

Code of practice for
Ships' cargo blocks

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Foreword

In this revision of BS 408 (now BS MA 47), this standard has been brought into line with complementary standards and its scope has been extended by the inclusion of snatch blocks.

All units are now in metric values and wire ropes are sized by diameter in place of circumference. In the case of sheaves, the diameter is now measured at the bottom of the rope groove.

The relationship between the proof load and safe working load (SWL) has been brought into line with the values in the International Labour Office pamphlet No. 188 "Safety and health in dock work" (ILO code), which are being incorporated in the new Docks Regulations now in preparation.

As in the 1963 edition of this standard, limitations have been placed on the use of screw threads having a depth of thread less than $0.04D$, where D is the diameter at the top of the thread. This limitation, which assumes a length of engagement equal to the diameter D , is a precaution against the possibility of the threads beginning to fail before the tensile failure of the core diameter area. (In the case of internal threads the increased circumferential area in shear will compensate for the reduced depth of thread.)

Where hooks are required they should comply with the relevant British Standard.

Unlike blocks for general engineering purposes, the SWL marked on any multiple sheave block will correspond to the *resultant load on the head fitting of that block*. Thus the fixed block in a purchase should normally have a greater SWL marked on it than the moving block, to allow for the downhaul pull.

This standard applies to ships' cargo blocks for use with wire rope. In order to determine the appropriate size of wire rope, and the resultant loads on the head fittings, reference should be made to the design information in BS MA 48 "*Code of practice for the design and operation of ships' derrick rigs*".

Where the position of a block in any set of lifting tackle is changed (for example, when the block is used in another combination of blocks), the loading imposed upon a block under a given cargo load may vary with the position in which it is placed. Care and discretion must therefore be exercised in the selection of blocks to be used in different sets or combinations, to avoid the possibility of overloading (see BS MA 48).

Attention is drawn to Appendix A which deals with provisions for testing and inspection in contracts.

Cargo blocks should be periodically overhauled and, when not in use, they should be stowed and protected against undue exposure to weather. Recommendations as to maintenance, overhaul and lubrication are given in Appendix F. Neglect of adequate lubrication seriously increases friction in the block and can also lead to rapid pin wear.

While those types of blocks which are known as "malleable blocks" and "wood blocks" are not included in this standard, this should not be interpreted as deprecating such blocks for the purposes for which they are commonly used.

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 16 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.

1 Scope

This standard covers ships' steel cargo blocks for use with wire rope and forming part of the cargo derrick rig, embracing the body, sheave(s), axle pin, head fittings and becket.

Materials, workmanship, design particulars (screw threads, bearings, sheave diameters for given rope sizes, sheave grooves), permissible stresses, proof loading, inspection, marking and certificate of test and examination are specified.

2 References

This standard makes reference to the following standards publications:

- BS 302, *Wire ropes for cranes, excavators and general engineering purposes.*
- BS 309, *Whiteheart malleable iron castings.*
- BS 310, *Blackheart malleable iron castings.*
- BS 919, *Screw gauge limits and tolerances.*
- BS 970, *Wrought steels in the form of blooms, billets, bars and forgings — Part 1: Carbon and carbon manganese steels, including free cutting steels.*
- BS 1452, *Grey iron castings.*
- BS 1486, *Lubricating nipples.*
- BS 1610, *Methods for the load verification of testing machines.*
- BS 1700, *Memorandum on ships' derrick rigs.*
- BS 1936, *Undercuts and runouts for screw threads.*
- BS 2772, *Iron and steel for colliery haulage and winding equipment — Part 2: Wrought steel.*
- BS 2789, *Iron castings with spheroidal or nodular graphite.*
- BS 3017, *Mild steel forged ramshorn hooks.*
- BS 3100, *Specification for steel castings for general engineering purposes.*
- BS 3810, *Glossary of terms used in materials handling — Part 6: Terms used in connection with pulley blocks.*
- BS 4360, *Weldable structural steels.*
- BS MA 48, *Design and operation of ships' derrick rigs.*

3 Definitions

For the purposes of this British Standard the following definitions apply.

