भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
BUREAU OF INDIAN STANDARDS

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व्यापक परिचालन मसौदा

हमारा संदर्भ : सीईडी 54/टी-21 **07 अप्रैल 2025**

तकनीकी समिति: कंक्रीट प्रबलन विषय समिति, सीईडी 54

प्राप्तकर्ता :

1. **सिविल अभियांत्रिकी विभाग परिषद, सीईडीसी के सभी सदस्य**
2. **कंक्रीट प्रबलन विषय समिति, सीईडी 54 और इसकी उपसमितियों के सभी सदस्य**
3. **रुचि रखने वाले अन्य निकाय।**

महोदय/महोदया,

निम्नलिखित मानक का मसौदा संलग्न हैं:

प्रलेख संख्या	शीर्षक
सीईडी 54 (27104) WC	**माइल्ड स्टील और मध्यम तन्यता वाले स्टील बार और कंक्रीट प्रबलन के लिए हार्ड-ड्रॉन स्टील वायर की विशिष्टि का भारतीय मानक मसौदा भाग 2 कोल्ड रीड्यूस्ड स्टील के तार** (IS 432 **का चौथा पुनरीक्षण**) **(ICS: 91.100: 77.140.15)**

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

सम्मतियाँ भेजने की अंतिम तिथि: 07 मई 2025

सम्मति यदि कोई हो तो कृपया अधोहस्ताक्षरी को ई-मेल द्वा **ced54@bis.gov.in** पर या उपरलिखित पते पर, संलग्न फोर्मेट में भेजें। सम्मतियाँ बीआईएस ई-गवर्नेंस पोर्टल, **www.manakonline.in** के माध्यम से ऑनलाइन भी भेजी जा सकती हैं।

यदि कोई सम्मति प्राप्त नहीं होती है अथवा सम्मति में केवल भाषा संबंधी त्रुटि हुई तो उपरोक्त प्रालेख 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 प्रालेख को अंतिम रूप दे दिया जाएगा।

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

धन्यवाद।

भवदीय
ह/-
द्वैपायन भद्र
वैज्ञानिक ई एवं प्रमुख
सिविल अभियांत्रिकी विभाग
ई-मेल: ced54@bis.gov.in

संलग्न: उपरलिखित

भारतीय मानक ब्यूरो
(उपभोक्ता मामले, खाद्य एवं सार्वजनिक वितरण मंत्रालय, भारत सरकार)
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WIDE CIRCULATION DRAFT

Our Reference: CED 54/T-21 **07 April 2025**

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 and its Subcommittees
3. All others interested.

Dear Sir/Madam,

Please find enclosed the following draft:

Doc No.	Title
CED 50 (27104) WC	**Draft Indian Standard Specification for Mild Steel and Medium Tensile Steel Bars and Hard-Drawn Steel Wire for Concrete Reinforcement** Part 2 Cold Reduced Steel Wires [Fourth Revision of IS 432 (Part 2)] **(ICS 91.100: 77.140.15)**

Kindly examine the attached 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: 07 May 2025

Comments if any, may please be made in the enclosed format and emailed at ced54@bis.gov.in or sent at the above address. Additionally, comments may be sent online through the BIS e-governance portal, www.manakonline.in.

In case no comments are received or comments received are of editorial nature, 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/-

Dwaipayan Bhadra
Scientist 'E' & Head
Civil Engineering Department
Email: ced54@bis.gov.in

Encl: As above

FORMAT FOR SENDING COMMENTS ON THE DOCUMENT

[Please use A4 size sheet of paper only and type within fields indicated. Comments on each clause/sub-clause/ table/figure, etc, be stated on a fresh row. Information/comments should include reasons for comments, technical references and suggestions for modified wordings of the clause. **Comments through e-mail to ced54@bis.gov.in shall be appreciated**.]

