise awareness of lead toxicity. Reference to various parts/sections of IS 101 for the requirements given in the standard were updated.

Additionally, the method of test for durability by carbon arc type weathering apparatus was substituted by a method using xenon arc type weathering apparatus as it is found that carbon arc type weathering apparatus is no more in use. Test conditions for fastness to light test was also prescribed.

In recognition of the substantial consequences of volatile organic compounds (VOC) on the environment and human health, this fifth revision has been taken up to limit the VOC content in paint products. This fifth revision aims to promote the usage of low VOC or VOC-free products, marking a significant step towards fostering a healthier and more sustainable environment. The prescribed limits have been carefully established, taking into account the current capabilities of small, medium, and large-scale manufacturers to produce compliant products. The ultimate goal of these measures is the complete elimination of VOC from paint products. These initial limits are expected to serve as the foundation for future reductions, encouraging manufacturers to develop and adopt innovative technologies and processes that facilitate the production of VOC-free paints.

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

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 ‘Rules for rounding off numerical values (*second revision*)’. 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

READY MIXED PAINT, AIR DRYING, FOR GENERAL PURPOSE — SPECIFICATION

(Fifth Revision)

1 SCOPE

This standard prescribes requirements and methods of sampling and test for ready mixed paint, air-drying, for general purposes, colour as required.

The material is normally used for the protection of parts of apparatus, appliances, equipment, etc, connected with ammunition where air-drying is required.

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 agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 shall apply.

4 TYPES

4.1 There shall be three types of the material, namely:

a) Brushing;
b) Spraying; and
c) Dipping.

4.1.1 The type of the material required, whether brushing, spraying or dipping, shall be clearly specified by the indentor.

5 REQUIREMENTS

5.1 Composition

The material shall be of such a composition so as to satisfy the requirements of this standard.

5.2 Fastness to Light

5.2.1 *Panel*

Prepare mild steel panel of sizes preferably 60 mm × 40 mm × 1.25 mm as prescribed in IS 101 (Part 1/Sec 3). Apply the paint on each side of the panel uniformly by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4).

5.2.2 *Test Conditions*

The material shall be tested according to the method prescribed in IS 101 (Part 4/Sec 3) in xenon arc apparatus with the test conditions as prescribed below:

a) black panel temperature (63 ± 3) °C;
b) continuous exposure in light; and
c) time of exposure to light for 250 h.

5.3 Lead Restriction

The material shall not contain lead or compounds of lead or mixtures of both, calculated as metallic lead more than 300 ppm, when tested for restriction from lead in accordance with ICP-OES or AAS method of IS 101 (Part 8/Sec 5).

5.4 Durability

The material shall pass the test as prescribed in Annex B.

5.5 The material shall also conform to the requirements given in Table 1.

6 PACKING AND MARKING

6.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the enamel shall be packed in suitable metal containers (*see* IS 1407 and IS 2552). The packing is subject to the provisions of the law in force in the country at that time.

6.2 Marking

6.2.1 Each container shall be marked with the following:

a) Name of the material;
b) Indication of the source of manufacture;
c) Lead content, *Max*;
d) The maximum content of VOC in g/l of the product as supplied in container;
e) Volume of the material;

f) Batch no. or lot no. in code or otherwise;

g) Month and year of manufacture;

h) Colour/shade of the material; and

j) 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; and
3) This product may be harmful if swallowed or inhaled.

