THE SOCIALIST REPUBLIC OF VIETNAM

QCVN 23: 2016/BGTVT

NATIONAL TECHNICAL REGULATION ON LIFTING APPLIANCES OF SEA-GOING SHIPS

HANOI - 2016

Preamble

National Technical Regulation on Lifting appliances of sea-going ships (symbol QCVN 23: 2016/BGTVT) is compiled by Vietnam Register, verified by the Ministry of Science and Technology, promulgated by the Minister of Transport under Circular No. 08/2017/TT-BGTVT dated March 14th 2017.

QCVN 23: 2016/BGTVT is to replace QCVN 23: 2010/BGTVT (National Technical Regulation on Rules for cargo handling appliances of ships).

NATIONAL TECHNICAL REGULATION ON LIFTING APPLIANCES OF SHIPS

CONTENTS

NATIONAL TECHNICAL REGULATION ON LIFTING APPLIANCES OF SHIPS

I GENERAL

1.1 Application and Scope

1.1.1 Application

The present National Technical Regulation (hereinafter referred to as “Regulation”) applies to the surveys and manufacture of lifting appliances on Vietnam flagged ships (hereinafter referred to as “Lifting appliances”).

1.1.2 Scope

The present Regulation is to apply to organizations and individuals involving in activities relating to lifting appliances falling under the application as specified in 1.1.1 above.

1.2 References and Definitions

1.2.1 References

1 QCVN 21: 2015/BGTVT: National Technical Regulation on the Classification and Construction of Sea-going steel ships promulgated under Circular No.11/2016/TT-BGTVT dated 2 June 2016 of the Ministry of Transport.

2 Circular No. 40/2016/TT-BGTVT, dated 07 December 2016: Regulations on the registration and verification of Vietnam's sea-going vessels promulgated by the Ministry of Transport.

3 Circular No. 15/2013/TT-BGTVT: Stipulating forms of certificates and survey booklet issued to sea-going and inland water way ships, dated 26 July 2013, promulgated by the Ministry of Transport.

1.2.2 Definitions

1 Organizations and Individuals:

Organizations and Individuals reffered to in 1.1.2 are Vietnam Register (hereinafter referred to as “VR”); shipowners; ship design centers, ship building, converting, innovating, repairing yards and operaters; design centers and manufacturers of lifting appliances installed onboard sea-going ships.

II TECHNICAL REGULATIONS

CHAPTER 1 GENERAL

1.1 General

1.1.1 Application

1 The relevant requirements in QCVN 21: 2015/BGTVT are to apply to the materials, equipment, installation and workmanship of the lifting appliances, unless otherwise specified in the Regulation.

2 Unless otherwise specified in this Regulation, lifting appliances manufactured or installed onboard the ships prior to the effective date of this Regulation may apply previous regulations, standards for their manufacture and installation.

3 Cranes used for personnel transfers are to comply with the requirements specified in Chapter 9, in addition to the requirements specified in this Regulation.

1.1.2 Equivalency

1 Lifting appliances which do not comply with the requirements of the Regulation may be accepted, provided that they are considered by VR to have the effectiveness equivalent to those complying with the Regulation.

2 Any lifting appliances designed and manufactured not under the requirements of the Regulation may be deemed by VR to comply with the Regulation, provided that they comply with any rules or standards recognized by VR to be appropriate and have passed the tests and inspection required by VR.

1.1.3 Precautions in Application

1 Precautions are to be taken to any manners of their treatment different from the requirements of the Regulation in the flag state of the ship or state of call.

2 VR may carry out inspection and issue necessary certificates for the lifting appliances under the authorization by such state or organization.

1.2 Definitions

1.2.1 Terminology

1 Unless otherwise specified elsewhere in this Regulation, the terms are defined as given in (1) through (18) below:

(1) Lifting appliances are cargo handling appliances and loose gear.

(2) Cargo handling appliances are cargo gears and cargo ramps include their installations of driving systems and cargo fittings.

(3) Cargo gears are derrick systems, cranes, cargo lifts and other machinery used for the loading and unloading of cargo and other articles except cargo ramps, and include their installations of driving systems and cargo fittings.

(4) Structural members are those of lifting appliances carrying the safe working load, including cargo fittings and cargo blocks permanently incorporated in the cargo gear and the cargo ramps.

(5) Cargo fittings are goose neck brackets, topping brackets, fittings at the derrick boom head, derrick heel lugs, guy cleats, eye fittings, etc. which are permanently fitted to the structural members or the hull structure for the purpose of cargo handling.

(6) Loose gears are blocks, ropes, chains, rings, hooks, shackles, swivels, clamps, grabs, lifting magnets, spreaders, etc. which are removable parts used for transmitting the loads of cargo to the structural members.

(7) Safe working load is the maximum allowable mass of cargoes specified by the Regulation with which the cargo gear and the cargo ramp can be safely operated. It is abbreviated to “SWL” and expressed in tons (t).

(8) Allowable minimum angle is the angle to horizontal of a derrick boom at which the derrick system is permitted to operate under the safe working load, and expressed in degrees (°).

(9) Maximum slewing radius is the radius at which a jib crane is permitted to operate under the safe working load, and expressed in meters (m).

(10) Safe working load, etc. are:

safe working load, allowable minimum angle and other restrictive conditions in case of the derrick systems;

safe working load, maximum slewing radius and other restrictive conditions in case of the jib cranes;

safe working load and other restrictive conditions deemed necessary by VR in case of other machinery used for the loading and unloading of cargo; and

safe working load and other restrictive conditions deemed necessary by VR in case of the cargo ramps.

(11) Safe working load of a loose gear is the maximum allowable mass of cargoes specified by the Regulation with which the loose gear can be used safely. It is abbreviated to “SWL” and expressed in tons (t). For cargo blocks, the safe working load is defined according to (a) or (b) below:

(a) The safe working load of a single sheave block is the maximum mass of cargoes that can be safely lifted by that block when it is suspended by its head fitting and the mass is secured to a wire rope passing round its sheave.

(b) The safe working load of a multiple sheave block is the maximum mass of

cargoes that may be applied to its head fitting of the block.

(12) Derrick systems are installations for handling cargo by suspending the cargo from the top of the derrick boom fitted to derrick post or mast, including those specified in (a), (b) and (c) below:

(a) The end of topping lift being fixed, two guy ropes fitted at the top of the derrick boom are wound by independent winches respectively to swing the boom horizontally (hereinafter referred to as swinging derrick system).

(b) Two derrick booms, on port and starboard sides, in pair are fixed at predetermined positions. The cargo falls of two derricks are connected to load or unload the cargo (hereinafter referred to as union-purchase derrick system).

(c) The cargo fall can be paid out or heaved in and luffing and slewing of derrick boom can be carried out singly or simultaneously while the cargo is suspended (hereinafter referred to as derrick crane system).

(13) Cranes cover jib cranes, gantry cranes, overhead cranes and hoists, cargo davits, etc. and are capable of performing the works of cargo loading and unloading, slewing and/or horizontal movement simultaneously or separately.

(14) Cargo lifts are the installations designed to contain the cargo in their structure to loading and unloading the cargo.

(15) Cargo ramps are 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.

(16) Lifting load is the sum of the safe working load defined as the maximum mass of cargoes themselves to be suspended and the mass of accessories such as hooks, cargo blocks, grabs, buckets, lifting beams, spreaders, etc. Unless otherwise deemed necessary by VR, the mass of wire ropes used as cargo falls need not be taken into account except when the installation is designed for a lift of 50 m or more.

(17) The acceleration of gravity is to be equal to 9.81 m/sec^2.

1.3 Arrangement, Construction, Materials and Welding

1.3.1 Arrangement

1 The arrangement and dimensions of the cargo gear and the cargo ramps are to be determined with due consideration given to avoid interference with manoeuvring lights, navigation lights and other functions of the ship.

2 When same parts of the cargo gear are utilized commonly for other functions, such as ventilators, or important systems or equipment designed for other purposes, or further, when some systems or equipment for other purposes are mounted on them, due considerations are to be given to avoid undue interference with each other in relation to their functions and strength.

3 When any parts of the cargo gear and the cargo ramps project beyond the ship's side under the working condition, it is recommended that such parts are to be of retractable, foldable or removable type designed for stowing within the line of ship's side when not in use.

4 The cargo gear and the cargo ramps are to be provided with equipments for securing the movable parts when not in use.

1.3.2 General Construction

1 The cargo gear and the cargo ramps other than those used ordinary trim and heel in calm weather and sea states are to comply with, in addition to the requirements in the Regulation, such additional requirements as considered appropriate by VR for the actual working condition.

2 The requirements in Chapter 3, 4 and 8 assume the use of hull structural rolled steels specified in 3.1 Part 7A of QCVN 21: 2015/BGTVT. High tensile steels used in the structural members, if any, are to comply with requirements specially made up by VR. The construction and dimensions of the structural members containing or made of materials other than those steel specified herebefore are to be specially considered by VR.

3 The structural members are to be designed to avoid structural discontinuities and abrupt change of sections as far as practicable. The welded joints are to be arranged to avoid the parts where concentration of stress is expected.

4 Corners of openings in the structural members are to be appropriately rounded off.

5 Openings causing dimensional anisotropy in the structural members are to be so arranged as their long sides or long axes may assume parallel to the direction of principal stresses.

6 Where two members having remarkably different stiffness are directly connected with each other, proper reinforcement is to be made by means of brackets, etc. to maintain the continuity of stiffness. Special consideration is to be given to the connection to the hull structures.

7 The cargo blocks of the structural members are to comply with the requirements in 6.2.

1.3.3 Direct Calculation of Strength

The dimensions of the structural members are to be determined by the method of direct calculation of strength approved by VR using the design loads and allowable stresses specified in respective Chapters concerned, with the exception of those members for which calculation formulae are given in Chapter 3.

1.3.4 Materials

1 The hull structural rolled steel used in the structural members are to be as given in Table 1.1 depending on their thickness, except in cases considered appropriate by VR.

Table 1.1 Thickness and Grades of Steels

Thickness t (mm)	t≤20	20< t ≤25	25< t ≤40	40<t
Grade	A/AH	B/AH	D/DH	E/EH

Note:

A, B, D, E, AH, DH and EH in the Table correspond to the following material grades:

A: A, AH: A32, A36 and A40

B: B, DH: D32, D36 and D40

D: D EH: E32, E36 and E40

E: E

2 For the cargo gear and the cargo ramps always used in especially cold zones or refrigerated hold chambers and for any other cases considered to be necessary by VR, VR may require the use of steel materials of higher notch toughness notwithstanding the requirement specified in -1.

3 Steel casting and steel forgings used in the structural members are, as a rule, to comply with the requirements in 5.1 and 6.1 Part 7A QCVN 21: 2015/BGTVT respectively or of equivalent qualities.

4 The materials of bolts and nuts used for connection of components of the structural members are to be considered appropriate by VR.

5 Wire ropes used as components of the structural members are to be those specified in Part 7B of QCVN 21: 2015/BGTVT for use as standing riggings or of an equivalent quality.

6 The materials used in the main parts of the installations of driving systems are to comply with the standard in Part 7A of QCVN 21: 2015/BGTVT or any standards recognized by VR to be of equivalent qualities.

1.3.5 Welding

1 The Welding of the structural members is to comply with the requirements in Part 6 of QCVN 21: 2015/BGTVT and the additional requirements considered necessary by VR according to the types of construction.

2 The arrangement of welded joints in the structural members is to be specially considered to avoid remarkable difficulties in welding work.

1.3.6 Prevention of Corrosion

1 The structural members are to be protected against corrosion with coating of a good quality or using other proper means.

2 Any parts liable to the accumulation of rainwater or dew condensation are to be provided with proper draining means.

CHAPTER 2 SURVEYS

2.1 General

2.1.1 Application

1 The requirements in this Chapter apply to the tests and surveys for the lifting appliances.

2 Where the structural members of the lifting appliances are permanently fitted to the hull structure or where they form an integral part thereof, the tests and surveys for these parts are to comply with the requirements in this Chapter and, in addition they are to comply with the relevant requirements of QCVN 21: 2015/BGTVT.

3 At the Periodical Surveys, VR may require other than those specified in 2.2 through 2.5 in this Chapter where deemed necessary.

4 With respect to Annual Thorough Surveys in cases where considered appropriate by VR, the Surveyor may modify the extent and contents of the tests and surveys specified in 2.2 through 2.5 in this Chapter, where deemed appropriate, based on the purpose, construction, age, history, results of the previous surveys and the current condition of the lifting appliances.

2.1.2 Preparation for Surveys and Others

1 All such preparations as required for the survey to be carried out as well as those which may be required by the Surveyor as necessary in accordance with the requirements in the Regulation are to be made by the applicant of the survey. The preparations are to include provisions of an easy and safe access, necessary facilities and necessary records for the execution of the survey. Inspection, measuring and test equipment, which Surveyors rely on to make decisions affecting classification are to be individually identified and calibrated to a standard deemed appropriate by VR. However, the Surveyor may accept simple measuring equipment (e.g. rulers, measuring tapes, weld gauges, micrometers) without individual identification or confirmation of calibration, provided they are of standard commercial design, properly maintained and periodically compared with other similar equipment or test pieces. The Surveyor may also accept equipment fitted on board a ship and used in examination of shipboard equipment (e.g. pressure, temperature or rpm gauges and meters) based either on calibration records or comparison of readings with multiple instruments.

2 The applicant for the survey is to arrange a supervisor who is well conversant with the survey items intended for the preparation of the survey to provide the necessary assistance to the Surveyor according to his requests during the survey.

