



財團法人驗船中心
CR CLASSIFICATION SOCIETY

RULES FOR THE CONSTRUCTION AND SURVEY OF CARGO GEAR 2013

AMENDMENT No.2

June 2026



RULES FOR THE CONSTRUCTION AND SURVEY OF CARGO GEAR 2013

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**RULES FOR THE CONSTRUCTION
AND SURVEY OF ~~CARGO GEAR 2013~~ LIFTING
APPLIANCES 2027**

AMENDMENT

This Amendment and *the Rules for the Construction and Survey of Cargo Gear 2013* are to be consolidated and published as *January 2027 Edition*.

List of major changes from 2013 edition

1.1~1.3	Revised	12.3	Revised
1.5(a)	Revised	Fig. A-1	Revised
1.5(b)~(e)	Revised	Table A-2	Revised
1.5(m)&(n)	Revised	Fig. A-2	Revised
1.5(o)~(u)	New	Table A-3a	Revised
1.6~1.7	Revised	Table A-3b	Revised
2.1	Revised		
2.2	Revised		
2.5	Revised		
2.6	Revised		
4.1~4.4	Revised		
Table 4.1	Revised		
Table 4.2	Revised		
5.1	Revised		
5.2	Revised		
5.5	Revised		
5.6	Revised		
Table 6.1	Revised		
7.1	Revised		
7.3	Revised		
7.6	Revised		
9.1	Revised		
12.1	Revised		

Rules for the Construction and Survey of Cargo Gear 2013 have been partly amended as follows:

1. General

Section 1.1 ~ 1.3 have been amended as follows:

- 1.1 The Rules for the Construction and Survey of ~~Cargo Gear~~ **Lifting Appliances** (hereinafter referred to as "the Rules") apply to the ~~cargo gear~~ **lifting appliances** which ~~is~~ **are** installed on the ships classed with the Society, and which ~~is~~ **are** intended to be registered under the requirement of Article 2 of the Rules.
- 1.2 Unless otherwise specified in the Rules, the materials, equipment, installation and workmanship of the ~~cargo gears~~ **lifting appliances** are to comply with the relevant requirements in the Rules for the Construction and Classification of Steel Ships (hereinafter referred to as "the Rules for Steel Ships").
- 1.3 ~~Cargo gears~~ **Lifting appliances** which are not designed and manufactured under the requirements of the Rules may be accepted, provided that they comply with any rule or standard having the equivalency recognized by the Society and pass the tests and inspection required by the Society.
- 1.4 Ships equipped with heavy lift appliance (see 1.5(n)) in accordance with the Rules will be assigned the notation **HLA**.
- 1.5 The terms used in the Rules are defined as ~~in the followings:~~

Paragraph 1.5(a) has been amended as follows:

- (a) ~~Cargo gears – lifting appliances and loose gears, where lifting appliances are derrick systems, cranes, cargo lifts, cargo ramps and other machinery used on board for the loading and unloading of cargoes and other articles and include their installations of driving systems, cargo fittings.~~
Lifting appliance – any load-handling ship's equipment, including:
 - (i) **used for cargo loading, transfer or discharge;**
 - (ii) **used for raising and lowering hold hatch covers or moveable bulkheads;**
 - (iii) **used as engine-room cranes;**
 - (iv) **used as stores cranes;**
 - (v) **used as hose handling cranes;**
 - (vi) **used for launch and recovery of tender boats and similar applications; and**
 - (vii) **used as personnel handling cranes.**

Paragraphs 1.5(b) ~ (e) have been amended as follows:

- (b) Loose gear – ~~blocks, ropes, chains, rings, hooks, links, shackles, swivels, clamps, grabs, lifting magnets, spreaders, etc.,~~ **an article of ship's equipment by means of which a load can be attached to a lifting appliance but which does not form an integral part of the lifting appliance or load, such as blocks, ropes, chains, rings, hooks, links, shackles, swivels, clamps, grabs, lifting magnets, spreaders, etc.**
- (c) ~~Safe working load (SWL) of the cargo gear assembly – the maximum allowable load of the cargo gear approved to operate safely excluding the weight of the cargo gear itself.~~
Safe working load (SWL) – the maximum static load at a specified radius which a lifting appliance or item of loose gear is certified to lift for a specified operating condition.
- (d) ~~Safe working load (SWL) of the loose gear – the maximum allowable load upon the loose gear in the designed conditions assumed.~~

- (ed) ~~Proof Load test~~ – the load of the test provided in Article 4 of the Rules applied to prove that the cargo gear has the capacity for loading and unloading with the safe working load. **a test in excess of the SWL, carried out in the presence of a competent person in order to check the structural integrity and adequacy of the lifting appliance and its attachments and its supporting structures.**

(e) **Proof test – a load test of loose gear as specified in (d).**

- (f) Derrick system – installations including derrick posts or masts, stays, booms, goose necks, eye plates, winches and running gears for handling cargoes by suspending the cargo from the top of the derrick boom in hoisting, lowering, luffing and slewing motion. Union purchase derrick system is that a pair of derrick booms, on port and starboard sides, are fixed predetermined positions. The cargo falls of two derricks are connected to load or unload the cargo.
- (g) Crane – jib cranes, gantry cranes, overhead cranes and hoists, cargo davits, etc. and are capable of performing the work of cargo loading and unloading, in slewing and/or horizontal movement simultaneously or separately.
- (h) Cargo lifts – the installations designed to contain the cargo in their structure to loading and unloading the cargo.
- (i) Cargo ramps – the installation mounted on the shell or provided in the ship, and arranged to permit passage of vehicles as cargo or vehicles loaded with cargo on themselves and having mechanism enabling its opening and closing or turning.
- (j) Allowable minimum angle – the minimum angle to horizontal of a derrick boom at which the derrick system is permitted to operate under the safe working load.
- (k) Maximum slewing radius – the maximum radius at which a jib crane is permitted to operate under the safe working load.
- (l) Cargo fittings – goose neck brackets, derrick heel lugs, fittings attached to head of derrick booms, etc. which are permanently fitted to the lifting appliances or the hull structure for the purpose of cargo handling.

Paragraphs 1.5(m)&(n) have been amended as follows:

- (m) Acceleration of gravity (g) – 9.81 m/sec².
- (n) Heavy lift appliance – ~~Cargo gear~~ **lifting appliance** with safety working load not less than 160 tonnes on the main hoist falls.

Paragraphs 1.5(o)~(u) have been added as follows:

- (o) **Competent person – a person possessing the knowledge and experience required for the performance of thorough examinations and tests of lifting appliances and loose gear and who is acceptable to the Society.**
- (p) **Responsible person – a person appointed by the master or company, as defined in regulation IX/1 of SOLAS, as appropriate, possessing the knowledge and experience required for the performance of duties specified in the Rules.**
- (q) **Inspection – an assessment carried out by a responsible person to ascertain if the lifting appliance or loose gear is in good working condition for continued safe use.**

- (r) Thorough examination – a detailed assessment carried out by a competent person in order to determine whether the lifting appliance or loose gear is in compliance with the applicable requirements of the Administration.
- (s) Maintenance – any activity carried out by a responsible person to keep the lifting appliance or loose gear in good working condition for continued safe use.
- (t) Operational testing – a test carried out by a responsible person to verify the correct functioning of a component or operation of the lifting appliance or associated loose gear.
- (u) Certificate of test and thorough examination – a certificate issued by a competent person upon satisfactory completion of the test and thorough examination of the lifting appliance and/or loose gear.

