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Indian Standard
SPECIFICATION FOR
FORGED RAMSHORN HOOKS

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

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Indian Standard

SPECIFICATION FOR FORGED RAMSHORN HOOKS

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(Continued on page 2)

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IS : 5749 - 1970

(Continued from page 1)

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IS : 5749 - 1970

Indian Standard

SPECIFICATION FOR FORGED RAMSHORN HOOKS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 29 May 1970, after the draft finalized by the Lifting Chains and Associated Fittings and Components Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 The ramshorn hooks covered by this standard are intended for crane loads above the range of point hooks and 'C' hooks covered in the earlier standards. The use of ramshorn hooks and triangular lifting eyes for loads of 40 tonnes and over is recommended in IS : 3177-1965*. These ramshorn hooks are designed for included sling angles of 90°.

0.3 The information to be supplied with enquiry and order is given in Appendix A.

0.4 The ramshorn hooks must be truly balanced if they are to rotate freely under load. To ensure this, it is desirable to mount the thrust bearing on a spherical seating (*see* Appendix B).

0.5 The recommendations for the use of ramshorn hooks are given in Appendix D.

0.6 In the preparation of this standard, considerable assistance has been derived from:

Entwurf DIN 15402 Blatt 1 Lasthaken für Hebezeuge : Doppelhaken : Rohlinge. (Load hooks for hoisting machinery : Clove hooks : Blanks). 1960. Deutscher Normenausschuss.

Entwurf DIN 15402 Blatt 2 Lasthaken für Hebezeuge : Doppelhaken : Fertigteile. (Load hooks for hoisting machinery : Clove hooks : Finished parts). 1960. Deutscher Normenausschuss.

BS 3017 : 1958 Mild steel forged ramshorn hooks. British Standards Institution.

*Code of practice for design of overhead (travelling cranes and gantry cranes other than steel work cranes).

IS : 5749 - 1970

0.7 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.

1. SCOPE

1.1 This standard covers forged ramshorn hooks having a range of safe working loads from 40 to 250 tonnes and designed for included angles between 0° and 90°.

2. TERMINOLOGY

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

2.1 Competent Person — A person who is approved and declared as such or recognized by the relevant statutory authority.

2.2 Inspector — The representative of the purchaser.

2.3 Processing - Any treatment of the hook subsequent to forging, such as heat treatment and polishing.

2.4 Proof Load — The load to which a ramshorn hook shall be subjected in the finished condition.

2.5 Rating — The maximum safe working load which the ramshorn hook shall withstand.

3. RATING

3.1 The ramshorn hooks shall be rated according to the safe working load given in Table 1.

4. MATERIAL

4.1 The steel used for the manufacture of swivel assembly shall be made by open hearth, electric or by other oxygen-blown process, having a tensile strength of at least 42 kgf mm², and shall be fully killed. It shall contain not less than 0.20 percent of aluminium. Sulphur and phosphorus shall not exceed 0.050 and 0.045 percent respectively. Any type of steel which meets these requirements and when suitably heat treated meets the specific requirements with regard to the mechanical properties may be used. Steels conforming to Grade 2 of IS : 1875-1966† or IS : 3261 - 1966‡ meet these requirements and are considered suitable.

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

†Specification for carbon steel billets, blooms and slabs for forgings (*revised*).

‡Specification for carbon steel forgings for shipbuilding industry.

IS : 5749 - 1970

5. FORM AND DIMENSIONS

5.1 The form and dimensions of ramshorn hooks shall be in accordance with Table 1.

5.2 Tolerances on Dimensions — The tolerances on dimensions a_1 , a_2 , b_1 , b_2 , d_1 and h shall be in accordance with Table 1. The forged dimensions for which no tolerance has been specified in the table shall be not less than the values given in the table and shall not exceed these by more than +8 percent.

5.2.1 Machining tolerances shall be in accordance with medium class of IS : 2102-1969*.

5.3 Screw Threads — Screw threads shall be either ISO metric screw threads conforming to IS 4218 - 1967† or round or knuckle threads.

