



भारतीय मानक ब्यूरो BUREAU OF INDIAN STANDARDS

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व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 54/T-20

05 दिसंबर 2023

तकनीकी समिति : कंक्रीट प्रबलन विषय समिति, सीईडी 54

प्राप्तकर्ता :

- 1 सिविल इंजीनियरी विभाग परिषद, सीईडीसी के सभी सदस्य
- 2 कंक्रीट प्रबलन विषय समिति, सीईडी 54 के सभी सदस्य
- 3 आईएस 12594 के पुनरीक्षण के लिए कार्य समूह, सीईडी 54/WG 6 के सभी सदस्य
- 4 रुचि रखने वाले अन्य निकाय

महोदया/महोदय,

निम्नलिखित प्रारंभिक मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 54 (22059)WC	कंक्रीट प्रबलन के लिए सतत तप्त आप्लावन जस्तीकृत इस्पात के सरिए — विशिष्ट का भारतीय मानक मसौदा (आई सी एस संख्या 77.140.15;91.080.40)

कृपया इस मसौदे का अवलोकन करें और अपनी सम्मतियाँ यह बताते हुए भेजे कि यह मसौदा प्रकाशित हो तो इस पर अमल करने में, आपको व्यवसाय अथवा कारोबार में क्या कठिनाइयाँ आ सकती हैं।

सम्मतियाँ भेजने की अंतिम तिथि: 05 जनवरी 2024

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को ई मेल द्वारा madhurima@bis.gov.in पर या उपरलिखित पते पर, संलग्न फॉर्मेट में भेजें।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा संबंधी त्रुटि हुई तो उपरोक्त प्रलेख को यथावत अंतिम रूप दे दिया जाएगा। यदि सम्मति तकनीकी प्रकृति की हुई तो विषय समिति के अध्यक्ष के परामर्श से अथवा उनकी इच्छा पर आगे की कार्यवाही के लिए विषय समिति को भेजे जाने के बाद प्रलेख को अंतिम रूप दे दिया जाएगा।

यह प्रलेख भारतीय मानक ब्यूरो की वेबसाइट www.bis.gov.in पर भी उपलब्ध हैं।

धन्यवाद।

भवदीय

ह/-

(अरुण कुमार एस.)

वै. 'ई'/निदेशक और प्रमुख (सिविल इंजीनियरी)

संलग्न: उपरलिखित



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**DRAFT IN
WIDE CIRCULATION**

DOCUMENT DESPATCH ADVICE

Reference	Date
CED 54/T-20	05 12 2023

TECHNICAL COMMITTEE:

CONCRETE REINFORCEMENT SECTIONAL COMMITTEE, CED 54

ADDRESSED TO:

1. All Members of Civil Engineering Division Council, CEDC
2. All Members of Concrete Reinforcement Sectional Committee, CED 54
3. All Members of Working Group for Revision of IS 12594, CED 54/WG 6
4. All other interests

Dear Madam/Sir,

Please find enclosed the following document:

Doc No.	Title
CED 54(22059) WC	Draft Indian Standard Continuous hot-dip galvanized steel bars for concrete reinforcement — Specification (ICS No. 77.140.15;91.080.40)

Kindly examine the draft and forward your views stating any difficulties which you are likely to experience in your business or profession, if this is finally adopted as National Standard.

Last Date for comments: 05 January 2024

Comments if any, may please be made in the enclosed format and emailed at madhurima@bis.gov.in or sent at the above address.

In case no comments are received or comments received are of editorial nature, you will kindly permit us to presume your approval for the above document as finalized. However, in case comments, technical in nature are received, then it may be finalized either in consultation with the Chairman, Sectional Committee or referred to the Sectional Committee for further necessary action if so desired by the Chairman, Sectional Committee.

The document is also hosted on BIS website www.bis.gov.in.

Thanking you,

Yours faithfully,

Sd/-

(Arun Kumar S.)

Sc. 'E'/Director and Head (Civil Engg.)