Section 1.6 ~ 1.7 have been amended as follows:

1.6 When an application of newly installed ~~cargo gear~~ lifting appliances and loose gear for registration is made to the Society, the following plans and calculations are to be submitted for consideration:

- (a) General arrangement of the ~~cargo gear~~ lifting appliances and loose gear (including rigging plan, if applicable).
- (b) Force diagrams and strength calculations.
- (c) Construction drawings.
- (d) Details of loose gear.
- (e) Drawings of safety devices and protective devices.
- (f) Construction drawings of the installation of driving machinery.
- (g) Power system diagram.
- (h) Drawings of operation and control system.
- (i) Other drawings and documents as deemed necessary by the Society.

1.7 The submission of drawings and data for existing ~~cargo gear~~ lifting appliances and loose gear is generally to be the same as prescribed in 1.6. However, partial omission of these drawings and documents may be accepted by the Society if the former inspection records and certificates are found satisfactory.

2. Registration and Certification

Section 2.1 has been amended as follows:

2.1 A Register of ~~Cargo Gear (ILO Form 1, "Register of Ship's Lifting Appliances and Items of Loose Gear", hereafter is called~~ Cargo Handling Gear ~~hereinafter referred to as "the Register")~~ is to be issued by the Society to a ship of which the ~~cargo gear~~ lifting appliances and loose gear ~~has have~~ been subjected to a registration survey to the satisfaction of the Surveyor to the Society.

Section 2.2 has been amended as follows:

2.2 The Register is to be open to the inspection of the authorities concerned, ~~with all necessary entries made and be available for endorsement~~ endorsed by the Surveyor to the Society ~~at the time~~ upon completion of each the survey.

2.3 The Register is to include the following records:

- (a) Thorough examination of lifting appliances and loose gear.
- (b) Regular inspections of loose gear.

2.4 The following certificates are required to be attached to the Register:

- (a) Certificate of Test and Thorough Examination of Derricks, Winches, and their Accessory Gear (~~ILO Form 2)(CC-17)~~.
- (b) Certificate of Test and Thorough Examination of Derricks, Winches, and their Accessory Gear, for operation in Union Purchase (~~ILO Form 2(U))(CC-17U)~~.
- (c) Certificate of Test and Thorough Examination of Cranes or Hoists and their Accessory Gear (~~ILO Form 2~~).
- (d) Certificate of Test and Thorough Examination of Cargo Lifts/Cargo Ramps and their Accessory Gear.
- (e) Certificate of Test and Thorough Examination of Loose Gear (~~ILO Form 3~~).
- (f) Certificate of Test and Thorough Examination of Rope (~~ILO Form 4~~).

Section 2.5 has been amended as follows:

2.5 Records of overhaul, replacement and reconditioning of the ~~cargo-gear~~ lifting appliances and loose gear together with certificates of tests and examinations are to be attached to the Register.

Section 2.6 has been amended as follows:

2.6 A diagram showing the arrangement of the assembled ~~cargo-gear~~ lifting appliances indicating the approved safe working load, the identifying mark for each component part and the particulars of special material are to be inserted in the Register.

4. Inspection and Tests

Section 4.1~4.4 have been amended as follows:

4.1 A Registration Survey is to be carried out when an application of newly installed ~~cargo-gear~~ lifting appliances and loose gear for registration is made to the Society.

4.2 At the Registration Survey—

- (a) The load tests of the ~~cargo-gears~~ lifting appliances and the proof tests of loose gear are to be carried out as follows:—
 - (i) The ~~load~~ proof tests of the loose gears are to be carried out with a ~~proof test~~ load as shown in Table 4.1. Ropes are to be tested to satisfy the safety factors as specified in 11.3 of the Rules. However, the load tests of loose gears may be omitted when the loose gears have been examined/tested by the competent persons and issued with the certificates with and testing records of them.
 - (ii) The load tests of the ~~cargo-gear assemblies~~ lifting appliances are to be carried out as a unit with a ~~proof test~~ load as shown in Table 4.2.
- (b) The structure, materials, scantlings, workmanship on the construction of ~~cargo-gears~~ lifting appliances and loose gear are to be subjected to thorough examinations and non-destructive testing where requested by the Surveyor.

- (c) Shop trial of the driving machinery.
- (b) Operation test of the ~~cargo gear~~ **lifting appliances and loose gear**, including the performance tests of safety devices and protective devices.
- (e) Other examinations/tests considered necessary by the Society.

Table 4.1 has been amended as follows:

Table 4.1
~~Proof Load for Loose Gear~~ Minimum Test Loads

Article of gear	Proof Test load (t)
Single sheave block	4 × SWL
Multi-sheave blocks and hook blocks with SWL ≤ 25 t	2 × block SWL
25 t < Multi-sheave blocks and hook blocks with SWL ≤ 160 t	(0.933 × block SWL) + 27
Multi-sheave blocks and hook blocks with SWL > 160 t	1.1 × block SWL
Chain, hook, shackle, ring, link, swivel, clamp and similar devices with SWL ≤ 25 t	2 × SWL
Chain, hook, shackle, ring, link, swivel, clamp and similar devices with SWL > 25 t	(1.22 × SWL) + 20
Lifting beam, lifting gear magnet, spreader and similar devices with SWL ≤ 10 t	2 × SWL
10 t < Lifting beam, lifting gear magnet, spreader and similar devices with SWL ≤ 160 t	(1.04 × SWL) + 9.6
Lifting beam, lifting magnet, spreader and similar devices with SWL > 160 t	1.1 × SWL

Note:

1. **Sheave blocks that are permanently attached to, or are integral with the hook, are called hook blocks. Hook blocks are to be tested with the load for multi-sheave blocks. The hook of the hook block is to be tested with the loads for hooks.**
2. In the case of a single sheave block, attention is to be called to the fact that the safe working load refers to the maximum resultant load and not to the load attached to a rope which passes around the sheave of the block. See Appendix ~~CG-1~~.
3. In determining the safe working load of the loose gear or any component part of a gear, the stress diagram and the strength calculation plans are to be referred. In the case of an existing ship without these plans, values given in Appendix ~~CG-2~~, may be used as ~~a~~ guidance.

Table 4.2 has been amended as follows:

Table 4.2
~~Proof Load for cargo gear assembly~~ Lifting Appliances Minimum Test Loads

Safe working load SWL (t)	Proof Test load (t)
$SWL \leq 20$	$1.25 \times SWL$
$20 < SWL \leq 50$	$SWL + 5$
$50 < SWL \leq 100$	$1.1 \times SWL$
$100 < SWL$	Load as considered appropriate by the Society

4.3 The load tests of the ~~cargo gear~~ lifting appliances are to be carried out in the following manners:-

....

- (e) The load tests are to be performed either by hoisting movable weights, or by means of a spring or hydraulic balance or a similar appliance, but when the ~~cargo gear~~ lifting appliance is newly installed and tested for the first time, the load test is to be carried out only by hoisting movable weights.
- (f) In the case of a load test by hoisting movable weights, after the movable weights have been hoisted, the ~~cargo gear~~ lifting appliance is to be swung as far as possible in both directions and then lifted/lowered at some position of the working range.
- (g) In the case of a load test is performed by a spring or hydraulic balance or a similar appliance, suitably and safely anchored. The ~~proof test~~ load is to be applied with the ~~cargo gear~~ lifting appliance swung as far as practicable first in one direction and then in the other, and such other intermediate positions may be directed at the discretion of the Surveyor. At any position, the indicator of the balance is to maintain a constant reading under the ~~proof test~~ load for a period of at least 5 minutes.
- (h) After being tested, all the gear is to be examined to see whether any part has been injured or permanently deformed by the test.