Doc. No.: CED 54 (27104) WC **BIS Letter Ref**: CED 54/T-21

Title: Draft Indian Standard Specification for Mild Steel and Medium Tensile Steel Bars and Hard-Drawn Steel Wire for Concrete Reinforcement
Part 2 Cold Reduced Steel Wires [Fourth Revision of IS 432 (Part 2)] (ICS 91.100: 77.140.15)

Last date of comments: 07 May 2025

Name of the Commentator/ Organization: _____

Sl No.	Clause/ Para/ Table/ Figure No. commented	Type of Comment (General/ Technical/ Editorial)	Comments/ Modified Wordings	Justification of Proposed Change

NOTE- Kindly insert more rows as necessary for each clause/table, etc

BUREAU OF INDIAN STANDARDS

DRAFT FOR COMMENTS ONLY

Draft Indian Standard

MILD STEEL AND MEDIUM TENSILE STEEL BARS AND COLD REDUCED STEEL WIRES FOR CONCRETE REINFORCEMENT — SPECIFICATION

PART 2 COLD REDUCED STEEL WIRES

[*Fourth Revision of* IS 432 (Part 2)]

Concrete Reinforcement Sectional Committee, CED 54	Last Date of Comments: **07 May 2025**

FOREWORD

(*Formal clauses to be added later*)

This standard (Part 2) has been formulated to cover cold reduced steel wire for concrete reinforcement, manufactured from either cold-drawing or cold rolling or a combination of both. These wires are especially used for the manufacture of wire mesh for reinforcement of concrete. These wires are cold reduced from wire rods by passing them through dies/rollers. Such wires made from cold-rolling process allow to provide ribs/indentations in the process.

This standard was first published in 1953 and subsequently revised in 1960, 1966 and 1982. In the last revision of the standard, apart from adopting SI units in specifying the various physical requirements, certain provisions were revised based on the then updated Indian Standards on physical and chemical tests for steel.

The present revision has been taken up with a view to modifying the earlier provisions in light of experience gained during the use of this standard by both the manufacturers and the users.

In this revision of the standard, the following major modifications have been incorporated:

a) The titles of standard have been accordingly modified to ‘Mild steel and Medium tensile steel bars and Cold reduced steel wires for concrete reinforcement — Specification’.
b) The standard previously covered wires made from cold drawing process only. The scope of the standard has been extended to cover wires made from cold rolling process as well as those made from combination of cold drawing and cold rolling.
c) The scope has been also extended to cover cold rolled ribbed and cold rolled indented wires in addition to plain hard-drawn wires.

d) Reverse bend test has been replaced by bend test and rebend test as later are suitable for both low diameter and high diameter wires.
e) Provisions on sampling and criteria for conformity has been aligned with IS 280 ‘Mild steel wire for general engineering purposes (*Fourth Revision*)’.
f) Physical Properties of Wires being changed as per ISO 10544 as follows:

Reference clauses	*Property / Parameter*	*Min. Values as per Earlier Third Revision*	*Proposed Values as per fourth Revision*
Clause 8.1 Table 3	Ultimate tensile strength	570 MPa	550 MPa
Clause 8.1 Table 3	0.2 Percent Proof strength or yield strength	480 MPa	500 MPa
Clause 8.1 Table 3	Percentage Elongation	7.5 percent Min on 8 times dia gauge length	12 percent Min on 5 times Dia or 5.65 x Sqrt (Area) – gauge length – based on guage length conversion of earlier 7.5 percent as per IS:3803
Clause 8.1 Table 3	UTS/YS Ratio	Not specified	1.05 Min

In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

Assistance has been derived from the following International Standard in the formulation of this standard:

ISO 10544:1992 Cold-reduced steel wire for the reinforcement of concrete and the manufacture of welded fabric
ISO 15630-1:2019 Steel for the reinforcement and prestressing of concrete Test methods Part 1: Reinforcing bars, rods and wire

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

DRAFT FOR COMMENTS ONLY

Draft Indian Standard

MILD STEEL AND MEDIUM TENSILE STEEL BARS AND COLD REDUCED STEEL WIRES FOR CONCRETE REINFORCEMENT — SPECIFICATION

PART 2 COLD REDUCED STEEL WIRES

[*Fourth Revision of* IS 432 (Part 2)]

Concrete Reinforcement Sectional Committee, CED 54	Last Date of Comments: **07 May 2025**

1 SCOPE

1.1 This standard (Part 2) covers the requirements of cold reduced steel wire of medium strength for use as reinforcement or welded wire fabric in concrete.