The length of the screwed portion shall be not less than the dimension m . If the shank and the nut which secure it are drilled for fixing of a retaining pin, there shall remain a continuous length of shank engaged by the nut on the load side at least equal to m .

6. WORKMANSHIP AND FINISH

6.1 The ramshorn hooks shall be free from defects and shall be cleanly forged in such a manner that the macroscopic flow line of the hooks follow the body outline. All the surfaces shall be smoothly finished.

6.1.1 Billets or blooms to be made into ramshorn hooks shall be gradually and uniformly worked from ingots from which at least five percent of the total weight has been removed from the bottom end and 25 percent from the top end. When finished, the sectional area of the body as forged shall not exceed one fourth of the mean sectional area of the original ingot used. The shank shall be wholly forged and the remainder wholly forged and machined. Machine gas-cutting may be used after rough forging of shape provided an adequate excess of material is left for removal of surface defects by machining.

7. HEAT TREATMENT

7.1 All the ramshorn hooks shall, before testing, be normalized by heating uniformly in a furnace until the whole of the material has attained a temperature between 880°C and 910°C. It shall then be withdrawn from the furnace and allowed to cool in still air.

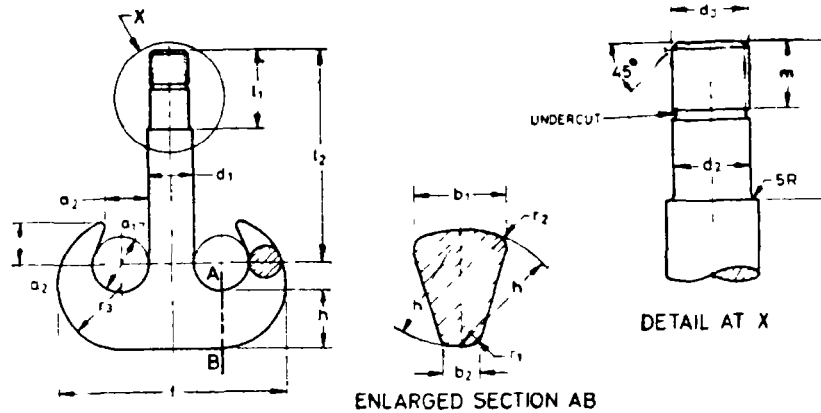
*Allowable deviations for dimensions without specified tolerances (*first revision*).

†ISO metric screw threads (issued in 6 parts).

TABLE 1 RATING, PROOF LOAD AND DIMENSIONS FOR RAMSHORN HOOKS

(Clauses 3.1, 5 1, 5 2, 8.1 and 10.1)

All dimensions in millimetres.



NOTE— Undercut according to IS . 1369- 1961 ' Dimensions of screw thread run outs and undercuts'.

Rating W , tonnes	40	50	63	80	100	125	160	200	250
Proof load P , tonnes	70	85	100	120	145	170	215	266	333
a_1 (28, P)	125 ± 4	140 ± 4	160 ± 5	180 ± 5	200 ± 6	224 ± 7	250 ± 8	280 ± 9	315 ± 10
a_2 (0.6 a_1)	100 ± 3	112 ± 3	125 ± 4	140 ± 4	160 ± 5	180 ± 5	200 ± 6	224 ± 7	250 ± 8

