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# WROUGHT IRON AND MILD STEEL HOOKS

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BRITISH STANDARD SPECIFICATION

# WROUGHT IRON AND MILD STEEL HOOKS

FOR CRANES, SLINGS, BLOCKS, AND GENERAL ENGINEERING PURPOSES
(Excluding building operations)

**B.S. 482 : 1958**

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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 23rd May, 1958.

First published April, 1933.
First revision February, 1945.
Second revision March, 1950.
Third revision May, 1958.

The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 3000, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook, price 15s.

This standard makes reference to the following British Standards:

B.S. 84. Parallel screw threads of Whitworth form.
B.S. 350. Conversion factors and tables.
B.S. 464. Thimbles for wire ropes.
B.S. 762. Wrought iron bars 'special' grade.
B.S. 825. Mild steel shackles.
B.S. 858. 'Best Yorkshire' wrought iron.
B.S. 919. Screw gauge limits and tolerances.
B.S. 970. Wrought steels.
B.S. 1580. Unified screw threads.
B.S. 1718. Tolerances for steel drop forgings and upset forgings.
B.S. 1936. Undercuts and runouts for screw threads.

*British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.*

The following B.S.I. references relate to the work on this standard:—
Committee reference MEE/12 and MEE/12/2.
Draft for comment CX(MEE) 5887.





## CO-OPERATING ORGANIZATIONS

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

*Admiralty
Air Ministry
*Associated Offices' Technical Committee
Association of Consulting Engineers (Incorporated)
British Chemical Plant Manufacturers' Association
British Compressed Air Society
*British Electrical and Allied Manufacturers' Association
*British Engineers' Association
British Gear Manufacturers' Association
British Internal Combustion Engine Manufacturers' Association
*British Iron and Steel Federation
*British Railways, The British Transport Commission
*Crown Agents for Oversea Governments and Administrations
*D.S.I.R.—Mechanical Engineering Research Laboratory
Electricity Council, the Generating Board and Area Boards in England and Wales
*Engineering Equipment Users' Association
Gas Council
High Commission of India
*Institute of Marine Engineers
Institute of Petroleum
Institution of Civil Engineers
Institution of Gas Engineers
Institution of Heating and Ventilating Engineers
*Institution of Mechanical Engineers
Institution of Mechanical Engineers (Automobile Division)
Institution of Production Engineers
Locomotive and Allied Manufacturers' Association of Great Britain
Machine Tool Trades Association
*Ministry of Labour and National Service (Factory Inspectorate)
*Ministry of Power
*Ministry of Supply
Ministry of Transport and Civil Aviation
*Ministry of Works
*National Coal Board
*National Physical Laboratory (D.S.I.R.)
Radio Industry Council
War Office

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committee entrusted with the preparation of this standard:

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



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## CONTENTS


| | Page |
|---|---|
| Co-operating organizations | 3 |
| Foreword | 6 |

### SPECIFICATION

Clauses

| | | |
|---|---|---|
| 1. | Scope | 7 |
| 2. | General | 7 |
| 3. | Rating | 7 |
| 4. | Types of hook | 7 |
| 5. | Material | 8 |
| 6. | Form and dimensions | 8 |
| 7. | Tolerances on dimensions | 8 |
| 8. | Diameter of shank | 8 |
| 9. | Screw threads | 9 |
| 10. | Workmanship | 9 |
| 11. | Heat treatment | 9 |
| 12. | Manufacturer's records of material | 10 |
| 13. | Proof testing | 10 |
| 14. | Testing facilities | 10 |
| 15. | Additional tests | 10 |
| 16. | Inspection | 12 |
| 17. | Marking | 12 |
| 18. | Certificate of test and examination | 12 |

### DIAGRAM

| | |
|---|---|
| Diagram for the measurement of permanent set and marking of hooks | 11 |

### FIGURES

| | | |
|---|---|---|
| 1. | Shank hook, trapezoidal section | 14 |
| 2. | Shank hook, trapezoidal section. Alternative for Fig. 1 having increased internal diameter for small loads | 16 |
| 2A. | Alternative shank, with integral collar for trapezoidal section shank hooks (Fig. 2 and Table 2) | 18 |
| 3. | Eye hook, trapezoidal section, for use with chain | 20 |
| 3A. | Alternative eye, for trapezoidal section eye hooks (Fig. 3 and Table 3), for use with shackle pins | 22 |
| 4. | Shank hook, circular section | 24 |
| 5. | Eye hook, circular section, for use with chain | 26 |
| 5A. | Alternative eye for circular section eye hooks, for use with shackle pins (Fig. 5 and Table 5) | 28 |
| 6. | Eye hook, trapezoidal section, for use with wire rope thimbles, B.S. 464 | 30 |