1.2 Cold reduced steel wires of the following surface configurations are covered in this standard:

a) Plain;
b) Ribbed (*see* Fig. 1); and
c) Indented (*see* Fig. 2).

1.3 This standard applies to wire made from rod by working through dies or rollers or a combination of both. The production process is at the discretion of the manufacturer.

1.4 Wires produced from plates and railway rail finished products, are excluded.

1.5 For wire supplied in coil form, the requirements of this standard apply to the straightened product.

2 REFERENCES

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

IS No.	*Title*
IS 228 (Part 1 to 24) (*relevant parts*)	Methods of chemical analysis of steels
IS 1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)

IS 1608 (Part 1) : 2022 /ISO 6892-1 : 2019	Metallic materials — Tensile testing: Part 1 Method of test at room temperature (*fifth revision*)
IS 1716 : 2023 /ISO 7801 : 1984	Metallic materials — Wire — Reverse bend test (*third revision*)

3 TERMINOLOGY

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

3.1 Bundle — Two or more coils or a number of lengths properly bound together.

3.2 Coil — One continuous piece of wire as drawn/rolled in the form of a coil.

3.3 Core — The part of cross-section of the wire that contains neither ribs nor indentations.

3.4 Elongation — The increase in length of a tensile test piece under stress. The elongation at fracture is conventionally expressed as a percentage of the original gauge length of a standard test piece.

3.5 Indented Wire — Wire with a regular pattern of surface indentations to enhance its bond properties.

3.6 Inclination of Indentation (*β*) — The angle between the indentation and the longitudinal axis of the wire (*see* Fig. 2).

3.7 Indentation Spacing (*c*) — The distance between the centres of two consecutive indentations measured parallel to the axis of the wire (*see* Fig. 1).

3.8 Inspection — Activities such as measuring, examining, testing, gauging one or more characteristics of a product or service and comparing these with specified requirements to determine conformity.

3.9 Nominal Cross-sectional Area — The cross- sectional area equivalent to the area of a circular plain wire of the nominal diameter.

3.10 Plain Wire — Smooth surfaced wire without bond enhancing properties.

3.11 Product Analysis — Chemical analysis of a sample from a wire.

3.12 Proof Stress — The stress which is just sufficient to produce, under load, a non-proportional elongation equal to a specified percentage of the original gauge length.

3.13 Ribbed Wire — Wire with a regular pattern of surface protrusions designed to enhance its bond properties.

3.14 Rib Height (*a*) — The distance from the highest point of the rib to the surface of the core, to be measured normal to the axis of the wire (*see* Fig. 2).

3.15 Rib Inclination — The angle between the rib and the longitudinal axis of the wire (*see* Fig. 1).

3.16 Rib Spacing (*c*) — The distance between the centres of two consecutive transverse ribs measured parallel to the axis of the wire (*see* Fig. 1).

3.17 Specific Projected Indentation Area (f_p) — The area of the projections of all indentations on a plane perpendicular to the longitudinal axis of the wire, divided by the wire length and the nominal circumference (*see* 7.2.2).

3.18 Specific Projected Rib Area (f_r) — The area of the projections of all ribs on a plane perpendicular to the longitudinal axis of the wire, divided by the wirelength and the nominal circumference (*see* 7.2.1).

3.19 Transversal Indentationless Perimeter (Σe_i) — The sum of the distances along the surface of the core between the transverse indentations of adjacent rows measured as the projection on a plane perpendicular to the wire axis (*see* Fig. 1).

