



सत्यमेव जयते

भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय Ministry of Railways

निर्देशसंख्या. टीआईएम/आई/0061Rev.1
MAINTENANCE INSTRUCTION No.
TI/MI/0061 Rev.1

ओवरलाइन संरचना के अंतर्गत 'कम्पोजिट हाई वोल्टेज इंसुलेटिंग कोटिंग' के प्रावधान के लिए रखरखाव अनुदेश, जहाँ भी रिड्यूस्ड इलेक्ट्रिकल क्लियरेंस को अपनाया जाता है।

Maintenance Instruction for Provision of 'Composite High Voltage Insulating coating' under the Overline Structure, wherever the reduced Electrical Clearances are adopted.

(December 2025)

अनुमोदित Approved by	प्रधानकार्यकारीनिदेशक (कर्षणसंस्थापन) Principal Executive Director (TI)	हस्ताक्षर/Signature
अनुशंसित Recommended by	कार्यकारीनिदेशक (कर्षणसंस्थापन) Executive Director (TI)	

जारीकर्ता/ ISSUED BY:

कर्षण संस्थापन निदेशालय
TRACTION INSTALLATION DIRECTORATE,
अनुसंधानअभिकल्प और मानक संगठन
RESEARCH DESIGNS & STANDARDS ORGANISATION,

मानकनगर, लखनऊ- 226011
MANAK NAGAR, LUCKNOW-226011

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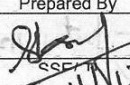
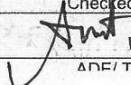
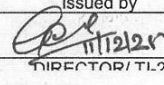
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Designation	ASE/TI	ASE/TL2	DIRECTOR/TL2

Amendment History

Revision Number	SMI No.	Total pages	Date of issue	Reasons for Amendment/Revision
0	Maintenance Instruction No. TI/MI/0061	07	17.04.2025	To provide increased headroom clearance, Zonal Railways adopt reduced electrical clearances
1	Maintenance Instruction No. TI/MI/0061Rev.1	08	xx.12.2025	Provision of a type-test clause has been added.

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Designation	ASST. DIR.	ANE/TL2	DIRECTOR/TL2

1. TITLE:

Maintenance Instruction for 'Provision of Composite High Voltage Insulating coating' under the Overline Structure, wherever the reduced Electrical Clearances are adopted.

2. BACKGROUND:

RDSO vide letter No. TI/OHE/EC-AC/11 dated 24.11.2011, Letter No:- TI/OHE/INSCAT/12 dated 15.02.2013 & RDSO-TI0LKO(OHE)/83/2020-O/o PED/TI/RDSO dated 09.02.2022 has recommended the use of Composite High Voltage Insulation Coating for increasing the OHE clearances.

Wherever the reduced Electrical Clearances are adopted, 'Composite High Voltage Insulating coating' must be used to insulate Overline Structure. The range of thickness shall be 3 mm (three millimeter) minimum. This compound is used to prevent insulation breaking from dust and moisture.

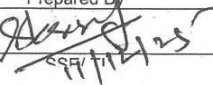
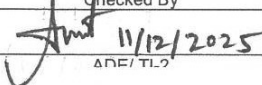

3. OBJECTIVE:

The objective of this SMI is to provide 'Composite High Voltage Insulating coating under the Overline Structure, wherever the reduced Electrical Clearances are adopted by Zonal Railways to increase headroom clearance with other options (Use of insulating sheet, Use of insulated Cantilever Assembly & Running of parallel contact wire below overline structure).

4.0 INSTRUCTIONS:

4.1 (a) Composite high voltage Insulating coating should be provided at least in the pantograph zone running area on the Girder/Rob/FOB/Tunnels.