4.4 For the registration survey of an existing ~~cargo gear~~ lifting appliance and loose gear or when important repair and alteration are made, a ~~proof~~ load test as specified in 4.2 is to be carried out.

5. Surveys for Maintaining Registration

Section 5.1 has been amended as follows:

5.1 After the ~~cargo gear~~ lifting appliances and loose gear ~~has~~ have been registered to the Society, ~~it is~~ they are to undergo periodical surveys at the following intervals:

- (a) ~~Annual~~ Thorough ~~surveys~~ examinations are to be carried out at the dates not exceeding 12 months from the date of completion of the registration survey or the previous ~~annual~~ thorough ~~survey~~ examinations.
- (b) Load tests are to be carried out at the registration survey and at the dates not exceeding 5 years from the date of completion of the registration survey or the previous load test. Upon completion of load test, thorough examinations are to be carried out.

Section 5.2 has been amended as follows:

5.2 An occasional survey is to be carried out when the ~~cargo gear~~ lifting appliances and loose gear fall under any of the following conditions at the time other than periodical surveys.

- (a) When serious damage is caused on the structural members and the repair or conversion is made.
- (b) When major conversion is made in the cargo handling procedures, rigging arrangements, operation and control methods.
- (c) When the assignment and marking of safe working load, etc. is altered.
- (d) Other cases when considered necessary by the Society.

....

Section 5.5 has been amended as follows:

5.5 ~~Annual~~ ~~Thorough surveys~~ **examinations**

- (a) Derrick systems
 - (i) At ~~annual~~ ~~thorough surveys~~ **examinations**, the following items in (1) are to be visually examined for derrick systems and ascertained to be in good order. Where considered necessary by the Surveyor, the items in (2) are to be examined.
 - (1) Items to be examined
 - Structural members.
 - Connection between the structural members and hull structure.
 - Driving systems.
 - Safety devices and protective devices.
 - Markings of the safe working load, etc., and the effectiveness of the relevant certificates.
 - Preservation of the instruction manual on board the ship.
 - (2) Items to be examined where considered necessary by the Surveyor
 - Checking of plate thickness of the structural members, non-destructive testing and open-up examinations of the topping brackets, goose neck brackets and derrick heel lugs.
 - Open-up examination of the driving systems.
 - Operation tests of the safety devices and protective devices.
 - (ii) Open-up examinations of the topping bracket, goose neck brackets and derrick heel lugs are to be carried out during ~~Annual Thorough Surveys~~ **thorough examinations** at intervals not exceeding five years from the date of completion of the registration survey or the previous open-up examination.
- (b) Crane

At ~~annual~~ ~~thorough surveys~~ **examinations**, the following items in (i) are to be visually examined for cranes and ascertained to be in good order. Where considered necessary by the Surveyor, the items in (ii) are to be examined.

....
- (c) Cargo Ramps

At ~~annual~~ ~~thorough surveys~~ **examinations**, the following items in (i) are to be visually examined for cargo ramps and ascertained to be in good order. Where considered necessary by the Surveyor, the items in (ii) are to be examined.

....
- (d) Cargo Lifts, etc.

At ~~annual~~ ~~thorough surveys~~ **examinations**, the following items in (i) are to be visually examined for cargo lifts and ascertained to be in good order. Where considered necessary by the Surveyor, the items in (ii) are to be examined.

....

- (e) At ~~annual thorough surveys~~ **examinations** for other ~~cargo gears~~ **lifting appliances** used for loading and unloading of cargoes and other articles, they are to be visually examined and ascertained to be in good order. When considered necessary by the Surveyor, a further examination may be carried out.
- (f) Loose Gears
- (i) At ~~annual thorough surveys~~ **examinations**, the following items in (1) through (3) of loose gears are to be visually examined and ascertained to be in good order. However, where considered necessary by the Surveyor, the items in (2) are to be opened up and examined.
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Section 5.6 has been amended as follows:

5.6 Load tests

- (a) The ~~cargo gear assembly is~~ **lifting appliances and loose gear are** to be tested as a unit with the ~~proof test~~ load as stated in Article 4 of the Rules. After being tested all parts of the gear are to be thoroughly examined, and the safe working load of the boom, the minimum angle of the boom to the horizontal at which the safe working load may be applied or the maximum outreach in the case of cranes, are required to be newly marked as specified in Article 7 of the Rules when applicable.
- (b) At each occasional survey, the ~~cargo gear is~~ **lifting appliances and loose gear are** to be tested in accordance with the requirements of (a) above, when applicable, provided that the Surveyor to the Society deems it necessary. **Upon completion of load test of lifting appliances or proof test of loose gear, thorough examinations are to be carried out.**

6. Annealing

6.1 Chains (other than bridle chains attached to booms and any component parts permanently attached to pulley blocks), rings, hooks, shackles and swivels made of wrought iron, used in loading or unloading are to be annealed at the intervals as shown in Table 6.1.

Table 6.1 has been amended as follows:

Table 6.1
Intervals of ~~Cargo Gear~~ **Loose Gear Annealing**

Class of gear	If used on lifting machinery driven by power	If used solely on lifting machinery worked by hand
Gear in general use of 12.5 mm Ø and under	6 months	12 months
Other gear in general use	12 months	2 years

7. Assignment of Safe Working Load and Marking

Section 7.1 has been amended as follows:

7.1 For the ~~cargo gear~~ **lifting appliances and loose gear** which ~~has~~ **have** satisfactorily complied with the requirements for the tests and inspections specified in Article 4 of the Rules, the Society will assign the safe working load, SWL, of the ~~cargo gear assembly~~ **lifting appliances and loose gear**, and the following particulars:

- (a) in the case of derrick systems, the allowable minimum angle of the boom to the horizon and other restrictive conditions.

- (b) in the case of jib cranes, the maximum outreach or ranges of slewing radius and other restrictive conditions.
- (c) in the case of union purchase derrick systems, the safe working load determined with due regard to individual booms and their associated gear for swing loads, and the maximum angle between two cargo falls (not exceeding 120°), or the allowable lifting height.

....

Section 7.3 has been amended as follows:

7.3 Marking for Lifting Appliances

- (a) On the heel of each boom and each crane, the mark of the Society, the safe working load, allowable minimum angle, maximum slewing radius and other restrictive conditions as specified in 7.1 are to be marked by stamping.
- (b) In the case of other ~~cargo gear~~ **lifting appliances** and cargo ramps, at the conspicuous place which is hardly fouled, the stamp mark of the Society, the safe working load and other restrictive conditions are to be marked by stamping.
- (c) In addition to the markings specified in (a) & (b) above, the same marks (except the mark of the Society) are to be painted at the conspicuous places in white or other suitable color. The size of letters is not to be less than 77 mm in height.

....

Section 7.6 has been amended as follows:

7.6 Where alterations of the assigned safe working load, etc. or of particulars of the ~~cargo gear~~ **lifting appliances** ~~machinery~~ take place, the ~~cargo gear~~ **lifting appliances** and ~~machinery~~ are to undergo survey and tests as specified in Article 4 of the Rules. Where necessary, the relevant entries in the Register and the markings are to be altered and verified by the Surveyor.

