RDSO SPECIFICATION No.
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SPECIFICATION FOR EPOXY BASED KNIFING STOPPER PUTTY (TWO PACK)

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0. FOREWORD

This standard was originally adopted in the year 1996.In this revision, requirement limit of epoxy equivalent, drying time, flash point and pot life has been revised in the light of technological advancement & experience gathered. The test methods for Stopping properties, Rubbing property, Hold out property, Adhesion and Compatibility in paint system have been incorporated in the specification itself as Appendix-I, II, III & IV. The minimum temperature of the surface to be painted has been incorporated. Methods of test have been specified as per revised IS: 101.

1. SCOPE

This standard specifies requirements and methods of testing of Epoxy Based Knifing Stopper Putty supplied in Two Packs, intended to be used over Zinc Phosphate (Epoxy based) Primer in the Exterior painting of Coaches, Diesel & Electric Locomotive and other Industrial Applications. It is suitable for application by knife of about 30 cm wide or more.

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. USES

Material complying with this standard is intended to be used for leveling up effectively the surface imperfection viz. dents and depressions of the exterior of the Coaches, Diesel & Electric Locomotive and other industrial applications. The material shall have good compatibility with Zinc Phosphate (Epoxy Based) Primer on which it is to be applied and PU Surfacer/ PU enamel finish which is to be used as a subsequent coat.

3. TERMINOLOGY:

3.1 For the purpose of this standard apart from the Glossary of Terms given in IS 1303 -1983, Reaffirmed 2017 or its latest version and as per clause.2 of IS: 9162-79, Reaffirmed 2016 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.

3.1.1 PACK:

The term used to describe each of the Two Packs of the paint which when mixed together, form Epoxy Based Knifing Stopper Putty.

3.1.2 **PAINT (KNIFING STOPPER PUTTY):**

The mixture of the Two Packs in the proportion shall be recommended by Manufacturer/Supplier. The mixing of the Two Packs shall be done with the heavy-duty mechanical stirrer for 15 Minutes Max. The rise in temperature shall not be more than 5°C.

4. REQUIREMENTS

4.1 The mixing ratio of the Pack 'A' and Pack 'B' shall be in simple ratio by weight or volume as recommended by the Manufacturer/Supplier.

4.2 COMPOSITION: The paint shall consist essentially of two packs (Components), namely Pack 'A' and Pack 'B'.

4.2.1 PACK 'A'- (COMPONENT 'A')

Normally referred to as Base, shall consist of Epoxy Resin, Pigment, Extenders and other suitable additives.

4.2.1.1 In the formulation of the paint, Epoxy resin of the following grade shall be used.

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

4.2.1.2 The material shall be of such composition as to satisfy the requirements of this standard in order to obtain satisfactory rubbing properties. Use of slate powder along with suitable extenders and pigments, as may be necessary, is recommended.

4.2.2 **PACK 'B' (COMPONENT 'B'):** Normally referred to as Hardener, 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.

5. PROPERTIES

5.1 GENERAL

The paint shall comply with the requirements specified in TABLE-I of this specification.

5.2 Unless otherwise specified, the following testing conditions shall apply.

5.2.1 The preparation of metal panels shall be in accordance with IS 101 (Part 1/Sec.3)-86, Reaffirmed 2012 or its latest version.

5.2.2 All the tests shall be conducted at room temperature $(27^{o} \pm 2)^{o}$ C and a Relative Humidity at (65 ± 5) % in a well-ventilated chamber free from draughts and dust.

5.2.3 The Two Packs A&B or (Components A&B) shall be mixed in the ratio recommended by the Manufacturer/Supplier before conducting the test/tests.

5.2.4 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.

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

5.2.6 **CONDITION IN CONTAINER**:

Each Pack as delivered shall be free of gel, coarse particle, 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 homogenous paint.

