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RDSO Specification for Epoxy based Micaceous Iron Oxide (Two pack)			

**RDSO SPECIFICATION No.
M&C/PCN/103/2020
(Rev 1.0)**



**SPECIFICATION FOR EPOXY BASED
MICACEOUS IRON OXIDE
(TWO- PACK)**

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0. FOREWORD:

This standard was originally adopted in the year 1986. In this revision requirement limit of epoxy equivalent, drying time, colour, keeping property and pot life has been revised in the light of technological advancement & experience gathered. The minimum temperature of the surface to be painted has been incorporated. The procedure for determining pot life has also been revised. Under scope, the suitability of the material by airless spray has also been incorporated. Methods of test have been specified as per revised IS: 101.

1. SCOPE:

- 1.1 This standard prescribes requirements and methods of testing of Epoxy Based Micaceous Iron Oxide paint supplied in Dual Pack, intended to be used for the protection of Interior of Railway coaches. It should be suitable for application by Airless/Air Spray and touch –up painting by Brush.
- 1.2 The paint obtained by mixing the material in Two Packs is used as an undercoating cum finishing coat as well as an intermediate coat on Bridges and other Industrial Applications.

NOTE: “Firm should comply Make in India Policy and Public Procurement (Preference to Make in India) Order-2017 under this specification” and subsequent Amendment done time to time.

2. TERMINOLOGY:

- 2.1 For the purpose of this standard apart from the Glossary of Terms given in IS 1303 - 1983, Reaffirmed 2017 or its latest version and Cl.2 of IS: 9162-79, Reaffirmed 2016 or its latest version, the following shall also apply. Rounding off, of observed values on different tests shall be done in accordance with IS: 2-1960, Reaffirmed 2016 or its latest version.
 - 2.1.1 **PACK:** The term used to describe each of the Two Packs of the paint which when mixed together, form an Epoxy Micaceous Iron Oxide in flakes/ lamellar structure.
 - 2.1.2 **PAINT:** The mixture of the two components in the proportion recommended by Manufacturer/Supplier.

3. REQUIREMENT:

The mixing ratio of the Pack ‘A’ and Pack ‘B’ shall be either in a simple ratio such as 1:1, 2:1 etc. by volume or mixing ratio shall be recommended by Manufacturer/Supplier.

- 3.1 **COMPOSITION:** The paint shall consist essentially of Two Packs, namely Pack ‘A’ and Pack ‘B’.

- 3.1.1 **PACK ‘A’:** Normally referred to as Base, shall consist of (a) Epoxy Resin and (b) Pigment.
- 3.1.2 In the formulation of the paint ,Epoxy Resin of the following grade shall be used:

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TABLE-I: Requirements for Epoxy Resin

SN	Characteristics	Requirement	Method of Test
1.	Weight per Epoxy equivalent on Non-volatile vehicle content basis	150-600	CI 2.2 & 4 of IS: 9162-79, Reaffirmed 2016 or its latest version

3.2.1.2. PIGMENT CONTENT:

- a) The material shall consist of a minimum of 30% by mass of pigment when both the components mixed in the ratio as given by manufacturer and tested as per IS: 101(Part 8/Sec.2)-90, Reaffirmed 2017 or its latest version by using the following extraction mixture.
- i) Methyl Iso-Butyl Ketone (MIBK) or 25 parts by volume
Methyl Ethyl Ketone (MEK) or a Mixture of both, in the ratio 1:1 by volume.
 - ii) Xylene 50 parts by volume
 - iii) Acetone 25 parts by volume.
- b) The pigment shall contain not less than 80% by mass of Micaceous iron oxide pigment, conforming to designation Grey/Dark Brown with metallic sheen as per ISO: 10601-2007 or BS EN ISO 1248:2008. The balance of the pigment composition shall consist of extenders, thixotropes etc. as may be considered necessary.

