

Code of practice for

Design and operation of ships' derrick rigs

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Foreword

This British Standard code of practice on ships' derrick rigs is intended to serve as a guide for the use of ships' officers, stevedores, designers and others connected with the working of cargo, and is a revision of BS 1700:1963.

In this revision, metric units have been used throughout and the wire rope tables in Appendix B have been brought into line with the recently published metric standards for wire ropes.

The diameters of block sheaves are now specified in relation to the diameter at the bottom of the rope groove.

Throughout this standard the forces, e.g. P , P_1 , etc., are those resulting from the application of a load W . The blocks and other items of equipment are rated in tonnes and therefore, for practical convenience, forces are expressed in tonnes instead of force units¹⁾.

Clause 4 gives standard nomenclature, and illustrates the various forms of rig, covering the ordinary cargo derrick and the conventional type of heavy-lift derrick. Typical head fittings of blocks are also included.

Clause 5 provides a method of estimating rope tensions. Frictional resistance is an important factor in the determination of rope tensions, and the coefficients given in Table 1 and Table 2 cover, respectively, sheaves with bushed plain bearings, and those with ball or roller bearings.

In clause 6, typical load diagrams are given for the purpose of estimating the resultant loads on blocks and shackles.

Clause 7 deals with the special case of a union purchase rig and describes a method of estimating the loading on the various components in the rig. In view of the many variables, a graphical method of calculation offers the most practical solution. The marking of the safe working load in union purchase, generally designated as s.w.l.(u) is optional.

Clause 8 gives the recommended safe working loads of slewing guys for swinging derricks, dealing with the normal case having the guys attached to the derrick head and also the case where the guys are attached to the load, which is applicable to some heavy-lift derricks and to mammoth derricks.

Clause 9 is applicable to the single sheave block and illustrates how the various positions in the rig affect its safe working load "as rigged". It also deals with the question of marking the safe working load in accordance with the requirements of the Docks Regulations.

Clause 10 includes information on the care and maintenance of cargo blocks. Cargo blocks should be periodically overhauled, and when not in use they should be carefully stowed and protected against exposure to weather so far as is practicable; they should also be lubricated. Neglect of adequate lubrication seriously increases friction in the blocks and can lead to rapid pin wear.

Clause 11 is given for the benefit of those responsible for carrying out tests and examinations of ships' derricks in accordance with the statutory requirements.

Clause 12 is an extract from Schedule to the Docks Regulations, 1934.

Appendix A gives the relationship between the proof load and the safe working load and applies to blocks, shackles and other components of lifting gear.

Appendix B contains extracts from BS 365 and BS 302, to assist in the selection of suitable wire ropes.

Appendix C indicates the methods used for calculating the friction coefficients in Table 1 and Table 2; it has been included since other methods of calculation (which are sometimes used) will give different coefficients for a given friction percentage and, unless the method of calculation is stated, the results can be somewhat misleading.

¹⁾ 1 tonne $\approx$ 9 810 N

For information appertaining to the design and construction of the blocks, reference should be made to BS MA 47²⁾.

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 to iv, pages 1 to 35 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.

²⁾ In course of preparation.

NOTE Users of this British Standard: Marine Series should note that while observing the requirements of the standard they should at the same time ensure compliance with such statutory requirements, rules and regulations as may be applicable to the individual ship concerned.

1 Scope

This British Standard code of practice refers to the design and operation of ships' derrick rigs. It gives coefficients for estimating rope tensions, load diagrams, safe working loads, requirements for testing and for care and maintenance. Reference is also made to union purchase rigs.

2 References

This standard makes reference to the following British Standards.

BS 302, *Wire ropes for cranes, excavators and general engineering purposes*.

BS 365, *Galvanized steel wire ropes for ships*.

BS 2763, *Round steel wire for ropes*.

BS MA 47, *Ships cargo blocks*³⁾.

3 Definitions

3.1

inboard boom

a derrick which is positioned over the hatchway

3.2

outboard boom

a derrick which is positioned outboard, either port or starboard

3.3

headroom (or drift)

the vertical distance from the top of the hatch coaming or from a permanent erection (whichever is the higher) to the point of connection of the runners (In practice the cargo hook will reduce this headroom.)

3.4

union purchase

a rig in which a pair of derricks is used in combination, the derricks being fixed and the cargo runners coupled in such a way that the load is swung from a position vertically under one derrick to a position vertically under the other (This is sometimes known as *burtoning*.)