3 The survey may be suspended where necessary preparations have not been made, any appropriate attendant mentioned in the previous -2 is not present, or the Surveyor considers that the safety for execution of the survey is not ensured.

4 Where repairs are deemed necessary as a result of the survey, the Surveyor will notify his recommendations to the applicant of the survey. Upon this notification, the repair is to be made to the satisfaction of the Surveyor.

5 In cases where it is necessary to replace any fittings, equipment or parts, etc. used onboard, replacements are to comply with the regulations to be applied during ship construction. However, in cases where new requirements are specified or where deemed necessary by VR, VR may require that such replacements comply with any new requirements in effect at the time the relevant replacement work is carried out. In addition, replacements are not to use any materials which contain asbestos.

2.1.3 Presentation of Certificates

All of the certificates for lifting appliances issued by VR are to be presented to the Surveyor when requested at the tests and surveys.

2.1.4 Records of the Surveys

The Register of Ship's Lifting appliances is to be made necessary entries on and endorsed by the Surveyor at the completion of the Surveys.

2.1.5 Notification of Survey Results

1 The Surveyor is to notify the results of the Survey to the applicant in a form of Survey Report.

2 In case where repairing is requested by the attending Surveyor, the repairs are to be made to his satisfaction.

3 The Survey Report in -1 is to be kept in the specified file and presented to the Surveyor at the subsequent Survey.

2.1.6 Re-Survey

In case where the applicant has any complaints in the Survey carried out in accordance with the Regulation, he may request execution of re-survey in writing to VR.

2.2 Surveys of Lifting Appliances

2.2.1 Kinds of Surveys

The kinds of Surveys for Lifting appliances are as follows:

(1) Surveys for registration (hereinafter referred to as Registration Survey)

(a) Registration Surveys during Construction;

(b) Registration Surveys of Lifting Appliances not built under Survey.

(2) Periodical Surveys for maintaining registration

(a) Annual Thorough Surveys;

(b) Load Tests.

(3) Occasional Surveys.

2.2.2 Timing of Surveys

The timing of the Surveys of lifting appliances are to be in accordance with the followings:

(1) A Registration Survey is to be carried out when the safety working load, etc. are assigned for the first time.

(2) Annual Thorough Surveys 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.

(3) 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.

(4) An Occasional Survey is to be carried out when the lifting appliances 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 lifting 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 VR

2.2.3 Periodical Surveys Carried Out in Advance

Periodical Surveys may be carried out in advance of the due date of each Survey upon application by the owner.

2.2.4 Postponement of Periodical Surveys

Periodical Surveys may be postponed subject to approval by VR. The period of such postponement is not to exceed 3 months from the date specified in 2.2.2.

2.2.5 Laid-up Ships

1 Laid-up ships are not subject to Registration Maintenance Surveys. However, Occasional Surveys may be carried out at the request of owners.

2 When laid-up ships are about to be re-entering service, the following surveys and surveys for specific matters which have been postponed due to being laid-up, if any, are to be carried out.

(1) If the due dates for Registration Maintenance Surveys have not transpired while the ship was laid-up, then an equivalent to the Annual Thorough Surveys specified in 2.4 is to be carried out.

(2) If the due dates for the Annual Thorough Surveys specified in 2.4 have transpired

while the ship was laid-up, such Annual Thorough Surveys are to be carried out.

(3) If the due dates for the Load Tests specified in 2.5 have transpired while the ship was laid-up, such Load Tests are to be carried out.

2.3 Registration Surveys

2.3.1 Drawings and Other Documents to be Submitted

1 At a Registration Survey, it is to be ascertained that the strength and construction of the lifting appliances comply with the Regulation based on the drawings and documents submitted to VR. In this case, the applicant is to submit the relevant drawings and documents out of listed in -2, -3 and -4.

2 The drawings and documents listed in the following (1) through (11) are to be submitted for approval for lifting appliances to be newly constructed:

(1) General arrangement of cargo gears and cargo ramps

(2) Construction drawings of cargo gears and cargo ramps (including the dimensions of structural members, specifications of materials and joint details)

(3) Drawings of cargo fittings (including the dimensions, specifications of materials and the fixing methods of these fittings with structural members or hull structure)

(4) Arrangement of loose gears (including rigging arrangement)

(5) List of loose gears (showing the construction, dimensions, materials and locations. For those in compliance with the well-known code or standard, the type symbol may be used in place of dimensions and materials)

(6) Construction drawings of driving gears

(7) Power system diagram

(8) Drawings of operation and control mechanism

(9) Drawings of safety devices

(10) Drawings of protective devices

(11) Other drawings and documents as deemed necessary by VR

3 The drawings and documents listed in the following (1) through (6) are to be submitted for reference for lifting appliances to be newly constructed:

(1) Specifications for cargo gears and cargo ramps

(2) Calculation sheets or check sheets relevant to drawings and documents for approval specified in -2

(3) Operation manual for cargo gears and cargo ramps

(4) Procedures of non-destructive testing

(5) Procedures of Load tests

(6) Other drawings and documents as deemed necessary by VR

4 At a Registration Survey of lifting appliances not built under Survey, the drawings and data to be submitted for the lifting appliances are to be same as specified in -2 and -3. However, some of these drawings and documents may be omitted instead of submitting the past survey records and certificates with respect to them subject to approval by VR.

2.3.2 Examinations for Workmanship

1 Workmanship of lifting appliances is to be examined and ascertained to be in good order when any of the following (1) through (5) is relevant:

(1) When, in process of manufacturing and assembling of structural members, requested by VR

(2) When structural members are installed on board the ship

(3) For driving gears, at the times when the finishing work on major parts is completed and when the Surveyor considers necessary during the process of manufacture

(4) When the subcontracted materials, parts or equipment are incorporated to the lifting appliances

(5) Other cases when considered necessary by VR

2 Lifting appliances are to be examined and ascertained to be in good order by the following tests and surveys:

(1) Testing as specified in Part 7A of QCVN 21: 2015/BGTVT where the materials need to be in compliance with the requirements in Part 7A

(2) Testing as specified in Part 6 of QCVN 21: 2015/BGTVT where the welding works need to be in compliance with the requirements in Part 6

(3) Non-destructive testing where requested by the Surveyor

(4) Shop trial of the driving gears

(5) Operation tests of the lifting appliances

(6) Operation tests of the safety devices and protective devices (including braking tests and electric power source cut-off tests with a testing weight equal to the safe working load applied (Hereinafter same in 2.4.1-1(2)(c), 2.4.2(2)(d), 2.4.3(2)(d) and 2.4.4-1(2)(c)))

(7) Other tests considered necessary by VR

2.4 Annual Thorough Surveys

2.4.1 Derrick Systems

1 At Annual Thorough Surveys, 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

(a) Structural members

(b) Connection between the structural members and hull structure

(c) Driving systems

(d) Safety devices and protective devices

(e) Markings of the safe working load, etc., and the effectiveness of the relevant certificates

(f) Preservation of the instruction manual on board the ship

(2) Items to be examined where considered necessary by the Surveyor

(a) 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

(b) Open-up examination of the driving systems

(c) Operation tests of the safety devices and protective devices

2 Open-up examinations of the topping brackets, goose neck brackets and derrick heel lugs are to be carried out during Annual Thorough Surveys at intervals not exceeding five years from the date of completion of the Registration Survey or the previous open-up examination.

2.4.2 Cranes

At Annual Thorough Surveys, the following items in (1) are to be visually examined for cranes 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

(a) Structural members

(b) For stationary cranes, the connection between the structural members and hull structure

(c) For track-mounted cranes, rails, buffers and the connection between those members and hull structure

(d) Installations of driving system

(e) Safety devices and protective devices

(f) Markings of the safe working load, etc., and the effectiveness of the relevant certificates

(g) Preservation of instruction manual on board the ship

(2) Items to be examined where considered necessary by the Surveyor

(a) Checking of plate thickness of the structural members, non-destructive testing and open-up examinations of the bearings

(b) Inside of the posts, their legs and stiffeners of cranes

(c) Open-up examinations of the driving gears

(d) Operation tests of the safety devices and protective devices

2.4.3 Cargo Ramps

At Annual Thorough surveys, the items in (1) are to be visually examined for cargo ramps in detail 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

(a) Structural members

(b) Connection between the structural members and hull structure

(c) Connection between the stoppers and hull structure

(d) Water-tight or weather-tight arrangements of cargo ramps that are used as water-tight or weather-tight doors when closed

(e) The driving gears

(f) Safety devices and protective devices

(g) Markings of the safe working load and the effectiveness of the relevant certificates

(h) Preservation of the instruction manuals on board the ship

(2) Items to be examined where considered necessary by the Surveyor

(a) Plate thickness measurements, open-up-inspection of lifting pins, nondestructive tests, etc.

(b) Hose testing or airtight testing for cargo ramps that are used as water-tight or weather-tight doors when closed

(c) Open-up examinations of the driving gears

(d) Operation tests of safety devices and protective devices

2.4.4 Cargo Lifts, etc.

1 At Annual Thorough surveys, the items in (1) are to be visually examined for cargo lifts in detail 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

(a) Structural members

(b) Connection between the holding parts of cargo lifts and hull structure

(c) Connection between the lifting/lowering devices of cargo lifts and hull structure

(d) Driving gears

(e) Safety devices and protective devices

(f) Markings of the safe working load and the effectiveness of the relevant certificates

(g) Preservation of the instruction manuals on board the ship

(2) Items to be examined where considered necessary by the Surveyor

(a) Plate thickness measurements, open-up-inspection of lifting pins, nondestructive tests, etc.

(b) Open-up examinations of the driving gears

(c) Operation tests of the safety devices and protective devices

2 At Annual Thorough Surveys for other 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.

2.4.5 Loose Gears

1 At Annual Thorough Surveys, 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.

(1) Wire ropes for their full length

(2) Cargo blocks, chains, rings, hooks, shackles, swivels, lifting beams, cramps, rigging screw, grabs, lifting magnets, spreaders, etc.

(3) Markings of the safe working load and identification symbols, and the effectiveness of the relevant certificates

2 In case where some of loose gears need to be repaired or renewed at times other than at the Periodical Surveys, VR may accept an autonomous inspection carried out by ship's master or his representative. In this case, the personnel who carried out an autonomous inspection is to record the following (1) through (6) for the loose gears renewed in the Inspection Record Book of Loose Gear, and show this Inspection Record Book and the certificates of the loose gears concerned to the Surveyor for his approval at the next Periodical Survey or Occasional Survey.

(1) Names and identification symbols

(2) Locations in service

(3) Safe working loads

(4) Testing loads

(5) Dates of renewal or repairs and dates of commencement of use

(6) Reasons for renewal or repairs

2.5 Load Tests

1 At Load Tests, lifting appliances are to be examined by applying movable weights or loads at least equal to the test loads as specified in -2 and in the manners specified in -3 or -4 depending on the types of lifting appliances and ascertained that they are in good order. However, Load Tests of loose gears may be omitted provided that the certificates with testing records of them are examined.

2 The test loads used for Load Tests are to comply with the requirements of the following (1) through (3) depending on the types of lifting appliances:

(1) The test loads for cargo gears and cargo ramps are to be as given in Table 2.1 according to the safe working loads;

(2) The test loads for loose gears except for ropes are to be as given in Table 2.2 according to the safe working loads;

(3) The test loads for ropes are to satisfy the following formula:

$T \geq W.f$

Where:

T : Test loads for ropes (t)

W : Safe working loads of ropes (t)

f : Safety factors specified in 6.3.1(5) or 6.3.2(3)

Table 2.1 Test Load for Cargo Gear and Cargo Ramps

Safe working load (SWL) (t)	Test load (t)
SWL < 20	1.25 × SWL
20 ≤ SWL <50	SWL + 5
50 ≤ SWL <100	1.1 × SWL
100 ≤ SWL	Load as considered appropriate by VR

Table 2.2 Test Loads for Loose Gears

Article of Gear		Safe Working Load (SWL) (t)	Test Load (t)
Pulley blocks	Single-sheave block without becket		4 × SWL
	Single-sheave block with becket		6 × SWL
	Multi-sheave block	SWL ≤ 25	2 × SWL
		25 < SWL ≤ 160	(0,933 × SWL) + 27
		160 < SWL	1,1 × SWL
Chain hook, shackle, ring, link, swivel, clamp and similar gear		SWL ≤ 25	2 × SWL
		25 < SWL	(1.22 × SWL) + 20
Lifting beam, Lifting magnet, spreader and similar gear		SWL ≤ 10	2 × SWL
		10 < SWL ≤ 160	(1.04 × SWL) + 9.6
		160 < SWL	1.1 × SWL

3 For lifting appliances of which the safe working loads, etc. are assigned for the first time, the methods of load tests are to comply with the following requirements in (1) through (5):

(1) Derrick systems

(a) In case of a swinging derrick system, the test weight is to be slewed throughout the working range at the allowable minimum angle and then lifted/lowered at some position of the working range.

(b) In case of a derrick crane, in addition to (a), the derrick boom is to be luffed with suspending the test weight at the position of outreach and ship's centre line.

(c) In case of a union-purchase derrick system, the test weight is to be manoeuvered throughout the working range within the allowable lifting height or the maximum angle between two cargo falls specified in 1.2.2-3 Section III of this Regulation.

(2) Cranes

(a) In case of a jib crane, the test weight is to be slewed throughout the working range at the maximum slewing radius and then lifted/lowered at some position of the working range. Further, jib is to be luffed at some position of the working range.