$b_1 (0.85 a_1)$	$106 + \frac{11}{0}$	$118 + \frac{12}{0}$	$132 + \frac{14}{0}$	$150 + \frac{16}{0}$	$170 + \frac{18}{0}$	$190 + \frac{20}{0}$	$212 + \frac{22}{0}$	$236 + \frac{25}{0}$	$265 + \frac{28}{0}$
$b_2 (0.335 a_1)$	$43 + \frac{5}{0}$	$46 + \frac{5}{0}$	$53 + \frac{6}{0}$	$60 + \frac{6}{0}$	$67 + \frac{7}{0}$	$75 + \frac{8}{0}$	$85 + \frac{9}{0}$	$95 + \frac{10}{0}$	$106 + \frac{11}{0}$
$d_1 (0.85 a_1)$	106 ± 5	118 ± 6	132 ± 7	150 ± 8	170 ± 9	190 ± 10	212 ± 11	236 ± 12	265 ± 13
$d_2 (0.71 a_1)$	90	100	110	125	140	160	180	200	225
d_2^*	M90 × 6	M100 × 6	M110 × 6	M125 × 6	M140 × 6	M160 × 6	M180 × 6	M200 × 6	M225 × 6
$f (4.25 a_1)$	530	600	670	750	850	950	1 060	1 180	1 320
$h (1.06 a_1)$	$132 + \frac{13}{0}$	$150 + \frac{15}{0}$	$170 + \frac{17}{0}$	$190 + \frac{19}{0}$	$212 + \frac{21}{0}$	$236 + \frac{24}{0}$	$265 + \frac{27}{0}$	$300 + \frac{30}{0}$	$335 + \frac{34}{0}$
l_1	188	207	234	260	282	325	357	405	455
l_2^\dagger	510	572	645	705	790	896	1 005	1 130	1 260
m, Min	80	90	100	112	125	140	160	180	200
$r_1 (0.125 a_1)$	16	18	20	22	25	28	32	36	40
$r_2 (1.18 a_1)$	13	14	16	18	20	22	25	28	32
$r_3 (1.18 a_1)$	150	170	190	212	236	265	300	335	375

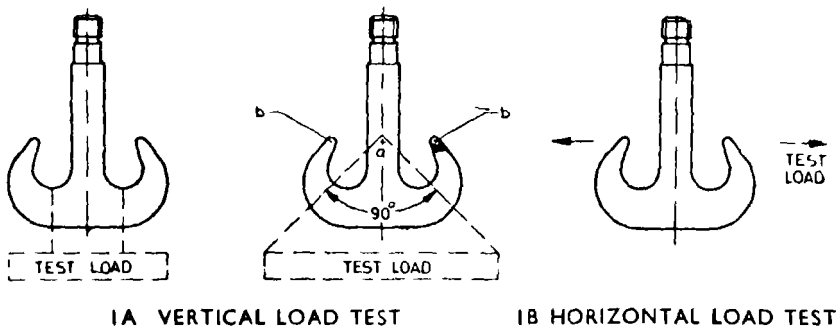
*Equivalent knuckle or round threads are permissible.

†A different length may be specified subject to agreement between the supplier and the purchaser.

IS : 5749 - 1970

8. PROOF LOADING

8.1 Each completed ramshorn hook shall, after heat treatment, be subjected to a vertical proof load specified in Table 1. If the vertical proof load test is applied in accordance with Fig 1A, an additional test of half the proof load specified for the vertical loading shall be applied horizontally as indicated in Fig 1B. Prior to the application of proof loading, each hook shall bear a centre punch mark at position *a* from which scribed lines shall be trammelled to position *b*. After removal of the load, the hook shall be re-scribed with the trammel unaltered, and the difference between the scribed lines shall be the amount of permanent set. The permanent set shall in no case exceed 0.25 percent of the distance *ab*. The ramshorn hook shall then be thoroughly examined by a competent person and shall be accepted as complying with this standard only if found free from flaw or defect.



1A VERTICAL LOAD TEST

1B HORIZONTAL LOAD TEST

FIG 1 POSITIONS FOR LOAD TEST

9. INSPECTION, CERTIFICATE OF TEST AND EXAMINATION

9.1 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 methods of examination.

9.2 The manufacturer shall supply a certificate of test and examination in the form shown in Appendix C with every supply of ramshorn hooks. The certificate shall give the results of all tests made.

9.3 For the purpose of this standard, test certificate in Form V of the Indian Dock Labourers Regulation, 1948, is acceptable provided that it is endorsed in col 2 by the manufacturer or supplier that the ramshorn hooks comply in all respects with this standard and that it states the material of which the ramshorn hooks are made and the details of heat treatment to which they have been subjected.

