भारतीय मानक

Indian Standard

IS 159 : 2024

तैयार मिश्रित रंग रोगन, ब्रशिंग, एसिड प्रतिरोधी — विशिष्टि

(दूसरा पुनरीक्षण)

Ready Mixed Paint, Brushing, Acid Resisting — Specification

(Second Revision)

ICS 87.040

भारतीय मानक ब्यूरो
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Price Group 6

Paints, Varnishes and Related Products Sectional Committee, CHD 20

FOREWORD

This Indian Standard (Second 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.

This standard was first published in 1950 and was largely based on the draft prepared by the coordinating subcommittee of the No. 5 standing Committee on specifications for paints and allied stores of the general headquarters, India (now Army Headquarters).

In the first revision, which was based on the suggestions of the Indian Paint Association, three-coat application was specified for testing resistance to acids and acid fumes and protection against corrosion. This was done as paint conforming to this specification will protect the surface against acids also. Besides, the requirements for covering power and spreading rate were dropped, the flash point reduced from 35 °C to 16 °C so as to allow the use of sophisticated resins to achieve desired resistance property and the use of chlorinated rubber-based paint was also permitted. The title of the standard was also simplified and amendment no. 1 issued in 1963 was incorporated in the revision.

The material covered by this standard is used for the protection of equipment and the interior of laboratories, factories and fume cupboards exposed to the action of acid fumes.

In recognition of the substantial consequences of volatile organic compounds (VOC) on the environment and human health, this second revision has been taken up to limit the VOC content in paint products. This 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.

In addition, the following changes have been made:

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 101 : 1964 has been withdrawn;

c) A suitable precautionary note has been added in the marking clause in order to prevent unforeseen events; and

d) References of Indian Standards have been updated wherever required.

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 (*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, BRUSHING, ACID RESISTING — SPECIFICATION

(*Second Revision*)

1 SCOPE

This standard prescribes requirements and methods of sampling and test for the material commercially known as ready mixed paint, brushing, acid resisting, for protection against acids and acid fumes, colour as 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 under IS 1303 and the following shall apply:

3.1 Volatile Organic Compounds (VOC) — It is determined as any organic compound having an initial boiling point less than or equal to 250 °C measured at a Standard atmospheric pressure of 101.3 kPa.

4 REQUIREMENTS

4.1 Composition

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

4.2 Resistance to Acids and Acid Fumes

The material, when tested as described in Annex B, shall pass the test.

4.3 Lead Restriction

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).

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

5 PACKING AND MARKING

5.1 Packing

Unless otherwise agreed between the purchaser and the supplier, the paint shall be packed in metal containers conforming to IS 1407 or IS 2552.

5.2 Marking

Each container shall be marked with the following:

a) Name, thinner used, flash point and class of the material;

b) Name of the manufacturer and/or his recognized trade-mark; if any;

c) Lead content (Maximum);

d) The maximum content of VOC in g/l of the product as supplied in container

e) Volume of the material;

f) Batch number or lot number in code or otherwise; and

g) Month and year of manufacture.

h) Caution notes as follows:

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 in haled.

5.2.1 The containers may also be marked with Standard Mark.

5.2.2 *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 thereunder, and the products may be marked with the Standard Mark.

Table 1 Requirements for Ready Mixed Paint, Brushing, Acid Resisting

(*Clauses* 4.4 *and* 7.1)