Encl: As above

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

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Draft Indian Standard

**CONTINUOUS HOT-DIP GALVANIZED STEEL BARS FOR CONCRETE
REINFORCEMENT — SPECIFICATION**

Concrete Reinforcement
Sectional Committee, CED 54

Last date of Comments:
05 January 2024

Concrete Reinforcement Sectional Committee, CED 54

FOREWORD

(Formal clauses to be added later)

Corrosion of steel reinforcement is a serious concern in reinforced concrete construction. One of the long-term measures, which could help in mitigate steel corrosion is coating bars through galvanization. The usage of galvanized bars is justified, both technically and economically, in corrosive environments such as, coastal regions, areas exposed to industrial pollution, and the like. The batch-wise hot-dip galvanized bars have been in use for several decades and are covered by the Indian Standard, IS 12594 : 1988 'Hot-dip zinc coating on structural steel bars for concrete reinforcement — Specification'. Worldwide, continuous galvanized bars are gaining acceptance as reinforcement in concrete and can be used to meet the demand of increased durability of concrete structures in the country.

The standard also covers guidelines for use of continuous hot-dip galvanized reinforcing bars at site as well as guidelines for using such bars with non-galvanized steel forms in Annex A and Annex B, respectively.

In the preparation of this standard, considerable assistance has been derived from ASTM A1094/A1094M-16 'Standard specification for continuous hot-dip galvanized steel bars for concrete reinforcement'.

For the purpose of deciding whether a particular requirement of this 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 2:2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

BUREAU OF INDIAN STANDARDS

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Draft Indian Standard

**CONTINUOUS HOT-DIP GALVANIZED STEEL BARS FOR CONCRETE
REINFORCEMENT — SPECIFICATION**

Concrete Reinforcement
Sectional Committee, CED 54

Last date of Comments:
05 January 2024

Concrete Reinforcement Sectional Committee, CED 54

1 SCOPE

1.1 This standard covers requirements for continuous hot-dip galvanized steel reinforcing bars for use in reinforced concrete structures. This specification covers steel reinforcing bars, with protective zinc or zinc-alloy coatings applied by the continuous hot-dip process.

NOTE — Continuous hot-dip galvanized steel reinforcing bars are hereinafter referred as CHG bars in this standard.

1.2 Batch-wise hot-dip galvanized reinforcing bars are covered in IS 12594.

2 REFERENCES

The standards listed below contain provisions, which through reference in this text constitute provisions of this 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:

<i>IS No.</i>	<i>Title</i>
IS 209 : 1992	Zinc ingot — Specification (<i>fourth revision</i>)
IS 1786 : 2008	High strength deformed steel bars and wires for concrete reinforcement — Specification (<i>fourth revision</i>)
IS 12554 (Part 2) : 1999	Specification for non-destructive coating thickness testing instruments: Part 2 Magnetic instruments

IS 12594 : 1988	Hot-dip zinc coating on structural steel bars for concrete reinforcement — Specification
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3 TERMINOLOGY

For the purpose of this standard, the following terms and their definitions shall apply.

3.1 Continuous Hot-Dip Galvanizing — The process of uninterrupted passage of long lengths of steel bars through a molten bath of zinc alloy.

3.2 Lot — A bunch of bars of same size and specification that have been coated during the single production shift.

4 ORDERING INFORMATION

4.1 Orders for CHG bars for concrete reinforcement as per this standard shall include the following information:

- a) Specification for reinforcing bars to be coated, along with designation of Indian Standard and its year of issue;
- b) Quantity of bars; and
- c) Size and grade of bars.

4.2 The purchaser shall have the option to specify additional requirements, including but not limited to, the following:

- a) Requirements of inspection;
- b) Manufacturer certification and report of test results; and
- c) Other special requirements, if any (for instance, packing instructions etc.).

5 MATERIALS

5.1 Reinforcing Steel

Reinforcing steel to be galvanized shall comply with IS 1786.

5.2 Coating Material

Appropriate amounts of zinc, aluminum and other elements shall be decided in order to meet the chemical compositions of the coating. The zinc used for coating shall conform to IS 209. The molten coating material shall contain at least 98 percent zinc, aluminum in the range of 0.20 - 0.25 percent, and lead content shall be less than 0.003 percent.