6.2.1.1 The material when intended for defence purposes, shall be packed and marked in accordance with IS 5661.

6.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

Table 1 Requirements for Ready Mixed Paint, Air Drying, for General Purposes

(*Clause* 5.5)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex of this standard	IS 101
(1)	(2)	(3)	(4)	(3)
i)	Drying time, h		—	(Part 3/Sec 1)
	a) Surface dry, *Max*	3		
	b) Hard dry, *Max*	6		
	c) Tack free, *Max*	18		
ii)	a) Consistency	Smooth and uniform	Annex C	—
	b) Viscosity, ford cup no. 4, Secs	60 to 120	—	(Part 1/Sec 5)
iii)	Weight in kg/10 l, *Min*	11.0, however it shall be within ± 3 percent of the sample approved, if any	—	(Part 1/Sec 7)
iv)	Flash point	Not below 20 °C	—	(Part 1/Sec 6)
v)	Water content, percent, *Max*	0.5 (if water is suspected to be present)	—	(Part 2/Sec 1)
vi)	Finish	Smooth and matt/semi-glossy	—	(Part 3/Sec 4)
vii)	Fineness of grind, *Max*	Matt finish 50		(Part 3/Sec 5)
	microns	Semi-glossy 40		
viii)	Colour	Close match to the specified colour as in IS 5	—	(Part 4/Sec 2)
ix)	Fastness to light	To pass the test	—	(Part 4/Sec 3)
x)	Gloss at:	45° 60°	—	(Part 4/Sec 4)
	a) Flat matt	0 to 5 0 to 10		
	b) Eggshell flat	6 to 15 —	—	
	c) Eggshell gloss	16 to 30 11 to 20		

Table 1 (*Concluded*)

Sl No.	Characteristic	Requirement	Method of Test, Ref to	
			Annex of this standard	IS 101
(1)	(2)	(3)	(4)	(3)
	d) Semi-gloss	31 to 50 21 to 60		
xi)	Impact resistance (by pendulum impact tester) (applicably for defence supply) (mass of steel tube approx 500 g)	Shall not show any signs of deterioration of the paint film	—	(Part 5/Sec 1)
xii)	Pressure test (18 h after application)	To pass the test	—	(Part 5/Sec 1)
xiii)	Flexibility and adhesion:			
	a) Bend test with type 1 apparatus and 6.25 dia. mandrel	No visible damage or detachment of film	—	(Part 5/Sec 2)
	b) Scratch hardness at a load of (1 200 g)	No such scratch as to show the bare metal	—	(Part 5/Sec 2)
xiv)	Durability test resistance to humidity	No sign of corrosion	—	(Part 6/Sec 1)
xv)	Volume solids percent, *Min*	33	—	(Part 8/Sec 6)
xvi)	Resistance to liquid		Annex D	—
	a) lubricating oil	To pass the test		
	b) petroleum hydrocarbon solvent	To pass the test		
xvii)	Accelerated storage stability	Test shall pass the test	Annex E	—
xviii)	Keeping properties	Not less than one year from the date of manufacturing	—	(Part 6/Sec 2)
xix)	Volatile organic compound, gm/litre, *Max* (*see* Notes)	500	—	IS 101 (Part 2/ Sec 3)
NOTE — Material may be suitably thinned with Petroleum Hydrocarbon solvent (145/205) for spraying and dipping application.				

NOTES

1 It is In-can VOC as supplied by manufacturer, without including any thinner. Since the amount of thinner used on-site can vary depending on the application method (brushing, spraying, etc), it can be challenging to precisely track the extent of thinning during application.

2 VOCs of colorant added at point of sale- The VOC content of product including the colorant added at the point-of-sale shall not exceed 50 grams per litre over and above the allowed VOC limit of product without colorant.

3 For the calculation of the VOC content, for solvent and water-based paints, Method 2 and Method 3 may be employed respectively as given in the IS 101 (Part 2/Sec 3) or IS 101 (Part 2/Sec 4).

7 SAMPLING

7.1 Representative samples of the material shall be drawn as prescribed under IS 101 (Part 1/Sec 1).

7.2 Preparation of Test Samples

7.2.1 *For Drying Time*

Prepare mild steel panel of sizes 150 mm × 100 mm × 1.25 mm as prescribed in IS 101 (Part 1/Sec 3). Apply the paint on each side of the panel uniformly by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/ Sec 4). Prepared test panel then subjected to the test as specified in IS 101 (Part 3/Sec 1) as soon as possible.

