BUREAU OF INDIAN STANDARDS
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Draft Indian Standard
भारतीय मानक प्रारूप

STEEL WIRE FOR HOSE REINFORCEMENT — SPECIFICATION
होज़ प्रबलन के लिए इस्पात के तार - विशिष्टि

ICS 77.140.65

Wrought Steel Products Sectional Committee. MTD 04	Last date for receipt of comments: **29 May 2025**

FOREWORD

(*Formal clauses would be added later*.)

This standard has been formulated to cover technical requirements of steel wire for hose reinforcement. There is a growing need for high-performance hoses capable of withstanding extreme pressures in various industrial applications. As industries have evolved and the demand for reliable and durable hoses increased, it has become essential to establish a standard that ensures the quality of the raw materials used in their production. Recognizing that carbon steel wires are fundamental to the integrity and performance of these hoses; this standard has been formulated to provide clear specifications for steel wire used in hose reinforcement. By adhering to these guidelines, the hose industry can ensure that it receives the requisite quality of raw materials, ultimately enhancing safety and performance in high-pressure applications.

In the preparation of this standard, assistance has been derived from the following international standard:

ISO 23717 : 2022	Steel wire and wire products — Hose reinforcement wire

The composition of the Committee responsible for the formulation of this standard is given in Annex C. (to *be added at later stage*)

For all the tests specified in this standard (chemical/physical/others), the method as specified in relevant ISO Standard may also be followed as an alternate method.

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.

Draft Indian Standard

STEEL WIRE FOR HOSE REINFORCEMENT — SPECIFICATION

1 SCOPE

This standard covers the requirements such as chemical composition, dimensions and mechanical properties of steel wire with a high mass fraction of carbon, generally brass coated, for reinforcing high-pressure hoses.

This is applicable to single wire used in multiple parallel braided or spirally wrapped form for reinforcement in a rubber or synthetic hose that is made to withstand a relatively high bursting pressure.

2 REFERENCES

The standards listed in Annex A 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

3 TERMINOLOGY

For the purpose of this standard. the definitions given in IS 1956 (Part 3) and the following shall apply.

3.1 Nominal Diameter *d*
The value of the diameter by which the wire is designated and specified by the purchaser

3.2 Out of Roundness
The arithmetic difference between the maximum and minimum diameter measured in a transverse cross-section perpendicular to the wire axis

3.3 Cast
The smallest external diameter of a wire loops naturally formed when placed on a smooth surface without external tension

3.4 Tip Rise/Dead Cast
The vertical height of the cut wire end that protrudes above the flat and smooth surface. on which the wire is placed without external tension

4 CLASSIFICATION

Hose wire is classified according to five classes of tensile strength.

a) LT — Low tensile strength — 2 150 MPa to 2 450 MPa;

b) NT — Normal tensile strength — 2 450 MPa to 2 750 MPa;

c) HT — High tensile strength — 2 750 MPa to 3 050 MPa;

d) ST — Super tensile strength — 3 050 MPa to 3 350 MPa;

e) UT — Ultra tensile strength — 3 350 MPa to 3 650 MPa.

5 DESIGNATION and ORDERING

5.1 Designation

For hose wire supplies. the designation shall state. in the following order:

a) The term: hose wire;
b) The coating: *see* **6.1.4**;
c) A reference to this document. i.e. IS XXXXX
d) The tensile strength class (*see* **4**) and the nominal tensile strength;
e) The nominal diameter.

Example: Brass coated hose wire. 0.30 mm. high tensile strength HT in accordance with IS XXXXX shall be designated.

Hose wire brass coated IS XXXXX HT-0.30.

5.2 Information supplied by the purchaser and items to be agreed upon

The purchaser shall clearly state the following information concerning the product in the enquiry or order:

a) The required nominal diameter;
b) The desired quantity;
c) The coating material;

Example: 20 t hose wire brass coated IS XXXXX HT-0.30 on spools of 30 kg.

6 REQUIREMENTS

6.1 Material

6.1.1 The wire shall be manufactured from steel rod conforming to IS 7904.

6.1.2 *Chemical Composition*

The ladle analysis of steel. when carried out either by the method specified in relevant parts of IS 228 or any other established instrumental/chemical method shall be conforming to relevant grade of steel as per IS 7904. In case of any dispute. the procedure given in IS 228 and its relevant parts shall be the referee method. However. where the method is not given in IS 228 or its relevant parts. the referee method shall be as agreed to between the purchaser and the manufacture.

