Draft Standard

Electrogalvanized Steel for Concrete Reinforcement

FOREWORD

Electro-galvanizing is a process in which a layer of zinc is applied to steel in order to protect it against corrosion. The process of electroplating takes place by placing the steel into a cold/hot solution of zinc salts and exposing it to electric current. One of the major benefits of electro-galvanizing process is that it has a higher level of thickness control, which provides uniform consistent and accurate coating. The layer of zinc coating above the steel surface prevents it to come into contact with oxygen or moisture.

This standard specifies a range of electroplated coatings of zinc for the protection of steel against corrosion under various service conditions.

While developing this draft standard, assistance has been derived from ISO 2081:1986 Metallic coatings- Electroplating coatings of zinc on iron or steel

For the purpose of whether a particular requirement of this draft standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this draft standard.

1 SCOPE

1.1 This draft standard covers the requirements of high strength deformed [HSD] steel bars for concrete reinforcement coated with zinc by electrolytic process.

2 REFERENCES

The following standards contain provisions which through in this text, constitute provisions of this draft standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1786:2008	High strength deformed steel bars and wires for concrete reinforcement- Specification (*Fourth Revision*)
3531:1997	Glossary of terms relating to corrosion of metals (*Second Revision*)
3554:2017	Glossary of terms relating to electroplating (*First Revision*)

8910:2010 General technical delivery requirements for steel and steel products (*First Revision*)

3 TERMINOLOGY

For the purpose of this draft standard the definitions given in IS 3531, IS 3554 and the following definitions shall apply.

3.1 Size of Bar — Nominal diameter of HSD steel bars for concrete reinforcement without any coating on it. This is also termed as BMD (base metal diameter). This is the size that should be used while ordering the coated steel. In case of coated steel, it is measured after removing the coating.

3.2 Lot — A production of 25t of the electrogalvanized HSD steel bars of same size, quality, dimensions and coating thickness that have been electroplated during the single production shift.

3.3 Product — Electrogalvanized HSD steel bars for concrete reinforcement.

3.4 Minimum average thickness - The mean of the thickness measurements, of which a specified number is made within a reference area of a HSD steel bar.

4 DESIGNATIONS

4.1 Coating Class

Expressed as EG “XXX”, where ‘XXX’ is the coating thickness in µm.

4.2 Base Metal Grade

Reinforcing steel to be electrogalvanized shall comply with the grade of the steel mentioned in IS 1786.

4.3 Designation of electrogalvanized HSD steel bars

4.3.1 The designation is the combination of base metal grade [Fe XXX] and the coating class separated by ‘hyphen’.

Example — Electrogalvanized HSD steel bars having base metal of carbon steel grade Fe 550 plated with coating class of EG010, the designation of that electrogalvanized HSD steel bars and wires for concrete reinforcement will be: Fe 550-EG010.

5 SUPPLY OF MATERIAL

The general requirements relating to supply of electrogalvanized HSD steel bars shall conform to IS 8910.

6 MANUFACTURE

6.1 Unless otherwise agreed to between the manufacturer and the purchaser, the processes used in the electrogalvanizing are left to the discretion of the manufacturer.

6.2 It shall be the responsibility of the manufacturer to maintain the identity of the steel reinforcement throughout the electrogalvanizing process and to the point of shipment.

7 FINISH AND APPEARANCE

7.1 The electrogalvanized HSD steel bars shall not have any uncoated areas. The coating shall be free from clearly visible plating defects such as blisters, pits, roughness, cracks or unplated areas other than those arising from defects in the base metal and other imperfections that are detrimental to the final product's practical application. On bars, usually where a contact mark is inevitable, this contact mark is excluded for inspection of appearance. Superficial stains that result from rinsing or slight discolouration resulting from drying shall not be the cause for rejection.

8 Sampling Frequency

8.1 One sample of the electrogalvanized HSD steel bars selected from the inspection lot.

9 CORROSION RESISTANCE FOR COATING

9.1 On request of the purchaser, corrosion resistance of the product may be tested. The test conditions for the corrosion resistance test and evaluation criteria shall be in accordance with the agreement between the purchaser and the manufacturer or as per the established national or international standards.

10 COATING THICKNESS

10.1 The minimum average thickness of electrogalvanized coating shall be as given in Table 1.

Table 1 Minimum average thickness of electrogalvanized coating

Service condition or Service life	**Designation**	**Minimum Average Thickness** [in micro meter]
Increasing severity of service condition or of life required	Fe XXX-EG005	5
	Fe XXX-EG008	8
	Fe XXX-EG010	10
	Fe XXX-EG020	20

11 METHOD FOR DETERMINATION OF AVERAGE THICKNESS

11.1 The thickness of electrogalvanized coating shall be determined by stripping solution method.

11.2 Dissolve 20 % Sulphuric Acid in in 500 ml of cold concentrated RO water [relative humidity 0.36].

11.3 Procedure

Accurately determine the thickness and length of test bar. Degrease it with an organic solvent such as trichloroethylene, dry thoroughly and weigh to an accuracy of one part in 10,000. Then totally immerse it and turn it over so that the reagent has free access to all surfaces. After the effervescence has ceased, remove the loose coating and immerse in clean acetone to remove any trapped water. Then remove the sample, dry by the process previously used and reweigh.

11.4 Calculation

Zinc coating thickness in micrometer = $\frac{(m_1 - m_2) \times 10^6}{\pi \; l \; d \; D}$

where

m_1 = original mass in g of the sample

m_2 = final mass in g of the sample, and

l = length of the sample in mm

d = diameter of HSD bar in mm

Note – The above calculation assumes a density [**D**] of 7.1 g/m^3 for zinc.

12 RE-TESTING

12.1 When a part of the test results fails to comply with the requirement specified in **7.1** and **10.1**, a re-test (two more sets of test samples shall be taken for specific test requirements from the same lot) on the relevant items may be carried out to determine whether it is acceptable or not. If any of the re-test samples fail to meet the test requirements of this standard, the lot represented by the sample shall be deemed as not conforming to this standard.

13 TEST REPORT

13.1 If mutually agreed, the manufacturer shall furnish the test report and test certificate stating that the Electrogalvanized HSD steel bars conform to this standard.

14 PACKING

14.1 Electrogalvanized HSD steel bars shall be delivered in the form of bundles of straight bars and suitably packed to avoid any transit/handling/storage damage and as per the agreement between the purchaser and the manufacturer.

15 MARKING

15.1 The following shall be legibly and indelibly marked on the top of each bundle/package of Electrogalvanized HSD steel bars or shown on a tag attached to each bundle/package:

a) IS No. of this standard;

b) Manufacturer's name or trade-mark;

c) Material identification/coil number/batch number, etc;

d) Product dimensions;

e) Number of bars or mass;

f) Designation of electrogalvanized HSD steel bars; and,

g) Date of manufacture.

16 BIS CERTIFICATION MARKING

16.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.