3.1

ships' cargo block (see Figure 1)

a block suitable for use with wire rope and forming part of the cargo derrick rig, embracing the body, sheave(s), axle pin, head fittings, becket, and/or other components

3.2

single, double, treble, four-fold, five-fold, etc. block

a block with one, two, three, four, five, etc., sheaves

3.3

mast head span block, lower cargo purchase block, etc.

blocks used in particular positions on derricks

3.4

snatch block

a single block with a hinged portion through which a rope can be passed to facilitate reeving

3.5

head fittings

the means by which the block is attached to its anchorage or to the load being lifted. Types of head fittings are shown in BS 3810-6, and are reproduced as Appendix H of this standard

3.6

safe working load of a single sheave block

the maximum load, W , which can safely be lifted in the manner shown in Figure 4, Appendix C

3.7

safe working load of a multiple sheave block

the maximum *resultant load* which can safely be applied to the head fitting of the block in service

NOTE A snatch block is regarded as suitable only when rigged as a lead block, and only when the hinged portion is properly closed and secured. In such condition it is deemed to have a similar function to that of a single sheave block, and the safe working load is similarly defined.

4 Factor of safety

For the purpose of this standard, the *factor of safety* of a block is the ratio between the ultimate strength of the block as a unit, and the maximum permitted load imposed on the block, neglecting frictional resistance, acceleration of the load and the affect of a ship's list, which are taken care of by the factor of safety.

The *factor of safety*, as so defined, should be not less than 5.

It is further required that the permissible working stresses specified in clause 5 should not be exceeded in the design of the block.

5 Permissible working stresses

5.1 Bearing pressure on axle pin. The bearing pressure between any sheave bush and the axle pin should not exceed 39 N/mm² for single sheave blocks, or 31 N/mm² for multiple sheave blocks.

For the purpose of calculation, the load transmitted by any sheave should be taken as not less than that shown in Table 1.

The pressure between the axle pin and the stress-bearing members (i.e. straps and supporting partitions) of the block should not exceed 154 N/mm² and, for the purpose of calculation, the load sustained by such members when each individual sheave has a support should be taken as not less than that shown in Table 2.

For the foregoing requirements, the projected area of the axle pin in contact should be taken, i.e. Area = appropriate length × diameter.

5.2 Shearing stress in axle pins and through bolts. In single shear the shearing stress should not exceed 62 N/mm² for mild steel, or 77 N/mm² for higher tensile steel (see clause 6). Twice these values may be taken in the case of double shear. In the design of snatch blocks, the loading may be assumed to be equally distributed on each side strap.

Table 1 — Load transmitted by block sheaves

Type of block	Number of sheaves in block	Percentage of resultant load on head fitting transmitted by any sheave, max.			
		Sheaves with bushed plain bearings (Friction allowance 6 %)		Sheaves with ball or roller bearings (Friction allowance 2 %)	
		Without becket	With becket	Without becket	With becket
		%	%	%	%
Double	2	53	44	51	42
Treble	3	38	33	35	30
Four-fold	4	30	27	27	24
Five-fold	5	25	24	22	20
Six-fold	6	22	21	19	18
Seven-fold	7	20	19	17	16
Eight-fold	8	19	18	15	14

NOTE 1 For all blocks covered by this table, the resultant load on the head fitting is the value of the SWL marked on the block (See definitions, clause 3).

NOTE 2 The percentages in this table are based on the maximum rope tensions on the moving block when hoisting, as calculated from the friction coefficients given in section 2 of BS 1700:1963.

Table 2 — Load on supporting straps (equal spans)

Type of block	Number of sheaves in block	Number of supports		Percentage of total load on axle pin sustained by supports, max.			
		Inner support	Outer support	Sheaves with bushed plain bearings (Friction allowance 6 %)		Sheaves with ball or roller bearings (Friction allowance 2 %)	
				Any inner support	Any outer support	Any inner support	Any outer support
				%	%	%	%
Double	2	1	2	63	20	63	19
Treble	3	2	2	40	15	38	14
Four-fold	4	3	2	32	12	30	11
Five-fold	5	4	2	27	10	24	9
Six-fold	6	5	2	24	9	21	8
Seven-fold	7	6	2	22	8	18	7
Eight-fold	8	7	2	20	7	16	6

NOTE 1 Provision should be made on the appropriate supports for the load imposed by the becket.