(b) In case of a track-mounted cranes, the crane with the test weight suspended is to be transveresed throughout the working range and test weight is to be lifted/lowered at some position.

(c) In case of a track-mounted hoisting gear, the hoisting gear with suspending the test weight is to be traversed from one end of the bridge span to the other and the test weight is to be lifted/lowered at some position.

(3) Cargo lifts

In case of a cargo lift, the test weight is to be so spaced that the most severe working condition is available taking into account one side loading, and the cargo lift is to be

moved between each stop position, and to be lifted or lowered within the entire stroke of motion.

(4) Cargo ramps

In case of a cargo ramp, the test weight is to be placed on the severest position of loading in the designed loading conditions, and the deflection is to be measured. As far as practicable, a vehicle with the mass corresponding to the safe working load is to run on the cargo ramp.

(5) In case of loose gear, the test load is to be loaded in the method considered as appropriate by VR.

4 For the lifting appliances other than described in -3, the methods of load tests are to comply with the following requirements in (1) or (2).

(1) The load test specified in -3(1), (2), (3), or (4) is to be carried out.

(2) The load test may be carried out using a spring or hydraulic weighing machine anchored suitably and safely in accordance with the method considered appropriate by VR.

CHAPTER 3 DERRICK SYSTEMS

3.1 General

3.1.1 Application

The requirements in this Chapter apply to the structural members of derrick systems.

3.2 Design Loads

3.2.1 Load Considerations

The loads to be taken into the calculations of dimensions of the structural members are to be as specified in (1) through (6) below:

(1) Safe working load of the derrick systems

(2) Self-weight of derrick boom and cargo fittings attached thereto

(3) Self-weight of loose gear

(4) Friction of cargo blocks

(5) Loads due to ship inclination

(6) Other loads considered to be necessary by VR

3.2.2 Friction of Cargo Blocks

In calculating the load at the rope end, the following friction load coefficients are to be taken into account depending on the types of bearing:

Bush bearing: 0.05

Roller bearing: 0.02

3.2.3 Load due to Ship Inclination

The angles of inclination used for the calculation of the loads due to ship inclination are to be the angles expected to occur in service condition, but they are not to be taken as less than 5° in angle of heel and 2° in angle of trim. If date on the angles of inclination of the ship concerned are submitted and recognized as appropriate by VR, however, these angles may be used in the calculations.

3.2.4 Load Combinations

1 The load to be used in the strength analysis of the structural members is to be such a combined load that these members may be put in the most severe load condition considering the loads specified in 3.2.1.

2 The union-purchase derrick system is to be analyzed as a swinging derrick system and a union-purchase derrick system respectively using the combined load according to the requirement in -1.

3.3 Strength and Construction of Derrick Posts, Masts and Stays

3.3.1 Strength Analysis

1 The strength of derrick posts, masts (hereinafter referred to as posts) and stays are to be analyzed for the combined load specified in 3.2.4 to determine the dimensions of their members in accordance with the requirement in 3.3.2 and 3.3.3.

2 The Young's modulus of the wire ropes to be used in the analysis of strength of stayed posts is to be 30.4 kN/mm^2 and 45.1 kN/mm^2 for the case of determining the dimensions of posts and stays respectively.

3.3.2 Allowable Stress for Combined Loads

1 The combined stress calculated by the following formula on the basis of the compressive stress due to bending moment, the compressive stress due to axial compression and the shearing stress due to twisting of the member is not to exceed the allowable stress σ_a given in Table 3.1.

$$\sqrt{(\sigma_b + \sigma_c)^2 + 3\tau^2} \qquad (N/mm^2)$$

Where:

σ_b: Compressive stress due to bending moment (N/mm^2)

σ_c: Compressive stress due to axial compression (N/mm^2)

τ: Shearing stress due to twisting of member (N/mm^2)

Table 3.1 Allowable Stress σ_a

Safe working load W (t)	Allowable stress σ_a (N/mm^2)
W < 10	$0.50\,\sigma_y$
10 ≤ W < 15	(0.016W + 0.34) σ_y
15 ≤ W < 50	$0.58\,\sigma_y$
50 ≤ W < 60	(0.005W + 0.33) σ_y
60 ≤ W	$0.63\,\sigma_y$

Note:

σ_y: The yield point or proof stress of material (N/mm^2)

2 The tension of the wire ropes used for stay is not to exceed the value obtained by dividing the value of breaking strength specified in Table 7B/4.3 of QCVN 21: 2015/BGTVT by the safety factor specified in 6.3.1(5).

3.3.3 Minimum Plate Thickness of Posts

The plate thickness of posts is not to be less than 6 mm.

3.3.4 Construction of Posts

1 The lower part of the post is to be effectively connected to hull structures by any of the following methods (1), (2) or (3), or any other method approved as appropriate by VR:

(1) To be supported by two or more superposed decks

(2) To be supported by deckhouse of an enough strength

(3) To be supported by bulkhead for an ample depth beneath the deck

2 The post well below the base to well above the goose neck bracket is to be of the dimensions equivalent to that at the base as far as practicable.

3 The post is to be locally reinforced by the use of thicker plating, doubling plates, additional reinforcing members, etc. in the connection of post body and portal beam, the parts where the goose neck brackets and topping brackets are fitted, etc. and the parts where stress concentration expected.

4 At the ends of the upper portal, its depth and plate thickness are to be properly increased. When opening hole at the end of the upper portal is unavoidably provided, properly reinforcement is to be provided around the opening hole.

3.4 Strength and Construction of Derrick Booms

3.4.1 General

The strength of derrick booms is to be analyzed for the load conditions specified in 3.2.4 and their dimensions are to be determined according to the requirements in 3.4.2 to 3.4.5.

3.4.2 Strength for Combined Load

The combined stress calculated by the following formula on the basis of the compressive stress due to twisting of the member is not to exceed the allowable stress σ_a given in Table 3.2.

$$\sqrt{(\sigma_b + \sigma_c)^2 + 3\tau^2} \quad (N/mm^2)$$

Where:

σ_b: Compressive stress due to bending moment (N/mm^2)

σ_c: Compressive stress due to axial compression (N/mm^2)

τ: Shearing stress due to twisting of member (N/mm^2)

Table 3.2 Allowable Stress σ_a

Safe working load W (t)	Allowable stress σ_a (N/mm^2)
W < 10	$0.34\,\sigma_y$
$10 \le$ W < 15	(0.018W + 0.16) σ_y
$15 \le$ W	$0.43\,\sigma_y$

Note:

σ_y: The yield point or proof stress of material (N/mm^2)

3.4.3 Buckling Strength

For member subjected to compression, the value obtained from the following formula is not to exceed the allowable stress σ_a given in Table 3.2.

$$1.15\,\omega\,\sigma_c \quad (\text{N/mm}^2)$$

Where:

σ_c: Axial compressive stress (N/mm^2)

ω: Coefficient calculated by the formula in Table 3.3(a) and Table 3.3(b) for the slenderness ratio and type of the member concerned.

Table 3.3(a) Formulae for ω

Relation of λ and λ_o	Type of member	Formulae for ω
$\lambda \ge \lambda_o$	All members	$2.9\left(\frac{\lambda}{\lambda_o}\right)^2$
$\lambda < \lambda_o$	Plate members	$\frac{1+0.45(\lambda/\lambda_0)}{1-0.5(\lambda/\lambda_0)^2}$
	Cylindrical members	$\frac{0.87+0.46(\lambda/\lambda_0)+0.12(\lambda/\lambda_0)^2}{1-0.5(\lambda/\lambda_0)^2}$

Notes:

1. λ is the slenderness ratio of the member subjected to compression to be obtained from the following formula:

$$l_e\sqrt{\frac{A}{I}}$$

Where:

A : Sectional area of the member (m^2)

I : Moment of inertia of section of member (m^4)

l_e : Effective length of the member to be determined as the product of the actual length of the member and coefficient K obtained from the following Table 3.3(b) for respective end conditions (m)

2. λ_o :is the value obtained from the following formula:

$$\sqrt{\frac{2\pi^2 E}{\sigma_y}}$$

Where:

π : The circular constant

E : Young's modulus (N/mm^2)

σ_y : Specified yield stress of material (N/mm^2)

Table 3.3(b) Values of K

Another end	One end			
	R: con. D: con.	R: con. D: free	R: free D: con.	R: free D: free
R: con. D: con.	0.5	1.0	0.7	2.0
R: con. D: free	1.0	-	2.0	-
R: free D: con.	0.7	2.0	1.0	-
R: free D: free	2.0	-	-	-

Note:

R : Rotation D : Displacement con.: constrained

3.4.4 Combined Compressive Stress

The compressive stress due to combination of the compressive stress due to axial compression and that due to bending moment is to meet the following formula:

$$\frac{\sigma_c}{\sigma_{ca}} + \frac{\sigma_b}{\sigma_a} \leq 1.0$$

Where:

σ_a : Allowable bending stress given in Table 3.2 (N/mm^2)

σ_{ca} : Allowable compressive stress to be taken as a quotient of σa divided 1.15 (N/mm^2)

σ_b : Compressive stress due to bending moment (N/mm^2)

σ_c : Compressive stress due to axial compression (N/mm^2)

3.4.5 Minimum Plate Thickness of Derrick Booms

The plate thickness used for the body of derrick booms is not to be less than 2% of the outside diameter at middle of the effective length or the boom or 6 mm, whichever is the greater.

3.4.6 Reinforcement of Derrick Booms

1 The plating at the head of the derrick booms to which fittings are attached is to be provided with doubling plates or reinforced by other suitable means.

2 Where cargo fittings for whipped rigging are attached to the boom, proper reinforcement is to be made by doubling plates or other suitable means.

3.4.7 Derrick Boom Stopper for Dropping out

Derrick booms are to be supported by a goose neck bracket and to be safeguarded against dropping out of their sockets or supports.

3.5 Simplified Calculation Method for Post and Stays of Swinging Derrick Systems

3.5.1 Application

Notwithstanding the provisions in 3.3.1 through 3.3.3 the dimensions of posts and stays of swinging derrick systems may be determined according to the requirements in 3.5.

3.5.2 Diameter of Post at the Base

The outside diameter of post at the base is not to be less than 5h, where h is vertical distance from the base of post to the topping bracket (m). For elliptic or oval section, its minor diameter is to be regarded as the outside diameter, while the short side is to be regarded as the outside diameter for rectangular cross section.

3.5.3 Section Modulus of Post at the Base

1 The section modulus of unstayed posts at the base is not to be less than the value obtained according to (1) through (3) below depending upon the arrangement of derrick booms.

(1) When a derrick boom is fitted on either of forward or aftward side of the post, the section modulus is to be the value obtained from the following formula:

$$C_1 C_2 \rho W \ (cm^3)$$

Where:

W: Safe working load (*t*).

ρ: Slewing radius at the allowable minimum angle (m).

C_1 and C_2: Coefficients obtained from Table 3.4 For intermediate values of *W*, the coefficients C_1 and C_2 are to be obtained by interpolation.

Table 3.4 Values of C_1 and C_2

W (t)	≤ 2	3	4	5	6	7	8	9	10
C_1	1.35	1.25	1.20	1.17	1.15	1.14	1.13	1.12	1.10
C_2	125	120	117	115	114	113	112	111	110

(2) The section modulus about the axis parallel to the longitudinal direction of the ship is to be the value obtained from (1) or the value obtained from the following formula,

whichever is the greater, when two derrick booms are fitted on both the forward and aftward the post:

$$\sum C_2 Wu \ (cm^3)$$

Where:

$\sum C_2 W$: Sum of C_2W for derrick booms situated forward and aftward the post respectively, C_2 and W are those obtained from (1).

u: Distance from the center of the post to the side of the ship, plus the outreach (m).

(3) Where derrick booms are supported by an independent structure other than the post, the section modulus is not to be less than obtained from the formula in (1) and (2), multiplied by $\frac{h}{h - h'}$. In this case, the coefficient C_1 in the formula specified in (1) is to be taken as 1.0.

Where:

h' : Vertical distance from the base of the post to the center of horizontal pin of the goose neck bracket

h: As specified in 3.5.2

2 The section modulus of stayed posts at the base may be the value specified in reduced by the value obtained from the following formula:

$$10\frac{h^3}{d_m}\Sigma R \quad (cm^3)$$

Where:

h: As specified in 3.5.2

d_m: Outside diameter of the post at the base in the direction in which R assumes minimum in the slewing range for the formula in -1(1), or in the axis parallel to the athwartship direction of the ship for the formula in -1(2) (cm).

ΣR: Sum of the values obtained from the following formula for each effective stay:

$$\frac{d_s^2 a^2}{l_o l_s^2}$$

Where:

d_s: Diameter of the wire rope for stays (mm)

l_s: Length of stays between the upper and lower ends (m)

l_o: Length equal to ls reduced by the value obtained from the following formula:

0.045ds + 0.26 (m)

a: Length of horizontal projection of the stays measured in the same direction as the

measurement of d_m (m).

3 Where the derrick booms are supported by a king post with a portal having uniform cross section, the section modulus of the post at the base is not to be less than the values obtained from (1), (2) and (3) below:

(1) The section modulus about the axis parallel to the athwartship direction of the ship is to be the value obtained by the formula in -1(1) multiplied by the following coefficient C_p:

Cp = 0.7 for r ≥ 0.6

Cp = 1- 0.5r for r < 0.6

Where:

r: Ratio of the breadth of the cross section of the portal to the diameter of the post at the base in the longitudinal of the ship.