9. Cranes

Section 9.1 has been amended as follows:

9.1 Design loads

- (e) Wind loading
 - (i) The wind loading is to be calculated by the following formula:

$$F = PA / 1000 \quad \text{kN}$$

where:

F = Wind loading, kN.

A = Sum of structural members and cargo under wind pressure in projection in respective wind direction, corresponding to respective conditions of the ~~cargo gear~~ **lifting appliance**, m². When a girder is wholly or partly protected from wind by another girder, the areas of the superposed portions may be multiplied by the reduction factor, η , obtained from Fig. 9.2. The distance b between girders is to be as given in Fig. 9.3.

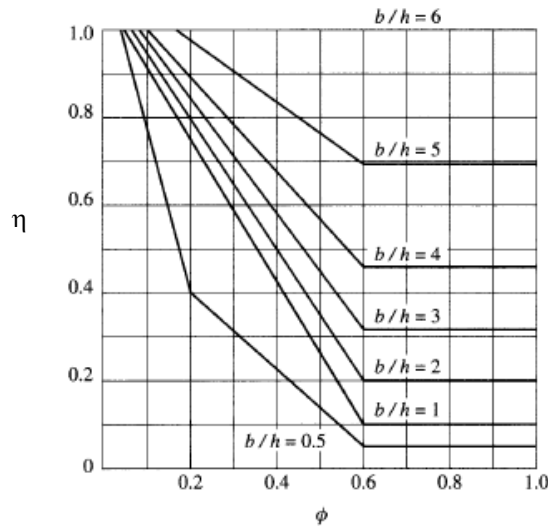


Fig. 9.2
Replenishment Ratio, Φ versus Reduction Factor, η

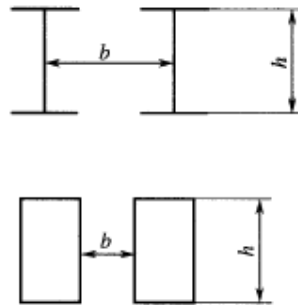


Fig. 9.3
Distance between two neighbouring girders, b

P = Wind pressure calculated by the following formula, Pa.

$$C_h C_s g V^2 / 16 \text{ Pa}$$

where:

V = Wind velocity according to (1) and (2) below, m/sec:

- (1) The velocity of wind giving effect on the structural members and cargo in the service conditions is to be the design wind velocity specified by the applicant, but not be less than 16 m/sec.
- (2) The velocity of wind giving effect on the structural members in the stowage conditions is to be the design wind velocity specified by the applicant. In no case is the design wind velocity to be less than 51.5 m/sec. In ships with restricted navigation areas, however, the design wind velocity may be decreased according to the degree of restriction as approved by the Society in the range down to 25.8 m/sec.

C_h = "Height factor" to be determined according to Table 9.2 depending on the height of the position ~~is in~~ in question from the light weight waterline.

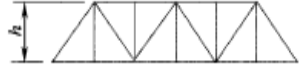
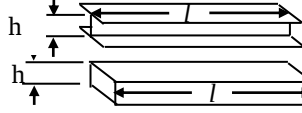
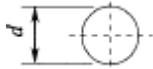
C_s = "Shape factor" to be determined according to Table 9.3 depending on the shapes of various parts of the ~~cargo gear~~ lifting appliance and the cargo.

- (ii) Notwithstanding the requirements in (i) above, the data on wind loading obtained by wind tunnel tests for the structural members and cargo may be used for calculations.

Table 9.2
Height Factor, C_h

Vertical height h (m)	C_h
$h < 15.3$	1.00
$15.3 \leq h < 30.5$	1.10
$30.5 \leq h < 46.0$	1.20
$46.0 \leq h < 61.0$	1.30
$61.0 \leq h < 76.0$	1.37
$76.0 \leq h$	As value considered appropriate by the Society

Table 9.3
Shape Factor C_s

Type of area under wind pressure	C_s
Truss of angle 	$\phi < 0.1$ 2.0 $0.1 \leq \phi < 0.3$ 1.8 $0.3 \leq \phi < 0.9$ 1.6 $0.9 \leq \phi$ 2.0
Plate girder or box girder 	$(l/h) < 5$ 1.2 $5 \leq (l/h) < 10$ 1.3 $10 \leq (l/h) < 15$ 1.4 $15 \leq (l/h) < 25$ 1.6
Cylindrical member or truss of cylindrical member 	$d \leq \sqrt{q}$ 1.2 $1.0 \leq d < \sqrt{q}$ 0.7

Note:

- ϕ = Repleteness ratio equal to the ratio of projected area under wind pressure to the projected area surrounded by the outer contour of the area under wind pressure.
- l = Length of plate girder or box girder, m.
- h = Height of plate girder or box girder looked at from windward, m.
- d = Outer diameter of cylindrical member, m.
- q = Value calculated by the following formula :
 $(gC_h V^2 / 16) \times 10^{-3}$ kPa

12. Machinery, Electrical Installations and Control Engineering Systems

Section 12.1 has been amended as follows:

12.1 Machinery

(a) General

The driving systems of the ~~crane gears~~ **lifting appliances** are to be steadily operated in the rated speed under the safe working load.

(b) Hoisting machinery

- (i) The construction of the hoisting machinery is to comply with the following requirements (1) through (6):
 - (1) The drum end flange diameter is to have an allowance corresponding to not less than 2.5 times the rope diameter as measured from the outer rim of the outermost layer of ropes in service

condition. However, where rope disengagement prevention system is provided or in case of single layer winding on the drum, this requirement may be dispensed with.

- (2) The pitch circle diameter of winch drum is to be not less than 18 times the rope diameter.
 - (3) Winches are to be installed on the winch foundation with foundation bolts having sufficient proof strength against the drum load (the maximum rope tension applied on the drum when the rope is wound under the single winding at a nominal rope hoisting speed) created when the safe working load is applied to the ~~cargo gear~~ **lifting appliances**.
 - (4) Braking system complying with the following requirements (A) through (C) is to be provided :
 - (A) The braking system is to be able to exert a ~~breaking~~ **braking** torque 50% in excess of the torque required when the safe working load is applied to the ~~cargo gear~~ **lifting appliances**.
 - (B) The power operated braking system is to operate automatically when the maneuvering is returned to its neutral position.
 - (C) The power operated braking system is to operate automatically when there is any failure in the power supply. In this case, emergency retrieval for cargo lowering is to be provided.
 - (5) Clutchable drums are to be provided with effective locking system capable of restricting rotation of the drum. The locking system is to be, as a rule, capable of resisting the torque not less than 1.5 times the torque required when the safe working load is applied to the ~~cargo gear~~ **lifting appliances**.
 - (6) Rope guards or suitable other means of protection are to be provided.
- (ii) The rope at its end is to be secured to the drum in such a manner that will not damage any part of the rope and to have such a length that not less than 3 complete turns in case of an ungrooved drum, or 2 complete turns in case of a grooved drum are remaining on the drum when the complete working length of rope has been paid out.

12.2 Power supply

- (a) The equipment, piping and cables consisting of the electric, hydraulic, pneumatic or steam power supply system and their arrangements are, as a rule, to comply with the relevant requirements of the Rules for Steel Ships.
- (b) The construction, strength, materials, etc. of internal combustion engine used as the prime mover are to comply with the requirements in Part IV of the Rules for Steel Ships.

