GUIDELINES FOR THE CLASSIFICATION AND CONSTRUCTION

PART 7. CLASS NOTATION

VOLUME 1
GUIDELINES FOR CERTIFICATION OF LIFTING APPLIANCES
2013 EDITION

BIRO KLASIFIKASI INDONESIA

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Foreword

This Guidelines is published as guidelines for certification of lifting appliances installed either on vessels or offshore structures classed by BKI and come into force on July 1st 2013. For lifting appliances installed on board vessels before that date, design of such lifting appliances may refer to Regulations For The Construction And Survey of Lifting Appliances 1998-Edition, however subsequent maintain survey shall be carried out according to this guidelines.

This Guidelines also assist the industry for compliance with optional BKI Class Notation related to lifting appliances “LA”.

This Guidelines contains the following six (6) main Sections and one (1) Annex:

Section 1	Scope and Condition of Certification
Section 2	Guidelines for Certification of Crane
Section 3	Guidelines for Certification of Cargo Gear on Merchant Vessels
Section 4	Derrick booms, Masts and Accessories
Section 5	Guidelines for Certification of Shipboard Elevators
Section 6	Guidelines for Certification of Bow, Stern and Sideport Ramps and Moveable Platforms (Decks)
Annex	Forms for Certification of Lifting Appliances

This Guidelines is to be applied in conjunction with other applicable BKI Rules and Guidelines, codes and standards referenced therein.

BKI continues to serve the industry with update to the latest technology and regulatory developments. However, the applicant’s (designer/builder/owner/operator) specific request for compliance with applicable requirements of Flag or Coastal State affecting the ship or offshore installation is to be filed as an addendum to the application for BKI classification service.

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Section 1
Scope and Condition of Certification

A. Certification

1. Process

1.1 The term certification, as used herein, indicates that a lifting appliance and its equipment have been designed, constructed, installed and surveyed in compliance with this Guidelines, existing Rules and Guidelines or other acceptable standards.

1.2 The continuance of certification is dependent on the fulfillment of requirements for surveys after construction. The certification process consists of:

a) The development of Rules, Guidelines, standards and other criteria for the design, construction, installation and maintenance of lifting appliances and their equipment;

b) The review of the design and survey during and after construction to verify compliance with such Rules, Guidelines, standards or other criteria;

c) The assignment and registration of certification when such compliance has been verified, and;

d) The issuance of a renewable certificate, with annual endorsements, valid for five years.

1.3 The Rules, Guidelines and standards are developed by the BKI staff. Theoretical research and development, established engineering disciplines, as well as satisfactory service experience are utilized in their development and promulgation. BKI can act only upon such theoretical and practical considerations in developing Rules and standards.

1.4 For Certification, the lifting appliance and its equipment are to comply with the applicable requirements of this Guidelines and all applicable Rules.

2. Certificates and Reports

2.1 Review of design documentation and surveys during and after construction are conducted by BKI to verify to itself that an item of material, equipment or machinery is in compliance with this Guidelines and is to the satisfaction of the attending Surveyor. All reports and certificates are issued solely for the use of BKI, its clients and other authorized entities.

3. Representations as to Certification

3.1 Certification is a representation by BKI as to the structural and mechanical fitness for a particular use or service, in accordance with its Rules, Guidelines and standards. The BKI Rules and Guidelines are not meant as a substitute for the independent judgment of professional designers, naval architects, marine engineers, owners, operators, masters and crew, nor as a substitute for the quality control procedures of ship and platform builders, engine builders, steel makers, suppliers, manufacturers and sellers of marine vessels, materials, system components, machinery or equipment. BKI, being a technical society, can only act through Surveyors or others who are believed by it to be skilled and competent.

3.2 BKI represents solely to the Lifting Appliance manufacturer or other clients of BKI that when certifying, it will use due diligence in the development of Rules, Guidelines and standards, and in using normally applied testing standards, procedures and techniques as called for by the Rules, Guidelines, standards or other criteria of BKI. BKI further represents to the Owner or other Clients of BKI that its certificates and reports evidence compliance only with one or more of the Rules, Guidelines, standards or other criteria of BKI, in accordance with the terms of such certificate or report. Under no circumstances whatsoever are these representations to be deemed to relate to any third party.

3.3 The user of this document is responsible for ensuring compliance with all applicable laws, regulations and other governmental directives and orders related to a vessel, its machinery and equipment,

or their operation. Nothing contained in any Rule, Guidelines, standard, certificate or report issued by BKI shall be deemed to relieve any other entity of its duty or responsibility to comply with all applicable laws, including those related to the environment.

4. Scope of Certification

4.1 Nothing contained in any certificate or report is to be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator, other entity or person of any duty to inspect or any other duty or warranty expressed or implied. Any certificate or report evidences compliance only with one or more of the Rules, Guidelines, standards or other criteria of BKI, and is issued solely for the use of BKI, its clients or other authorized entities. Nothing contained in any certificate, report, plan or document review or approval is to be deemed to be in any way a representation or statement beyond those contained in A.3. BKI is not an insurer or guarantor of the integrity or safety of a vessel or of any of its equipment or machinery. The validity, applicability and interpretation of any certificate, report, plan or document review or approval are governed by the Rules, Guidelines and standards of BKI, who shall remain the sole judge thereof. BKI is not responsible for the consequences arising from the use by other parties of the Rules, Guidelines, standards or other criteria of BKI, without review, plan approval and survey by BKI.

4.2 The term “approved” is to be interpreted to mean that the plans, reports or documents have been reviewed for compliance with one or more of the Rules, Guidelines, standards or other criteria acceptable to BKI.

4.3 This Guidelines is published with the understanding that responsibility for reasonable handling and loading operations, beyond the limit specified in the lifting appliance design basis, does not rest upon BKI.

B . Suspension and Termination of Certification

1. Suspension of Certification

Certification will be suspended and the Register of Lifting Appliance will become invalid from the date of any use, operation or other application of any lifting appliance and its equipment for which it has not been approved and which affects or may affect certification or the structural integrity, quality or fitness for a particular use or service.

Certification will be suspended and the Register of Lifting Appliance will become invalid in any of the following circumstances:

i) If recommendations issued by the Surveyor are not carried out by their due dates and no extension has been granted,

ii) If the periodical surveys required for maintenance of certification, other than Annual, Quinquenneal or Retesting Surveys, are not carried out by the due date and no Rule-allowed extension has been granted, or

iii) If any damage, failure or deterioration repair has not been completed as recommended.

Certification may be suspended, in which case the Register of Lifting Appliance will become invalid, if proposed repairs have not been submitted to BKI and agreed upon prior to commencement.

Certification is automatically suspended and the Register of Lifting Appliance is invalid in any of the following circumstances:

i) If the Annual Survey is not completed by the due date,

ii) If the Quinquenneal or Retesting Survey is not completed by the due date.

2. Lifting of Suspension

Certification will be reinstated after suspension for overdue surveys upon satisfactory completion of the overdue surveys. Such surveys will be credited as of the original due date. Certification will be reinstated after suspension for overdue recommendations upon satisfactory completion of the overdue

recommendations. Certification will be reinstated after suspension for overdue continuous survey items upon satisfactory completion of the overdue items.

3. Termination of Certification

The continuance of the Certification of the Lifting Appliance and its equipment is conditional upon the Guidelines requirements for periodical, damage and other surveys being duly carried out. BKI reserves the right to reconsider, withhold, suspend or terminate the certificate of any lifting appliance and its equipment for non-compliance with the Guidelines and Rules, for defects reported by the Surveyors which have not been rectified in accordance with their recommendations or for nonpayment of fees which are due on account of Lifting Appliances Surveys. Suspension or termination of certification may take effect immediately or after a specified period of time.

4. Notice of Surveys

It is the responsibility of the Owner to ensure that all surveys necessary for the maintenance of certification are carried out at the proper time. BKI will give proper notice to an Owner of upcoming surveys. This may be done by means of a letter, a quarterly status report or other communication. The non-receipt of such notice, however, does not absolve the Owner from his responsibility to comply with survey requirements for maintenance of certification.

C . Rules for Certification

1. Applications

1.1 This Guidelines contains provisions for the certification of lifting appliances installed aboard vessels and/or offshore floating/fixed structures (i.e., pedestal mounted rotating, heavy lift, gantry, shearleg, stiffleg and “A” frame type cranes installed aboard vessels, barge, drilling units and platforms, operating in harbors and/or offshore, cargo gears on merchant vessels, shipboard elevators, stern, bow and sideport ramps and moveable platforms).

1.2 If specifically requested by the Owner, this Guidelines can also be used as a basis for acceptance or certification under the requirements of Administrations. Owners who desire to have a lifting appliance evaluated for compliance with National Regulations should contact BKI.

2. Scope

2.1 This Guidelines provides requirements for certification of lifting appliances installed on vessels and offshore floating and/or fixed structures classed by BKI including but not limit to:

- Pedestal and tub mounted rotating heavy lift, gantry, shearleg, stiffleg and “A” frame type cranes operating in harbors and offshore
- Cargo handling gear including masts, stays, boom, winches, standing and running gear
- Shipboard personnel and passenger elevators, including their systems, of traction and winding drum type driven by electric or hydraulic motors, direct-plunger hydraulic type, roped hydraulic type and rack and pinion type.

Stern, bow and sideport ramps and moveable platform

3. Alternatives

3.1 BKI Head Office is at all times ready to consider alternative arrangements and designs which can be shown, through either satisfactory service experience or a systematic analysis based on sound engineering principles, to meet the overall safety, serviceability and strength standards of the applicable Rules and Guidelines.

3.2 BKI Head Office will consider special arrangements or design for details of lifting appliances and their equipment which can be shown to comply with standards recognized in the country in which the lifting appliance and its equipment are designed or built, provided these are not less effective than the requirements contained in this Guidelines.

4. Effective Date of Change of Requirement

4.1. Effective Date

This Guidelines and subsequent changes to this Guidelines are to become effective on the date specified by BKI. In general, the effective date is not less than six months from the date on which the Guidelines is published and released for its use. However, BKI may bring into force the Guidelines or individual changes before that date, if necessary or appropriate.

4.2. Implementation of Rule Changes

In general, until the effective date, plan approval for designs will follow prior practice, unless review under the latest Guidelines is specifically requested by the party signatory to the application for certification. If one or more systems are to be constructed from plans previously approved, no retroactive application of the subsequent Rule changes will be required, except as may be necessary or appropriate for all contemplated construction.

5. BKI Type Approval Program

5.1. Type Approval

5.1.1. Products that are used as components for lifting appliances and can be consistently manufactured to the same design and specification may be Type Approved under the BKI Type Approval Program. The BKI Type Approval Program is a voluntary option for the demonstration of compliance of a product with the Rules or other recognized standards. It may be applied at the request of the designer or manufacturer. The BKI Type Approval Program generally covers Product Type Approval 5.3, but is also applicable for a more expeditious procedure towards Unit-Certification, as specified in 5.2.

5.2. Unit-Certification

5.2.1 Unit-Certification is a review of individual materials, components, products and systems for compliance with BKI Rules, Guidelines or other recognized standards. This allows these items to be placed on a vessel, marine structure or system to become eligible for classification. Certification is a “one-time” review. The process is:

i) A technical evaluation of drawings or prototype tests of a material, component, product or system for compliance with the BKI Rules, Guidelines or other recognized standards.

ii) A survey during manufacture for compliance with the BKI Rules, Guidelines or other recognized standards and results of the technical evaluation.

iii) Alternatively, a certificate of type approval (see below) will expedite the requirements of *i)* and *ii)* above.

iv) Product found in compliance are issued “Individual Unit Certification”.

v) There is no requirement for subsequent reviews or surveys.

5.3. Product Type Approval

Product Type Approval is a voluntary program used to prove eligibility for certification by demonstrating a product manufacturer’s conformance to a specific standard or specification. Manufacturers who can demonstrate the ability to produce consistent products in compliance with these standards are issued “Type Approval Certificate". The Type Approval Certificate is neither an alternative to nor an equivalent of an Individual Unit Certificate. In order to remain valid, the Type Approval Certificate requires routine audits of the manufacturer and continued compliance of the product with existing or new specifications.

5.4. Approval on Behalf of Administrations

BKI has also been authorized and/or notified to type approve certain equipment on behalf of Administrations. The list of authorizations and notifications are maintained at BKI Head Office.

5.5. Applicable Uses of Type Approved Products

i) When a product is at a stage suitable for testing and/or for use in a classed vessel, and unit certification is required, the manufacturer is to present the product to an attending Surveyor for witnessing of all required Rule testing. Unless specified in the Design Assessment, technical evaluation would not normally be required.

ii) When a product is at a stage suitable for use in a classed vessel, and unit certification is not required, the product may be installed, to the satisfaction of the attending Surveyor, without the need for technical evaluation.

5.6. Definitions

5.6.1 *Audit.* A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the stated objectives.

5.6.2 *General Audit.* An audit that addresses the general operation of a site, and addresses applicable sections of the Quality and Environmental System Manual, quality and environmental system procedures, and operating procedures and process instructions.

5.6.3 *Surveillance Audit.* An audit that addresses specific areas within the operation at a site, and addresses selected sections of the Quality and Environmental System Manual, quality and environmental system procedures, and operating procedures and process instructions.

5.6.4 *Audit Checklist.* A listing of specific items within a given area that are to be audited.

5.6.5 *Audit Report/Checklist.* A combination of audit report and associated checklist.

5.6.6 *Component.* Parts/members of a product or system formed from material.

5.6.7 *Finding.* A statement of fact supported by objective evidence about a process whose performance characteristics meet the definition of non-conformance or observation.

5.6.8 *Manufacturing Process.* The process is the steps that one takes to produce (manufacture) a product.

5.6.9 *Manufacturing System.* The system is bigger than the manufacturing process, since it considers all of the factors that affect the process. This includes control of the process inputs, process controlling factors
(such as competency of personnel, procedures, facilities and equipment, training, etc.) process outputs and measurements of quality, process and product for continual improvement, etc.

5.6.10 *Material.* Goods used that will require further forming or manufacturing before becoming a new component or product.

5.6.11 *Non-conformance.* Non-fulfillment of a specified requirement.

5.6.12 *Observation.* A detected weakness that, if not corrected, may result in the degradation of product or service quality or potential negative impact on the environment.

5.6.13 *Original Equipment Manufacturer (OEM).* The OEM is the person or legal entity that has the legal or patent rights to produce the material, component, product or system.

5.6.14 *Product.* Result of the manufacturing process.

5.6.15 *Production Testing.* This is the destructive and nondestructive examination of the materials and components used in the manufacture of a product and its final testing that is recorded in Unit Certification. The waiving of witnessed testing during production testing may only be allowed as defined in BKI Regulations for the Performance of Type Test Part-I Procedure.

5.6.16 *Prototype Testing*. This is the destructive and nondestructive testing of the materials and components presented for evaluation of the original design of a product. If a Surveyor's witness is required, this may not be waived under any section of the Rules, unless it is done by a recognized third party.

5.6.17 *Recognized Third Party*. Is a member of the International Association of Classification Societies, a Flag Administration, Nationally Certified testing Laboratories or others who may be presented to BKI for special consideration.

5.6.18 *Type Testing.* This is the destructive and nondestructive testing of the materials and components of the first article of a product manufactured. If a Surveyor's witness is required, this may not be waived under any section of the Rules.

6. Other Regulations

6.1. International and Other Regulations

6.1.1 While this Guideline covers the requirements for the certification of lifting appliances and their equipment, the attention of Owners, designers and builders is directed to the regulations of international, governmental and other authorities dealing with those requirements in addition to or over and above the classification requirements.

6.1.2 Where authorized by the Administration of a country signatory thereto and upon request of the Owners of a certified lifting appliance or one intended to be certified, BKI will survey for compliance with the provision of International and Governmental Conventions and Codes, as applicable.

6.2. Governmental Regulations

6.2.1 Where authorized by a government agency and upon request of the Owners of a new or existing lifting appliance, BKI will survey and certify a classed lifting appliance or one intended to be classed for compliance with particular regulations of that government on their behalf.

6.3 Other Rules

6.3.1 Where the vessel on which the lifting appliances are installed is built in accordance with *the Rules of other Recognized Classification Society*, BKI will consider the lifting appliances constructed to the satisfaction of the BKI Surveyors in accordance with the plans that have been approved to the Rules/Guidelines of another recognized classification society with verification of compliance by BKI.

7. Submission of Plans

7.1 Each Section of this Guideline identifies a list of lifting appliance components that are required for the certification of lifting appliance. In most cases, manufacturer's component and system related drawings calculations and documentation are required to be submitted to substantiate the design of the system or component. In these cases, upon satisfactory completion of BKI review of the manufacturer's submittal, BKI Engineers will issue a review letter. This letter, in conjunction with the submitted package, will be used and referenced during surveys and subsequently issued reports by attending BKI Surveyors.

7.2 Upon satisfactory completion of all of the required engineering and survey processes, BKI will issue the Certificate to the lifting appliance.

8. Notification and Availability for Survey

8.1 The Surveyors are to have access to certified lifting appliances and their equipment at all reasonable times. For the purpose of Surveyor monitoring, monitoring Surveyors are also to have access to certified lifting appliances and their equipment at all reasonable times. Such access may include attendance at the same time as the assigned Surveyor or during a subsequent visit without the assigned Surveyor. The Owners or their representatives are to notify the Surveyors for inspection on occasions when the vessels/units on which the lifting appliances are installed are in dry dock or on a slipway.

8.2 The Surveyors are to undertake all surveys on certified lifting appliances and their equipment upon request, with adequate notification, of the Owners or their representatives, and are to report thereon to BKI

Head Office. Should the Surveyors find occasion during any survey to recommend repairs or further examination, notification is to be given immediately to the Owners or their representatives so that appropriate action may be taken. The Surveyors are to avail themselves of every convenient opportunity for carrying out periodical surveys in conjunction with surveys of damages and repairs in order to avoid duplication of work.

9. Units

9.1 This Guideline is written in SI units.

10. Fees

10.1 Fees in accordance with normal BKI practice will be charged for all services rendered by BKI. Expenses incurred by BKI in connection with these services will be charged in addition to the fees. Fees and expenses will be billed to the party requesting that particular service.

11. Disagreement

11.1. Rules and Guidelines

11.1.1 Any disagreement regarding either the proper interpretation of Rules and Guidelines or the translation of Rules and Guidelines from the English language edition is to be referred to BKI Head Office for resolution.

11.2. Surveyor

11.2.1 In case of disagreement between the Owners or builders and the Surveyors regarding the material, workmanship, extent of repairs or application of the Rules and Guidelines relating to any system classed or proposed to be classed by BKI, an appeal may be made in writing to BKI Head Office, who will order a special survey to be held. Should the opinion of the Surveyor be confirmed, expense of this special survey is to be paid by the party appealing.

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Section 2

Guidelines for Certification of Crane

A. General

1 Scope

1.1 This Guidelines sets forth requirements for the certification of pedestal mounted rotating, heavy lift, gantry, shear leg, stiffleg and "A"-frame type cranes installed aboard vessels, and/or floating/fixed structures classed by BKI, operating in harbors and offshore.

1.2 The vessel or unit classed by BKI having an installed shipboard crane certified by BKI will be distinguished by the additional class notation **LA**.

2 Submission of Plans and Design Data

2.1 General

Plans showing the arrangements and details of the crane are to be submitted for review before fabrication begins. These plans are to clearly indicate the scantlings, materials, joint details and welding. Plans should generally be submitted hard copies to BKI. However, electronic drawing will also be accepted.

2.2 Information to be Submitted

The following plans and supporting data are to be submitted for review and approval where appropriate.

2.2.1 Crane Structure

i) General arrangement, assembly plans and description of operating procedures and design service temperature.

ii) Dead, live and dynamic loads. Environmental loads including the effects of wind, snow and ice. Load swing caused by non-vertical lifts. Loads due to list and/or trim of the vessel or structure.

iii) Details of the principal structural parts and crane supporting structure. Stress diagram, stress analysis and other supporting calculations, suitably referenced. Where computer analysis is used for the determination of scantlings, details of the programs describing input and output data and procedures are to be included together with the basic design criteria.

iv) Wire rope specifications.

v) Material specifications and painting procedures.

vi) Welding details and procedures and a plan indicating extent and locations of nondestructive inspection of welds for crane structure, pedestal and foundation.

vii) Crane capacity rating chart.

viii) Crane pedestal and foundation (where required as per B 3.11) drawings together with calculations indicating the maximum reactions and overturning moments, identifying the portions of each coming from the hoisted load and counterweight if fitted.

ix) Swing circle assembly, hold down bolt size with calculations, arrangement of bolts, material, grade and pretensioning, together with the method used for pretensioning.

2.2.2 Crane Machinery, Piping and Electric System

i) Description and general details of "fail-safe" arrangements.

ii) Detailed diagrammatic plans of piping system accompanied by lists of materials, giving size, wall thickness, maximum working pressure and material (including mechanical properties) of all pipes

and the type, size, pressure rating and material of pumps, hoses, manifolds, valves and fittings.

iii) Detailed diagrammatic plans of electrical wiring systems including complete feeder lists, type of wire or cable, rating or setting of circuit breakers, rating of fuses and switches, interrupting capacity of circuit breakers and fuses.

iv) Details of accumulators, heat exchangers and lift and telescoping cylinders indicating shell, heads, pistons, piston rods, lug attachments, tie rod dimensions and threading details, as applicable with material specifications (including mechanical properties)[1)].

v) Details of slewing systems and hoisting-winches, including all torque-transmitting components such as drums, brakes, clutches, shafts, reduction gears and coupling bolts and foundation arrangements, as applicable.

vi) Design justification including component strength calculations, stress analysis, material specifications, weld procedure specifications and the extent of nondestructive examination as considered necessary are to be submitted for items 2.2.2.iv) and 2.2.2.v) above.

vii) Details of all prime movers such as diesel engines, motors and generators[1)].

viii) The above items i) through vii) are not applied to small davits/cranes with SWL of less than 100 kN and without powered slewing systems or powered luffing systems.

3 Submission of Load Diagram of Assembled Crane

3.1 Diagram showing the arrangement of the assembled gear specifying the Safe Working Load for each component part is to be submitted for review. An approved copy is to be inserted in the Register of Lifting Appliances and placed aboard the vessel or unit. See H.1.

4 Loading, Handling and Securing

4.1 This Guideline is published on the understanding that responsibility for control of Safe Working Loads, crane handling during lifting and setting loads, avoidance of improper weight distributions while lifting a load, securing of the crane on the vessel or unit when not in use, maintenance of the crane, and handling and stability of the vessel or unit during operation of the crane, rest with the Operator/ Owner.

5 Definitions

5.1 Shipboard Cranes

In general, Shipboard Cranes are lifting appliances mounted on surface-type vessels, used to move cargo, containers and other materials while the vessel is within a harbor or sheltered area. See Fig. 2.1 and Fig. 2.2, for sketches of typical shipboard cranes.

5.2 Offshore Cranes

In general, Offshore Cranes are lifting appliances mounted on a bottom-supported or floating structure, used in oil drilling and production operations, as well as for moving supplies and materials. See Fig 2.1, for sketch of typical offshore crane.

5.3 Heavy Lift Cranes

In general, Heavy Lift Cranes are lifting appliances mounted on barges, semi-submersibles or other vessels, used in construction and salvage operations within a harbor or sheltered area or in very mild offshore environmental conditions. See Fig. 2.3, Fig. 2.4, Fig. 2.5 and Fig. 2.6 for sketches of typical heavy lift cranes.

5.4 Safe Working Load (SWL)

The Safe Working Load for shipboard lifting appliances and heavy lift cranes is the load that each complete crane assembly is approved to lift on the cargo hook, excluding the weight of the gear (hook, block, wire,

1) Design approval may be obtained separately by the equipment manufacturer.

etc.). The SWL for grab cranes is, in general, 80% of the load that each complete crane assembly is approved to lift on the cargo hook. The weight of cargoes lifted by the grab including the weight of the grab and its accessories is not to be greater than the SWL for the grab crane.

The Safe Working Loads for offshore cranes are the static rated loads that each complete crane assembly is approved to lift on the cargo hook including the weight of the gear (hook, block, wire, etc.).

The Safe Working Loads for offshore cranes are the static rated loads that each complete crane assembly is approved to lift on the cargo hook including the weight of the gear (hook, block, wire, etc.).

5.5 Live Load

Live Load is the load that is suspended from the boom head (i.e., the sum of the SWL, the weight of the hook block and any other connected component undergoing the same motion as the hook load).

5.6 Dead Load

Dead Load is the weight of the crane components not included in the live load.

5.7 Existing Cranes

Existing Cranes are defined as cranes not previously certified by BKI, see B.7.

5.8 Swing Circle Assembly (Pedestal Mounted Cranes)

Swing Circle Assembly is the connection component between the crane revolving upper structure and the pedestal. This component allows crane rotation and sustains the moment, radial and axial loads imposed by the crane operations.

5.9 Fail-safe Arrangement

A system is considered to be arranged as fail-safe if failure of a mechanical component will result in the braking or slow and controlled release of the load. A fail-safe device is a device fitted for such purposes.

5.10 Design Service Temperature

The Design Service Temperature is the minimum anticipated temperature at which the crane will operate, as specified by the Owner, crane manufacturer or builder.