3.20 Transversal Ribless Perimeter (Σf_i) — The sum of the distances along the surface of the core between the transverse ribs of adjacent rows measured as the projection on a plane perpendicular to the wire axis (*see* Fig. 2).

3.21 Ultimate Tensile Stress — The maximum load reached in a tensile test divided by the original cross-sectional area of the gauge length portion of the test piece.

3.22 Cold Reduced Wire — Cold-drawn or cold rolled steel wire of largely circular cross section.

4 MANUFACTURE AND CHEMICAL COMPOSITION

4.1 The wire shall be cold-drawn or cold rolled or a combination thereof from mild steel made by the open hearth, electric arc furnace, new oxygen furnace, electric duplex, acid bessemer, basic oxygen, or a combination of these processes. Induction furnace with secondary refining may also be used for steel making.

4.1.1 The ladle analysis of steel tested in accordance with relevant parts of IS 228, shall not contain quantities of the given elements higher than those specified in Table 1.

Table 1 Chemical Composition - Maximum Values in Percentage by Mass
(*Clause* 4.1)

Sl No.	Carbon, C	Silicon, Si	Manganese, Mn	Phosphorus, P	Sulphur, S	Nitrogen, N	C_{eq}
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	0.22	0.60	1.60	0.050	0.050	0.008	0.5
ii)	(0.24)[1)]	(0.65)	(1.70)	(0.055)	(0.055)	(0.009)	(0.52)

[1)]The values in brackets apply for the product analysis.

The carbon equivalent, C_{eq}, shall be calculated according to the formula,

$$C_{eq} = C + \frac{Mn}{6} + \frac{(Cr + V + Mo)}{5} + \frac{(Cu + Ni)}{15}$$

where C, Mn, Cr, V, Mo, Cu and Ni are percentage by mass of respective elements of the steel.

5 FREEDOM FROM DEFECTS

All finished wire, subject to the provisions of **8** shall be cleanly drawn to the specified size and shall be sound, free from splits, surface flaws and other defects likely to impair its use for concrete reinforcement, and finished in a workmanlike manner.

6 NOMINAL SIZES

6.1 Cold reduced wire shall be supplied in the following nominal sizes:

a) Plain Wires — 2.50 mm, 3 mm, 4 mm, 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm and 12 mm; and

NOTE — Wire diameter 2.50 mm, 3 mm and 4 mm shall be manufactured for application as per purchaser's requirements. These wire sizes are used in curved concrete elements.

b) Ribbed/Indented Wires — 5 mm, 6 mm, 7 mm, 8 mm, 9 mm, 10 mm, 11 mm and 12 mm.

7 TOLERANCES

7.1 For plain wires, the tolerance on the nominal diameter shall be $^{+2}_{-1}$ percent. For ribbed or indented wires, the values for the nominal cross-sectional area and nominal mass per unit length of individual wires and tolerance thereon shall be as given in Table 2.

7.1.1 As regards plain wires, for the purpose of determining whether the actual diameter of the wire is within the specified tolerances, the diameter shall be determined with a micrometer by taking two measurements at right angles to each other at three places along a length of not less than 250 mm and the average of these six measurements shall be taken as the diameter of the wire.

7.1.2 As regards ribbed or indented wires, for the purpose of checking the actual diameter of the wire, same shall be determined from actual cross-sectional area which shall be in turn determined as measured mass per metre divided by density of steel taken as 0.007 85 kg/mm^2.

