GUIDE FOR CERTIFICATION OF

LIFTING APPLIANCES

JULY 2007 (Updated August 2014 – see next page)

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the State of New York 1862

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**Foreword (1 August 2014)**

This new *Guide for Certification of Lifting Appliances* is the consolidated edition of the following four existing Guides and one newly-developed Guide:


The consolidated Guide has been published in electronic format and posted on the ABS website since October 2006, so that the Guide can be easily updated in response to the users’ feedback. During the first three months, numerous editorial and technical comments on the Guide were received, and consequently, these comments were thoroughly reviewed and incorporated in the Guide updated in February 2007.

In the development of this consolidated edition, the individual Guide requirements have been updated in accordance with the latest industry standards as well as ABS plan review and survey practice. The particular changes made to the Guide are as follows:

- **Chapter 1, Scope and Conditions of Certification:**
  The certification policies commonly applied for the certification of lifting appliances are specified in this Chapter, together with the updated “Scope and Conditions” for certification applicable for lifting appliances.

- **Chapter 2, Guide for Certification of Cranes:**
  i) Many of the requirements have been updated in line with the latest edition of the API Specification 2C, “Specification for Offshore Pedestal Mounted Cranes”.
  ii) Additional updated information/requirements are provided for selection of materials for shipboard cranes intended to operate in low temperature environments.
  iii) Requirements for Personnel Lifting has been upgraded to be more in line with Industry practices.

- **Chapter 3, Guide for Certification of Cargo Gear on Merchant Vessels:**
  The factor of safety of wire rope for working load of 100 kN or more is updated in line with the revision made to the ILO standards.

- **Chapter 4, Guide for Certification of Self-unloading Gear on Great Lakes Vessels:**
  No essential technical changes have been made since the original Guide was published in 1991.

- **Chapter 5, Guide for Certification of Shipboard Elevators:**
  The requirements have been extensively updated in line with the latest edition of the ASME A17.1, “Safety Code for Elevator and Escalators”.

- **Chapter 6, Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks):**
  The requirements specified in this Chapter were newly developed based on ABS plan review and survey practice.

- **Appendix, Samples of ABS Register of Lifting Appliances and Register of Cargo Gear:**
  These sample forms to be commonly used for lifting appliances are listed in this appendix for the users’ convenience.

This Guide will become effective on 1 July 2007 and supersedes the existing Guides, 1 through 4, as listed above.
GUIDE FOR CERTIFICATION OF
LIFTING APPLIANCES

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CHAPTER 1 Scope and Conditions of Certification

SECTION 1 Certification

1 Process

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 Guide, existing Rules and Guides or other acceptable standards.

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, Guides, 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, Guides, 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.

The Rules, Guides and standards are developed by the ABS staff and passed upon by committees made up of naval architects, ocean and marine engineers, shipbuilders, engine builders, steel makers, process engineers and by other technical, operating and scientific personnel associated with the worldwide maritime industry. Theoretical research and development, established engineering disciplines, as well as satisfactory service experience are utilized in their development and promulgation. ABS and its committees can act only upon such theoretical and practical considerations in developing Rules and standards.

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

3 Certificates and Reports

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

5 Representations as to Certification

Certification is a representation by ABS as to the structural and mechanical fitness for a particular use or service, in accordance with its Rules, Guides and standards. The Rules and Guides of the American Bureau of Shipping 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. ABS, being a technical society, can only act through Surveyors or others who are believed by it to be skilled and competent.
ABS represents solely to the Lifting Appliance manufacturer or other clients of ABS that when certifying, it will use due diligence in the development of Rules, Guides and standards, and in using normally applied testing standards, procedures and techniques as called for by the Rules, Guides, standards or other criteria of ABS. ABS further represents to the Owner or other Clients of ABS that its certificates and reports evidence compliance only with one or more of the Rules, Guides, standards or other criteria of ABS, 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.

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, Guide, standard, certificate or report issued by ABS 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.

7 Scope of Certification

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, Guides, standards or other criteria of the American Bureau of Shipping, and is issued solely for the use of ABS, its Committees, 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 1-1/5. ABS 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, Guides and standards of the American Bureau of Shipping, who shall remain the sole judge thereof. ABS is not responsible for the consequences arising from the use by other parties of the Rules, Guides, standards or other criteria of the American Bureau of Shipping, without review, plan approval and survey by ABS.

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, Guides, standards or other criteria acceptable to ABS.

