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RDSO Specification for Epoxy based Coal Tar paint (Two pack)			

**RDSO SPECIFICATION No.
M&C / PCN /105 /2020
(Rev 1.0)**



**SPECIFICATION FOR EPOXY BASED
COAL TAR PAINT
(TWO PACKS)**

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PACK)**

0. FOREWORD:

This standard was originally adopted in the year 1986. In this revision, requirement limit of epoxy equivalent, mass in kg/10lt, 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:

This standard prescribes requirements and methods of testing of Epoxy Coal Tar paint intended to be used for the protection of interior of Railway Coaches and other Industrial Applications against aggressive conditions of corrosion. It is suitable for application by Brush/Spray/Airless Spray.

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 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 Epoxy coal tar paint.

2.1.2 **PAINT:** The mixture of the Two Packs will be mixed in the proportion recommended by the Manufacturer/Supplier.

3. REQUIREMENT:

3.1.1 The mixing ratio of the Pack ‘A’ and Pack ‘B’ shall either be 1:1 by volume or recommended by Manufacturer/Supplier.

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

3.2.1 **PACK ‘A’:** Normally referred to as base, shall consist of resin with or without diluents.

3.2.1.1 In the formulation of the paint epoxy resin of the following grade shall be used.

TABLE-1: REQUIREMENTS FOR EPOXY RESIN

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

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322 **PACK 'B'**: Normally referred to as Hardener, shall consist of (1) any liquid Hardener and (2) Liquid coal tar.

323 LIQUID HARDENER:

This shall be liquid type, such as an Aliphatic amine, an Aliphatic or Aromatic Amine adducts a Polyamide or Amido Polyamine or any other suitable Hardener. It shall react with Epoxy Resin at normal ambient temperature.

324 LIQUID COAL TAR

325 It should be incorporated in the Hardener provided the quantity added does not exceed 1:1 ratio by volume or the proportion recommended by the Manufacturer/Supplier of the Epoxy Resin and Coal tar Hardener mixture.

325.1 Coal Tar used in the formulation of the paint shall be of such composition so as to satisfy the requirement of this specification.

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.

421 The preparation of metal panels shall be in accordance with IS: 101(Part1/Sec.3)-86, Reaffirmed 2012 or its latest version.

422 All the tests shall be conducted at room temperature ($27^{\circ} \pm 2^{\circ}$)C and a Relative Humidity at (65 ± 5)% in a well-ventilated chamber free from draughts and dust. The temperature of the surface to be painted must be at least 3° C above the dew point to prevent moisture condensation.

423 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/Airless Spray.

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

4.3. **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 stirrer again in order to give a homogeneous paint.

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TABLE-II: REQUIREMENTS FOR EPOXY BASED COAL TAR PAINT
(TWO PACK)

SN	Characteristics	Requirements	Test Method
1.	Drying time a) Surface Dry, Max. b) Hard Dry, Max c) Curing time, Max.	4 Hours 16 Hours 7 days	IS:101(Part 3/Sec.1)-86, Reaffirmed 2017 or its latest version -do-
2.	Consistency	Smooth, uniform and Suitable for brush/spray application.	IS:101(Part 1/Sec.5)-89, Reaffirmed 2019 or its latest version
3.	Finish	Smooth and semi-glossy free from sagging & wrinkling	IS:101(Part 3/Sec.4)-87, Reaffirmed 2019 or its latest version
4.	Colour	Black/Brown	IS:101(Part4/Sec2)-89, Reaffirmed 2016 or its latest version
5.	Dry Film Thickness per coat, min. a) By Brush b) By Airless Spray	100 microns 125 microns	IS:101(Part 3/Sec.2)-89, Reaffirmed 2019 or its latest version
6.	Volume Solids, % Min	65	APPENDIX-I
7.	Scratch Hardness (1.5 Kg LOAD)	No such scratch as to show bare metal	IS:101(Part 5/Sec.2)-88, Reaffirmed 2019 or its latest version
8.	Flexibility & Adhesion (6.25 mm Mandrel)	No visible damage or detachment of film.	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 hours.	IS:101(Part 6/Sec.1)-88, Reaffirmed 2015 or its latest version
11.	Protection against corrosion under conditions of condensation	-do-	IS:101(Part 6/Sec.1)-88, Reaffirmed 2019 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	Mass in Kg/10 litres, Min.	11.5	IS:101(Part 1/Sec.7)-87, Reaffirmed 2019 or its latest version
14	Pot life a) at 27±2 °C , Min b) at 40±2 °C, Min	3 hours 30 minutes. 2 hours	APPENDIX-II