Section 12.3 has been amended as follows:

12.3 Control engineering systems

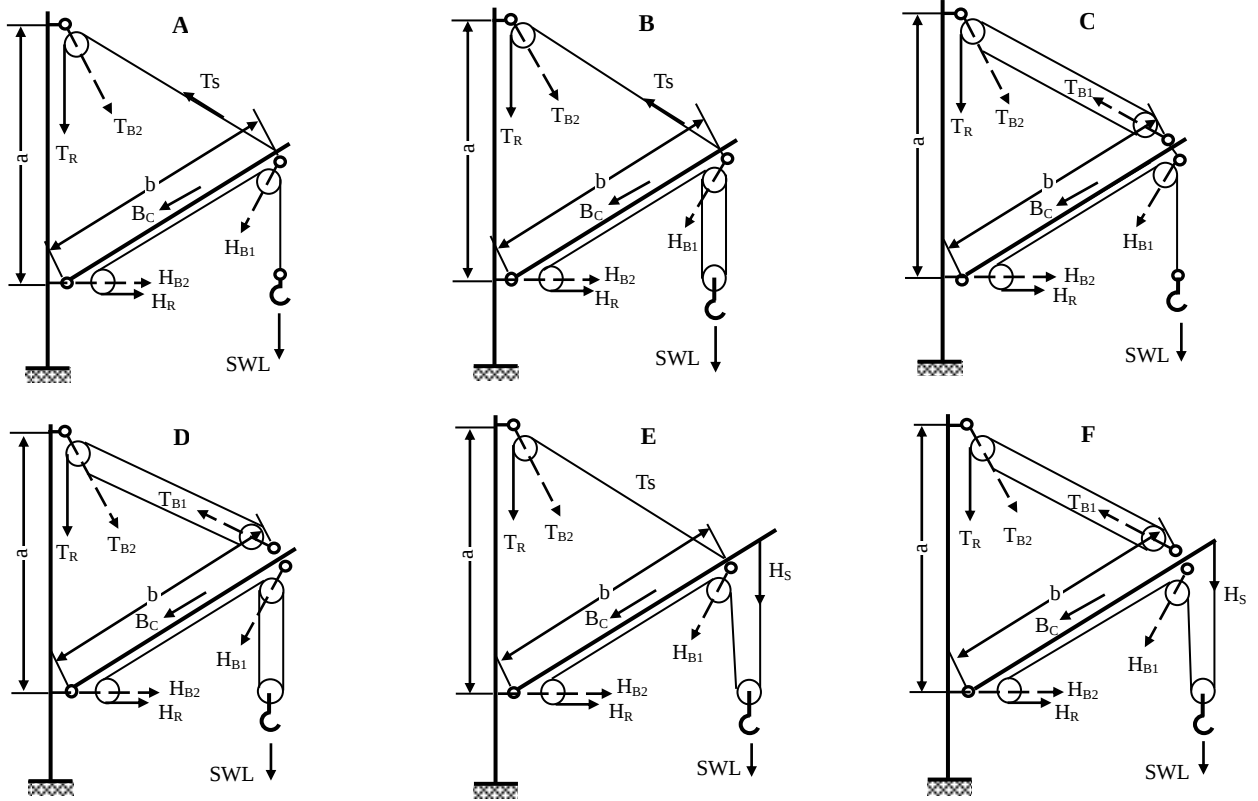
- (a) General
 - (i) The electric, hydraulic or pneumatic equipments used for the control, alarm and safety systems are, as a rule, to comply with the relevant requirements of the Rules for Steel Ships.
 - (ii) The control, alarm and safety systems are to be designed on the basis of the principle of fail-safe.
- (b) Control system
 - (i) Control systems are to be so arranged as not **to** interfere with the operator or **other** qualified ~~other~~ personnel giving signals for operation.
 - (ii) Control systems are, as a rule, to be of such design that controls automatically return to the neutral position when control operation by the operator is interrupted.
 - (iii) For electric winches, **a** local power disconnecting switch is to be provided at the position in the proximity of the place of operation.
 - (iv) Cranes and cargo lifts are to be provided with **an** emergency switch capable of stopping all the motions at the position readily accessible for the operator.
 - (v) Cargo lifts are to be provided with a suitable automatic speed control system that reduces the starting acceleration and stopping deceleration as far as practicable.

- (vi) Cargo lifts are to be provided with a suitable control system that stops the lift at the specified deck position.
 - (vii) Where cargo lifts are secured by locking latches, suitable means is to be provided so as to prevent the impact load to be induced on the lift in case of withdrawal of the latches.
- (c) Safety system
- (i) The ~~cargo gears~~ **lifting appliances** are, as a rule, to be provided with an overload protection system.
 - (ii) The ~~cargo gears~~ **lifting appliances** are to be provided with suitable safety systems capable of preventing the abnormalities given in the following (1) through (6) according to kind of appliances and their motion:
 - (1) Over hoisting.
 - (2) Over slewing.
 - (3) Over luffing.
 - (4) Excessive traveling speed.
 - (5) Over run on the track.
 - (6) Other items of abnormality recognized by the Society.
 - (iii) In cranes where the safe working load varies according to the operating radius, a rating chart showing the relationship between the operating radius and safe working load are to be provided in the control cab and in addition, equipment satisfying the following (1) and (2) or (3) is, as a rule, to be provided:
 - (1) Operating radius indicator.
 - (2) Hoisting load indicator.
 - (3) Overload preventor with respect to the safe working load according to the operating radius.
- (d) Protection system
- (i) For the rotating parts of the driving machinery, electrical installations and steam pipes, necessary means to protect the operator are to be provided.
 - (ii) Steam winches are to be arranged not to interfere with the operator's field of vision by the steam.
 - (iii) Cargo lifts are to be provided with the protection systems given in the following (1) through (4):
 - (1) Protective barriers of a height of not less than 1 m above deck level around the deck opening provided for lift platform.
 - (2) Interlocking system so that cargo lifts cannot be moved unless the barriers are all closed.
 - (3) Interlocking system that prevents opening of protective barriers unless cargo lifts are at the opening position of the barriers.
 - (4) Warning lights or suitable other warning signs at the boarding place of cargo lifts.

APPENDIX C-2

Fig. A-1 has been amended as follows:

Resultant Load and Rope Tension of ~~Cargo Gear Assembly~~ the Lifting Appliances



- SWL = Safe working load of the ~~cargo gear assembly~~ lifting appliances.
- a = Distance between the cargo boom goose-neck to the mast head fitting for the topping-lift block.
- b = Cargo boom length.
- H_S = Resultant load on the cargo boom head hoist shackle.
- H_{B1}, H_{B2} = Resultant loads on the hoist blocks.
- H_R = Tension in the hoist rope.
- B_C = Axial compression on the cargo boom.
- T_S = Resultant load on the cargo boom head topping-lift shackle.
- T_{B1}, T_{B2} = Resultant loads on the topping-lift blocks.
- T_R = Tension in the topping-lift rope.