This Guide 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 the Committee.
CHAPTER 1 Scope and Conditions of Certification

SECTION 2 Suspension and Termination of Certification

1 Suspension of Certification

Certification will be suspended and the Certificate 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 Certificate 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, Quadrennial 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 Certificate of Lifting Appliance will become invalid, if proposed repairs have not been submitted to ABS and agreed upon prior to commencement.

Certification is automatically suspended and the Certificate 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 Quadrennial or Retesting Survey is not completed by the due date.

3 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.

5 Termination of Certification

The continuance of the Certification of the Lifting Appliance and its equipment is conditional upon the Guide requirements for periodical, damage and other surveys being duly carried out. ABS reserves the right to reconsider, withhold, suspend or terminate the certificate of any lifting appliance and its equipment for non-compliance with the Guide 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.
7 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. ABS 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.
CHAPTER 1 Scope and Conditions of Certification

SECTION 3 Rules for Certification

1 Applications
This Guide 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, self-unloading cargo gear on Great Lakes vessels, stern, bow and sideport ramps and moveable platforms).

If specifically requested by the Owner, this Guide 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 ABS.

3 Scope
This Guide provides requirements for certification of lifting appliances installed on vessels and offshore floating and/or fixed structures classed by ABS including but not limited 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.
- Self-unloading cargo gear on Great Lakes Vessels
- Stern, bow and sideport ramps and moveable paltforms

5 Alternatives
The Committee 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 Guides.

The Committee 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 Guide.

7 Effective Date of Change of Requirement

7.1 Effective Date
This Guide and subsequent changes to this Guide are to become effective on the date specified by ABS. In general, the effective date is not less than six months from the date on which the Guide is published and released for its use. However, ABS may bring into force the Guide or individual changes before that date, if necessary or appropriate.
7.3 Implementation of Rule Changes
In general, until the effective date, plan approval for designs will follow prior practice, unless review under
the latest Guide 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.

9 ABS Type Approval Program

9.1 Type Approval
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 ABS Type Approval Program. The ABS
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
ABS Type Approval Program generally covers Product Type Approval (1-3/9.5), but is also applicable for
a more expeditious procedure towards Unit-Certification, as specified in 1-3/9.3.

9.3 Unit-Certification
Unit-Certification is a review of individual materials, components, products and systems for compliance with
ABS Rules, Guides 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 ABS Rules, Guides or other recognized standards.

ii) A survey during manufacture for compliance with the ABS Rules, Guides 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) Products found in compliance are issued “Individual Unit Certification”.

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

9.5 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 “Confirmations of
Type Approval” (see 1-1-A3/5.3.4 of the Rules for Conditions of Classification (Part 1)). The Confirmation
of Type Approval is neither an alternative to nor an equivalent of an Individual Unit Certificate. In order to
remain valid, the Confirmation of Type Approval requires routine audits of the manufacturer and continued
compliance of the product with existing or new specifications.

9.7 Approval on Behalf of Administrations
ABS 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 each ABS Technical Office.

9.9 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.
9.11 Definitions

**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.

**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.

**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.

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

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

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

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

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

**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.

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

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

**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.

**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.

**Product.** Result of the manufacturing process.

**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 1-1-A3/3 “Limitations” and 1-1-A3/5.5 “Product Quality Assurance Certification (PQA) Tier 4” of the *Rules for Conditions of Classification (Part 1).*

**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.

**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 ABS for special consideration.

**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.

9.13 The Terms and Conditions for use of ABS Type Approved Product Logo

When a product is eligible for a Confirmation of Type Approval (1-1-A3/5.3.4 of the *Rules for Conditions of Classification (Part 1)*), the Type Approved Product Logo may also be used with the understanding that it is copyrighted and its use must be controlled as follows:
Section 3 Rules for Certification

1) Any advertisement or other use of the logo is to be presented to the Manager of ABS Programs for review prior to use.

2) The logo may only be used on correspondence, advertising and promotional material and must not be used except in connection with those goods or services described in the scope and conditions of the Product Design Assessment Certificate.

3) The logo may be used only on those materials (i.e., Internet site, letterhead, marketing literature, advertising, invoice stock forms, packaging, etc.) relating to the particular facility and process/product lines included within the Product Type Approval Certificate.

4) The logo may not, under any circumstances, be used directly on or closely associated with products in such a way as to imply that the products themselves are “Unit-certified” by ABS.

5) If used with other logos, ABS may ask that the manufacturer discontinue any use of other logos that are unacceptable to ABS and any form of statement that, in the opinion of ABS, might be misleading.

6) Upon the termination of certification, for whatever reason, the manufacturer must undertake to immediately discontinue all use of the logo and to destroy all stocks of material on which they appear.

