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TECHNICAL SPECIFICATION

FOR

Corrosion Resistant Paint System for Outdoor Structures of Traction Distribution and Traction Rolling Stock

Specification No.: TI/SPC/CIV/POR/0080(08/2008)

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ISSUED BY:

TRACTION INSTALLATION DIRECTORATE

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SIGNATURES				
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DESIGNATION				

Specification for Corrosion Resistant Paint System for Outdoor Structures of Traction Distribution and Traction Rolling Stock

1. SCOPE:

1.1 This standard specifies the requirements and methods of testing of Corrosion resistant Polymeric System, which can be applied over rusted surface without any surface preparation, except the removal of large flakes of loose rust by light scraping or wire brushing. The Product is intended to be used on TRD structures which are located outdoors and does not demand highly trained manpower or complicated surface preparation machines and the corrosion prone areas in Electric locomotives, EMUs/MEMUs and coaches (Details at annexure-A). The material shall have good adhesion on substrate and shall have good compatibility with subsequent coats and top coat paints.

1.2 The method of application can be brush, roller or spray.

1.3 The Corrosion preventive system shall be inherently UV stable for outdoor applications.

1.4 Complete system shall be procured to ensure compatibility with various sub-components.

1.5 Any deviation from this specification proposed by the tenderer to improve upon the performance, utility and efficiency of the equipment will be given due consideration, provided full particulars of the deviation with justification thereof are furnished. In such a case, the tenderer shall quote according to this specification and deviation, if any, proposed by him shall be quoted as an alternative(s).

2. SERVICE CONDITIONS

2.1 The Paint System is intended to be used on outdoor galvanized steel structures which have been exposed to open atmospheric conditions for several years and started rusting. This will also be used for corrosion prone areas of Electric Locomotive, EMUs/MEMUs and coaches. The structures and rolling stocks are exposed to industrial, chemical & coastal pollution as well as smoke emission from industries and vehicles. The application of corrosion control product is intended to be used primarily on corroded structures/Equipments/Rolling stock.

2.2 **ENVIRONMENTAL CONDITIONS:**

a) For OHE structure

i)	Maximum temperature of metallic Structure under sun	-	70^0C
ii)	Minimum temperature	-	-30^0C
iii)	Maximum relative humidity	-	100%
iv)	Annual rain fall	-	Ranging between 1750 mm and 6250mm
v)	Number of thunderstorm days/annum	-	85 (maximum)
vi)	Number of dust storm days/annum	-	120 (maximum)
vii)	Maximum wind pressure	-	216 kgf/m^2
viii)	Altitude	-	Not exceeding 2500 m.

The structures are subjected to vibrations on account of trains running on nearby railway tracks. The amplitude of these vibrations of 15 to 70 ms, lies in the range of 30 to 150 microns with the instantaneous peak going up to 350 microns.

Traction rolling stocks are subjected to vibrations and shocks as per IEC 61373 normally encountered in service as given below:

a)	Max. Vertical acceleration	-	3.0 g
b)	Max Longitudinal acceleration	-	5.0 g
c)	Max. Transverse acceleration ('g' being acceleration due to gravity)	-	3.0 g

The system shall be so designed as to work in coastal area in humidity and salt laden and corrosive atmosphere. The maximum values of the condition will be as follows:

a) Maximum pH value – 8.5
b) Sulphate - 7 mg/liter
c) Max. concentration of chlorine - 6mg/liter
d) Maximum conductivity - 1130 micro Siemens/CM

3. GENERAL DISCRIPTION: Corrosion control product shall be polymer based. It shall not chip, crack or peel off like ordinary paints and its hardness shall be resistant to abrasion.

4. PHYSICAL PROPERTIES: These properties are indicated as general guideline which are required to be declared at the time of submission of tender document however, the material quoted shall have to meet the Performance requirement as under.

Properties	**Value**
Finish	Gloss, Semi Gloss & clear
Components	Single/multiple
Curing Mechanism	Natural-air curing
Solid content	>70%
Percentage Elongation	75% (min)
Viscosity	> 200 cps at 25^0C
Flashpoint	Min 40^0C
Curing time	Approx. 6 hours

5. APPLICATION REQUIREMENT

5.1 The Corrosion control system shall be used on outdoor and traction rolling stock applications. It should not required specialized surface preparation techniques such as sand blasting/power tools/air blast etc.

