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IS 13238 (1991): Epoxy based zinc phosphate primer (two pack) [CHD 20: Paints, Varnishes and Related Products]
Indian Standard

EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

UDC 667.638.2
FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Paints (Other than Industrial Paints) and Allied Products Sectional Committee had been approved by the Chemical Division Council.

The paint obtained by the in two packs is used as a highly protective anti-corrosive primer on steel surfaces for providing a much higher degree of protection than conventional single pack primer.

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 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
AMENDMENT NO. 3 OCTOBER 2007
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

(Page 2, Table 1, Sl No. 6, col 2) — Delete 'by mass, Min'.

(Page 2, Table 1, Sl No. 10, col 2) — Add the following after 500 hours:

'with single coat dry film thickness of 35-45 micron'.

(Page 2, Table 1, Sl No. 11, col 2) — Add the following after 500 hours:

'with single coat dry film thickness of 35-45 micron'.

(CHD 20)

Reprography Unit, BIS, New Delhi, India
AMENDMENT NO. 2 APRIL 2006
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

( Page 2, Table 1, col 2, Sl No. 10 ) — Substitute 'Resistance to salt spray at 40 ± 5 microns DFT, 500 hours' for 'Resistance to salt spray 500 hours'.

( Page 2, Table 1, col 2, Sl No. 11 ) — Substitute 'Protection against corrosion under condition of condensation at 40±5 microns DFT, 500 hours' for 'Protection against corrosion under condition of condensation, 500 hours'.

( CHD 20 )

Reprography Unit, BIS, New Delhi, India
AMENDMENT NO. 1 DECEMBER 1994
TO
IS 13238 : 1991 EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK)—SPECIFICATION

(Page 2, Table 1) — Add the following after Sl No. (i)(b):

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Characteristic</th>
<th>Requirement</th>
<th>Method of Test, Ref to</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Hard dry, 70°C,</td>
<td>30 min, with Max</td>
<td>101 (Part 3/Sec 1): 1986 (see Note)</td>
</tr>
<tr>
<td></td>
<td>15 min flash</td>
<td>off time</td>
<td></td>
</tr>
</tbody>
</table>

(Page 2, Table 1, col 2) — Renumber Sl No. ‘1 (c)’ as ‘1 (d)’.

(Page 2, Table 1, col 2, Sl No. 7) — Substitute ‘1 500 g’ for ‘1 200 g’.

(Page 2, Table 1, col 3, Sl No. 4) — Substitute ‘offwhite/grey’ for ‘grey’.

(Page 2, Table 1, col 3, Sl No. 14) — Substitute ‘Not less than Twelve months from date of manufacture’ for ‘Not less than Nine months’

(Page 2, Table 1) — Add the following note at the end of the table:

‘NOTE — Test Panels shall be kept at 70°C for hard drying.’

(Page 2, clause 6.1.1) — Substitute ‘Any sediment formed in the container shall be mixed thoroughly preferably with power driven stirrer to form homogeneous paint’ for ‘Any sediment that does form must be easy to stir up again in order to give a homogeneous paint’.

(CHD 031) Reprography Unit, BIS, New Delhi, India
Indian Standard

EPOXY BASED ZINC PHOSPHATE PRIMER (TWO PACK) — SPECIFICATION

SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for two pack epoxy based zinc phosphate primer, intended to be used for the protection of exterior of Railway Coaches, wagons and bridges.

1.1.1 The material is intended to be used as an anti-corrosive primer in epoxy/polyurethane paint System over adequately prepared exterior eel surfaces of railway coaches, etc.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1303:1983 and the following shall apply.

3.1.1 Component

Each of the two parts of the paint which when mixed together, forms an epoxy based zinc phosphate priming paint.

3.1.2 Paint

The mixture of the two components in the proportion recommended by the manufacturer.

4 REQUIREMENTS

4.1 Composition

The paint shall consist essentially of two components, base and hardner in such simple ratio preferably by volume to satisfy all the requirements of this standard.

4.1.1 Base shall consist of: (a) epoxy resin and (b) a pigment.

4.1.1.1 Epoxy resin, used in the formulation of the paint, shall have the weight per epoxy equivalent of 400-600 on non-volatile vehicle content, when tested according to 4 of IS 9162:1979.