3.2.2 PACK B: Normally referred to as Hardener, shall be liquid type, such as an Aliphatic Amine, an Aliphatic or Aromatic Amine adduct, a Polyamide or Amido-Polyamine or any other suitable Hardeners. It shall react with Epoxy Resin at normal ambient temperature.

4. PROPERTIES:

- 4.1 General: The paint shall comply with the requirements specified in TABLE-II of this specification.
- 4.2 Unless otherwise specified, the following testing conditions shall apply.
- 4.2.1 The preparation of metal panels shall be in accordance with IS: 101(Part1/Sec.3)-86, Reaffirmed 2012.
- 4.2.2 All the tests shall be conducted at room temperature $(27 \pm 2)^{\circ} \text{C}$ and a Relative Humidity at $(65 \pm 5)\%$ in an well-ventilated chamber free from draughts and dusts. The temperature of the surface to be painted must be at least 3°C above the dew point to prevent moisture condensation. The minimum temperature for satisfactory cure is 10°C .
- 4.2.3 The two packs i.e. Base and Hardener shall be mixed in the ratio recommended by the Manufacturer/Supplier, before conducting the test or tests. Where the paint is required to be applied on panels, it shall be done so by suitable Brush/Spray.

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4.2.4 For conducting different tests of painted panels mentioned in TABLE-II, the details of preparation of test panels given in TABLE-III shall be followed.

43 **CONDITION IN CONTAINER:** Each Pack 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 with a power driven mechanical stirrer again in order to give a homogeneous paint.

TABLE-II - REQUIREMENT FOR EPOXY BASED MICACEOUS IRON OXIDE (TWO-PACK)

SN	Characteristics	Requirements	Test Methods.
1.	Drying time a) Surface dry, Max. b) Hard Dry Max. c) Curing time, Max.	4 Hours 8 Hours 7 Days	IS:101(Part 3/Sec.1)-86, Reaffirmed 2017 or its latest version.
2.	Consistency	Smooth and uniform and suitable for brush/spray application	IS:101(Part 1/Sec.5)-89, Reaffirmed 2019 or its latest version.
3.	Finish	Smooth and matt to egg shell	IS:101(Part 3/Sec.4)-87, Reaffirmed 2019 or its latest version.
4.	Colour	Grey/Dark Brown with Metallic Sheen	IS:101(Part4/Sec2)-89, Reaffirmed 2019 or its latest version.
5.	Dry Film Thickness per coat, Min. a) By Brush b) By Airless Spray	100 125	IS:101(Part 3/Sec.2)-89, Reaffirmed 2019 or its latest version.
6.	Volume Solid %, Min.	50	APPENDIX-I
7.	Scratch Hardness (1.5 kg load)	No such scratch as to show bare metal	IS:101(Part5/Sec.2)-88, Reaffirmed 2019 or its latest version.
8.	Flexibility & Adhesion (6.25 mm Mandrel)	No visible damage	IS:101(Part 5/Sec.2)-88, Reaffirmed 2019 or its latest version.
9.	Flash Point for both Packs	Above 20°C	IS:101(Part 1/Sec.6)-87, Reaffirmed 2019 or its latest version.
10.	Resistance to Salt Spray	No sign of corrosion & no sign of deterioration upto 1000 hrs.	IS:101(Part 6/Sec.1)-88, Reaffirmed 2015 or its latest version.
11.	Protection against corrosion under condition of condensation	-do-	IS:101(Part 6/Sec.1)-88, Reaffirmed 2015 or its latest version.
12.	Keeping Properties for both Packs	Not less than 9 months	IS:101(Part 6/Sec.2)-89, Reaffirmed 2019 or its latest version.
13.	Pot life a) at 27±2 °C , Min b) at 40±2 °C , Min	3 hours and 30 min. 2 hours	APPENDIX-II
14.	Mass in kg/10 litres, Min	17.0	IS:101(Part 1/Sec.7)-87, Reaffirmed 2019 or its latest version.

