IS 12594 (1988): Hot-dip Zinc Coating on Structural Steel Bars for Concrete Reinforcement [MTD 7: Light Metals and their Alloys]

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Indian Standard

HOT-DIP ZINC COATING ON STRUCTURAL STEEL BARS FOR CONCRETE REINFORCEMENT — SPECIFICATION

भारतीय मानक

कंक्रीट प्रबलन के लिए संरचना इस्पात सरियों पर तप्त निमज्जित जस्ता लेपन — विशिष्टि

UDC 669·14·018·29-422 : 669·586·5 : 666·982·24

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1989

Price Group 2

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards on 22 December 1988, after the draft finalized by the Hot-Dip Sprayed and Diffusion Coatings Sectional Committee had been approved by the Structural and Metals Division Council.

Corrosion of steel reinforcement in RCC constructions is assuming alarming proportions. In desperate efforts to restore structures, very often temporary repair methods are adopted. One of the reliable methods of long term measures which could prevent corrosion of concrete reinforcement bars totally, is through giving a hot dip galvanized zinc coating on these bars. The use of galvanized bars is justified fully both technically and economically in highly corrosive areas, such as, in severe marine corrosion belts and areas suffering from industrial pollution.

Keeping in view the likely demand for hot-dip galvanized concrete reinforcement bars in our country, it was felt necessary to prepare this standard. It is hoped that this standard specification will help the users to procure galvanized steel bars of acceptable quality.

In the preparation of this standard, considerable assistance has been derived from ASTM 767M—1985 'Zinc coated (galvanized) steel bars for concrete reinforcement', issued by the American Society for Testing and Materials, USA.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results 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 standard.

AMENDMENT 1 APRIL 2001
TO
IS 12594 : 1988 HOT-DIP ZINC COATING ON STRUCTURAL STEEL BARS FOR CONCRETE REINFORCEMENT — SPECIFICATION

(*Page* 1, *clause* 4.2) — Substitute the following for the existing :

'4.2 Quality of Zinc

Zinc used for galvanizing shall conform to any of the grades specified in IS 209: 1992 Zinc ingot or IS 13229: 1991 Zinc for galvanizing.'

(MTD 20)

Reprography Unit, BIS, New Delhi, India

Indian Standard

HOT-DIP ZINC COATING ON STRUCTURAL STEEL BARS FOR CONCRETE REINFORCEMENT — SPECIFICATION

1 SCOPE

This standard specifies requirements for zinc coating applied by hot-dip galvanizing on structural steel bars for concrete reinforcement.

2 REFERENCES

The Indian Standards listed below are necessary adjuncts to this standard.

IS No.	*Title*
IS 432 (Part 1) : 1982	Specification for mild steel and medium tensile steel bars (*third revision*)
IS 1786 : 1985	Specification for high strength deformed steel bars and wires for concreate reinforcement (*third revision*)
IS 2062 : 1984	Specification for weldable structural steel (*third revision*)
IS 2629 : 1985	Recommended practice for hot dip galvanizing of iron and steel
IS 6745 : 1972	Methods for determination of mass of zinc coating on zinc coated iron and steel articles
IS 8910 : 1978	General technical delivery requirements for steel and steel products

3 SUPPLY OF MATERIAL

General requirements relating to the supply of material shall conform to IS 8910 : 1978.

4 GENERAL REQUIREMENTS

4.1 The concrete reinforcement steel bars shall conform to IS 2062 : 1984, IS 1786 : 1985 and IS 432 (Part 1) : 1982.

4.2 Quality of Zinc

Zinc containing at least 98·5 percent shall be used for the purpose of galvanizing.

4.2.1 *Galvanizing Bath*

The molton metal in the galvanizing bath shall contain not less than 98·5 percent by mass of zinc.

4.3 Galvanizing

The concrete reinforcement steel bars, as far as practicable, shall be galvanized in accordance with IS 2629 : 1985.

4.3.1 *Handling*

After immersion in the molten zinc, the bars may be subjected to air/steam wiping to remove excess zinc from the bars provided the minimum coating mass is met.

4.3.1.1 The galvanizer shall ensure the proper tagging requirements of the bar to maintain identification during process to the point of despatch.

4.4 For the guidance of the purchaser and the manufacturer, particulars to be specified while ordering for the product to this specification, have been given in Annex A.

5 COATING REQUIREMENTS

5.1 Mass of Zinc Coating

For reinforcement concrete bar, the minimum mass of zinc coating based on actual area of bar, when determined in accordance with IS 6745 : 1972 shall be as given in Table 1.

Table 1 Requirement of Mass Zinc Coating

(*Clauses* 5.1, 6.1 *and* 6.2)

Coating Class	Mass of Zinc Coating, Min, g/m² of Surface
A	915
B	610

NOTES

1 The coating class to be selected depends on the aggressiveness of the surrounding area, that is, chemical plants, marine areas, or if the water/aggregate used contains chemical salts, the class of coating shall be subject to mutual consent between the galvanizer and the end user.

2 The nominal diameter of a deformed bar is equivalent to that of a plain round bar having the same mass per metre as the deformed bar. Coating masses shown in Table 1 are based on as assumed area ratio 1·2 : 1 (actual to nominal surface area of the reinforcing bar).

