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भारतीय मानक
जंजीर के साथ प्रयुक्त आई हुक — विशिष्टि
(दूसरा पुनरीक्षण)

Indian Standard

**EYE HOOKS FOR USE
WITH CHAINS — SPECIFICATION**
(*Second Revision*)

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 3

Cranes and Lifting Chains Sectional Committee, ME 14

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Cranes and Lifting Chains Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first published in 1966 and revised in 1982. The second revision of this standard was taken up, since a need was felt by the industry to revise the standard to incorporate the increased safe working load limits and to reduce the sulphur and phosphorus limits for Grade *L* and Grade *M* hooks.

During manufacturing of the hook, a single piece forging has been introduced to increase the longevity. The construction details and the complicated dimensional details of the hook are left to the choice of the manufacturers and dimensional tolerances eliminated completely. The radiographic/ultrasonic tests on the hook have been deleted.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirements 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 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
**EYE HOOKS FOR USE
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1 SCOPE

1.1 This standard covers basic requirements, materials and dimensions of mild steel, high tensile steel and alloy steel eye hooks for use, with Grade *L*(3), Grade *M*(4), and Grade *S*(6) and Grade *T*(8) chains respectively.

1.1.1 This standard applies to the drop-forged and open-die forged eye hooks up to a safe working load of 63 000 kg.

2 REFERENCES

The following Indian Standards 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>
1500 : 1983	Method for Brinell hardness test for metallic materials (<i>second revision</i>)
1875 : 1992	Carbon steel billets, blooms, slabs and bars for forging (<i>fifth revision</i>)
4367 : 1991	Alloy steel forgings for general industrial use (<i>first revision</i>)
4748 : 1988	Method for estimating average grain size of metal (<i>first revision</i>)
7847 : 1975	General characteristics of lifting hooks

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 7847 shall apply.

4 RATING

The hooks shall be rated according to the safe working load for a particular grade given in Table 1.

5 MATERIALS

5.1 The steel shall be produced by the open hearth or electric process or by any oxygen top blown process.

5.2 In its finished state, as supplied to the hook manufacturer, the steel shall be fully killed and shall meet the maximum sulphur and phosphorus content limits as under:

	<i>Cast Analysis (Percent), Max</i>	<i>Check Analysis (Percent), Max</i>
a) <i>For Grade L and M hooks</i>		
Sulphur	0.045	0.050
Phosphorus	0.040	0.045
b) <i>For Grade S and T hooks</i>		
Sulphur	0.035	0.040
Phosphorus	0.035	0.040

5.3 The steel shall be made in conformity with a suitable de-oxidation practice to obtain an austenitic grain size of 5 or finer when tested in accordance with IS 4748.

5.3.1 This could be accomplished, for example, by ensuring that it contains sufficient aluminium, or an equivalent element to enable the manufacture of hooks stabilized against strain and age-embrittlement during service, a minimum of 0.02 percent of metallic aluminium is quoted for guidance.

5.4 Within the above limitations it is the responsibility of the hook manufacturers to select steel, so that the finished hook, suitably heat-treated, meets the mechanical properties required by this specification. Class 1A and Class 3 steels of IS 1875 may be used for Grade *L* and Grade *M* hooks respectively. Alloy steel conforming to IS 4367 may be used for Grade *S* and Grade *T* hooks. Any other material having equivalent mechanical properties may also be used.

6 SHAPE AND DIMENSIONS

The shape and dimensions of hook shall be within the maximum and minimum limits specified in Table 1 and generally according to Fig. 1.

In addition, the following requirements shall be met:

- a) The point height B_s shall be greater than the actual throat opening, G of the same hook (see Fig. 1).

Table 1 Mechanical and Dimensional Characteristics of Eye Hooks

(Clauses 4, 6, 9 and 10.1; and Fig. 1)

All dimensions in millimetres.