Permissible limits of variation in case of product analysis from the limits stipulated for ladle analysis shall also be in accordance with IS 7904.

6.1.3 *Wire*

The wire shall be cold drawn from wire rods, with or without intermediate heat treatment, in order to provide the required mechanical properties.

6.1.4 *Coating Material*

If not otherwise stipulated by the purchaser at the time of enquiry or order (*see* **5.2***)*. the coating material shall be brass with a chemical composition of Cu : (67.5 ± 4) %. A tighter range may be agreed upon.

In the case of other coatings. the specification shall be agreed between the purchaser and supplier at the time of enquiry or order.

6.2 Mechanical Properties

6.2.1 Tensile Strength. Breaking Load and Elongation

Purchaser and supplier can agree to specify the tensile strength class and diameter. or breaking load range and diameter.

When tested in accordance with **7.3.1** before and after the braiding operation. the wire shall conform to the tensile strength or breaking load values and have an elongation at rupture as specified in **Table 1.**

6.2.2 Reverse Bend Test

When tested in accordance with **7.3.2.** the wire shall withstand the minimum number of reverse bends (N_b). as specified in **Table 1** without rupture.

6.2.3 Torsion Test

When tested in accordance with **7.3.2**. the wire shall withstand the minimum number of torsions (N_t). as specified in **Table 1** without fracture.

Table 1 Mechanical Properties

Diameter. *d* mm	**Tensile Strength Class**[a] MPa	**Breaking Load Range**[b] N	**Elongation at Rupture** A_t. %. **min.**	**Reverse Bends** (N_b) **on r2.5 mm min.**	**Torsion** (N_t) (l=200d) **min.**
	Low Tensile Strength (LT)				
0.28	2 150 to 2 450	129 to 154	1.6	125	80
0.295	2 150 to 2 450	143 to 171	1.6	105	78
0.30	2 150 to 2 450	148 to 177	1.6	105	78
0.35	2 150 to 2 450	203 to 239	1.6	85	72
0.38	2 150 to 2 450	241 to 281	1.6	75	70
0.40	2 150 to 2 450	267 to 311	1.6	65	68
0.45	2 150 to 2 450	339 to 392	1.8	55	63
0.50	2 150 to 2 450	420 to 483	1.9	46	60
0.56	2 150 to 2 450	529 to 604	2.0	45	55
0.60	2 150 to 2 450	608 to 693	2.0	40	52
0.65	2 150 to 2 450	715 to 812	2.2	35	48
0.71	2 150 to 2 450	854 to 967	2.2	30	45
0.75	2 150 to 2 450	954 to 1 078	2.2	24	40
0.78	2 150 to 2 450	1 033 to 1 165	2.2	23	37
0.80	2 150 to 2 450	1 087 to 1 225	2.2	22	35
1.00	2 150 to 2 450	1 705 to 1 908	2.5	10	15

	Normal Tensile Strength (NT)				
0.20	2 450 to 2 750	73 to 90	1.6	170	85
0.22	2 450 to 2 750	89 to 109	1.6	150	82
0.25	2 450 to 2 750	116 to 139	1.6	125	78
0.28	2 450 to 2 750	146 to 174	1.6	110	76
0.295	2 450 to 2 750	163 to 192	1.6	95	74
0.30	2 450 to 2 750	169 to 199	1.6	95	74
0.33	2 450 to 2 750	205 to 240	1.6	85	69
0.35	2 450 to 2 750	231 to 269	1.6	80	67
0.38	2 450 to 2 750	273 to 316	1.6	65	66
0.40	2 450 to 2 750	303 to 350	1.6	60	65
0.45	2 450 to 2 750	386 to 441	1.8	50	58
0.50	2 450 to 2 750	478 to 544	1.9	35	55
0.56	2 450 to 2 750	601 to 680	2.0	30	49
0.60	2 450 to 2 750	691 to 779	2.0	28	47
Normal Tensile Strength (NT)					
0.65	2 450 to 2 750	812 to 913	2.2	27	43
0.71	2 450 to 2 750	971 to 1 088	2.2	25	40
0.75	2 450 to 2 750	1 085 to 1 213	2.2	23	36
0.78	2 450 to 2 750	1 174 to 1 311	2.2	21	33
0.80	2 450 to 2 750	1 235 to 1 378	2.2	20	30
	High Tensile Strength (HT)				
0.20	2 750 to 3 050	82 to 100	1.3	160	80
0.22	2 750 to 3 050	100 to 121	1.6	145	80
0.25	2 750 to 3 050	130 to 155	1.6	120	76
0.28	2 750 to 3 050	164 to 193	1.6	100	74
0.295	2 750 to 3 050	183 to 214	1.6	85	72
0.30	2 750 to 3 050	189 to 221	1.6	85	72
0.33	2 750 to 3 050	230 to 266	1.6	74	66
0.35	2 750 to 3 050	259 to 299	1.6	66	64
0.38	2 750 to 3 050	306 to 352	1.6	60	61
0.40	2 750 to 3 050	340 to 389	1.6	50	57
0.45	2 750 to 3 050	432 to 491	1.8	40	50
0.50	2 750 to 3 050	535 to 604	1.9	25	45
0.56	2 750 to 3 050	673 to 756	2.0	25	41
0.60	2 750 to 3 050	774 to 866	2.0	20	39
0.65	2 750 to 3 050	910 to 1 015	2.2	20	35
0.71	2 750 to 3 050	1 087 to 1 209	2.2	15	32