6 GALVANIZING PROCEDURE

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

6.2 Continuous Hot-Dip Galvanizing

6.2.1 After adequate pretreatment, the reinforcing bars shall be coated by passing individual bars through a zinc-alloy flooded trough or tube located above a zinc-alloy bath, then immediately through an air or steam wiping device to remove excess coating and provide a uniform coating. The aluminum can be added in the form of master alloy or as the specified ingredient in the zinc smelter. The chromate treatment is not recommended.

7 CHARACTERISTICS OF ZINC-COATED STEEL REINFORCING BARS

7.1 Characteristics of Coating

7.1.1 Finish and Appearance

The galvanized bars shall not have any uncoated areas. The coating shall be free from blisters, flux spots or inclusions, dross, and acid spots. In addition, the presence of tears or sharp spikes, which make the bar hazardous to handle, shall be cause for rejection.

The cut ends of the bars shall be coated with an appropriate zinc-rich formulation.

7.1.2 Adherence

The adherence of the zinc coating shall be evaluated by the bend test as specified in IS 1786. After the test, the coating on the outer surface of the bent bar shall not peel or flake-off (as per a person with normal or corrected vision). In addition, the coating shall be adherent so that it cannot be removed by any reasonable process of handling.

7.1.3 Thickness

The minimum average thickness of zinc alloy coating shall be at least 50 micrometers (equivalent to 360 g/m²). The measured thickness at any location shall be at least 40 micrometers.

7.2 Testing of CHG Bars

7.2.1 Test Unit

Unless otherwise agreed to, three percent random samples, subject to a minimum of three samples from each lot offered for inspection or testing by the manufacturer, shall be drawn and tested for confirming the galvanized coating.

7.2.2 The thickness of the coating shall be determined by magnetic thickness gauge measurements in accordance with IS 12554 (Part 2).

NOTE — Measuring the coating thickness on curved surfaces is difficult. It is essential that the probe in the measuring tool be positioned perpendicular to the surface in-between the ribs

to determine the coating thickness; and accordingly, an appropriate probe shall be chosen for measurement.

7.2.3 Testing of Mechanical Properties

CHG bars shall meet the requirements of mechanical properties as specified in IS 1786 for that particular grade of parent bar which is coated.

7.2.4 Retests

If the coating thickness requirements specified in 7.2.1 are not met, three additional random samples from the lot shall be taken, and checked for conformance. The lot shall be accepted only if all three additional samples satisfy the requirement.

8 PERMISSIBLE AMOUNT OF DAMAGED COATING AND REPAIR OF DAMAGED COATING

Damage in coating discernible to a person with normal or corrected vision shall be repaired using an appropriate zinc-rich formulation.

The total damaged surface area, prior to repair with the zinc-rich formulation, shall not exceed one percent of the surface area in a sample of 1 m length of a reinforcing bar. This limit on repaired damage does not include sheared or cut ends that are coated with the zinc-rich formulation.

The coating at repaired areas shall have a minimum thickness of 50 μm .

NOTE — These requirements apply to the coated product before the galvanized steel reinforcement is accepted from the manufacturer by the purchaser and are not site acceptance criteria.

9 PACKING, HANDLING, STORAGE, TRANSPORT

CHG bars shall be delivered in the form of bundle of straight bars subject to agreement between manufacturer and purchaser. Arrangements shall be made such that the coating is not significantly altered during handling, storage, or transport.

10 MANUFACTURER'S TEST CERTIFICATE

When specified in the purchase order or contract, the manufacturer shall furnish, at the time of shipment, a certification that the material was manufactured and tested in accordance with this standard. A report of the test results, shall be included in the manufacturer's test certificate.

11 MARKING

11.1 Labeling shall be sufficient to ensure product traceability. At least the following information shall be marked on each bundle of CHG bars:

- a) Name or address of manufacturer's factory (both steel manufacturer and galvanizer);
- b) Product identification (grade, diameter, length, or configuration as appropriate);
- c) Mass of bundle of straight CHG bars; and
- d) Batch number or equivalent information for cross reference to inspection documents.