7.2.2 *For Impact Resistance Test*

Prepare burnished steel tube piece as prescribed in IS 101 (Part 5/Sec 1). Apply one coat of material uniformly by brushing on the test piece as to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/ Sec 4). The coated test panels shall be dried for 72 h and then shall be conditioned at a temperature of (27 ± 2)°C and relative humidity of (65 ± 5) percent for a minimum time of 16 h. Prepared test piece then subjected to the test as prescribed in IS 101 (Part 5/Sec 1).

7.2.3 *For Pressure Test*

Prepare burnished tin plate panels, rectangular, of sizes 100 mm × 50 mm × 0.3 mm as prescribed in IS 101 (Part 1/Sec 3). Apply one coat of material uniformly by brushing on the panels as to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/ Sec 4). The coated test panels shall be dried for 18 h and then shall be conditioned at a temperature of (27 ± 2) °C and relative humidity of (65 ± 5) percent for a minimum time of 16 h. Prepared test piece then subjected to the test as prescribed in IS 101 (Part 5/Sec 1).

7.2.4 *For Flexibility and Adhesion Test*

Prepare separate burnished tin plate panels, rectangular, of sizes 100 mm × 50 mm × 0.3 mm as prescribed in IS 101 (Part 1/Sec 3). Apply one coat of material uniformly by brushing on the panels as to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4). The coated test panels shall be dried for 48 h for both the tests and then shall be conditioned at a temperature of (27 ± 2) °C and relative humidity of (65 ± 5) percent for a minimum time of 16 h. Prepared test panels then subjected to the test as prescribed in IS 101(Part 5/Sec 2) for bend test and scratch hardness test respectively.

7.3 Criteria for Conformity

A lot shall be declared as conforming to the requirements of this standard if the test results of the composite sample satisfy the requirements prescribed under **5**.

8 TEST METHODS

8.1 Tests shall be conducted as prescribed in **5.2** to **5.4** and the methods referred in co1 (4) and col (5) of Table 1.

8.2 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.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 5 : 2007	Colours for ready mixed paints and enamels (*sixth revision*)
IS 101	Methods of sampling and test for paints, varnish and related products:
(Part l)	Test on liquid paints (general and physical),
(Sec 1) : 2023	Sampling (*fourth revision*)
(Sec 2) : 2023	Preliminary examination and preparation of samples for testing (*fourth revision*)
(Sec 3) : 1986	Preparation of panels (*third revision*)
(Sec 5) : 2024	Consistency (*fourth revision*)
(Sec 6) : 1987	Flash point (*third revision*)
(Sec 7) : 2020	Mass per 10 litres — Determination of density — Pycnometer method (*fourth revision*)
(Part 2/Sec 1) : 2018	Test on liquid paints (chemical examination), Section 1 Water content (*fourth revision*)
(Part 3)	Tests on paint film formation,
(Sec 1) : 1986	Drying time (*third revision*)
(Sec 4) : 1987	Finish (*third revision*)
(Sec 5) : 2022	Determination of fineness of grind (*fourth revision*)
(Part 4)	Optical tests on paint films,
(Sec 2) : 2021	Colour-visual comparison of colour of paints (*fourth revision*)
(Sec 3) : 1988	Light fastness test (*third revision*)
(Sec 4) : 2020	Gloss — Determination of gloss value at 20°, 60° and 85° (*fourth revision*)
(Part 5)	Mechanical tests on paint film,
(Sec 1) : 1988	Hardness tests (*third revision*)
(Sec 2) : 1988	Flexibility and adhesion (*third revision*)
(Part 6)	Durability tests on paint films,
(Sec 1) : 1988	Resistance to humidity under conditions of condensation (*third revision*)
(Sec 2) : 1989	Keeping properties (*third revision*)
(Part 7/Sec 2) : 1990	Environmental test on paint films, Section 2 Resistance to liquids (*third revision*)
(Part 8)	Tests for pigments and other solids,
(Sec 5) : 2022	Lead restriction test (*fourth revision*)
(Sec 6) : 1993	Volume solids
IS 1070 : 2023	Reagent grade water — Specification (*fourth revision*)
IS 1303 : 1983	Glossary of terms relating to paints (*second revision*)
IS 1407 : 1980	Round paint tins (*second revision*)
IS 1745 : 2018	Petroleum hydrocarbon solvents — Specification (*third revision*)
IS 2552 : 1989	Steel drums (galvanized and ungalvanized) (*third revision*)
IS 5661 : 2023	Packing and marking of packages of paints, enamels, varnishes and allied products-code of practice (*first revision*)