Table 2 Nominal Diameters and Nominal Mass
(*Clause* 7.1)

Sl No.	Nominal Wire Diameter	Nominal Cross Sectional Area	Nominal Mass per unit Length	
			Requirement	Permissible Deviation
	mm	mm^2	kg/m	percent
(1)	(2)	(3)	(4)	(5)
i)	5	19.6	0.154	± 8
ii)	6	28.3	0.222	± 8
iii)	7	38.5	0.302	± 8
iv)	8	50.3	0.395	± 8
v)	9	63.6	0.499	± 5
vi)	10	78.5	0.617	± 5
vii)	11	95.0	0.746	± 5
viii)	12	113.1	0.888	± 5

[1)] Refers to a single wire

7.2 Cutting Tolerances on Length

Cutting tolerance for wire shall be as follows:

Length	*Tolerance*
Over 3 m	± 13 mm
Less than 3 m	± 6 mm

8 PHYSICAL REQUIREMENTS

8.1 The ultimate tensile stress (UTS), proof stress/yield stress (YS), elongation and UTS/YS ratio of the cold reduced steel wire when tested in accordance with **9.2** shall meet the requirements as given in Table 3. The tensile properties shall be determined according to IS 1608 (Part 1). The test piece shall have an original gauge length of 5 times the nominal diameter. The free distance between grips shall not be less than 180 mm. For calculation of proof stress/yield stress and ultimate tensile stress, nominal cross-sectional area of the wire shall be used.

Table 3 Tensile Properties
(*Clause* 8.1)

Sl No.	0.2 Percent Proof Stress/ Yield Stress (YS), *Min*	Ultimate Tensile Stress (UTS), *Min*	Elongation Percentage ($A_{5.65}$) on Gauge Length of $5.65\sqrt{A}$, (where A is the cross-sectional area), *Min*	UTS/YS, *Min*
	N/mm^2	N/mm^2	Percentage	
(1)	(2)	(3)	(4)	(5)
i)	500	550	12	1.05

Wherever specified by the purchaser., total elongation at maximum force (A_{gt}) may be determined in accordance with IS 1608 (Part 1) which shall not be less than 2.0 percent .

8.2 Geometry of Indented and Ribbed Wires

8.2.1 *Indented Wire*

8.2.1.1 Indented wire shall have two or more rows of indentations. The indentations shall be distributed uniformly over the circumference and length of the wire. Fig. 1 shows an example of indented wire with three rows of indentations.

8.2.1.2 The minimum value for the specific projected indentation area, f_p shall be,

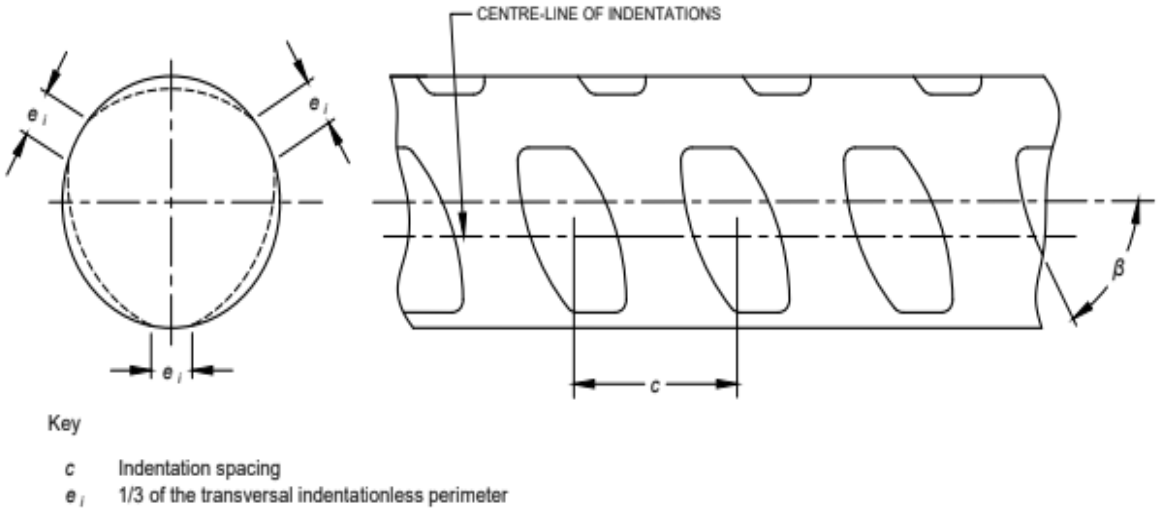
0.007 for 4 mm ≤d < 5 mm;
0.008 for 5 mm ≤d ≤ 6 mm;
0.010 for 6 mm <d ≤ 8 mm;
0.013 for 8 mm <d ≤ 10 mm; and
0.014 for 10 mm <d ≤ 16 mm.