11.2 BIS Certification Marking

Each bundle of CHG bars 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 bundle of bars may be marked with the Standard Mark.

ANNEX A
(Foreword)

GUIDELINES FOR SITE PRACTICE

A-1 This standard is a product specification. Its requirements cease when the purchaser accepts the CHG bars from the manufacturer. As a product standard, it does not delineate requirements for subsequent practices at the site.

The project specifications shall prescribe requirements for the CHG bars from the time the purchaser accepts the CHG bars from the manufacturer, and subsequent practices at the site. In the absence of such requirements in the project specifications, the following guidelines for site practices are recommended.

- a) Exercise care when handling CHG bars. Avoid bundle-to-bundle abrasion or bar-to-bar abrasion resulting from sagging bundles;
- b) Equipment for handling CHG bars should have protected contact areas;
- c) CHG bars should be off-loaded as close as possible to their usage area in order to minimize re-handling;
- d) CHG bars should be stored off the ground on protective bearers, and timbers placed between bundles when stacking is necessary. The supports should be spaced sufficiently close to prevent sags in the bundles;
- e) CHG bars and uncoated steel reinforcing bars should be stored separately;
- f) CHG bars and uncoated steel reinforcing bars should not be used in combination in reinforced concrete members;
- g) The maximum amount of repaired damaged areas of coating, including areas repaired at the manufacturer's facility, should not exceed 2 percent in any one metre length of the coated bar:
 - 1) When the extent of damaged coating exceeds 2 percent of the surface area in any one metre length of the coated steel reinforcing bar, the coated bar should be discarded; and
 - 2) When the extent of damaged coating does not exceed 2 percent of the surface area in any one metre length of the coated bar all damaged coating discernible to a person with normal or corrected vision should be repaired with a zinc-rich formulation complying with this standard.
- h) In case CHG bars are joined through welding or by using mechanical splices such as threaded couplers or coupling sleeves,
 - 1) the threaded coupler or coupling sleeve conforming to IS 16172 used for mechanical splicing of CHG bars should also be galvanized with zinc rich formulation complying with this standard.
 - 2) After installing mechanical splices on CHG bars, damaged coating and areas of removed coating around the mechanical splices should be repaired with zinc rich formulation complying with this standard.
 - 3) After completing welds on CHG bars, damaged coating areas should be repaired with zinc rich formulation complying with this standard. Welded area should also be coated with the same zinc-rich formulation as used for the repair of damaged coating.

- j) Fixed CHG bars should be inspected for damaged coating prior to pouring the concrete. Particular attention should be paid to sheared ends of coated bars. Where damage exists, it should be repaired with an appropriate zinc-rich formulation;
- k) When fixing CHG bars, all wire bar supports and spacers, and tying wire should be coated with zinc or with dielectric material;
- m) After fixing, walking on coated steel reinforcing bars should be avoided. The positioning of mobile equipment should be planned to avoid damage to the coated reinforcement; and
- n) When immersion-type vibrators are used to consolidate concrete around coated steel reinforcing bars, the vibrators should be equipped with non-metallic, resilient heads.

ANNEX B
(Foreword)

**GUIDELINES FOR USE OF CONTINUOUS HOT-DIP GALVANIZED STEEL
REINFORCING BARS WITH NON-GALVANIZED STEEL FORMS**

B-1 CHG bars contain a zinc or zinc-alloy coated surface that is of a different electrochemical potential than uncoated steel or stainless steel. When forms for casting concrete are made of uncoated steel or stainless steel, the use of continuous hot-dip galvanized steel reinforcing bars necessitates an electrical isolation of the continuous hot-dip galvanized steel reinforcing bars from the forms. Should electrical contact between the two occur, the result will be a shadowing of a ghost appearance of the reinforcing bar on the finished concrete surface. Zinc ions will tend to migrate to the surface of the concrete and appear in a darker color, or shadow, on the concrete surface, in the shape of the reinforcing bar configuration. In more severe cases, the concrete can adhere to the metal forms.