5.11 Ton

1 kN = 1000 N

5.12 Personnel Lifting

Lifting of Personnel may consist of:

i) Transfer of personnel between installations or vessels

ii) Access to work position

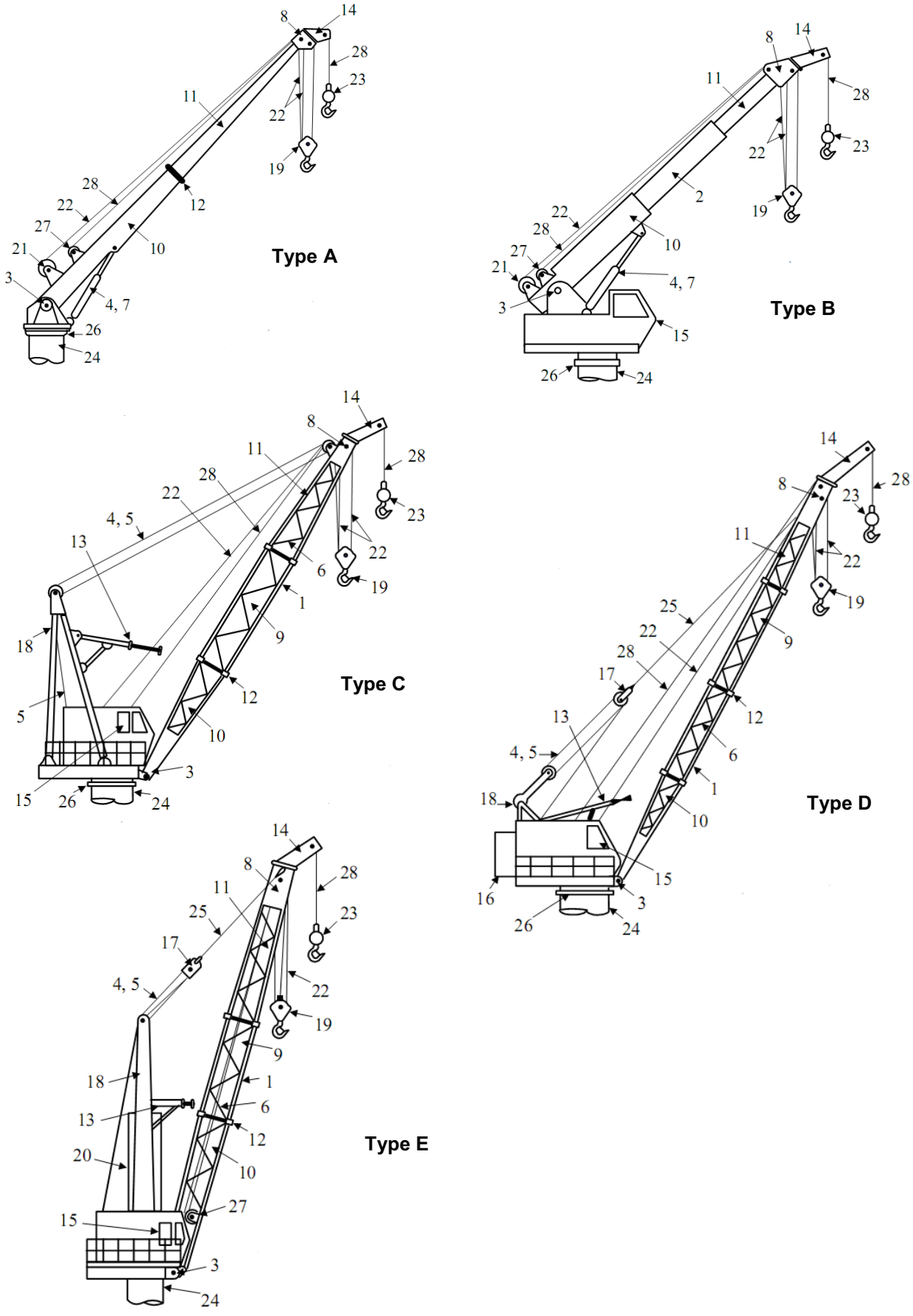
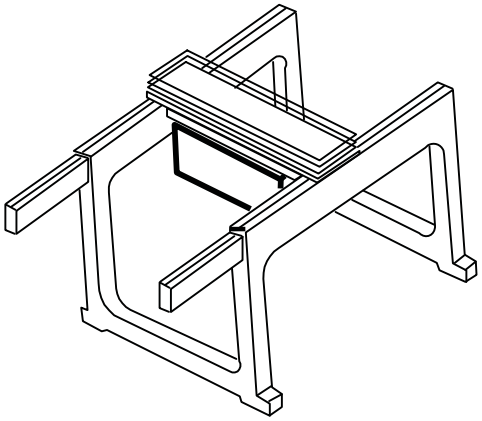


Figure 2.1 - Pedestal Mounted Rotating Cranes

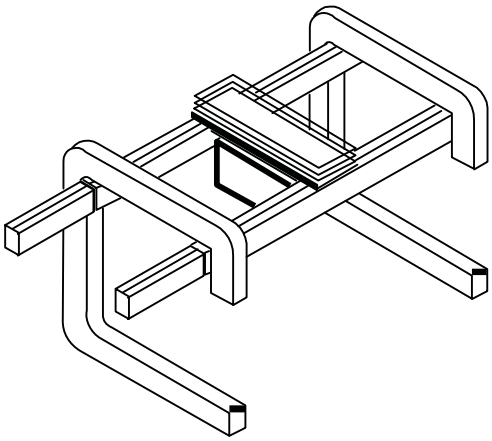
Table 2.1 - Crane Nomenclature

No.	Component	Type of Crane See Figure 2.1				
		A	B	C	D	E
1	Boom Chord	--	--	X	X	X
2	Boom Extension	--	X	--	--	--
3	Boom Foot Pin	X	X	X	X	X
4	Boom Hoist Mechanism	X	X	X	X	X
5	Boom Hoist Wire Rope	--	--	X	X	X
6	Boom Lacing	--	--	X	X	X
7	Boom Lift Cylinder	X	X	--	--	--
8	Boom Point Sheave Assembly or Boom Head	X	X	X	X	X
9	Boom Section, Insert	--	--	X	X	X
10	Boom Section, Lower, Base or Butt	X	X	X	X	X
11	Boom Section, Upper, Point or Tip	X	X	X	X	X
12	Boom Splice	X	--	X	X	X
13	Boom Stop	--	--	X	X	X
14	Boom Tip Extension or Jib	X	X	X	X	X
15	Cab	--	X	X	X	X
16	Counterweight	--	--	--	X	--
17	Floating Harness or Bridle	--	--	--	X	X
18	Gantry, Mast or “A”-Frame	--	--	X	X	X
19	Hook Block	X	X	X	X	X
20	King Post or Center Post	--	--	--	--	X
21	Main Hoist Drum	X	X	--	--	--
22	Main Hoist Rope	X	X	X	X	X
23	Overhaul Ball	X	X	X	X	X
24	Pedestal	X	X	X	X	X
25	Pendant Line	--	--	--	X	X
26	Swing Circle Assembly	X	X	X	X	--
27	Whip Line or Auxiliary Hoist Drum	X	X	--	--	X
28	Whip Line or Auxiliary Hoist Rope	X	X	X	X	X

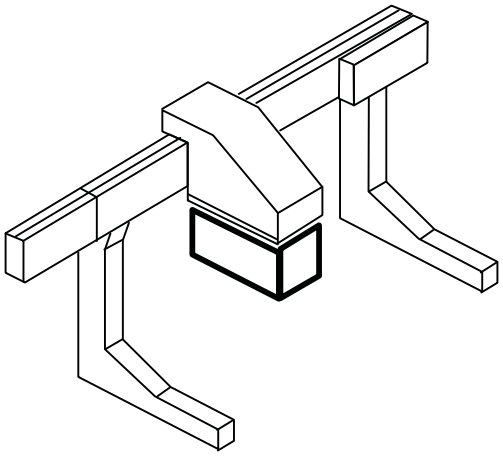
Note : "X" indicates application for type crane shown.



"U" Type crane



"C" Type crane



"L" Type crane

Figure 2.2 - Gantry Cranes

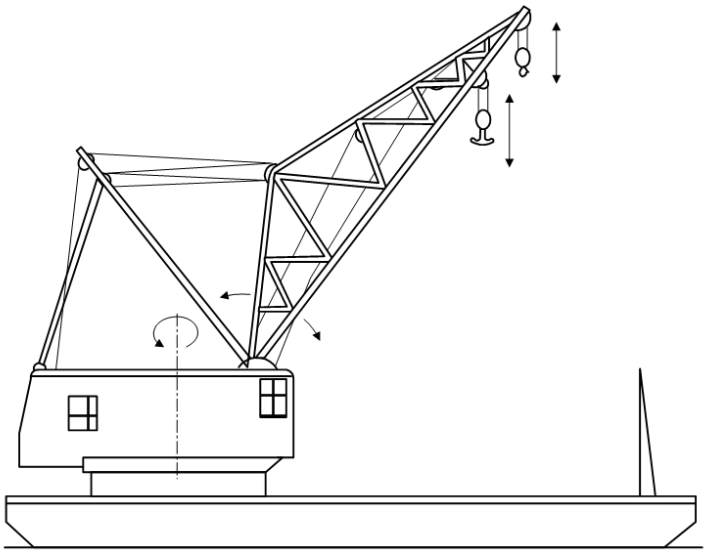


Figure 2.3 - Tub Mounted Rotating Crane

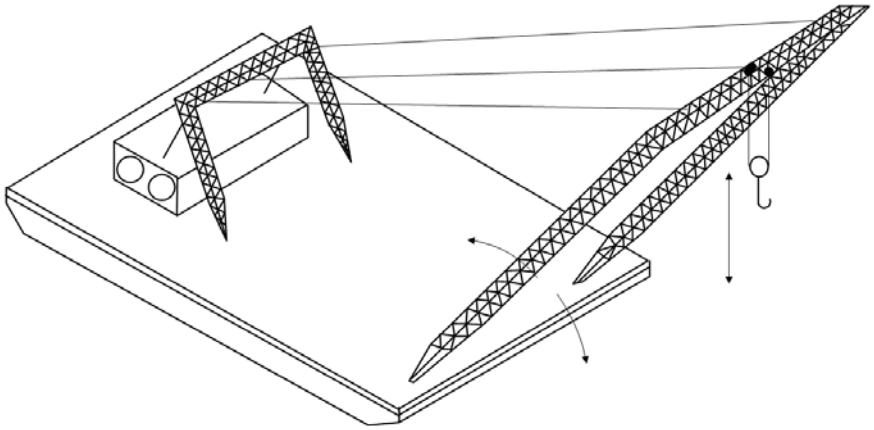


Figure 2..4 - Shear Leg Crane

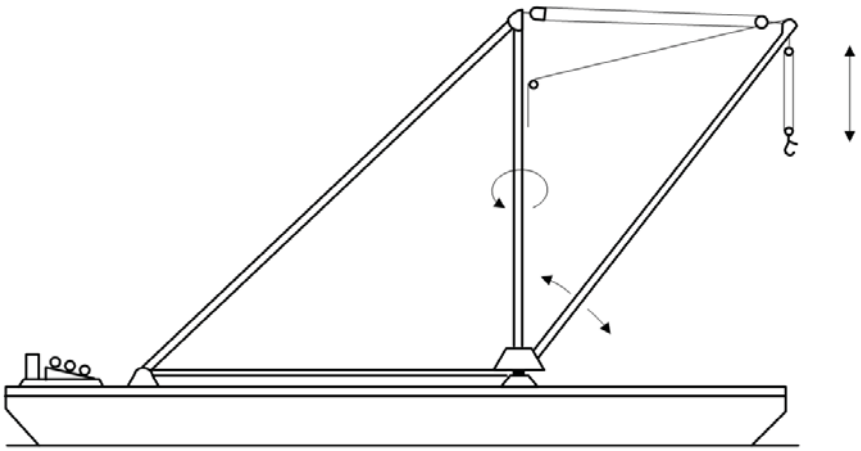


Figure 2.5 - Stiffleg Derrick Crane

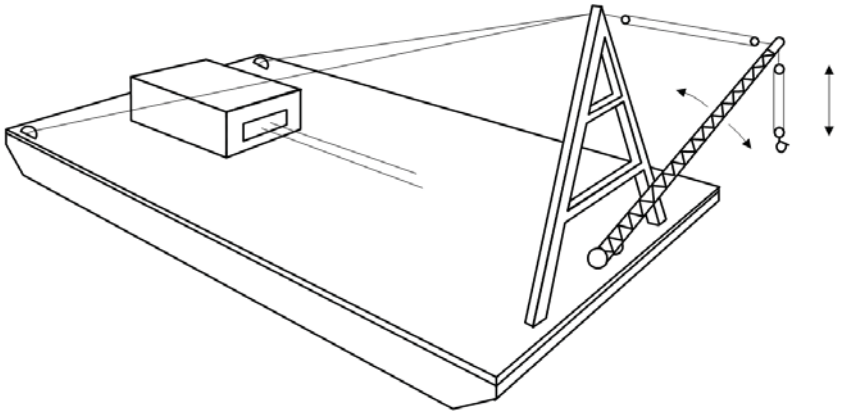


Figure 2.6 - “A”-Frame Derrick Crane

B. Structural Requirements

1 General

1.1 Cranes

These requirements are applicable to pedestal mounted rotating, heavy lift, gantry, shear leg, stiffleg and "A"-frame type cranes, as defined in. A.5.1, A.5.2 and A.5.3. Other types of cranes will be considered on an individual basis. Except where indicated otherwise, 2 and 3 are general requirements which apply to the cranes specified in 4, 5 and 6.

1.2 Crane Structural Components

Structural components covered by this Guidelines are as follows:

i) Boom, including upper, lower and insert sections

ii) Boom point sheave assembly and tip extension

iii) Boom foot pins and sheave pins

iv) Boom hoist wire rope, pendants, bridle or lift cylinders

v) Main and auxiliary hoist wire rope

vi) Center post, gantry, mast or "A"-frame

vii) Revolving upper structure

viii) Swing circle assembly and bolts or fastenings

ix) Pedestal

x) Foundation, where required as per 3.11

xi) Crane boom rest or other stowage arrangements

1.3 Conditions for Strength Assessment

Crane structural components are to be designed for full compliance with the requirements in this Section. The following three conditions are to be considered in application of these strength criteria:

i) Crane in-service; crane suspends a load from the cargo hook,

ii) Crane out-of-service; the boom not stowed on boom rest or on other stowage arrangement,

iii) Crane out-of-service, the boom stowed on boom rest or other stowage arrangement

2. Materials

2.1 Material Selection Requirements

Material for structural members and components is to be as required in C.

2.2 Minimum Thickness of Structural Members

Crane boom chords and other members considered to be critically stressed are to have the following minimum thickness:

Solid Sections : 6 mm thick

Hollow Sections (e.g., truss boom lacings) : 4 mm thick

For less stressed members, a minimum thickness of 4 mm is to be provided.

Interior of hollow sections is to be either coated or is shown to be tight to the attending Surveyor.

2.3 Effective Corrosion Control

Special protective coatings are to be applied to those structural members of the crane where the thickness is less than 6 mm. Crane manufacturer's painting procedure is to be submitted for review and the finish painting to the satisfaction of the attending Surveyor. [See A.2.2.1v]

3 Loads and Stresses

3.1 Loading Conditions

3.1.1 In-service Loads

Typical loads to be submitted and considered in the analysis of the cranes, as applicable, are:

i) Dead and live loads

ii) Dynamic loads

iii) Loads due to wind

iv) Load swing caused by non-vertical lift

v) Loads due to list and/or trim

vi) Snow and ice

Loads of unusual design or subject to unusual operating conditions are also to be submitted and are specially considered for each case.

3.1.2 Out-of-service Loads

In addition to the operational loads, the out-of-service loads are to be submitted and considered in the structural analysis of the crane. The out-of-service loads are to include the loads resulting from the weight of the crane and the following environmental and motion loads:

i) Environmental forces (wind, etc.)

ii) Forces due to vessel's motions

In the out-of-service condition no load is to be suspended from the crane's hook.

3.2 Allowable Stress Coefficients

The allowable stress coefficients, S_C, referred to herein are specified in Table 2.2.

Table 2.2 - Allowable Stress Coefficient, S_C

Type of Stress	Shipboard & Offshore Cranes	Heavy Lift Cranes
Tension:		
Non-Pin Connected members (gross area)	0,45	0,60
Pin Connected members (net area)	0,33	0,45
Shear:		
On the Cross Sectional Area Effective in Resisting Shear	0,30	0,40
Bending: (Tension and Compression on Extreme Fibers)		
I & H Members, Hot-Rolled Built-Up & Rectangular Tube	0,50	0,66
Box Type Flexural Members	0,45	0,60

Notes:

1 Members subjected to combined stresses are to be proportioned to satisfy requirements of 3.5

2 For additional guidance, see AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, latest edition.

3 The bearing stress on pins is not to exceed 0.9 x Fy.

3.3 Individual Stresses

Computed individual tensile, bending and shear stress components and, as applicable, combinations of such stresses, are not to exceed the allowable stress, *F*, as obtained from the following equation:

$$F = F_y \times S_C$$

For steel booms:

F_y = specified minimum yield point or yield strength of the material

For all other steel structural parts:

F_y = minimum yield point or yield strength. For design purposes, Fy is to be considered taken as not greater than 72% of the minimum ultimate strength of the steel.

S_C = specified in 3.2

3.4 Column Buckling Stresses

3.4.1 Overall Buckling

For compression members which are subject to overall column buckling, the calculated axial compressive stress is not to exceed the following.

3.4.1(a) On the cross section of axially loaded compression members when $K\ell/r$, the largest effective slenderness ratio on any unbraced segment is less than C_C:

$$F_a = \frac{Q\left[1 - \frac{\left(\frac{k \cdot \ell}{r}\right)^2}{2 \cdot C_c^2}\right] \cdot F_y}{\frac{5}{3} + \frac{3 \cdot \left(\frac{K \cdot \ell}{r}\right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot \ell}{r}\right)^3}{8 \cdot C_c^3}}$$

3.4.1(b) On the cross section of axially loaded compression members, when $K\ell/r$ exceeds C_C:

$$F_a = \frac{12 \cdot Q \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot \ell}{r}\right)^2}$$

where

F_a = allowable axial compressive stress

E = modulus of elasticity

ℓ = unsupported length of column

K = effective length factor which accounts for support conditions at ends of length ℓ. For cases where lateral deflection of end supports may exist, K is not to be considered less than 1.0.

r = radius of gyration

$$C_c = \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}}$$

Q = coefficient given in Table 2.3

Fy = as defined in 3.3

For additional guidance, see AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest edition.

Table 2.3 - Coefficient Q

Type of Crane	Coefficient Q
Shipboard (See 4)	0.75
Offshore (See 5)	0.75
Heavy Lift (See 6)	1.0

3.4.2 Local Buckling

In addition to overall buckling as specified in 3.4.1, members are to be investigated for local buckling.

In the case of unstiffened or ring-stiffened cylindrical shells, local buckling is to be investigated if the proportions of the shell conform to the following relationship:

$$D / t > E / 9F_y$$

where

D = mean diameter of cylindrical shell

t = thickness of cylindrical shell

F_y and E are as defined in 3.3 and 3.4.1.

3.5 Members Subjected to Combined Axial and Bending Stresses

When structural members are subjected to axial compression or tension in combination with compression due to bending, the computed stresses are to comply with the following requirements:

$$\frac{f_a}{F_a} + \frac{C_{mx} \cdot f_{bx}}{\left(1 - \frac{f_a}{F_{ex}}\right) \cdot F_{bx}} + \frac{C_{my} \cdot f_{by}}{\left(1 - \frac{f_a}{F_{ey}}\right) \cdot F_{by}} \leq 1.0$$

and

$$\frac{f_a}{0.6 \cdot Q \cdot F_y} + \frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1.0$$

When $f_a/F_a \leq 0.15$, the following formula may be used:

$$\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} + \frac{f_{by}}{F_{by}} \leq 1.0$$

The subscripts x and y, combined with subscripts b, m and e, indicate the axis of bending about which a particular stress or design property applies, and

f_a = computed axial stress

f_b = computed stress due to bending

F_a = allowable axial compressive stress (obtained from 3.4)

F_b = allowable stress due to bending, determined by multiplying the yield stress by the allowable stress coefficients specified in Table 2.2, as appropriate

$$F_e = \frac{12 \cdot Q \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot \ell_b}{r_b}\right)^2}$$

= Euler stress divided by a factor of safety. In the expression for F_e, ℓ_b is the actual unbraced length in the plane of bending and r_b is the corresponding radius of gyration. K is the effective length factor in the plane of bending. Q is the applicable coefficient as specified in Table 2.3.

C_m = coefficient whose value shall be taken as follows:

i) For compression members in frames subject to joint translation (sideways), $C_m = 0.85$.

ii) For restrained compression members in frames braced against joint translation and not subject to transverse loading between their supports in the plane of bending, $C_m = 0.6 - 0.4\ M_1/M_2$, but not less than 0.4, where M_1/M_2 is the ratio of the smaller to larger moments at the ends of that portion of the member unbraced in the plane of bending

under consideration. M_1/M_2 is positive when the member is bent in reverse curvature, negative when bent in single curvature.

iii) For compression members in frames braced against joint translation in the plane of loading and subject to transverse loading between their supports, the value of C_m may be determined by rational analysis. However, in lieu of such analysis, the following values may be used:

- For members whose ends are restrained $C_m = 0.85$
- For members whose ends are unrestrained $C_m = 1.0$

For additional guidance, see AISC Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, latest edition.

3.6 Design Properties for Structural Members

3.6.1 General

The design section properties for a box type boom of lattice construction with tapered ends are specified in 3.6.2. Other types of members will also be considered.

3.6.2 Tapered Members

The moment of inertia, section modulus and radius of gyration to be used in the design of box- type booms of lattice construction, having tapered ends of similar proportions and constant-size corner members, are to be those of a prismatic member of equivalent stiffness, having ends that are similar, equal and parallel. See Figure 2.7.

The moment of inertia I_Z at any cross-section within the tapered portion may be computed as:

$$I_z = I_1 \cdot \left(\frac{Z}{a}\right)^2$$

where I_1, is the moment of inertia at the small end of tapered portion and the distances *Z* and *a* are shown in Figure 2.7.

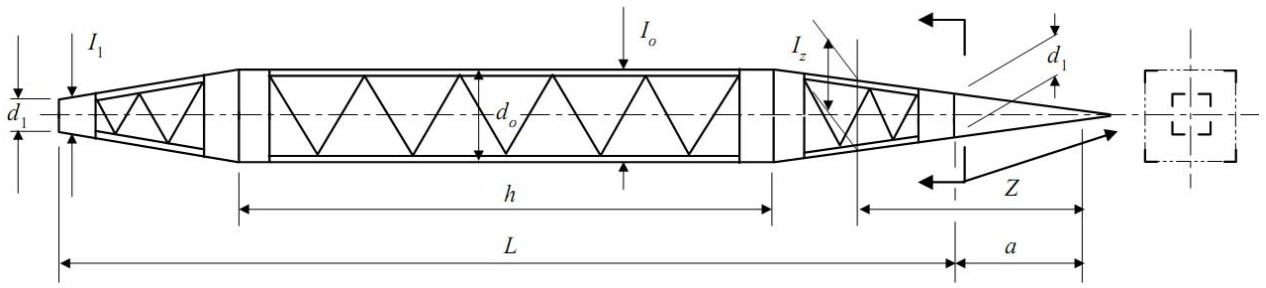


Figure 2.7 - Box Type Boom

If the moment of inertia I_1, at the top end of the boom, differs from the bottom end, the smaller of the two values is to be used to find the ratio I_1/I_O

The moment of inertia I_O at the large end of the tapered portion may be computed as:

$$I_o = I_1\left(\frac{d_o}{d_1}\right)^2$$

where d_O and d are, respectively, the out-to-out distance of chord angles at the large and small end of the

tapered portion.

The equivalent radius of gyration, *r*, for use in determining the slenderness ratio of the boom acting as a column, is:

$$r = \sqrt{\frac{C \cdot I_0}{A}}$$

Where

I_o = moment of inertia at any section through length h (prismatic central portion) of the member

C = applicable coefficient from Table 2.4

A = area of cross-section at any section through length *h* (prismatic central portion)

CI_o = average moment of inertia

Table 2.4 - Coefficients *C*

I1/I0	h/L					
	0	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**
0.0	0.101	0.158	0.282	0.633	0.970	1.000
0.01	0.350	0.479	0.667	0.873	0.984	1.000
0.1	0.548	0.675	0.818	0.937	0.993	1.000
0.2	0.645	0.760	0.873	0.957	0.995	1.000
0.4	0.772	0.852	0.929	0.976	0.998	1.000
0.6	0.863	0.916	0.962	0.987	0.999	1.000
0.8	0.937	0.963	0.982	0.995	1.000	1.000
1.0	1.000	1.000	1.000	1.000	1.000	1.000

3.7 Crane Boom and Structural Component Fasteners

Allowable tension and shear stresses for boom and structural component rivets, bolts and thread parts are to be as per AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, or other similar standards. For hold-down bolts see 3.8.2

3.8 Swing (Slewing) Mechanism

The following applies to Shipboard and Offshore Cranes, 4 and 5. For Heavy Lift Crane swing mechanisms, see 6.

3.8.1 Swing Circle Assembly

The following design items are to be considered in the analysis of the swing circle assembly defined in A.5.8.

i) Loads and moments from 4 and 5

ii) The maximum calculated stress with the dead load plus 5.0 times the live load is not to exceed the minimum specified ultimate tensile strength of the material.

Plans of the swing circle assembly, the hold-down bolting arrangement, crane and pedestal structure

in way of the swing circle assembly and calculations giving design loads in association with the allowable stresses for the circle assembly and bolts are to be submitted.

3.8.2 Hold-down Bolts

The load, *P*, due to external loading on the most heavily loaded swing bearing bolt, may be calculated by:

$$P = \frac{4 \cdot M}{N \cdot D} - \frac{H}{N}$$

where

M = moment calculated with dead load plus 5.0 times the live load

H = dead axial load plus 5.0 times the live load

D = pitch circle diameter of bolts

N = total number of bolts in bolt circle 360°

The maximum calculated stress is not to exceed the minimum specified ultimate tensile strength of the bolt material. Consideration will be given to load P calculated by independent analysis, which is to be submitted for review.

During installation, bolts are to be pretensioned by controlled means to a level not exceeding 70 percent of the yield strength of the bolts, to the satisfaction of the attending Surveyor. Pretensioning, by bolt torque or by hydraulic tensioning device, is to be in accordance with the bearing manufacturer's instructions, which are to be submitted for review. Elongation of the bolts is to be measured to verify pretensioning. At least 10 percent of the bolts, randomly selected, are to be measured to the satisfaction of the attending Surveyor.

The material used in bolts is to be in accordance with recognized standards. Hold-down bolts are to be permanently marked with fastener manufacturer's identification mark and SAE, ASTM or ISO grade. The bolt test certificate furnished by the manufacturer is to be to the satisfaction of the attending Surveyor. Additional tests, as deemed necessary by the attending Surveyor, may be required to ensure the quality of the bolt material.

3.8.3 Bolting Arrangement

Where the swing circle assembly utilizes a roller or ball bearing slewing ring, the inner and outer bearing rings are to have a 360-degree uniform bolting pattern. Slew ring bearings are to be sealed from foreign matter and contamination. Consideration will be given to the use of sector bolting arrangement, provided a detailed structural analysis which includes side loading of the race, rings and bolted connection is submitted for review.

Where sector bolting is used, it is not to be less than 140-degree sectors and at least one additional bolt is to be fitted at the mid-point between each 140-degree sector where sectors extend to include a full circle. The center of each 140-degree sector is to be in line with the centerline of the boom. See Figure 2.8.

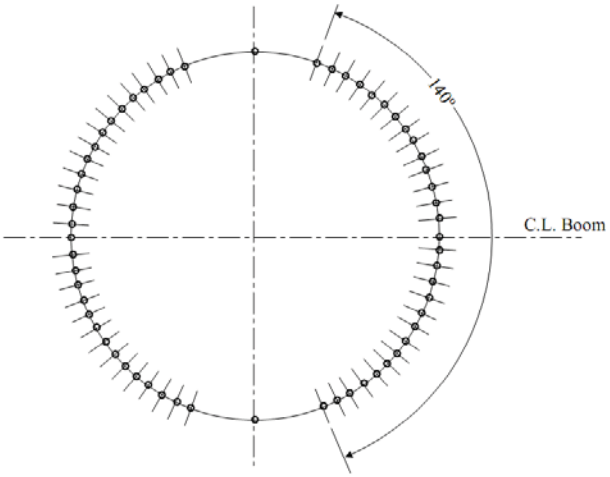


Figure 2.8 - Sector Bolting

3.8.4 Swing Circle Assembly Retainer

An auxiliary device to restrain the upper frame against separation from the pedestal may be supplied at the option of the buyer. When the auxiliary device is supplied, the properties of materials used in its design and manufacture should be selected to resist fracture under impact loading. The maximum calculated stress, with the dead load plus 5.0 times the live load, is not to exceed the minimum specified ultimate tensile strength of the material.

3.8.5 Materials

Materials used in the swing circle mechanism are to be in accordance with C.

3.9 Pedestals and Kingposts

For Shipboard and Offshore Cranes (4 and 5), pedestals and kingposts are to be designed for 75 percent of dead load at the center of the gravity of the boom plus 1.5 times the live load at the boom head. The allowable stresses are not to exceed those given by Table 2.2.

No doubler is allowed between the pedestal and deck plate where any tension load is anticipated.

For Heavy Lift Crane tub structure requirements, see 6

3.10 Crane Capacity Rating Chart

For Shipboard and Heavy Lift Crane (4 and 6) approved for varying capacities, the Safe Working Load ratings are to be indicated for every increment not exceeding 1.5 m, or corresponding boom angles for the specified boom and jib length. An approved copy of the crane capacity rating chart will be included in the Register of Lifting Appliances and is to be furnished to the Owner for use by crane personnel. See 2.6.

For Offshore Crane capacity rating chart requirements, see 5.5

For capacity rating chart requirements of cranes used for personnel lifting, see J.

3.11 Foundations and Supporting Structure

For lifting appliances installed on vessels or offshore structures classed with BKI, detail drawings of the foundation and supporting structure on which the crane is to be installed are to be submitted and approved prior to certification.

For lifting appliances installed on vessels or offshore structure not classed with BKI, it is the responsibility of the Owner to verify that the foundation and supporting structure above and below deck on which the lifting appliance is installed are and will remain fit for the safe operation of the lifting appliance.

4 Shipboard Cranes

4.1 General

These requirements apply to shipboard cranes having a SWL up to 1600 kN. See 5.1. For additional requirements see 1, 2 and 3.

Typical shipboard cranes considered are:

i) Pedestal mounted deck cranes for handling cargo or equipment. See Figure 2.1

ii) Gantry cranes for handling containers. See Figure 2.2

Cranes of unusual design or subject to unusual operating conditions will be specially considered.

