

Specification for

# Mild steel forged Ramshorn hooks

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|                                                        |                                                   |
|--------------------------------------------------------|---------------------------------------------------|
| Association of Crane Makers                            | Institute of Welding                              |
| Association of Hand Lifting Tackle Makers              | Lloyd's Register of Shipping                      |
| British Constructional Steelwork Association           | Machine Made Chain Manufacturers' Association     |
| Chain and Anchor Manufacturers' Association            | National Association of Drop Forgers and Stampers |
| Chain Testers' Association of Great Britain            | Individual Manufacturers                          |
| Dock and Harbour Authorities' Association              |                                                   |
| Federation of Civil Engineering Contractors            |                                                   |
| Federation of Wire Rope Manufacturers of Great Britain |                                                   |

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 3 September 1958

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# Foreword

This standard makes reference to the following British Standards:

BS 84, *Parallel screw threads of Whitworth form*.

BS 350, *Conversion factors and tables*.

BS 825, *Mild steel shackles*.

BS 919, *Screw gauge limits and tolerances*.

BS 970, *Wrought steels*.

BS 1104, *General purpose Acme screw threads*.

BS 1580, *Unified screw threads*.

BS 1657, *Buttress threads*.

BS 1936, *Undercuts and runouts for screw threads*.

BS ..... (in preparation), *“Triangular eye-hooks”*.

This British Standard specifies forged ramshorn hooks of trapezoidal cross-section, with a range of safe working loads from 20 to 200 tons.

Hooks of safe working loads up to about 50 tons are specified in BS 482<sup>1)</sup> and in BS 2903<sup>2)</sup>. For heavy loads ramshorn hooks (with triangular hooks as an alternative, BS .....<sup>3)</sup>) are preferable. They are recommended for the cranes of BS 466<sup>4)</sup>.

To facilitate the lifting of light loads, a square cross-section is formed at the centre of the hook, and is drilled to receive the pin of a special shackle (see Appendix E). The nuts on these shackle pins are of circular cross-section, and are drilled to receive a tommy bar. This type of nut has been chosen because suitable spanners for use on large hexagon nuts are not always available.

Particulars of suitable ball or roller thrust bearings are given in Appendix D.

Ramshorn hooks outside the range specified may be required. Such hooks can be designed from the information given in “Notes on Design”, Appendix C. The use of the term “British Standard Ramshorn Hook” is, however, restricted to the actual hook sizes and forms laid down in the table of this standard.

Recommendations for the use of ramshorn hooks are given in Appendix F.

The Committee entrusted with the preparation of this standard desires to record its indebtedness to the Engineering Division of the National Physical Laboratory<sup>5)</sup> for the theoretical investigations involved in determining the stresses in the hooks specified.

Throughout this standard British weights and measures only are used: ton 2 240 lb, cwt 112 lb, dimensions in inches. (For corresponding metric equivalents, see BS 350<sup>6)</sup>).

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 13 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

<sup>1)</sup> BS 482, *“Wrought iron and mild steel hooks”*.

<sup>2)</sup> BS 2903 *“Higher tensile steel hooks”*.

<sup>3)</sup> BS . . . . (in preparation), *“Triangular eye-hooks”*.

<sup>4)</sup> BS 466, *“Electric overhead travelling cranes”*.

<sup>5)</sup> This Division was closed down in 1951, and its functions transferred to the Mechanical Engineering Research Laboratory, East Kilbride, Glasgow.

<sup>6)</sup> BS 350, *“Conversion factors and tables”*.

## 1 Scope

This British Standard specifies mild steel forged ramshorn hooks of trapezoidal cross-section, having a range of safe working loads from 20 tons to 200 tons, and designed for included sling angles of 90°. (No increase of safe working load is permitted for included angles less than 90°.)

In addition to the required forged dimensions, the finished machined diameters of the shanks, and the diameter at the top of the screw thread are also specified.

To facilitate the lifting of light loads, the hooks are designed to accommodate a central shackle, particulars of which are given in Appendix E.

## 2 Material

The hook shall be made from steel complying with BS 970<sup>7)</sup>, Specification En. 3A.

## 3 Form and dimensions

The form of the hook shall be in accordance with the figure to the table, and the dimensions, subject to the tolerances in Clause 4, shall be in accordance with the table. When a central shackle is fitted, the form and dimensions of the shackle shall be in accordance with Appendix E.

## 4 Tolerance on forged dimensions

The forged dimensions of the hook shall be not less than the dimensions given in the table, and shall not exceed them by more than the following amounts:

33 $\frac{1}{3}$  per cent on radii N, S and Z.