(2) The section modulus about the axis parallel to the longitudinal direction of the ship is to be the values obtained from -1(1) or (2), whichever is the greater, multiplied by the following coefficient:

0.35 for r' ≥ 0.3

$0.5 - 1.67r'^2$ for r' < 0.3

Where:

r': Ratio of the depth of the cross section of the portal to the diameter of the post at the base in the athwarship direction.

(3) Where the distance between posts on the port and starboard sides exceed 2/3 of the height of the post, the coefficients specified in (1) and (2) are to be suitably increased.

4 The section modulus of the stayed king post at the base is not to be less than the values obtained from (1) and (2) below:

(1) The section modulus about the axis parallel to the athwartship direction of the ship is to be the value obtained from the following formula:

$$C_p\left(C_1C_2\rho W - 10\frac{h^3}{d_m}\Sigma R\right) \quad (cm^3)$$

Where:

C_p: As specified in -3(1)

C_1, C_2 , W and ρ : As specified in -1(1).

$\left(10\frac{h^3}{d_m}\Sigma R\right)$: Values obtained according to -2, provided that stays on one side only are to be taken into account.

(2) The section modulus about the axis parallel to the longitudinal direction of the ship is to be the value given in -3(2) above.

5 The section modulus of the short side post at the base supporting the derrick boom is not to be less than the value obtained according to (1) or (2) below:

(1) When a derrick boom is fitted on either of the forward or aftward side post, the section modulus is to be the value obtained from the following formula:

$$85\frac{h'}{h-h'}\rho W \ (cm^3)$$

Where:

W and ρ: As specified in -1(1)

h': As specified in -1(3)

h: As specified in 3.5.2

(2) Where derrick booms are fitted on the forward and aftward the side post, the section modulus of the side post about the parallel to the longitudinal direction of the ship is to be the greater of the value obtained from (1) or the value obtained from the formula in (1) using, in place of ρW , the product of the sum of ρW values for the forward and aftward booms and the value u given in -1(2), provided that u is to be measured from the center of the side post.

3.5.4 Dimensions of Post other than at the Base

1 The post from well below the base to well above the goose neck bracket is to be of the dimensions equivalent to that at the base as far as practicable.

2 The diameter and thickness of the post above the position specified in -1 may be gradually reduced according to the following (1) and (2).

(1) The outside diameter where the outrigger or the topping bracket is fitted may be 85% of the diameter at the base.

(2) The plate thickness at any arbitrary position of the post is not to be less than obtained from the following formula.

$$0.1d_m + 2.5 \ (mm)$$

Where:

d_m: Minimum outside diameter of the post at each position (cm).

3.5.5 Outriggers

Outriggers are to be properly constructed and of sufficient strength.

3.5.6 Portals

1 The section modulus of the portal of uniform section fitted to the king post is not to be less than the values obtained from (1) to (3) below:

(1) The section modulus about the vertical axis is to the value obtained from the formula given in 3.5.3-1(1) multiplied by 0.1 + 0.235r/c. Where this coefficient exceeds 0.2, it may be taken as 0.2.

Where:

r: As specified in 3.5.3-3(1)

c: Ratio of the actual section modulus (cm^3) of the post at the base about the axis parallel to the athwarship direction of the ship to that obtained from the formula in 3.5.3-1(1).

(2) Notwithstanding the requirements in (1), the section modulus of the portal about the vertical axis may be reduced to a half of the value in (1) where derrick boom is fitted only on one side of the forward of post.

(3) The section modulus about the horizontal axis is to be the value obtained from the formula in 3.5.3-1(2) multiplied by 0.25r'/c'. Where this coefficient exceeds 0.2, it may be taken as 0.2.

Where:

r': As specified in 3.5.3-3(2)

c': Ration of the actual section modulus (cm^3) of the post at the base about the axis parallel to the longitudinal direction of the ship to that obtained from the formula in 3.5.3-1(2).

2 The portal is to be properly stiffened so as to prevent the deformation due to bending.

3.5.7 Stays

The tension in wire ropes used for stays is to be less than the value obtained from the following formula.

$$18\frac{d_s^2 a}{l_o l_s}\delta \quad \text{(kN)}$$

Where:

a, d_s, l_o and l_s: As specified in 3.5.3-2. In this case, a is to be measured in the same direction as in the calculation of the value of δ.

δ: Value obtained from the following formula:

$$C_s \frac{h}{h-h'} \times \frac{\rho W}{\frac{I}{h^2} + 7.32 h \Sigma R}$$

Where:

I: Moment of inertia of section (cm^4) of the post at the base about the axis parallel to the athwarship direction of the ship. For the king posts, however, the value of I divided by the coefficient C_p given in 3.5.3-3(1) is to be used in place of I.

h: As specified in 3.5.2

h', W and ρ: As specified in 3.5.3-1(1) and (3)

ΣR: As specified in 3.5.3-2. In this case, a is to be measured in all directions in the slewing range of the derrick boom in calculating ΣR.

C_s: Value given in Table 3.5. For intermediate values of W, the coefficient C_s is to be obtained by interpolation.

Table 3.5 Values of C_s

W (t)	≤ 2	3	4	5	6	7	8	9	10	≥ 15
C_s	2.64	2.52	2.46	2.41	2.38	2.35	2.33	2.31	2.29	2.22

3.6 Simplified Calculation Methods for Derrick Booms

3.6.1 General

Notwithstanding the requirements in 3.4.1 through 3.4.5, the dimensions of derrick booms may be determined in accordance with requirements in this 3.6.

3.6.2 Derrick Booms without Whipped Rigging

1 The dimensions of derrick booms of derrick system without whipped rigging are not to be less than obtained according to (1), (2) and (3) below:

(1) The moment of inertia of derrick boom at the middle post is not to be less than obtained from the following formula:

$$C_B P l^2 \qquad (cm^4)$$

Where:

C_B: Value obtained from Table 3.6.

l: Effective length of derrick boom (m) (see Fig. 3.1).

P: Axial compression of derrick boom to be determined according to (a) or (b) depending on the type of the derrick systems. When the self-weight of derrick boom and its fitting are accurately estimated, the value obtained from the force diagram may be used as P.

(a) Swinging Derrick Systems:

$$P = (\alpha_1 \frac{l}{h - h'} + f)Wg \qquad (kN)$$

Where:

W and h': As specified in 3.5.3-1(1) and (3)

h: As specified in 3.5.2

α_1: Value obtained from Table 3.7. For intermediate values of *W*, α_1 is to be obtained by interpolation.

f: Coefficient obtained from Table 3.8 depending on the number of cargo block for cargo fall. Where the cargo fall is carried to the top of the post through the sheave fixed to the top of the boom, *f* may be taken as zero.

Table 3.6 Values of C_B

Safe working load W (t)	C_B
$W \leq 10$	0.28
$10 < W < 15$	0.40 - 0.012W
$15 \leq W \leq 50$	0.22
$50 < W$	Value as considered appropriate by VR

Table 3.7 Values of α_1

W(t)	≤ 2	3	4	5	6	7	8	9	10	≥ 10
α_1	1.28	1.23	1.20	1.18	1.16	1.15	1.14	1.13	1.13	Value as considered appropriate by VR

Table 3.8 Values of f

n	1	2	3	4	5	6	7	8
f	1.102	0.570	0.392	0.304	0.251	0.216	0.192	0.172

Notes:

n: The sum of sheaves of cargo block for cargo fall.

(b) Derrick systems other than swinging derrick systems:

$$P = (\alpha_1 \frac{l}{h - h'} + f)Wg + \frac{Kn_1\alpha_1\alpha_2}{n_2\sqrt{b^2 + l^2}} lWg \quad (kN)$$

Where:

α_1, l, h, h', f and W: As specified in (a);

α_2: As specified in 5.2.2;

b: Horizontal distance from the goose neck bracket to guy post (m);

n_1: Number of guy ropes;

n_2: Number of topping ropes;

K: Values given in Table 3.9 depending on the type of rigging.

Table 3.9 Values of K

Rigging system	K
Type A	0
Type B	1.2
Type C	2.0

Notes:

1. Type A is rigging system having two guy tackles on port and starboard sides of the top of the post so that these guy tackles may also serve as topping lifts.
2. Type B is a rigging system having a deltaplate connecting the end of topping lift and ends

of port and starboard side guy ropes so that the tension of topping lift may absorb the slackening of guy ropes.

3. Type C is a rigging systems having a connecting block connecting the end of guy rope(s) of both sides (or of one side) and the topping lift led along the derrick post so that the slackening of guy rope(s) may be absorbed by the topping lift.

(2) In derrick booms with tapered end parts, the parallel part in the midlength is, as a standard, to be of a length equal to 1/3 of the effective length, and the diameter at the ends is not to be less than 60% of the diameter of the parallel midlength part.

(3) The thickness of steel plate used for the body of derrick booms is not to be less than the value obtained from the following formula or 2% of the outside diameter at the middle part whichever is the greater.

6 (mm) for P < 75.5 (kN)

5 + 0.0133P (mm) for P ≥ 75.5 (kN)

Where P: As specified in 3.6.2-1(1).

2 The shape and dimensions of the derrick boom of swinging derrick system may be in accordance with standards recognized by VR to be equivalent (e.g. JIS F 2201).

3.6.3 Derrick Booms with Whipped Rigging

The dimensions of derrick booms of derrick system with whipped rigging are not to be less than obtained according to (1) and (2).

(1) The moment of inertia of section at an arbitrary position at a distance of x (m) from the center of eye fitting at derrick heel is not to be less than obtained from the following formula. Where a doubling plate is fitted for a sufficient length, 70% of the doubling plate may be added to D (x) and A (x) in the formula.

$$I(x) = C_B P l^2 \left\{1 - 3.136\left(\frac{x}{l} - 0.5\right)^2\right\} + \frac{D(x) l_1 x}{2\left(\sigma_o - \frac{P}{A(x)} \times 10\right) l} \times \frac{Wg}{N} \cos\theta \times 10^3$$

Where:

I(x): Required moment of inertia of section at a distance of x (m) from the derrick heel (cm^4).

C_B: As specified in 3.6.2.

P: Axial compression of boom specified in 3.6.2-1(1) (kN).

l: Effective length of boom (m).

W: Safe working load as specified in 3.5.3-1(1) (t).

N: Sum of sheaves of cargo block for cargo fall (except cargo block for cargo relief)

θ : Allowable minimum angle of boom (degree)

l_1: Distance between the eye fittings for whipped rigging (m) (see Fig. 3.1).

D(x): Outside diameter of derrick boom at a distance of x (m) from the boom heel minus plate thickness (cm)

A(x): Sectional area of derrick boom at a distance of x (m) from the boom heel (cm^2).

σ_o: Value given in Table 3.10 (N/mm^2).

(2) The length of parallel part at the middle, the diameter at ends and the plate thickness of the boom body are to be as specified in 3.6.2-1(2) and (3).

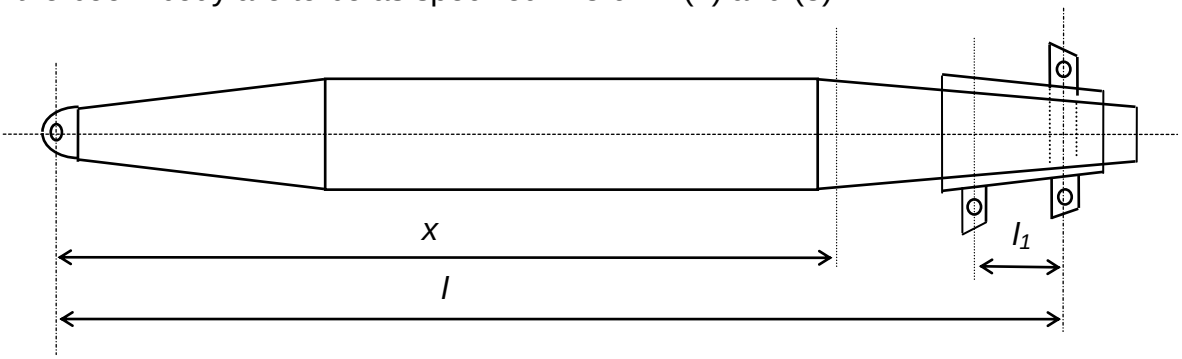


Fig. 3.1 Derrick Boom with Whipped Rigging

Table 3.10 Values of σ_o

Safe working load W (t)	σ_o
W ≤ 10	80.4
10 < W < 15	4.04W + 40.0
15 ≤ W ≤ 50	100.6
50 < W	Value as considered appropriate by VR

CHAPTER 4 CRANES

4.1 General

4.1.1 Application

The requirements in this Chapter apply to the structural members of cranes.

4.2 Design Loads

4.2.1 Load Considerations

The loads to be taken into the calculation of dimensions of structural members are to be those related to the crane concerned among the items enumerated from (1) to (11) below:

(1) Safe working load of the cranes

(2) Additional impact loads

(3) Self-weight of crane system and cargo fittings attached thereto

(4) Self-weight of loose gear

(5) Friction of cargo blocks

(6) Horizontal forces

(7) Wind loading

(8) Buffer forces

(9) Loads due to ship inclination

(10) Loads due to ship motion

(11) Other loads considered necessary by VR

4.2.2 Additional Impact Loads

1 The additional impact load is to be the product of the hoisting load and the impact load coefficient given in Table 4.1 depending on the type of cranes. When the stress due to hoisting of cargo and the stress due to the self weight have different signs in a member, 50% of additional impact load is to be taken into account in addition to the self-weight, considering the shock due to unloading.

2 Notwithstanding the requirements specified in -1, additional impact load coefficient based on actual measurements taking into account the hoisting speed, deflections of girders, length of ropes, etc. may be used in place of the values given in Table 4.1.