15.	Resistance to Chemicals a) 25% Caustic Soda solution (w/v) b) 20% Hydrochloric Acid solution (v/v) c) 30% Sulphuric Acid solution (v/v)	Shall not show any sign of blistering, wrinkling, and lifting, of paint film upto 500 hrs.	APPENDIX-III
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**TABLE-III: DETAILS OF PREPARING PAINTED PANELS FOR TESTING
EPOXY COAL TAR PAINT (TWO PACK)**

S N	Characteristics	Type of Metal Panel	Size in mm	Painting Detail	DFT microns	Method of application	Duration of Air Drying Before Commencement of test	Special Instructions
1.	Drying time	M.S.	150x100x1.25	One coat of Epoxy Coal tar paint	100 micron	Brush/Spray	-	-
2.	Finish	-do-	-do-	-do-	-do-	-do-	48 hrs.	-
3.	Colour	-do-	-do-	-do-	-do-	-	24 hrs.	-
4.	Dry film thickness a)By Brush b)By Airless Spray	-do- -do-	-do- -do-	-do- -do-	- -	Brush/Spray	-do- -do-	- -
5.	Flexibility & Adhesion	Tin	150x50x0.315	-do-	100 micron	Brush/Spray	7 days	-
6.	Scratch Hardness	-do-	-do-	-do-	-do-	-do-	-do-	Apply a load of 1.5 kg instead of 1 kg
7.	Resistance to Salt Spray	M.S.	150x100x1.25	One coat of epoxy zinc phosphate primer & one coat of epoxy coal tar paint.	60 micron + 100 micron	-do- -do-	24 hrs. 7 days	--
8	Protection against corrosion under conditions of condensation	-do-	-do-	-do-	-do-	-do-	-do-	-
9	Resistance to Chemical a) 25% Caustic Soda solution (w/v). b)20% Hydrochloric Acid(v/v) c) 30% Sulphuric Acid (v/v)	-do-	-do-	Two coat of epoxy coal tar paint	200 micron	-do-	-do-	Prepare & paint both side of panel & seal the edges with wax.

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APPENDIX-I

PROCEDURE FOR DETERMINING VOLUME SOLIDS PERCENTAGE IN EPOXY/POLYUREYHANE PAINTS

1. SCOPE

This method is applicable to the determination of the volume nonvolatile 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 (square feet 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** - Preferable stainless steel, 60mm Dia and 0.70 mm thickness with a small hole 2 to 3mm 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) Breaker** 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^oC for 10 minutes and cool
- ii) Weight the disc** in air. Let it be W1 grams.
- iii) Suspend the disc** in water and weigh again. Let it be W2 grams
- iv) Calculate the volume** of the disc V as follows

$$V = \frac{W1 - W2}{d} \text{---where } d \text{ is the density of the water at room temperature}$$

- v) Determine the weight** of non-volatile content per gram 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 beads 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 in be W3 grams
- x) Suspend the coated disc in water and weigh again. Let be W4 grams
- xi) Calculate the volume of the coated disc as follows

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

- xii) Calculated 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

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

- xiv) Calculated the percentage volume solids of the paints as follows :

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

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

$$\text{a) Theoretical coverage(sq.m/l)} = \frac{\% \text{ of Volume solids}}{\text{Dry film thickness (microns)}} \times 10$$

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

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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 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.

APPENDIX-III

Accelerated Tests

Resistance to Chemicals

The following short term tests of chemical resistance do not categories the type of service for which epoxy coal tar finishing paint are intended but are included to assure the customer that the coating contains a sufficiency of cured resin to exhibit the long term requirements.

(a) Resistance to 25% Caustic Soda Solution

Immerse $3/4^{\text{th}}$ of the panel in 25% (w/v) Caustic Soda solution for 500 hrs. Remove the panel, wash in running water and allow it to dry for an hour and record the observations.

(b) Resistance to 20% Hydrochloric Acid

Immerse $3/4^{\text{th}}$ of the panel in 20% (v/v) Hydrochloric acid solution for 500 hrs. Remove the panel, wash in running water and allow it to dry for an hour and record the observations.

(c) Resistance to 30% Sulphuric Acid

Immerse $3/4^{\text{th}}$ of the panel in 30% (v/v) Sulphuric acid solution for 500 hrs. Remove the panel, wash in running water and allow it to dry for an hour and record the observations.