4.1.1.2 The paint shall contain a minimum of 40 percent by mass of pigment in the mass of paint. The pigment shall contain a minimum of 16 percent by mass of zinc phosphate in the total pigment content apart from other pigments such as extenders, rust inhibitors, etc, when tested according to 27 of IS 101 (Part 8/Sec 2):1990 using the following extraction mixture:

i) Methyl iso-butyl ketone 25 parts
(see IS 9850:1981) or methyl ethyl ketone or a mixture of both in the ratio 1:1, by volume;

ii) Xylene; and

iii) Acetone (see IS 170:1986) 25 parts

4.1.2 Hardner shall be liquid type, such as an aliphatic amine, an aliphatic or aromatic amine adduct, a polyamide or amidopolyamine. It shall react with epoxy resin at normal ambient temperature.

4.1.3 The mixture of base and hardner shall be allowed to mature for 20 minutes at 27 ± 2°C. This mixture must be consumed within 4 hours after mixing.

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

5 TESTS

5.1 Unless specified otherwise, tests shall be conducted as prescribed in specifications mentioned in col 4 of Table 1.

5.2 The preparation of metal panels shall be according to IS 101 (Part 1/Sec 3):1986.

5.3 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (see IS 1070:1977) shall be employed.

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

5.4 All the tests shall be conducted at 27 ± 2°C and a relative humidity at 65 ± 5 percent in a well ventilated chamber free from draught and dust.

5.5 The two component epoxy zinc phosphate primer shall be mixed in the ratio recommended by the manufacture of paint, before conducting the tests. Where the primer is required to be applied on panels, it shall be done so by using suitable brush/spray apparatus.

6 PACKING AND MARKING

6.1 Packing

Unless otherwise agreed to between the purchaser and the supplier, the material shall
### Table 1 Requirements for Apsyox Based Zinc Phosphate Primer (Two Pack)  
(Clause 4.2)

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Characteristics</th>
<th>Requirements</th>
<th>Methods of Test Ref to IS No./Annex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Drying time</td>
<td></td>
<td>101 (Part 3/Sec 1) : 1986</td>
</tr>
<tr>
<td></td>
<td>a) Surface dry, Max</td>
<td>4 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Hard dry, Max</td>
<td>16 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Curing time, Max</td>
<td>7 days</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Smooth uniform and suitable for brush/spray application</td>
<td></td>
<td>101 (Part 1/Sec 5) : 1991</td>
</tr>
<tr>
<td>3.</td>
<td>Finish</td>
<td>Smooth matt and egg shell flat</td>
<td>101 (Part 3/Sec 4) : 1987</td>
</tr>
<tr>
<td>5.</td>
<td>Dry film thickness per coat, Min</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) By brushing</td>
<td>30 micron</td>
<td>101 (Part 5/Sec 1) : 1988 C</td>
</tr>
<tr>
<td></td>
<td>b) By airless spray</td>
<td>35-40 micron</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Volume solids, percent by mass, Min</td>
<td>40</td>
<td>101 (Part 5/Sec 2) : 1988</td>
</tr>
<tr>
<td>7.</td>
<td>Scratch hardness with 1 200 g load</td>
<td>No scratch as to show bare metal</td>
<td>101 (Part 6/Sec 1) : 1988 D</td>
</tr>
<tr>
<td>8.</td>
<td>Flexibility and adhesion</td>
<td>No visible damage or detachment of the film</td>
<td>101 (Part 6/Sec 2) : 1989</td>
</tr>
<tr>
<td>10.</td>
<td>Resistance to salt spray 500 hours</td>
<td>No sign of corrosion and no sign of deterioration</td>
<td>101 (Part 1/Sec 7) : 1987</td>
</tr>
<tr>
<td>11.</td>
<td>Protection against corrosion under condition of condensation, 500 hours</td>
<td>do</td>
<td>do</td>
</tr>
<tr>
<td>12.</td>
<td>Mass in kg/10 litres, Min</td>
<td>13.0</td>
<td>101 (Part 1/Sec 7) : 1987 D</td>
</tr>
<tr>
<td>13.</td>
<td>Pot life at 27 ± 2°C, Min</td>
<td>4 hours</td>
<td>101 (Part 1/Sec 7) : 1987 D</td>
</tr>
<tr>
<td>14.</td>
<td>Keeping properties</td>
<td>Not less than Nine months</td>
<td>101 (Part 6/Sec 2) : 1989</td>
</tr>
</tbody>
</table>


6.1.1 Each component as delivered shall be free of gel, coarse particles, skins, foreign matter and sediments. Any sediment that does form must be easy to stir up again in order to give a homogenous paint.