- (b) Coating thickness of the Composite high voltage Insulating coating shall be minimum 3.00 mm. Coating thickness shall be measured with a suitable coating thickness meter for metal as well as concrete substrates and duly recorded.
- (c) Before application of Composite high voltage Insulating coating the substrate shall be adequately cleaned and scrapped for all foreign materials/rust/contamination by suitable means to ensure adhesion of the coating to the substrate to provide long service life.
- (d) The Coating thickness shall be monitored at regular intervals. The Railways should ensure the proper conditions and monitoring at regular intervals. Periodicity and methodology to be decided by PCEE of the zonal railway to assess any deterioration in thickness of the coating due to surrounding pollutants and erosion. The maximum interval of the said checking can be once in every 12 months.
- (e) The Composite high voltage Insulating coating can be applied on concrete as well as metal substrates based on site condition where available headroom clearances are not adequate.
- (f) ***Zonal Railways should ensure that the firm has the prototype test reports approved by RDSO before carrying out the acceptance test of the Composite High Voltage Insulating Coating.***
- (g) The test report of the same should be examined by zonal railway for achieving the following.
 - I. Composite high voltage Insulating coating should withstand 42Kv AC for 1 minute without puncture. Coating thickness should be 3.00 mm. Testing should be conducted as per ASTM D149 or IS 2584.
 - II. Composite High Voltage Insulation Coating should have a Breakdown Voltage of ≥ 55 Kv AC with a coating thickness of 3.00 mm. Testing

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should be conducted as per ASTM D149 or IS 2584.

- III. Material should be inspected by Third Party Inspection agencies (RITES/similar TPI as nominated by Indian Railways) before application. Test Reports should be available for necessary parameters as mentioned in Table No 1.

(h) The test protocol, inspection & certification should be as per details given below:

Tests for Composite High Voltage Insulation Coating

Sr. No.	Test Description	Test Standard	Required Value	Type test	Acceptance test	Routine test
1	Cure System	Visual	As mentioned in Table No 1.	Yes	No	No
2	Percent Solid Contents		As mentioned in Table No 1.	Yes	Yes	No
3	Drying Time of Finished Coating	Visual/Ford Cup Method	As mentioned in Table No 1.	Yes	No	No
4	Specific Gravity of finished coating	ASTMD297	As mentioned in Table No 1.	Yes	Yes	No
5	Proof voltage withstand @3.00mm Coating Thickness	ASTMD149 /IS2584	As mentioned in Table No 1.	Yes	Yes	No
6	Minimum Breakdown Voltage of Insulation Coating at 3.00 mm Coating Thickness	ASTMD149 /IS2584	As mentioned in Table No 1.	Yes	Yes	No
7	Volume Resistivity	ASTMD257	As mentioned in Table No 1.	Yes	Yes	No
8	Surface Resistivity	ASTMD257	As mentioned in Table No 1.	Yes	Yes	No
9	Temperature Stability		As mentioned in Table No 1.	Yes	Yes	No
10	Water Absorption after 12hours immersion.	ASTMD570	As mentioned in Table No 1.	Yes	Yes	No
11	Loss Tangent @ 50Hz @	ASTMD150	As mentioned in Table No 1.	Yes	Yes	No

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	500 V					
12	Comparative Tracking Index	UL745 or IEC 60112	As mentioned in Table No 1.	Yes	Yes	No
13	Resistance to Tracking & Erosion Test	IEC 60587:202 2	As mentioned in Table No 1.	Yes	No	No
14	Adhesion Test @ 20 Kg Load	ASTM D 2197	As mentioned in Table No 1.	Yes	No	No
15	Fire resistance Test horizontal & 30 sec burn		As mentioned in Table No 1.	Yes	No	No

(j) The manufacturer shall maintain the record of all type of tests i.e. Type/Acceptance/Routine Test.

The Type tests shall be carried out at the works of the manufacturer or at any reputed NABL accredited laboratory in the presence of the representative of the RDSO, Lucknow in accordance with the relevant standards laid down in the specification (Table – 1)

TABLE- 1

Parameters	Test Standards	Value
Cure System	Visual	Neutral Air Drying moisture cure
Percent Solid Contents		>85%
Drying Time of Finished Coating	Visual/Ford Cup Method	45-50 Minutes
Specific Gravity of finished coating	ASTM D297	1.10-1.50
Proof voltage withstand @3.00mm Coating Thickness	ASTM D149/ IS2584	42KV AC (Withstand for 1 Minute)
Minimum Breakdown Voltage of Insulation Coating at 3.00 mm Coating Thickness	ASTM D149/ IS2584	>=55kVAC
Volume Resistivity	ASTMD 257	>2.20X10 ¹¹ ohm/in
Surface Resistivity	ASTMD 257	>1.5X10 ¹¹ ohm
Temperature Stability		-20 Degrees C to 100 Degrees C. No cracking observed on the coating material.
Water Absorption after 12 hours immersion.	ASTMD570	<=0.02%
Loss Tangent @ 50Hz @ 500 V	ASTMD150	Max0.05