Fig. A-1
Stress Diagram of ~~Cargo Gear Assembly~~ the Lifting Appliances under Light-load

Table A-2 has been amended as follows:

Table A-2
Resultant Load and Rope Tension of Cargo Gear Assembly the Lifting Appliance under Light-load
(SWL Below 10 Tons Rigged According to Figs. A-1 A to F)

Type of rigging Fig. A-1	a/b	H _{B1}	H _{B2}	H _S	H _R	B _C			T _S or T _{B1}			T _{B2}			T _R		
		Inclination of cargo boom, θ															
		15°~45°	15°~45°	15°~45°	15°~45°	15°	30°	45°	15°	30°	45°	15°	30°	45°	15°	30°	45°
A	0.4	2.00	2.15	—	1.11	3.82	3.82	3.82	2.70	2.41	2.15	4.19	3.36	2.42	2.81	2.51	2.24
	0.5					3.27	3.27	3.27	2.19	1.92	1.65	3.53	2.78	2.04	2.28	2.00	1.72
	0.6					2.91	2.91	2.91	1.87	1.61	1.32	3.11	2.47	1.77	1.94	1.67	1.37
	0.7					2.64	2.64	2.64	1.65	1.40	1.11	2.84	2.25	1.62	1.72	1.46	1.16
	0.8					2.45	2.45	2.45	1.51	1.25	0.99	2.66	2.10	1.54	1.57	1.30	1.03
	0.9					2.29	2.29	2.29	1.41	1.16	0.91	2.54	2.02	1.48	1.46	1.21	0.94
	1.0					2.17	2.17	2.17	1.33	1.09	0.85	2.43	2.09	1.44	1.38	1.13	0.87
	1.1					2.07	2.07	2.07	1.27	1.05	0.81	2.37	1.91	1.42	1.32	1.09	0.84
	B					0.4	1.50	1.12	—	0.58	3.30	3.30	3.30	2.70	2.41	2.15	4.19
0.5		2.75	2.75	2.75	2.19	1.92					1.65	3.53	2.78	2.04	2.28	2.00	1.72
0.6		2.39	2.39	2.39	1.87	1.61					1.32	3.11	2.47	1.77	1.94	1.67	1.37
0.7		2.12	2.12	2.12	1.65	1.40					1.11	2.84	2.25	1.62	1.72	1.46	1.16
0.8		1.93	1.93	1.93	1.51	1.25					0.99	2.66	2.10	1.54	1.57	1.30	1.03
0.9		1.77	1.77	1.77	1.41	1.16					0.91	2.54	2.02	1.48	1.46	1.21	0.94
1.0		1.65	1.65	1.65	1.33	1.09					0.85	2.43	2.09	1.44	1.38	1.13	0.87
1.1		1.55	1.55	1.55	1.27	1.05					0.81	2.37	2.91	1.42	1.32	1.09	0.84
C		0.4	2.00	2.15	—	1.11					3.82	3.82	3.82	2.70	2.41	2.15	3.24
	0.5	3.27					3.27	3.27	2.19	1.92	1.65	2.73	2.19	1.65	1.16	1.02	0.88
	0.6	2.91					2.91	2.91	1.87	1.61	1.32	2.39	1.93	1.42	0.99	0.85	0.70
	0.7	2.64					2.64	2.64	1.65	1.40	1.11	2.17	1.74	1.26	0.87	0.74	0.59
	0.8	2.45					2.45	2.45	1.51	1.25	0.99	2.03	1.60	1.20	0.80	0.66	0.53
	0.9	2.29					2.29	2.29	1.41	1.16	0.91	1.93	1.54	1.15	0.75	0.62	0.48
	1.0	2.17					2.17	2.17	1.33	1.09	0.85	1.86	1.49	1.12	0.71	0.58	0.45
	1.1	2.07					2.07	2.07	1.27	1.05	0.81	1.80	1.46	1.10	0.67	0.56	0.43
	D	0.4					1.50	1.12	—	0.58	3.30	3.30	3.30	2.70	2.41	2.15	3.24
0.5		2.75	2.75	2.75	2.19	1.92					1.65	2.73	2.19	1.65	1.16	1.02	0.88
0.6		2.39	2.39	2.39	1.87	1.61					1.32	2.39	1.93	1.42	0.99	0.85	0.70
0.7		2.12	2.12	2.12	1.65	1.40					1.11	2.17	1.74	1.26	0.87	0.74	0.59
0.8		1.93	1.93	1.93	1.51	1.25					0.99	2.03	1.60	1.20	0.80	0.66	0.53
0.9		1.77	1.77	1.77	1.41	1.16					0.91	1.93	1.54	1.15	0.75	0.62	0.48
1.0		1.65	1.65	1.65	1.33	1.09					0.85	1.86	1.49	1.12	0.71	0.58	0.45
1.1		1.55	1.55	1.55	1.27	1.05					0.81	1.80	1.46	1.10	0.67	0.56	0.43
E		0.4	1.00	1.12	0.51	0.58					3.42	3.55	3.65	2.70	2.41	2.15	4.19
	0.5	2.89					3.02	3.12	2.19	1.92	1.65	3.53	2.78	2.04	2.28	2.00	1.72
	0.6	2.52					2.65	2.75	1.87	1.61	1.32	3.11	2.47	1.77	1.94	1.67	1.37
	0.7	2.30					2.35	2.40	1.65	1.40	1.11	2.84	2.25	1.62	1.72	1.46	1.16
	0.8	2.06					2.19	2.29	1.51	1.25	0.99	2.66	2.10	1.54	1.57	1.30	1.03
	0.9	1.91					2.04	2.14	1.41	1.16	0.91	2.54	2.02	1.48	1.46	1.21	0.94
	1.0	1.78					1.91	2.01	1.33	1.09	0.85	2.43	2.09	1.44	1.38	1.13	0.87
	1.1	1.89					2.02	2.12	1.27	1.05	0.81	2.37	1.91	1.42	1.32	1.09	0.84
	F	0.4					1.00	1.12	0.51	0.58	3.42	3.55	3.65	2.70	2.41	2.15	3.24
0.5		2.89	3.02	3.12	2.19	1.92					1.65	2.73	2.19	1.65	1.16	1.02	0.88
0.6		2.52	2.65	2.75	1.87	1.61					1.32	2.39	1.93	1.42	0.99	0.85	0.70
0.7		2.30	2.35	2.40	1.65	1.40					1.11	2.17	1.74	1.26	0.87	0.74	0.59
0.8		2.06	2.19	2.29	1.51	1.25					0.99	2.03	1.60	1.20	0.80	0.66	0.53
0.9		1.91	2.04	2.14	1.41	1.16					0.91	1.93	1.54	1.15	0.75	0.62	0.48
1.0		1.78	1.91	2.01	1.33	1.09					0.85	1.86	1.49	1.12	0.71	0.58	0.45
1.1		1.89	2.02	2.12	1.27	1.05					0.81	1.80	1.46	1.10	0.67	0.56	0.43

Notes:

- The above tabular resultant load and rope tension are calculated at a SWL of 1 ton $\frac{1}{2}$, for other values:
 (Actual load or tension) = (Table value) $\times$ (Required SWL)

- The values at intermediate ratio of a/b or angle of inclination of the cargo boom, θ , are to be determined by interpolation.