3.5

jack-knifing

the self-closing of a derrick boom under load, due to the forces tending to lift it exceeding those tending to hold it down

3.6

standing guy

a guy used for holding a derrick in its required position, as in the case of a union purchase rig (Hitherto referred to as a preventer guy.)

NOTE Standing guys should be looped directly around derrick booms or attached to a separate derrick head lug, and secured to the ship's structure by a separate and independent anchorage.

3.7

slewing guy

a guy used for manoeuvring a derrick. These guys are "eased off" when the standing guys are set up in union purchase

NOTE Slewing guy tackles should be so placed that they exert the maximum holding force on the derrick boom (see clause 8).

3.8

journal friction

the effort required to rotate a pulley on its axle

3.9

rope friction

the effort required to bend and unbend a rope around a pulley, which is largely due to the internal friction between the individual wires and strands in the rope as they adjust themselves to the different lengths along the inner and outer curves of the bend

4 Nomenclature

Figure 1 to Figure 7 show arrangements of tackle and give their names.

5 Coefficients for estimating rope tensions

5.1 Effects of friction. As the effect of frictional resistance and rope stiffness is to increase materially the tension in the rope at the winch when hoisting, it should be allowed for when determining the size of the rope and the power required for the winch.

Frictional resistance in ropes and pulleys is due to the combined effect of journal friction (see 3.8) and rope friction (see 3.9).

Because of the many factors affecting frictional resistance, calculations cannot be made with any great degree of accuracy and, for this reason, when estimating rope tensions, the friction coefficients which are to be allowed can only reasonably be based upon an arbitrary percentage depending upon the equipment used and the method of calculation.

³⁾ In course of preparation.

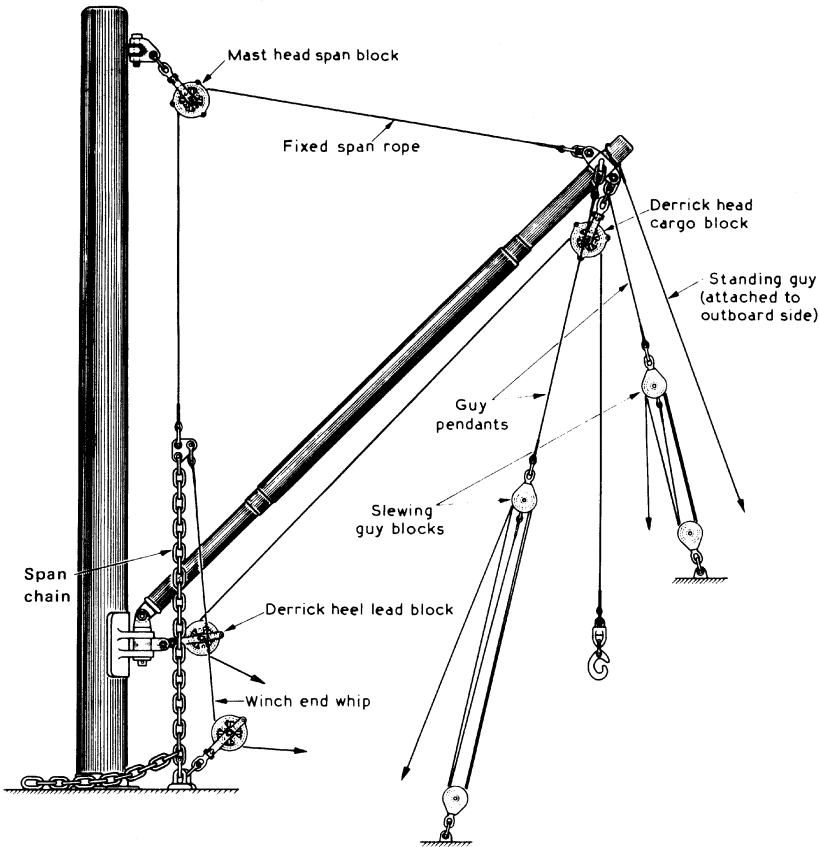
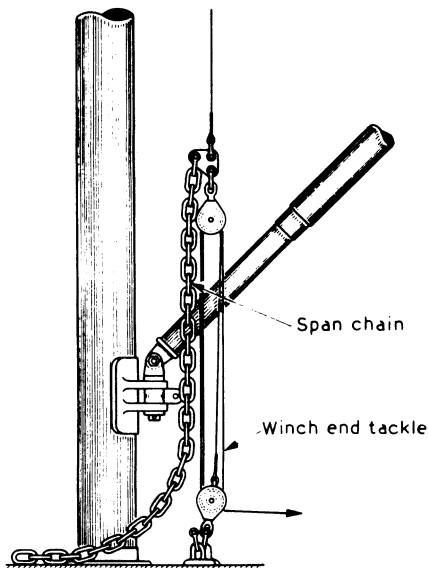