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Comparative Tracking Index	UL745orIEC 60112	>=600
Resistance to Tracking & Erosion Test	IEC 60587:2022	2.5 Kv - 1 Hour Pass 2.75 kV - 1 Hour Pass 3.00 kV - 1 Hour Pass 3.25 Kv - 20 minutes Pass
Adhesion Test @ 20 Kg Load	ASTM D 2197	Pass
Fire Resistance Test Horizontal & 30 sec burn		Pass. Should not spread flame.

- 4.2 Zonal Railways are advised to use 'Composite High Voltage Insulating coating under the Overline Structure first on trial basis for a period of six months at very limited locations as approved by PCEE. After getting the satisfactory performance, Zonal Railways may provide on other location as per local requirement.

5.0 AGENCY FOR IMPLEMENTATION:

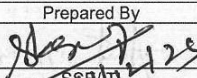
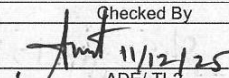
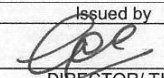
Composite high-voltage insulating coating arrangements may be provided under the Overline Structure (OLS) wherever reduced electrical clearances are adopted or flashing occurs under/over the OLS, as approved by the PCEE.

6.0 MAINTENANCE OF RECORDS:

Railways are advised to inspect the Overline Structure for the condition of the insulating paint once every three months or as per the inspection schedule approved by the PCEE. Records should be maintained in the prescribed format for the inspected locations.

Proforma for Performance Feedback

S No	Description	Remarks
1	Location where applied (FOB/ROB/Girder Bridge/Tunnel)	
2	Type of overline structure (FOB/ROB/Girder Bridge/Tunnel)	
3	Substrate of overline structure (Metal/Concrete)	
4	Clearance of Catenary Wire from the overline structure	
6	Peeling off / Damage or Raised Surfaces/Air Pocket.	
7	Flash marks/Black Spots/Tripping Marks on the surface of the coating.	
8	Comparison of OHE Tripping before and after providing the coating.	
9	Date of Composite High Voltage Insulating coating applied.	
10	Make, type, grade of Composite High Voltage Insulating coating.	
11	Approximate area of Composite High Voltage Insulating coating applied.	
12	Thickness of the insulating coating	

