



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

EDMS 29-300-1

SPECIFICATION

FOR

ELECTRICAL INSULATION COATING

Issue: Sep.-2021/ Rev- 1



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

CONTENTS

CLAUSE	DESCRIPTION	PAGE
1	SCOPE	3
2	APPLICABLE STANDARDS	3
3	ENVIRONMENTAL CONDITION	4
4	SYSTEM CHARACTERISTICS	4
5	TECHNICAL REQUIREMENTS	5
6	MARKING	7
7	TESTING	7
8	GUARANTEE	8
9	SUBMITTALS	8
10	TRAINING	9
11	TECHNICAL DATA SCHEDULE	9
12	RECOMMENDATIONS	10



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

1. SCOPE

This specification covers the minimum technical requirements for designing, manufacturing, and supplying of electrical insulation coatings to protect the metallic and nonmetallic surfaces. The coating is required to improve the surface resistance against chemicals and weathers (such as salt water, acid, alkalis, alcohol, hydrocarbon). The coating shall ensure safe electrical insulation for new and old poles of low voltage distribution and street lighting. The coating can be either brush or spray applied, leading to rapid applications over wide areas. Materials can be applied to virtually (steel poles) including cast iron and concrete surfaces.

2. APPLICABLE STANDARDS

Unless otherwise specified in this specification, electrical insulation coatings should be designed, manufactured and tested according to the latest editions of the applicable standards given in Table (1).

Table (1)

S. No	Standard No.	Description
1	ASTM 4541/ISO 4624 on grit blasted steel	Adhesion test
2	ASTM B 117-90	Salt spray test
3	API5L2, ISO 2812-2	Water test
4	ASTM D2794-93, ASTM D256	Impact test
5	ASTM D522-93a	Bend test
6	ASTM G53	UV resistance test
7	ASTM D149, IEC 60243-1	Dielectric strength
8	ASTM D150	Dielectric constant
9	ASTM D257, IEC 60093	Surface resistivity
10	ASTM D695	Compressive strength



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

11	ASTM D-790	Flexural Strength
12	ASTM D-2240	Shore D/hardness
13	ASTM D2583	Barcol /Hardness
14	ISO 1522	Keening Pendulum/Hardness
15	ISO 11357	Dry heat resistance
16	ASTM G8	Corrosion protection
17	ASTM D256	Impact Strength
18	ASTM D638	Tensile Properties

3. ENVIRONMENTAL CONDITIONS:

The chemical, electrical and mechanical properties of the coating material should be guaranteed under the environmental conditions given in Table (2). Any differences in the guaranteed performance should be clearly set out in the offer.

Table (2)

Mean daily temperature	40 °c
Maximum ambient shade temperature	50 °c
Minimum ambient shade temperature	-10 °c
Maximum relative humidity	95 %
Environmental conditions	Humid tropical climate with heavily polluted atmosphere
Maximum Rainfall	250 mm
Altitude	Up to 1000 m above sea-level

4. SYSTEM CHARACTERISTICS

The required coating should have a safe electrical insulation behavior for the electrical system given in Table (3).



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

Table (3)

Nominal Voltage	380 V, 3-phase, 50 Hz
Highest System Voltage	1 kV, 3-phase, 50 Hz

5. TECHNICAL REQUIREMENTS

The insulation coating should be designed to achieve the following requirements:

- It should achieve insulation for more than 1 kV via cured layer around 0.25-0.5 mm maximum in dry film thickness (DFT), for safe insulating properties during provision of super conducting medium.
- The insulation coating is recommended to be solvent free which means that there are no volatile compounds (solvents) present in the product that are designed to leave the coating through evaporation.
- It can be directly applied to the prepared carbon-steel surface and valid to be applied also on a cured galvanizing coating, or any primer paint.
- It could be easily applied on the steel structures establish in surface.
- The Pot Life should not be less than 2 hours.
- Cure time should not be less than 7 hours at 30° C.
- Both Base and Solidifier components should be specified according to their appearance, color, and density.
- Shelf Life: Separate base and solidifier components should have a shelf life of at least 3 years from manufacturing date at storage temperature not more than 30° C.
- The required insulation coating material should be designed to achieve the technical specification given in Table (4).