Sl No.	Characteristic	Requirement	Method of Test, Ref to.
(1)	(2)	(3)	(4)
i)	Consistency	Smooth, uniform and suitable for application by brushing without appreciable drag on the brushes	IS 101 (Part 1/Sec 5)
ii)	Drying time:		
	Hard dry	Not more than 8 hours	IS 101 (Part 3/Sec 1)
iii)	Finish	Smooth and glossy	IS 101 (Part 3/Sec 4)
iv)	Wet opacity	Between - 10 and + 20 percent of the approved sample or the value declared by the manufacturer and accepted by the competent testing laboratory	IS 101 (Part 4/Sec 1)
v)	Colour	Close match to the specified IS colour, or to the approved sample where IS colour is not specified	IS 101 (Part 4/Sec 2)
vi)	Fastness to light	To pass the test	IS 101 (Part 4/Sec 3)
vii)	Residue on sieve, percent by mass, *Max*	0.3	IS 101 (Part 8/Sec 1)
viii)	Water content (if water is suspected to be percent), percent by mass, *Max*	0.5	IS 101 (Part 2/Sec 1)
ix)	Flexibility and adhesion after 96 h air drying	No visible damage or detachment	101 (Part 5/Sec 2)
x)	Stripping test at a load of 1 000 g	Scratches free from jagged edges	Annex C
xi)	Scratch hardness	No visible scratch as to show the bare metal	IS 101 (Part 5/Sec 1)
xii)	Protection against corrosion	No signs of breakdown or corrosion	Annex D
xiii)	Flash point	Not below 16 °C	IS 101(Part l/Sec 6)
xiv)	Keeping properties	Not less than one year	Annex E
xv)	Volatile organic compound, gm/litre, *Max* (*see* Note)	500	IS 101 (Part 2/Sec 3)

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).

5.3 The containers shall also be marked 'HIGHLY FLAMMABLE LIQUID' in red letters (either printed on the label affixed to the container or lithographed or stencilled thereon with indelible ink) in a type size of not less than 50 mm. In addition all containers for storage and transport shall comply with the requirements of latest issues of red tariff and requirements as laid down from time to time by the chief inspectorate of explosives, Government of India, for packing, storage and transit of flammable liquids and the *Board of Trade Regulations* as applicable thereon for transport by steamers.

5.4 Other details of packing and marking shall be in accordance with instructions given by the purchaser.

6 SAMPLING

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

6.2 Criteria for Conformity

A lot shall be declared as conforming to the requirements of this standard if the test results on the composite sample satisfy the requirements prescribed under **4** of this standard.

7 TEST METHODS

7.1 Tests shall be conducted as prescribed in **4.1** to **4.3**. The test methods referred to are given in co1 (4) of Table 1 and Annex B to Annex D.

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 For match against Indian Standard colours IS 5 shall be used.

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, varnishes and related products:
(Part 1)	Tests on liquid paints (general and physical),
(Sec 1) : 1986	Sampling (*third revision*)
(Sec 3) : 1986	Preparation of Panels (*third revision*)
(Sec 5) : 2024	Consistency (*fourth revision*)
(Sec 6) : 1987	Flash point (*third revision*)
(Part 2)	Test on liquid paints (chemical examination),
(Sec 1) : 2018	Water content (*fourth revision*)
(Sec 3) 2015/ ISO 11890-1 : 2007	determination of volatile organic compound (VOC) content — Difference method
(Part 3)	Tests on paint film formation,
(Sec 1) : 1986	Drying time (*third revision*)
(Sec 4) : 1987	Finish (*third revision*)
(Part 4)	Opacity (*third revision*),
(Sec 1) : 1988	Optical test
(Sec 2) : 2021	Colour-visual comparison of colour of paints (*fourth revision*)
(Sec 3) : 1988	Light fastness test (*third revision*)
(Part 5)	Mechanical test on paint films,
(Sec 1) : 1988	Hardness tests (*third revision*)
(Part 5)	Mechanical tests
(Sec 2) : 1988	Flexibility and adhesion (*third revision*)
(Part 8)	Tests for pigments and other solids
(Sec 1) : 1989	Residue on sieve (*third revision*)
(Sec 5) : 2022	Lead restriction test (*fourth revision*)
IS 1070 : 2023	Reagent grade water — specification (*fourth revision*)
IS 1303 : 1983	Glossary of terms relating to paints (*second revision*)
IS 1407 : 1980	Specification for round paint tins (*second revision*)
IS 2552 : 1989	Steel drums (galvanized and ungalvanized) — Specification (*third revision*)

ANNEX B

(*Clause* 4.2)

TEST FOR RESISTANCE TO ACIDS AND ACID FUMES

B-1 GENERAL

A film of the material when tested as prescribed in this Annex shall be satisfactorily resistant to the action of sulphuric acid, nitrating acid and nitric acid fumes, and in this respect shall not be inferior to the approved sample when both are tested in the same manner and at the same time.