Table 4.1 Additional Impact Load Coefficient

Types of cranes	Additional impact load coefficient
Provision handling crane, Machinery handling crane, Maintenance crane and Hose handling crane	0.10
Jib crane and gantry crane for cargo handling	0.25
Jib crane and gantry crane occasionally used with hydraulically operated of rope-operated bucket, etc. for cargo handling	0.40
Jib crane and gantry crane always using grab, lifting magnet, etc. for cargo handling and Offshore jib crane	0.60

4.2.3 Friction of Cargo Blocks

The friction of cargo blocks is to be as specified in 3.2.2.

4.2.4 Horizontal Forces

1 In track-mounted cranes, the transverse forces due to travel motion is to be taken into consideration as a factor of horizontal force in addition to the inertial force and centrifugal force.

2 The inertial force is to be obtained by multiplying the sum of the mass of the moving parts and the hoisting load (in slewing motion, the load is assumed to be at the top of jib) by the following coefficient depending on the condition of motion. In the case of travelling by driven wheels, however, this inertial force need not exceed 15% of the driving wheel load.

Level luffing motions: $0.01\sqrt{V}$

Traversing or travelling motions: $0.008\sqrt{V}$

Slewing motions: $0.006\sqrt{V}$

Where:

V: Velocity of motion concerned to be determined by the designer (m/min).

3 Notwithstanding the requirements in -2 the values of the actual acceleration deceleration characteristics, the actual braking time, etc. for the mode of motion concerned may be used as the inertial forces, if such values are known.

4 For a system having structural members which will make slewing motions while supporting the safe working load, the centrifugal force determined from following formula is to be taken into consideration.

$$\frac{Wv^2}{R} \text{ (kN)}$$

Where:

W: Safe working load (t)

R: Slewing radius (m)

v: Circular speed (m/s)

5 The transverse force due to travel motions is to be calculated from the following formula:

$$\lambda D \text{ (kN)}$$

Where:

D: Wheel load (kN)

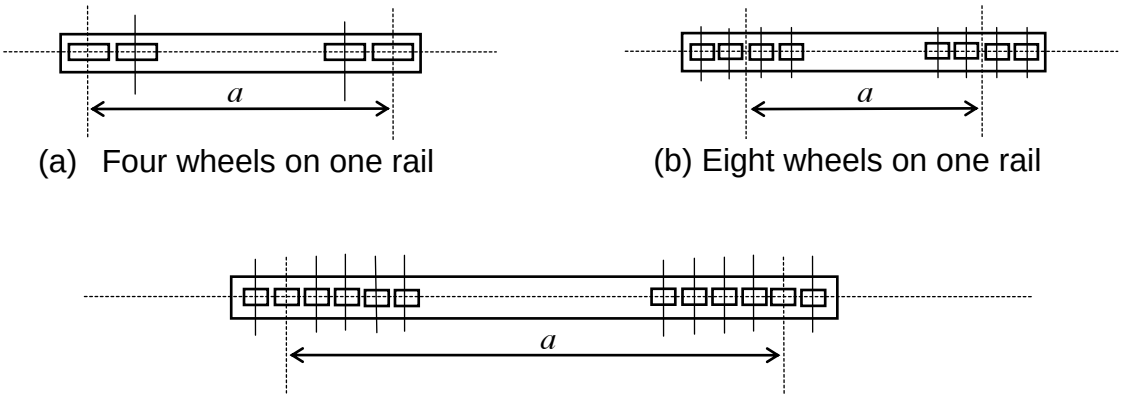
λ: Transverse force coefficient to be determined from the following formula depending on the value of l/a. However, l need not exceed 0.15

0.05 for *l*/a ≤ 2

$\frac{1}{60}(\frac{l}{a}+1)$ for l/a > 2

l: Span of rails (m)

a: Effective wheel base to be determined according to Fig. 4.1 (m).



(a) Four wheels on one rail (b) Eight wheels on one rail

(c) More than 8 wheels on one rail

Fig. 4.1 Measurement of Effective Wheel Base

4.2.5 Wind Loading

1 The wind loading is to be calculated by the following formula:

$$F = PA \times 10^{-3} \text{ (kN)}$$

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 (m^2). 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. 4.2. The distance b between girders is to be as given in Fig. 4.3.

P: Wind pressure calculated by the following formula (Pa):

$$\frac{1}{16} C_h C_s g V^2 \text{ (Pa)}$$

Where:

V: Wind velocity according to (1) and (2) below (m/s):

(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 VR in the range down to 25.8 m/sec.

C_h : Height factor to be determined according to Table 4.2 depending on the height of the position is question from the lightweight waterline.

C_s : Shape factor to be determined according to Table 4.3 depending on the shapes of various parts of the cargo gear and the cargo.

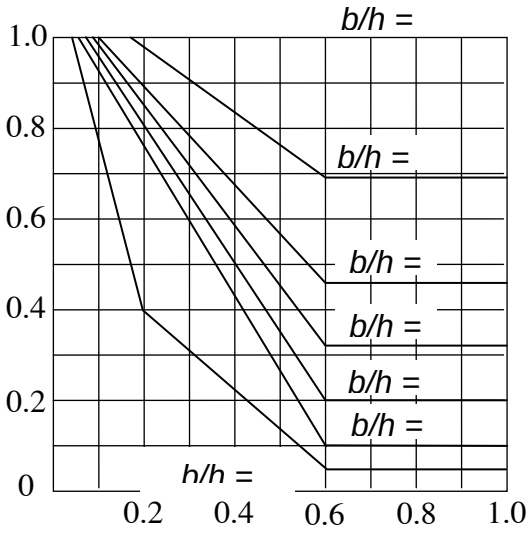


Fig. 4.2 Repleteness Ratio ϕ Reduction Factor η

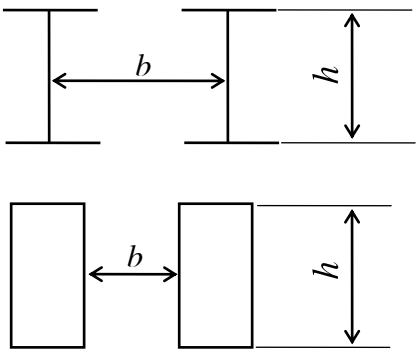
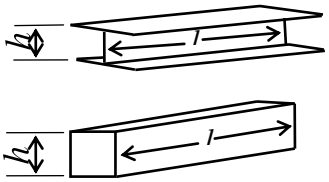
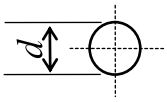


Fig. 4.3 Distance between two Neighbouring Girders, b

Table 4.2 Height Factor C_h

Vertical height h (*m*)	C_h
$h < 15.3$	1.00
$15.3 \le h < 30.5$	1.10
$30.5 \le h < 46.0$	1.20
$46.0 \le h < 61.0$	1.30
$61.0 \le h < 76.0$	1.37
$76.0 \le h$	Value as considered appropriate by VR

Table 4.3 Shape Factor C_s

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

Notes:

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: $q = \frac{1}{16} C_h . g V^2 . 10^{-3}$ (kPa)

2 Notwithstanding the requirements in -1, the data on wind loading obtained by wind tunnel tests for the structural members and cargo may be used for calculations.

4.2.6 Buffer Forces

1 The buffer forces are assumed to be the loads in the crane system originating from collision with buffer at a speed equal to 70% of the rated speed when no cargo is suspended from the crane. In a crane system having a rigid guide, etc. to limit the swinging of suspended cargo due to collision, the influence of the cargo weight is also to be taken into consideration.

2 Notwithstanding the requirement in -1, in a crane system designed to be automatically decelerated before colliding the buffer, the speed after deceleration may be regarded as the rated speed in the requirement in -1.

4.2.7 Loads due to Ship Inclination

The angles of inclination used for the calculation of loads due to ship inclination are not to be less than the values specified below:

In service conditions: 5 degrees in angle of heel and 2 degrees in angle of trim occurring simultaneously

In stowage conditions: 30 degrees in angle of heel

4.2.8 Loads due to Ship Motion

The accelerations used for the calculation of loads due to ship motion are the severest of the combinations (1) or (2) below for the stowage condition, and values recognized by VR to be appropriate for the service condition. If data on the ship's motions are submitted and recognized by VR to be appropriate, the values in such data may be used in the calculations.

(1) ±1.0 g in the direction normal to the deck and ±0.5 g in the longitudinal direction parallel to the deck

(2) ±1.0 g in the direction normal to the deck and ±0.5 g in the transverse direction parallel to the deck

4.2.9 Load Combinations

1 The load to be used in the strength analysis of structural members is to be such a combined load that these members may be put in the severest loading condition considering the loads specified in -2 through -5 below.

2 When the wind loading is not taken into account in service condition, the sum of loads from (1) to (9) below multiplied by a work coefficient given in Table 4.4 according to the type of crane concerned is to be considered.

(1) Safe working load of the cranes

(2) Additional impact loads

(3) Self-weights of crane system and cargo fittings attached thereto

(4) Self-weights of loose gear

(5) Friction of cargo blocks

(6) Horizontal loads

(7) Loads due to ship inclination

(8) Loads due to ship motion (except those intended to cargo handling in harbours only)

(9) Other loads considered necessary by VR

Table 4.4 Work Coefficient of Crane Systems

Type of crane	Work coefficient
Provision handling crane, Machinery handling crane, Maintenance crane and Hose handling crane	1.00
Jib crane and gantry crane for cargo handling	1.05
Jib crane and gantry crane occasionally used with hydraulically operated or rope-operated bucket, etc. for cargo handling	1.10
Jib crane and gantry crane always using grab, lifting magnet, etc. for cargo handling and Offshore jib crane	1.20

3 When the wind loading are to be taken into consideration in the service conditions, the wind loading is to be added to the design load as specified in -2.

4 The buffer forces as given in 4.2.6 are to be taken into consideration for the track-mounted cranes.

5 In stowage condition, the loads from (1) to (5) below are to be considered

(1) Self-weights of crane system and cargo fittings attached thereto

(2) Wind loading in the stowage conditions

(3) Loads due to ship inclination in the stowage conditions

(4) Loads due to ship motion stowage conditions

(5) Other loads considered necessary by VR

4.3 Strength and Construction

4.3.1 General

1 The strength of structural members is to be analyzed on the load conditions specified in 4.2.9 to determine their dimensions according to requirements in 4.3.2 through 4.3.9.

2 For structures connected by bolts and nuts, proper considerations are to be given to the decrease of effective sectional areas.

3 When considered necessary VR may require the confirmation of the appropriateness of strength analyses by examination of models or the things in question.

4.3.2 Allowable Stress for Combined Loads

The allowable stress given in Table 4.5 are to be used for components subjected to combined loads.

4.3.3 Buckling Strength

For members subjected to compression, the values obtained from the following formula is not to exceed the allowable compressive stress given in Table 4.5.

$$\omega\sigma_c \quad (N/mm^2)$$

Where: ω and σ_c as specified in 3.4.3.

4.3.4 Combined Compressive Stress

When the compressive stress of a member is determined as a combination of compressive stress due to axial compression and that due to bending moment such a compressive stress is to comply with the following formula:

$$\frac{\sigma_c}{\sigma_{ca}} + \frac{\sigma_b}{\sigma_a} \leq 1.0$$

Where:

σ_b: Compressive stress due to bending moment (N/mm^2).

σ_c: Compressive stress due to axial compression (N/mm^2).

σ_a: Allowable bending stress given in Table 4.5 (N/mm^2). For fixed posts at the base, however, the allowable stress σ_a in Table 3.1 is to be used.

σ_{ca}: Allowable compressive stress given in Table 4.5 (N/mm^2). For fixed post at the base, however, the allowable stress (N/mm^2) is to be taken equal to the allowable stress in Table 3.1 divided by 1.15.

Table 4.5 Allowable Stress σ_a

Load Condition	Kind of stress					
	Tension	Bending	Shear	Compression	Bearing	Combined
Condition specified in 4.2.9-2	$0.67\sigma_y$	$0.67\sigma_y$	$0.39\sigma_y$	$0.58\sigma_y$	$0.94\sigma_y$	$0.77\sigma_y$
Condition specified in 4.2.9-3	$0.77\sigma_y$	$0.77\sigma_y$	$0.45\sigma_y$	$0.67\sigma_y$	$1.09\sigma_y$	$0.89\sigma_y$
Condition specified in 4.2.9-4 and -5	$0.87\sigma_y$	$0.87\sigma_y$	$0.50\sigma_y$	$0.76\sigma_y$	$1.23\sigma_y$	$1.00\sigma_y$

Notes:

1. σ_y: The yield point or proof stress of material (N/mm^2)

2. The combined stress is to be the value obtained from the following formula:

$$\sqrt{\sigma_x^2 + \sigma_y^2 - \sigma_x\sigma_y + 3\tau_{xy}^2} \quad (\text{N/mm}^2)$$

Where:

σ_x: Applied stress in x-direction at the middle of plate thickness (N/mm^2)

σ_y: Applied stress in y-direction at the middle of plate thickness (N/mm^2)

τ_{xy}: Applied shear stress in the x-y plane (N/mm^2).

4.3.5 Fatigue Strength

Where the influence of repeated stress cannot be neglected, the member is to have an ample strength against fatigue with due consideration for the magnitude and frequency of repeated stress, the form of the member in question, etc.

4.3.6 Minimum Thickness

The thickness of structural members is not to be less than 6 mm.

4.3.7 Strength of Bolts, Nuts and Pins

Bolts, nuts and pins are to have sufficient strength for the magnitudes and directions of the loads they are subjected to.