5.2 Surface preparation shall be limited to metal wire brushing or gentle tapping to remove rust flakes.

5.3 Cleaning/degreasing compound can be used for surface cleaning but shall not require any power tools for application.

6. PERFORMANCE REQUIREMENTS

S.N.	**Properties**	**Test Method**	**Results**
1.	Flexural Strength	ASTM C-580-18	>5000 psi
2.	Compressive Strength	ASTM C-579-18	>10000 psi
3.	Tensile Strength	ASTM C-307-18	>3000 psi
4.	Percentage Elongation	ASTM D-412-16	75%(min)
5.	Flammability	ASTM D-635-18	Self extinguishing
6.	Bond strength to concrete/mild steel	ASTM D-4541-17	80 kg/cm^2
7.	Bacterial & Fungus Resistance	BS 3900	Zero Growth
8.	Salt spray Test for 1000 hrs	ASTM B-117-19	No change
9.	Water Absorption	ASTM C-413-18	0.0001 max
10.	Porosity	Holiday detector	Non porous
11.	Thermal cycling	120 days -34^0C to 90^0C	Pass
12.	Resistance to Elevated temp	Holding 30 minutes at 150^0C	Pass
13.	Chemical bath test (10% hydrochloric acid, 50% sulphuric acid, 55% chromate, 85% phosphoric acid, 10% sodium hydroxide 98% methanol)	200 hrs	No change
14.	Abrasion Resistance at 1 kg load for 1000 cycles	ASTM D 4060-18	Zero weight loss
15.	Impact resistance ($^{1/2}$ inch steel ball dropped from 24 inch height)	ASTM D2794-19	No Crack
16.	Mandrel Bend Test (bend around 3/8 inch mandrel for 180 deg)	ASTM D-522-17	No chipping or cracking
17.	Crosshatch adhesion test	ASTM D3359-17	Pass

7. TEST

7.1 **Preparation of Panel for type tests:** The 150x150x1.25 mm MS panels (both rusted and new) shall be selected for type tests on which a layer of 6 mils of corrosion preventive system shall be applied and shall be dried/cured for 72 fours before start of tests.

7.2 New MS sheet shall be used for tests Nos.1 to 12 and rusted sheets to be used for tests Nos. 13 to 17 of para 6 above.

7.3 The tests shall be carried out at the works of the manufacturer or at a reputed testing laboratory, in the presence of RDSO's representative (s) in accordance with the relevant governing specification:

8. Material Storage: Material shall have two years shelf life at room temperature of 2^0C to 40^0C.

9. Safety: Material safety data with respect to storage, handling, application and toxicity level shall be supplied along with the offer.

10. Packing and Marking: The material shall be packed in 1 liter airtight cans in proper boxes to prevent damage during transit. Every box shall have following information:

a) Manufacture's trade name and brand mark.
b) Number of cans packed.
c) Date of manufacture and expiry.
d) Contact/purchase order number with date.
e) Consignee's address.
f) Date of inspection and inspecting authority.
g) Any other particulars specified by the purchaser.

Annexure-A

Scope of application in corrosion prone areas of concern for Traction Distribution, Traction Rolling Stock & Coaching Stock:

A. Electric locomotives: In locomotives there are specific areas/locations where there is accumulation of moisture as well as exposure to the air. They are underneath the driving desk, floor/doors/windows of driving cab, pneumatic pipe lines in the cab and various panels.

The under slung battery box gets corroded due to spilling of electrolyte in battery.

B. Motor & Trailer coaches of EMU: The major areas for corrosion due to accumulation of moisture and exposure to atmosphere in coaches are head sock, trough floor, body side wall panel plate/pillar bottom portion, driving cab front panel, end wall bottom plate, trough floor of LT & HT compartment, U channels, crib angle, window frames and pneumatic pipe lines. The severity of corrosion is much more in vendor compartments.

The under slung battery box, panels and covers of under slung equipment also get corroded/ rusted with the passage of time.

C. Coaching stock AC/Non-AC: The area adjoining toilets, wash basins are more prone to corrosion. The other areas are coach envelope near Roof Mounted AC Package Units, under slung battery boxes, panels and covers of under slung Ac equipment.

D. Traction Distribution: Masts, structures and other equipment of OHE and Traction Power Supply System exposed to atmosphere.