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APPENDIX-I

PROCEDURE FOR DETERMINING VOLUME SOLIDS PERCENTAGE IN POLYURETHANE PAINTS

1. SCOPE

This method is applicable to the determination of the volume of non volatile matter of paint coatings.

2. SIGNIFICANCE

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 (sq. meter of surface covered at a specific film thickness per unit volume) and also for calculating the wet film thickness of the given paint.

3. APPARATUS

- i) Analytical balance
- ii) Steel disc – Preferably stainless steel, 60 mm dia 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 and made of the appropriate length for suspending the disc in a liquid.
- iii) Weight box
- iv) Beaker 1 litre, for weighing the disc in liquid.
- v) Weight per litre cup for determining the specific gravity of the paint material and of the suspending liquid if not known.
- vi) Oven.

4. PROCEDURE :

- i) Dry the disc in an oven at 105°C for 10 minutes and cool.
- ii) Weigh the disc in air. Let it be W1 grams.
- iii) Suspend the disc in water and weight again. Let it be W2 grams.
- iv) Calculate the volume of the disc V as follows :

$$V = \frac{W1 - W2}{d}$$
 where d is the density of the water at room temperature.
- v) 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.
- vi) Determine the specific gravity of the paint to the nearest 0.001 g/ml by using weight per gallon cup. Let it be P.
- vii) Dip the disc in the paint sample for 10 minutes and take out the disc and allow the excess coating material to drain off. Blot the coating material off the bottom edge of the disc so that heads or drops do not dry on the bottom edge of the disc.
- viii) Dry the disc. in an oven for 3 hours at 105°C and cool.
- ix) Weigh the coated disc in air. Let it be W3 grams.
- x) Suspend the coated disc in water and weigh again. Let it be W4 grams.

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xi) Calculate the volume of the coated disc as follows :

$$V1 = \frac{W3 - W4}{d} \text{ where } d \text{ is the density of the water at room temperature.}$$

xii) Calculate the volume of the dried coating as follows:-

$$\text{Volume of dried coating (Vd)} = V1 - V$$

xiii) Calculate the volume of wet coating as follows:

$$V1 = \frac{W3 - W1}{W \times P} \text{ where } W = \text{grams of non-volatile matter in 1.0 gm paint.}$$

$$P = \text{specific gravity of the paint.}$$

xiv) Calculate the percentage volume solids of the paints as follows :

$$= \frac{V1 - V}{Vw} \times 100 \quad \text{OR} \quad \frac{Vd}{Vw} \times 100$$

The volume of non-volatile matter or the percentage volume solids of a paint is related to the covering capacity and thickness in the following manner :-

$$\text{a) } \frac{\% \text{ Volume solids}}{\text{Dry film thickness (microns)}} \times 10 = \text{Covering Capacity}$$

$$\frac{\text{Dry film thickness (microns)}}{\% \text{ Volume solids}} \times 100 = \text{wet film thickness}$$

APPENDIX-II

PROCEDURE FOR DETERMINING OF POT LIFE

(AS PER U.S. DEPTT. OF TRANSPORT/FED. RAIL, ROAD ADMN. OFFICE OF SAFETY TEST METHOD 2.7.1)

Take the usable time as the pot life of paint. Condition the components of the coating for one hour at $(27 \pm 2)^{\circ}\text{C}$ and mix immediately in proper ratio as recommended by the manufacturer/supplier to get approx. 200 ml. of paint in 250 ml. of container. The lid should be loosely placed on the container. Measure the viscosity initially and every hour thereafter. However, the interval may be shortened, if desired. Near the end of the paint's working life, the viscosity builds-up rapidly. During this period, when it appears the paint may be too viscous to spray, remove a small portion and add the appropriate compatible thinner. If the paint can still be thinned, the end of the working life has not been reached. The end of the working life is reached when the paint gels, becomes stringy or cannot be thinned for application.