4.3.8 Fixed Posts

1 The fixed posts are to be effectively connected to the hull structure in accordance with the requirements in 3.3.4-1.

2 The upper part of fixed post where the flange is attached is to be sufficiently reinforced by increasing the plate thickness or by providing of brackets.

4.3.9 Slewing-ring Fixing Bolts

1 Any material having a tensile strength exceeding 1.18 kN/mm^2 and yield stress exceeding 1.06 kN/mm^2 is not to be used for the bolts fixing the slewing-rings except when special considerations have given to the strength characteristics of the bolts.

2 Special considerations are to be given to the tightening force of fixing bolts.

3 The stress generated in fixing bolts is not to exceed the allowable stress given in Table 4.6 according to the load conditions specified in 4.2.9. In this case, the stress in bolts is taken as the value of the axial compression determined by the following formula divided by the minimum sectional area of fixing bolts.

$$\frac{4M}{DN} - \frac{W}{N} \quad (N)$$

Where:

M: Upsetting moment (N.mm^2)

D: Pitch circle diameter of fixing bolts (mm)

N: Number of fixing bolts

W: Axial compression on the slewing-ring (N)

Table 4.6 Allowable Stress of Fixing Bolts δ_a

Load condition	σ_a
Condition specified in 4.2.9-2 and -3	$0.4\sigma_y$
Condition specified in 4.2.9-5	$0.54\sigma_y$

Notes:

σ_y : The yield point or proof stress of the material (N/mm^2).

4.4 Special Requirements for Track-mounted Cranes

4.4.1 Stability

The track-mounted cranes are to have a suffocate stability under the load conditions specified in 4.2.9.

4.4.2 Prevention of Upsetting

The track-mounted crane is to be designed with sufficient considerations for the stability to prevent upsetting even if the wheel shafts or wheels are damaged.

4.4.3 Deflection Criteria

When suspending the safe working load, deflection of the traveling girder of the track-mounted cranes is not to exceed 1/800 of the span between the supporting points.

4.4.4 Travel Gear

The travel gear is to be securely fixed to the main body of the track-mounted cranes by bolts, welding or pins. The inclinations of hull in service condition and stowage condition are to be taken into consideration.

4.4.5 Buffers

The track-mounted cranes are to be provided with buffers in accordance with (1) and (2) below, except when automatic system for prevention of collision is provided.

(1) At both ends of tracks or any other equivalent positions. These buffers may be replaced by stops of a height not less than 1/2 of the diameter of wheels.

(2) Where more than two track-mounted cranes are provided on one track, between these track-mounted cranes.

CHAPTER 5 CARGO FITTINGS

5.1 General

5.1.1 Application

The requirements in this Chapter apply to the cargo fittings.

5.2 Cargo Fittings

5.2.1 Goose Neck Brackets and Derrick Heel Lugs

1 The sizes of goose neck pin, cross bolt and derrick heel lug shown in Fig. 5.1 are to be not less than the following values. The sizes of other parts are to be as deemed appropriate by VR.

$$b = e_1\sqrt{\frac{P}{g}} \quad \text{(mm)}$$

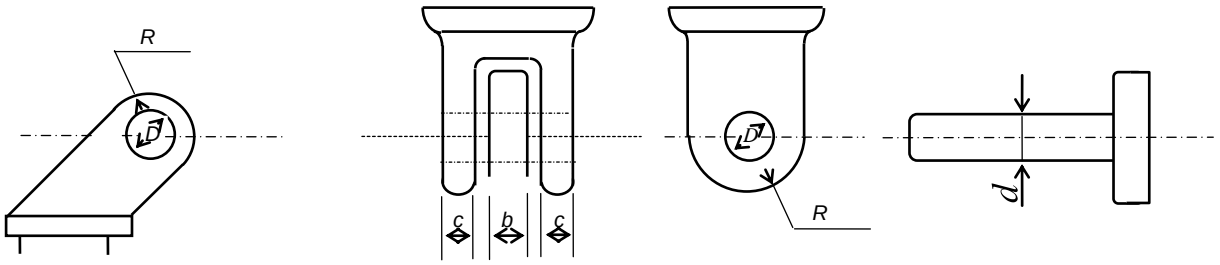
$$c = 0.55e_1\sqrt{\frac{P}{g}} \quad \text{(mm)}$$

$$d = e_1\sqrt{\frac{P}{g}} \quad \text{(mm)}$$

Where:

P: Design axial compressive force acting on derrick boom (kN).

e_1 = 15.6. However, in the swinging derrick system, the values given in Table 5.1 may be used according to the safe working load.



Gooseneck pin Derrick heel lug Cross bolt

Fig. 5.1 Gooseneck Pin, Derrick Heel Lug and Cross Bolt

Table 5.1 Values of e_1

Safe working load W (t)	e_1
$W \le 10$	15.6
$10 \le W < 15$	18.8 - 0.32W
$15 \le W \le 50$	14.0
$50 < W$	Value as considered appropriate by VR

2 It is recommended that clearance at parts where the cross bolt penetrates through the derrick heel lug and the gooseneck pin of gooseneck bracket is to be less than 2 mm in diameter. The size of the outer parts of bolt holes for the gooseneck pin and derrick heel lug is to be of the same size at the cross bolt radius, as a standard.

3 Notwithstanding the requirements in -1, the sizes of gooseneck bracket and derrick heel lug may be in accordance with any other standards recognized by VR. However, for the fittings used for other than the swinging derrick systems, consideration to the effect of increasing load caused by the guy ropes is to be given.

5.2.2 Fittings Attached to Head of Derrick Booms

1 The sizes of fittings attached to the head of derrick booms are not to be less than the values given in the following (1) and (3) according to the respective purpose and shapes of the fittings:

(1) Where the shape of cargo fittings attached to the head of derrick boom are as given in Fig.5.2, the sizes of them are not to be less than the following values. The sizes of other parts are to be as deemed appropriate by VR.

$$d = e_2\sqrt{\frac{T}{g}} \quad (mm)$$

$$t = e_2\sqrt{\frac{T}{g}} \quad (mm)$$

Where:

e_2: Value as given in Table 5.2

T: Maximum tension applied to cargo fitting at the head of derrick boom (kN). However, in the swinging derrick system, the following value may be used:

$\alpha_1\alpha_2$ Wg for topping lift

λ Wg for cargo fall

Where:

W: Safe working load (t).

α_1: As specified in 3.6.2.

α_2: As given in Table 5.3 depending on the value of l/(h – h') . However, for intermediate values of α_2, it is to be obtained by interpolation.

λ: Value given in Table 5.4 depending on the number of sheaves of blocks for cargo fall. However, the value of λ may be taken as 1.0 where the cargo fall is led to the top of derrick post through the sheave incorporated in the head of the derrick boom.

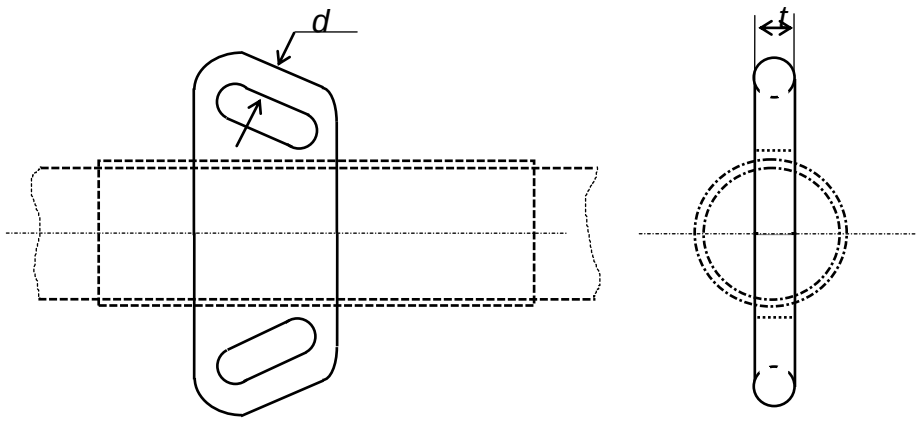


Fig. 5.2 Cargo Fitting Attached at Head of Derrick Boom

Table 5.2 Values of e_2

Safe working load W (t)	e_2
$W \leq 10$	12.5
$10 < W < 15$	15.1 - 0.26W
$15 \leq W \leq 50$	11.2
$50 < W$	Value as considered appropriate by VR

Table 5.3 Values of α_2

$l/(h-h')$		2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2
α_2	W < 10	1.99	1.90	1.81	1.73	1.65	1.57	1.49	1.42	1.35
	15≤W< 50	1.82	1.73	1.65	1.57	1.49	1.41	1.33	1.26	1.19

Notes: l, h and h' as specified in 3.6.2.

Table 5.4 Values of λ

Sum of the number of sheaves of blocks for cargo fall	1	2	3	4	5	6	7	8
λ	2.10	1.58	1.40	1.31	1.26	1.23	1.2	1.18

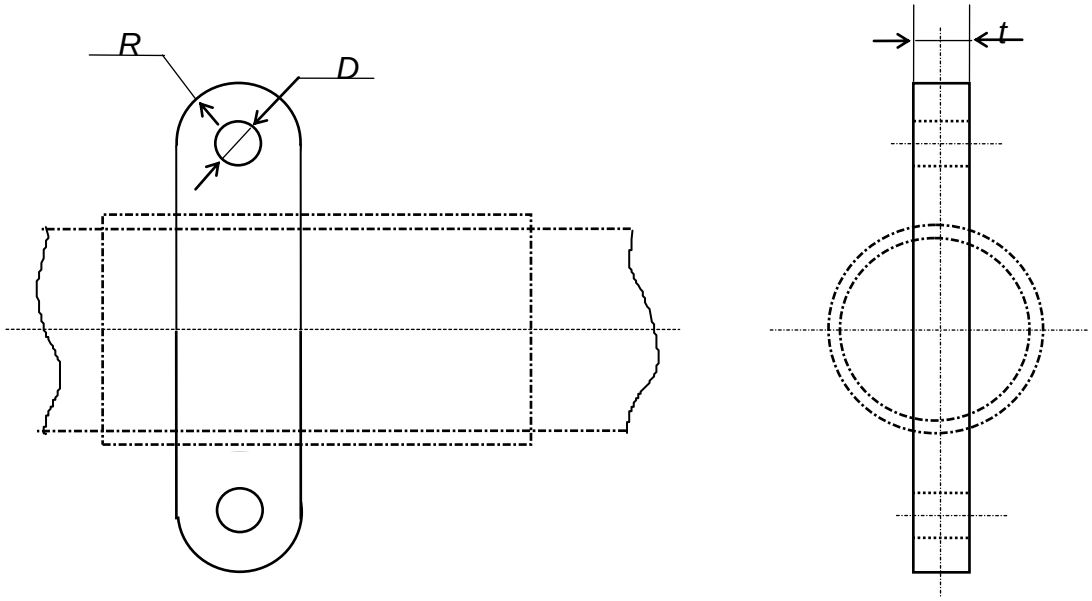


Fig. 5.3 Fitting Attached at Head of Derrick Boom

Table 5.5 Values of e_3

Safe working load W (t)	e_3
$W \leq 10$	122
$10 < W < 15$	170 - 4.8W
$15 \leq W \leq 50$	98
$50 < W$	Value as considered appropriate by VR

(2) Where the shape of cargo fitting attached to the head of cargo derrick boom is as shown in Fig. 5.3, the sizes of them are not to be less than the following values.

$R \geq D$

$$t = e_1\sqrt{\frac{T}{g}} \quad (mm)$$

The sizes of other parts are to be as deemed appropriate by VR.

However, where the value of *R* is larger than 1.15*D*, the value obtained from the following formula may be taken:

$$t = \frac{e_3}{(R - \frac{D}{2})} \times \frac{T}{g} \quad (mm)$$

Where:

e_1: as specified in 5.2.1-1

T: as specified in (1)

e_3: as given in Table 5.5.

(3) The sizes of guy fittings attached the head of derrick boom are to be enough against the design load.

2 Notwithstanding the requirements in -1, the sizes of cargo fittings attached at the head of derrick boom may be in accordance with any other standards recognized by VR to be equivalent. However, for the fittings used for other than the swinging derrick systems, consideration to the effect of increasing load caused by the guy ropes is to be given.

5.2.3 Other Cargo Fittings

The sizes of the other cargo fittings such as topping bracket, guy cleat, eye and so on are to provide adequate strength under applied forces and their shapes are to be in line with associated fittings. However, for the topping bracket used for other than the swinging derrick systems, consideration to the effect of increasing load caused by the guy ropes is to be given.

CHAPTER 6 LOOSE GEAR

6.1 General

6.1.1 Application

The requirements in this Chapter apply to the loose gear.

6.1.2 General Requirements

When the safe working load is applied to the cargo gear and cargo ramps, the load created in the important part of those loose gears and ropes is not to exceed the respective specified safe working load.

6.2 Cargo Blocks

6.2.1 Cargo Blocks for Wire Ropes

The cargo blocks for wire ropes are to comply with the following requirements (1) through (4). However, in sheaves for equalizer sheaves or those for overload sensors, they are to be as deemed appropriate by VR. (See Fig. 6.1)

(1) The diameter of the sheave at the bottom of the rope groove is not to be less than 14 times the wire rope diameter.

(2) The depth of the groove of the sheave is not to be less than the wire rope diameter.

(3) The bottom of the groove of the sheave is to have a circular contour over a segment sustained by angle of not less than 120 degrees.