4.2 Design Considerations

The following conditions are to be used to determine the structural adequacy under the specific Safe Working Loads for single and varying capacities for which the cranes are to be certified:

i) Unless indicated otherwise by the submitter, the vessel will be assumed to be on an even keel with no motions of the vessel during loading or unloading.

ii) Design load is the maximum possible load resulting from the simultaneous application of the following loads without exceeding the allowable stresses resulting from the use of coefficient S_C given in Table 2.2.

- *Vertical Load:* 100% of live load at the boom head plus 75% of the boom dead load at the center of the gravity of the boom
- *Horizontal Load:* 2% of live load in the athwartship direction.

4.3 Wire Rope Factors of Safety

The following factors of safety are to be used for the load and boom hoist ropes and pendants. They are to be based on the maximum Safe Working Load capacity of the crane for all boom angles.

Table 2.5 - Safety Factor of Shipboard Crane Wire Rope

Wire Rope	Factors of Safety		
	SWL < 100 kN	100 kN ≤ SWL ≤ 600 kN	600 kN < SWL < 1600 kN
Standing & Running Rigging	5.0	$5 - \frac{(\text{SWL} - 100)}{500}$ kN	4.0

5. Offshore Cranes

5.1 General

These requirements apply to offshore cranes. See 5.2. For additional requirements see 1, 2 and 3

5.2 Design Considerations

5.2.1 Static Rated Loads

The Static Rated Load applies to lifts with a crane mounted on an offshore bottom-supported structure, or on an offshore floating structure experiencing no significant motion, or list, during crane operation. Static Rated Loads are intended for lifting and setting loads on the structure on which the crane is installed.

The Static Rated Load is the maximum possible load resulting from the simultaneous application at boom head of the following loads.

i) *Vertical Load:* 100% of live load plus 75% of the boom dead load without exceeding the allowable stresses resulting from the use of coefficient S_C given in Table 2.2.

ii) *Horizontal Load:* 2% of live load in the athwartship direction.

5.2.2 Dynamic Rated Loads

The Dynamic Rated Load applies to lifts with the crane mounted on an offshore bottom-supported structure, or on an offshore floating structure which may be experiencing motion, or where there may be motion relative to the other vessel during crane operations. Dynamic Rated Loads are intended for lifting and setting loads on the vessel or structure on which the crane is installed, or on other structures or vessels.

The Dynamic Rated Loads are to be determined as specified in Paragraph 2.1.2 of the "API Specification for Offshore Cranes", API Spec 2C-Latest Edition.

5.3 Allowable Stresses

5.3.1 Static Conditions

The crane structural components are to be designed to conform to the allowable stresses resulting from the coefficient S_C given in Table 2.2.

5.3.2 Dynamic Conditions

The crane structural components are to be designed to conform to the allowable stresses specified in Section 3 of the "API Specification for Offshore Cranes", API Spec 2C – latest edition.

5.4 Wire Rope Factors of Safety

The minimum factors of safety specified in Table 2.6 are to be satisfied for the load, auxiliary and boom hoist wires and pendants. The actual factors of safety reflecting the onboard wire rope arrangements are to be calculated as follows:

i) The load hoist running rigging safety factors is to be determined by dividing the breaking strength of the total parts of line by the maximum Static Rated Loads.

ii) The boom hoist running rigging safety factor is to be obtained by dividing the breaking strength of the total parts of line by the maximum load imposed on the rope by the maximum Static Rated Load plus the gear weight (one-half dead weight of boom, weight of wire ropes and blocks, etc.)

iii) The pendant line safety factor is to be obtained by dividing the breaking strength of the wire rope by the maximum load imposed on the rope by the maximum Static Rated Load plus the gear weight (one half dead weight of boom, weight of wire ropes and blocks, etc.).

iv) The load hoist running rigging safety factors for Dynamic Rated Loads is to be determined as specified in sub-section 5.4(c) of API Spec 2C – latest edition.

Table 2. 6 - Safety Factor of Offshore Crane Wire Rope

Wire Rope	Factor of Safety
Load and Auxiliary Hoist Rigging	5.0
Boom Hoist Rigging	5.0
Pendant Lines	4.0

5.5 Crane Capacity Rating Charts

The load rating charts shall indicate rating conditions as applicable: Static or Dynamic Rated Loads, or both. The load ratings are to be indicated for every increment not exceeding 1.5 m or corresponding boom angle for the specified boom and jib length.

The rated loads indicated on the chart may or may not include the weight of the hook, hook block, etc., and this is to be so noted. However, the weight of hook, hook block, etc., are to be indicated on the chart when they are not included in the rated loads.

An approved copy of the crane capacity rating chart is to be included in the Register of Lifting Appliances and furnished to the Owner for use by crane personnel. See E.2.6 and H.1.

6. Heavy Lift Cranes

6.1 General

These requirements apply to heavy lift cranes having a Safe Working Load of not less than 1600 kN on the main hoist falls. See A. 5.3. For additional requirements, see 1, 2 and 3.

The types of heavy lift cranes considered are:

i) Tub mounted cranes

ii) Shear leg cranes

iii) Stifflleg cranes

iv) “A”-frame cranes

See Figures 2.3, 2.4, 2.5 and 2.6 for crane configurations. Cranes of unusual design or subject to unusual operating conditions will be specially considered.

6.2 Design Considerations

The following conditions shall apply to determine the Safe Working Loads for which the cranes are to be certified:

i) Offshore heavy lifts are to be carried out in very mild environmental conditions.

ii) Actual specific design and operational parameters which include vertical impacts and side loads. However, these loads are not to be taken as less than the following, without exceeding the allowable stresses resulting from the use of coefficient S_C given in Table 2.2:
   - The vertical impact is to be 10 percent of the live load.
   - The side load is to be 2 percent of the live load plus 2 percent of the boom point dead load applied as a horizontal side load to the boom head.

iii) Where auxiliary hook capacities are less than 1600 kN the structural components supporting these loads at the boom point are to be designed in accordance with 4 for shipboard cranes.

6.3 Wire Rope Factors of Safety

The minimum factors of safety specified in Table 2.7 are to be satisfied for the load, auxiliary and boom hoist wires and pendants. The actual factors of safety reflecting the onboard wire rope arrangements are to be calculated as follows:

Running rigging factor of safety is to be obtained by dividing the breaking strength of the wire rope by the maximum load, boom or auxiliary hoist line pull. The hoist line pull is the load seen at the winch, and is the product of the rated load and the winch pull factors. These factors are based on the number of parts of wire, plus friction loss per sheave in the system. Data is to be submitted substantiating the friction loss per sheave used in the calculations.

Table 2.7 - Safety Factor of Heavy Lift Crane Wire Rope

Wire Rope	Factor of Safety *
Load and Boom Hoist Rigging	3.5
For Aux. Hoist Rigging Above 1600 kN	3.5
For Aux. Hoist Rigging 1600 kN & below	4.0
Standing rigging and pendants	3.0

* If the crane needs to comply with the ILO Regulations at the request of the Authorities where the crane will be operating, selection of wire ropes for both running and standing rigging is to be in accordance with Table 2.5

6.4 Tub Mounted Crane Hook Roller Restraining Components

Hook roller restraining components are to be designed for 1.2 times the live load plus dead load without exceeding the allowable stresses specified in Table 2.2.

6.5 Tub Structure

Tub structure is to be designed for dead load plus 110 percent of the live load. Allowable stresses are not to exceed those specified in Table 2.2.

6.6 Hooks

Hooks are to be treated as structural material as specified in C.1.1. Allowable stresses are not to exceed those specified in Table 2.2.

7. Existing Cranes

7.1 Existing Cranes without Register

For existing cranes that do not have a Register issued by a recognized classification society, or a recognized cargo gear organization, submission of information as noted in A.2.2, with verification of material, is required.

Existing cranes may be certified subject to satisfactory plan review, general examination, operational tests including luffing, slewing, test of safety devices, and proof testing of the crane as a unit as required by E.2, with the exception that a dynamometer or load cell may be used. The test should not be regarded as satisfactory unless the load indicator remains constant for a period of at least five minutes. The general examination shall include visual inspection for excessive wear, damage, corrosion, and fractures. Nondestructive testing or verification of materials may be required at the discretion of the Surveyor. In addition, all crane hooks are to be examined using magnetic particle or other suitable crack detecting inspection methods to the satisfaction of the attending Surveyor. The crane prime movers, piping, electrical cable and circuit breakers are to be examined as deemed necessary by the attending Surveyor.

7.2 Existing Cranes with Register

For cranes having a Register issued by a recognized classification society or a recognized cargo gear organization, evidence of previous design approval is to be submitted. Suitable evidence of the design approval would be an approval letter from the authority issuing the previous register or the previous register itself. An BKI Register of Lifting Appliance may be issued after review of above data and a proof test and examination in accordance with the requirements of G.5.

8 Miscellaneous Requirements and Equipment

The following equipment is to be fitted to the satisfaction of the Surveyor:

8.1 Boom Equipment

i) A boom hoist limiter or shutoff is to be provided to automatically stop the boom hoist when the boom reaches a predetermined high and low angle.

ii) Boom stops are to be provided to resist the boom from falling backwards in a high wind or sudden release of the load.

iii) A boom angle or load radius indicator readable from the operator's station is to be provided. Cranes designed for one SWL from minimum to maximum radii are not required to have boom angle or load radius indicators.

8.2 Other Equipment

i) A load-moment or load-radius indicating device for main and auxiliary hoist is to be provided.

ii) An anti-two block system is to be provided to protect hoist ropes, structural components and machinery from damage.

iii) An audible warning device, within easy reach of the operator, is to be provided.

iv) Aviation warning beacons and spotlights on the boom at night are to be as specified by the Owner.

8.3 Miscellaneous Requirements

i) Each control is to be marked to show its function.

ii) Lighting for controls is to be provided.

iii) Gasoline engines are prohibited.

iv) Fuel tank fills and overflows are not to run close to exhausts.

v) Spark arrestors are to be provided on exhausts.

vi) Control levers for boom hoist, load hoist, swing and boom telescope (when applicable) shall return automatically to their center (neutral) positions on release.

vii) Fail-safe arrangements are to be provided on all cranes. See A.5.9

C. Material and Welding

1 General

1.1 Structural Materials

Structural materials are to be suitable for the intended service conditions. They are to be of good quality, free of injurious defects and are to exhibit satisfactory formability and weldability characteristics. Materials used in the construction of cranes are to be verified by the attending Surveyors that they are the materials certified by the test reports issued by the mill. Material is to be clearly identified by the steel manufacturer with the specification, grade and heat number. For those rolled steel products used for crane pedestals and kingposts, the appropriate grade to be used for respective material class and thickness is shown in Table 2.8.

Table 2.8 - Material Grades

	Design Service Temperature [3]				
Thickness in mm	***0°C***	***–10°C***	***–20°C***	***–30°C***	***–40°C***
$t \leq 12.5$	A / AH	A / AH	A / AH	A / AH	B [2] / AH
$12.5 < t \leq 20$	A / AH	A / AH	A / AH	B / AH	D / DH
$20 < t \leq 25$	A / AH	A / AH	B / AH	D / DH	D [1] / DH [1]
$25 < t \leq 30$	A / AH	A / AH	D / DH	D / DH	E / EH
$30 < t \leq 35$	A / AH	B / AH	D / DH	D / DH	E / EH
$35 < t \leq 40$	A / AH	D / DH	D / DH	D / DH	E / EH
$t > 40$	B / AH	D / DH	D / DH	D / DH	E / EH

Notes:

1) To be normalized.
2) May be "A" if fully killed.
3) The design service temperature is the minimum anticipated temperature at which the crane will operate, as specified by the owner, crane manufacturer or builder (see A.5.10). The design service temperature is to be indicated at an appropriate place for the crane operator's information. For Shipboard and Heavy Lift Cranes (B.4 and B.6) approved for varying capacities, it is to be indicated on crane capacity rating chart

1.2 Toughness

For cranes with design service temperature of −10°C and below, primary structural members given in 5 are to be in conformity with the toughness criteria in 7.

For cranes with design service temperature above −10°C , primary structural members are to have fracture toughness satisfactory for the intended application as evidenced by previous satisfactory service experience or appropriate toughness tests similar to those in 7. Charpy V-Notch initial test requirements are to be in accordance with Part 1 Seagoing Ships Rules for Materials Vol. V section 4, B. except for swing circle mechanisms where the single specimen requirements are as given in 6 of this Guidelines.

1.3 Additional Requirements

In cases where principal loads, from either service or weld residual stresses, are imposed perpendicular to the material thickness, the use of special material with improved through thickness properties is required. Material complying with Part 1 Seagoing Ships Rules for Materials Vol. V section 4, I is considered as meeting this requirement.

1.4 Steel

Materials, test specimens and mechanical testing procedures having characteristics differing from those prescribed herein may be approved upon application, due regard being given to established practices in the

country in which the material is produced and the purpose for which the material is intended. Wrought iron is not to be used.

1.5 Other Materials

Materials other than steel will be specially considered.

2 Bolting

Bolts subjected to tensile loading (other than pretensioning) employed in joining of critical components of cranes are to be selected to meet strength, fracture toughness and corrosion resistance requirements for the intended service and are to be in accordance with a recognized bolting standard. Round bottom or rolled thread profiles are to be used for bolts in critical bolt connections.

3 Welding

In general, welding may be in accordance with Part 1. Seagoing Ships, Rules For Welding, Volume VI or other recognized codes. Notes on drawings are to indicate the code to be followed. Welding procedures are to be to the satisfaction of the attending Surveyor.

4 Nondestructive Inspection (NDT) of Welds

Inspection is to be in accordance with Part 1. Seagoing Ships, Rules For Welding, Volume VI, Section 12 or other recognized codes. The areas to be nondestructively inspected and methods of inspection are to be submitted together with the design plans. The Surveyor is to be provided with records of NDT inspections. The Surveyor, at his discretion, may require additional inspections.

5 Primary Structural Members

The following load carrying primary structural members are to meet the requirements of Table 2.8 for BKI Grade materials or of 7. for non BKI Grade materials, and the requirements of 6, as appropriate:

i) Boom or jib chord members

ii) “A”-frame, mast or gantry chord members

iii) Crane base (revolving frame and tub-structure)

iv) Load carrying beams

v) Eye plates and brackets

vi) Swing circle mechanism

vii) Pins

6 Material Toughness Requirements for Swing Circle Mechanism

Swing Circle Mechanisms for offshore cranes are to comply with the following Charpy V-Notch impact values when tested at -20°C or at 10°C below the design service temperature, whichever is lower:

Average Energy: 42 J minimum

Single Energy: 27 J minimum

The alternative requirements in 7.2 could also be considered. Swing Circle Mechanisms for cranes not intended for offshore applications will be reviewed on a case-by-case basis. Appropriate supporting information and test data relative to previous design and service experience and to the intended design and environmental conditions are to be submitted.

7 Material Toughness Requirements for Primary Structural Members of Cranes with Design Service Temperatures of −10°C and Below

7.1 Steels up to and Including 410 N/mm^2 Yield Strength

Appropriate supporting information or test data is to indicate that the toughness of the steels will be adequate for their intended application in the crane at the minimum design service temperature. In the absence of supporting data, tests are required to demonstrate that steels would meet the following longitudinal Charpy V-Notch (CVN) impact requirements.

Table 2.9 – Impact Requirements for Steels up to and Including 410 N/mm^2

Yield Strength [N/mm^2]	CVN (Longitudinal) [J]	Test Temperature
< 315	27	10°C below design service temperature
315 - 410	34	

7.2 Extra High Strength Steels above 410 N/mm^2 Yield Strength

Steels in the 410-690 N/mm^2 yield strength range are to meet the following longitudinal CVN impact requirements.

Table 2.10 - Impact Requirements for Extra High Strength above 410 N/mm^2

Design Service Temperature [°C]	Test Temp [°C]	Impact Energy [J]
– 20	– 40	34
– 30	– 50	34
– 40	– 60	34

7.3 Alternative Requirements

As an alternative to the requirements in 7.1 or 7.2, one of the following may be complied with.

i) For transverse specimens, 2/3 of the energy shown for longitudinal specimens.

ii) For longitudinal specimens, lateral expansion is not to be less than 0.5 mm. For transverse specimens, lateral expansion is not to be less than 0.38 mm

iii) Nil-ductility temperature (NDT) as determined by drop weight tests is to be 5°C below the test temperature specified in 6, 7.1, or 7.2 as appropriate.

iv) Other means of fracture toughness testing, such as Crack Opening Displacement (COD) testing, will be specially considered.

D. Wire Rope

1 General

The construction of the wire rope is to comply with a recognized standard such as API Spec 9A. In general, boom hoist, load hoist and load block sheaves and wire rope drums are to have a pitch diameter of not less than 18 times the nominal diameter of the rope used. Plain or grooved drums will be acceptable provided

that five (5) wraps of wire rope remain on the drum with the hook in its lowest position, unless otherwise approved by BKI Head Office. The end of the wire rope is to be effectively secured to the drum.

2 Factors of Safety

The breaking strength of the wire rope is not to be less than the calculated maximum tension in the rope multiplied by a factor for the appropriate crane in B.4, B.5 and B.6. For cranes used for personnel lifting see J.

3 Wire Rope Test

All wire rope is to have a certificate of test, furnished by the manufacturer or the certificating authority, showing the breaking test load of a sample. The certificate is to show also size of rope, number of strands, number of wires per strand, lay, core, quality of wires, date of test, and is to be submitted for inclusion in the Register of Lifting Appliances. See H.1.

4 Splicing of Wire Rope

Single wire rope cargo falls, wire rope pendants, topping lifts and preventers shall consist of clear lengths without splices except splices are permitted at the ends. Wire rope clips shall not be used to form eyes in the working ends of single wire rope cargo falls.

A thimble or loop splice made in any wire rope is to have at least three (3) tucks with a whole strand of the rope and two (2) tucks with one-half of the wires cut out of each strand, provided that this requirement shall not preclude the use of another form of splice which can be shown to be as efficient as that required in this Subsection. Bolted cable clips for splicing wire rope are not acceptable.

E. Testing of Crane

1 Loose Gear Test

1.1 General

All chains, rings, hooks, links, shackles, swivels, and blocks of crane are to be tested with a proof load at least equal to the following:

Table 2.11 – Loose Gear Proof Load

Article of Gear	Proof Load
Chain, ring, hook, link, shackle or swivel	100% in excess of the safe working load
Single sheave block	300% in excess of the safe working load[2)]
Multiple sheave block and container spreader with safe working load up to and including 20 tonnes	100% in excess of the safe working load
Multiple sheave block and container spreader with safe working load over 20 tonnes up to and including 40 tonnes	20 tonnes in excess of the safe working load
Multiple sheave block and spreader with safe working load over 40 tonnes	50% in excess of the safe working load

Notes :

1) Alternatively, the proof tests as recommended in the latest applicable edition of the I.L.O. publication "Safety and Health in Dock Work" may be accepted where the items of gear are manufactured or tested or both to the requirements of those regulations and are intended for use on vessels under jurisdictions accepting them.

2) The safe working load to be marked on a single sheave block is to be the maximum load which can safely be lifted by the block when the load is attached to a rope which passes around the sheave of the block. In the case of a single-sheave block where the load is attached directly to the block instead of to a rope passing around the sheave, it is permissible to lift a load equal to twice the marked safe working load of the block as defined in this note.

Evidence of compliance with the proof load test requirements in this Section for all rings, hooks, links, shackles, swivels, blocks, and any other loose gear whether accessory to a machine or not, but which is used as crane gear is to be listed on an appropriate certificate as required by .E.1.2.

1.2 Certificates

Articles of loose gear are to have a certificate furnished by the manufacturer. The certificate is to show the distinguishing number or mark applied to the article of gear, description, kind of material, carbon content, date of test, proof load applied, and safe working load. Loose gear certificates are to be inserted in the Register of Lifting Appliances. See H.1. The safe working load SWL is to be marked on the hoist blocks.

1.3 Special Components

Blocks of special nature, together with their connecting components, special lifting devices and components built into or for cranes, heavy lift gear, crane hooks or hoisting machinery which are specially designed for use with a particular lifting unit, the designs of which are submitted for approval as steel structural parts, need not be considered loose gear for the purpose of certification. They are, however, to be tested and examined with the gear as a unit, as required by E.2. Appropriate nondestructive methods of examination will be required for crane hooks by the attending Surveyor. Nondestructive methods of examination will also be required for other components where visual inspection is considered to be inadequate. For material requirements, see C.1.

2 Testing Cranes as a Unit

2.1 Test Loads

The crane is to be tested onboard to the following proof loads:

Table 2.12 – Testing Crane Proof Load

SWL of Assembled Crane, tonnes	Proof Load
Up to 20 tonnes	25% in excess of SWL
20 - 50 tonnes	5 tonnes in excess of SWL
Over 50 tonnes	10% in excess of SWL

2.2 Proof Testing and Inspection

Unless otherwise approved and as specified in B.7, G.5 and H.4, the Original Proof Load Test is to be carried out using movable known weights. Booms shall be tested at the minimum, maximum and intermediate radii. These radii are to be stated on the Certificate of Test together with the proof loads used. Test rating conditions most likely to represent all intended service should be selected. The proof load should be lifted and held for at least five minutes. The Proof Load Test should include hoisting and lowering of the main hook load, auxiliary hook load and boom; slewing (swinging) and luffing; test of safety, fail-safe and limiting devices and load-moment and boom-angle indicators.

For testing subsequent to the Original Test, in the case of hydraulic cranes, when owing to built-in arrangements for limitation of pressure, or in electric drive cranes when there is built-in load limiting control, it is impossible to lift the required proof-load, it will be sufficient to lift the greatest possible load. When the load lifted is less than the proof test load required in E.2.1, a notation is to be made on the certificate that this load was the maximum possible load. However, in no case is the test load to be less than the safe working load stated on the certificate. It will also be noted on the certificate that the load was limited by a built in electric or hydraulic load limit control and that the adjusting devices or relief valves were found sealed.

After being tested, each crane, together with all critical accessories, is to be examined to see whether any part has been damaged or permanently deformed by the test. In addition to the list of crane structural components listed in B.1, the Surveyor should examine at least the following items:

i) Foundation, where required as per B.3,11

ii) *Sheaves* and rope guides

iii) Wire ropes including end connections

iv) Hoist machinery, brakes and clutches

v) Hooks

vi) Slewing assembly and bolting arrangements

2.3 Source of Electrical Power

Current for electrical winch operation during the test is to be taken through the vessel's cables. Shore current may be used when supplied through the main switchboard.

2.5 Brakes and Fail-safe Devices

The operation of all brakes and fail-safe devices is to be demonstrated under simulated loss of power conditions to the satisfaction of the Surveyor. The crane manufacturer shall prepare a test memorandum outlining the cautions and procedures for proper testing of the devices.

2.5 Machinery

General examination of machinery, piping and electrical equipment. See F.3.

2.6 Marking of Assembled Crane

For single rated booms, the Safe Working Load (abbreviated "SWL") for the assembled gear is to be marked on the legs of gantry cranes and on the heel of jib crane booms together with the minimum angle to the horizontal or radius and date of test for which the boom is certified. These letters and figures shall be in contrasting colors to the background and at least one inch in height.

Where the crane is approved for varying capacities, crane capacity rating chart indicating the maximum safe working loads are to be conspicuously posted near the controls and visible to the operator when working the gear. These charts should indicate the various working angles of the boom and the maximum and minimum radii at which the boom may be safely used, for each boom length intended. See B.3.10 and B.5.5.

2.7 Record of Test

Copies of the initial and subsequent certificates of tests issued by the Surveyor are to be inserted in the Register of Lifting Appliances. See H.1.

F. Construction Standards for Crane Machinery, Piping and Electrical Systems

1 General

The mechanical, piping and electrical systems and components of the crane that are used for hoisting, luffing and slewing systems are subject to design review for compliance with the requirements of this Section. Plan submission is to be in accordance with A.2 of this Guidelines.

2 Design Acceptance Criteria

Machinery, electrical and piping systems are to be designed and constructed to the requirements contained in this Section, and as applicable, Part 1, Seagoing Ships, Rules for Machinery Instalations, Volume III and Rules for Electrical Installations, Volume IV. Systems which are shown to be designed, constructed and tested to other recognized standards or codes of practice such as ANSI, ASME, IEEE, IEC, AGMA, etc., may be accepted on this basis, provided the alternative standard is not less effective.

Designs may also be reviewed for certification to manufacturer's standards. In such cases, complete details of manufacturer's standard and engineering justification are to be submitted for review. The manufacturer will be required to demonstrate by way of testing or analysis that the design criteria employed results in a level of safety consistent with that established herein or that of a recognized standard or code of practice.

3 Inspection and Material Testing

Crane Machinery Systems are to be constructed and installed and tested to the satisfaction of the Surveyor in accordance with approved plans. Materials used in the construction of mechanical components of cranes under the scope of this Section are to be certified by the mill and verified by the attending Surveyors.

Winches and other machinery are to be tested to the proof load of the crane. See E.2.2 for exception for hydraulic cranes.

4 Controls

Suitable monitoring of the crane's controls is to be provided. Crane controls are to be clearly marked to show their functions. As appropriate, monitoring is to indicate availability of power, air pressure, hydraulic pressure, motor running and slewing brake mechanism engagement. Cranes are to be provided with an overload-protection system. Motor running protection is to be provided and is to be set between 100% and 125% of motor rated current.

5 Low Temperature Operation

For crane machinery systems whose loading environmental criteria consider operations at or below -10°C, the manufacturers of the machinery components are to demonstrate by way of testing or analysis that the machinery components will operate satisfactorily.

6 Rotating Machinery

Design, construction and installation of generators and motors is to be in accordance with Part 1, Seagoing Ship, Rules for Electrical Installations, volume IV. Such equipment, however, need not be inspected at the plant of the manufacturer, but will be accepted subject to satisfactory testing witnessed by the Surveyor after installation of the crane.

Internal combustion engines are to be designed, constructed and equipped in accordance with good commercial and marine practice. Such equipment need not be inspected at the plant of the manufacturer, but will be accepted based on manufacturer's affidavit, verification of the nameplate data and satisfactory performance witnessed by the Surveyor after installation in the crane.

Internal combustion engines having a rated power of 100 kW and over are to be provided with safety features as per Part 1, Seagoing Ships, Rules for Machinery Instalations, Volume III Section 2. F

Internal combustion engines are to meet the angle of inclination requirements of Part 1, Seagoing Ships, Rules for Machinery Instalations, Volume III Section 1.C or Part 5, Offshore Technology, Rules for Machinery Instalations, Volume 4, Section 1.C. as applicable.

Internal combustion engine exhaust manifolds are to be water jacketed or effectively insulated. The exhaust is to be fitted with an effective means of spark arresting.

Exhaust piping insulation is to be protected against possible absorption of oil or hydraulic fluid in areas or spaces where the exhaust piping may possibly be exposed to oil, oil vapors or hydraulic fluid leakage.

7 Hazardous Locations

Machinery arrangements, all electrical power, control and safety devices and wiring on cranes installed in hazardous locations (where a flammable atmosphere may exist) are to be suitable for operation in such areas.

Where essential for operational purposes, internal combustion engines may be installed in hazardous areas and such installation will be subject to special consideration. Additionally, exhaust outlets are to discharge outside of all hazardous areas, air intakes are to be not less than 3 m from hazardous areas.

8 Fail-safe Arrangements, Safety Devices and Brakes

Fail-safe arrangements and safety devices are to be provided and are to be approved by BKI. Brakes are to be provided for all winches and are to be effective in stopping and holding the test load of the crane in any position. Fail-safe arrangements, safety devices and brakes are to be in accordance with applicable

recognized industry standards such as API Spec. 2C or EN 13852-1.

For cranes used for personnel lifting, see J.

G. Surveys

1 General

Before being taken into use, all cranes, including all accessory gear, are to have been tested and examined by the crane manufacturer. The person performing the testing and examination is to be duly authorized by the manufacturer.

The Surveyor will witness tests during In-Plant, Initial, Annual, Retesting and Damage Surveys. The particulars of these tests and examinations will be entered on the applicable certificate and inserted in the Register of Lifting Appliances. See H.1.