6.2 Marking
Each container shall be marked with the following:
- a) Name of the material with component's name and induction period;
- b) Indication of the source of manufacture;
- c) Volume of the material;
- d) Safe storage period;
- e) Month and year of manufacture;
- f) Mixing proportion recommended for use; and
- g) Other instructions for safe handling and use of the material.

### 7 SAMPLING

7.1 Representative samples of the material shall be drawn according to 6 of IS 101 (Part 1/Sec 1) : 1986.

7.2 Criteria for Conformity

7.2.1 Drying time and film thickness shall be tested on at least two samples taken from different containers selected according to 7.1. For lot size above 1 000 kg, this shall be minimum 3. For the rest of the characteristics, tests shall be conducted on one composite sample prepared from individual samples taken from different containers in the sample.

7.2.2 There shall be no failure in respect of any test if the lot is to be considered conforming to the requirements of this specification.
ANNEX A
(Clause 2.1)

LIST OF REFERRED INDIAN STANDARDS

<table>
<thead>
<tr>
<th>IS No.</th>
<th>Title</th>
<th>IS No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 ( Part 1/Sec 1 ) : 1986</td>
<td>Methods of sampling and test for paints, varnishes and related products: Part 1 Test on liquid paints (general and physical), Section 1 Sampling (third revision)</td>
<td>( Part 6/Sec 1 ) : 1988</td>
<td>Part 6 Durability tests on paint films, Section 1 Durability under conditions of condensation</td>
</tr>
<tr>
<td>Sec 2 ) : 1987</td>
<td>Section 2 Preliminary examination and preparation of samples for testing (third revision)</td>
<td>Sec 2 : 1989</td>
<td>Section 2 keeping properties (third revision)</td>
</tr>
<tr>
<td>Sec 3 ) : 1986</td>
<td>Section 3 Preparation of panels (third revision)</td>
<td>170 : 1986</td>
<td>Part 8 Tests for pigments and other solids, Section 2 Pigments and non-volatile (third revision)</td>
</tr>
<tr>
<td>Sec 5 ) : 1991</td>
<td>Section 5 Consistency</td>
<td>1070 : 1970</td>
<td>Acetone (third revision)</td>
</tr>
<tr>
<td>Sec 6 ) : 1987</td>
<td>Section 6 Flash point (third revision)</td>
<td>1303 : 1983</td>
<td>Water for general laboratory use (second revision)</td>
</tr>
<tr>
<td>Sec 7 ) : 1987</td>
<td>Section 7 Mass per 10 litres (third revision)</td>
<td>1407 : 1980</td>
<td>Glossary of terms relating to paints (second revision)</td>
</tr>
<tr>
<td>(Part 3/Sec 1 ) : 1986</td>
<td>Part 3 Test on paint film formation, Section 1 Drying time (third revision)</td>
<td>2552 : 1979</td>
<td>Round paint tins (second revision)</td>
</tr>
<tr>
<td>Sec 4 : 1987</td>
<td>Section 4 Finish (third revision)</td>
<td>9162 : 1979</td>
<td>Steel drums (galvanized and ungalvanized) (second revision)</td>
</tr>
<tr>
<td>( Part 5/Sec 1 ) : 1988</td>
<td>Part 5 Mechanical test on paint films, Section 1 Hardness test</td>
<td>9850 : 1981</td>
<td>Methods of tests for epoxy resins, hardners and epoxy resin composition for floor topping</td>
</tr>
<tr>
<td>Sec 2 ) : 1988</td>
<td>Section 2 Flexibility and adhesion</td>
<td>10897 : 1984</td>
<td>Methyl iso butylketone</td>
</tr>
</tbody>
</table>

ANNEX B
(Table 1, Sl No. 5)

DETERMINATION OF PAINT FILM THICKNESS

B-0 GENERAL

B-0.1 This specifies non-destructive methods for determining the thickness of dry paint films on metallic substrates. It is, therefore, primarily intended for use in checking the thickness of paint films on painted articles.

B-1 APPARATUS

B-1.1 Electromagnet

This type of instrument, requires a supply of electrical power and incorporates means of stabilizing the supply to an electromagnetic head.