Nominal Dia Chain	Lifting Capacity in Tonnes for Grades				Proof Load 'Fe' in kN for Grades				Throat Opening $2.9 d_n$ Min	$2.7 d_n$ Min	Seat Dia $3.8 d_n$ Min	Section Depth $4.3 d_n$ Max	Section Width $2.9 d_n$ Max	$1.75 d_n$ Min	$1.8 d_n$ Max	$15.5 d_n$ Max
	d_n	L	M	S	T	L	M	S	T	G	G_1	D	H_m	L_m	E	F
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
6.0	0.50	0.63	1.00	1.25	10.00	12.50	20.00	25.00	17.40	16.20	22.80	25.80	17.40	10.50	10.80	93.00
7.1	0.63	0.80	1.25	1.60	12.50	16.00	25.00	31.50	20.60	19.20	27.00	30.50	20.60	12.40	12.80	110.00
8.0	0.80	1.00	1.60	2.00	16.00	20.00	31.50	40.00	23.20	21.60	30.40	34.40	23.20	14.00	14.40	124.00
9.0	1.00	1.25	2.00	2.50	20.00	25.00	40.00	50.00	26.10	24.30	34.20	38.70	26.10	15.80	16.20	139.50
10.0	1.25	1.60	2.50	3.20	25.00	31.50	50.00	63.00	29.00	27.00	38.00	43.00	29.00	17.50	18.00	155.00
11.0	1.60	2.00	3.20	4.00	31.50	40.00	63.00	80.00	31.90	29.70	41.80	43.70	31.90	19.30	19.80	170.50
12.0	2.00	2.50	4.00	5.00	40.00	50.00	80.00	100.00	34.80	32.40	45.60	51.60	34.80	21.00	21.60	186.00
14.0	2.50	3.20	5.00	6.30	50.00	63.00	100.00	125.00	40.60	37.80	53.20	60.20	40.60	24.50	25.20	279.00
16.0	3.20	4.00	6.30	8.00	63.00	80.00	125.00	160.00	46.40	43.20	60.80	68.80	46.40	28.00	28.80	248.00
18.0	4.00	5.00	8.00	10.00	80.00	100.00	160.00	200.00	52.20	48.60	68.40	77.40	52.20	31.50	32.40	279.00
20.0	5.00	6.30	10.00	12.50	100.00	125.00	200.00	250.00	58.00	54.00	76.00	86.00	58.00	35.00	36.00	310.00
22.0	6.30	8.00	12.50	16.00	125.00	160.00	250.00	315.00	65.00	59.40	83.60	94.60	63.80	38.50	39.60	341.00
25.0	8.00	10.00	16.00	20.00	160.00	200.00	315.00	400.00	72.20	67.50	95.00	107.50	72.50	43.80	45.00	387.50
28.0	10.00	12.50	20.00	25.00	200.00	250.00	400.00	500.00	81.20	75.60	106.40	120.40	81.20	49.00	50.40	434.00
32.0	12.50	16.00	25.00	32.00	250.00	315.00	500.00	630.00	92.80	86.40	121.60	137.60	92.80	56.00	57.60	496.00
36.0	16.00	20.00	32.00	40.00	315.00	400.00	630.00	800.00	104.40	97.20	136.80	154.80	104.40	63.00	64.80	558.00
40.0	20.00	25.00	40.00	50.00	400.00	500.00	800.00	1000.00	116.00	108.00	152.00	172.00	116.00	70.00	72.00	620.00
45.0	25.00	32.00	50.00	63.00	500.00	630.00	1000.00	1260.00	130.50	121.50	171.00	193.00	130.50	78.80	81.00	697.50

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- b) The actual throat opening G shall not exceed 95 percent of the actual seat diameter D of the same hook.
- c) The minimum value for E specified in table (that is $1.75 d_n$) applies to hooks used in all welded slings. For hooks used in slings assembled by methods other than welding, the minimum value shall be $1.9 d_n$.
- d) If any safety latch is fitted, it shall be capable of closing over the maximum diameter of the

bar which can be admitted through the actual opening G_1 as indicated by the dotted lines in Fig. 1.

7 WORKMANSHIP AND FINISH

The hooks shall be free from defects and shall be cleanly forged in one piece in such a manner that the macro etched flaw lines follow the body of the hook except at the eye. The finished hook shall be clean and free from coating of any description, unless otherwise specified by the purchaser.