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

Table (4)

No	Test	Standards	Required
1	Film Thickness	0.25-0.5 mm	
2	Dielectric Strength	IEC 60243-1 and ASTM D149	> 36 kV/mm
3	Specific Surface Resistivity	IEC 60093 and ASTM D257	> $1 \times 10^6 \Omega$
4	Dielectric Constant	(100 Hz - 1 MHz) ASTM D150	2-10
5	Compressive Yield Strength	ASTM D695	>40 MPa
6	Pull Off Adhesion	ASTM D4541/ISO 4624 on grit blasted steel	≥ 25 MPa
7	Tensile Shear	ASTM D1002	> 15 MPa
8	Impact Strength	ASTM D256 - 4 hour at 100° C	> 4 kJ/m ²
9	Compressive Strength	ASTM D695 (Ambient Cure)	> 400 kg/cm ²
10	Tensile strength (Yield)	ASTM D638 - 7 days at 22° C	> 10 MPa
11	Elongation	ASTM D638 - 7 days at 22° C	> 1%
12	Corrosion	ASTM G8	Pass
13	Acceleration corrosion test	Wet/dry corrosion cycling using a dilute (NH ₄) ₂ SO ₄ /NaCl-based electrolyte	Pass
14	Chemical Resistance	5% Sulfuric Acid 20% Hydrochloric Acid 20% Sodium Hydroxide	Excellent Resistance
15	Hardness Shore D	ASTM D-2240 (Ambient Cure)	> 65
16	Flexural Strength	ASTM D-790 (Ambient Cure)	> 250 kg/m ²
17	Pot Life	ASTM-2471	≥ 2 hour
18	Net Coverage rate	For one or multilayers	> 1.5 m ²
19	Shelf Life	Store at 0-30° C	> 3 Years
20	Heat Resistance	- Stable for continuous immersion in aqua solution up to 50° C - Stable under dry condition up to 150° C	



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1
14-09-2021

6. MARKING

- The following information should be marked on each pot:
 - a. Manufacturer`s name
 - b. Country of origin
 - c. ASTM standard
 - d. Base component (appearance, color, and density)
 - e. Solidifier (appearance, color, and density)
 - f. Pot life
 - g. Coverage rate
 - h. Cure time
 - i. Shelf life
 - j. Manufacturing date: year/month/day
 - k. Expiry date: year/month/day
 - l. Weight in kg
- The marking should be durable and easily legible. Compliance is checked by inspection.

7. TESTING

- All tests shall be carried out by and at the expense of the supplier.
- All supplied coatings shall be tested according to the latest ASTM standards at EEHC approved laboratory in the presence of an authorized EEHC representative for the following tests:
 - a. Heat Resistance
 - b. Adhesion (tensile shear), pull off
 - c. compressive strength
 - d. Temperature
 - e. Salt spray test
 - f. Hardness
 - g. Corrosion protection



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

- h. Hydrophobic test
- i. Flexural properties
- j. Impact strength
- k. Dielectric strength
- l. Immersion resistance
- m. Tensile properties

8. GUARANTEE

- The supplier should guarantee the supplied materials against all defects arising out of defective manufacturing for 3 years at least from putting in service.
- The supplier should guarantee that the supplied materials maintain their properties along the shelf life at the specified storing temperature.

9. SUBMITTALS

- The tenderer should submit original catalogues describing the electrical and chemical properties of the supplied materials details.
- Copy of recent tests should be submitted with the tender.
- A valid EEHC approval letter must be attached to the offer.
- The supplier should provide all the instructions of use/storing for all surfaces in (Arabic & English).
- The supplier should submit the cure time table of the coating at different time and conditions.
- The supplier should guarantee that all the provided materials are nontoxic and eco-friendly.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

**EDMS 29-300-1
14-09-2021**

10. TRAINING

- The vendor shall provide a sufficient on-site training toEDC workers for free.

11. TECHNICAL DATA SCHEDULE

- The tenderer must fill in thoroughly the attached technical data schedule.
- Any offer does not accompanied with clear and complete technical data schedule shall be rejected.