### TABLES

| | | |
|---|---|---|
| 1. | Shank hooks, trapezoidal section | 15 |
| 2. | Shank hooks trapezoidal section, having increased internal diameter for small loads | 17 |
| 2A. | Alternative shanks with integral collars, for trapezoidal section shank hooks (Fig. 2 and Table 2) | 19 |
| 3. | Eye hooks, trapezoidal section, for use with chain | 21 |
| 3A. | Alternative eyes for trapezoidal section eye hooks (Fig. 3 and Table 3), for use with shackle pins | 23 |
| 4. | Shank hooks, circular section | 25 |
| 5. | Eye hooks, circular section, for use with chain | 27 |
| 5A. | Alternative eyes for circular section eye hooks (Fig. 5 and Table 5), for use with shackle pins | 29 |
| 6. | Eye hooks, trapezoidal section, for use with wire rope thimbles, B.S. 464 | 31 |
| 7. | Whitworth coarse screw threads, free class | 34 |
| 8. | Whitworth fine screw threads, free class | 35 |
| 9. | Unified coarse screw threads, Class 1A | 36 |
| 10. | Unified fine screw threads, Class 1A | 37 |

### APPENDICES

| | | |
|---|---|---|
| A. | Information which should be supplied with the enquiry and order | 32 |
| B. | Certificate of test and examination | 33 |
| C. | Whitworth and Unified screw threads | 34 |
| D. | Notes on design | 38 |








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BRITISH STANDARD SPECIFICATION FOR

# WROUGHT IRON AND MILD STEEL HOOKS

## FOREWORD

In this revised standard the recommended finished machined diameters for the shanks have been added, and also the diameter at the top of the thread to give an average stress of not more than 3 tons/sq.in. at the minimum core diameter of the thread, (see Tables 1, 2, 2A and 4). Appropriate amendments have been made to the clauses and figures concerned.

Trapezoidal shank hooks are limited to a safe working load of 50 tons. Crane hooks exceeding 40 tons safe working load are for many purposes preferably of ramshorn or triangular design and are so specified in B.S. 466.* Nevertheless hooks outside the range specified may sometimes be required, particularly for cranes. Such hooks can be designed from the information given in Appendix D. The use of the term 'British Standard' is, however, restricted to the actual forged hook sizes and forms laid down in the tables and figures of this standard.

This standard does not recognize the design of hook in which welding has been incorporated in the shank, because such welding would introduce, unnecessarily, a potential source of danger.

The forged dimensions of the hooks are proportional to each other and are related to the internal diameter of the hook (dimension $C$), and, in hooks for use with chain, to the nominal size of the chain (dimension $d_c$). The proportions are given to two places of decimals at the head of each column in the tables. The actual dimensions given in the tables are to increments of one-sixteenth of an inch.

The inside width between the jaws of the shackles will be greater than the thickness of the eye of complementary hooks. This 'play' is unavoidable as, in most instances, the inside width of the shackle must accept a more bulky component. If the gaps are objectionable they may be reduced by suitable washers on the shackle pin. The washers should be placed on either side of the hook, so that it is kept central.

The Committee entrusted with the preparation of this standard desires to record its indebtedness to the Engineering Division of the National Physical Laboratory† for theoretical investigation and experimental work involved in determining the proportions, dimensions, and strength of the hooks specified.

Throughout this standard, tons are of 2240 lb (1016 kg) and hundredweights (cwt) are of 112 lb (50·8 kg). Dimensions are given in inches 1 inch = 2·54 cm.‡

* B.S. 466, 'Electric overhead travelling cranes'.

† This division was closed down in August, 1951, and its functions transferred to the ~~Mechanical~~ Engineering Research Laboratory, East Kilbride, Glasgow.

‡ See B.S. 350, 'Conversion Factors and Tables'.





## SPECIFICATION

### SCOPE

1. This standard provides for six types of hand forged or drop forged hooks of two forms: trapezoidal and circular in cross section. The hooks are specified with cylindrical shanks and with eyes. The eyes specified are of three types:

*a.* for use with chain,

*b.* for use with shackles,

*c.* for use with wire rope thimbles.

The trapezoidal shank and eye hooks specified in Tables 1, 3 and 6 for cranes, chain slings and wire rope slings, respectively, are recommended as normal standards.