(4) The groove diameter of the sheave is to be 1.1 times the wire rope diameter, as a standard.

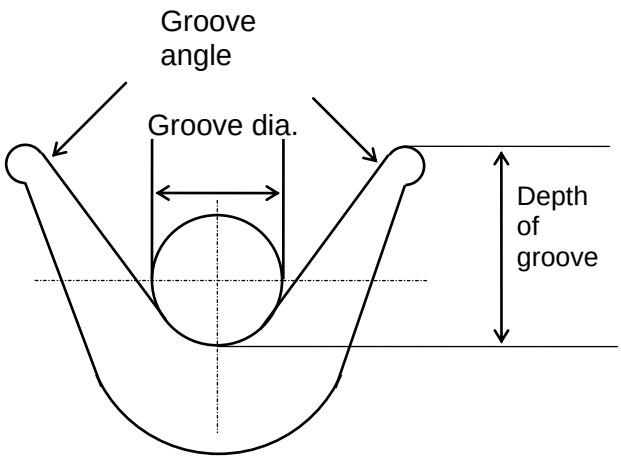


Fig. 6.1 Sheave Groove

6.2.2 Cargo Blocks for Fibre Ropes

The cargo blocks for fibre ropes are to comply with the following requirements (1) through (3):

(1) The diameter of the bottom of the rope groove is not to be less than 5.5 times the fibre rope diameter.

(2) The depth of the groove of the sheave is not to be less than the fibre rope diameter.

(3) The groove diameter of the sheave is to be the fibre rope diameter plus 2 mm, as a standard.

6.3 Ropes

6.3.1 Wire Ropes

The wire ropes are to comply with the following requirements (1) through (5):

(1) The wire ropes are to be subjected to suitable corrosion prevention treatment.

(2) The wire ropes are to be suitable for the purpose of application, and in addition are to attach a certificate stating that they conform to the requirements of Part 7B of QCVN 21: 2015/BGTVT or the requirements of the standards as deemed appropriate by VR.

(3) No splicing of the wire ropes is permitted.

(4) Terminal connection of wire ropes is to be made in a method approved by VR to have sufficient strength.

(5) The safety factor of the wire ropes is not to be less than the following value according to their purpose and their safe working load. However, the safety factor of the wire ropes for running rigging may not exceed 5, and those for standing rigging, 4.

$$\frac{10^4}{8.85W + 1910} \quad \text{for } W \leq 160$$

$$3 \quad \text{for } W > 160$$

Where: W is Safe working load (t)

6.3.2 Fibre Ropes

Fibre ropes are to comply with the following requirements (1) through (3):

(1) The fibre ropes are to comply with the recognized standards and to be provided with the certificate deemed appropriate by VR.

(2) The diameter of the fibre ropes is not to be less than 12 mm.

(3) The safety factor of fibre ropes is not to be less than the value given in Table 6.1 depending on the rope diameter.

Table 6.1 Safety Factor or Fibre Ropes

Rope diameter D (mm)	Safety factor
$12 \leq D < 14$	12
$14 \leq D < 18$	10
$18 \leq D < 24$	8
$24 \leq D < 40$	7
$40 \leq D$	6

6.4 Other Loose Gears

6.4.1 General

The design loads of loose gears such as chain, rings, hooks, shackles, swivels, clamps, grabs, lifting beams, lifting magnets, spreader, etc. are not to be more than the value obtained by dividing the breaking strength of each gears by the safety factor of 5.

6.5 Equivalent Requirements

Notwithstanding the requirements in 6.2 through 6.4, the constructions of loose gear may be in accordance with any other standards recognized by VR.

CHAPTER 7 MACHINERY, ELECTRICAL INSTALLATIONS AND CONTROL ENGINEERING SYSTEMS

7.1 General

7.1.1 Application

The requirements in this Chapter apply to the machinery, electrical installations and control engineering systems used in the lifting appliances. However, in applying the requirements in this Chapter to winches used for cargo ramps, they may be suitably modified.

7.2 Machinery

7.2.1 General

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

7.2.2 Hoisting Machinery

1 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 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 torque 50% in excess of the torque required when the safe working load is applied to the lifting appliances.

(b) The power operated braking system is to operate automatically when the manoeuvring 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 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 lifting appliances.

(6) Rope guards or suitable other means of protection are to be provided.

2 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.

7.3 Power Supply

7.3.1 General

1 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 QCVN 21: 2015/BGTVT.

2 The construction, strength, materials, etc. of internal combustion engine used as the prime mover are to comply with the requirements in Part 3 of QCVN 21: 2015/BGTVT.

7.4 Control Engineering Systems

7.4.1 General

1 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 QCVN 21: 2015/BGTVT.

2 The control, alarm and safety systems are to be designed on the basis of the principle of fail-safe.

7.4.2 Control System

1 Control systems are to be so arranged as not interfere with the operator or qualified other personnel giving signals for operation.

2 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.

3 For electric winches, local power disconnecting switch is to be provided at the position in the proximity of the place of operation.

4 Cranes and cargo lifts are to be provided with emergency switch capable of stopping all the motions at the position readily accessible for the operator.

5 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.

6 Cargo lifts are to be provided with a suitable control system that stops the lift at the specified deck position.

7 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.

7.4.3 Safety System

1 The lifting appliances are, as a rule, to be provided with an overload protection system.

2 The 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 travelling speed

(5) Over run on the track

(6) Other items of abnormality recognized by VR

3 In cranes where the safe working load varies according to the operating radius, 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

7.4.4 Protection System

1 For the rotating parts of the driving machinery, electrical installations and steam pipes, necessary means to protect the operator are to be provided.

2 Steam winches are to be arranged not to interfere with the operator’s field of vision by the steam.

3 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.

CHAPTER 8 CARGO LIFTS AND CARGO RAMPS

8.1 General

8.1.1 Application

The provisions in this Chapter apply to the structural members of cargo lifts and cargo ramps.

8.2 Design Loads

8.2.1 Load Considerations

Consideration is to be given to the utilization and duty of the particular type of cargo lifts and cargo ramp in the in service and stowage conditions with respect to the following loads listed from (1) to (7).

(1) Safe working load

(2) Self-weight of the installation

(3) Wind loading

(4) Wave loading

(5) Loads due to ship inclination

(6) Loads due to ship motion

(7) Other loads considered necessary by VR

8.2.2 Wind Loading

The wind loading is to be calculated according to 4.2.5.

8.2.3 Wave Loading

For the structural members forming parts of shell plating and subjected to the wave load, the head of water is not to be less than that obtained from the following formula:

$$\left\{d - 0.125D + 0.05L' + \Delta H_{\omega}(x)\right\}\frac{gD}{D + 2h_s}\ (kPa)$$

Where:

x: Distance from the forward face of stem on the designed maximum load line defined in 1.2.29 Part 1A QCVN 21: 2015/BGTVT (m).

D: Depth of ship defined in 1.2.24 Part 1A QCVN 21: 2015/BGTVT (m).

d: Designed maximum load draught defined in 1.2.30 Part 1A QCVN 21: 2015/BGTVT (m).

L': Length of ship defined in 1.2.20 Part 1A QCVN 21: 2015/BGTVT (m). L' is to be taken as 230 m when the length exceeds 230 m.

$\Delta H_w(x)$: Value obtained from the following formula for respective value of x:

$$(38 - 45C_b')(1 - \frac{x}{0.3L})^2 \qquad \text{for } x \le 0.3L$$

$$0 \qquad \text{for } x > 0.3L$$

Where:

C'_b: Block coefficient defined in 1.2.32 Part 1A QCVN 21: 2015/BGTVT, is to be taken as 0.85 when the block coefficient exceeds 0.85

L: Length of ship defined in 1.2.16 Part 1A QCVN 21: 2015/BGTVT (m)

h_s: Value shown in Table 8.1 depending on the length of ship

8.2.4 Loads due to Ship Inclination

The loads due to ship inclination are to be as recognized by VR to be appropriate.

Table 8.1 Values of h_s

Length of ship L (m)	h_s
$L \le 90$	1.95
$90 < L < 125$	0.01L + 1.05
$125 \le L$	2.30

8.2.5 Loads due to Ship Motion

The loads due to ship motion are to be as specified in 4.2.8.

8.2.6 Load Combinations

1 The load combinations to be used in strength analysis of structural members is to be those causing the more severe loading condition of the structural members resulting from the load combinations specified in -2 to -5 below.

2 The load combination of the following loads (1) to (5) are to be taken into consideration in service conditions:

(1) Safe working load

(2) Self-weight of slewing or moving parts of the cargo lifts and cargo ramps

(3) Self-weight of the fixed parts of the cargo lifts and cargo ramps

(4) Loads due to ship inclination

(5) Other loads considered necessary by VR

3 The loads -2(1) and (2) are to be multiplied by 1.2 for the installations designed to slew or move with cargo loaded thereon/therein and by 1.1 for the cargo ramps designed not to slew or move with cargo loaded thereon.

4 The following loads (1) to (6) are to be taken into consideration for cargo lifts in stowage conditions.

(1) Loads in stowage conditions

(2) Self-weight of the cargo lifts

(3) Wind loading

(4) Loads due to ship inclinations in navigation

(5) Loads due to ship motions in navigation

(6) Other loads considered necessary by VR

5 The following loads (1) to (5) are to be taken into consideration for cargo ramps in stowage conditions.

(1) Self-weight of the cargo lifts

(2) Wind loading

(3) Loads due to ship inclinations in navigation

(4) Loads due to ship motions in navigation

(5) Other loads considered necessary by VR

8.3 Strength and Construction

8.3.1 General

1 The strength of structural members is to be analyzed for the load conditions specified in 8.2.6 according to the requirements in 8.3.2 to 8.3.7.

2 For the installations loaded with vehicles, the concentrated loads from wheels corresponding to their loading or running conditions are to be taken into account.

3 The strength of structural members forming parts of shell plating is, in general, to be equivalent to that of the surrounding hull structure.

4 The structural members are to have proper stiffeners and, in addition, suitable lushing devices for preventing their vertical and horizontal movements when stowed in position.

8.3.2 Allowable Stress for Combined Loads

The allowable stress prescribed in Table 8.2 are to be used for components subjected to combined loads.

8.3.3 Lift Deck Plating and Ramp Plating Thickness

1 The thickness of the plating forming a part of shell plating is not to be less than the thickness of shell plating at the position concerned to be determined regarding the actual stiffener spacing as the frame spacing.

2 The plate thickness of the plating forming a part of bulkhead is not to be less than the thickness of bulkhead plating at the position concerned to be determined regarding the actual stiffener spacing as the bulkhead stiffener spacing.

3 For the installations loaded with vehicles the thickness of lift deck plating or ramp plating is not to be less than required for deck plating of the car deck.

Table 8.2 Allowable Stress σ_a

Load condition	Kind of stress					
	Tension	Bending	Shear	Compression	Bearing	Combined
Condition given in 8.2.6-2	$0.67\sigma_y$	$0.67\sigma_y$	$0.39\ \sigma_y$	$0.58\ \sigma_y$	$0.94\ \sigma_y$	$0.77\ \sigma_y$
Condition given in 8.2.6-4 and -5	$0.77\ \sigma_y$	$0.77\ \sigma_y$	$0.45\ \sigma_y$	$0.67\ \sigma_y$	$1.09\ \sigma_y$	$0.89\ \sigma_y$

Notes:

1. σ_y : The yield point or proof stress of material (N/mm^2)
2. The combined stress is to be the value obtained from the following formula:

$$\sqrt{\sigma_x^2 + \sigma_y^2 - \sigma_x\sigma_y + 3\tau_{xy}^2} \qquad (N/mm^2)$$

Where:

σ_x: Applied stress in x-direction at the middle of plate thickness (N/mm^2)

σ_y: Applied stress in y-direction at the middle of plate thickness (N/mm^2)

τ_{xy}: Applied shear stress in the x-y plane (N/mm^2).

8.3.4 Minimum Thickness

The thickness of structural members is not to be less than 6 mm in the parts exposed to weather and 5 mm in the parts not exposed to weather.

8.3.5 Deflection Criteria

The deflection of the structural members due to the safe working load is to be limited, as a rule, to 1/400 of the span between supports in cargo lifts and 1/250 of the span between supports in cargo ramps.

8.3.6 Strength of Bolts, Nuts and Pins

Bolts, nuts and pins are to have ample strength for the magnitudes and directions of the loads they are subjected to.

8.3.7 Locking Devices of Cargo Ramps

1 Stowage locks are to be provided to resist the load resulting from consideration of loads specified in 8.2.6-5.

2 The hydraulic locking devices are to be designed to keep the ramp locked mechanically even in the event of failure of the hydraulic pressure.

3 For a cargo ramp utilized commonly as a means for closing openings, the closing devices may be utilized as locking devices, if the area of opening is larger than half of the projected area of the stowed ramp. The design load of the closing devices is to include also the loads specified in 8.2.6-5 in addition to the loads in Chapter 21 Part 2A of QCVN 21: 2015/BGTVT.

CHAPTER 9 ADDITIONAL REQUIREMENTS FOR CRANES USED FOR PERSONNEL TRANSFERS

9.1 General

9.1.1 Application

1 Cranes in cases where they are used to transfer personnel are to comply with the requirements in this Chapter in addition to the requirements of Chapter 1 through Chapter 8.

2 The means of embarkation and disembarkation required by QCVN 21: 2015/BGTVT is not to be substituted by such cranes.

9.2 Surveys

9.2.1 Registration Surveys

1 Drawings and Other Documents to be Submitted

(1) Drawings for approval

The following drawing is to be submitted to VR for approval:

(a) Equipment added for personnel transfers.