Fig. A-2 has been amended as follows:

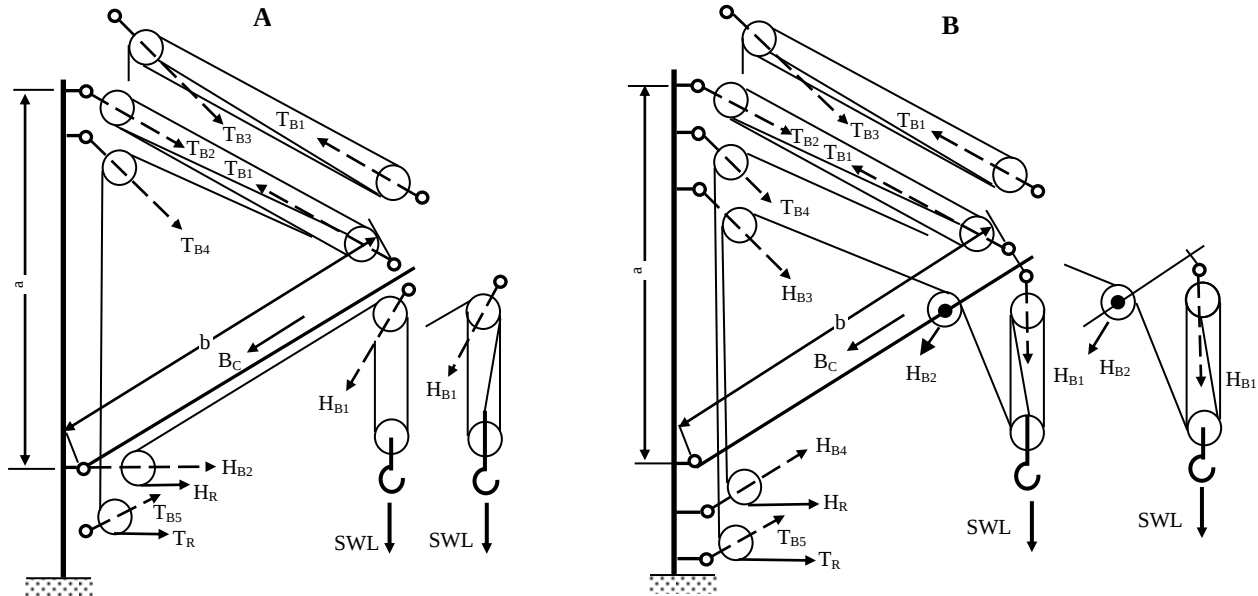


Fig. A-2
Stress Diagram of Cargo Gear Assembly the Lifting Appliance under Heavy-lift Load
(SWL 10 Tons and Over)

Table A-3a has been amended as follows:

Table A-3a
Resultant Load and Rope Tension of Hoist Gear of the Cargo Gear Assembly Lifting Appliance
under Heavy-lift Load (SWL 10 Tons and Over, Inclination of Cargo Boom $\theta = 15^\circ \sim 45^\circ$, Riggered
According to Figs. A-2 A and B)

Total number of sheaves in hoist blocks	H_{B1}	H_{B2}	H_R	H_{Bc}						
				a/b						
				0.6	0.7	0.8	0.9	1.0	1.1	1.2
1+1	1.50	1.12	0.58	2.40	2.13	1.94	1.78	1.66	1.56	1.47
1+2	1.40	0.75	0.39	2.22	1.95	1.76	1.60	1.48	1.38	1.29
2+2	1.30	0.58	0.29	2.12	1.86	1.66	1.50	1.38	1.28	1.19
2+3	1.20	0.47	0.24	2.07	1.80	1.61	1.45	1.33	1.23	1.14
3+3	1.17	0.39	0.20	2.03	1.76	1.57	1.41	1.29	1.19	1.10
3+4	1.16	0.35	0.18	2.01	1.74	1.55	1.39	1.27	1.17	1.08
4+4	1.15	0.31	0.16	1.99	1.72	1.53	1.37	1.25	1.15	1.06
4+5	1.14	0.29	0.15	1.98	1.71	1.52	1.36	1.24	1.14	1.05
5+5	1.13	0.27	0.14	1.97	1.70	1.52	1.35	1.23	1.13	1.04

Notes:

- The above tabular resultant load and rope tension are calculated at a SWL of 1 ton, for other values:
(Actual load or tension) = (Table value) $\times$ (Required SWL)
- The values at intermediate ratio of a/b are to be determined by interpolation.

Table A-3b has been amended as follows:

Table A-3b
Resultant Load and Rope Tension of Topping-lift Gear of the Cargo Gear Assembly Lifting
Appliances under Heavy-lift Load (SWL 10 Tons and Over Rigged According to Figs. A-2 A and B)