where, f_p is calculated using the formula,

$$f_p = \frac{k \times F_p \times sin\beta}{\pi \times d \times c}$$

where,

k = number of indentation rows;
F_p = area of projection of one indentation on a plane parallel to that indentation;
β = inclination of the indentation relative to the axis of the wire;
d = nominal diameter of the wire; and
c = indentation spacing.



Key

c Indentation spacing
e_i 1/3 of the transversal indentationless perimeter

FIG. 1 EXAMPLE OF INDENTED WIRE WITH THREE ROWS

8.2.2 *Ribbed Wire*

8.2.2.1 Ribbed wire shall have two or more rows of transverse ribs equally distributed around the perimeter with a substantially uniform spacing not greater than 0.8 x *d*, where *d* is the nominal diameter. Fig. 2 shows an example of ribbed wire with three rows of transverse ribs.

8.2.2.2 The minimum value for the specific projected rib area, f_r shall be,

0.036 for 4 mm ≤ d < 5 mm;
0.039 for 5 mm ≤ d ≤ 6 mm;
0.045 for 6 mm < d ≤ 8 mm;
0.052 for 8 mm < d ≤ 10 mm;
0.056 for 10 mm < d ≤ 16 mm.

where, f_r is calculated using the formula,

$$f_r = \frac{k \times F_R \times sin\beta}{\pi \times d \times c}$$

where,

k = number of rib rows;
F_R = area of the projection of one rib on a plane parallel to that rib;
β = rib inclination relative to the axis of the wire;
d = nominal diameter of the wire; and
c = rib spacing.