B-2 PREPARATION OF PANELS

Prepare three metal panels as prescribed in IS 101 (Part 1/Sec 3). Apply the paint on each side of the panel and allow it to air dry for 24 hours. Apply two further coats of the material in similar manner and allow the panel to dry for seven days after the final coat. Coat the edge of the painted panel to a depth of 6 mm all-round by dipping in a molten paraffin wax bath.

B-3 PROCEDURE

B-3.1 Resistance to Sulphuric Acid

Immerse one panel to half the length in a solution containing 20 g of sulphuric acid (relative density l.84) per 100 ml of water and allow it to stand for 24 hours at room temperature. Remove the panel, wash it carefully with cold water and allow it to dry in a vertical position for two hours at room temperature.

B-3.2 Resistance to Nitrating Acid

Immerse the second panel to half the length in a solution containing the following:

Nitric acid (relative density 1.42)	1 volume
Sulphuric acid (relative density 1.84)	3 volumes
Water	16 volumes

Allow it to stand for 24 hours at room temperature. Remove the panel, wash it carefully with cold water and allow it to dry in a vertical position for two hours at room temperature

B-3.3 Resistance to Nitric Acid Fumes

Take a spoutless beaker or a glass jar approximately 130 mm high (internally) with 75 mm internal diameter. Dip its open end in molten beeswax and withdraw slightly so that a film of bees wax is formed on the rim of the jar. Cool till the wax solidifies. Add two millilitre of concentrated nitric acid (relative density 1.42) to the jar and cover the jar with third panel (half the length of the panel) as prepared in **B-2**. Place a mass of 1 000 g on top of the panel and maintain the temperature of the jar at 38 °C. Remove the panel after two hours, wash the exposed paint film immediately with cold water till free from acid, and allow it to dry in a vertical position for two hours at room temperature.

B-4 COMPARISON OF FILMS

B-4.1 Compare in all cases the toughness, hardness and adhesion of the portion of the paint film, which has been in contact with the acids or fumes, with the rest of the film. It shall not show any blister or wrinkle. Minor change in colour gloss, toughness, hardness and adhesion shall not be the cause for rejection.

B-4.2 Remove the strip of the paint film, including a part which has been in contact with the acids or fumes, with a suitable paint remover and examine the exposed steel surface for signs of acid attack. The material shall be taken as passing the requirements of this test, if no attack of acids/acid fumes on the metal surface is noticed.

ANNEX C

STRIPPING TEST

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

C-1 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.

C-2 APPARATUS

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

C-3 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 48 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.

C-4 The scratch so produced shall be free from jagged edges.

ANNEX D

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

PROTECTION AGAINST CORROSION UNDER CONTITIONS OF CONDENSATION

D-1 OUTLINE OF THE METHOD

This test is carried by suspending the painted panel after specified period of drying in a corrosion cabinet maintained at 100 percent relative humidity and a temperature cycle of 42 °C to 48 °C for seven days and examining it for any signs of deterioration and corrosion of metal surface.

D-2 APPARATUS

D-2.1 Metal Panels — of mild steel as prescribed in IS 101 (Part 1/Sec 3).

The panels shall be prepared as prescribed in IS 101 (Part 1/Sec 3).

NOTE — Results of tests carried out on different substrates do not necessarily correlate with each other.

D-2.2 Corrosion Cabinet

The apparatus consists of a closed cabinet in which the relative humidity is maintained at approximately 100 percent and the temperature cycles continuously over a range of 42°C to 48°C, thereby ensuring that copious condensation occurs on test panels positioned vertically within the cabinet.

NOTES

1 Should the cabinet be copper lined, the copper shall be tinned or coated with a suitable organic coating to prevent the dissolution of small amounts of copper in the water.