2 In-Plant Surveys and Certification

All cranes are to be surveyed at the crane manufacturer's plant during construction. In-plant surveys of the cranes during construction are required to the extent necessary for the Surveyor to determine that the details, material, welding and workmanship are acceptable to BKI and are in accordance with the approved drawings.

The Surveyor is to have access to all material test certificates. All in-plant testing of the crane structural components or assembled cranes is to be witnessed and reported on by the attending Surveyor.

The in-plant survey report is to identify all members of the crane that have thickness less than 6 mm and where special protective coatings were applied as per B.2.3

The crane manufacturer shall establish and maintain a quality control system to assure that all BKI requirements, including design approval, materials, verification, fabrication workmanship and nondestructive testing, are complete.

The quality control system should provide sufficient details of manufacturing and inspection to assure that crane manufacturer's inspections are performed at appropriate stages of fabrication. In the event of non-compliance, fabrication should be delayed for rectification.

The quality control system should fully document welding procedures and qualification of welding personnel. The quality control system should also detail the procedures and qualifications of nondestructive testing personnel to be employed in all stages of fabrication and manufacture. The crane manufacturer's quality control system should provide assurance that required heat treatments have been performed.

Upon satisfactory fabrication, the Surveyor may issue a certificate certifying that the crane has been built in accordance with these requirements, the extent of testing witnessed, and showing the model and serial numbers, a description of the crane, and the date of issue. See H.1.

Upon satisfactory proof testing after installation, a Register of Lifting Appliances may be issued which will contain the in-plant certificate and reports.

3 Initial Survey

During the Initial Survey, the original proof testing and examination should be conducted in accordance with E.2 and the test conditions and results should be included in the Register of Lifting Appliances, see H.1. For cranes fitted with slewing ring bearings, the results of a "Rocking Test", taken in accordance with the bearing manufacturer's instructions, are to be included in the Register of Lifting Appliances.

A load rating vs. boom angle chart with clearly legible letters and figures on durable material shall be securely fixed to the crane in a location easily visible to the operator. Where more than one boom length is supplied, or where more than one rating is applicable to a boom (e.g., static rating and dynamic rating), a chart should be supplied for each. See E.2.6

Where cranes are installed on a vessel or offshore unit during new construction and are placed in service

before delivery of the vessel or offshore unit, a load test in accordance with E.2 will be required to be carried out within 30 days of delivery of the vessel or offshore unit.

4 Annual Survey

After undergoing the original test and examination required by E.2, each crane is required to undergo an Annual Survey at intervals of 12 months. The Annual Survey should include the following:

- Visual inspection of the crane structure for deformation, excessive wear, corrosion, damage or fractures,as necessary. The boom is to be lowered for this examination.
- Visual examination of crane hooks for deformation, excessive wear or fractures.
- Nondestructive testing of crane hooks for fractures is to be carried out on all cranes used in the Offshore Drilling, Production and Construction industry and any crane used for personnel lifting.
- Visual external examination and operational test of crane machinery including prime mover, clutches,brakes; hoisting, slewing and luffing machinery.
- Visual inspection of wire rope including end attachments.
- The slewing ring assembly, where applicable, is to be examined for slack bolts, damaged bearings and deformation or fractured weldments. Rocking Tests, in accordance with the bearing manufacturer's instructions, are to be taken every six months. The results of these tests are to be recorded in the Register of Lifting Appliances for review by the attending surveyor at each annual survey.
- Functional tests including main and auxiliary load hoisting and lowering, boom raising and lowering,slewing (swinging), safety protective (fail-safe) and limiting devices and load and boom angle or radius indicators.

5 Retesting Survey

At intervals of five years, in addition to the requirements of the Annual Survey in G.4 above, the crane is to undergo testing and examination as noted in E.2. If movable weights are not available for proof tests, a dynamometer or load cell may be used in lieu of weights, provided that the tests are repeated at two locations, at opposite sides of the slewing circle. Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and BKI is prepared to do such retesting and note it in the Register of Lifting Appliances.

Prior to proof load testing, cranes fitted with slewing ring bearings are to undergo the following tests and examinations:

i) Cranes 1 to 5 years old – Surveyor is to witness Rocking Test and a grease sample is to be analyzed.

ii) Cranes 5 to 10 years old – Surveyor is to witness the requirements of i) above plus 10 percent of the slew ring bearing bolts are to be removed and nondestructively tested.

iii) Cranes 10 to 15 years old – Surveyor is to witness the requirements of i) above plus 15 percent of the slew ring bearing bolts are to be removed and nondestructively tested.

iv) Cranes 15 to 20 years old – Surveyor is to witness the requirements of i) above plus 20 percent of the slewing ring bearing bolts are to be removed and nondestructively tested.

v) Cranes 20 years and older – Surveyor is to witness the requirements of i) above plus 25 percent of all slewing ring bearing bolts are to be removed and nondestructively tested.

Notes:

1 If the results of the Rocking Test and grease samples indicate bearing wear in excess of the manufacturer's recommendation the bearing is to be opened for internal examination.

2 chosen for examination are to be taken from the most highly loaded area of the slew ring bearing. If any bolts are found with defects additional bolts are to be removed to confirm suitability for continued use.

Upon completion of proof tests, the critical welds of offshore crane pedestals are subject to the following nondestructive testing to the satisfaction of the attending Surveyor:

- Volumetric NDT of all critical butt welds in the crane pedestals, including any transition pieces between the pedestal and crane slew ring.
- NDT of critical fillet welds in the pedestal and transition pieces.

In addition to the items noted in E.2, the slewing ring assembly including bolting arrangements and foundation are to be examined for slack bolts, damaged bearings, and deformed or fractured weldments. As deemed necessary by the Surveyor, analysis of slew ring grease samples for metal particles and NDT examination of the slew ring for fractures or damage may be required.

6 Inspection of Wire Rope

All running wire ropes are to be visually inspected at each Annual and Retesting Survey. The crane Owner or operator is to examine the wire rope, including end connections, at frequent intervals between surveys.

Wire rope is not to be used if in any length of ten diameters:

- The total number of visible broken wires exceeds 5 percent of the total number of wires,
- If there is more than one broken wire immediately adjacent to an end fitting,
- If the broken wires are concentrated in one area or one strand, or
- If the rope shows signs of excessive wear, corrosion, flattening, kinks, separation of the strands or wires, core failures or other defect which renders it unfit for use.

7 Repairs and Alterations

7.1 Crane Structure, Booms and Permanent Fittings

When repairs or renewals, including welding and or replacement of major structural components are required to be made to the Primary or Secondary load bearing structures or permanent fittings of cranes, the repairs are to be carried out to the satisfaction of the Surveyor. Any welding is to be done by an approved procedure. Tests and examination of the crane are to be carried out in accordance with E.2, but a dynamometer or load cell may be used in lieu of weights. Examples of Primary or Secondary Load bearing structures are:

i) Booms, or jibs including chords and bracing
ii) Center post, gantry, mast or “A”-frame
iii) Pedestal
iv) Foundation
v) Revolving upper structure
vi) Swing circle assembly
vii) Pins and sheaves
viii) Load blocks, lower and upper
ix) Eye plates and brackets

7.2 Repairs to Loose Gear

Welding is not to be used to lengthen, alter or repair chains, hooks, links, shackles or swivels.

H. Register of Lifting Appliances

1 General

The Register of Lifting Appliances is to be available onboard for endorsement by the Surveyor at the time of periodical and damage surveys. See G.4 and G.5. In it is to be kept the diagram of the arrangement of the assembled crane, loose gear location and marking list, load diagrams, the particulars and location of special materials and welding procedures and record of periodical surveys. Also, attached to it are to be copies of certificates covering original and replacement loose gear, original tests to cranes and repairs or addition to cranes. An approved copy of the crane capacity rating chart is also to be included in the Register of Lifting Appliances as required in B.3.10

2 Certificates and Forms

The following certificates and forms are usually provided by the builder, manufacturer, testing authority or the firm undertaking annealing (when required). Copies as required and appropriate in each case are to be made available for inclusion in the Register. See H.1.

- F33.3.04-2012/Rev.0 Certificate of Test and Thorought Examination of Interchangeable Components and Loose Gear (ILO Form No.3)
- F33.3.05-2012/Rev.0 Certificate of Test and Examination of Wire Rope (ILO Form No.4)
- Manufacturer's bolt and torque standards for slew ring bearings
- Approved crane capacity rating chart
- Manufacturer's procedures for proof-testing of cranes including overriding of limiting devices (where required) to achieve full proof load.

The following forms and reports are provided and issued by the Surveyors (as applicable) upon completion of prescribed tests and surveys. Copies are to be included in the Register. See H.1

- F33.3.01-2012/Rev.0 Register of Lifting Appliances (ILO Form No. 1)
- F33.3.02-2012/Rev.0 Certificate of Test and Thorought of Lifting Appliances (ILO Form No. 2)

3 Owner's Overhaul and Inspection Record

A record is to be kept onboard the vessel or unit which is to show particulars of all overhauls, inspections, repairs and replacements carried out by the crane Owner or Operator between surveys. This record is to include a log of the "Rocking Test" results required by G.3 and G.4.

4 Repairs and Alterations

Certificates covering tests are to be inserted in the Register. See 1.

5 Addition of New Gear and Wire Rope

Replacement wire rope and loose gear is to be supplied with manufacturer's certificate conforming to tests in accordance with D.3 and D.1. The wire rope and loose gear certificates are to be inserted in the Register (see 1), and each article and certificate is to be identified as to location in the crane assembly. Certificates covering discarded loose gear are to be removed from the Register.

I. Personnel Lifting

1 General

Cranes intended for lifting or moving of personnel shall be equipped with the specific features given in the subsequent paragraphs, in addition to the other requirements of this Guidelines.

2 Personnel Rated Loads

A "load chart" is to be provided specifically for Personnel Lifts. The rated load when handling personnel shall be the least of

i) Thirty-three percent of the calculated SWL for non-personnel load ratings.

ii) Maximum load based on load line reeving and wire rope design factors as per 3.

iii) Maximum load based on load hoist line pull available considering line reeving losses with manufacturer's design reeving for a load at the boom tip.

The published "load chart" rated load shall be reduced from the above calculated rated loads by the weight of the hook and block excluding the load hoist rope. The personnel net or basket shall be considered part of the load.

The personnel rating of the crane shall be supplied on the load chart for all working radii.

3 Personnel Hoist System

The wire rope safety factor of load hoist wire rope when handling personnel shall not be less than 10.

The personnel rating design factor of the load block is to be not less than 12, based on the load block minimum plastic failure load. The load block used for personnel lifting is to be permanently marked with the maximum safe working load to be used for lifting personnel.

The latch of hooks used for personnel lifting is to be lockable.

4 Secondary Brake

In addition to the normal brakes, hoisting and luffing winches shall be equipped with a mechanically and operationally independent secondary brake, with separate control circuits.

The secondary brake shall preferably act directly on the winch drum but a fully independent load path will be considered on a case by case basis. Means shall be provided for the user to conduct an individual test of the secondary brake. The secondary brake shall fulfill the requirements given in F.8 for the rated capacity for lifting of personnel.

5 Cylinders

Where cylinders are used for lifting, folding or telescoping, they shall be provided with a mechanical "brake". Brakes based on hydraulic restrictions, such as shut off valves, etc. shall be capable of withstanding pressure shocks due to brake impacts. Fluid loss prevention shall be provided.

Alternatively each motion shall have two independent cylinders where each cylinder is independently capable of holding the rated capacity for personnel lifting.

6 Mode Selection for Personnel Lifting

The control station shall be equipped with a manual key selection switch for the purpose of lifting personnel. The switch shall be lockable in both the personnel lift mode and cargo lift mode positions with a removable key and have an adjacent warning light continuously indication when it is activated. The key may only be removed in normal operation (no personnel lifting). The light shall not illuminate unless selection for personnel lifting is made. Selection of modes shall only be possible without load on the hook.

When the mode for personnel lifting is selected, the following functions shall be maintained:

i) All brakes shall automatically be activated when the controls are in neutral position and in case of emergency stop being activated or the event of power failure.

ii) All automatic overload protection systems and manual overload protection systems are to be overridden and locked out.

iii) Where fitted, active heave compensation systems, active rope tensioning systems, passive heave compensation systems and passive rope tensioning systems shall be overridden and locked out, unless the heave compensation systems are specifically designed for personnel lifting.

7 Personnel Rescue

Cranes designed for the lifting of personnel shall have emergency means for the recovery of the lifted personnel from any position.

In the event of power failure or control system failures, means shall be provided for a controlled slew, luff down and lowering operation to land the personnel safely. Means shall provide controlled lowering and stopping of the hoist drum under all load conditions. A secondary power supply system and an independent control system for all main functions (i.e., hoist, luff and slew) may be used for this purpose.

The manual activation switches or handles for the emergency operation system shall be of a “hold to run type” and clearly and permanently marked for their purpose. An instruction plate giving detailed instructions shall be provided at the operator’s station for all procedures.

8 Structural Design Criteria

Providing a substantially increased structural safety margin for the personnel handling the rated load for these operations is established in 2i). This provides a dynamic factor of at least 4.0 against allowable stresses (i.e., Personnel Design Load to be 4 times the SWL) and at least a safety factor of 6.0 against yield for structural components (i.e., Allowable stress to be 0.167 times the yield point).

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Section 3

Guidelines for Certification of Cargo Gear on Merchant Vessels

A. General

1 Scope

This Guide sets forth requirements for certification of cargo gear installed aboard BKI-classed merchant vessels and covers the cargo gear, but is not limited to:

- Cargo gear as defined in 2.1
- Davits (or crane) - manual slewing type
- Engine room overhead cranes
- Monorail hoist

2 Definitions

2.1 Cargo Gear

Cargo Gear includes masts, stays, booms, winches, cranes, standing and running gear forming part of the shipboard cargo gear used in connection with the loading and unloading of a vessel. Slings, pallets, spreaders and similar loose gear, as well as vangs, preventers and the tackle and structures associated therewith, are not included in the certification of cargo gear unless their details were specifically approved.

2.2 Existing Cargo Gear

Existing Cargo Gear is defined as cargo gear not previously certified by BKI. See E.1

2.3 Safe Working Load

The Safe Working Load, SWL on which the design of any component part of the cargo gear is to be based, is to be taken as the maximum resultant load upon the component in the design conditions assumed.

2.4 Working Load of Assembled Gear

Working Load of Assembled Gear is the load for which each complete assembly is approved to lift excluding the weight of the gear itself (i.e., the load on the cargo hook). This load is the Safe Working Load, SWL, required to be marked on the heel of boom; see C. 3.4 and D. 3.4.

2.5 Swinging Loads

Swinging Loads refers to the use of a single boom to lift a load, with arrangements for changing the position of the boom while supporting the load.

2.6 Union Purchase

Union Purchase means an arrangement in which a pair of booms is used in combination, the booms being fixed and the cargo runners coupled. Such an arrangement is also known as "coupled derricks", "married falls", or "burtoning".

2.7 Ton

The Guide is written in SI units. 1 kN = 1000 N

B. New Cargo Gear

1 Certification

Certification may be granted subject to survey during the construction as well as during the installation of the gear.

2 Design

2.1 Design Plans Required

Plans showing a force diagram and principal details of the cargo gear are to be submitted for approval before the gear is fabricated.

2.2 Loading Conditions

The required factors of safety indicated in 3. 1 and 3.2 are to be obtained when considering maximum possible forces resulting from the working load of the assembled gear and the weight of the gear. For certification, the vessel will be considered on an even keel except where the maximum heel of the vessel is specified in submitted data. Where the SWL of the assembled gear exceeds 60 tonnes or where the factors of safety in 3.2 are to be used in design, the additional effects of list and trim, proof test loads and dynamic considerations are to be shown in a separate calculation and submitted for evaluation in each case. The loading conditions for certification of cargo gear of unusual design or subject to unusual operating conditions will be specially considered in each case.

2.3 Column Action Effect

Boom stresses are to be augmented to reflect the increased deflection from column action.

2.4 Material

The mechanical properties and chemical composition of the steel to be used in the booms, kingposts, masts and other principal structural parts are to be submitted. Steel having a yield point above 410 N/mm^2 is to be subject to special approval.

2.5 Minimum Thickness of Structural Members

Structural members are to be not less than 6.0 mm thick (see also Section 2, B. 2.2).

2.6 Quality Control

Quality control procedures including nondestructive inspection techniques to be employed during fabrication and erection are to be noted on design plans. If it is intended to utilize the minimum factor of safety as provided in 3.2, such procedures and techniques are to include welding procedure and operator qualification tests, established nondestructive test methods such as radiographic, ultrasonic, magnetic particle or dye penetrant inspection as appropriate in each case. The Surveyor may require such additional procedures as appropriate.

2.7 Stress Measurement

Results of stress measurements may be required for the assembled gear where the factors of safety from 3.2 are used in design.

2.8 Boom Foot Lift Prevention

Means are to be provided to prevent the foot of the boom being accidentally lifted out of its socket.

2.9 Assembled Gear Diagrams

A diagram showing the arrangement of the assembled gear indicating the approved safe working load and the identifying mark for each component part is to be inserted in the Register of Lifting Appliances and placed aboard the vessel (see M.1)

3 Safety Factors

3.1 Design of Cargo Gear

The factors of safety in Table 3.1, which are to be regarded as minimum, taken in association with suitable design assumptions, are to be used.

3.2 Special Consideration

In the design of cargo gear where appropriate consideration is given to documented design assumptions including dynamic effects, list and trim, and the loads to be imposed during proof tests, the factors of safety in Table 3.2, which are to be regarded as minimum, will be specially considered in each case. Written approval of BKI is to be obtained prior to applying the provisions of this Paragraph for design. See also 2.2, 2.6, and 2.7.

3.3 Other Standards

Reference to the applicable sections of generally recognized steel design standards appropriate to the construction and service which are to be identified on the plans submitted for approval and in the accompanying calculations will be specially considered in each case. In the calculation of allowable stresses permitted under such standards, detailed consideration are to be given to the weight of the gear, live loads, impact loads, loads resulting from the angle of heel of the vessel, an allowance for corrosion and the proof loads specified in C. 3.1.

TABLE 3.1 - Factors of Safety

Component Part	Working Load of Assembled Gear	Factor of Safety based on [1]	
		Minimum Ultimate Strength	Minimum Yield Point
All metal structural parts except steel booms, stayed masts, pins, and connections	5 tonnes or less 15 tonnes 60 tonnes or more	5.00 or 2.75 [2] 4.00 or 2.20 [2] 3.75 or 2.05 [2]	
Steel booms	10 tonnes or less 13 tonnes or more	--- ---	3.00 2.50
Stayed masts	10 tonnes or less 13 tonnes or more	5.00 4.00	--- ---
Pins and connections	10 tonnes or less	--- ---	3.00 [2] 2.50 [2]
Wire rope	10 tonnes or less 10 tonnes or more	5.00 See Note 4	--- ---
Manila rope [3]			
For fixed gear and vangs	All	7.00	---
For running rigging	All	5.00	---
Chains	All	4.50	---
Wooden structural parts	All	8.00	---

Notes:

1 Intermediate values of safety factors may be used.

2 The minimum yield point for design purposes is not to be considered greater than 72% of the minimum ultimate strength of the steel.

3 Where synthetic fiber ropes are substituted for manila ropes the size of the synthetic rope is to be determined from the following equation.

$$C = \sqrt{0.6 \cdot C_S^2 + 0.4 \cdot C_m^2}$$

where

C = required circumference of the synthetic rope, in mm.

C_s = circumference to the nearest 5 mm of a synthetic rope having a breakingstrength not less than that required for manila rope based on the table.

C_m = circumference of manila rope, in mm, based on the table.

In making such a substitution it is to be ascertained that the inherent characteristics of the synthetic fiber are suitable for the intended service of the rope.

4 Factor of Safety : $5 - \frac{SWL - 10}{50}$

TABLE 3.2 - Alternative Factors of Safety

Component Part	Working Load of Assembled Gear	Factor of Safety based on (1)	
		Minimum Ultimate Strength	Minimum Yield Point
All metal structural parts except steel booms, stayed masts, pins, and connections	5 tonnes or less	4.45	or 2.45 (2)
	15 tonnes	4.00	or 2.20 (2)
	60 tonnes or more	3.35	or 1.85 (2)

Notes:
1 Intermediate values of safety factors may be used.
2 The minimum yield point for design purposes is not to be considered greater than 72% of the minimum ultimate strength of the steel.

C. Original Tests to Cargo Gear

1 Loose Gear Test

1.1 Proof Test

1.1.1 Test Load

All chains, rings, hooks, links, shackles, swivels and blocks of cargo gear are to be tested with a proof load at least equal to that shown against the article in the following table:

Table 3.3 - Proof Load Test

Article of Gear	Proof Load (1)
Chain, ring, hook, link shackle or swivel	100% in excess of the safe working load
Pulley blocks:	
- Single sheave block	300% in excess of the safe working load (2)
- Multiple sheave block with safe working load up to and including 20 tonnes	100% in excess of the safe working load
- Multiple sheave block with safe working load over 20 tonnes up to and including 40 tonnes	20 tonnes in excess of the safe working load
- Multiple sheaves block with safe working load over 40 tonnes	50% in excess of the safe working load

Notes:
1 Alternatively, the proof tests as required in "Code Practice on Safety and Health in Port" may be accepted where the items of gear are manufactured or tested or both and intended for use on vessels under jurisdictions accepting these requirements.
2 The safe working load to be marked on a single sheave block is to be the maximum load which can safely be lifted by the block when the load is attached to a rope which passes around the sheave of the block. In the case of a single sheave block where the load is attached directly to the block instead of to a rope passing around the sheave, it is permissible to lift a load equal to twice the marked safe working load of the block as defined in this note.

1.2 Inspection

After being tested, all the gear is to be examined, the sheaves and the pins of the pulley blocks being removed for the purpose, to see whether any part has been injured or permanently deformed by the test.

1.3 Certificates

Articles of gear are to have a certificate furnished by the manufacturer or the surveying authority. The certificate is to show the distinguishing number or mark applied to the article of gear, description of particular article of gear, kind of material, carbon content, date of test, proof load applied and safe working load and is to be attached to the Register of Lifting Appliances (see M.1). The safe working load SWL is to be marked on the blocks.

1.4 Special Components

Blocks of special nature, together with their connecting components, special lifting devices and components built into or for cranes, heavy lift gear or hoisting machinery which are specially designed for use with a particular lifting unit, the designs of which are submitted for approval as steel structural parts, need not be considered loose gear for the purpose of certification. They are, however, to be tested and examined with the gear as a unit, as required by C.3. Appropriate nondestructive methods of examination will be required where visual inspection is considered to be inadequate.

2 Wire Rope Test

All wire rope of cargo gear is to have a certificate of test, furnished by the manufacturer or the surveying authority, showing at least the following breaking test load for sample :

Table 3.4 - Breaking Test Load

Lifting Capacity	Breaking Test Load for Sample
10 tonnes or less	5 × SWL
10 tonnes or more	FS × SWL

Factor of Safety (FS) : $5 - \frac{SWL - 10}{50}$

This certificate is to show also size of rope, in mm, number of strands, number of wires per strand, quality of wires and date of test and is to be attached to the Register of Lifting Appliances (see M.1).

3 Proof Test to Gear as a Unit

3.1 Test Loads

Before the cargo gear is placed in service, it is to be tested on the vessel to the following proof loads :

Table 3.5 - Cargo Gear Proof Load Test

Working Load of Assembled Gear	Proof Load
Up to 20 tonnes	25% in excess
20 tonnes to 50 tonnes	5 tonnes in excess
Over 50 tonnes	10% in excess

3.2 Testing and Inspection Details

Unless otherwise approved, the proof load is to be applied by hoisting movable weights with the cargo boom at an angle to the horizontal which is to be stated in the certificate of the test. This angle is not to be greater than 15 degrees to the horizontal for loads up to and including 10 tonnes and 25 degrees for loads above 10 tonnes , or the lowest angle approved in association with the design, or when these angles are impracticable, at the lowest

practicable angle. After the proof load has been lifted, it is to be swung as far as possible in both directions. After being tested as aforesaid, all cargo gear, with the whole of the gear accessory thereto, and all chains, rings, hooks, links, shackles, swivels, pulley blocks or other loose gear is to be examined to see whether any part has been injured or permanently deformed by the test.

3.3 Source of Electrical Power

Current for electrical winch operation during the test is to be taken through the vessel's cables. Shore current may be used when connected to the main switchboard.

3.4 Braking Requirements

On all types of winches, efficient means are to be provided to stop and hold the load in any position and such means shall be demonstrated. Where electrical winches are fitted with efficient electromagnetic brakes, mechanical brakes for manual operation will not be required, but if fitted, are to be in operating condition.

3.5 Marking of Assembled Gear

The Safe Working Load, SWL, for the assembled gear is to be marked on the heel of all booms and cranes in contrasting colors to the background, with minimum angle to the horizontal at which this load may be applied and date of test. Letters and numbers are to be at least 25 mm high.

3.6 Record of Cargo Gear Test

Copy of the certificate of cargo gear test issued by the Surveyor is to be attached to the Register of Lifting Appliances (see M. 1).

D. Union Purchase

1 General

1.1 Certification Procedure

Cargo gear may be certified for union purchase only when the gear is certified in accordance with B, C and E.

1.2 Working Conditions for Gear

The safe working load for union purchase should be determined with due regard for the swinging safe working loads for which the individual booms are certified. In no case is the safe working load for union purchase to exceed the safe working load of either of the individual booms and their associated gear for swinging loads.

1.3 Boom Head Locations

The boom head locations for the certification of union purchase conditions should reflect realistic operating conditions for the particular gear and hatch configuration.

2 Design

2.1 Design Plans Required

Plans are to be submitted showing the configuration of the cargo gear, vang and preventer details and locations, hatch opening, coaming height, deck at side, bulwark height, vessel's maximum beam and the boom head location over the hatch and over the side of the vessel.

2.2 Force Diagrams and Calculations

Force diagrams and calculations are to be submitted showing the forces in all components of the gear for the configuration to be certified.

2.3 Path of Load Hook for Analysis and Testing

The path of the load hook between booms for analysis and testing is to be a straight line parallel to the deck. The height of the path above the deck is to be the lowest height at which the angle between the cargo runners equals 120 degrees. Where sufficient hook clearance above coamings and bulwarks can be obtained using a lesser height, such a height may be approved.

2.4 Angle Between Cargo Runners

The angle between the cargo runners is not to exceed 120 degrees.

2.5 Record of Union Purchase Arrangement

A diagram showing the configuration of the gear, vang locations and boom head locations for which the gear is certified is to be submitted and placed in the Register of Lifting Appliances (See M.1).

2.6 Factors of Safety

Factors of safety are to be as specified in B.3.

3 Proof Test to Cargo Gear for Union Purchase

3.1 Required Tests

Before the cargo gear is placed in service, it is to be tested and examined, with the addition of those items specified in the following paragraphs.

3.2 Gear Rigged for Testing

The gear is to be rigged as shown on the diagram required by D. 2.5.

3.3 Testing and Inspection Details

The proof load as specified in 3.1 is to be applied by hoisting movable weights. The proof load is to be lifted to the approved hook height above the deck in such a manner that all the load is taken by one runner, then transferred along a path parallel to the deck until it reaches the other boom and the entire load is taken by the runner which had been slack. After being tested as aforesaid, the gear is to be rigged so that the inboard (hatch) boom will become the outboard (shore) boom and vice versa. The test is to then be repeated. After being tested for union purchase on both sides of the vessel, all cargo gear, with the whole of the gear accessory thereto, and all chains, rings, hooks, links, shackles, swivels, pulley blocks or other loose gear are to be examined to see whether any part has been injured or permanently deformed by the test.

3.4 Marking for Union Purchase

The Safe Working Load for union purchase, SWL (U), for the assembled gear is to be marked on the heel of each of the booms in contrasting colors to the background, with the date of test. Letters and numbers are to be at least 25 mm high.

3.5 Record of Union Purchase Test

Copies of the certificate of union purchase test issued by the Surveyor and the diagram showing the configuration of the gear (see D.2.5) are to be attached to the Register of Lifting Appliances (see M. 1).

E. Existing Cargo Gear

1 Existing Cargo Gear without Register

For existing cargo gear that does not have a Register issued by a recognized classification society, or a recognized cargo gear organization, submission of information as noted in B.2.1, with verification of material, is required.