For certain purposes, however, users sometimes prefer hooks of circular cross section for small working loads; there is also a need for a somewhat larger internal diameter in shank hooks of trapezoidal section for small working loads. For the foregoing reasons, in addition to the standard shank and eye hooks of trapezoidal section, Tables 1, 3 and 6, shank hooks of circular section, Table 4, eye hooks of circular section, Table 5, and shank hooks of trapezoidal section of increased internal diameter, Table 2, are included.

### GENERAL

2. British Standard hooks, hereinafter referred to as 'the hook', shall conform in all respects to the dimensions and tests herein laid down.

### RATING

3. The hooks shall be rated according to the safe working loads given in Tables 1 to 6.

### TYPES OF HOOK

4. The hooks shall be one of the following types as may be specified by the purchaser:

*Type* 1. Shank hooks, trapezoidal section (see Fig. 1 and Table 1).

*Type* 2. Shank hooks, trapezoidal section. Alternative to Type 1, having increased internal diameter for small loads (see Fig. 2 and Table 2) or with shanks with integral collars (see Fig. 2A and Table 2A).

*Type* 3. Eye hooks, trapezoidal section. For use with chain (see Fig. 3 and Table 3) or with shackle pins (see Fig. 3A and Table 3A).

*Type* 4. Shank hooks, circular section (see Fig. 4 and Table 4).



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*Type* 5. Eye hooks, circular section. For use with chain (see Fig. 5 and Table 5) or with shackle pins (see Fig. 5A and Table 5A).

*Type* 6. Eye hooks, trapezoidal section. For use with wire rope thimbles (see Fig. 6 and Table 6).

### MATERIAL

5. The hooks shall be made from open hearth steel complying with the requirements of B.S. 970,* Specification En 3A. In the normalized condition the steel shall have a minimum tensile strength of 28 tons/sq. in. and a maximum tensile strength of 33 tons/sq. in.

Alternatively, the hooks shall be made from wrought iron complying with B.S. 762† or B.S. 858.‡

### FORM AND DIMENSIONS

6. The form of the hook shall be in accordance with Figs. 1 to 6 and the forged dimensions shall be in accordance with Tables 1 to 6, respectively.

### TOLERANCES ON DIMENSIONS

7. *a. Tolerances for drop-forged hooks:*

The tolerances on drop-forged hooks shall be the relevant 'DF' tolerances specified in B.S. 1718§. The 'close' thickness tolerances included in table DF1 of that standard shall not apply.

*b. Tolerances for hand-forged hooks:*

Hand-forged dimensions shall not be less than the values in tables 1 to 6 and shall not exceed these by more than the following amounts:

33⅓ per cent on the radius, Dimension Z, in Figs. 1 to 6.
7½ per cent on all other dimensions.

In all cases dimension C shall be as nearly as possible exact to size.

### DIAMETER OF SHANK

8. A plus allowance shall be made when forging the shank, to allow for machining the shank G, and the top of the screwed thread $G_1$. In no case shall the core diameter of the screwed thread be less than $0{\cdot}65\sqrt{W}$ inches, where $W$ is the safe working load of the hook in tons.

In all cases a fillet or radius shall be machined at the junction of the shank, diameter G, and the forged diameter M.

NOTE. Dimension $M$ in Tables 1, 2 and 4 is sufficient to allow machining to the recommended finished diameters of shank and screwed thread.

* B.S. 970, 'Wrought steels'.
† B.S. 762, 'Wrought iron bars, 'special' grade'.
‡ B.S. 858, ''Best Yorkshire' wrought iron'.
§ B.S. 1718, 'Tolerances for steel drop forgings and upset forgings'.





### SCREW THREADS*

9. The screw threads on the shanks of the hooks shall conform either to B.S. 84,† or, preferably, to B.S. 1580.‡.

Screw threads to B.S. 84† shall be of the Free Class, and shall be either B.S.W., B.S.F., Whit. S. or Whit.

Screw threads to B.S. 1580‡ shall be of Class 1A and shall be either UNC, ~~UNF~~, UNS, or UN.

The portion of the shank adjacent to the shoulder shall have an undercut and fillet in accordance with the appropriate recommendations in B.S. 1936§ to conform to the standard undercut Form A, Grade 1.

It is recommended that the screw threads be gauged in accordance with the system laid down in B.S. 919.¶

If the shank and the nut which secures it are drilled to take 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.

Amdt No 2. —

### WORKMANSHIP

10. The hooks shall be free from obvious defect and shall be cleanly forged in such manner that the macroscopic flow lines follow the body outline of the hook.