0.80	2 750 to 3 050	1 384 to 1 532	2.2	15	25
	Super Tensile Strength (ST)				
0.20	3 050 to 3 350	91 to 110	1.3	110	70
0.25	3 050 to 3 350	144 to 170	1.6	80	65
0.28	3 050 to 3 350	182 to 212	1.6	75	62
0.295	3 050 to 3 350	202 to 235	1.6	60	60
0.30	3 050 to 3 350	209 to 243	1.6	60	60
0.33	3 050 to 3 350	254 to 293	1.6	50	58
0.38	3 050 to 3 350	339 to 387	1.6	40	50
0.40	3 050 to 3 350	376 to 428	1.6	35	45
0.50	3 050 to 3 350	592 to 664	2.0	25	35
0.56	3 050 to 3 350	754 to 831	2.0	20	30
Super Tensile Strength (ST)					
0.60	3 050 to 3 350	857 to 953	2.0	15	21
0.71	3 050 to 3 350	1 204 to 1 330	2.0	12	15
	Ultra tensile strength (UT)				
0.25	3 350 to 3 650	158 to 186	1.6	55	54
0.295	3 350 to 3 650	221 to 257	1.6	40	52
0.30	3 350 to 3 650	229 to 265	1.6	40	52

NOTE — Special requirement can be determined by agreement between the purchaser and the supplier.

[a] Tensile strength and breaking load should be measured fresh and may increase above the upper limit after natural ageing.

[b] The breaking load range is calculated based on 6 sigma method.

6.3 Surface Quality

6.3.1 *General*

The wire shall not have defects such as waviness. knots. undulation. etc. The surface of the wire shall be smooth and free from grease/foreign matter. stains. oxidation areas and other contaminants. mechanical damage. scratches or brass coating damage and delamination. etc.

The wire should be uniformly and continuously coated with brass. with the exception of half-product welds.

6.3.2 *Coating Mass*

The mass of coating on the wire shall be in accordance with the values listed in **Table 2**.

Table 2 Coating Mass

Diameter. *d* mm	**Coating Mass** g/kg
$d^a \leq 0.33$ $0.33 < d$	5 ± 2 4 ± 2
[a] For those diameters. a coating mass of 5 ± 3 g/kg can be applied following an agreement between the parties concerned.	

6.3.3 *Cast and tip rise/dead cast*

If not otherwise stipulated by the purchaser at the time of enquiry or order. the cast and tip rise/dead cast shall be in accordance with the values listed in **Table 3.**

Table 3 Cast and Tip Rise

Diameter. *d* mm	**Cast** mm	**Tip Rise/Dead Cast** mm
$0.20 \leq d < 0.65$ $0.65 \leq d \leq 1.0$	100 to 250 150 to 300	<40 <40

6.4 Dimension and Tolerances

6.4.1 *Tolerance on Diameter*

The tolerance on the nominal wire diameter shall be in accordance with the values listed in **Table 4**:

Table 4 Tolerance on Diameter

Diameter. *d* mm	**Tolerance on Diameter** mm
$0.20 \leq d < 0.65$ $0.65 \leq d \leq 1.0$	±0.010 ±0.015

6.4.2 *Out of Roundness*

The out of roundness shall be not more than half the tolerance on diameter.