5.2 Freedom from Defects

The zinc coating shall have no bare spots. The coating shall be free of blisters, flux spots or inclusions, dross and acid or black spots (*see* IS 2629 : 1986). Bars that stick together after galvanizing shall be rejected. The presence of tears or sharp spikes which make the bar hazardous to handle shall be the cause for rejection.

5.3 Adhesion of Galvanized Coating

The coating shall be adherent and it shall not be affected/damaged by any reasonable process of handling or erection.

5.4 Chromating

The galvanized coating shall be chromate treated to preclude a reaction between the bars and fresh portland cement paste. Proprietary chromating solutions of equivalent strength may also be used in place of the generic chemical treatment.

5.4.1 In case the chromate treatment is performed immediately after galvanizing, it may be accomplished by quenching the reinforcement bars in a solution containing at least 0·2 percent by mass of sodium dichromate in water (2 kg/m^3) or by quench chromating in a minimum of 0·2 percent chromic acid solution. The galvanized bars shall be immersed in the solution at a temperature of at least 32°C for at least 20s.

5.4.2 In case the galvanized bars are at ambient temperature, the chromate treatment shall be the same as prescribed in **5.4.1** except that 0·5-1·0 percent concentration of sulphuric acid shall be added as an activator of the chromate solution. In this case, there is no temperature requirement for the activated chromate solution.

6 SAMPLING AND CRITERIA FOR CONFORMITY

6.1 Number of Tests

Unless otherwise agreed to, three percent random samples subject to a minimum of three samples from each lot shall be drawn and tested for ascertaining the conformity of galvanized coating on concrete reinforcement bars. The average coating mass of these tests shall conform to the requirement of Table 1. No individual zinc coating mass of the test sample shall vary 10 percent less than the mass specified in Table 1.

6.1.1 *Lot*

All bars of one size furnished to the same hot-rolled reinforcing bar specification that have been galvanized within a single production shift, from one bath, shall be grouped together to constitute a lot.

6.2 Retest

If the average coating mass fails to meet the requirements of Table 1, six additional random samples from the lot shall be taken. If the average coating mass of these six samples conforms to the requirements of Table 1, the lot shall be accepted. No individual zinc coating mass of the test sample shall vary 10 percent less than the mass specified in Table 1.

7 FABRICATION

7.1 Fabrication Before Galvanizing

In case the bars are bent cold prior to galvanizing, these shall be fabricated to a bend diameter equal to or greater than 6 *d* for bar sizes up to 20 mm and 8 *d* for bar sizes larger than 20 mm.

7.1.1 The bar may be cold bent closer then specified in **7.1** if stress relieved at a temperature from 480 to 560°C for 1 h per 25 mm of bar diameter.

7.2 Fabrication After Galvanizing

In case galvanizing is performed before bending, some cracking and flaking of the galvanized coating in the area of the bend shall not be the cause of rejection.

7.2.1 Damage to the coating as a result of fabrication is not subject to repair unless desired in accordance with supplementary requirement *see* **8**.

NOTE — The tendency for cracking of the zinc coating increases with bar diameter and with severity and rate of bending.

8 SUPPLEMENTARY REQUIREMENTS OF GALVANIZED COATING

The bars shall be supplied with the following supplementary requirements when specified by the purchaser.

8.1 Sheared Ends

Sheared ends shall be coated with a zinc-rich formulation and the dried film shall have 92-95 percent zinc content.

8.2 Damaged Coating

Damage of the coating as a result of bending shall be repaired with zinc-rich formulation and the dried film shall have 92-95 percent zinc content.

9 INSPECTION

The material shall be inspected at the galvanizer's plant prior to despatch. However, if specified, the purchaser may make the tests which govern the acceptance or the rejection of the materials.

10 REJECTION

Visual inspection of material shall be made to determine conformity with the requirement of 5.2. When inspection warrants rejection of a lot, the manufacturer may resort the inspection lot and resubmit it for inspection.

10.1 Material that have been rejected may be stripped and re-galvanized and re-submitted for test and inspection and shall conform to the requirements of this specification, otherwise the entire lot shall be rejected.

11 PACKING

The galvanized concrete reinforcement bars shall be packed as stipulated in the reinforced bar specification or as mutually agreed upon.

12 MARKING

The marking related to the coating shall include the following:

a) Manufacturer's name/trade mark,

b) Quantity of bars,

c) Size of bars,

d) Lot number, and

e) Class of coating.

12.1 Standard Marking

The coated bars may also be marked with the Standard Mark which shall relate only to the coating of the article.

ANNEX A

(*Clause* 4.4)

INFORMATION TO BE SUPPLIED BY THE PURCHASER

A-1 BASIS FOR ORDER

While placing an order for the purchase of galvanized reinforced concrete bars to this specification, the purchaser should specify the following:

a) Quantity of bars;

b) Size of bars;

c) Reinforcing bar specification;

d) Class of coating;

e) Galvanizing before or after fabrication; and

f) Supplementary requirement(s), if needed.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Indian Standards are reviewed periodically and revised, when necessary and amendments, if any, are issued from time to time. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition. Comments on this Indian Standard may be sent to BIS giving the following reference:

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