7 $\frac{1}{2}$  per cent on all other forged dimensions.

In all cases dimensions C, H<sub>1</sub> and M shall be as nearly as possible exact to size.

## 5 Shank

The shank shall be forged to dimension G.

The machined diameter of the shank, G<sub>1</sub>, and the diameter at the top of the screwed thread, G<sub>2</sub>, shall be as specified in the table.

A fillet or radius shall be machined at the junction of the shank, diameter G<sub>1</sub>, and the forged diameter G.

The core diameter area of the screwed end shall be such that the tensile stress in the shank does not exceed the following values:

| Safe working load, W<br>tons    | Maximum average tensile stress in shank<br>tons/sq. in. |
|---------------------------------|---------------------------------------------------------|
| Up to and including 50          | 3                                                       |
| Over 50, up to and including 75 | $\frac{W}{25} + 1$                                      |
| Over 75                         | 4                                                       |

NOTE For capacities of suitable anti-friction thrust bearings, see Appendix D.

## 6 Screw threads

Screw threads shall be one of the following forms:

Unified to BS 1580<sup>8)</sup>, Class IA.

Whitworth to BS 84<sup>8)</sup>, Free Class.

Acme to BS 1104<sup>8)</sup>.

Buttress to BS 1657<sup>8)</sup>.

The depth of the thread shall be not less than 0.04 times the major diameter (dimension G<sub>2</sub> in the table).

<sup>7)</sup> BS 970, "Wrought steels". The mechanical properties of specification En. 3A do not apply to hooks with a ruling section above 6 in.

<sup>8)</sup> Titles are given in the list on page ii.

NOTE The recommended number of threads per inch for the threads of Unified and Whitworth form is listed in the table. Other pitches may be used, provided that the threads comply with this standard. (These recommendations do not apply to Acme or Buttress threads.)

The portion of the shank adjacent to the shoulder shall have an undercut and fillet in accordance with the recommendations for the undercut Form A, Grade 1, in BS 1936<sup>9)</sup>.

It is recommended that the screw threads be gauged with an appropriate gauge made to a relevant specification in BS 919<sup>9)</sup>.

The length of the screwed portion of the shank shall be not less than dimension  $G_2$ .

If the shank and the nut which secures it are drilled for a fixing or retaining pin, or for any other purpose, there shall remain a continuous threaded length of shank engaged by the nut on the load side at least equal to the diameter of the shank.

## 7 Workmanship

The hook shall be free from patent defects and shall be cleanly shaped from ingots, billets or blooms. All surfaces shall be smoothly finished.

Ingots, billets or blooms to be made into hook forgings shall be gradually and uniformly worked from ingots from which at least 5 per cent of the total weight has been removed from the bottom end and 25 per cent from the top end.

When finished, the sectional area of the body of the hook forging (as forged) shall not exceed approximately one-fifth of the mean sectional area of the original ingot used.

At all stages of manufacture laps, folds, etc. shall be removed. The shank and hook shall be forged in one piece.

Shanks shall be wholly forged, and the remainder of the hook shall be completed only by one of the following methods, as agreed between the purchaser and the manufacturer:

- a) wholly smithed and forged to finished dimensions;
- b) rough forged by spreading out in such a way that the hook portion may be profiled to shape and dimensions by machining operations only, and excluding any form of gas cutting;
- c) as in Method b) but machine gas cutting may be used provided that an adequate excess of material remains for removal of surface defects by machining, chipping or flame dressing.

The manufacturer should state which of the methods, a), b) or c), has been allowed for in his quotation.

A straight line drawn in contact with the bed of each horn shall be at right angles to the axis of the shank.

The central hole for the shackle pin, if required, shall be accurately drilled or bored at right angles to the axis of the hook. The faces of the hook should be spot-faced locally, if necessary, to accommodate the shackle.

## 8 Heat treatment

After completion of all operations covered by Clause 7, the hook shall be normalized by heating uniformly in a furnace until the whole of the material has attained a temperature between 880 °C and 910 °C (1 616 °F and 1 670 °F). The hook shall then be withdrawn from the furnace and allowed to cool in still air.

## 9 Shackle

If required by the purchaser, a central shackle with machined pin shall be supplied with the hook. Apart from dimensions, and from the method of application of the proof load, the shackle shall comply with the requirements laid down in BS 825.<sup>10)</sup>

The form and dimensions of the shackle shall be in accordance with Appendix E. The safe working load shall be legibly marked on the shackle.

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<sup>9)</sup> Titles are given in the list on page ii.

<sup>10)</sup> BS 825, "Mild steel shackles".