Technical Data Schedule

NO	ITEMS	Vendor specifications
1	Nominal operating (service) voltage	
2	Base component	Appearance
		Color
		density g/cm ³
3	Solidifier component	Appearance
		Color
		density g/cm ³
4	Work life	
5	No of coating layers & thickness Layers, mm
6	Dielectric strength kV/mm ²
7	Cure time	
8	Shelf lifeyears at° C temperature
9	Country of origin	
10	Manufacturing date: year/month/day	
11	Expiry date: year/month/day	
12	Guarantee period years
13	Training	Yes / No

We guarantee the data given above for the offered coating materials toEDC.

Signature: Date:



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

12. RECOMMENDATIONS

Surface preparation of metals (According to ASTM D6386)

- The Surface abrasion and roughening must achieve two objectives:
 - a. Remove contaminants including oil, grease, rust, scale, old paint etc.
 - b. Increase the surface bonding area and improve mechanical bonding.
- Both objectives are normally achieved at the same time if the correct tool choice is made.

Method one: Surface preparation using Blast Cleaning (For newly-fabricated poles):

Pre-blasting operations:

- All traces of oil and grease contamination shall be removed by a suitable cleaner/degreaser prior to blast cleaning of the surface.
- Where surface defects are revealed during blast cleaning these shall be suitably dressed and the area concerned re-blasted to the original standard.
- Blast Cleaning:
 - Sand blasting the surface, sand abrasives shall be clean and dry and free from any contaminants, which may adversely affect the performance of the coating.
 - The size of the abrasive particles shall give the required surface profile height in accordance with the requirements for the applicable coating system but in any event not less than 75 microns.
 - Following blast cleaning all dust/ blast media and other debris shall be removed by sweeping or vacuuming.
 - All surfaces shall then be degreased using a suitable cleaner-degreaser, which does not have a residue, such as MEK or Acetone (Non-residue chemical cleaner).



EEHC DISTRIBUTION MATERIALS SPECIFICATION

**EDMS 29-300-1
14-09-2021**

- Sand blasting will not be suitable in case of hot dip galvanized low-voltage distribution poles due to the deterioration of galvanizing layer with mechanical blasting process.
- Based on the chemical nature of coating vehicle (binder or resin), high build epoxy coatings cured by polyamines or polyamides and cured polyesters coatings cannot be applied on the hot dip galvanized surface without making surface roughness and with the long-run exposure to the severe conditions and hazardous external exposures, these coating leave the hot-galvanized steel with the galvanizing layer and this is not observed on the near-period of application.
- High build epoxy coatings cured by polyamines or polyamides and cured polyesters coatings can be applied on the roughened steel surface directly or after application of cold galvanizing layer with thickness around 30-50 micron and also in case of presence of interfacial coating layer containing on sacrificial pigments.
- For hot dip galvanized steel working species, ceramic coating based on highly cross-linked polymer blend can be described as completely compatible coating for this type of galvanized specimens.
- Emery papers without intensive application can be used for surface preparation of hot-dip galvanized steel specimens.
- High build epoxy coatings cured by polyamines or polyamides and cured polyesters coatings form strong layer and can up-left the previous applied cured coated layer such as red primer or sacrificial primer. It could only be applied on zinc-rich epoxy.
- The condition of the blasted surface must be maintained until application of the first coat. If this is not possible then the surface shall be re-blasted and degreased prior to application of the coating system.



EEHC DISTRIBUTION MATERIALS SPECIFICATION

EDMS 29-300-1

14-09-2021

Method two: Surface preparation using hand tools (For existing poles):

- Roughening the surface using hand tools which do not cause sparks, such as files, wire brushes or emery papers.
- All surfaces shall then be degreased using a suitable cleaner-degreaser, which does not have a residue, such as MEK or Acetone (Non-residue chemical cleaner).

Applying Protective Coating (externally)

- Apply protective coating (High performance immersion grade coating for long term protection of metallic & non-metallic surfaces under immersion conditions in contact with aqueous solutions. The coating exhibits excellent corrosion resistance) with total thickness 0.3-0.5 mm.

Recommendation before using the electrical Insulating coating materials

- A mesh fence or similar must be installed around the painting pole to protect the paint until completely dry.
- There is two meters from the lower level of the pole must be painted beside the concrete base of the pole.
- Before using the product, a pot life period must be taken between mixing the product and applying it.
- Surface preparation instructions must be strictly commitment.