6.5 Delivery Conditions

6.5.1 *Unit Packages*

The wire shall be supplied in units of one single length of wire. the unit package being spools.

6.5.2 *Welds*

Welding on intermediate half-product is permitted. provided the weld is properly cleaned and smooth so as to permit proper processing. Welding on final construction sizes is not permitted.

NOTE — Welding numbers on intermediate half-product can also be determined by agreement between the purchaser and the supplier.

7 TESTING AND INPSECTION

7.1 Testing and Inspection Documents

Products shall be delivered with specific testing and the relevant inspection document. specified by the purchaser at the time of enquiry or order (*see* **5.2**).

7.2 Scope of Test Programme for Acceptance Inspection

Where appropriate. statistical testing shall be performed in accordance with criteria to be agreed between the purchaser and the supplier.

7.3 Test Procedures

7.3.1 *Tensile Test*

Tensile testing shall be carried out in accordance with IS 1608 (Part 1) on pieces comprising the full cross-section of the wire. The minimum breaking force and the elongation (A_t) at the moment of rupture shall be recorded.

7.3.2 *Reverse Bend Test and Torsion Test*

The torsion test and reverse bend test shall be performed in accordance with IS 1716 and IS 1717. The test length (l) for the torsion test shall be 200d. If agreed between the purchaser and the supplier. the test length and the spec could be changed.

The test pieces shall be subjected to a thermal ageing treatment at 150 °C for 1 h. If agreed between the purchaser and the supplier. the thermal ageing treatment may be omitted and the specification could be changed.

7.3.3 *Diameter and Out of Roundness*

The diameter shall be measured using a micrometer with a precision of ±0.001 mm.

7.3.4 *Cast and Tip Rise/ Dead Cast*

The cast and tip rise/dead cast shall be measured using a ruler with a precision of ±1 mm without external tension

7.3.5 *Coating Test*

The test on brass coating components and mass fraction of copper shall be in accordance with ISO 23475-1. or as agreed between the customer and supplier at the time of ordering.

8 Marking. Labelling and Packaging

Each spool and each unit package shall be marked with the information needed to permit traceability and reference to inspection documents.

Each spool and each unit package shall have a label attached to it. bearing at least the information specified in **Table 5.**

Other information on the label shall be as agreed between the purchaser and the supplier.

Wire shipments shall be suitably protected against mechanical damage and/or contamination during transport. *See* Annex B for examples of packaging details.

Table 5 Packing Information

Information	Spool	Box
Product identification (*d*. TS class. length)	+	+
Manufacturing plant	+	+
Identification number	+	(+)
Batch number		(+)
Delivery or order number		+
Mass (nett and gross) in kg		+
Origin		+
Customer reference		(+)
+ = mandatory (+) = optional or customer required		

9 BIS Certification Marking

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 product(s) may be marked with the Standard Mark. BIS marking or printing may not be required on the topcoat surface of the strip or cut sheet.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 228 (various parts)	Methods for chemical analysis of steels
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	Metallic materials — Wire — Reverse Bend Test (*third revision)*
IS 1717: 2018/ISO 7800 : 2012	Metallic materials — Wire — Simple Torsion Test (*fourth revision)*
IS 1956 (Part 3) : 2019	Glossary of terms relating to iron and steel : Part 3 Long products (Including Bars. Rods. Sections And Wires) (*second revision*)
IS 7904 : 2018	High carbon steel wire rods — Specification (*second revision*)
IS 8910 : 2022/ISO 404 : 2013	Steel and steel products — General technical delivery requirements (*second revision*)
ISO 23475-1 : 2021	Testing method for steel tyre cord Part 1: General requirements

ANNEX B

(*Informative*)