Existing cargo gear may be certified subject to satisfactory plan review, general examination, operational tests including luffing, slewing, test of safety devices, and proof testing of the cargo gear as a unit as required by C.3, with the exception that a dynamometer or load cell may be used.

The test should not be regarded as satisfactory unless the load indicator remains constant for a period of at least five minutes. The general examination shall include visual inspection for excessive wear, damage, corrosion, and fractures. Nondestructive testing or verification of materials may be required at the discretion of the Surveyor. In addition, all cargo gear hooks are to be examined using magnetic particle or other suitable crack detecting inspection methods to the satisfaction of the attending Surveyor.

2 Existing Cranes with Register

For cargo gear having a Register issued by a recognized classification society or a recognized cargo gear organization, evidence of previous design approval is to be submitted. Suitable evidence of the design approval would be an approval letter from the authority issuing the previous register or the previous register itself. An BKI Register of Lifting Appliance may be issued after review of above data and a proof test and examination in accordance with the requirements of F.2.

F. Periodical Surveys

1 Annual Inspection

After undergoing the original test and examination required by C. 3 and D. 3, when applicable, every vessel is required to undergo an inspection by the Surveyor at intervals of 12 months, at which time the cargo gear is to be examined, including a thorough examination of the gear which does not require to be periodically heat treated, and the certificate of inspection furnished to be attached to Register of Lifting Appliances (see M. 1).

2 Retesting Survey

At intervals of five years, the cargo gear is to undergo the proof loads and examination stated in C. 3 and D.3, when applicable, together with removal of pins from sheaves and pulley blocks for examination. Where the boom head and heel blocks are fitted with ball or roller bearings, the removal of the pins may be dispensed with at the discretion of the Surveyor. If movable weights are not available, a spring or hydraulic balance may be used for testing for swinging loads. In the case of use of spring or hydraulic balance, the proof load is to be applied with the boom swung, as far as possible, first in one direction and then in the other. The Surveyor may at his discretion require the proof load to be applied with the boom at intermediate positions. The test should not be regarded as satisfactory unless the indicator remains constant for a period of at least five minutes. Certificate of survey is to be furnished and attached to Register of Lifting Appliances (see M.1).

Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and BKI is prepared to do such retesting and note it in the Register of Lifting Appliances.

G. Examination of Cargo Gear Prior to Use

1 General

All wire rope, chains (other than bridle chains attached to booms or masts) and all rings, hooks, links, shackles, swivels and pulley blocks used in loading or unloading are to be inspected by the vessel's officer designated by the Master immediately before each occasion on which they are used in loading or unloading.

H. Repairs

1 Mast, Booms and Permanent Fittings

When important repairs or renewals are required to be made to the masts, booms and permanent fittings of cargo gear, the repairs are to be carried out under the attendance and to the satisfaction of the Surveyor. Tests and examination of the particular cargo gear as may be deemed necessary are to be carried out in accordance with C. 3 and D. 3 when applicable, but spring or hydraulic balances may be used in lieu of weights when testing for swinging loads. Certificates covering tests are to be attached to Register of Lifting Appliances (see M. 1).

2 Repairs to Cargo Gear

When welding is used to lengthen, alter or repair chains, rings, hooks, links, shackles or swivels, they are to be properly heat treated and are to be adequately tested and examined in accordance with C.1 and certificate furnished before being again put in use. The certificates are to be attached to the Register of Lifting Appliances (see M. 1).

I. Additions to Cargo Gear

1 Addition of New Gear and Wire Rope

When articles of loose gear and wire rope conforming with tests in accordance with C.1 and C.2 are supplied from time to time, the vessel's officer designated by the Master is to enter and initial such replacements in the record noted in M. 3 kept with the Register of Lifting Appliances (See M. 1), identifying each article and certificate of same.

J. Wire Rope and Chains

1 Splicing of Wire Rope

A thimble or loop splice made in any wire rope is to have at least three (3) tucks with a whole strand of the rope and two (2) tucks with one-half of the wires cut out of each strand, provided that this requirement does not prevent the use of another form of splice which can be shown to be as efficient as that required in this Subsection. Clips for splicing wire rope are not acceptable.

2 Condition of Wire Rope

No wire rope is to be used if in any length of eight (8) diameters, the total number of visible broken wires exceeds 10% of the total number of wires, or if the rope shows signs of excessive wear, corrosion or other defect which renders it unfit for use.

3 Knots in Chain

Chains are not to be shortened by tying knots in them.

K. Annealing

1 Chains, Hooks and Connecting Elements

Chains, hooks, rings, links, shackles and swivels of wrought iron used in loading or unloading are to be annealed at the following intervals.

Chains and gear in general use and of 12.7 mm or less, once at least in every six months.

All other chains and gear, including span (topping lift) chains in general use, once at least every 12 months.

2 Annealing Details

The annealing is to be done in a suitable closed oven and not over an open fire. Wrought iron is to be annealed at a temperature of between 593°C to 649°C for a period between 30 and 60 minutes. After being annealed, the article should be allowed to cool slowly.

3 Annealing Certificate

A certificate on prescribed form (see F33.3.10-2012/Rev.0 Certificate of Heat Treatment of interchangeable Component and Loose Gear which Require such Treatment) furnished by the firm undertaking the annealing, describing gear annealed, which is to be attached to the Register of Lifting Appliances (see M. 1).

L. Register of Lifting Appliances

1 Availability of Register of Lifting Appliances

Every vessel is to carry a Register of Lifting Appliances which is to be open to inspection by a proper authority and be available for endorsement by the Surveyor at the time of periodical surveys (see F. 1 and F. 2) and repairs (see H. 1 and H. 2). In it is to be kept the diagram of the arrangement of the assembled gear, the particulars of special materials, periodical surveys and annealing of wrought iron gear as required by L. 1. Attached to it is to be copies of certificates covering original tests to cargo gear and repairs and additions to cargo gear as required in C. 1.3, C. 2, C. 3.6, D. 3.5, H. 1, H. 2, J. 1 and L. 3.

2 Cargo Gear Overhaul and Replacement Record

A record is also to be kept which is to show particulars of all overhauls and replacements to cargo gear.

Section 4

Derrick Booms, Masts and Accessories

The Requirements for design and dimensioning of Derrick booms, masts and accessories see **BKI Regulation for the Construction and Survey of Lifting Appliances-1998 Section 3**.

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Section 5

Guidelines for Certification of Shipboard Elevators

A. General

1 Scope

This Guidelines provides requirements for the certification of shipboard elevators on vessels classed with BKI. The requirements contained herein are applicable to personnel and passenger elevators of the traction and winding drum type driven by electric or hydraulic motors. They apply also (with modifications as noted) to elevators of the direct-plunger hydraulic type, roped hydraulic type and rack-and-pinion type. They do not apply to lifts for the vertical movement of cargo or to other devices such as dumbwaiters, all of which are subject to special consideration. Personnel and passenger elevators certified in accordance with the requirements of this Guidelines may be used to transport vessel's stores and equipment.

2 Submission of Design Plans and Data

Plans, specifications and design data are to be submitted for approval as indicated below:

- Rated load, rated speed and operating conditions.
- Hoistway construction and arrangement details including size and location of structural members, machine beams, buffer supports, guide rails and brackets, etc., together with a load diagram indicating magnitude, direction and point application of loads incident to elevator installations. Also, details of openings, doors and fire integrity of enclosure.
- Car construction details including entrances and doors, guides and net inside platform area.
- Counterweight construction details.
- Details of driving machines, brakes and buffers.
- Wire rope data (as indicated in D.11.5).
- Electric power installation details including traction or hoisting motors, motor generator sets, controls, wiring and protective devices.
- Details of lighting, alarms, controls, interlocks, safety devices, communication systems and ventilation.
- Hydraulic and control piping system details, including cylinders, pumps and hydraulic motors as required for hydraulic installations.
- Arrangements for emergency operations, including means of escape, manual control and operation of car and counterweight safeties.
- Ventilation arrangements for the elevator car and hoistway.

Plans should generally be submitted in hard copies to BKI. However, electronic drawing will also be accepted.

3 Design Criteria

3.1 Operating Conditions

Elevators, together with ancillary equipment and controls, are to be capable of satisfactory operation with the vessel in motion under the following conditions inherent to the installation location:

i)	Continuous vibrations:	2 mm peak to peak of frequency 0 to 25 Hz
ii)	Rolling:	±10 degrees, period 10 seconds
iii)	Pitching:	±5 degrees, period 7 seconds

iv) Heaving amplitude, A: period 10 seconds, calculated by the formula:

$$A = 3.8 – 0.01(L – 250) \text{ m}$$

where L is the length of the vessel in m. See B.11. The heaving amplitude, *A*, need not be taken to be greater than 3.8 m

The manufacturer is to certify the maximum conditions of roll and pitch for which the elevator can remain in operation, and when these limits are exceeded, the elevator is not to be operated. In addition to the operational limits noted above, the elevator and ancillary equipment are to be capable of sustaining without damage (in the out-of-service condition) ship motions as follows.

i) Rolling: ±30 degrees, period 10 seconds

ii) Pitching: ±10 degrees, period 7 seconds

3.2 Control Systems

Control systems are to be designed to operate satisfactorily under conditions of vibration, voltage regulation and frequency variation present in the vessel (see Part 1, Seagoing Ships, Volume VII)

3.3 Corrosion Resistance

All equipment is to be designed to withstand corrosion conditions inherent in the marine environment.

3.4 Rated Speed

Generally, rated speeds for elevators are not to exceed 60 m per minute. Rated speeds for elevators of the winding drum type are not to exceed 30 m per minute (see D.10.2). Other types of elevators having rated speeds in excess of 60 m per minute will be subject to special consideration.

3.5 Rated Load

Rated load for elevators is the lifting capacity and is to be based on the inside net platform area. The rated load is to be not less than shown in the table 5.1.

Table 5.1 - Rated Load

Inside Net Platform Area	*Rated Load*
m^2	*N*
0.65	2250
0.77	2 650
0.89	3150
1.23	4400
1.45	5400
1.76	6850
2.05	7850
2.25	8850
2.70	11300
3.13	13250
3.53	15700
3.92	17650
4.29	19600
4.65	22050

B. Definitions

The following definitions of terms are to be understood (in the absence of other specifications) where they are used in this Guide.

1. Buffer

A *Buffer* is a device designed to stop a descending car or counterweight beyond its normal limit of travel by storing or absorbing and dissipating the kinetic energy of the car or counterweight. A spring buffer utilizes one or more springs to cushion the impact force of the descending car or counterweight. An oil buffer uses oil as a medium to absorb and dissipate the kinetic energy of the car or counterweight.

2. Car

An *Elevator Car* is the load-carrying unit including its platform, car frame, enclosure and car door.

3. Driving Machine

A *Driving Machine* is the power unit which applies the energy necessary to raise and lower an elevator.

3.1 Traction Driving Machine

A *Traction Machine* is a direct-drive machine in which the motion of the car is obtained through friction between the suspension ropes and a traction sheave.

3.2 Winding Drum Driving Machine

A *Winding Drum Machine* is a gear-drive machine in which the suspension ropes are fastened to wind on a drum.

3.3 Hydraulic Driving Machine

A *Hydraulic Machine* is one in which energy is applied by means of a liquid under pressure in a cylinder equipped with a plunger or piston.

3.3.1 Direct-plunger Hydraulic Driving Machine

A *Direct-plunger Hydraulic Machine* is a hydraulic driving machine in which the plunger or cylinder is directly attached to the car frame or platform.

3.3.2 Roped Hydraulic Driving Machine

A *Roped Hydraulic Machine* is a hydraulic driving machine in which the plunger or piston is connected to the car by means of wire ropes or indirectly coupled to the car by means of wire ropes and sheaves.

3.4 Rack-and-Pinion Driving Machine

A *Rack-and-Pinion Machine* is an electric driving machine in which the motion of the car is obtained by power driving pinion(s) mounted on the car, traveling on a stationary rack mounted in the hoistway.

4. Elevator

As used herein, the term *Elevator* denotes lifting equipment for the vertical transportation of crew, passengers, visitors or others having business with the vessel, as well as vessel's stores and equipment (provided the load rating is not exceeded), which is permanently installed in the vessel,
serves defined landing levels and comprises an enclosed car running between rigid guides, the dimensions and means of construction of which permit access of persons.

5. Factor of Safety

Factor of Safety is the ratio of ultimate strength to the working stress of a member under maximum static loading.

6. Governor

A *Speed Governor* is a continuously operating speed monitoring and detection device which, at predetermined speeds, provides signals to the controller and imparts a retarding force to activate the car or counterweight safety.

7. Hatch

A *Hatch* is a horizontally or vertically positioned door in the trunk or roof of the car.

8. Headroom

The hoistway *Headroom* is the clear space between the top of the car, at its highest landing, and the overhead structure in the hoistway.

9. Hoistway

A *Hoistway* is an opening through a structure for the travel of elevators, extending from the pit floor to the roof or floor above. The hoistway enclosure is the fixed structure consisting of vertical walls or partitions, which isolates the hoistway from all other areas or from an adjacent hoistway and in which the hoistway doors and door assemblies are assembled

10. Landing

An *Elevator Landing* is the portion of a deck or platform used to receive and discharge persons. The bottom terminal landing is the lowest landing served by the elevator. The top terminal landing is the highest landing served by the elevator.

11. Length (of Vessel)

The *Length of the Vessel*, for the purpose of this Guide, is the length, in meters, measured between perpendiculars taken at the extremities of the deepest subdivision load line.

12. Lift

Elevator, see B.4.

13. Passenger

A *Passenger* is every person other than the Master and members of the crew or other persons employed or engaged in any capacity onboard a vessel for the business of that vessel.

14. Pit

The *Elevator Pit* is the portion of the hoistway extending from the sill level of the lowest landing to the floor at the bottom of the hoistway.

15. Rated Load

Rated Load is the load which the elevator is designed and installed to lift at the rated speed.

16. Rated Speed

Rated Speed is the speed at which the elevator is designed to operate in the upward position with rated load in the car.

17. Rope

A *Suspension (Hoisting) Rope* is the wire rope used to raise and lower an elevator car or its counterweight, or both. A compensating rope is a wire rope used to counterbalance, or partially counterbalance, the weight of the suspension ropes.

18. Safety

A *Car or Counterweight Safety* is a mechanical device attached to the car frame or to the counterweight frame, to stop and hold the car or counterweight under conditions of overspeed, free-fall or slackening of the suspension ropes.

19. Stroke (of Buffer)

Spring Buffer Stroke is the distance the contact end of the spring can move under a compressive load until all coils are essentially in contact with each other or until a fixed stop is reached. Oil buffer stroke is the oil-displacing movement of the buffer plunger or piston.

20. Travel

Travel is the vertical distance between the bottom terminal landing and the top terminal landing.

21. Traveling Cable

A *Traveling Cable* is made up of electrical conductors which provide electrical connection between an elevator and a fixed outlet in the hoistway or machine room.

22. Trunk

Hoistway, see B.9.

C. Materials

1. Material Standards

Materials intended for use in the construction of elevators are to be manufactured and tested in accordance with *Part 1 Seagoing Ships, Volume V, Rules for Material* as applicable and as limited by this Guide. Materials conforming to other recognized standards will be considered, provided they are not less effective.

2. Gray Cast Iron

Gray cast iron is not to be used for parts subject to tension or shear including machinery or equipment supports, worms, gears, shafts or any parts of the machinery which are in motion. Gray cast iron is not to be used in the construction of car frames, platforms or safeties. Ductile (nodular) iron conforming to the requirements of *Part 1 Seagoing Ships, Volume V, Rules for Material* Section 8.C may, in general, be used without limitation.

3. Non-combustible Material

All materials used in the construction of the hoistway, car frame and car and machine room (seeD.9) are to be incombustible except that material of low flame spread may be used for decorative trim within the car.

D. Construction

1. Hoistway

1.1 General

Each elevator is to operate in a hoistway (trunk) entirely enclosed over all its height by means of a solid steel enclosure and complying with the following requirement

1.2 Strength of Enclosure

The hoistway enclosure is to be of sufficient strength to prevent contact between the enclosure and the car or counterweight when the enclosure is subjected to a force of 1112 N applied at right angles at any point over an area of 102 mm by 102 mm.

1.3 Fire Protection

1.5.1 Passenger Vessels

For passenger vessels, the fire integrity of the hoistway enclosure is to be in accordance with Chapter II-2, Part A, Regulation 2 or Part C, Regulation 9 of the International Convention for the Safety of Life at Sea (SOLAS) 1974 and Amendments in force, as applicable. The hoistway is also to comply with Chapter II-2, Regulation 13.

1.5.2 Cargo Vessels

For cargo vessels, including tankers, the fire integrity of the hoistway enclosure is to be in accordance with Chapter II-2, Part A, Regulation 2 or Part C, Regulation 9 of the International Convention for the Safety of Life at Sea (SOLAS) 1974 and Amendments in force, as applicable. The hoistway is also to comply with Chapter II-2, Regulation 13.

1.5.3 Mobile Offshore Drilling Units

For mobile offshore drilling units, the hoistway and the fire integrity of the hoistway enclosure is to be in accordance with Part.5-Offshore Technology Volume IV Rules for Machinery Installation Section 10.

1.4 Elevators Traveling within a Single Compartment

Hoistways for elevators which serve one or more grating levels and which pierce no solid decks (as for engine rooms, cargo holds or pump rooms) may be of the open type, suitably enclosed with wire mesh or expanded metal having openings the maximum of 25 mm.

Elevators in atriums on passenger vessels serving multiple decks may be of an open type.

1.5 Multiple Elevators in Single Hoistway

Where two or more elevators are fitted in one hoistway, the car and counterweight of each elevator is to be separated from those of other elevators by means of sheet steel, which need not be fire rated, over the full height of the hoistway. Wire mesh is not permitted for this purpose.

1.6 Bottom and Top Car Clearance

When the car is resting on its fully compressed buffers, the free distance between the pit floor and the underneath of the car floor is to be at least 600 mm.

For traction lifts, when the counterweight is resting on its fully compressed buffers or, for positive drive lifts, when the car is stopped at its highest possible position, the free distance above the roof of the car is to be at least 750 mm. Additionally, an unobstructed area of not less than 0.5 m^2 is to be provided at the top of the enclosure for refuge space. This space is to measure not less than 600 mm on any side and have a height of no less than 1100 mm when the car has reached its maximum upward movement.

1.7 Openings in Hoistway

Openings in hoistway bulkheads are to be protected by doors of like construction and fire-resistive rating as the bulkheads.

1.8 Protection Against Flooding

Hoistway enclosures are to be constructed and located so as to prevent the entrance of water and hoistway doors are not to be exposed to the open deck.

1.9 Ventilation

The hoistway is not to be used as part of the ventilation ducting for the vessel, but it is to be ventilated by an independent system complying with G.3.1.

1.10 Escape Ladder

The hoistway is to be fitted with a fixed ladder or pole steps over its entire height, giving access to landing doors and to the escape hatch, if any, in the headroom (see D.7.7 andE.9.2).

1.11 Equipment Permitted in Hoistway

Only equipment which forms part of the elevator installation is to be permitted on the interior of the hoistway enclosure.

1.12 Traveling Cables

Traveling cables inside the hoistway are to be protected against damage by an internal smooth metal trough, the width of which is to permit passage of the free hanging loop of the traveling cable and which is to be provided with a slot having round edges, permitting the free passage of the cables coming from the elevator car. See also F.4.

2. Guide Rails

2.1 General

Elevators are to be provided with car guide rails and counterweight guide rails (where counterweights are fitted) which are to extend so that guiding members cannot travel beyond the ends of the guide rails with the car in extreme positions of travel.

2.2 Materials

Guide rails, brackets, rail clips, fishplates and their fastenings are to be of steel construction.

2.3 Spacing of Brackets

Guide rail brackets, suitably supported, are to be provided and are to be spaced not more than 2.4 m apart.

2.4 Strength and Deflection

Car and counterweight rails are to be capable of withstanding loads resulting from operation of the car or counterweight safeties (seeD.5) under test conditions, or from loads imposed by motion of the vessel as described in A.3.1, without permanent deformation. Deflection of car and counterweight guide rails is not to exceed 3 mm for operation under the conditions outlined in A.3.1.

3. Hoistway Doors

3.1 General

Hoistway doors are to be of the single or double panel, horizontal sliding type or single section swinging type, and may be either manually or power operated. They are to be guided top and bottom and are to completely close the hoistway opening. Other types of hoistway doors (i.e., vertical sliding, combination) will be considered provided the design and installation is not less effective.

3.2 Restraint Systems

Doors are to be provided with restraint systems so that they will be held closed or held open (as the case may be) against maximum motion of the vessel specified in A.3.1.

3.4 Closing of Hoistway Doors

Doors are to be arranged to close automatically if the car leaves the landing for any reason. Doors are to be interlocked with the control system to prevent operation of the car unless the doors are closed. See E.2.

3.5 Vision Panels

Each manually operated or self-closing door of the sliding type is to be provided with a vision panel of clear wire inserted glass not less than 6 mm thick having an area not less than 0.015 m^2, except at landings of automatic elevators where a hall position indicator is provided. Vision panels of this type are also to be fitted in all swinging doors. The total area of vision panels in any hoistway door is not to be greater than 0.055 m^2

3.6 Size of Hoistway Entrances

The clear opening of each hoistway entrance is to be not less than 800 mm wide and 2030 mm high.

3.7 Escape Doors

In general, an emergency escape door is to be provided at every third deck, but not more than 11 m apart from sill-to-sill. Emergency or access doors for inspection and maintenance may be horizontal swinging type, in which case they are to open outward. All such doors are to be of steel construction and are to be interlocked with the elevator control system to prevent operation of the elevator unless they are in the closed position. E.2. For elevators of the direct-plunger hydraulic type, emergency doors are required only when car safeties are provided.

3.8 Location of Hoistway Entrances

Hoistway doors are not to be located with direct access to machinery spaces or hazardous areas. See J.

3.9 Illumination at Entrances

For lighting requirements, see F.2.4.

3.10 Flooring

Deck areas at entrances to elevators are to be slip resistant.

4. Car Frame and Enclosure

4.1 General

Car frames, platforms and enclosures are to be of steel construction designed to withstand forces resulting from rated loads and from motion of the vessel as outlined in A.3.1.

Materials other than steel may be considered for elevators for the compartments as specified in D.1.4. The arrangement and details are to be submitted for review.

4.2 Guides

Car frames are to be guided on each guide rail by upper and lower guide shoes or rollers attached to the frame. Guide shoes or rollers are to be of a proven design modified and reinforced as necessary to provide for loading resulting from motion of the vessel.

Cars are also to be fitted with a guidance medium independent of the normal guide shoes or rollers. This may be achieved by an independently fixed steel plate which will locate onto the guide rails in the event of primary guidance failure. Where the rail and guidance system are arranged such that the guide rails will not become disengaged under the worst case operating and static conditions, a secondary guidance system will not be required.

4.3 Car Platforms

Car platforms and enclosures are to be non – perforated, properly stiffened and attached to the car frame.

4.4 Car Doors

Car doors are to be of the single or double panel, horizontal sliding type of a construction similar to that specified for hoistway doors inD.3, including restraint systems and interlocks, but excluding the requirements for fire resistive rating. Vision panels are not required, but if provided, they are to comply with D.3.5. Other types of closures will be subject to special consideration. Each power operated door is to be fitted with a protective device on each leaf which will reopen the car door and the hoistway door in the event of obstruction. This device is to extend for the full length of the door.

4.5 Escape Hatch

An escape hatch is to be provided in the overhead of the elevator car. The escape hatch is to have an area of at least 0.26 m^2 and is to measure not less than 400 mm on any side. Also refer to E.9.5.

4.6 Ventilation

For ventilation requirements, see G.3.2.

4.7 Illumination of Cars

For lighting requirements, see F.2.1.

4.8 Handrails

Handrails are to be provided around the interior of the car except in way of the entrance.

4.9 Flooring

Cars are to be provided with slip resistant flooring.

5 Car Safety

5.1 General

A car safety is required for each car that is suspended by wire ropes and the safety is to be mounted on the car frame. A car safety is also required for each rack-and-pinion elevator (see D.5.7).

5.2 Operation of Safeties

Safeties are to operate on overspeed, free-fall or slackening of the suspension ropes. They are to act by applying pressure on the guide rails and are to be applied mechanically. Electric, hydraulic or pneumatic devices are not to be used to apply safeties nor to hold safeties in a retracted position.

5.3 Release of Safeties

Safeties are to be released only by upward movement of the car.

5.4 Stopping Distances and Governor Tripping Speeds

Stopping distances and governor tripping speeds are to be in accordance with the table 5.2:

Table 5.2 - Maximum Governor Trip Speed & Stopping Distance

Rated Speed	*Maximum Governor Trip*	*Maximum Stopping Distance*
m per minute	*m per minute*	*mm*
38 or less	54	380
45	63	406
52	75	483
60	84	559

5.5 Marking Plates

A metal plate is to be attached to each safety indicating the maximum tripping speed for which the safety may be used and the maximum weight for which the safety is designed and installed to stop and sustain.

5.6 Car Safeties for Direct-Plunger Hydraulic Elevators

When car safeties are provided, they are to comply with D.5.2 through D.5.5.

5.7 Car Safeties for Rack-and-Pinion Elevators

Elevators of the rack-and-pinion type are to be provided with a safety complying with D.5.2 through D.5.5 or with a rack-and-pinion safety. Rack-and-pinion safeties are safeties in which a freely rotating pinion travels on a stationary rack mounted vertically on the hoist structure. The rotating pinion drives the governor. When the speed of the car reaches the tripping value, the rotating governor actuates the safety. Stopping distances and governor tripping speeds for rack-and-pinion safeties are to be in accordance with the table 5.3:

Table 5.3 - Stopping distances and governor tripping speeds for rack-and-pinion-type elevator

Rated Speed	*Maximum Governor Trip*	*Maximum Stopping Distance*
m per minute	*m per minute*	*mm*
37.8 or less	52.8	1639
45.6	63.6	1704
53.4	82.2	1791
60.6	85.2	1867

6. Counterweights

6.1 General

Counterweights for traction elevators are to be provided with rigid steel frames so designed as to retain the filler weights securely in place. Concrete fillers in counterweights are not permitted.

6.2 Guides

Counterweight frames are to be provided with primary and secondary guides similar to those specified for car frames (see D.4.2).

6.3 Counterweight Safety

A safety similar in operation to those specified for elevator cars (see D.5) is to be provided and mounted on the frame of each counterweight.

6.4 Counterweight Runways

Counterweight runways are to be guarded within the pit area by wire mesh enclosures with removable panels for access and inspection.

7. Elevator Pit and Headroom

7.1 General

The headroom and pit are to permit a person in the hoistway to be protected when the car is at its highest or lowest position.

7.2 Depth of Pit

The depth of the pit is to be sufficient for installation of and access to all elevator accessories located therein and to allow for run by of the elevator car and compression of buffers.

7.3 Access to Pit

Access to the pit may be from the lowest hoistway door or a separate access door may be provided. Where a separate access door is provided, it is to be self closing with a spring type lock arranged to permit the door to be opened from inside the pit without a key. Such doors are to be normally locked from the outside and are to open outward unless they do not interfere with moving equipment within the pit when opened inward.

7.4 Strength of Pit Base

The base of the pit is to be designed for an imposed load of not less than 5000 N/m^2.

7.5 Illumination of Pit

Each pit is to be provided with a permanent lighting fixture. See F.2.5.

7.6 Stop Switch in Pit

There is to be provided in the pit of each elevator a manually operated enclosed switch. When opened, this switch is to cause the electric power to be removed from the driving machine and brake. The switch is to be accessible from the pit access door.

7.7 Headroom Escape Hatch

For elevators reserved for the crew, the headroom of the hoistway is to be provided with an escape hatch with an area of at least 0.26 m^2 and is to measure not less than 400 mm on any side. Also seeE.9.4.

8. Buffers

8.1 General

Buffers of spring, oil or other approved types are to be installed under all elevator cars and counterweights and are to be mounted on a suitable structure of the vessel.