NOTE 2 The loadings shown in this table have been calculated on the assumption that the axle pin is a continuous beam having free ends and supports equally spaced, and is subjected to a varying load, due to rope/sheave friction and increasing in magnitude along the length of the axle pin, when hoisting or lowering.

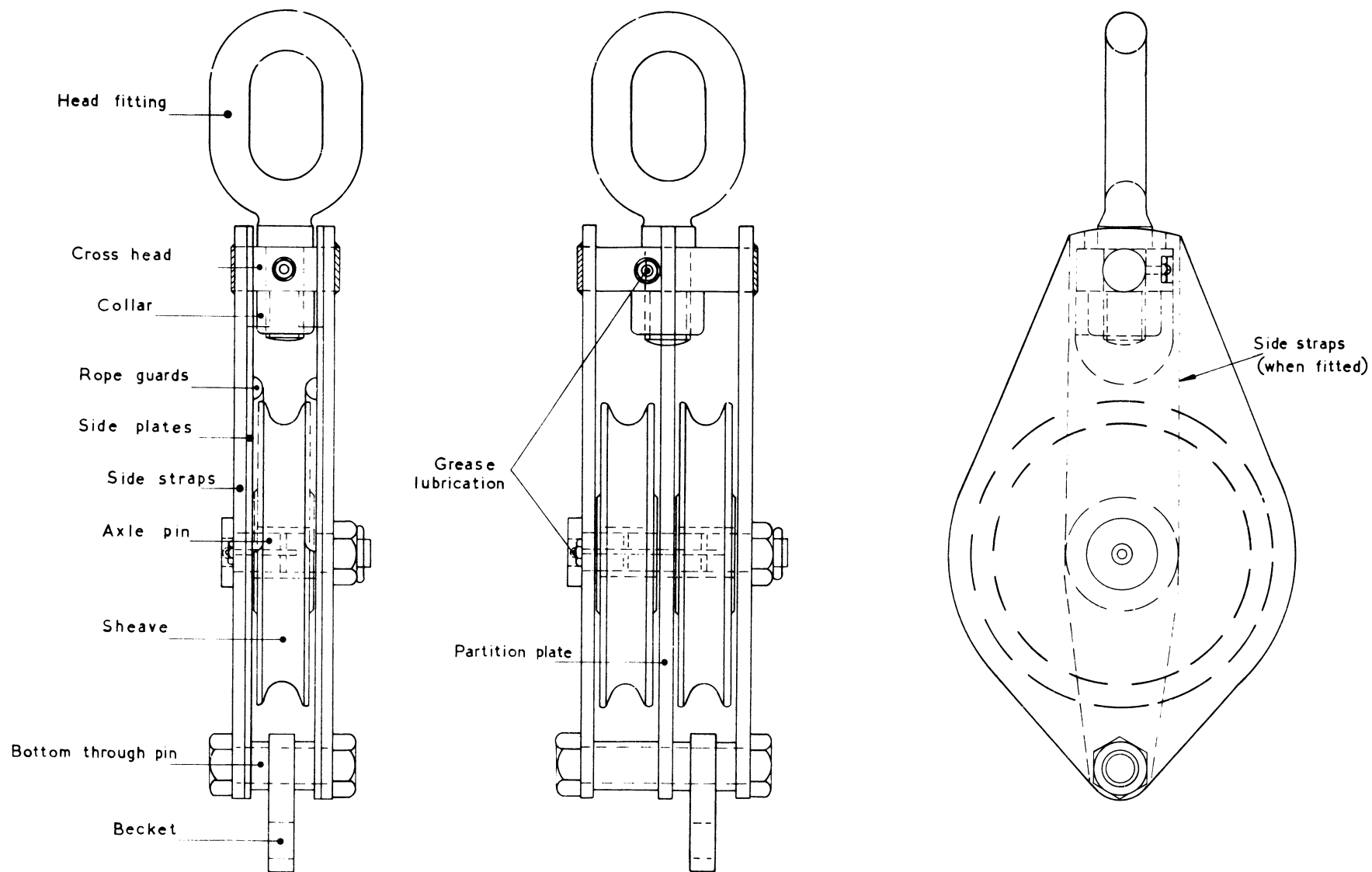


Figure 1 — Ships' cargo blocks