ANNEX B

(*Clause* 5.4)

TEST FOR DURABILITY

B-1 GENERAL

B-1.1 Outline of the Method

This test consists of exposure of painted panels in two different equipments. Here painted panels are subjected to an artificial accelerated weathering apparatus under controlled exposure to heat, light and water and then in salt spray apparatus and at the end of the test condition of the paint film examined.

B-2 APPARATUS

B-2.1 Accelerated Weathering Apparatus — An artificial weathering apparatus of the xenon arc type for uniform and controlled exposure to the effects of heat, light and water.

B-2.2 Salt Spray Apparatus — As prescribed in IS 101 (Part 6/Sec 1).

B-2.3 Carbon Arc Lamp

NOTE — Any of the three apparatus can be used, but in case of dispute "Xenon Arc Lamp" apparatus being the referee apparatus shall be followed

B-3 TEST PANELS

B-3.1 The panels shall be of mild steel plate preferably of sizes 60 mm × 40 mm × 1.25 mm and shall be prepared as prescribed in IS 101 (Part l/ Sec 3). However, panels may be of any other sizes suitable for accommodating in the test apparatus.

B-3.2 Preparation of Panels

Apply the paint on each side of the panel uniformly by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in Table 1 of IS 101 (Part 3/Sec 4). Allow the panels to air-dry under laboratory conditions, free from draught and dust, for 24 h and store at a temperature of 60 °C to 65 °C for 1 h. Cool the panels to room temperature.

B-4 TEST CONDITIONS

B-4.1 Commonly used cycles and test conditions for xenon arc apparatus are given below:

a) Black panel temperature (63 ± 3) °C,

b) Continuous exposure in light for 102 min and intermittent exposure to water spray for 18/20 min light and spray, and

c) Irradiance 0.55 W/m^2/nm.

However, any other cycle may be used if mutually agreed upon between the purchaser and the supplier.

NOTES

1 As a precaution against inadvertent accidents, it is recommended that the accelerated weathering test is carried out in duplicate.

2 For details of method of tests for xenon arc apparatus follow as IS 101 (Part/Sec 5).

B-5 PROCEDURE

B-5.1 In Weathering Apparatus

The test panels so prepared then placed in the apparatus and exposed for a period of 24 h under the test conditions as prescribed in **B-4.1.** At the end of test period, note the conditions of the paint film of the tested panel. The painted panel shall show no signs of permanent softening/blistering/ chalking/ signs of corrosion.

B-5.2 In Salt Spray Apparatus

B-5.2.1 *Preparation of Spray Solution* — The spray solution shall have the following composition:

Sl No.	*Salt*	*Mass* (in g)
(1)	(2)	(3)
i)	Calcium sulphate	1.3
ii)	Magnesium chloride	2.6
iii)	Magnesium sulphate	1.7
iv)	Sodium chloride	21.4
v)	Water	To make up to 1 litre

B-5.2.2 Suspend the same tested panels, after the accelerated weathering test, in the cabinet and expose them for 8 h to a baffle spray of the spray solution.

B-5.2.3 The above cycles shall commence with exposure to accelerated weathering test and end with salt spray and shall be carried out 6 times. The painted panels, thereafter, are examined.

B-6 OBSERVATIONS

The material shall be deemed to have passed the test when the painted panel shall show no signs of permanent softening/blistering/chalking/signs of corrosion. A portion of paint films removed with suitable paint remover and exposed metal surface is examined for signs of corrosion. Neglecting the stains, if any**,** there shall not be any pitting on the surface.

