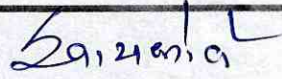
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<p align="center"><u>COLD DRAWN SPRING STEEL WIRE</u> <u>(HIGH CARBON)</u></p>		SUPERSEDES BP 10398 Rev.05
<p>1. GENERAL :</p> <p>This specification governs the quality requirements for patented cold draw carbon spring steel wire. Refer AA 10301 for col draw spring steel wire for general purpose.</p> <p>2. APPLICTION:</p> <p>Suitable for the manufacture of springs, such as, highly stressed static springs under moderate to high dynamic stressed and in smaller diameter even for impact loaded springs.</p> <p>3. CONDITION OF DELIVERY:</p> <p>Wire shall be supplied in the phosphate and / or oiled condition.</p> <p>4. COMPLIANCE WITH NATIONAL STANDARDS:</p> <p>The material shall comply with the requirements of the following national standard and also meet the requirements of this specification.</p> <p>IS: 4454 (Part-I) 2001 Gr. SM) Specification for steel wires (REAFFIRMED 2015) for cold formed springs.</p> <p>5. DIMENSION AND TOLERANCE:</p> <p>5.1 Sizes:</p> <p>The material shall be supplied to the dimensions specified on the order.</p>		
Revision :IS – 4454 (Part-I) 2001 Gr. SM) (REAFFIRMED)		Issued by :  STANDARDS AND MATERIALS GROUP TECHNICAL SERVICES DEPARTMENT
Rev.06	Date : 31/08/2019	Date of first Issue: July - -1974



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5.2 Tolerances:

- 5.2.1 The tolerance of the wire shall comply with table 2 of IS: 4454 (Part I), reproduced below:-

Nominal Diameter mm	Permissible Variation mm
0.07 to 0.18	± 0.005
0.20 to 0.80	± 0.010
0.85 to 1.40	± 0.015
1.50 to 1.90	± 0.020
2.0 to 3.2	± 0.03
3.4 to 5.6	± 0.035
6.0 to 8.5	± 0.04
9.0 to 10.0	± 0.06
10.5 to 12.5	± 0.07
13.0 to 17.0	± 0.08

- 5.2.2 The cross-section of the round wire shall be circular to within half the tolerance of the permitted diameter tolerance specified below.

6. MANUFACTURE:

Steel for springs shall be manufactured by the electric, basic oxygen of a combination of this process. If any other process is employed, prior approval of BHEL shall be obtained.

Material shall be manufactured from killed steel.

7. FREEDOM FROM DEFECTS :

The surface of the wire shall be smooth and free from defects such as seams, pits, die marks and other imperfections.

8. CHEMICAL COMPOSITION:

The melt analysis of steel and permissible variation in the composition of the material from the melt analysis except for carbon, manganese and copper shall be as specified below.

Element	Percent		Permissible Variation Max.
	Min.	Max.	
Carbon	0.75	1.0	-
Silicon	0.15	0.35	± 0.03
Manganese	-	0.80	-
Sulphur	-	0.030	± 0.005
Phosphorus	-	0.030	± 0.005
Copper	-	0.12	-



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Note :-

1. The limits for carbon and manganese are for general guidelines only and slight deviations are permissible provided the test samples satisfied the specified physical properties.
2. Sulphur + phosphorus shall not exceed 0.050 percent including permissible variation..

9. MECHANICAL PROPERTIES:

9.1 Tensile : (For wires of diameter 0.07 mm and upto and including 10 mm)

The tensile test shall be carried out in accordance with IS : 1608

The tensile strength and percentage reduction of area, obtained from the test pieces shall comply with those given in table 3 of IS : 4454 (Part I)

9.2 Wrapping test :

For wires of diameter 0.5 mm and under:

The wrapping test shall conform to IS:1755 and shall be carried out in such a way that approximately 500 mm long test wire is tightly wound close on an arbour equal to three times the diameter of the wire and then stretched to five times the original length of the coil.

After stretching and releasing the test spiral shall show an uniform pitch

9.3 Torsion test:-

For wire of diameter 0.5 mm upto and including 10 mm

The sample piece of length equal to 100 times the wire diameter, but not exceeding 500 mm shall be twisted in accordance with IS:1717. The test piece shall withstand, without failure, the minimum number of turns given in table 3 of IS : 4454 (Part I). The fracture shall be smooth, clean and perpendicular to the wire axis and any secondary helical fracture shall be ignored.

The test shall show, in addition, a uniform twist. However the pitch in the two broken pieces may differ. The test piece shall be free from surface cracks.

9.4 Dead wire test

The wire shall lie flat in the coil without any cork-screw set.

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9.5 Decarburization Test :

Decarburization test shall be carried out in accordance with IS: 6396.

The wire shall be free from any totally decarburized zones. Partial decarburization as indicated by a network of ferrite not exceeding to a depth below 1.00 percent of the nominal diameter of the wire shall be permissible.

9.6 Deep Etch test –for wire of diameter 1mm and above

The test piece shall be immersed in a boiling solution of 50 percent of concentrated hydrochloric acid and 50 percent of water for a period of time equivalent to two seconds of every 0.025 mm of diameter, with a maximum of five minutes, after which, when examined microscopically, they shall be free from seams or other defects likely to prejudice the performance of the finished spring.

It is necessary to heat the test piece to temperature of about 500 deg. C, for the purpose of stress relief before carrying out this test.

9.7 Microscopic Examination:

Test samples taken in the longitudinal direction, when examined microscopy shall reveal a structure corresponding to cold drawn condition.

10. PROTECTIVE COATING:

The wire shall be supplied in the phosphate and / or oiled condition.

11. TEST CERTIFICATE :

Unless otherwise specified three copies of test certificate shall be supplied, alongwith the consignment.

In addition, the supplier shall ensure to enclose one copy of the test certificate alongwith the dispatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

BHEL Reference:

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Order No.

Supplier's References

Name

Process of manufacture

Identification No.

Melt No/Lot No.

Size & weight.

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Results of Test

Result of chemical and other tests, called for in this specification.

12. PACKING AND MARKING

The wire shall be supplied in coils having a maximum weight of 50 kr. The wire shall be coiled in such a way that the coils remain flat when the ties are cut. The coil shall be suitably packed to prevent corrosion and damage during transit.

A metal label shall be securely attached to each coil and shall bear the following information:

BP: Cold drawn Spring Steel Wire (High Carbon).

Our Order NO

Consignment or Identification No.

Size and Weight

Supplier's Name.