2 The design and dimensions are left to the user's discretion, provided that the following conditions are observed:

a) *Humidification* — The humidity shall be maintained by evaporation of water from a reservoir covering (or situated in) the bottom of the cabinet;

b) *Water* — Fill the water tank at the bottom of the oven to a depth of 45 mm with distilled water. The water level in the tank shall be adjusted to the same level daily; and water shall be maintained free from grease or oil;

c) *Heating* — The cabinet shall be heated through the medium of water by a heater placed immediately below the water reservoir, or preferably by a heater completely immersed in water;

d) *Temperature Cycle* — The heater shall be controlled by two thermostats (placed in the air space above the water) in such a way that the temperature of the air space cycles continuously from 42 °C to 48 °C in not less than 45 minutes and not more than 75 minutes. The time required for heating and cooling shall be approximately equal.

e) *Air Circulation* — The air in the cabinet shall be circulated by means of a fan in such a way that the temperature in any part of the air space does not differ by more than 1 °C at any given moment. Necessary particulars of the fan are given below:

Blades	Two
Fan diameter	150 mm

Fan width	25 mm at edge
Diameter of the shaft	6.75 mm
Height of the fan from bottom	180 mm
Fan diameter at pulley	15 mm
Speed	1 440 rev/min approximately

f) *Spacing Test Panels* — If the panels hang in the cabinet, the hooks and rods from which they are suspended shall be made of glass or plastics. If the panels are placed on metal racks,

g) they shall be suitably insulated at their points of contact with rack. It shall be ensured that all the panels are strictly vertical. The panels shall not be placed less than 37 mm apart or less than 37 mm from any side of the cabinet.

h) *Ambient Conditions* — The cabinet conditions shall be controlled [to give cycles as required in (d) above] at room temperature.

i) *Rotating of Panel Rack* — In view of the fact that the circulating fan is located on one side only, it is necessary to turn the panel rack everyday to ensure uniformity in actual working.

NOTE — The cabinet shall be opened only once every 24 hours for the rotation of panels and maintenance of water level.

D-3 PROCEDURE

D-3.1 The metal panel is cleaned and prepared as prescribed in **D-2.1**. Apply one coat of the paint on both sides of the mild steel panel to give a dry film weight of the material as specified in **D-3.1.1**.

D-3.1.1 *Dry Film Weight for Test Purposes*

The weight of the dry film of a single coat of the material applied to test panels either by brushing or spraying shall vary with the weight per 10 liters of the material as given below:

Sl No.	*Weight of the Wet Material* Kg/10 litres	*Limits of Dry Film Weight* g/m^2
(1)	(2)	(3)
i)	Up to 12	27 to 34
ii)	Over 12 and up to 14	34 to 44
iii)	Over 14 and up to 16	44 to 54
iv)	Over 16 and up to 18	54 to 68
v)	Over 18	68 to 80

D-3.2 Keep the painted panel in a vertical position at room temperature for 24 hours to air-dry, and then at a temperature of 60 °C to 65 °C got one hour or stove for the specified period. Cool the panel to room temperature and protect the edges to a depth of 5 mm with a suitable protective composition (*see* Note) which shall have melting point above 50 °C; and then suspend it vertically in the corrosion cabinet.

NOTE — Preferably consisting of 3 parts by weight of paraffin wax (melting point 60 °C) and 1 part by weight carnauba wax (melting point 82°C).

D-3.3 After exposure under these conditions for seven days, remove the panel and examine for signs of deterioration of the paint film. Remove 25 mm strip of the film from the centre of the panel carefully with a non-corrosive paint remover neglecting 25 mm portion of the exposed surface from each end and examine the exposed metal for signs of corrosion. The metal surface shall show no sign of corrosion; changes in appearance and condition of the paint film shall not be taken into consideration in deciding about acceptability.

NOTE — Immediately after assessment is made the exposed area shall be protected with a suitable non-corrosive transparent lacquer for reference purposes.

ANNEX E

KEEPING PROPERTIES

[*Table* 1 *Sl No.* (xiv)]

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 **4** 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.

ANNEX F

(*Foreword*)

COMMITTEE COMPOSITION

Paints, Varnishes and Related Products Sectional Committee, CHD 20

Organization	*Representative(s)*
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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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