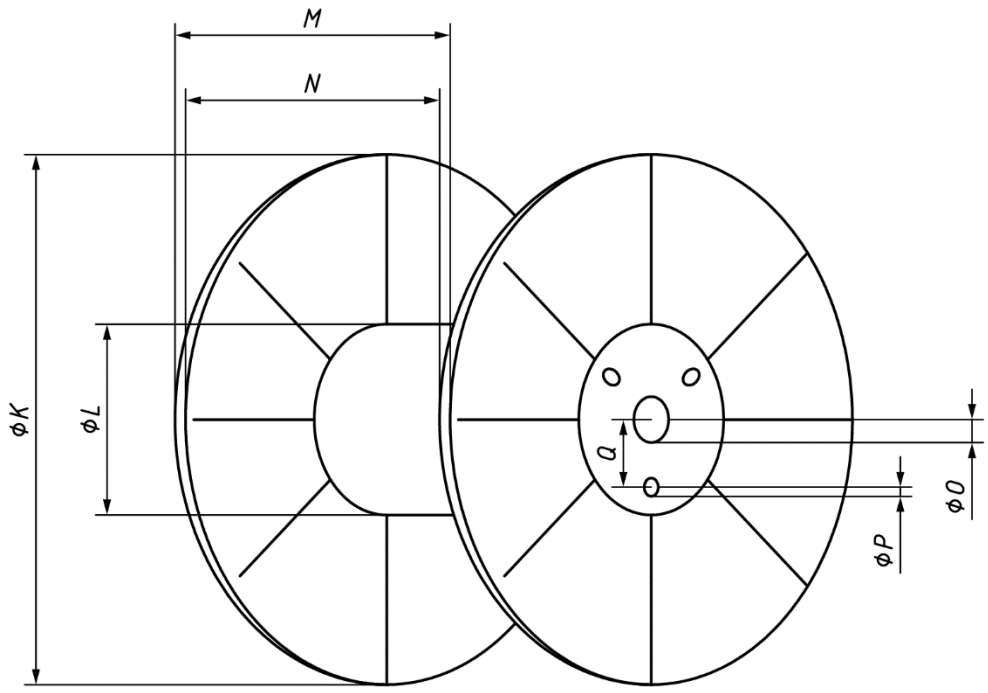
PACKAGING OF HOSE REINFORCEMENT WIRE

B-1 RECOMMENDED TYPES OF SPOOLS

Hose reinforcement wire is supplied wound on metal or plastic spools. (*see* Fig. 1)

NOTE The arrow on the flange indicates the rotation direction for unwinding the spool.

Recommended types of spool are given in **Table 6.**



Key

K diameter of flange
L diameter of barrel
M overall width
N traverse
O bore
P number x diameter of drivehole/bore
Q distance of drivehole /bore

Fig. 1 — SPOOL FOR PACKING HOSE REINFORCEMENT WIRE

Table 6 Recommended Types of Spools

(Dimensions in millimetres)

Spool type	BP60
Diameter of flange (*K*)	254
Diameter of barrel (*L*)	102
Overall width (*M*)	184
Traverse (N)	153
Bore (O)	32.5 to 33
Number x diameter of drivehole	3 × 6
Distance drivehole/bore (*Q*)	30
Mass (kg)	1.2 to 1.4
Approximate wire capacity (kg)	28

NOTE — Special requirement on spool type can be agreed between the purchaser and the supplier.

B-2 EXAMPLE OF WIRE LENGTH PER SPOOL

Table 7 gives examples of wire length per spool. Tolerance of the wire length is suggested ±0.3 % for diameter equal to or smaller than 0.8 mm. and ±0.5 % for diameter bigger than 0.8 mm.

Table 7 Example of Wire Length Per Spool

Diameter mm	**Length per BP60 Spool** m	**Diameter** mm	**Length per BP60 Spool** m
0.20	100 000	0.40	30 000
0.22	91 500	0.45	24 000
0.25	82 500	0.50	21 000
0.28	60 000	0.56	15 000
0.295	60 000	0.60	14 000
0.30	58 000	0.65	11 000
0.33	45 000	0.70	9 500
0.35	40 000	0.80	7 000
0.38	35 000	1.00	4 200

NOTE — Special requirement on wire length can be agreed between the purchaser and the supplier.

B-3 RECOMMENDED TYPES OF PACKAGING

The hose reinforcement wire spools are packed in a waterproof carton strapped to a pallet in units of approximately 1 500 kg net mass. The pallet is made of wood or plastic. Some internationally recognized packaging styles are listed in **Table 8** and Fig. 2.

Table 8 Example of Packaging

Type of Spools	Composition	Number of spools
BS60, BP60	4×3×4	48
BS60, BP60	4×3×5	60

a) The appearance

b) The internal display

Fig. 2 — EXAMPLE OF PACKAGING