TABLE-I: – REQUIREMENTS FOR EPOXY BASED KNIFING STOPPER PUTTY (TWO PACK)

SN	Characteristics	Requirements	Test Method
1.	Drying time a) Surface Dry, Max. b) Hard Dry, Max c) Hard Dry at 70°C, Max.	 2 Hours 8 Hours 2 Hrs with 30 Minutes flash off time.	IS:101-86(Part 3/Sec1), Reaffirmed 2017 or its latest version --do--
2.	Consistency	Smooth, uniform and suitable for Knife Application.	IS:101-89(Part 1/Sec5), Reaffirmed 2019 or its latest version
3.	Colour	Grey	IS: 101-89(Part4/Sec2), Reaffirmed 2019 or its latest version
4.	Dry Film Thickness per coat, Min.	500 microns	IS:101-89(Part3/Sec2), Reaffirmed 2019 or its latest version
5	Flash Point for both Packs, A&B	Above 25° C	IS:101-87(Part1/Sec 6 , Reaffirmed 2019 or its latest version
6..	Stopping Properties	Shall show no sagging, cracking or shrinkage	APPENDIX-I
7.	Rubbing Properties	Shall dry rub with 150 grade paper and wet rub with 280 grade water proof paper without clogging of the paper and shall not show defects like roughness, scratches, cracks and pinholes after rubbing.	APPENDIX-II
8	Hold- Out Properties	Shall have finish with uniform gloss & colour.	APPENDIX-III
9.	Adhesion and Compatibility in Paint system	Shall have good adhesion and compatibility with primer and surfacer/ finish coat.	APPENDIX-IV
10.	Pot life, a) at 27 ±2° C Min. b) at 40 ±2° C Min	 1 hour 30 minutes 1 hour	See note below.
11.	Keeping Properties	Not less than 12 months	IS:101-89(Part6/Sec2), Reaffirmed 2019 or its latest version

Note: - Pot life is taken as the duration up to which the mixed material/ paint is still in a usable condition, starting from the time of mixing.

TABLE-II: DETAILS OF PREPARING PAINTED PANELS FOR TESTING OF EPOXY BASED KNIFING STOPPER PUTTY (Two Pack)

SN	Test	Type of Metal Panel	Size in mm	Painting Detail	DFT in Microns, min.	Method of application	Duration of Air Drying Before commencement of test (Applicable for panels either air dried or dried at elevated temp.)
1.	Drying Time	M.S.	150x 100x 1.25	One coat of Epoxy Based Knifing Stopper Putty	500 microns	Knife/Spatula	-
2.	Colour	-do-	-do-	-do-	-do-	-do-	24 hrs.
3.	Dry Film Thicknes s	-do-	-do-	-do-	-do-	-do-	-do-
4.	Stopping Properties	-do-	300x 150x 0.90	One coat of Epoxy Zinc Phosphate Primer* (allow it to air dry for 8 hrs.) followed by four coats of Epoxy Based Knifing Stopper Putty (giving interval of not less than 8 hrs and not more than 24 hrs. between successive applications)	60 microns & 2000 microns (Total DFT)	Air/Airle ss spray & Knife/Spatu la	- 02 hrs. after application of each coat of Epoxy based Knifing Stopper Putty
5.	Rubbing Property.	-do-	-do-	One coat of epoxy zinc phosphate primer* (allow it to air dry for 8hrs) followed by one coat of epoxy based Knifing stopper putty	60 micron & 500 microns	Air/Air less Spray & Knife / Spatula	- 8 hours after application of Epoxy based Knifing stopper putty
6.	Hold out Property.	-do-	-do-	One coat of Epoxy Zinc Phosphate Primer* (allow it to air dry for 8hrs), followed by four coats of Epoxy based Knifing Stopper Putty (giving interval of not less than 8 hrs and not more than 24 hrs. between successive applications).Allow final coat of putty to air dry for 08 hrs., followed by one coat of PU Surfacer* (allow it to air dry for 8 hrs), followed by Two coats of PU Enamel Finish* (Apply 2nd coat after 8hrs of air drying of 1st coat)	60 microns & 2000 microns & 60 microns. & 40+40=80 microns	Air/Air less Spray & Knife / Spatula Air/Airle ss spray -do-	- - - 48 hrs.
7.	Adhesion & Compati-bility in Paint system	-do-	-do-	-do-(same as at S.No.6)	-do-- (same as at S.No.6)	-do— (same as at S.No.6)	07 days