In the case of hooks with shanks, the whole of the shank shall be forged in one piece, integral with the hook.

### HEAT TREATMENT

11. The hooks, whether made of wrought iron or mild steel, shall be heat-treated after the completion of all forging operations.

*Wrought iron hooks* shall be normalized by heating them uniformly in a furnace until the whole of the metal has attained a temperature between 950°C and 1000°C (1742°F and 1832°F) and then cooling them in still air.

Alternatively, they shall be annealed by heating them uniformly in a furnace until the whole of the metal has attained a temperature between 600°C and 650°C (1112°F and 1202°F), and then cooling them in still air.

* See Appendix C, Tables 7 to 10, the values in which have been extracted from the standard series of threads in B.S. 84 and B.S. 1580, or have been calculated from the principles laid down in those standards.
† B.S. 84, 'Parallel screw threads of Whitworth form'.
‡ B.S. 1580, 'Unified screw threads'.
§ B.S. 1936, 'Undercuts and runouts for screw threads'.
¶ B.S. 919, 'Screw gauge limits and tolerances'.



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*Mild steel hooks* shall be normalized by heating them uniformly in a furnace until the whole of the metal has attained a temperature between 880°C and 910°C (1616°F and 1670°F), and then cooling them in still air.

### MANUFACTURER'S RECORDS OF MATERIAL

**12.** The manufacturer shall afford proof to the purchaser that the material in the hooks supplied complies with the requirements of Clause 5 of this standard. In the case of steel the manufacturer shall obtain from the steel maker a copy of the cast analysis and tensile tests of the steel. In the case of 'Special' Grade or 'Best Yorkshire' wrought iron, the material shall be obtained only from a maker previously approved in writing by the purchaser.

### PROOF TESTING

**13.** Each hook forging covered by this standard shall, after manufacture and subsequent heat treatment, be subjected to a proof load of twice the safe working load (Column 1, Tables 1 to 6) and shall not then show a permanent set exceeding one-quarter of one per cent of the distance *a*, *b* (see Diagram). After removal of the proof load and determination of the permanent set (if any) each hook shall be thoroughly examined by a competent person and shall be accepted as complying with the standard only if found free from flaw or defect.

Prior to the application of the proof load each hook shall bear a centre punch mark at position *b*, from which a scribed line shall be trammelled to position *a* (see Diagram). After removal of the load the hook shall be re-scribed with the trammel unaltered and the difference (if any) between the two scribed lines shall be the amount of permanent set.

In no case shall the plus or minus tolerance of the testing machine used exceed 5 per cent of the proof load applied.

### TESTING FACILITIES

**14.** Unless otherwise required by the purchaser, the manufacturer shall, at his own cost, supply the necessary labour and appliances for the tests required by this standard. In the absence of facilities at his own works for making the specified proof test, the manufacturer shall bear the cost of carrying out such proof test at a public test-house.

### ADDITIONAL TESTS

**15.** If the purchaser requires analysis or tensile or bend tests of the steel or iron from which the hooks are to be made, or if the purchaser requires such tests on the finished hook or hook shank subsequent to forging, the cost of the preparation of such tests, of the material destroyed, and of





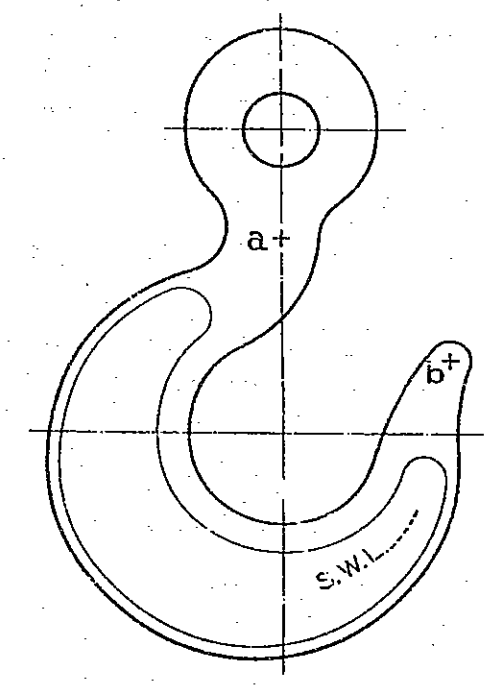


Diagram showing points (*a* and *b*) between which the hook shall be measured before and after proof testing, to ascertain the amount of permanent set (see Clause 13); and recommended position for marking hook with safe working load, and for marking identification symbol on reverse side of hook (see Clause 17).



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