ANNEX C

[*Table* 1, *Sl No.* (ii) (a)]

CONSISTENCY

C-1 APPARATUS

C-1.1 Palette Knife or Metal Rod

C-1.2 Panels

Unless specified otherwise, mild steel panels of size 150 mm × 50 mm × 1.25 mm shall be prepared as prescribed in IS 101 (Part 1/Sec 3).

C-2 PROCEDURE

Insert a clean metal rod or palette knife into the original container and examine the nature of settling.

C-2.2 Observations

The material shall not cake hard inside the container and shall be in such a condition that stirring easily produces a smooth uniform paint suitable for brushing on steel panels.

ANNEX D

[*Table* 1, *Sl No.* (xvi)]

TEST FOR RESISTANCE TO PETROLEUM HYDROCARBON SOLVENT AND LUBRICATING OIL

D-1 GENERAL

D-1.1 Outline of the Method

The painted panels, after specified drying period, is dipped in lubricated oil and solvent separately at specified temperature and time. On completion of the time periods, the panels are subjected for visual examination.

D-2 PREPARATION OF TEST PANELS

Prepare two sets of tin plate panels as prescribed in **7.2.4**.

D-3 REAGENTS

D-3.1 Lubricating Oil — Mineral lubricating oil having a viscosity of 18.0 cst or having a time of flow of approximately 80 s for 50 ml in a no.1 Redwood Viscometer.

D-3.2 Petroleum Hydrocarbon Solvent — Solvent 145/205 (low aromatic grade) conforming to IS 1745.

D-4 PROCEDURE

D-4.1 Follow the procedure as prescribed in IS 101 (Part 7/Sec 2). Immerse one prepared panel in lubricating oil (*see* **D-3.1**) at 50 °C for 48 h. Take out the panel from the oil and remove any residual lubricating oil from the surface by dabbing with a suitable absorbent paper or cloth or a pad of cotton wool and examine the test piece after a recovery period of 30 min at room temperature.

D-4.2 Follow the procedure as prescribed in IS 101 (Part 7/Sec 2). Immerse one prepared panel in petroleum hydrocarbon solvent (*see* **D-3.2**) at room temperature for 1 min. Take out the panel from petroleum solvent and allow the panel to stand in a vertical position for 5 min at room temperature and then swab it vigorously for about 5 s with a cotton wool swab soaked in petroleum hydrocarbon solvent.

D-5 OBSERVATIONS

The sample shall be treated as passing if there is no blistering, flaking and corrosion. The material shall be deemed to have passed the test if the film shall not show signs of disintegration, permanent injury or change of colour to a greater extent. The loss of gloss shall not be more than 50 percent of the original gloss.

ANNEX E

[*Table* 1, *Sl No.* (xvii)]

ACCELERATED STORAGE STABILITY TEST

E-1 OUTLINE OF THE METHOD

The material is subjected to higher temperature and then tested for drying time, viscosity and gloss value.

E-2 PROCEDURE

Store 250 ml of the paint sample in a clean closed 500 ml container having tight lid to avoid leakage of volatile paint thinners. Close the tin properly and keep it at (60° ± 2) °C for 96 h in an electrically heated oven. Take out the sample and allow it to cool for 24 h. The sample is then stirred well and tested for drying time, viscosity and gloss value.

.

E-3 OBSERVATIONS

After the test, the paint shall not gel, liver, curdle or increase in viscosity by more than 20 percent, and there shall be no evidence of seeding. The paint shall meet the drying time requirements and shall produce dry film that is uniform in appearance and free from streaking, mottling and seediness. Further, in case of finishing paint, the change in gloss value shall not be more than 5 units from that of original value.

NOTE — Keep the paint sample in the oven and gradually increase the temperature 60 °C.

ANNEX F

(*Foreword*)

COMMITTEE COMPOSITION

Paints, Varnishes and Related Products Sectional Committee, CHD 20

Organization	*Representative(s)*
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CHEMICAL, BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

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