Figure 1 — Ship's derrick rigged with single span (span with winch end whip)



NOTE The plate to which the span chain is attached is variously known as the "triangle plate" or "monkey face".

Figure 2 — Ship's derrick rigged with single span (span with winch end tackle)

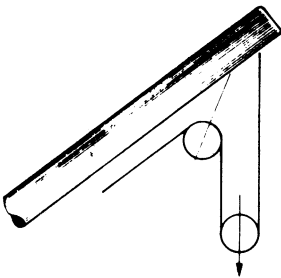


Figure 3 — Gun tackle rig

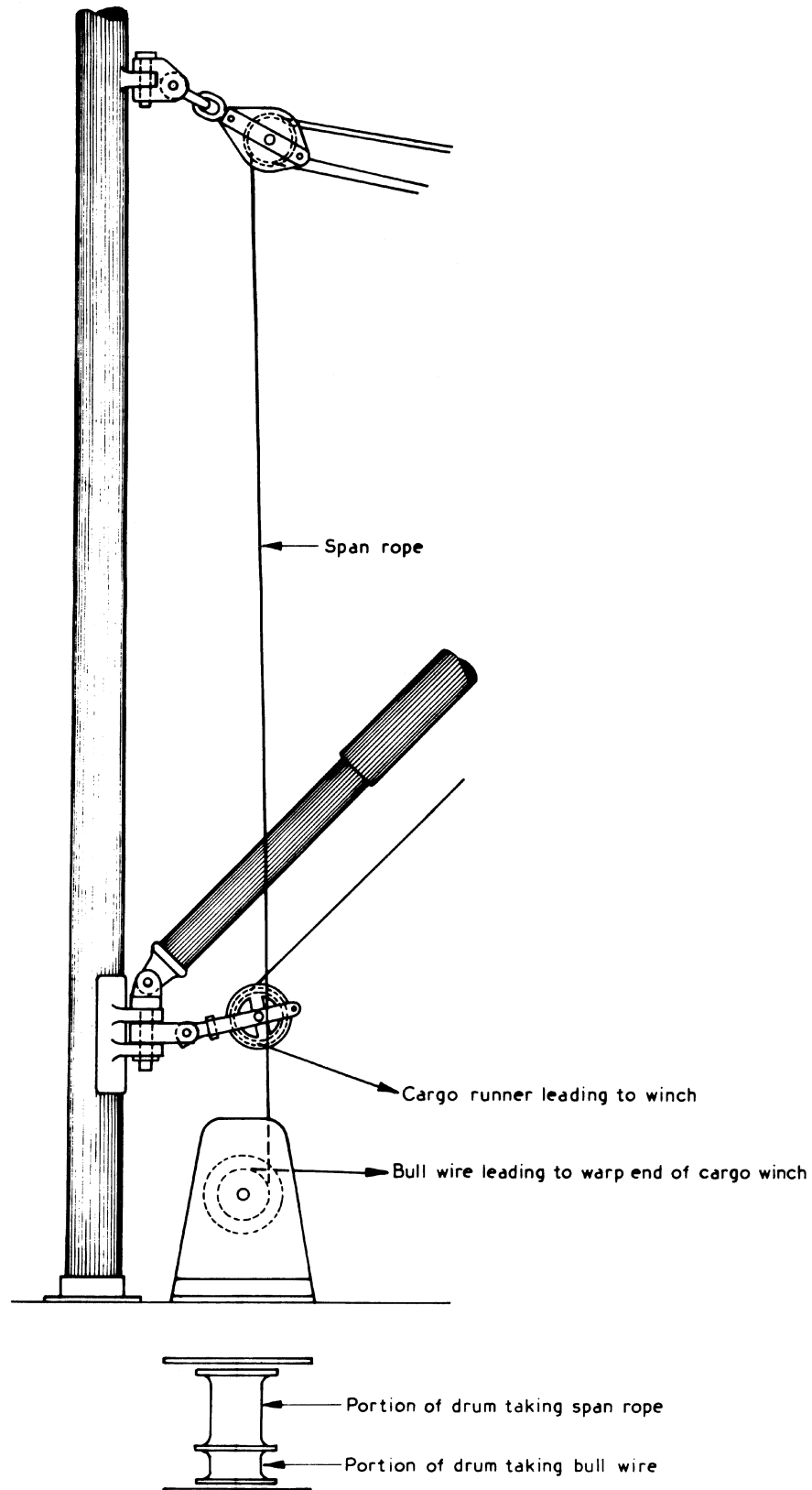
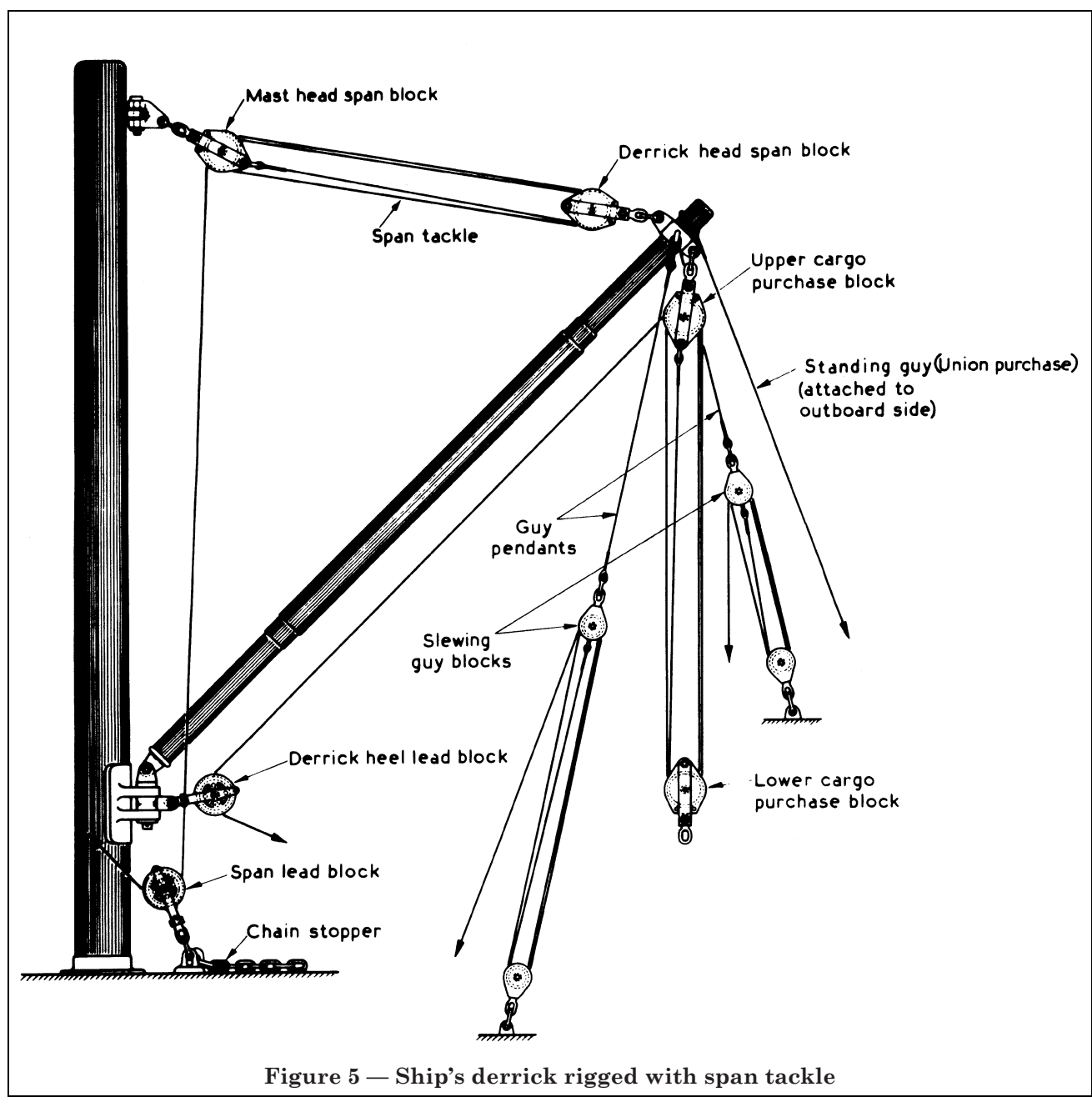
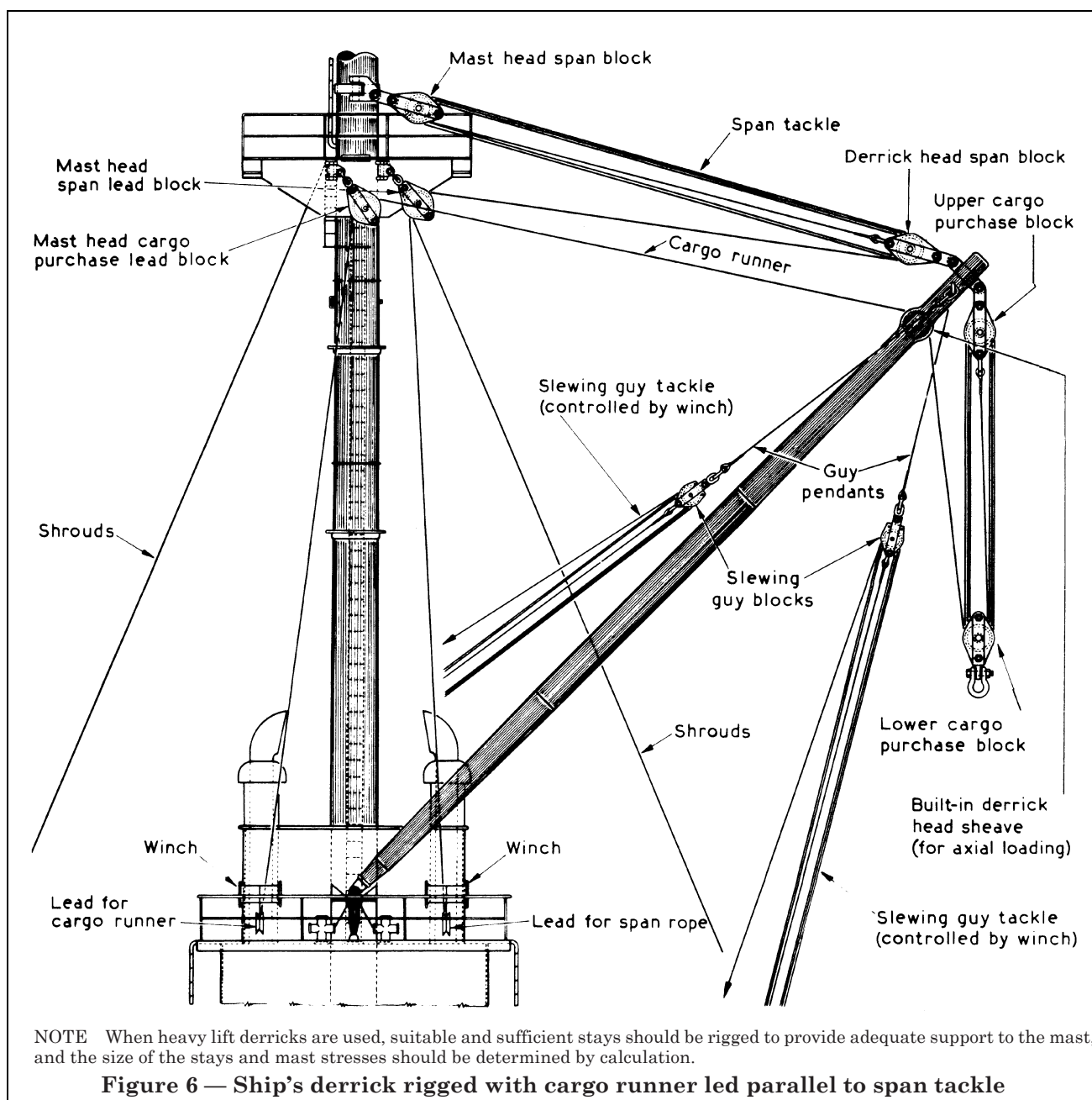