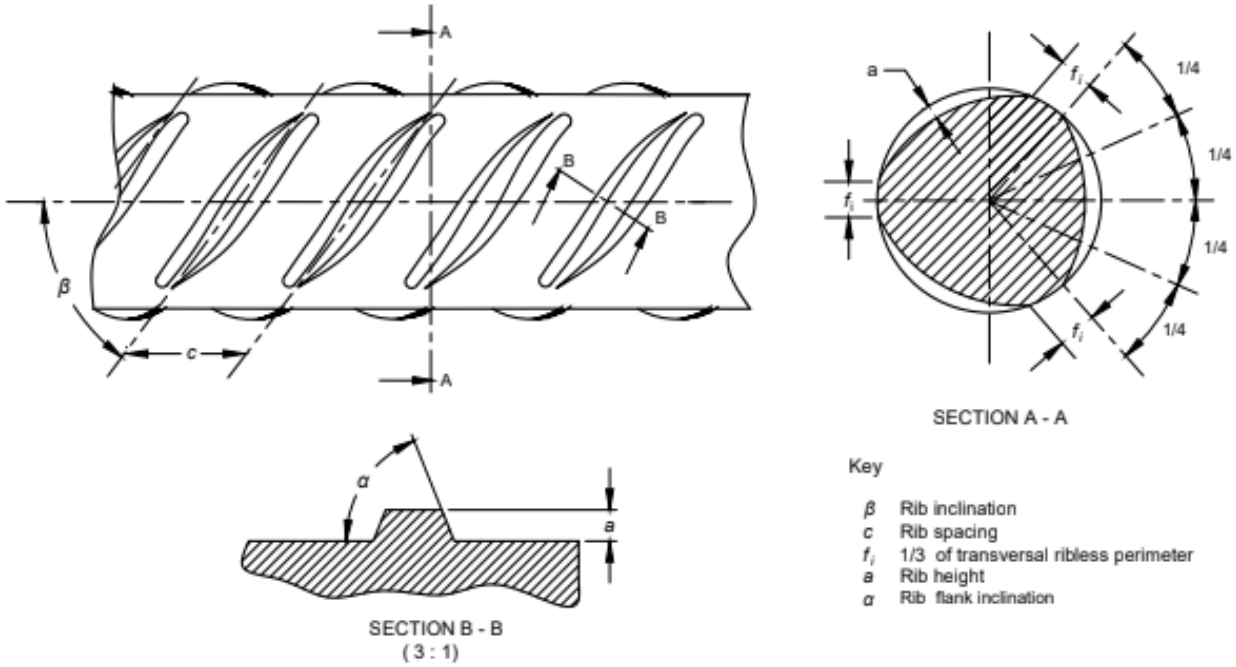


FIG. 2 EXAMPLE OF RIBBED WIRE WITH THREE ROWS

8.3 The wire shall withstand the bend test specified in **9.3**.

8.4 The wire shall withstand rebend test as specified in **9.4**.

9 TESTS

9.1 All test pieces of wire shall be selected by the purchaser or his authorised representative from the cuttings of lengths of wires or ends of coils of wires, or if they so desires, from the coil or length of wire, after it has been cut to the required or specified length and the test piece taken from any part of it.

9.1.1 In neither case, the test pieces shall be detached from the coil or length of wire, except in the presence of the purchaser or his authorised representative.

9.1.2 Before test pieces are selected, the manufacturer or supplier shall furnish the purchaser or his authorised representative with copies of the mill records giving the number of coils or bundles in each cast with sizes as well as the identification marks, whereby each coil or bundle of wire can be identified.

9.2 Tensile Test

The ultimate tensile stress, proof stress, elongation and UTS/YS ratio of wire shall be determined in accordance with IS 1608 (Part 1). The test pieces shall be cut from the finished material and straightened, where necessary. The test pieces shall not be annealed or otherwise subjected to heat treatment. Any slight straightening which may be required, shall be done cold.

9.3 Bend Test

Bend test shall be made on a test piece cut from the finished product. The test piece shall be subjected to the test method as given in Annex A.

9.4 Rebend Test

Rebend test shall be made on a test piece cut from the finished product. The test piece shall be subjected to the test method as given in Annex B.

9.5 Sampling

Sampling and criteria for conformity shall be as given in Annex C.

10 DELIVERY, INSPECTION AND TESTING FACILITIES

10.1 Unless otherwise specified, general requirements relating to supply of material, inspection and testing shall conform to IS 1387.

10.2 No material shall be despatched from the manufacturer's or supplier’s premises prior to its being certified by the purchaser or his authorized representative as having fulfilled the tests and requirements laid down in this standard except where the bundle or coil containing the wire is marked with the BIS Standard Mark (*see* **11.4**).

10.3 The purchaser or his authorized representative shall be at liberty to inspect and verify the steel makers certificate of cast analysis at the premises of the manufacturer or the supplier; when the purchaser requires an actual analysis of finished material, this shall be made at a place agreed to between the purchaser and the manufacturer or supplier.

10.4 Manufacturer’s Certificate

In case of wires which have not been inspected at the manufacturer's works, the manufacturer or supplier, as the case may be, shall supply the purchaser or his authorized representatives with the certificate stating the process of manufacture and also the test sheet signed by the manufacturer giving the result of each mechanical test and the chemical composition, if required. Each test sheet shall indicate the number or identification mark of the cast to which it applies, corresponding to the number or identification mark to be found on the material.

11 IDENTIFICATION AND MARKING

11.1 The manufacturer or supplier shall have wires, coils or bundles of wires marked in such a way that all finished wires can be traced to the cast from which they were made. Every facility shall be given to the purchaser or his authorized representative for tracing the wires to the cast from which they were made.