8.2 Spring Buffers

8.2.1 Stroke

The stroke of the buffer spring is to be in accordance with the table 5.4:

Table 5.4 - Stroke of spring buffers

Rated Car Speed	*Minimum Stroke*
m per minute	*mm*
30 or less	38
30.6 to 45	63
45.6 to 60	100

8.2.2 Load Rating

Buffers for cars and counterweights are to be capable of supporting, without being compressed solid or to a fixed stop, a static load of a minimum of two times the total weight of the car plus its rated load for car buffers or the counterweight for counterweight buffers. Buffers are to be compressed solid or to a fixed stop with a static load of three times the total weight of the car plus its rated load for car buffers or the counterweight for counterweight buffers.

8.2.3 Marking Plates

Each spring buffer is to be provided with a marking plate indicating its load rating and stroke and the number of springs.

8.3 Oil Buffers

8.3.1 Stroke

The minimum stroke for oil buffers is to be such that the car or counterweight, on striking the buffer at 115% of the rated speed, will be brought to rest with an average retardation of not more than 9.81 m/s^2. Peak retardation is not to exceed 24.5 m/s^2.

8.3.2 Load Rating

The minimum load rating is to be not greater than the total weight of the car plus 686 N
for car oil buffers or the weight of the counterweight for counterweight oil buffers. The maximum load rating is to be not less than the total weight of the car plus the rated load for car oil buffers or the weight of the counterweight for counterweight oil buffers.

8.3.3 Marking Plates

Each oil buffer is to be provided with a marking plate indicating the maximum and minimum loads and maximum striking speeds for which the buffer may be used and the stroke of the buffer.

8.4 Buffers for Direct-Plunger Hydraulic Elevators

Elevators of the direct-plunger hydraulic type are to be provided with car buffers complying with

D.8.1 throughD.8.3, except that where oil buffers are used, the minimum stroke of the buffer is to be such that the car, on striking the buffer at 115% of the maximum speed in the downward direction, will be brought to rest with an average retardation of not more than 9.81 m/s^2 . Car buffers are to be located so that the car will come to rest on the fully compressed buffers or fixed stop before the plunger reaches its downward limit of travel.

9. Machine Room

A machine room is to be provided to accommodate the driving machine and other equipment and controls necessary for operation of the elevator. The machine room is to be of steel construction with a permanent and safe means of access and provided with permanent lighting (see F.2). Only equipment directly associated with the operation of the elevator is to be located in the machine room.

10.2 Winding Drum Driving Machines

Driving machines of the winding drum type may be driven by electric or hydraulic motors and be used for limited service applications such as access to cargo holds, pump rooms, etc., for rated loads not exceeding
5480 N. They are not to be used for transport of passengers. Winding drum machines are not to be fitted with counterweights and are restricted to a rated speed not exceeding 15 m per minute and a travel not

exceeding 12.5 m. Winding drum machines are to have positive means ofremoving power from the machine in the event of over-travel. See also E.4.

10.3 Hydraulic Driving Machines (Direct-Plunger and Roped Hydraulic)

Power units and equipment for direct-plunger hydraulic type and roped hydraulic type elevators are to comply with Part 1 Seagoing Ships Volume III Rules for Machinery Installation Section 10 and Section 14 or other relevant standard, provided it is not less effective. The hydraulic system is to be provided with an automatic check valve which will hold the car with rated load at any point when the pump stops or the maintained pressure drops below the minimum operating pressure. In addition, a manually operated valve which permits lowering the car at a speed not exceeding 6.0 m per minute is to be provided and is to be located in an easily accessible area.

For roped-hydraulic elevators, the ratio of driving machine speed to car speed is not to exceed 1:2. See also E.4.

10.4 Rack-and-Pinion Driving Machines

Rack-and-pinion driving machines are to consist of one or more power-driven rotating pinions mounted on the car and arranged to travel on a stationary rack mounted on the supporting structure. The drive is to have at least one pinion, one rack and two backup rollers, which act on the same section of rack as the drive pinion. The rack and pinion are to be designed in accordance with a recognized standard such as AGMA or ISO.

10.5 Driving Machine Brakes

Each driving machine is to be equipped with a spring or gravity-applied friction brake capable of holding the rated load plus 25% in excess of the rated load. The brake is to be released by application of electric or hydraulic power (as the case may be) to the driving machine.

10.6 Manual Operation

Driving machines are to be provided with a manual means of operation, allowing the car to be moved to the nearest landing in the event of a power failure. This is to be done by having the end of the drive shaft arranged to receive a hand crank or by other suitable means. The manual effort to move the car is not to exceed
400 N. A metal plate with instructions for operation of the device is to be permanently mounted in the elevator machine room.

10.7 Factors of Safety for Driving Machines and Sheaves

The factors of safety, based on the ultimate strength of the material, to be used in the design of the driving machines and in the design of sheaves used with suspension and compensating ropes are to be not less than the following:

i) 8 for steel, bronze or other metals having an elongation of at least 14% in a length of 50 mm

ii) 10 for cast iron or other metals having an elongation of less than 14% in a length of 50 mm The load to be used to determine the factor of safety is the total weight of the elevator plus the rated load.

10.8 Diameter of Sheaves

Sheaves and drums are to have a pitch diameter of not less than 40 times the diameter of the rope where used with suspension ropes and 32 times the diameter of the ropes where used with compensating ropes.

10.9 Other Arrangements

Hoisting arrangements other than those noted above will be subject to special consideration.

11. Hoisting Ropes

11.1 General

Hoisting ropes are to be of steel wire and are to be certified by the manufacturer that they are suitable for elevator service.

11.2 Number of Ropes

The minimum number of hoisting ropes to be used for traction type elevators is three. The minimum number of hoisting ropes to be used for winding drum elevators and for roped hydraulic elevators is two.

11.3 Diameter of Ropes

Minimum diameter for hoisting ropes is to be 9.5 mm. Outer wires of ropes are to be not less than 0.6 mm in diameter.

11.4 Factor of Safety

The minimum factor of safety for hoisting ropes is to be in accordance with the table 5.5:

Table 5.5 - Safety factor of hoisting ropes

Rope Speed m per minute	*Minimum Factor of Safety*
15.2	7.60
22.2	7.75
30.0	7.97
37.2	8.10
45.0	8.25
52.2	8.40
60.0	8.60

11.5 Wire Rope Data

A data plate is to be attached to the car frame with the following information:

- Number of ropes
- Diameter, in mm
- Manufacturer's rated breaking strength per rope, in kN

A data tag is to be provided for each set of ropes with the following information:

- Diameter, in mm
- Type, (grade of material, construction classification)
- Month and year of installation
- Name of rope manufacturer

The tag is to be secured to one of the wire rope fastenings, and a new tag is to be installed at each renewal of wire ropes.

11.6 Repair and Replacement of Ropes

Hoisting ropes are not to be repaired or lengthened by splicing. When replacement of one or more of the hoisting ropes is required, the entire set is to be replaced.

11.7 Ropes for Winding Drum Machines

Winding drum type elevators are to have at least two full turns of hoisting rope on the drum when the car is resting on its fully compressed buffers.

E. Operation and Control

1 Control System

1.1 Normal Terminal Stopping Devices

A system for control and operation of the elevator is to be arranged to automatically slow down and stop the car at the uppermost and lowest landing and to prevent operation past these points.

1.2 Final Terminal Stopping Device

Limit switches or other mechanically operated devices are to be provided and arranged to remove power from the driving machine and brake in the event that the car travels beyond the uppermost or lowest landing. Such devices are to function independently of the normal terminal stopping devices. Where spring buffers are provided, the device is to function before the buffer is engaged. Final terminal stopping devices are not required for elevators of the hydraulic type.

2. Interlocks

All hoistway doors, access and emergency openings, elevator car doors and car escape hatches are to be interlocked with the control system to prevent operation of the elevator unless all such units are in the closed position.

3. Top-of-Car Operating Device

Means are to be provided to operate the elevator from on top of the car during adjustment, inspection, maintenance and repair. The operating means are to be of the continuous-pressure type, capable of operating the car at a speed not exceeding 45.7 m per minute, and arranged so that when operative, movement of the car is to be solely under the control of this device. The means for transferring control of the elevator to the top-of-car operating device is to be located on the car top and is to be of the manually closed type and be positively opened mechanically.

4. Slack Rope Switch

Winding drum machines are to be provided with a slack rope switch of the manually reset type which will remove power from the driving machine and brake in the event the hoisting ropes become slack. Roped hydraulic elevators are to be provided with a similar slack rope switch which will remove power from the pump motor and control valves in the event any rope becomes slack.

5. Stop Switches

An emergency stop switch is to be provided in each elevator car. Operation of this device is to cause power to be removed from the driving machine and brake. Stop switches are also to be provided on top of every elevator and in every elevator pit (see D.7.6).

Phase-reversal and Failure Protection

For elevators with polyphase alternating current power supply, means are to be provided to prevent operation in the event of incorrect phase rotation or failure of any phase.

7. Release and Application of Driving Machine Brakes

Driving machine brakes are not to be electrically released until power has been applied to the driving machine motor. All power feed lines to the brake are to be opened and the brake is to apply automatically when the operating device of a car-switch or continuous-pressure elevator is in the stop position, a floor stop device functions, or any of the electrical protective devices functions.

8. Indicators

A light is to be provided at each landing to indicate when the elevator car is in use. Additionally, sufficiently visible notices or signals are to be provided to permit persons in the car to know at which landing the elevator has stopped.

9. Means of Escape

9.1 General

In case of emergency, it is to be possible to rescue vessel's passengers from the elevator car. The vessel's crew is to be able to escape from the elevator car and hoistway by their own resources.

9.2 Hoistway Escape Ladder

A vertical steel ladder is to be permanently installed for the full height of each hoistway and is to be so arranged as to give access to the hoistway escape doors required by D.3.7. This ladder is to be accessible also from the escape hatch of the car required by D.4.5.

9.3 Car Escape Ladder

A ladder is to be provided for entering the car through the emergency hatch in the car roof (see D.4.5). The ladder is to be kept in a watchkeeping room or a room to which only the vessel's crew has access. For elevators reserved for the crew, a fixed ladder or similar device is to be provided in the car.

9.4 Headroom Escape Hatch

The escape hatch required by D.7.7 in elevators for crew only is to open outward. The opening of the escape hatch is to be possible from the inside without a key. From the outside, opening is to be possible only by means of a special key placed in a box in the immediate vicinity of the hatch accessible in case of emergency (for instance, a break-glass-to-open box), when the exit from the hoistway leads to an area accessible to passengers.

9.5 Car Escape Hatch

The escape hatch required by D.4.5 in cars for passengers is to be fitted with a mechanical latch-type lock with a handle on the outside only. The escape hatch required by D.4.5 in cars for crew only is to be fitted with a mechanical latch-type lock with handles on both inside and outside.

9.6 Safety Circuit

Opening of the escape hatches referred to in E.9.4 and E.9.5 is to break the safety circuit and thereby cause the car to stop. The safety circuit is to remain broken until the escape hatch is closed. Resumption of service is to be possible only after manual and intentional resetting of the circuit on the roof of the car.

9.7 Escape Route Notices

Notices in at least two relevant languages and pictographs describing the escape routing are to be fixed in the following locations:

i) Inside the car

ii) On the car roof

iii) Inside the hoistway, adjacent to every exit

iv) In the elevator machine room

F. Electrical Power, Lighting and Communication

1. General

Electrical power, lighting and communication systems are to comply with the requirements of IEC Publication 60092 “Electrical Installations in Ships” and, as applicable, Part 1 Seagoing Ships, Rules for Electrical Installation, Volume IV. The driving machines are to be supplied by circuits which are not subject to load shedding. For passenger vessels, the driving machines are to be supplied by an emergency source of power for a period of half-an-hour to bring the elevator car to deck level for the escape of passengers.

2. Lighting

2.1 Cars

Car illumination is to be provided by not less than two lights. Light intensity at the car floor is to be not less than 54 lux. Lighting fixtures are to be shock resistant of a type suitable for elevator service.

2.2 Machine Room

The machine room is to have normal illumination by more than one light to an intensity of not less than 54 lux.

2.3 Hoistway

Permanently installed lighting fixtures are to be provided in the hoistway at every escape door (see D.3.7).

2.4 Elevator Landings

Elevator landings are to be illuminated to an intensity of not less than 50 lux. In locations where illumination to such an intensity would interfere with the normal working environment of the space (e.g., wheelhouse darkened at nighttime), special consideration will be given to alternate arrangements.

2.5 Pit

The hoistway pit is to be illuminated to an intensity of not less than 100 lux at the pit floor. Light bulbs are to be adequately protected from mechanical damage and the light switch is to be accessible from the pit access door.

3. Emergency Lighting

The car, hoistway and machine room are to be provided with emergency lighting fed from the emergency source of power. In addition, a battery operated emergency light with rechargeable batteries and automatic charger is to be provided in the car. This emergency light is to be capable of providing illumination in the event of failure of the normal and emergency lighting circuits for a period of at least one hour.

4. Traveling Cables

Traveling cables for electrical supply, control and communication to the elevator car are to have a flame retardant and moisture resistant outer cover and are to be of a flexible type constructed to an applicable recognized standard suitable for this service.

5. Communication

5.1 Alarm

An alarm device, which can be activated from the inside of each elevator car and will produce an audible and visual display in a manned control center, is to be provided and is to be independent of the power and control systems.

5.2 Telephone

In all cars, a telephone is to be permanently installed and connected to a permanently manned area. The

telephone may be sound powered, battery operated or electrically powered from the emergency source of power and is to be independent of the ship's service electrical power and control circuits.

G. Piping and Ventilation

1. Piping

All hydraulic, control and other piping is to comply with the applicable requirements of Part 1 Seagoing Ships, Rules for Machinery Installation, Volume III Section 11.

2. Hydraulic Oil Storage Tanks

Storage tanks for hydraulic oil are to be constructed in such a manner to prevent spillage of hydraulic oil under the following conditions inherent to the installation location.

i) Rolling: ±45 degrees.

ii) Pitching: ±10 degrees.

3. Ventilation

3.1 Hoistway

The hoistway is to be ventilated by a mechanical ventilating system capable of providing five air changes per hour based on the gross volume of the hoistway.

3.2 Cars

Elevator cars are to be provided with screened ventilation openings and an electric fan drawing from or exhausting to the hoistway. A switch to shut down the fan is to be provided inside the car.

H. Tests and Inspection

1. Acceptance Tests

New elevators, after completion and before being placed in service, are to be subjected to acceptance tests and inspections on the vessel to determine that the installation conforms to the requirements of this Guide and that all safety equipment functions as required. A similar test and inspection is to be made following a major alteration to an existing installation. Acceptance tests are to be witnessed by the Surveyor. The following are to be included in the test program:

- Test of car safety with rated load in car
- Test of counterweight safety
- Test of governor tripping speed
- Test of hoistway and car door interlocks and escape hatch interlocks
- Operating test of entire installation including check of car and position indicators
- Operating test of manual hoisting device
- Test of driving machine brake with maximum load weight plus 25% of rated load
- Test of buffers
- Test of slack rope switch

2. Periodic Tests and Inspections

Periodic tests and inspections of the elevator installation are to be made at Annual Survey, each second or third Annual Survey and 5-Year Retesting Survey, as applicable. The tests, as specified in Table 5.6, are to be conducted and witnessed by the Surveyor:

Inspection is to be made of the entire installation at this time with particular attention to the following:

- Hoisting cables
- Driving machine brake
- Safeties
- Guide rails and guide shoes or rollers

3. Capacity Plate and Data Plate

A capacity plate of engraved metal is to be permanently installed in each elevator car and is to indicate the safe capacity of the car, in N, and number of persons.

A data plate of engraved metal is to be permanently mounted on each car frame and is to indicate the following.

- Weight of complete car including safety and all auxiliary equipment attached to car
- Rated load and speed
- Wire rope data as per D.11.5
- Manufacturer's name and date of installation

Table 5.6 - Shipboard Elevator – Periodic Test Requirements

Annual Survey			
No.	*Testing Items*	*Test Load*	*Confirmation*
Electric/hydraulic elevators			
A1	Car and counterweight safeties	No load	Functional test – satisfactory operation
A2	Governors	No load	Manual operation – to be operated freely
A3	Slack rope devices or winding drum machineries	No load	Manual operation – to be worked correctly
A4	Normal and final terminal stopping devices	No load	Functional test – to be worked correctly
A5	Firefighters' emergency operation	R	Functional test – to be worked correctly
A6	Standby or emergency power operation	No load	Functional test – to be worked correctly
A7	Power operation of door system	No load	Functional test – to be worked correctly
A8	Broken rope, tape or chain switch	No load	Functional test – to be worked correctly
Additional items for hydraulic elevator		*Test Pressure*	*Confirmation*
A9	Relief valve setting and system pressure test	<1.5P	Functional test – bypass and endurance
A10	Cylinders	R	Visual inspection and endurance for 15 min.
A11	Flexible hose and fitting assemblies	RVS	Visual inspection and endurance for 30 seconds
A12	Pressure switch	R	Functional test – to be worked correctly

Second or Third Annual Survey (Hydraulic elevator only)			
No.	*Testing Items*	*Test Pressure*	*Confirmation*
I1	Unexposed portions of pistons	NL	Visual inspection – wear or corrosion
I2	Pressure vessels	1.5P	Visual inspection and endurance for 1 min.

5-Year Retesting Survey			
No.	*Testing Items*	*Test Load*	*Confirmation*
Electric/hydraulic elevators			
S1	Car and counterweight safeties	R	Satisfactory operation
S2	Governors	R	Functional test – to be worked correctly
S3	Oil Buffers	No load	Manual operation – to be worked correctly
S4	Braking system	1.25R	Functional test – to be worked correctly
S5	Standby or emergency power operation	1.25R	Functional test – to be worked correctly
S6	Emergency terminal stopping and speed limiting devices	R	Functional test – to be worked correctly
S7	Power operation of door system	R	Functional test – to be worked correctly
S8	Leveling zone and leveling speed	R	Functional test – to be worked correctly
S9	Inner landing zone	R	Functional test – to be worked correctly
S10	Emergency stopping distance	1.25R	Functional test – to be worked correctly
Additional items for hydraulic elevator		*Test Pressure*	*Confirmation*
S11	Flexible hose and fitting assemblies	RVS	Visual inspection and endurance for 30 seconds
S12	Pressure switch	R	Functional test – to be worked correctly
S13	All applicable requirements of Annual Survey		As applicable
S14	All applicable requirements of $2^{nd}/3^{rd}$ Year Survey		As applicable

Notes:

R = Rated load
P = Working pressure

RVS = Relief valve setting pressure

I. Elevators in Hazardous Locations

1. Scope

The provisions of this Section are applicable to elevators installed in cargo pump rooms of oil carriers. They are supplementary to the requirements of A. through H. Elevators installed in other hazardous locations will be subject to special consideration.

2. Design Review

Plans and design data supplemental to that required by A.2 are to be submitted for review in accordance with the following list:

- Description of hazardous equipment
- Location of elevator
- Precautions against static discharge or sparking

3. Materials

Impacting metal and metal in rubbing contact, as well as hoisting cables, are to be non-sparking in all cases (i.e., steel to brass or bronze, bronze to bronze, etc.). The use of non-conducting materials is to be restricted to areas where no other material is suitable (gaskets, seals, etc.) and where the extent of the non-conducting material is not deemed to present any danger due to static discharge. The use of aluminum for any purpose is not permitted.

4. Electrical Installation

The electrical installation is subject to special consideration but in general is to comply with the requirements of Part 1 Seagoing Ships, Volume IV, Rules for Electrical Installation. All conducting materials are to be suitably bonded and grounded to prevent the buildup of potential differences. Special provision is to be made for grounding of hoisting and governor cables. Traveling cables are to have outer conducting sheath or other means for dissipating static charges. Grounding and bonding cables are to be of extra flexible construction, uninsulated and of a size not less than 5.5 mm^2 cross sectional area (No. 10 AWG).

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Section 6

Guidelines for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

A. General

1 Scope

This Guidelines provides requirements for the certification of stern, bow and sideport ramps and moveable platforms (decks) on vessel classed with BKI.

2 Submission of Design Plans and Data

2.1 Stern, Bow and Sideport Ramps

Plans, specifications and design data are to be submitted for approval as indicated below:

- Details of ramp loading conditions, including ramp self weight and center of gravity.
- Maximum loading of ramp during the transit of vehicles (i.e., the most adverse vehicle positions) number of vehicles and traffic lanes and axle weight on the ramp at any one instant, including tractor axle loads.
- Any impact loads due to the movement of vehicles.
- Maximum reactions on ramp hinges, suspension stays and on ramp flaps on the quay.
- Any limits to ramp elevation, angle or vessel heel and trim with respect to the quay.
- Calculations and detailed structural drawings.
- Ramp general arrangement, load diagrams and testing plan suitable for insertion in the Register of Lifting Appliances are to be submitted.
- Operations and Maintenance manual.

2.2 Moveable Platforms (Decks)

Plans should generally be submitted hard copies to BKI. However, electronic drawings will also be accepted.

- Details of moveable platform (deck) loading conditions, including moveable platforms (decks) self weight and center of gravity.
- Arrangements and details of supporting/securing means.
- Calculations and detailed structural drawings.
- Moveable platform (deck) general arrangement, load diagrams and testing plan suitable for insertion in the Register of Lifting Appliances.
- Operations and Maintenance manual.

If moveable platforms (decks) are arranged in ro-ro spaces, similar drawings of ramps for vehicle loading are to be submitted.

B. Design Criteria

1 General

The strength of ramps and moveable platforms (decks) is to comply with the following design criteria.

2 Stern, Bow and Sideport Ramps

Design calculations for the ramp structure are to be submitted in support of the above loading conditions in accordance with:

i) Section 3, B.3.3, “Guidelines for Certification of Cargo Gear on Merchant Vessels” of this Guidelines.

ii) Part 1, Seagoing Ships Rules for Hull Volume II Section 7.A.7

iii) Part 1, Seagoing Ships Rules for Hull Volume II Section 7.B.2

iv) Manual of the American Institute of Steel Construction, eighth or later edition, Sections 1.5 and 1.6 and other applicable sections.

v) Where the various strength members are subjected to compressive or shear stresses, the stability of the local plate panels and the supporting members is to be checked against buckling. Calculations, showing that adequate strength has been provided against buckling, are to be submitted for review. For column buckling, see Section 2, B.3.4, Section 2,B.3.5 and Section 2,B.3.6, “Guidelines for Certification of Cranes” of this Guidelines.

vi) For operational conditions, ramps are to be reviewed to the self weight and applied loads multiplied by the submitted corresponding dynamic amplification factors. The dynamic amplification factors need not be verified by BKI through an independent analysis, unless specifically requested by the submitter.

3 Moveable Platforms (Decks)

3.1 Loading

The following loading criteria are to be taken into account:

i) Assume free end supports for beams and girders unless ends are effectively fixed

ii) Part 1, Seagoing Ships Rules for Hull Volume II Section 7.A.7

iii) Part 1, Seagoing Ships Rules for Hull Volume II Section 17.B.4 and Section 7.B.2

iv) Use static load and imprint submitted by designer.

v) Check each member for the worst possible loading condition.

vi) Dynamic load increases due to rolling, pitching and heaving accelerations are disregarded.

vii) Special attention is to be paid to supporting details and attachments to ship structure.

3.2 Allowable Stresses

Moveable platforms (decks) are to comply with the following maximum allowable stresses:

i) Maximum allowable bending stress for beams and girders (14.0 kN/cm^2).

ii) Maximum allowable shear stress for beams and girders (10.5 kN/cm^2).

iii) Maximum allowable bearing stress for beams and girder (21.0 kN/cm^2).

iv) Maximum allowable resisting tearing failure for beams and girders (12.0 kN/cm^2).

C . Tests for New Construction

1 Loose Gear Test

1.1 Proof Test

1.1.1 Test Load

All chains, rings, links, shackles, swivels and blocks of ramps and moveable platforms (decks), as applicable, are to be tested with a proof load at least equal to that shown against the article in the following table:

Table 6. 1 - Proof Load of Loose Gear Test

Article of Gear	*Proof Load (1)*
Chain, ring, link shackle or swivel	100% in excess of the safe working load
Single sheave block	300% in excess of the safe working load (2)
Multiple sheave block with safe working load up to and including 20 tonnes	100% in excess of the safe working load
Multiple sheave block with safe working load over 20 tonnes up to and including 40 tonnes	20 tonnes in excess of the safe working load
Multiple sheaves block with safe working load over 40 tonnes	50% in excess of the safe working load

Notes :

1 Alternatively, the proof tests as required in “Code Practice on Safety and Health in Port” may be accepted where the items of gear are manufactured or tested or both and intended for use on vessels under jurisdictions accepting these requirements.

2 The safe working load to be marked on a single sheave block is to be the maximum load which can safely be lifted by the block when the load is attached to a rope which passes around the sheave of the block. In the case of a single sheave block where the load is attached directly to the block instead of to a rope passing around the sheave, it is permissible to lift a load equal to twice the marked safe working load of the block as defined in this note.

1.2 Inspection

After being tested, all the gear is to be examined, the sheaves and the pins of the pulley blocks being removed for the purpose, to see whether any part has been injured or permanently deformed by the test.

1.3 Certificates

Articles of gear are to have a certificate furnished by the manufacturer or the surveying authority. The certificate is to show the distinguishing number or mark applied to the article of gear, description of particular article of gear, kind of material, carbon content, date of test, proof load applied and safe working load and is to be attached to the Register of Lifting Appliances (see Section 3,M.1). The safe working load SWL is to be marked on the blocks.

1.4 Special Components

Blocks of special nature, together with their connecting components, special lifting devices and components built into or hoisting machinery which are specially designed for use with a particular lifting unit, the designs of which are submitted for approval as steel structural parts, need not be considered loose gear for the purpose of certification. They are, however, to be tested and examined with the gear as a unit, as required by 3. Appropriate nondestructive methods of examination will be required where visual inspection is considered to be inadequate.

2 Wire Rope Test

All wire rope of lifting devices for ramps and moveable platforms (decks) is to have a certificate of test, furnished by the manufacturer or the surveying authority, showing at least the following breaking test load for sample:

Table 6. 2 - Breaking Test Load for Sample of Wire Rope Test

Lifting Capacity in Tonnes	*Breaking Test Load for Sample*
10 or less	5 × SWL
13 or more	4 × SWL

For gear with capacities between 10 and 13 tonnes, intermediate values of factors of safety may be used. This certificate is to show also size of rope, in mm, number of strands, number of wires per strand, quality of wires and date of test and is to be attached to the Register of Lifting Appliances (see Section 3,M.1).

3 Proof Test to Gear as a Unit

3.1 Test Loads

Before the lifting devices for ramps and moveable platforms (decks) are placed in service, they are to be tested on the vessel to the following proof loads:

Table 6. 3 - Proof Load Test of Gear as a Unit

Working Load of Assembled Gear in Tonnes	*Proof Load*
Up to 20	25% in excess
20-50	5 tonnes in excess
Over 50	10% in excess

3.2 Testing and Inspection Details

The ramp proof load test and the positioning of the test weights is to be conducted in accordance with the approved test load procedures. Unless otherwise approved, the proof load is to be applied by hoisting the ramp or moveable platform with the moveable testing weight up to the position where the angle of the ramp is horizontal, or for moveable platforms, at least 1 meter above the resting position and maintain the position for 5 minutes before putting it back to the resting position. Fixed ramps or movable decks are to be tested in accordance with the approved test load procedures at their angle. After being tested, ramp or movable platform structure, together with any hinged connection points including cantilever hinges (if applicable) and all hydraulic cylinders, chains, rings, links, shackles, swivels, pulley blocks hoisting wires or other loose gear is to be examined to see whether any part has been injured or permanently deformed by the test. All securing, supporting and locking devices are to be examined and tested.

3.3 Portable Ramps

If portable ramps are included as part of the certification, they are to be proof load tested in accordance with the approved test procedures. Where the portable ramp is designed to be attached to the side ramp or stern ramp at ends and/or sides then the portable ramp is to be tested at each location where it may be connected to the ramp(s). Test weights are to be placed on the portable ramp at positions indicated in the approved test load procedures. Unless otherwise approved, the proof load is to be applied for at least five (5) minutes. Upon completion of testing the portable ramp, portable ramp structure, ramp structure and all hinged and fixed connection points are to be examined to determine if part has been damaged or deformed.

