



Technical Specification For
Spraying Zinc Coating on the OHE Mast For Railway Electrification

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Specification for Spraying Zinc Coating on the OHE Masts

1. SCOPE:

- 1.1 This standard covers the method, requirements and inspection of sprayed zinc coating on the OHE masts.
- 1.2 In preparation of this specification assistance has been taken from **IS:6586-1989 (or its latest version)** and **IS:5905-1989 (or its latest version)**
- 1.3 The spraying may be done either at the works of the manufacturer or at site.

2. CLEANING AND PREPARATION OF SURFACE:

- 2.1 The Steel surface of the masts to be sprayed shall be cleaned and roughened in accordance with Clause-S of **IS:6596-1972 (or its latest version)**. Both cleanliness and roughness greatly affect the bond strength between the coating and the substrate.
- 2.2 Cleaning consists of removing grease, oil and other contaminants that would impair the bonding of the sprayed metal. Any suitable solvent may be used to clean the surface.
- 2.3 Roughening of the surface shall be done by compressed air blast with a chilled conical steel abrasive grit of grade GC 100/GC 42 as per **IS:4683-1968 (or its latest version)**. The mast after cleaning shall show visibly a grey white uniform metallic surface, free from mill scale, rust, paint and other foreign matter.
- 2.4 **Blasting Method:**

The steel surface shall be blasted manually or by mechanised operation. If manual blasting is adopted, the entire surface should be covered systematically by traversing the nozzle at a fairly constant speed in straight paths, each succeeding path overlapping the preceding one, and exposing the cleaned white metal. Mechanical blasting equipment may be of the suction type or pressure-tube. The nozzle distance during blasting should be 150mm to 250mm. The angle of blasting should generally be 15° -20° from vertical. The blast nozzle should be replaced when diameter of the orifice is worn and has increased by 25%. Special care should be taken to blast the holes and the corners properly. It is essential that the compressed air should be dry and free from oil vapours.

IS:6586- 1989 (or its latest version) : Recommended practice for metal spraying for protection of iron and steel.

IS:5905-1989 (or its latest version): Sprayed aluminium and zinc coating on iron and steel.

IS:4683-1968 (or its latest version): Chilled iron shot and grit for use in foundries.

2.5 Method of checking the surface

2.5.1 The cleaned surface shall be comparable in roughness with a reference surface produced in accordance with Appendix Á' of **IS:5905-1989 (or its latest version.)**. Relevant extracts are given in Appendix 'A' this specification.

2.5.2 No visible dark areas representing rust and mill scale shall be observed when 4% solution of copper sulphate in 1% sulphuric acid is applied to the newly cleaned surface on a small representative area. Only bright copper shall be deposited representing the clean steel surface. If dark areas, indicating mill scale etc., occur the whole mast shall be re-blasted. The copper deposit should be completely removed from the acceptable masts by re-blasting locally to avoid pitting corrosion which may otherwise occur.

3. ZINC SPRAYING:

3.1 The chemical composition of the zinc to be sprayed shall conform to Gr. 99.95% of **IS:209-1992 (or its latest version.)**

NOTE: Should the contractor suggest a mixture of zinc with other metals like aluminium, full particulars of mixture suggested with the benefits intended to be derived from such mixtures and the published performance reports etc. may be given.

3.2 The metal shall be sprayed immediately after surface preparation to minimise surface oxidation or contamination. The cleaned masts should not be left over night without spraying. If deterioration in the surface to be coated is observed, by comparison with a freshly prepared metal surface of similar quality, the surface treatment shall be repeated.

3.3 The spraying also should be completed once it is started and should not be left midway for next day. Adequate precautions should be taken by the Contractor to ensure that the difficulty due to power interruption etc. do not hamper the quality of the spray coating.

3.4 The metal may be sprayed either using zinc powder or zinc wire, of required purity, as approved by the Purchaser. The amount of torch heat for adequate particle melting must be balanced with the correct torch-to-work distance.

3.5 The mast must be rotated to obtain uniform distribution of the coating. The coating thickness specified shall be obtained by multiple passes and in no cases shall be less than 2 passes of spraying on every part of the surface.

IS:209-1992 (or its latest version): Zinc Ingot.

- 3.6 The surface of the sprayed coating shall be of uniform texture, free from the lumps, coarse areas and loosely adherent powder. The spraying shall be done in such a manner that the thickness of the surface is uniform over the entire surface.
- 3.7 Spraying shall be done in the presence of Railways representative. The thickness shall be measured frequently during the progress of work using the magnetic type elcometer thickness gauge.