11.2 For each bundle/coil of wires, a metal tag shall be attached indicating cast/lot number, nominal size and surface configuration (plain, indented or ribbed).

11.3 It is recommended that plain, indented or ribbed wire should also have an identification of the manufacturer (such as name of the manufacturer or their brand

name) introduced during manufacture of the wire itself. However, identification marks introduced during rolling shall be designed and located in such a manner that the performance in use of the wire is not affected.

11.4 BIS Certification Marking

The product 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 product may be marked with the Standard Mark.

ANNEX A

(Clause 9.3)

Bend Test

The bend test shall be carried out according to IS0 15630-1. The test piece shall be bent to an angle between 160” and 180” over a mandrel of the diameter specified in table 4. The mandrel diameter for intermediate sizes shall be that of the next lower size in table 4

ANNEX B
(*Clause* 9.4)

Rebend Test

The rebend test shall be carried out according to IS0 15630-1. The test piece shall be bent over a mandrel of the diameter specified in table 5. The angle of bend, before heating (ageing) shall be 90°, and the angle of rebend shall be 20”. Both angles shall be measured before unloading. The mandrel diameter for intermediate sizes shall be that of the next lower size in table 5.

Table 4 - Mandrel diameter to be used for the bend test

Nominal diameter of wire, *d*	2.5	3	4	5	6	7	8	9	10	12	14	16
Mandrel diameter, *D*	7.5	9	12	16	20	20	25	32	32	40	50	63

Table 5 - Mandrel diameter to be used for the rebend test

Nominal diameter of wire, *d*	2.5	3	4	5	6	7	8	9	10	11	12
Mandrel diameter, *D*	12	15	20	25	32	32	40	50	50	36	63

ANNEX C
(Clause 9.5)

SAMPLING AND CRITERIA FOR CONFORMITY

A-1 LOT

A-1.1 In any consignment, all the coils of wire of the same surface configuration and diameter, manufactured under essentially similar conditions of manufacture, shall be grouped together to constitute a lot.

A-1.1.1 Samples shall be taken from each lot and tested for conformity to the standard.

A-2 SAMPLING

A-2.1 The number of coils to be taken from a lot shall be according to col 2 and 4 of Table 6. These coils shall be chosen at random (see IS 4905). Samples shall be cut from each coil so chosen as per A-3.1 and A-3.2 for physical and chemical requirements.

Table 6 Scale of Sampling and Permissible Number of Defectives
(*Clauses* A-2.1, A-3.1 and A-3.2)

No. of oils/Bundles in a Lot	No. of oils/Bundles for Physical Requirements	Permissible Defective	No. of coils/Bundles for Chemical Requirements
(1)	(2)	(3)	(4)
Up to 25	2	0	1
26-50	3	0	1
51-150	5	0	2
151-300	8	1	2
301 and above	13	1	2

A-3 PREPARATION OF SAMPLES AND NUMBER OF TESTS

A-3.1 Tests for Physical Requirements

From the coils selected from col 2 of Table 3, adequate length of test piece shall be cut from each end and subjected to physical tests, namely, size, surface condition, tensile, bend and rebend tests. A test piece failing to meet any of the requirements shall be called a defective. If the number of defective found is less than or equal to the permissible number of defective specified in col 3 of Table 3, the lot shall be considered to have conformed to physical requirements.

A-3.2 Tests for Chemical Requirements

Unless otherwise agreed, the following procedure shall be followed for chemical requirements:

From those test pieces which have conformed to physical requirements, further test pieces shall be selected at random according to col 4 of Table 3. These samples shall be tested for all the chemical requirements. If a test piece fails to meet the respective chemical requirements, it shall be called a defective. The lot shall be considered to have conformed to the chemical requirements, if all the individual test pieces tested for chemical requirements pass the test.

A-4 CRITERIA FOR CONFORMITY

A lot shall be considered to have conformed to the requirements of the standard, if A-3.1 and A-3.2 are satisfied.

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