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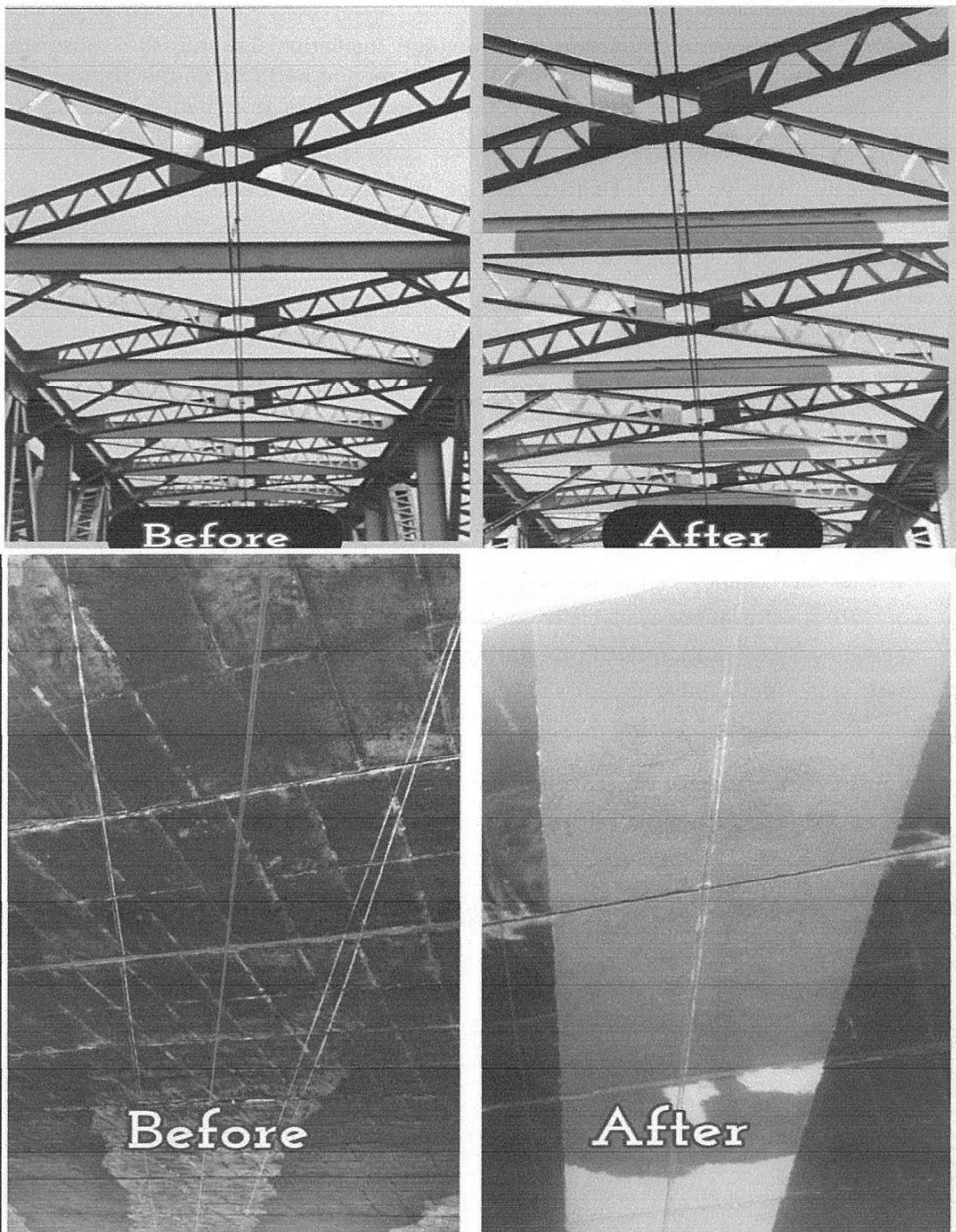
7.0 General Requirement and precautions to be taken: -

1. Before Application of Composite High Voltage Insulation Coating, the substrate shall be duly cleaned, scrapped and remove all foreign particles on the area where it is being applied. This shall ensure proper adhesion of the coating material to provide longer service life.
2. Composite High Voltage Insulation coating material base coating should have an inherent anti corrosive property and the top layer should be water repellent in nature. This shall ensure that there is NO breakdown due to dust and moisture.
3. Coating should have adequate mechanical and adhesion strength to sustain repeated vibration from running of locos/trains over a period of time.
4. Zonal railways should take proper precautions and avoid applying any silver paint of top of the said coating. Engineering/Bridges department should be duly informed about the same.
5. Coating thickness can be checked once every year to ensure that there has been no deterioration from the original coating thickness. This may be jointly checked with the execution agency. Non – destructive coating thickness meter for metal as well as concrete substrates are available to check the coating thickness. The meter should be having a valid calibration certificate during checking. Coating thickness to be checked using Non – destructive coating thickness meter (i.e. *Elcometer or similar meters as available in the open market*).
6. During maintenance activities of OHE assets, adequate care should be taken to avoid any physical damage of the coating area or use of sharp tools which can damage the coating surface.
7. In highly polluted areas if there are excessive carbon deposits or contaminants deposited on the surface of the coating it is recommended to clean surface with a lint – free cloth. However if the contaminants are difficult to remove it is recommend use of isopropyl alcohol or a standard non polar solvent mixed with 50% clean water. This procedure can be done once in 24 months depending on the extent of deposition if required.

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8.0 Photographs:

Some photo graphs of the Composite High Voltage Insulation Coating are given as below for guidance:



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