* Epoxy Zinc Phosphate Primer, PU surfacer and PU Enamel Finish shall be as per RDSO Specification No. M&C/PCN/100/2018, Specification for Epoxy cum PU painting system and from the same source to ensure compatibility.

APPENDIX-I

DETERMINATION OF STOPPING PROPERTIES

OUTLINE OF THE METHOD:

A mild steel panel is dented with a specified numbers of dents and then coated with Epoxy Based Zinc Phosphate Primer followed by Epoxy based Knifing Stopper Putty. It is then suitably examined at the dents for satisfactory Stopping properties.

PROCEDURE:

Dent a 300 x 150 x0.9 mm mild steel plate with the help of blunt iron ball hammer and make 10 dents of about 3 mm diameter and 1 mm deep. The dents shall be so made that they are 50 mm away from the side of the panels and 50 mm apart from one another. Roughen the panel with emery paper no. 180. Wipe this with Petroleum Hydrocarbon Solvent, 145/205, Low Aromatic, IS: 1745- 2018 (Third Revision) and allow to dry. Apply one coat of Epoxy Based Zinc Phosphate Primer to produce minimum 60 microns DFT and air dry for 8 hrs, minimum. Make 4 applications of Epoxy Based Knifing Stopper Putty giving an interval of not less than 8hrs and not more than 24 hrs between successive applications, each having dry film thickness of 500 microns, minimum. Keep the panel vertically.

The material shall be deemed to have passed the test if there is no sagging after 2 hours, after every application, at the dents; it works hard in 8 hours and shows no sign of crack or shrinkage after 18 hours.

APPENDIX-II

DETERMINATION OF RUBBING PROPERTIES

OUT OF THE METHOD:

The material in a specified film thickness is applied on a mild steel panel. The film when dry is tested for its rubbing properties by rubbing with abrasive paper.

PROCEDURE:

Take 300 x 150 x0.9 mm mild steel plate. Roughen the panel with emery paper no. 180. Wipe this with Petroleum Hydrocarbon Solvent, 145/205 , Low Aromatic, IS: 1745- 2018 (Third Revision) or its latest version and allow to dry. Apply one coat of Epoxy Based Zinc Phosphate Primer to produce minimum 60 microns DFT as per specification. Allow to air dry for 8 hrs and apply one coat of Epoxy Based Knifing Stopper Putty having dry film thickness of 500 microns, minimum.

The film prepared as above shall be suitable for dry rubbing with 150 grade paper and wet rubbing with 280 grade water proof abrasive paper without any clogging of the paper. After rubbing down, the surface shall not show defects like roughness, scratches, cracks, pin holes etc. Minor pin holes or scratches which will duly be filled by subsequent coat of PU under coat/PU surfacer paint shall not be the cause for rejection.

APPENDIX-III

DETERMINATION OF HOLD- OUT PROPERTY IN PAINT SYSTEM

1. OUTLINE OF METHOD:

The material is tested in a painting system and schedule simulating actual use. Finish with uniformity of colour and gloss is taken as criteria for having passed the test.