IS : 5749 - 1970

10. MARKING

10.1 Each ramshorn hook shall, after testing, be permanently marked on a non-vital part with the following information:

- a) Safe working load given in Table 1;
- b) Limiting included angles, that is 0 to 90°; and
- c) Distinguishing marks or symbols as will allow identification with the manufacturer's certificate of test and examination.

10.1.1 The ramshorn hooks, may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufactures or processors, may be obtained from the Indian Standards Institution

A P P E N D I X A

(Clause 0.3)

INFORMATION TO BE SUPPLIED WITH ENQUIRY AND ORDER

The enquiry and order should state:

- a) safe working load,
- b) form of screw thread,
- c) length of shank,
- d) method of manufacture, and
- e) further tests or chemical analysis required.

A P P E N D I X B

(Clause 0.4)

THRUST BEARINGS FOR RAMSHORN HOOKS

B-1. Up to 125 tonnes capacity, standard single thrust ball bearings may be obtained. With the majority of ball thrust bearings, it is generally found necessary to locate the bearings on spigots or recesses on the hook nut and crosshead.

IS : 5749 - 1970

B-2. For hooks above 125 tonnes capacity, tapered roller or special thrust ball bearings are recommended. The bearing manufacturer should be consulted for suitable sizes.

B-3. When mounting single thrust ball bearings, care should be taken that the race does not take excessive horizontal load due to clearance between the ramshorn hook shank and the bore of the crosshead.

A P P E N D I X C

(Clause 9.2)

FORM FOR CERTIFICATE OF TEST AND EXAMINATION

DISTINGUISHING MARK	DESCRIPTION OF RAMSHORN HOOKS	MATERIAL	PROOF LOAD APPLIED	SAFE WORKING LOAD
(1)	(2)	(3)	(4) tonnes	(5) tonnes

Particulars of heat treatment to which the ramshorn hooks have been subjected are as follows:

We hereby certify that the ramshorn hooks, described above, comply in all respects with IS 5749-1970 'Specification for forged ramshorn hooks' and that they were subjected to the proof load and subsequently examined and passed by a competent person.

Signature

Date

IS : 5749 - 1970

APPENDIX D

(Clause 0.5)

RECOMMENDATIONS FOR THE USE OF RAMSHORN HOOKS

D-1. The ramshorn hooks covered by this standard should not be upgraded for use with slings at included angles less than 90°, as the capacity of the hook is also governed by the permissible stress in the shank. (Advantage cannot therefore be taken of the increased body strength when the included sling angles are less than 90°.)

D-2. Ramshorn hooks should not be used with sling legs at excessive angles, since the stress in the body of the hook will increase at a greater rate than that in the sling leg. (Tables of angular loading on slings will not therefore be equally applicable to the loading on the ramshorn hooks.)

D-3. For heavy and bulky loads, it is preferable to use a lifting beam suspended from the hook by two pairs of links at fixed centres, the centres of the link pins on the beam being slightly greater than the centres of the bed diameters of the hook.

D-4. An appropriate included angle between the link plates would be of the order of 30°. With so small an included angle, the stress reduction factor for the hook body is less than one-half.

D-5. To avoid the danger of overloading individual link plates and their associated link pins, due to the possible tilting of the beam and the consequent out-of-balance effect, link plate assemblies should be designed with an ample margin of safety.

D-6. When using lifting beams, their length can be arranged to take varying centres of slings to suit the loads and ensure true balancing. True balancing is essential in order that the hook may rotate freely under load when required.

D-7. When lifting bulky loads where the centre of gravity is not central between the points of slinging, it is desirable to adjust the length of the slings so that the centre of gravity of the load is immediately below the centre line of the hook.

D-8. In order to reduce the effort required to rotate the hook when loaded, it is recommended that the hook be carried on a ball or roller thrust bearing (see Appendix B).

D-9. When sling angles approach the limiting included angle for which the hook is designed, it is necessary to take care that neither of the two horns is subjected to a load exceeding one-half of the safe working load of the hook, since the stress reduction factor would then be nearly unity, and any out-of-balance effect could overload one of the horns. When lifting loads just within the capacity of the hook, extreme care is needed in this respect.

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