(2) Documents for reference

The following document is to be submitted to VR for reference:

(a) Operation manual for personnel transfers.

(3) The operation manual specified in (2)(a) is to contain the following (a) to (c):

(a) Restrictions on personnel transfer operations, which contain at least the following:

(i) Wind velocity, wave height, and visibility

(ii) The maximum angle and slewing radius of cranes (horizontal and vertical distance to the object of embarkation or disembarkation)

(iii) Safe working loads and hoisting, lowering, and swinging speeds

(iv) Embarkation areas of equipment used to transport personnel such as baskets (hereinafter referred to as the basket)

(b) Items regarding persons engaged in personnel transfer operations, which contain at least the following:

(i) Roles of the operational master

(ii) Qualification of the crane operator

(iii) Arrangement of signalmen in cases where the object of embarkation or disembarkation cannot be visible from the crane control position

(iv) Means to ensure the safety of persons in the basket and engaged in the operation

(v) Communications between the operational master and persons involved

(vi) Means to address the emergency situations such as rescue means in the case of crane malfunctions

(vii) Inspection and testing items prior to personnel transfer operations

(c) Items to be checked prior to use of the basket, which contain at least the following:

(i) Specifications of the basket such as its own weight, SWL and capacity

(ii) Maintenance records

(iii) Certifications issued by an official body or a third-party body

2 Examinations at Registration Surveys

(1) Crane appliances are to be examined and ascertained to be in good order by the following tests and surveys:

(a) Operation tests of the equipment added for personnel transfers;

(b) Other tests considered necessary by VR.

(2) Appliances specified in Chapter 6 on board the ship and Markings specified in Chapter 7 are to be examined.

9.2.2 Annual Thorough Surveys

1 At annual thorough surveys, crane appliances are to be examined and ascertained to be in good order by the following tests and surveys, in addition to the requirements in 2.4.2.

(1) Operation tests specified in 9.2.1-2(1)(a);

(2) Examinations specified in 9.2.1-2(2).

9.3 Crane

9.3.1 Safe working load

The safe working load of the cranes for use for personnel transfers is to be less than 50 % of the safe working load specified in Chapter 1. The total weight of the basket (sum of its own weight and capacity load) is not to be more than this load.

9.4 Loose gear

9.4.1 General

The safety factor of any loose gear is to be 10 and more against the safe working load specified in 9.3.1.

9.4.2 Wire Ropes

In addition to the requirements specified in 6.3.1, wire ropes are to be of an anti-rotation type.

9.5 Machinery, electrical installations and control engineering systems

9.5.1 General

The machinery, electrical installations and control engineering systems used in the lifting appliances are to be arranged to prevent accidental falls of the basket and are to be able to lower the basket in the case of a power supply malfunction.

9.5.2 Brakes

1 The braking system of hoisting machinery is to comply with the following (1) and (2):

(1) Brakes normally equipped on hoisting machinery are to be provided with an override device.

(2) Hoisting machinery is to be provided with an additional brake which:

(a) Complies with 7.2.2-1(4);

(b) Is capable of being operated by circuits other than those for the brakes specified in (1); and

(c) Is provided with an override device.

2 Hydraulic cylinders used for luffing or extending jibs are to be provided with mechanical devices which can maintain the position of the hydraulic cylinders in the case of a loss of power.

9.6 Other Appliances

9.6.1 Communication Devices

Appropriate communication devices are to be provided to the operational master, the crane operator, the signalmen, and persons in the basket.

9.6.2 Wind Gauge

Wind gauge is to be provided to ensure that the operational master can be informed of the wind velocity.

III REGULATIONS ON MANAGEMENT

1.1 Lifting appliances registration

All lifting appliances installed onboard the ship which are covered by the scope of this Regulation are to registered in accordance with requirements on registration in QCVN 21: 2015/BGTVT.

1.2 Certification, Marking and Documentation

1.2.1 General

The requirements in this section apply to the certification, marking and documentation of the lifting appliances.

1.2.2 Assignment of Safe Working Load, etc.

1 General

VR assigns the safe working load, etc., for the lifting appliances that have passed the inspection and load tests specified in Chapter 2 Section II.

2 Duplicated Assignment of Safe Working Load, etc.

VR will assign, at the application of the shipowner, the following (1) and (2) in addition to the safe working load etc. in accordance with the requirements in -1 above:

(1) The maximum load corresponding to an angle smaller than the assigned allowable minimum angle in case of derrick systems

(2) The maximum load corresponding to a radius exceeding the assigned maximum slewing radius in case of jib cranes

3 Assignment for Union-purchase Derrick Systems

(1) The assignments of the safe working load, etc. for the union-purchase derrick systems are the safe working load and maximum angle between two cargo falls or the safe working load and allowable lifting height (the vertical distance between the highest position of the structure above the upper deck with hatch opening and the delta plate or ring attached to the cargo falls).

(2) The maximum angle between two cargo falls specified in (1) is not to be assigned to exceed 120°.

1.2.3 Marking of Safe Working Load, etc.

1 Marking for Cargo Gear and Cargo Ramps

(1) On the cargo gear and cargo ramps assigned by the requirements specified in 1.2.2, the safe working load, allowable minimum angle, maximum slewing radius and other

restrictive conditions are to be marked by using stamps in accordance with the following requirement in (a) through (c):

(a) Derrick systems

At the conspicuous place of the base of derrick boom, the stamp mark of VR, the safe working load, the allowable minimum angle of the boom and other restrictive conditions are to be marked

(b) Jib cranes

At the conspicuous place of the base of jib or the similar position, the stamp mark of VR, the safe working load, the maximum slewing radius and other restrictive conditions are to be marked.

(c) Other cargo gear and cargo ramps

At the conspicuous place which is hardly fouled, the stamp mark of VR, the safe working load and other restrictive conditions are to be marked.

(2) In the case of the duplicated assignment of safe working loads are assigned to derrick systems and jib cranes in accordance with the requirements of 1.2.2-2, the necessary markings for respective combinations are to be made correspondingly in according to the requirements of (1).

(3) For the cargo gear which is used with grabs, lifting beams, lifting magnets, spreaders and similar other loose gear and assigned the maximum cargo load excluding the self-weight of such loose gear to safe working load, the notation in this connection to be marked as other restrictive conditions correspondingly according to (1).

(4) The stamp marks are to be coated with anti-corrosive paint and framed with paint for easy recognition.

(5) In addition to the stamp marks specified in (1), (2) and (3), the same markings (except for the stamp mark of VR) are to be made so as to be permanently and easily visible at conspicuous places using welded bead and paint, etc. In this case, the size of the letters is not to be less than 77 mm in height.

(6) Cargo handling appliances which are not assigned safe working load are to be marked with a limitation of working load less than one ton.

2 Marking for Loose Gear

(1) On the loose gear other than wire ropes and fibre ropes, the test load, the safe working load and the identification symbols are to be marked by using stamps at the conspicuous place and no adverse effects are to be caused for both their strength and service. On grabs, lifting beams, lifting magnets, spreaders and similar other loose gear, the self-weight of them are to be stamped additionally.

(2) The stamp marks are to be coated with anti-corrosive paint and framed with paint for easy recognition.

(3) In addition to the markings specified in (1), grabs, lifting beams, lifting magnets, spreaders and similar other loose gear are to be marked with the safe working load and the self-weight of them with paint, etc. In this case the size of letters should not be less than 77 mm in height.

(4) Notwithstanding the requirements in (1) and (3), where it is difficult to make direct stamp mark or marking with paint, other means may be taken when approved by VR.

1.3 Documentation

1.3.1 Documentation and Certificate

1 The kinds of the documents and certificates issued by VR for cargo gears, cargo ramps and loose gear are to be as specified in the followings:

(1) Register of Ship's Lifting Appliances (Form CG.1);

(2) Certificate of Test and Thorough Examination of Derricks, Winches and their Accessory Gear (Form CG.2);

(3) Certificate of Test and Thorough Examination of Derricks, Winches and their Accessory Gear, for Operation in

Union Purchase (Form CG.2U);

(4) Certificate of Test and Thorough Examination of Cranes or Hoists and their Accessory Gear (Form CG.3);

(5) Certificate of Test and Thorough Examination of Cargo Lifts/Cargo Ramps and their Accessory Gear (Form CG.3 LR);

(6) Certificate of Test and Thorough Examination of Loose Gear (Form CG.4);

(7) Certificate of Test and Thorough Examination of Wire Rope (Form CG.5).

1.3.2 Timing of Issuance of Documents

The timing of issuance of documents specified in 1.3.1 is to be as given in Table III.1 depending on the tests and survey.

1.3.3 Revocation of the Documents

1 The whole or part of the certificates specified in 1.3.1 will be revoked when either of the following (1) through (9) is relevant:

(1) When application is made by the shipowner for cancellation or alteration of the assignment of the safe working load, etc.

(2) When the construction, arrangement or rigging of the lifting appliances are altered

(3) When the lifting appliances are removed

(4) When the surveys specified in Chapter 2 are not subjected to

(5) When the lifting appliances are considered to be unserviceable by the Surveyor

(6) When the contents is the certificates are intentionally altered

(7) When the contents in the certificates have become illegible due to foul or damage

(8) When the specified fee covering the survey is not paid

(9) In case where VR has a doubt on the effectiveness of the certificates, etc.

2 The certificates which become invalid in accordance with the provisions in -1 are to be returned to VR without delay.

1.3.4 Reissuance and Corrections of Documents

In case where the certificates, etc. become invalid in accordance with the provisions of the preceding 1.3.3-1 or lost, VR will reissue the certificates or make necessary corrections thereto depending on the circumstances involved.

1.4 Preservation of Documents

1.4.1 General

The Certificates issued depend on the requirements in 1.3.1 by VR and the instruction manual for cargo handling appliances are to be preserved aboard the ship or by shipowner’s responsible person in case of towing boat not manned.

1.4.2 Instruction Manual

The instruction manual mentioned in 1.4.1 is to note essential items necessary for operation and maintenance of the lifting appliances among those given in the following (1) through (8):

(1) General arrangement of cargo gear and cargo ramps

(2) Arrangement drawing of loose gear (including rigging arrangement)

(3) List of loose gear

(4) Design conditions (including safe working load, wind speed, trim and heel of ship, etc.)

(5) List of materials

(6) Operation manual (including functions of safety systems and protective systems)

(7) Load testing procedure

(8) Maintenance and control procedures

Table III.1 Timing of Issuance

Kind of Documents		Timing of Issuance
A	Document in 1.3.1(1)	When the application for assignment is made and the ship passes the Registration Survey for the first time.
B	Document in 1.3.1(2) Document in 1.3.1(3) Document in 1.3.1(4) Document in 1.3.1(5)	(1) When the application for assignment is made and the ship passes the Registration Survey for the first time. (2) When the lifting appliances that are installed additionally pass the Registration Survey. (3) When the safe working load, etc. is altered. (4) When the ship passes the load tests specified in 2.5-4 Section II.
C	Document in 1.3.1-1(6) Document in 1.3.1(7)	(1) When the application for assignment is made and the ship passes the Registration Survey for the first time. (2) When the lifting appliances that are installed additionally pass the Registration Survey. (3) When loose gear is replaced or repair at time of the Periodical Surveys and the Occasional Survey, and when the contents of autonomous inspection is recognized appropriate by VR.

IV RESPONSIBILITIES OF ORGANIZATIONS, INDIVIDUALS

1.1 Responsibilities of shipowners; lifting appliance design centers, building, converting yards

1.1.1 Responsibilities of shipowners, ship operators

To implement all relevant requirements of this Regulation for lifting appliances being newly constructed, converted in order to ensure and maintain good technical condition of lifting appliances.

1.1.2 Responsibilities of design centers

1 To design lifting appliances in accordance with this Regulation.

2 To prepare sufficient design documents as required and submit those in accordance with this Regulation.

1.1.3 Responsibilities of lifting appliance building and converting yards

1 To comply with approved design documents during the construction and conversion of lifting appliances.

2 To comply with relevant requirements for surveys of VR in this Regulation during the construction and conversion of lifting appliances.

1.2 Responsibilities of Vietnam Register

1.2.1 Design approval, technical supervision

To approve the design documents, supervise during the construction and conversion of lifting appliances in accordance with this Regulation.

1.2.2 Certification for lifting appliances

VR is to issue certifications and technical documents for lifting appliances as per requirements in 1.3.1 Section III of the Regulation.

1.2.3 Entry into “Ship Technical Registry Book”

To make entries into “Ship Technical Registry Book” for lifting appliances which have been satisfactorily inspected and surveyed.

1.2.4 To give instructions for implementation/application

To give instructions for the application of requirements of this Regulation to shipowners; ship operators; lifting appliance design centers, building, converting yards

1.2.5 To amend and supplement the Regulation

Based on the fact, Vietnam Register is to have responsibility to petition the Ministry of Transport for amendment, supplementation of the Regulation based on the Law of technical standard and regulation.

V IMPLEMENTATION

1.1 It is the responsibility of Vietnam Register to manage the survey system, technical supervision for lifting appliances in accordance with this Regulation.

1.2 In case of inconsistency between the requirements in this Regulation and those in other rules, standards or technical regulations relating to lifting appliances, the requirements of this Regulation is to prevail over those of others.

1.3 In case the documents referred to in this Regulation are amended, implemented or replaced, the latter is to prevail over the former.

1.4 Unless detailed provision is made for existing lifting appliances, this Regulation and its amendment is to apply to lifting appliances which are constructed on or after effective date of relevant promulgating circulars.