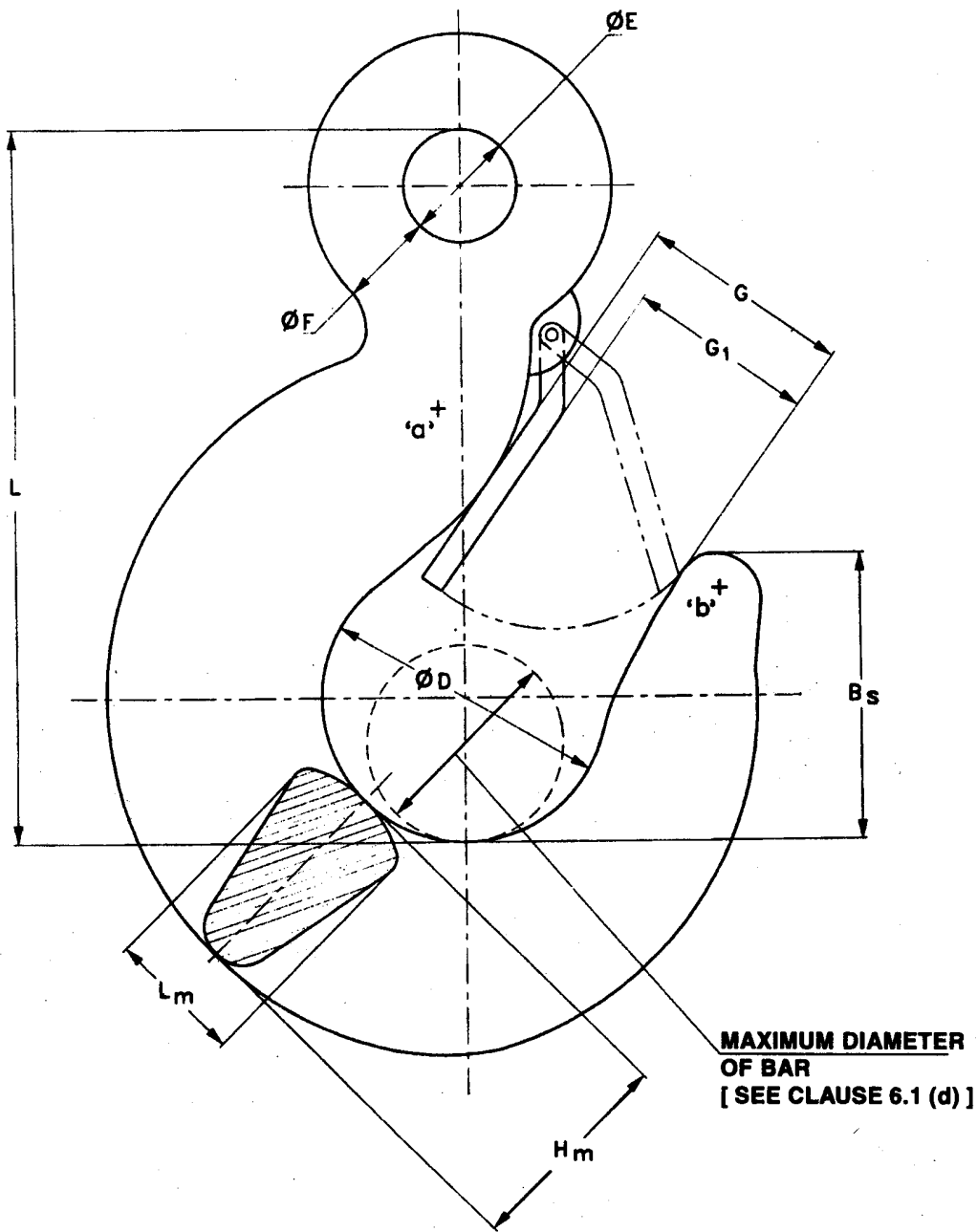


FIG. 1 DIMENSIONS OF HOOK

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8 HEAT TREATMENT

8.1 All hooks shall, before proof testing, be subjected to one of the following heat treatments:

- a) Normalizing by heating to a temperature within 50°C above the upper critical point of the steel used, followed by cooling in still air; or
- b) Hardening by heating to a temperature within 50°C above the upper critical point of the steel used, followed by quenching in oil or water and tempering.

8.1.1 Normalizing treatment shall be permitted for Grade *L* hooks and Grade *M* hooks only. Grade *S* hooks and Grade *T* hooks shall be hardened and tempered necessarily.