3.4 Source of Electrical Power

Current for electrical winch operation during the test is to be taken through the vessel’s cables. Shore current may be used when connected to the main switchboard.

3.5 Braking Requirements

On all types of winches, efficient means are to be provided to stop and hold the load in any position and such means shall be demonstrated. Where electrical winches are fitted with efficient electromagnetic brakes, mechanical brakes for manual operation will not be required, but if fitted, are to be in operating condition.

3.6 Ramp Monitoring Systems

If ramp monitoring/alarm systems are fitted as part of the certification due to the operation of the ramp they are to be calibrated and tested in accordance with the approved test load procedures.

3.7 Marking of Assembled Gear

The Safe Working Load, SWL, for the assembled gear is to be marked on a visible location on the ramp, movable deck or portable ramp in contrasting colors to the background, with minimum angle to the horizontal at which this load may be applied and date of test. Letters and numbers are to be at least 25 mm high.

In addition, if the ramp has been approved for use in specific environmental conditions then these conditions should be noted on the cargo gear certificate.

3.9 Record of Cargo Gear Test

A copy of the certificate of cargo gear test issued by the Surveyor is to be attached to the Register of Lifting Appliances (see Section 3,M.1).

D. Periodical Survey

1 Annual Inspection

After undergoing the original test and examination required by C.3, every vessel is required to undergo an inspection by the Surveyor at intervals of 12 months, at which time the lifting devices of ramps, moveable platforms (decks) and portable ramps are to be examined, operationally tested including a thorough examination of the gear which does not require to be periodically heat treated, and the certificate of inspection furnished to be attached to Register of Lifting Appliances (see Section 3,M.1).

The annual survey should include the following:

i) A close visual inspection of all securing supporting and locking devices of ramps and moveable platforms (decks). If accessible, clearances are to be measured in accordance with manufacturer's Operation and Maintenance manual.

ii) Close up survey of hinges, bearings and supporting structure. If accessible, bearing clearances are to be measured in accordance with manufacturer's Operation and Maintenance manual.

iii) Nondestructive testing of hinges, pins and supporting structure in accordance with manufacturer requirements contained in the approved Operation and Maintenance Manual. If the manual contains no specific instructions for NDT, then the attending Surveyor is to recommend random NDT be carried out.

If corrosion is noted on the ramp, movable platform or portable ramp structures including hinges

iv) and supporting structure then thickness measurements are to be taken to determine extent of corrosion and results submitted to BKI Head Office for assessment.

v) Function test of safety protective devices including where applicable ramp monitoring systems.

2 Retesting Survey

At intervals of five years, in addition to the applicable requirements of the Annual Survey in 1, the lifting devices of ramps, moveable platforms (decks) and portable ramps are to undergo the proof loads and examination stated in C.3 together with removal of pins from hinges, sheaves and pulley blocks for examination including by NDT. Certificate of survey is to be furnished and attached to Register of Lifting Appliances (see Section 3,M.1).

A close visual inspection together with representative nondestructive testing is to be carried out of securing, supporting and locking devices as well as measurement of clearances.

Where applicable thickness measurements are to be carried out as per the approved Operation and Maintenance Manual.

Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and BKI is prepared to do such retesting and note it in the Register of Lifting Appliances.

E. Maintenance

1 Repairs

When important repairs or renewals are required to be made to the lifting devices of ramps, moveable platforms (decks) and portable ramps, the repairs are to be carried out under the attendance and to the satisfaction of the Surveyor. Tests and examination of the particular lifting devices as may be deemed necessary are to be carried out in accordance with C.3. Certificates covering tests are to be attached to Register of Lifting Appliances (see Section 3,M.1).

When welding is used to lengthen, alter or repair chains, rings, links, shackles or swivels, they are to be properly heat treated and are to be adequately tested and examined in accordance with C.1 and certificate furnished before being again put in use. The certificates are to be attached to the Register of Lifting Appliances (see Section 3,M.1).

2 Addition of New Gear and Wire Rope

When articles of loose gear and wire rope conforming with tests in accordance with C.1 and C.2 are supplied from time to time, the vessel's officer designated by the Master is to enter and initial such replacements in the record noted in Section 3, M.2 kept with the Register of Lifting Appliances (See Section 3,M.1), identifying each article and certificate of same.

3 Splicing of Wire Rope

A thimble or loop splice made in any wire rope is to have at least three (3) tucks with a whole strand of the rope and two (2) tucks with one-half of the wires cut out of each strand, provided that this requirement does not prevent the use of another form of splice which can be shown to be as efficient as that required in this Subsection. Clips for splicing wire rope are not acceptable.

4 Condition of Wire Rope

No wire rope is to be used if in any length of eight (8) diameters, the total number of visible broken wires Exceeds 10% of the total number of wires, or if the rope shows signs of excessive wear, corrosion or other defect which renders it unfit for use.

5 Knots in Chain

Chains are not to be shortened by tying knots in them.

6 Annealing of Chains and Connecting Elements

Chains, rings, links, shackles and swivels of wrought iron used in lifting operations are to be annealed at the following intervals.

Chains and gear in general use and of 12.7 mm or less, once at least in every six months.

All other chains and gear in general use, once at least every 12 months.

7 Annealing Details

The annealing is to be done in suitable closed oven and not over an open fire. Wrought iron is to be annealed at a temperature of between 593°C to 649°C for a period between 30 and 60 minutes. After being annealed, the article should be allowed to cool slowly.

8 Annealing Certificate

A certificate on prescribed form (see F33.3.10-2012/Rev. 0) is to be furnished by the firm undertaking the annealing, describing gear annealed, which is to be attached to the Register of Lifting Appliances (see Section 3,M.1).

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Annex

Forms for Certification of Lifting Appliances

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BIRO KLASIFIKASI INDONESIA

LAPORAN SURVEY ALAT ANGKAT

REPORT ON LIFTING APPLIANCES SURVEY

☐ For ILO Statutory Compliance

☐ For Class Notation "LA"

Nama Kapal/ Bangunan Lepas Pantai : _____
Ship's Name or Offshore Structure

_____

No. Laporan : _____
Report No.

No Register BKI : _____
BKI Register No.

Pemilik : _____
Owners

Tonase : _____
Gross Tonnage

Tempat Survey : _____
Place of Survey

Bendera : _____
Flag

Tanggal Survey : **Dari** (tg/bl/th)/ **s/d** (tg/bl/th)
Gross Tonnage From (dd/mm/yy) Until (dd/mm/yy)

Tanda Panggilan : _____
Call Sign

. Yang bertanda tangan dibawah ini Surveyor Biro Klasifikasi Indonesia telah mengawasi/melaksanakan pengujian dan / atau pemeriksaan:
The undersigned Surveyor of Biro Klasifikasi Indonesia supervised/performed the following test and/or examination:

a) Uji beban alat bongkar muat :
Load test of cargo handling appliances

☐ Pertama No
Initial No. ☐ Lima tahunan No.
Quenquenial No.

☐ Dengan beban
By weighths ☐ Dengan dinamo meter
by dynamometer ☐ Kerusakan/perbaikan/lain[2] No.
Damage/Repair/Other No.

b) Pemeriksaan seksama alat bongkar muat :
Through examination of cargo handling appliances

☐ Pertama No
Initial No. ☐ Lima tahunan No.
Quenquenial No.

☐ Tahunan No
Annual No. ☐ Kerusakan/perbaikan/lain[2] No.
Damage/Repair/Other No.

2. "Gambar susunan alat angkat" tersedia di kapal disetujui tanggal (tg/bl/th):
The "Rigging Plans" are on board approved on the (dd/mm/yy)

3. Penandaan alat bongkar muat ☐ Terpasang ☐ Diinstruksikan
Marking of cargo handling appliances Existing Ordered

4. Sertifikat baru diterbitkan :
New certificate issued

Form :

No. :

5. Catatan dan visa, kekurangan yang masih ada dan pembatasan :
Remarks and entries, remaining defects and restrictions

Cacat tersebut diatas harus dihilangkan paling lambat (tg/bl/th):
These defects are to be eliminated until (dd/mm/yy)

6. Buku Registrasi diusulkan untuk diterbitkan ☐
Register Book to be issued

Tempat _____ Tanggal _____
Place Date

Surveyor

(……)

Form No. : L A 1

Nama Kapal/ Bangunan Lepas Pantai: .....
Name of ship or offshore structure

.....

Nama Panggilan/No. IMO : .....
Call Sign / IMO Number

Pelabuhan Pendaftaran : .....
Port of Registry

Pemilik : .....
Owner

No. Register BKI : .....
BKI - Register No.

Tanggal Penerbitan : .....
Date of Issue

BUKU REGISTRASI PENGUJIAN ALAT ANGKAT
REGISTER OF LIFTING APPLIANCES

Catatan : Buku ini diterbitkan mengikuti Standar Internasional sesuai dengan rekomendasi dari Kantor Organisasi Perburuhan Internasional (ILO) di Jenewa yang tercantum dalam Konvensi ILO No. 152

Note : This Register is based on the standard international form as recommended by the International Labour Office in Geneva in accordance with ILO Convention No. 152.

Form No. L A 2

BIRO KLASIFIKASI INDONESIA

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

Catatan/Note :

Sertifikat ini berdasarkan pada format Standar Internasional yang direkomendasikan oleh Kantor Organisasi Perburuhan Internasional sesuai dengan konvensi ILO No. 152

This certificate is based on the standard International Form as recommended by the International Labour Office in accordance with ILO Convention No. 152

No. Sertifikat : _____
Certificate No.

Nama Kapal/ Bangunan Lepas Pantai : _____
Name of Ship/ Offshore Structure

_____

Tanda Panggilan : _____
Call Sign

No. Register BKI : _____
BKI –Register- No.

Sertifikat Uji dan Pemeriksaan Seksama Alat Angkat
Certificate of test and thorough examination of Lifting Appliances

(1) Situasi dan rincian Alat Angkat (dengan nomor pengenal atau marka, bila ada) yang telah diuji dan diperiksa seksama Situation and description of Lifting appliances (with distinguishing numbers or marks, if any) which have been tested and thoroughly examined	(2) Tanggal uji Date of test	(3) Sudut terhadap garis datar atau jari-jari tempat beban uji diletakkan Angle to the horizontal or radius at which test load applied	(4) Beban uji Test load [ton] [tones]	(5) Beban kerja aman (SWL) pada sudut atau jari-jari sebagaimana tercantum pada kolom (3) [ton] Safe working load (SWL) at angle or radius shown in column (3) [tonnes]

Posisi Alat Angkat dan kondisi khusus untuk penggunaan lihat gambar susunan alat bongkar muat.
Position of Lifting Appliances and special conditions for the use see Rigging Plans.

Disetujui oleh Biro Klasifikasi Indonesia No. _____ tanggal _____
Approved by Biro Klasifikasi Indonesia No. on the

Gambar susunan alat bongkar muat dilampirkan pada Buku Registrasi Pengujian (Form No. LA 1).
These Rigging Plans are attached to the Register Book (Form No. LA1).

Nama dan alamat perusahaan atau pejabat yang berwenang yang menyaksikan pengujian dan melaksanakan pemeriksaan seksama :
Name and address of the firm or competent person who witnessed testing and carried out through examination :

Surveyor Biro Klasifiksi Indonesia
JL. Yos Sudarso 38-40 Jakarta 14320

Dengan ini saya menyatakan bahwa Derek seperti tercantum pada kolom (1) telah diuji dan diperiksa seksama dan tidak didapati adanya cacat atau deformasi permanent, dan bahwa beban kerja aman adalah sebagaimana yang tercantum diatas.
I certify that the derricks shown in column (1) were tested and thoroughly examined and no defects or permanent deformations were found; and that the safe working loads are as shown.

Tempat _____ , Tanggal _____
Place Date

Tanda tangan _____
Signature

.....

(Instruksi lihat halaman belakang)
For instructions see reverse side

INSTRUKSI

1. Setiap Alat Angkat harus diuji dengan suatu beban uji yang melebihi beban kerja aman (SWL) sebagai berikut :

Beban Kerja Aman	Beban Uji
s/d 20 ton	25 % diatas beban kerja aman
diatas 20 s/d 50 ton	5 ton diatas beban kerja aman
diatas 50 ton	10 % diatas beban kerja aman

2. Untuk sistem derek beban uji harus diangkat dengan derek normal kapal dengan posisi batang derek pada sudut minimum sesuai perencanaan (umumnya 15^0), atau pada sudut yang lebih besar yang telah disetujui. Sudut derek pada saat pengujian harus dicantumkan pada sertifikat uji. Setelah beban uji dilepas batang derek harus diayun sejauh mungkin pada dua arah yang berbeda.

   2.1. Beban kerja aman yang ditunjukkan hanya berlaku bagi derek dengan sistem ayunan. Untuk jenis derek ganda (union purchase) beban kerja aman ditentukan sebagaimana tercantum pada formulir LA 2 (U).

   2.2. Untuk derek kapasitas besar harus diperhatikan apakah stay telah terpasang dengan benar.

3. Untuk kran, beban uji harus digantungkan, diayun dan ditegakkan secara perlahan. Kran (gantry) dan kran berjalan harus digerakkan bersama dengan keretanya (bila mungkin) secara melintang dan memanjang pada seluruh panjang lintasannya.

   3.1 Untuk kran yang memiliki beban radius karja yang bervariasi pengujian umumnya dilaksanakan dengan beban uji yang sesuai pada radius maximum, minimum, dan pertengahan.

   3.2 Untuk kran hidrolik dimana keterbatasan tekanan menyebabkan ketidakmungkinan penganngkatan beban 25 % diatas Beban Kerja Aman, maka cukup dilakukan pengangkatan seberapa mungkin dengan syarat tidak boleh kurang dari 1,1 SWL.

4. Sebagai suatu ketentuan umum, pengujian harus dilakukan dengan beban uji dan untuk pengujian pertama tidak boleh ada kekecualian. Untuk perbaikan, penggantian atau bila pengujian periodik mensyaratkan pengujian ulang, maka penggunaan pegas atau penyeimbangan hidrolis dapat dipertimbangkan dengan syarat SWL dari alat angkat tidak lebih dari 15 t. Jika menggunakan per atau penyeimbangan hidrolis maka peralatan tersebut harus dikalibrasi dan ketelitiannya harus dalam batas ± 2 % dan indikatornya harus tetap konstan selama 5 (lima) menit.

   4.1 Jika tidak menggunakan beban uji maka hal tersebut harus disebutkan pada kolom (3).

5. Pengertian 1 ton adalah 1000 kg.

6. Pengertian “Pejabat yang berwenang”, “Pemeriksaan seksama” dan “alat angkat” ditentukan pada formulir LA 1.

CATATAN

Untuk rekomendasi mengenai prosedur uji, dokumen ILO (Safety and Health in Dock Work) ”dapat dijadikan acuan Keselamatan dan Kesehatan Kerja Dok”.

INSTRUCTION

1. Every lifting appliance shall be tested with a test load which shall exceed Safe Working Load SWL (U) as follows :

SWL	Test load
Up to 20 tonnes	25 per cent in excess
20 to 50 tonnes	5 tonnes in excess
Over 50 tonnes	10 per cent in excess

2. In the case of derrick systems the test load shall be lifted with the ship’s normal tackle with derrick at the minimum angle to the horizontal for which the derrick system was designed (generally 15 degrees), or at such greater angle as may agreed. the angle which the test was made should be stated in the certificate of test. After the test load has been lifted it should be swung as far as possible in both directions.

   2.1 The SWL shown is applicable to swinging derricks systems only when derricks are used in union purchase the SWL (U) is to be as Shown on from LA 2 (U).

   2.2 In the case of heavy derrick, care should be taken to ensure that the appropriate stays are correctly rigged.

3. In the case of cranes, the test load is to be hoisted, slewed and luffed at slow speed. Gantry and traveling cranes together with their trolleys, where appropriate, are to be transversed and traveled over the full length of their track.

   3.1 In the case of variable load-radius cranes, the tests are generally to be carried out with the appropriate test load at maximum, minimum and at an intermediate radius.

   3.2 In the case of hydraulic cranes, where limitations of pressure make it impossible to lift a test load 25 per cent in excess of the safe working load, it will be sufficient to lift to greatest possible load, but in general this should not be less than 1,1 SWL.

4. As a general rule, test should be carried out using test loads, and no exception should be allowed in the case of initial test. In the case of repairs, replacement or when the periodic examination calls for re-test, considerations may be given to the use of spring or hydraulic balances provided the SWL of the lifting appliance does not exceed 15 tonnes. Where a spring or hydraulic balance is used it shall be calibrated and accurate to with in ± 2 per cent and the indicator should remain constant for 5 (five) minutes.

   4.1 If test weight are not used this is to be indicated in column (3).

5. The expression “tonne” shall mean a tonnes of 1,000 kg.

6. The terms “competent person”, “thorough examination” and “lifting appliance” are defined in form No. LA 1.

NOTE

For recommendations on test procedures reference may be made to the ILO document “Safety and Health in Dock Work”.

Form No. L A 2 (U)

BIRO KLASIFIKASI INDONESIA

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

Catatan/Note :

Sertifikat ini berdasarkan pada format Standar Internasional yang direkomendasikan oleh Kantor Organisasi Perburuhan Internasional sesuai dengan konvensi ILO No. 152

This certificate is based on the standard International form as recommended by the International Labor Office in accordance with ILO Convention No. 152

No. Sertifikat :_____
Certificate No.

Nama Kapal/ Bangunan Lepas Pantai:_____
Name of ship or Offshore Structure

_____

Tanda Panggilan :_____
Call sign

No. Register BKI :_____
BKI register No.

Sertifikat Uji dan Pemeriksaan Seksama Derek yang beroperasi sebagai Derek Ganda

Certificate of test and thorough examination of Derricks used in union purchase

(1) Situasi dan rincian derek yang digunakan sebagai derek ganda (dengan nomor pengenal atau marka, bila ada) yang telah diuji dan diperiksa seksama Situation and description of derricks used in union purchase (with distinguishing numbers of marks, if any) which have been tasted and thoroughly examined	(2) Tanggal uji Date of test	(3) Tinggi maximum pelat segitiga diatas ambang palka (m) atau sudut maximum antara kedua tali pengikat pelat segitiga Maximum height of triangle plate above hatch coaming (m) or maximum angle between runners	(4) Beban uji Test load [Ton] [Tonnes]	(5) Beban kerja aman SWL (U), bila bekerja sebagai derek ganda [Ton] Safe working load SWL (U), when operating in union purchase [Tonnes]

Posisi pemasangan gai penahan luar :
Position of outboard preventer guy attachments
(a) Didepan / dibelakang mast *) _____ [m]
Foreward/aft *) of mast
(b) Dari garis tengah kapal _____ [m]
From ship's center line

Posisi pemasangan gai penahan dalam :
Position of inboard preventer guy attachments
(a) Didepan / dibelakang mast *) _____ [m]
Foreward/aft *) of mast
(b) Dari garis tengah kapal _____ [m]
From ship's center line

*) Coret yang tidak perlu/delete as appropriate

Nama dan alamat perusahaan atau pejabat yang berwenang yang menyaksikan pengujian dan melaksanakan pemeriksaan seksama :
Name and address of the firm or competent person who witnessed testing and carried out through examination

Surveyor Biro Klasifiksi Indonesia
JL. Yos Sudarso 38-40 Jakarta 14320

Dengan ini saya menyatakan bahwa Derek seperti tercantum pada kolom (1) telah diuji dan diperiksa seksama dan tidak didapati adanya cacat atau deformasi permanent, dan bahwa beban kerja aman adalah sebagaimana yang tercantum diatas.
I certify that the derricks shown in column (1) were tested and thoroughly examined and no defects or permanent deformations were found; and that the safe working loads are as shown.

Tempat _____ , Tanggal _____
Place Date

Tanda tangan _____
Signature

.....

(Instruksi lihat halaman belakang)
For instructions see reverse side

INSTRUKSI

1. Sebelum digunakan, derek ganda yang beroperasi harus diuji dengan beban yang melebihi beban kerja aman derek ganda SWL (U) seperti berikut :

Beban Kerja Aman	Beban Uji
s/d 20 ton	ditambah 25 %
diatas 20 s/d 50 ton	ditambah 5 ton
diatas 50 ton	ditambah 10 %

2. Pengujian harus dilaksanakan dengan ketinggian pelat segitiga maximum diatas ambang palka yang disetujui atau pada sudut antara tali-tali muatan dan dengan batang derek pada kondisi opersi, untuk membuktikan kekuatan pelat mata geladak dan sistem derek ganda. Tinggi pelat segitiga atau sudut antar tali-tali tidak boleh melebihi nilai yang tercantum dalam gambar susunan peralatan bongkar muat.
3. Pengujian harus dilaksanakan menggunakan beban uji.
4. 1 ton adalah 1000 kg.
5. Definisi “Pejabat yang berwenang”, “Pemeriksaan seksama” dan “alat angkat” ditentukan dalam Form No. LA 1.

CATATAN

Untuk rekomendasi mengenai prosedur pengujian agar mengacu pada dokumen ILO ”Keselamatan dan Kesehatan Kerja di Pelabuhan”.

INSTRUCTION

1. Before being taken into use, the derricks rigged in union purchase shall be tested with a test load which shall exceed the Safe Working Load SWL (U) as follows :

SWL	Test load
Up to 20 tonnes	25 per cent in excess
20 to 50 tonnes	5 tonnes in excess
Over 50 tonnes	10 per cent in excess

2. Test are to be carried out at the approved maximum height of the triangle plate above the hatch coaming or at the angle between the cargo runners and with the derrick booms in their working positions, to prove the strength of deck eye plates and the union purchase system. These heights or angles must not exceed the values shown on the rigging plan.
3. Test should be carried out using test load.
4. The expression “tonne” shall mean a tonne of 1,000 kg.
5. The terms “competent person”, “thorough examination” and “lifting appliance” are defined in form No. LA 1.

NOTE

For recommendations on test procedures reference may be made to the ILO document “Safety and Health in Port”.

Form No. L A 3

BIRO KLASIFIKASI INDONESIA

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

Catatan/Note :

Sertifikat ini berdasarkan pada format Standar Internasional yang direkomendasikan oleh Kantor Organisasi Perburuhan Internasional sesuai dengan konvensi ILO No. 152

This certificate is based on the standard International form as recommended by the International Labor Office in accordance with ILO Convention No. 152

No. Sertifikat :_____
Certificate No.

Nama Kapal/ Bangunan Lepas Pantai:_____
Name of ship or Offshore Structure

_____

Tanda Panggilan :_____
Call sign

No. Register BKI :_____
BKI register No.

Sertifikat Uji dan Pemeriksaan Seksama Komponen yang Mudah Diganti dan Peralatan Lepas

Certificate of test and thorough examination of Interchangeable Components and Loose Gear

(1) Nama pengenal atau marka Distinguishing number or mark	(2) Uraian komponen yang mudah diganti dan peralatan lepas Description of interchangeable components and loose gear	(3) Jumlah yang diuji Number tested	(4) Tanggal uji Date of test	(5) Beban uji Test load [Ton] [Tonnes]	(6) Batas beban kerja Working Load Limit (WLL) [Ton] [Tonnes]

Nama dan alamat pembuat atau pemasok : _____
Name and address of markers or suppliers

_____

Nama dan alamat perusahaan atau pejabat yang berwenang yang menyaksikan pengujian dan melaksanakan pemeriksaan seksama :
Name and address of the firm or competent person who witnessed testing and carried out through examination

Surveyor Biro Klasifiksi Indonesia
JL. Yos Sudarso 38-40 Jakarta 14320

Dengan ini saya menyatakan bahwa semua bagian-bagian dari komponen yang mudah diganti dan peralatan lepas tersebut diatas telah diuji dan diperiksa seksama dan tidak didapati cacat yang dapat mempengaruhi kondisi keselamatan kerjanya.
I certify that the above mentioned items of interchangeable components and loose gear were tested and thoroughly examined and no defects affecting their safe working condition were found.

Tempat _____ , Tanggal _____
Place Date

Tanda tangan _____
Signature

.....

(Instruksi lihat halaman belakang)
For instructions see reverse side

INSTRUKSI

1. Setiap bagian dari komponen yang mudah diganti dan peralatan lepas harus diperiksa seksama sebelum digunakan untuk pertama kalinya dan sesudah suatu perubahan yang penting atau perbaikan dari bagian yang berpengaruh pada keselamatannya Beban uji yang digunakan harus sesuai dengan tabel berikut :

Komponen yang mudah diganti	Batas beban kerja *)	Beban uji "PL_{Stat}"
Rantai, cincin, kait, segel, kili-kili, dll	s/d 25 t diatas 25 t	2 x WLL (1,22 x WLL) + 20 t
Kerek roda ganda	s/d 25 t diatas 25 t s/d 160 t diatas 160 t	2 x WLL (0,933 x WLL) + 27 t
Kerek roda tunggal tanpa beket	s/d 12,5 t diatas 12,5 t	4 x WLL (2,44 x WLL) + 20 t
Kerek roda tunggal dengan beket	s/d 8,0 t diatas 8,0 t	6 x WLL (3,66 x WLL) + 20 t
Peralatan lepas seperti balok angkat, spreader dan alat sejenis lainnya.	s/d 10 t diatas 10 t s/d 160 t diatas 160 t	2 x WLL (1,04 x WLL) + 9,6 t 1,1 x WLL

*) Untuk kerek roda ganda, batas beban kerja adalah sama dengan beban yang diizinkan pada gantungan kerek.

Untuk kerek roda tunggal tanpa beket, batas beban kerja adalah sama dengan setengah beban yang diizinkan pada gantungan. Jika kedua bagian tali bergerak sejajar maka batas beban kerja adalah sama dengan tegangan pada tali.

Untuk kerek jalur tunggal dengan beket batas beban kerja adalah sama dengan sepertiga beban suspensi yang diizinkan pada gantungan. Jika ketiga bagian tali bergerak sejajar maka batas beban kerja adalah sama dengan beban tali.

2. Menyimpang dari butir 1 komponen dengan Batas Beban kerja diatas 100 t dan peralatan lepas kapal dengan Batas Beban kerja diatas 10 t yang akan digunakan untuk peralatan angkat yang sejenis boleh diuji dinamis bersamaan dengan uji beban peralatan angkat tersebut dengan menggunakan beban uji.

Beban kerja aman (SWL) dari alat angkat	Beban uji "PL_{dyn}"
s/d 20 t	SWL + 25%
Dari 20 t s/d 50 t	SWL + 5 t
Di atas 50 t	SWL + 10%

Komponen yang diuji dengan beban "PL_{dyn}" bukan merupakan “komponen yang mudah diganti”, dapat juga digunakan, dengan persetujuan tertulis dari Biro Klasifikasi Indonesia, untuk peralatan angkat lainnya. Untuk tiap komponen tersebut harus diterbitkan sertifikat tersendiri dalam format LA3.

3. Pengertian 1 ton adalah 1000 kg.

4. Definisi “Pejabat yang berwenang”, “Pemeriksaan seksama” dan “peralatan lepas” disebutkan pada Form No. LA 1.

CATATAN

Untuk rekomendasi mengenai prosedur pengujian agar mengacu pada dokumen ILO ”Keselamatan dan Kesehatan Kerja di Pelabuhan”.

INSTRUCTION

1. Every item of interchangeable components and loose gear is to be tested and thoroughly examined before being put into use for the first time and after any substantial alteration or repair to any part liable to affect its safety. The test loads to be applied shall be in accordance with the following table :

Interchangeable components	Working Load Limit WLL *)	Proof Load "PL_{Stat}"
Chains, rings, hooks, shackles, swivels,etc.	Up to 25 t Over 25 t	2 x WLL (1,22 x WLL) + 20 t
Multiple sheave blocks	Up to 25 t Over 25 t to 160 t Over 160 t	2 x WLL (0,933 x WLL) + 27 t
Single sheave blocks without becket	Up to 12,5 t Over 12,5 t	4 x WLL (2,44 x WLL) + 20 t
Single sheave blocks with becket	Up to 8,0 t Over 8,0 t	6 x WLL (3,66 x WLL) + 20 t
Loose gear such as lifting beams, spreaders and similar devices	Up to 10 t Over 10 t to 160 t Over 160 t	2 x WLL (1,04 x WLL) + 9,6 t 1,1 x WLL

*) For multiple sheave blocks, the working load limit WLL is equal to the permissible load at the suspension of the block.