2. PROCEDURE:

A panel of 300x150x0.9 mm, mild steel with full paint system shall be prepared as described below:

a) Clean the surface either by shot/ grit/garnet blasting/ Phosphating / any appropriate chemical treatment/roughen the panel with Emery paper no. 180 and wipe this with Petroleum Hydrocarbon solvent, 145/205 ,Low Aromatic, IS: 1745- 2018 (Third Revision) or its latest version and allow to dry.

b) Spray/Apply one coat of Epoxy Based Zinc Phosphate Primer (Two Pack), 60 microns, minimum DFT as per the specification and allow to air dry for 8 hours, minimum. Dry rub with emery paper no. 400 and wipe clean with a dry soft cloth.

c) Make 4 applications of Epoxy Based Knifing Stopper Putty with a suitable knife, each application having a dry film thickness of 500 microns, minimum, at an interval of not less than 8hrs and not more than 24 hrs between successive applications. The over all dry film thickness of 4 applications shall be minimum 2000 microns. Allow the final coat to air dry for at least 8 hours and not more than 24 hours. Wet rub with 280 grade water proof abrasive paper and allow to dry.

d) Spray/Apply one coat of Polyurethane Surfacer (Two- Pack), 60 microns, minimum DFT, as per the specification. Allow to air dry for 8 hours, minimum. Dry rub with emery paper no. 400 and clean the surface.

e) Spray/Apply two coats of Full Gloss Polyurethane Enamel (Two-Pack) of 40microns, minimum DFT per coat, as per the specification at an interval of 8 hours, minimum between 1st and 2nd coat. Allow to air dry for at least 48 hours before assessing the performance.

3. The material shall be deemed to have passed the test, if the resultant finish is uniform all over the surface with regard to gloss and colour. The gloss when measured shall have a value specified in the specification.

APPENDIX-IV

DETERMINATION OF ADHESION AND COMPATIBILITY IN PAINT SYSTEM

1. OUTLINE OF METHOD:

The material is tested in a painting system and schedule simulating actual use. Satisfactory adhesion and compatibility between the coats is taken as criteria for having passed the test.

2. PROCEDURE:

A panel 300x150x0.9 mm, mild steel, with full paint system shall be prepared as described below:

a) Clean the surface either by shot/grit/garnet blasting/ Phosphating / any appropriate chemical treatment/ roughen the panel with emery paper no. 180 and wipe this with Petroleum Hydrocarbon solvent, 145/205, Low Aromatic, IS: 1745- 2018 (Third Revision) or its latest version and allow to dry.

b) Spray/Apply one coat of Epoxy Based Zinc Phosphate Primer (Two Pack), 60 microns, minimum DFT as per the specification and allow to air dry for at least 8 hours, minimum. Dry rub with emery paper no. 400 and wipe clean with a dry soft cloth.

c) Make 4 applications of Epoxy Based Knifing Stopper Putty with a suitable knife, each application having a dry film thickness of 500 microns, minimum, at an interval of not less than 8hrs and not more than 24 hrs between successive applications. The overall dry film thickness of 4 applications shall be minimum 2000 microns. Allow the final coat to air dry for at least 8 hours and not more than 24 hours. Wet rub with 280 grade water proof abrasive paper and allow to dry.

d) Spray /Apply one coat of Polyurethane Surfacer (Two- Pack) , 60 microns ,minimum DFT, as per the specification . Allow to air dry for 8 hours, minimum .Dry rub with emery paper no. 400 and clean the surface.

e) Spray/Apply two coats of Full Gloss Polyurethane Enamel (Two-Pack), minimum 40 microns DFT per coat, as per the specification at an interval of 8 hours, minimum between 1st and 2nd coat. Allow to air dry for at least 7 days before assessing the performance.

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3.The material shall be deemed to have passed the test, if the material shows good adhesion over substrate and between various coats, and compatibility between Primer, Putty ,Surfacer and Finish Coat of the system.

This is assessed as per Test Method B-Cross Cut Tape Test of ASTM D 3359 (latest version) by making grid and placing 25 mm wide adhesive tape, semi transparent, pressure sensitive, Parmacel 99 make or equivalent. The adhesive tape is then pulled away with a jerk. The material shall be deemed to have passed the test, if the edges of the cuts are completely smooth and none of the squares of the lattice is detached i.e. it matches to 5B class of the above mentioned specification.