

IS : 432 ( Part II ) - 1982

*Indian Standard*

SPECIFICATION FOR  
MILD STEEL AND MEDIUM TENSILE STEEL  
BARS AND HARD-DRAWN STEEL WIRE FOR  
CONCRETE REINFORCEMENT

**PART II HARD-DRAWN STEEL WIRE**

*( Third Revision )*

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

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**PART II HARD-DRAWN STEEL WIRE**

( *Third Revision* )

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# *Indian Standard*

## SPECIFICATION FOR MILD STEEL AND MEDIUM TENSILE STEEL BARS AND HARD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT

### PART II HARD-DRAWN STEEL WIRE

### *( Third Revision )*

#### 0. FOREWORD

**0.1** This Indian Standard ( Part II ) ( Third Revision ) was adopted by the Indian Standards Institution on 14 May 1982, after the draft finalized by the Joint Sectional Committee for Concrete Reinforcement had been approved by the Civil Engineering Division Council and the Structural and Metals Division Council.

**0.2** This standard was first published in 1953 subsequently revised in 1960 and 1966. The present revision has been taken up with a view to modifying the earlier provisions in light of experience gained in working to this standard by both manufacturers and users.

**0.3** Apart from incorporating an amendment issued to this standard, this standard adopts SI units in specifying the various physical requirements. Further, certain provisions of the standard have been revised based on the latest Indian Standards on physical and chemical tests for steel.

**0.4** 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.

**0.5** 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 : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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\*Rules for rounding off numerical values ( revised ).

**1. SCOPE**

**1.1** This standard ( Part II ) covers the requirements of hard-drawn steel wire of medium strength for use as reinforcement in concrete.

**2. TERMINOLOGY**

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

**2.1 Bundle** — Two or more ' coils ' or a number of lengths properly bound together.

**2.2 Coil** — One continuous piece of wire as drawn in the form of a coil.

**2.3 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.

**2.4 Parcel** — Any quantity of finished ' wire ' whether in ' coils ' or ' bundles ' presented for examination and test at any one time.

**2.5 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.

**2.6 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.

**2.7 Wire** — Cold-drawn steel wire of circular cross section.

**3. MANUFACTURE AND CHEMICAL COMPOSITION**

**3.1** The wire shall be cold-drawn from mild steel made by the open hearth, electric duplex, acid bessemer, basic oxygen, or a combination of these processes. In case any other process is employed in the manufacture of steel, prior approval of the purchaser should be obtained. In case basic oxygen process is employed for manufacture, the nitrogen content of the steel shall not exceed 0.008 percent.

**3.1.1** The ladle analysis when made in accordance with relevant parts of IS : 228\* shall show that the steel contains not more than 0.050 percent of sulphur and not more than 0.050 percent of phosphorus.

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\*Methods for chemical analysis of steels ( *second revision* ) ( being issued in parts ).

#### 4. FREEDOM FROM DEFECTS

4.1 All finished wire, subject to the provisions of 7 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.

#### 5. NOMINAL SIZES

5.1 Hard-drawn wire shall be supplied in the following nominal sizes:

Diameters of hard-drawn wire	2.65, 3.0, 3.15, 3.55, 4.0, 4.5, 4.75, 5.0, 5.3, 5.6, 6.0, 6.3, 7.1, 7.5, 8.0, 9.0, 9.5 and 10 mm
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NOTE—It is proposed to rationalize the diameters of hard-drawn wire and include only 3, 4, 5, 6, 8 and 10 mm in the next revision of the standard. Sizes other than these are now included to facilitate manufacturers and users to change over to the rationalized sizes in this period.

#### 6. TOLERANCES

6.1 The tolerance on the nominal diameter shall be  $\pm \frac{2}{1}$  percent.

6.1.1 For purposes 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.

6.2 Cutting Tolerances on Length—Cutting tolerance for wire shall be as follows:

<i>Length</i>	<i>Tolerance</i>
Over 3 m	$\pm 13$ mm
Less than 3 m	$\pm 6$ mm

#### 7. PHYSICAL REQUIREMENTS

7.1 The ultimate tensile stress, proof stress and elongation of the wire when tested in accordance with 8.2 shall not be less than the following values:

- Ultimate tensile stress, N/mm<sup>2</sup> 570
- Proof stress (0.2 percent), N/mm<sup>2</sup> 480
- Elongation over a gauge length of  $7\frac{1}{2}$  percent  
8 D, where D is the dia of wire,

7.2 The wire shall withstand the reverse bend test specified in 8.3.

## 8. TESTS

8.1 All test pieces of wire shall be selected by the purchaser or his authorized representative, either

- a) from the cuttings of lengths of wires or ends of coils of wires, or
- b) if he 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.

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

8.1.2 Before test pieces are selected, the manufacturer or supplier shall furnish the purchaser or his authorized 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.

8.2 **Tensile Test** — The ultimate tensile stress, proof stress and elongation of wire shall be determined in accordance with IS : 1521-1972\*. 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.

8.3 **Reverse Bend Test** — Reverse bend test shall be made on a test piece cut from the finished product. The test piece shall not be annealed or subjected to any heat treatment before testing. The test piece shall withstand one complete cycle of reverse bend around a pin of size indicated below, without showing any sign of fracture when reverse bend test is carried out in accordance with the requirements of IS : 1716-1971†:

<i>Dia of Specimen Wire</i>	<i>Dia of Pin</i>
7.5 mm and under	Equal to diameter of specimen
Over 7.5 mm	Twice the diameter of specimen

\*Method for tensile testing of steel wire (*first revision*).

†Method for reverse bend testing of steel wire (*first revision*).

**8.4 Re-tests** — Should any one of the test pieces first selected fail to pass any of the tests specified in this standard, two further samples shall be selected for testing in respect of each failure. Should the test pieces from both these additional samples pass, the material represented by the test samples shall be deemed to comply with the requirements of that particular test. Should the test piece from either of these additional samples fail, the material represented by the test sample shall be considered as not having complied with this standard.

**8.5 Sampling** — One tensile test and one bend test each shall be made for every 5 tonnes or less in any parcel of wire.

## 9. DELIVERY, INSPECTION AND TESTING FACILITIES

**9.1** Unless otherwise specified, general requirements relating to the supply of material, inspection and testing shall conform to IS : 1387-1967\*.

**9.2** 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 ISI Certification Mark.

**9.3** The purchaser or his authorized representative shall be at liberty to inspect and verify the steel maker's 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.

**9.4 Manufacturer's Certificate** — In the 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.

## 10. IDENTIFICATION AND MARKING

**10.1** The manufacturer or supplier shall have ingots, billets and wires, or bundles of wires marked in such a way that all finished wires can be

\*Specification for general requirements for the supply of metallurgical materials (first revision).



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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.

### **10.2 BIS Certification Marking**

The product may also be marked with Standard Mark.

**10.2.1** The use of the Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

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