Figure 4 — Ship's derrick with derrick topping winch





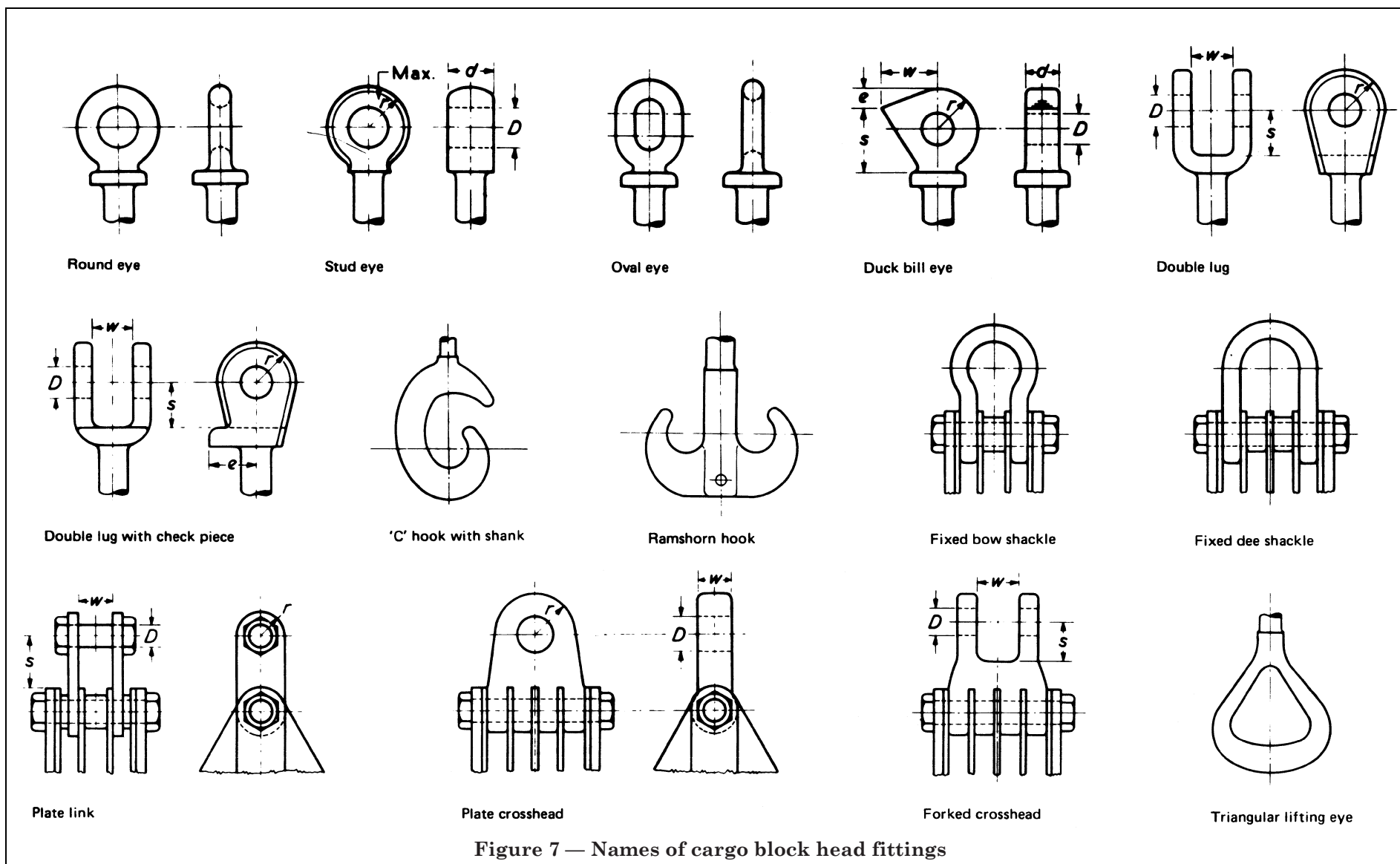
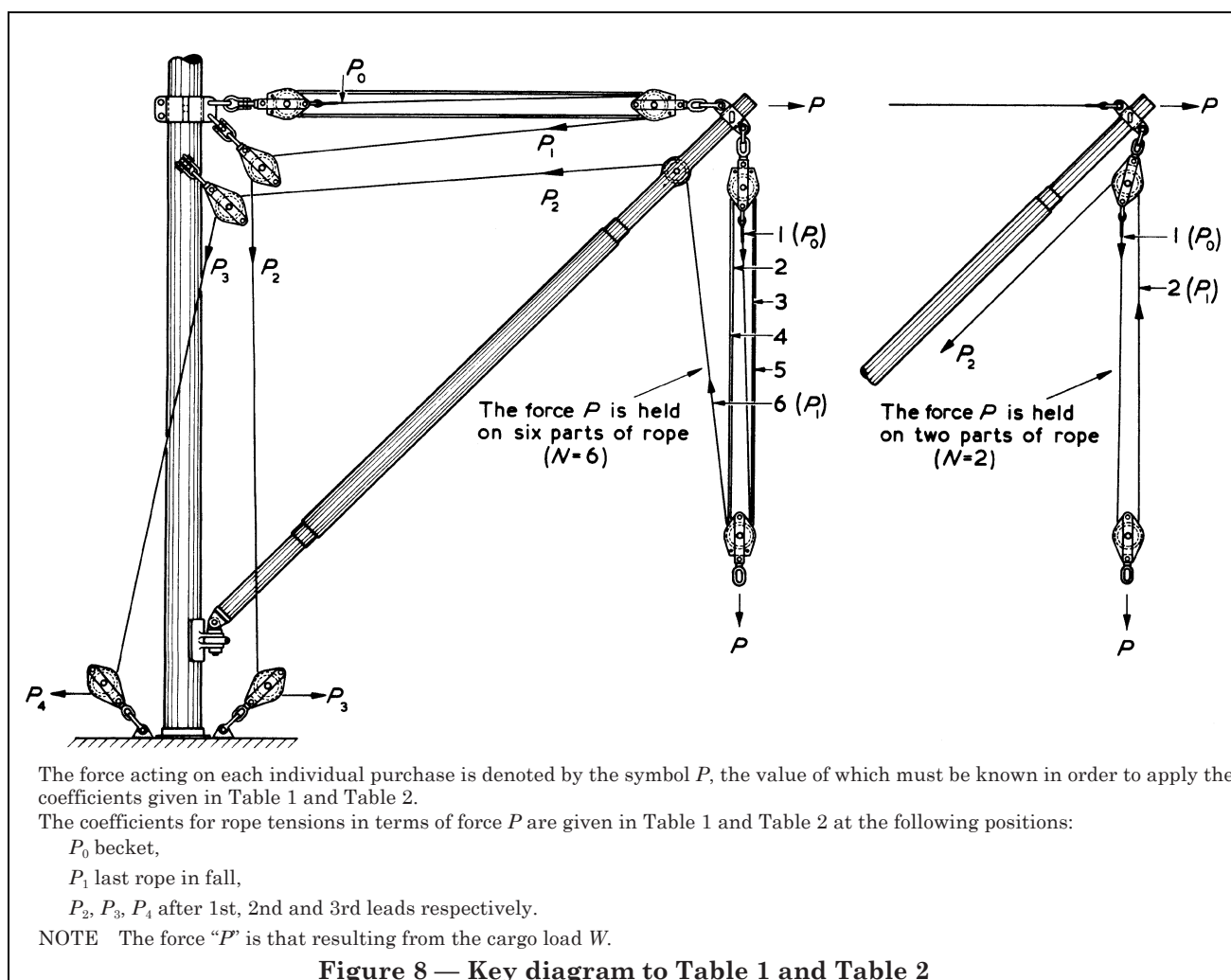


Figure 7 — Names of cargo block head fittings



5.2 Coefficients. The coefficients in this section (see Table 1 and Table 2 and Figure 8) have been calculated on the basis that the sum of the individual rope tensions in any purchase equals the force, P , held by that purchase (neglecting such dynamic effects as acceleration and deceleration and any increase in rope tension due to a ship's list). (For method of calculation, see Appendix C.)

A different method of applying the percentages may call for a materially smaller percentage to obtain comparable results, e.g. 3 % per sheave accumulative, or 4 % per sheave by simple addition (applied to the static rope tension P/N , where N is the number of parts of rope) will give coefficients comparable to 6 % by the method given in Appendix C. However, the sum of the individual rope tensions would be found to exceed the value of P which, neglecting dynamic effects, cannot occur in actual practice.

5.3 Resultant loads on the head fittings of purchase blocks. Table 3 and Table 4 give the resultant loads in terms of load P on the head fittings of fixed and moving blocks in a purchase.

These particular tables have been prepared from the 6 % friction allowances given in Table 1.

If desired, similar tables may be prepared, giving resultant loads corresponding to friction allowances of 2 % per sheave, applicable to blocks with ball or roller bearings.