8.1.2 The minimum hardness of hooks after heat treatment, when tested according to the method given in IS 1500, shall be 250 HB and 350 HB for Grade *S* and Grade *T* respectively. This test shall be carried out on the hooks selected for destructive testing.

8.2 Details of heat treatment given to the hooks during manufacture shall be endorsed on the manufacturer's test certificate.

9 PROOF TESTING

After heat treatment and other processing, the finished hooks shall be subjected to proof load of twice the safe working load as given in Table 1. Prior to the application of the proof load, each hook shall bear two centre punch marks at positions 'a' and 'b' as shown in Fig. 1. The change in distance between 'a' and 'b' before applying proof load and after removal of the proof load will be the amount of permanent deformation up to 0.5 percent of the actual throat or the dimension between 'a' and 'b' or 0.2 mm whichever is higher. After removal of the proof load and determination of the permanent set, each hook shall be thoroughly examined by a competent person and shall be accepted as complying with the standard if no permanent deformation or visible defects are observed on the hook.

10 DESTRUCTION TEST

10.1 A sample hook shall be selected out of a lot of every 50 hooks or less and tested to four times the safe working load specified for the appropriate grade hook in Table 1. The load shall be applied as specified in 7.3 of IS 7847. The hook shall withstand any load less than four times the safe working load, neither fracture nor so distort as to be incapable of retaining the load.

NOTE — It is not necessary to test the hook up to its actual ultimate strength for mechanical properties to be demonstrated. It is sufficient that the minimum ultimate strength specified is exceeded and the hook deforms significantly at the maximum force of the test.

10.2 Micro-Structure Test

After destruction test, a portion of the hook, which has not undergone deformation, shall be taken and micro-structure test shall be carried out to ensure that hooks have been given proper heat treatment.

10.3 Hardness Testing

Hook of Grade *S* and Grade *T* selected for destructive testing shall be tested for hardness value as given in 8.1.2. The hardness shall be checked at least 10 mm away from the edge and 1 mm below the surface.

11 INSPECTION, CERTIFICATE OF TEST AND EXAMINATION

11.1 The representative of the purchaser shall have access to the works of the manufacturer at all reasonable times for the purpose of witnessing the specified tests and inspecting the machine and method of examination. The manufacturer shall give the inspector copies of the reports of the tests made in his presence.

11.2 The manufacturer shall supply a certificate of test and examination in accordance with 8.2 and 8.3 of IS 7847.

12 MARKING

12.1 Provided that the hook passes the proof test, each hook shall be legibly and indelibly marked on parts not highly stressed. This marking shall include at least the following information:

- a) Chain size,
- b) Grade letter,
- c) Safe working load, and
- d) Manufacturer's identification mark.

12.2 BIS Certification Marking

The hook may also be marked with the Standard Mark.

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

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ANNEX A
(Foreword)

COMMITTEE COMPOSITION

Cranes and Lifting Chains Sectional Committee, MED 14

<i>Organization</i>	<i>Representative(s)</i>
Bharat Heavy Electricals Ltd, Tiruchirappalli	SHRI K. MANICKAM (<i>Chairman</i>)
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Indian Chain Pvt Ltd, Kolkata	SHRI P. CHITLANGIA SHRI LALITMOHAN (<i>Alternate</i>)
Indian Link Chain Manufacturers Ltd, Mumbai	SHRI P. K. NEVATIA
Jessop and Co Ltd, Kolkata	SHRI BIMAL CHANDRAPAL SHRI TAPAN DATTA (<i>Alternate</i>)
Larsen and Toubro Limited, Kolkata	SHRI M. S. CHAKRABORTHY SHRI L. N. MISHRA (<i>Alternate</i>)
Lifting Equipment and Accessories Ltd, Delhi	SHRI RAJIV KHETAN
Mega Drives Pvt Ltd, Thane	SHRI MAJUMDAR SHRI N. B. BHUILE (<i>Alternate</i>)
Metallurgical and Engineering Consultants (I) Ltd, Ranchi	SHRI T. K. ROY SHRI H. S. SINGH (<i>Alternate</i>)
M. N. Dastur and Co Ltd, Kolkata	SHRI D. GHOSH SHRI G. C. BANERJEE (<i>Alternate</i>)

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Amendments Issued Since Publication

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