4. REQUIREMENT OF COATING:

4.1 Thickness:

Nominal thickness of the coating shall be 100 micrometer and shall be determined in accordance with **IS: 3203-1982 (or its latest version)**. Minimum thickness at any place shall not be less than 90% of the specified nominal thickness, i.e.90 micrometer. The average thickness shall not be less than 100 micro-meter.

4.2 Appearance:

The surface of the spray coating shall be of uniform texture and free from lumps, coarse areas and loosely adherent powder.

4.3 Adhesion:

The spray metal coating shall be adherent and satisfy the requirements of test for adhesion described in clause 4.3.1. The number and areas selected for this test shall be as decided by the purchaser. A minimum number of two areas (location), as decided by the purchaser, shall be tested in each mast.

- 4.3.1 Using a straight edge and a hardened steel scribe which has been ground to a sharp 30° point, scribe two parallel lines at a distance apart equal to approximately ten times the average coating thickness. In scribing the two lines, apply enough pressure on each occasion to cut through the coating to the basic metal on a single stroke. If any part of the coating between the lines breaks away from the basic metal, it shall be deemed to have failed in the test.

4.4 Sealing of sprayed coating:

A sealing coat of approved phenolic resin varnish shall be applied on the sprayed surface immediately after spraying for providing further protection to the coating from corrosive elements and to the base metal by diffusing into pores of the coating. The sealer may preferably be applied by spraying method.

IS:3203-1982 (or its latest version) : Method of testing local thickness of electroplated coating.

4.5 Additional Protective Painting:

For the masts to be located in severely polluted areas and near the sea coast, if required, additional protective painting may be provided. Instead of providing a sealing coat of phenolic resin, one coat of zinc chromate primer should be applied immediately after zinc spray. This should be followed by one coat of aluminium paint. The tenderer shall furnish details of painting scheme, which shall be subject to approval of the purchaser.

5. TESTS:

5.1 Surface Preparation Tests:

The masts after surface preparation shall be tested in accordance with Clause 2.5. Only the masts which pass the tests satisfactorily shall be sprayed. The rejected masts shall be blast cleaned again.

5.2 Thickness of Coating:

The thickness of the zinc coating shall be measured by magnetic method in accordance with **IS:3203-1982 (or its latest version)**. The accuracy of the elcometer used for the measurement of the coating thickness shall be determined by measuring the thickness of zinc coating on a sample panel of 10 cm x 10 cm size and cross checking with the stripping method as per **IS: 6745-1972 (or its latest version.)** The thickness of the zinc coating shall be checked on each mast at five different locations, by the magnetic method and shall comply with clause 4.1

5.3 Tests for Adhesion:

Adhesion tests shall be done on all masts at the locations selected by the Purchaser, in accordance with clause 4.3

6. RE-TREATMENT OF DEFECTIVE AREAS:

6.1 Any defective area shall be cleaned of all the sprayed metal by blasting, and re-prepared to conform to the requirements of Clause-2 for re-spraying. Such areas shall be re-sprayed to the satisfaction of the Purchaser.

IS: 6745-1972 (or its latest version): Method of determination of weight of zinc coating on zinc coated iron and steel articles.

APPENDIX 'A'

METHOE OF PREPARATION OF A REFERENCE SURFACE FOR COMPARISON

A.1 BASIC METAL:

A.1.1 A flat piece of medium of low carbon steel not less than 6 mm thick having a Vickers hardness of 180 to 200 @ HV 10.

A.2 ABRASIVE:

A.2.1 Chilled iron grit of sizes IS Designation G-C 100 to G-C 42 * is suitable.

A.3 GRIT-BLASTING EQUIPMENT:

A.3.1 Any suitable direct-pressure equipment, such that the air pressure is 3 kg/cm² at the pressure grit container, the blast hose being not more than 4.5m long and of diameter not less than three times the nozzle diameter, is suitable.

A.4 PROCEDURE:

A.4.1 Grit-blast with the blasting nozzle approximately at right angles to and 250mm from the surface, until a uniformly rough, clean surface not less than 250 mm² in area, has been obtained, and maintained without visible change for at least 25% of the total blasting time, and preserved in that condition.

NOTE: The blasting conditions given in the Appendix are not necessarily those for blasting the actual work.

@ See IS:1501-2013 (or latest revision) : Method for Vickers hardness test for steel.

* See IS:4683 -1968 (or latest revision): Specification for chilled iron shot and grit for use in foundries.