For single sheave block without becket, the working load limit WLL is equal to one half of the permissible load at the suspension. If both parts of the rope are running parallely the working load the limit WLL is equal to the rope tension.

For single sheave block with becket, the working load limit WLL is equal to one third of the permissible load at the suspension. If the three parts of the rope are running parallely the working load the limit WLL is equal to the rope tension.

2. Deviating from 1 this components with Working Load Limits exceeding 100 t and shipborne loose gear Working Load Limits exceeding 10 t intended for identical lifting appliances may during load testing of the lifting appliance be tested dynamical together with it, applying the following test loads :

SWL of gear	Test Load "PL_{dyn}"
Up to 20 t	SWL + 25%
From 20 t to 50 t	SWL + 5 t
Over 50 t	SWL + 10%

Components subjected to test load "PL_{dyn}" are not interchangeable, they can be used with written consent of Biro Klasifikasi Indonesia for other lifting appliances also. For each of these components must be issued on own certificate form LA3.

3. The expression “tonne” shall mean a tonne of 1,000 kg.

4. The terms “competent person”, “thorough examination” and “loose gear” are defined in form No. LA 1.

NOTE

For recommendations on test procedures reference may be made to the ILO document “Safety and Health in Port”.

BIRO KLASIFIKASI INDONESIA

Form No. L A 4

☐ For ILO Statutory Compliance

☐ For Class Notation "LA"

Catatan/Note :

Sertifikat ini berdasarkan pada format Standar Internasional yang direkomendasikan oleh Kantor Organisasi Perburuhan Internasional sesuai dengan konvensi ILO No. 152

This certificate is based on the standard International form as recommended by the International Labor Office in accordance with ILO Convention No. 152

No. Sertipikat Uji : _____
Test Certificate No.

Sertipikat Pabrik Pembuat : _____
Manufacturer Certificate

Nama Kapal/ Bangunan Lepas Pantai : _____
Name of Ship or Offshore Structure

_____

Tanda Panggilan : _____
Code Letters

No. Register BKI : _____
BKI Register No.

Sertipikat Uji dan Pemeriksaan Tali Kawat

Certificate of test and examination of wire rope

Tanggal uji : _____
Date of test

Panjang : _____ m
Length

Diameter Nominal : _____ mm
Nominal Diamteter

Standar : _____
Standard

Konstruksi : _____
Construction

Lapisan permukaan kawat : _____
Surface of the wires

Tipe inti tali : _____
Type of core

Tegangan tarik nominal kawat : _____ N/mm^3
Nominal tensile grade of wire

Jenis lilitan/Arah lilitan : _____
Type of lay/direction of lay

A) Beban putus benda uji : _____ kN
Load at which sample broke:

B) Dengan pengujian kawat yang diambil dari satu berkas diperoleh hasil sebagai berikut :
By testing of the wires from one strand the following mean values were ascertained:

Jumlah kawat : _____
Number of the wires

Diameter kawat : _____ mm
Diameter of the wires

Luas penampang kawat : _____ mm^3
Sectional areas of the wires

Beban putus kawat : _____ N
Breaking load of the wires

Tegangan tarik kawat : _____ N/mm^3
Tensile strength of the wires

Hasil beban putus gabungan dari tali : _____ kN
Measured aggregate breaking load of the rope

Faktor pemintal : _____
Spinning factor

Hasil beban putus gabungan tali X faktor pemintal: _____ kN
Measured aggregate breaking load X spinning factor

Beban kerja aman dikaitkan dengan faktor utilisasi ”K” (lihat halaman belakang adalah: _____ kN
The safe working load subject to the coefficient utilization “K” (see reverse side) is

C) Pengujian berikutnya : _____
Further tests

Nama dan alamat pabrik pembuat/pemasok tali : _____
Name and address of manufacturer or supplier of rope

Tanda identifikasi strip (dicetak) : _____
Manufactures identification strip (print)

Nama dan alamat perusahaan atau pejabat yang berwenang yang menyaksikan pengujian dan melaksanakan pemeriksaan seksama: _____
Name and address of firm or competent person who witnessed testing and performed the thorough examination

Dengan ini saya menyatakan bahwa pernyataan diatas adalah benar bahwa tali telah diuji dan diperiksa seksama pemeriksaan tali dilaksanakan oleh pejabat yang berwenang dan tidak didapati adanya cacat.

I certify that the above statements are correct, that the rope was tested and thorough examined by a competent person and no defects were found.

Tempat, _____ ,Tanggal _____
Place Date

Tanda tangan
Signature

_____

(Instruksi lihat halaman belakang)
For Instruction see reverse side

INSTRUKSI

1. Tali kawat harus diuji dengan menggunakan sebuah contoh benda uji dengan cara uji merusak. Jika keadaan ini tidak memungkinkan maka beban putus diperoleh dengan cara menguji kawat hingga putus.

2. Prosedur uji harus sesuai dengan standar internasional atau standar nasional yang diakui.

3. Beban kerja aman tali ditentukan dengan membagi beban putus dengan koefisien utilisasi tersebut dibawah ini:

Beban kerja aman (SWL) dari alat bongkar muat, alat angkat, peralatan lepas [ton]	Koefisien utilisasi "K"		
	Tali gerak	Tali penahan	Sling tali kawat *) (sling kaki tunggal)
S/d 10	5	4	6
10 s/d 107	-	$\frac{8000}{(8{,}85 \times SWL) + 1910}$	-
10 s/d 160	$\frac{10.000}{(8{,}85 \times SWL) + 1910}$	-	$\frac{12.000}{(8{,}85 \times SWL) + 1910}$
Melebihi 107	-	2,8	-
Melebihi 160	3	-	3,6

Koefisien tersebut diatas harus dipakai kecuali ada persyaratan lain yang ditentukan oleh badan nasional.

4. 1 ton adalah 1.000 kg.

5. Definisi "Pejabat yang berwenang", "Pemeriksaan seksama" dan "Alat Angkat" ditentukan dalam Form L A 1.

*) Jika sling tali kawat merupakan satu kesatuan dari "Peralatan lepas", maka penentuan ukuran sling ini dapat dianggap sebagai "tali statis" dengan syarat tiap sling dilengkapi dengan simpul ujung atau rongga tali pada kedua ujung.

Kutipan dari Peraturan Biro Klasifikasi Indonesia untuk pengakuan sertifikat uji dan pemeriksaan seksama dari tali kawat.

A. Pabrik pembuat tali kawat boleh menguji sendiri produknya dan menerbitkan sertifikat yang dapat diakui oleh Biro Klasifikasi Indonesia jika memenuhi persyaratan berikut:
   1. Pabrik pembuat harus disetujui oleh Biro Klasifikasi Indonesia.
   2. Tali harus diperiksa sesuai dengan Peraturan Biro Klasifikasi Indonesia.
   3. Semua tipe konstruksi tali harus mendapat persetujuan dari Biro Klasifikasi Indonesia.
   4. Suatu tanda pengenal dengan nama pabrik harus diterakan pada tali. Sebagai tambahan bahwa tanda pengenal tersebut harus mencantumkan nomor pengenal yang diberikan oleh Biro Klasifikasi Indonesia. Disamping itu juga pada tali harus diikatkan benang berwarna yang menunjukkan tegangan tarik dari tali tersebut. Benang tersebut dapat dihilangkan bila tanda pengenal mempunyai warna yang sama dengan masing-masing kuat tarik.
   5. Semua mesin uji tarik untuk pengujian kawat dan tali harus berada dalam pengawasan Biro Klasifikasi Indonesia.
   6. Formulir yang digunakan adalah formulir yang dikeluarkan oleh Biro Klasifikasi Indonesia.

B. Atas permintaan pemasok tali kawat dapat diberi wewenang oleh Biro Klasifikasi Indonesia untuk menyalin sertifikat asli pabrik ke dalam formulir Biro Klasifikasi Indonesia. Hal ini hanya dapat dimungkinkan untuk tali dari pabrik yang diakui oleh Biro Klasifikasi Indonesia untuk tali yang diuji secara bebas.

INSTRUCTIONS

1. Wire rope shall be tested by sample, a piece being tested to destruction. If this is not feasible, the minimum breaking load may be proved by means of destruction tests of the wires.

2. The test procedure should be in accordance with an international or recognized national standard.

3. The SWL of the rope is to be determined by dividing the load at which the sample broke, by a coefficient of utilisation, determined as follows:

Safe Working Load (SWL) of Cargo Handling Appliance, Lifting Appliance, Loose Gear [tonnes]	Coefficient of utilization "K"		
	Running rigging	Standing rigging	Wire rope sling *) (single leg sling)
Up to 10	5	4	6
10 up to 107	-	$\frac{8000}{(8{,}85 \times SWL) + 1910}$	-
10 up to 160	$\frac{10.000}{(8{,}85 \times SWL) + 1910}$	-	$\frac{12.000}{(8{,}85 \times SWL) + 191}$
Exceeding 107	-	2,8	-
Exceeding 160	3	-	3,6

These coefficients should be adopted unless other requirements are specified by a national authority.

4. The expression "tonne" shall mean a tonne of 1.000 kg.

5. The terms "competent person", "thorough examination" and "loose gear" are defined in form LA 1.

*) If wire rope slings are integral part of loose gear, these slings may be dimensioned as "Standing Rigging" provided that all single slings are fitted with thimbles or rope sockets on both ends.

Excerpt from the Rules of Biro Klasifikasi Indonesia with respect to recognition of certificates of test and examination of fibre ropes.

A. Manufacturers of wire ropes may test their product independently and issue certificates which are recognized by Biro Klasifikasi Indonesia if the following conditions are fulfilled :
   1. The manufacturer's workshop must be approved by Biro Klasifikasi Indonesia.
   2. The ropes must be examined in accordance with the Rules of Biro Klasifikasi Indonesia.
   3. All types of rope construction must be approved by Biro Klasifikasi Indonesia.
   4. An identification strip with the name of the manufacturer must be worked into the rope. Additionally this strip must bear the identification number assigned by Biro Klasifikasi Indonesia. Furthermore a colored distinguishing thread denoting the tensile grade of yarns must be worked into the rope. This colored distinguishing thread can be dispensed with, if the identification strip is of color of the respective tensile grade.
   5. All tensile testing machines for testing of wires and ropes must be subject to Biro Klasifikasi Indonesia control.
   6. Only forms issued by Biro Klasifikasi Indonesia may be used for test certificates.

B. Suppliers of wire ropes may be authorized by Biro Klasifikasi Indonesia on application to transcribe original certificates issued by manufacturers on BKI-certificate forms. This is only possible for ropes from manufacturers authorized by Biro Klasifikasi Indonesia for independent testing of ropes.

BIRO KLASIFIKASI INDONESIA

Sertifikat Uji Lift
Certificate of Testing of Lift

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

No. Sertifikat : _____
Certificate No.

Nama Kapal/ Bangunan Lepas : _____
Name of Ship or Offshore Structure

No. Register BKI : _____
BKI Register No.

Tanda Panggilan : _____
Code Letter

No. Seri : _____
Serial No.

Tipe : _____
Type

No. Lift : _____
Lift No.

Pengujian yang dilaksanakan :
- Uji Pertama / Initial Test ☐
- Uji Utama / Main Test ☐
- Uji Antara / Intermediate Test ☐
- Uji Khusus / Extraordinary Test ☐

Lift telah diuji sesuai Peraturan : _____
This lift has been tested subject to Regulation

Tidak didapati / didapati *) adanya cacat : _____
No / following *) defects were found

Cacat tercantum berikut _____ mempengaruhi keselamatan manusia
Following defects imply risk to person

Sesuai persyaratan _____
Subject to

pengoperasian lift hanya dapat dilakukan setelah cacat-cacat tersebut diatas dihilangkan'
operation of the lift may only resumed upon elimination of these defects

Cacat tersebut harus dihilangkan paling lambat : ☐☐☐ (tg/bl/th)
The defects found are to be eliminated until (dd/mm/yr)

Perbaikan cacat harus diinformasikan pada BKI
Elimination of the defects is to be notified to BKI

Cacat sesuai sertifikat No. _____ telah diperbaiki, kecuali:
The defects acc. To certificate No.

Pengawas lift _____ hadir/ tidak *) hadir
The lift Supervisor did/ did not *) attend

)* Coret yang tidak perlu/ delete as appropriate

Tempat , _____, Tanggal, _____
Place Date

Kepala Cabang
Branch Office, Head

Surveyor

(.....) (.....)

INSTRUKSI

Seluruh komponen harus dibersihkan.

Setiap komponen yang merusak atau tidak berfungsi dengan baik diganti atau diperbaiki secara khusus harus ditentukan sebelum pengujian, apakah alat pengaman dari pintu (kontak, magnit dan alat pengunci lainnya) beroperasi dengan baik, apakah peralatan pelepas ujung dapat menghentikan Lift dan apakah penyelaras tingkat dari lift berfungsi dengan baik dicoba dari berfungsi dengan baik.

Seorang yang familiar dengan Lift harus mengoperasikan Lift tersebut selama pengujian. Personil pembantu dan peralatan yang diperlukan (beban uji, perkakas, sekering listrik, dan seterusnya) harus tersedia.

Catatan Lift tersebut harus diberikan kepada surveyor BKI sebelum pengujian.

Bila, akibat persiapan yang tidak memadai, pengujian tidak dapat atau tidak seluruhnya dapat dilakukan pada waktu yang ditentukan atau bila selama dalam pengujian Lift tersebut ternyata tidak berada pada kondisi yang ditetapkan maka pengujian harus diulang.

Oleh karena itu, dianjurkan agar selalu untuk menghadirkan mekanik Lift dalam persiapan pengujian dan melakukan penggerakan dan melaksanakan percobaan selama pengujian, kecuali tersedia personil lain yang memadai.

INSTRUCTION

All lift components are to be cleaned.

Any defective or unsatisfactory functioning components are to be renewed or repaired: in particular, it will have to be ascertained prior to the testing, whether the existing securing devices for the doors (contacts, magnets, and other locking devices) operate reliably, whether the end disengaging gears stop the lift and the storey adjustment of the lift functions properly.

A person familiar with the lift is to operate the lift during the test. Any assistant personnel and equipment required (test weight, tools, electric fuses, etc) are to be made available.

The register of the lift is to be handed to the BKI Surveyor prior to testing.

If due to inadequate preparation a test can either not or only partly be performed at the envisaged time or if during the test the lift proves not to be in the condition stipulated, the test will have to be repeated.

It is, therefore, advisable under all circumstances to call a lift mechanic to assist in preparing the test and in performing the travelling and catch trials during the testing, unless other suitable persons are available.

No. Sertifikat : _____
Certificate No.

BIRO KLASIFIKASI INDONESIA

Sertifikat Uji
Test Certificate

Dengan ini kami menyatakan bahwa komponen tersebut dibawah ini telah diuji oleh surveyor kami.
We hereby certify that the item described in the following was tested by our Surveyor.

Pemasok : _____
Supplier

Tempat Pengujian : _____
Place of test

Komponen dan pengujiannya : _____
Item and test

Stempel
Stamping

Digunakan untuk : _____
Intended for

Nomor pesanan pelanggan : _____
Customer's Order No

Nomor pesanan pemasok : _____
Supplier's order No

Tempat dan Tanggal, _____
Place and date

Surveyor

(……)

F 33.3. 08 – 2012/ Rev. 0

BIRO KLASIFIKASI INDONESIA

No. Sertifikat Uji : _____
Test Certificate No.

Sertifikat Pabrik Pembuat : _____
Manufacturer Certificate

Nama Kapal / Bangunan Lepas Pantai : _____
Name of Ship or Offshore Structure

_____

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

Tanda Panggilan : _____
Code Letters

No. Register BKI : _____
BKI Register No.

Sertifikat Uji dan Pemeriksaan Tali Serat

Certificate of test and examination of fibre ropes

Tanggal uji : _____
Date of test

Diameter Nominal : _____
Nominal Diamteter

Konstruksi: _____
Construction

Jumlah seluruh benang : _____
Date of test

Material : _____
Material

Titik leleh terendah : _____
Lowest melting point

Beban putus tali yang disyaratkan : _____ kN
Required breaking load of rope

Panjang : _____
Length

Berat : _____
Weight

Standar : _____
Standard

Warna : _____
Colour

Berat jenis : _____ Kg/dm^3
Spec Weight

Stabilisasi cahaya: _____
Light stabilization

Hasil Uji

Test Result

A) Satu potong tali telah diuji merusak dengan panjang benda uji _____ mm
One piece of rope was tested to destruction with a test length of

Beban putus adalah : _____ kN
The breaking load is

B) Dengan pengujian : _____ Benang yang diambil dari tali secara rata-rata
By testing of Yarns taken from the rope an average

Beban putus benang yang diperoleh : _____ kN
Yarn breaking load of was certained

Beban putus gabungan seluruh pilihan serat dengan factor reduksi : _____
A multiplication of yarn breaking load with the number of yarns and the reduction factor

Hasil beban putus adalah : _____ kN
Result to a breaking load of

Beban kerja aman sesuai dengan koefisien utilisasi (lihat halaman belakang) adalah: _____ kN
The safe working load subject to the coefficient of utilization (see reverse side) is

Nama dan alamat pabrik pembuat atau pemasok tali : _____
Name and address of manufacturer or supplier of rope

Tanda tercetak pada pelat identifikasi pabrik : _____
Print on the manufacturer identification strip

Nama dan alamat perusahaan atau pejabat yang berwenang yang melaksanakan pengujian dan pemeriksaan :
Name and address of firm or competent person who witnessed testing and performed examination

Dengan ini saya menyatakan bahwa pernyataan diatas adalah benar, bahwa pengujian dan pemeriksaan tali dilaksanakan oleh pejabat yang berwenang dan tidak didapati adanya cacat.
I certify that the above statements are correct, that the rope was tested and examined by a competent person and no defects were found.

Tempat, _____ ,Tanggal _____
Place Date

Tanda tangan _____
Signature

(Instruksi lihat halaman belakang)
For Instruction see reverse side

INSTRUKSI

1. Tali serat harus diuji dengan benda uji yang ditarik sampai putus. Beban putus boleh juga ditentukan dengan uji merusak benang bila hal ini disepakati oleh pembuat dan pemesan. Akan tetapi prosedur ini hanya dapat diterapkan pada tali yang faktor realisasinya telah ditentukan dalam Peraturan Biro Klasifikasi Indonesia. Untuk jumlah benang yang harus diambil lihat peraturan Biro Klasifikasi Indonesia Vol. V, Appendik S.A. atau ISO 2307.

2. Untuk tali serat yang digunakan di kapal, Beban Kerja Aman tidak boleh melebihi 1/N dari beban putus hasil uji.

Diameter Nominal Tali	Koefisien Utilisasi ”N”*)
10-17	10
18-23	8
24-39	7
40 dan seterusnya	6

Tali serat yang digunakan sebagai saling harus memenuhi standar yang diakui up. DIN. 83.302

3. Tali serat untuk tali jalan dan tali diam dari alat bongkar muat dan alat angkat hanya boleh digunakan dengan izin khusus dari Biro Klasifikasi Indonesia.

*) Untuk tali pliamida nilai koefisien utilisasi ”N” harus ditambah 10%

Kutipan dari Peraturan Biro Klasifikasi Indonesia untuk pengakuan sertifikat uji dan pemeriksaan tali serat.

A. Pabrik pembuat tali serat boleh menguji sendiri produknya dan menerbitkan sertifikat yang akan diakui oleh Biro Klasifikasi Indonesia apabila memenuhi persyaratan berikut:
   1. Bengkel kerja dari pabrik pembuat telah disetujui oleh Biro Klasifikasi Indonesia.
   2. Tali harus diperiksa sesuai dengan Peraturan Biro Klasifikasi Indonesia.
   3. Konstruksi, bahan dan struktur tali memenuhi standar yang diakui oleh Biro Klasifikasi Indonesia.
   4. Tanda identifikasi dengan nama pabrik pembuat harus tercantum pada tali.
   5. Semua mesin uji tarik untuk pengujian benang dan tali harus dibawah pengawasan Biro Klasifikasi Indonesia.
   6. Hanya formulir yang diterbitkan Biro Klasifikasi Indonesia yang dapat digunakan sebagai sertifikat uji.

B. Pemasok tali serat untuk kapal, atas permintaan, dapat diberi wewenang oleh Biro Klasifikasi Indonesia untuk mrenyalin sertifikat uji asli yang dibuat oleh pembuat pada formulir sertifikat Biro Klasifikasi Indonesia. Hal tersebut hanya dibolehkan untuk tali dari pembuat yang diberi wewenang oleh Biro Klasifikasi Indonesia untuk mengadakan pengujian sendiri.

INSTRUCTIONS

1. Fibre ropes shall be tested by sample a piece being tested to destruction. The breaking load of ropes may be also proved by destruction test of yarns if this is agreed upon between manufacturers and orderers. However, this procedure may exclusively be applied to ropes for which realization factors have been laid down in the rules of Biro Klasifikasi Indonesia For the number of yarn samples to be taken, see Biro Klasifikasi Indonesia Rules vol. V Appendix 5.4 or ISO 2307.

2. For fibre ropes used for marine purpose, the SWL must not exceed 1/N of the proved breaking load.

Nominal rope Dimater	Coefficient of Utilization ”N”*)
10-17	10
18-23	8
24-39	7
40 dan seterusnya	6

Fibre ropes used as slings must comply with recognize standard cq. DIN. 83 302.

3. Fibre ropes for the running and standing rigging of cargo handling appliances and lifting appliances may only be used with special permission of Biro Klasifikasi Indonesia.

*) For polyamide ropes, the values of Coefficient of Utilization “N” are to be increased by 10% percent.

Excerpt from the Rules of Biro Klasifikasi Indonesia with respect to recognition of certificates of test and examination of fibre ropes.

A. Manufacturers of fibre ropes may test their product independently and issue test certificates which are recognized by Biro Klasifikasi Indonesia if the following conditions are fulfilled :
   1. The manufacturer’s workshop must be approved by Biro Klasifikasi Indonesia.
   2. The ropes must be examined in accordance with the Rules of Biro Klasifikasi Indonesia.
   3. Construction, material and structure of ropes must conform to a standard recognized by Biro Klasifikasi Indonesia.
   4. An identification strip with the name of the manufacturer must be worked into the rope. Additionally this strip must be bearing the identification number assigned by Biro Klasifikasi Indonesia. Furthermore a colored distinguishing thread denoting the tensile grade of yarn according to the standard is also to be worked into the rope.
   5. All tensile testing machines for testing of yarns and ropes must be subject to Biro Klasifikasi Indonesia control.
   6. Only forms issued by Biro Klasifikasi Indonesia may be used for test certificates.

B. Suppliers of fibre ropes for ships, may be authorized by Biro Klasifikasi Indonesia on application to transcribe original test certificates issued by manufacturers on Biro Klasifikasi Indonesia-certificate forms. This is only possible for ropes from manufacturers authorized by Biro Klasifikasi Indonesia for independent testing of ropes.

BIRO KLASIFIKASI INDONESIA

☐ For ILO Statutory Compliance
☐ For Class Notation "LA"

Catatan/Note :

Sertifikat ini berdasarkan pada format Standar Internasional yang direkomendasikan oleh Kantor Organisasi Perburuhan Internasional sesuai dengan konvensi ILO No. 152

This certificate is based on the standard International form as recommended by the International Labor Office in accordance with ILO Convention No. 152

No. Sertifikat :_____
Certificate No.

Nama Kapal/ Bangunan Lepas Pantai:_____
Name of ship or Offshore Structure

_____

Tanda Panggilan :_____
Call sign

No. Register BKI :_____
BKI register No.

Sertifikat Uji Perlakuan Panas Komponen yang Mudah Diganti dan Peralatan Lepas

Certificate of heat treatment of Interchangeable Components and Loose Gear

(1) Nama pengenal atau marka Distinguishing number or mark	(2) Uraian komponen yang mudah diganti dan peralatan lepas* Description of interchangeable components and loose gear*	(3) Nomor sertifikat test dan pengujian Number of certificate of test and examination	(4) Jumlah benda yang diperlakuan panas Number heat- treated	(5) Tanggal Perlakuan Panas Date of heat treatment	(6) Jenis perlakuan panas yang diberikan Nature of heat treatment given	(7) Cacat yang ditemukan saat inspeksi setelah perlakuan panas Defects found at inspection after heat treatment

* Ukuran dari peralatan, tipe material dari peralatan, dan perlakukan panas yang diberikan pada saat pembuatan harus disebutkan.
* The dimension of the gear, the type of material of which it is made, and the heat treatment received in manufacture should be stated.

(8) Nama dan alamat dari penyedia jasa, asosiasi, atau perusahaan yang melaksanakan perlakuan panas dan inspeksi
Name and address of public service, association, company or firm carrying out the heat treatment and inspection

_____

_____

(9) Jabatan penanda tangan dalam penyedia jasa, asosiasi atau perusahaan _____
Position of signatory in public service, association, company or firm

_____

Dengan ini saya menyatakan bahwa pada tanggal yang tercantum pada kolom 5, peralatan yang tercantum pada kolom 1 sampai 4 telah dikenai perlakuan panas (sesuai pada kolom 6) di bawah pengawasan saya. Setelah dikenai perlakuan panas, setiap peralatan diperiksa dengan seksama dan tidak ditemukan cacat yang dapat mempengaruhi kondisi keselamatan kerja, selain yang tertera pada kolom 7.
I certify that on the date shown in Column 5, the gear referred to in Columns 1 to 4 was heat-treated (indicated in Column 6) under my supervision. After being heat-treated, every article was carefully inspected and no defects affecting its safe working condition was found, other than those items indicated in Column 7.

Tempat _____ , Tanggal _____
Place Date

Tanda tangan
Signature _____

Catatan: Orang yang mengawasi pekerjaan ini harus berkompeten, dinyatakan secara teknis sebagai orang yang layak dan berkualifikasi yang merupakan karyawan dari perusahaan pembuan komponen atau perusahaan pelaksana perlakuan panas yang diakui..
NOTE: The person under whose supervision the work is done must be a competent person, defined as a reasonably and technically qualified employee of the manufacturer of the gear tested or of a recognized heat treating company.

Untuk persyaratan perlakuan panas, lihat halaman sebaliknya.
For requirements as to heat treatment, see reverse side.

INSTRUKSI ANIL

1. Rantai (selain rantai pengekang yang terpasang pada tiang dan derek) komponen yang mudah diganti dan peralatan lepas (cincin, kait, segel, dan kili-kili) yang digunakan untuk mengangkat dan menurunkan harus dianil pada interval berikut:

	Jika digunakan pada mesin angkat yang digerakkan dengan tenaga mesin	**Jika hanya digunakan pada mesin angkat yang digerakkan dengan tangan**
Rantai, cincin, kait, segel, dan kili-kili dengan ukuran 12.5 mm (0.5 in) atau lebih kecil	6 bulan	2 tahun
Rantai, cincin, kait, segel, dan kili-kili lainnya	12 bulan	2 tahun

2. Anil harus dilakukan di dalam oven tertutup yang sesuai dan tidak langsung di atas api. Besi tempa harus dianil pada suhu antara 593°C dan 649°C selama 30 sampai 60 menit. Setelah dianil, peralatan tersebut harus didinginkan secara perlahan.

INSTRUCTIONS ANNEALING

1. Chains (other than bridle chains attached to derricks or masts), interchangeable components and loose gear (rings, hooks, shackles and swivels made of wrought iron, used in hoisting or lowering, shall be annealed at the following intervals:

	If used on lifting machinery driven by power	**If used solely on lifting machinery worked by hand**
12.5 mm (0.5 inch) and smaller chains, rings, hooks, shackles and swivels in general use	6 months	2 years
All other chains, rinks, hooks, shackles and swivels in general use	12 months	2 years

2. The annealing shall be done in a suitable closed oven and not over an open fire. Wrought iron shall be annealed at a temperature of between 593°C and 649°C for a period between thirty and sixty minutes. After being annealed, the article should be allowed to cool slowly.