B-2 PROCEDURE

B-2.1 The head is placed on an unpainted metal surface similar in nature to that bearing the paint film under test. A reading is taken and the operation repeated on the painted surface. The scale on the instrument is calibrated to indicate the thickness of the paint film shown by the difference between two readings.
C-1 GENERAL

C-1.1 This method is intended to provide a measure of the volume of dry coating obtainable from a given volume of liquid coating. This volume is considered to be the most equitable means of comparing the coverage and the wet film thickness of the given paint.

C-2 APPARATUS

C-2.1 Analytical Balance — Sensitive to 0.1 mg.

C-2.2 Stainless Steel Disc
60 mm diameter and 0.70 mm thickness with a small hole 2 to 3 mm from the edge. A fine wire such as chromel is attached through the hole for suspending the disc in a liquid.

C-2.3 Weight Box

C-2.4 Beaker — 1 litre.

C-2.5 Mass per Litre Cup

C-2.6 Hot Air Oven — Capable to maintain 105 ± 2°C.

C-3 PROCEDURE

C-3.1 Dry the disc in an oven at 105°C for 10 minutes and cool. Weigh the disc in air. Let it be \( W_1 \) grams.

C-3.2 Suspend the disc in water and weigh again. Let it be \( W_2 \) grams.

C-3.3 Calculate the volume of the disc \( V \) as follows:

\[
V = \frac{W_1 - W_2}{d}
\]

where

\( d \) = the density of the water at room temperature.

C-3.4 Determine the weight of non-volatile content of the liquid coating material by drying a known amount of paint at 105°C for 3 hours. Let it be \( W \) grams.

C-3.5 Determine the specific gravity of the paint to the nearest 0.001 g/ml by using mass per litre cup. Let it be \( p \).

C-3.6 Dip the disc in the paint sample for 10 minutes and take out the disc. Allow the excess coating material to drain off. Blot the coating material off the bottom edge of the disc so that beads or drops do not dry on the bottom edge of the disc. Dry the disc at 105°C for 3 hours and cool. Weigh the coated disc in air. Let it be \( W_3 \) grams.

C-3.7 Suspend the coated disc in water and weigh again. Let it be \( W_4 \) grams.

C-3.8 Calculate the volume of the coated disc \( V_1 \) as follows:

\[
V_1 = \frac{W_3 - W_4}{d}
\]

where

\( d \) = the density of water at room temperature.

C-3.9 Calculate the volume of the dried coating as follows:

Volume of dried coating \( = V_1 - V \)

C-3.10 Calculate the volume of wet coating as follows:

\[
V_w = \frac{W_5 - W_1}{W 	imes p}
\]

where

\( W \) = grams of non-volatile matter in 1 g of wet coating.

C-3.11 Calculate the percentage volume solids of the paint as follows:

\[
\frac{V_1 - V}{V_w} \times 100 \text{ OR } \frac{V_3 - V_4}{V_w} \times 100
\]

C-3.12 The percent volume solids of a paint is related to the covering capacity and wet film thickness in the following manner:

a) Theoretical coverage ( \( \text{m}^2/\text{l} \) )

\[
= \frac{\text{Percent Volume Solids}}{\text{Dry film thickness (microns)}} \times 10
\]

b) Wet film thickness ( microns )

\[
= \frac{\text{Dry film thickness (microns)}}{\text{Percent Volume Solids}} \times 100
\]
ANNEX D
( Table 1, Sl No. 13 )

DETERMINATION OF POT LIFE

D-1 GENERAL

D-1.1 The time taken to reach to end of working life from the original viscosity shall be considered as the pot life of the material.

D-2 PROCEDURE

D-2.1 Condition the components of the coating for one hour at 27°C and mix immediately in the proper ratio to fill the can to be approximately 1 cm of the top. The lid should be loosely placed on the can.

D-2.2 Measure the viscosity initially and every hour thereafter, as prescribed in IS 101 ( Part I/ Sec 5 ).

D-2.3 Near the end of the coating's working life, the viscosity builds up rapidly. When it appears that the coating may be too viscous to spray, remove a small portion and add the appropriate thinner. If the paint can still be thinned, the end of the working life has not been reached.

D-2.4 The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.

D-3 Report the working life as pot life of the period.

NOTE — The interval may be shortened, if desired.
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Doc : No. CHD 020 (9685)

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</thead>
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