	Total number of sheaves in topping-lift blocks without influence	$\theta = 15^\circ$							$\theta = 30^\circ$							$\theta = 45^\circ$						
		a/b							a/b							a/b						
		0.6	0.7	0.8	0.9	1.0	1.1	1.2	0.6	0.7	0.8	0.9	1.0	1.1	1.2	0.6	0.7	0.8	0.9	1.0	1.1	1.2
T _{B1}		1.87	1.65	1.51	1.41	1.33	1.27	1.23	1.61	1.40	1.25	1.16	1.09	1.05	1.02	1.32	1.11	0.99	0.91	0.85	0.81	0.79
T _{B2}	1+1	0.86	0.76	0.69	0.65	0.61	0.58	0.67	0.74	0.64	0.57	0.53	0.50	0.48	0.47	0.61	0.51	0.46	0.42	0.39	0.37	0.36
	1+2	1.18	1.04	0.95	0.99	0.84	0.80	0.77	1.01	0.88	0.79	0.73	0.69	0.66	0.64	0.83	0.70	0.62	0.57	0.54	0.51	0.49
	2+2	1.35	1.19	1.09	1.12	0.96	0.91	0.89	1.16	1.01	0.90	0.84	0.78	0.76	0.73	0.95	0.80	0.71	0.66	0.61	0.58	0.57
	2+3	1.46	1.29	1.18	1.20	1.04	0.99	0.96	1.26	1.09	0.97	0.90	0.85	0.82	0.80	1.03	0.87	0.77	0.71	0.66	0.63	0.62
	3+3	1.51	1.34	1.22	1.24	1.08	1.03	1.00	1.30	1.13	1.01	0.94	0.88	0.85	0.83	1.07	0.90	0.80	0.74	0.69	0.66	0.64
	3+4	1.55	1.37	1.25	1.27	1.10	1.05	1.02	1.34	1.16	1.04	0.96	0.90	0.88	0.85	1.10	0.92	0.82	0.76	0.71	0.67	0.66
	4+4	1.59	1.40	1.28	1.30	1.13	1.08	1.05	1.37	1.19	1.06	0.99	0.93	0.89	0.87	1.12	0.94	0.84	0.77	0.72	0.69	0.67
	4+5	1.61	1.42	1.30	1.31	1.14	1.07	1.06	1.38	1.20	1.07	1.00	0.94	0.90	0.88	1.14	0.95	0.85	0.78	0.73	0.70	0.68
	5+5	1.65	1.45	1.33	1.34	1.17	1.10	1.08	1.42	1.23	1.10	1.02	0.96	0.92	0.90	1.16	0.98	0.87	0.80	0.75	0.71	0.70
T _{B3}	1+1	2.92	2.57	2.36	2.20	2.07	1.98	1.92	2.51	2.18	1.95	1.81	1.70	1.64	1.59	2.06	1.73	1.54	1.42	1.33	1.26	1.23
	1+2	2.58	2.28	2.08	1.95	1.84	1.75	1.70	2.22	1.93	1.73	1.60	1.50	1.45	1.41	1.82	1.53	1.37	1.26	1.17	1.12	1.09
	2+2	2.41	2.13	1.95	1.82	1.72	1.64	1.59	2.08	1.81	1.61	1.60	1.41	1.35	1.32	1.70	1.43	1.28	1.17	1.10	1.04	1.02
	2+3	2.30	2.03	1.86	1.73	1.64	1.56	1.51	1.98	1.72	1.54	1.43	1.34	1.29	1.25	1.62	1.37	1.22	1.12	1.05	1.00	0.97
	3+3	2.24	1.98	1.81	1.69	1.60	1.52	1.48	1.93	1.68	1.50	1.49	1.31	1.26	1.22	1.58	1.33	1.19	1.09	1.02	0.97	0.95
	3+4	2.21	1.95	1.78	1.66	1.57	1.50	1.45	1.90	1.65	1.48	1.37	1.29	1.24	1.20	1.56	1.31	1.17	1.07	1.00	0.96	0.93
	4+4	2.17	1.91	1.75	1.64	1.54	1.47	1.43	1.87	1.62	1.45	1.35	1.26	1.23	1.18	1.53	1.29	1.15	1.06	0.99	0.94	0.92
	4+5	2.15	1.90	1.74	1.62	1.53	1.46	1.41	1.85	1.61	1.44	1.33	1.25	1.21	1.17	1.52	1.28	1.14	1.05	0.98	0.93	0.91
	5+5	2.11	1.86	1.71	1.59	1.50	1.44	1.39	1.82	1.58	1.41	1.31	1.23	1.19	1.15	1.49	1.25	1.12	1.03	0.96	0.92	0.89
T _{B4}	1+1	1.68	1.52	1.45	1.37	1.30	1.24	1.23	1.32	1.20	1.12	1.07	1.04	1.02	1.10	0.95	0.86	0.81	0.79	0.78	0.77	0.77
	1+2	1.14	1.05	0.98	0.94	0.89	0.86	0.85	0.91	0.83	0.76	0.73	0.71	0.70	0.69	0.65	0.58	0.56	0.55	0.53	0.53	0.53
	2+2	0.87	0.79	0.75	0.71	0.68	0.66	0.65	0.70	0.74	0.59	0.56	0.55	0.53	0.52	0.49	0.44	0.43	0.42	0.41	0.40	0.40
	2+3	0.70	0.63	0.60	0.56	0.54	0.52	0.51	0.54	0.50	0.47	0.45	0.43	0.42	0.41	0.39	0.35	0.34	0.33	0.32	0.32	0.31
	3+3	0.60	0.54	0.52	0.48	0.46	0.45	0.44	0.48	0.44	0.40	0.38	0.37	0.36	0.35	0.34	0.31	0.29	0.28	0.27	0.27	0.27
	3+4	0.54	0.50	0.47	0.43	0.42	0.41	0.40	0.42	0.40	0.36	0.35	0.34	0.33	0.32	0.30	0.28	0.26	0.25	0.25	0.25	0.24
	4+4	0.49	0.44	0.42	0.38	0.37	0.35	0.34	0.39	0.35	0.32	0.30	0.29	0.29	0.28	0.27	0.25	0.24	0.23	0.22	0.22	0.22
	4+5	0.44	0.40	0.38	0.36	0.34	0.33	0.32	0.35	0.32	0.29	0.27	0.26	0.26	0.26	0.25	0.23	0.22	0.21	0.21	0.20	0.20
	5+5	0.38	0.35	0.33	0.32	0.30	0.29	0.28	0.31	0.28	0.25	0.24	0.23	0.22	0.22	0.21	0.19	0.18	0.18	0.18	0.18	0.17
T _{B5}	1+1	1.51	1.32	1.22	1.14	1.07	1.02	0.99	1.30	1.12	1.00	0.94	0.88	0.85	0.82	1.07	0.89	0.79	0.73	0.69	0.65	0.63
	1+2	1.02	0.91	0.82	0.78	0.73	0.69	0.68	0.88	0.76	0.69	0.63	0.59	0.58	0.56	0.72	0.60	0.55	0.50	0.46	0.45	0.43
	2+2	0.78	0.70	0.63	0.59	0.56	0.53	0.51	0.68	0.59	0.52	0.49	0.46	0.43	0.43	0.55	0.46	0.42	0.37	0.36	0.33	0.33
	2+3	0.62	0.55	0.50	0.46	0.45	0.42	0.40	0.53	0.46	0.42	0.39	0.36	0.35	0.33	0.43	0.37	0.33	0.30	0.29	0.27	0.26
	3+3	0.53	0.48	0.48	0.40	0.39	0.36	0.36	0.46	0.40	0.36	0.33	0.32	0.30	0.29	0.37	0.32	0.29	0.26	0.24	0.23	0.23
	3+4	0.49	0.43	0.39	0.36	0.35	0.33	0.31	0.42	0.36	0.33	0.30	0.29	0.27	0.26	0.35	0.29	0.26	0.23	0.22	0.22	0.20
	4+4	0.43	0.37	0.34	0.33	0.30	0.29	0.29	0.37	0.32	0.29	0.27	0.24	0.24	0.23	0.30	0.26	0.23	0.23	0.20	0.19	0.19
	4+5	0.40	0.36	0.33	0.30	0.29	0.27	0.26	0.35	0.30	0.27	0.25	0.23	0.23	0.22	0.29	0.24	0.21	0.20	0.19	0.17	0.17
	5+5	0.35	0.30	0.29	0.26	0.24	0.24	0.23	0.30	0.26	0.23	0.22	0.20	0.20	0.19	0.24	0.20	0.19	0.17	0.16	0.16	0.14
T _R	1+1	1.08	0.96	0.88	0.82	0.77	0.74	0.71	0.93	0.81	0.73	0.67	0.63	0.61	0.59	0.77	0.64	0.57	0.53	0.49	0.47	0.46
	1+2	0.75	0.66	0.60	0.56	0.53	0.51	0.49	0.64	0.56	0.50	0.46	0.44	0.42	0.41	0.53	0.44	0.40	0.36	0.34	0.32	0.32
	2+2	0.56	0.50	0.45	0.42	0.40	0.38	0.37	0.48	0.42	0.38	0.35	0.33	0.32	0.31	0.40	0.33	0.30	0.27	0.26	0.24	0.24
	2+3	0.45	0.40	0.36	0.34	0.32	0.30	0.30	0.39	0.34	0.30	0.28	0.26	0.25	0.24	0.32	0.27	0.24	0.22	0.20	0.19	0.19
	3+3	0.39	0.35	0.32	0.30	0.28	0.27	0.26	0.34	0.29	0.26	0.24	0.23	0.22	0.21	0.28	0.23	0.21	0.19	0.18	0.17	0.17
	3+4	0.36	0.31	0.29	0.27	0.25	0.24	0.23	0.31	0.27	0.24	0.22	0.21	0.20	0.19	0.25	0.21	0.19	0.17	0.16	0.15	0.15
	4+4	0.32	0.28	0.26	0.24	0.23	0.22	0.21	0.27	0.24	0.21	0.20	0.19	0.18	0.17	0.22	0.19	0.17	0.15	0.14	0.14	0.13
	4+5	0.30	0.26	0.24	0.23	0.21	0.20	0.20	0.26	0.22	0.20	0.19	0.17	0.17	0.16	0.21	0.18	0.16	0.15	0.14	0.13	0.13
	5+5	0.26	0.23	0.21	0.20	0.19	0.18	0.17	0.23	0.20	0.18	0.16	0.15	0.15	0.14	0.18	0.16	0.14	0.13	0.12	0.11	0.11

Notes:

- The above tabular resultant load and rope tension are calculated at a SWL of 1 ton. For other values:

(Actual load or tension) = (Table value) $\times$ (Required SWL)

2. The values at intermediate ratio of a/b or angle of inclination of the cargo boom. θ , are to be determined by interpolation.



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