7) When advertising the product as ABS Type Approved, the manufacturer’s name, if different from the parent company, is to be used in conjunction with this logo. Any use should be specific to the process/product line covered and not represented as a blanket approval of the company.

8) The logo may be scaled uniformly to any size necessary. The color of the logo shall be either black or blue (reflex blue or PMS 294 blue).

9) Logos are available by e-mail from type_approval@eagle.org.

See the ABS Type Approved Product Logo, as follows:

See the ABS Type Approval Program in Appendix 1-1-A3 of the Rules for Conditions of Classification (Part 1). The ABS Type Approval Program and the indicated references are available for download from the ABS website at: http://www.eagle.org.

11 Other Regulations

11.1 International and Other Regulations

While this Guide 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.

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, ABS will survey for compliance with the provision of International and Governmental Conventions and Codes, as applicable.

11.3 Governmental Regulations

Where authorized by a government agency and upon request of the Owners of a new or existing lifting appliance, ABS 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.
11.5 Other Rules

Where the vessel on which the lifting appliances are installed is built in accordance with 1-1-4/7.5 of the Rules for Conditions of Classification (Part 1), ABS will consider the lifting appliances constructed to the satisfaction of the ABS Surveyors in accordance with the plans that have been approved to the Rules/Guides of another recognized classification society with verification of compliance by ABS.

13 Submission of Plans

Each Chapter of this Guide 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 ABS review of the manufacturer’s submittal, ABS 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 ABS Surveyors.

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

15 Notification and Availability for Survey

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.

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 the Committee. 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.

17 Units

This Guide is written in three systems of units: SI units, MKS units and US customary units. Each system is to be used independently of any other system. Unless indicated otherwise, the format of presentation of the three systems of units in this Guide is as follows:

SI units (MKS units, US customary units)

19 Fees

Fees in accordance with normal ABS practice will be charged for all services rendered by ABS. Expenses incurred by ABS 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.

21 Disagreement

21.1 Rules and Guides

Any disagreement regarding either the proper interpretation of Rules and Guides or the translation of Rules and Guides from the English language edition is to be referred to ABS for resolution.
21.3 Surveyor

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 Guides relating to any system classed or proposed to be classed by ABS, an appeal may be made in writing to the Committee, 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.

23 Limitation of Liability

The combined liability of the American Bureau of Shipping, its committees, officers, employees, agents or subcontractors for any loss, claim or damage arising from its negligent performance or nonperformance of any of its services or from breach of any implied or express warranty of workmanlike performance in connection with those services, or from any other reason, to any person, corporation, partnership, business entity, sovereign, country or nation, will be limited to the greater of a) $100,000 or b) an amount equal to ten times the sum actually paid for the services alleged to be deficient.

The limitation of liability may be increased, up to an amount twenty-five times the sum paid for services, upon receipt of Client’s written request at or before the time of performance of services, and upon payment by Client of an additional fee of $10.00 for every $1,000.00 increase in the limitation.

Under no circumstances shall American Bureau of Shipping be liable for indirect or consequential loss or damage (including, but without limitation, loss of profit, loss of contract, or loss of use) suffered by any person as a result of any failure by ABS in the performance of its obligations under these Rules. Under no circumstances whatsoever shall any individual who may have personally caused the loss, damage or expense be held personally liable.

25 Hold Harmless

The party requesting services hereunder, or his assignee or successor in interest, agrees to release ABS and to indemnify and hold harmless ABS from and against any and all claims, demands, lawsuits or actions for damages, including legal fees, to persons and/or property, tangible, intangible or otherwise which may be brought against ABS incidental to, arising out of or in connection with this Agreement, the work to be done, services to be performed or material to be furnished hereunder, except for those claims caused solely and completely by the negligence of ABS, its agents, employees, officers, directors or subcontractors. The parties agree that for the purposes of the Convention on Limitation of Liability for Maritime Claims, 1976, ABS is a person for whose acts the shipowner is responsible.

Any other individual, corporation, partnership or other entity who is a party hereto or who in any way participates in, is engaged in connection with or is a beneficiary of, any portion of the services described herein shall also release ABS and shall indemnify and hold ABS harmless from and against all claims, demands, lawsuits or actions for damages, including legal fees, to persons and/or property, tangible, intangible or otherwise, which may be brought against ABS by any person or entity as a result of the services performed pursuant to this Agreement, except for those claims caused solely and completely by the negligence of ABS, its agents, employees, officers, directors or subcontractors.

27 Time Bar to Legal Action

Any statutes of limitation notwithstanding, Owner’s right to bring or to assert against ABS any and all claims, demands or proceedings whether in arbitration or otherwise shall be waived unless (a) notice is received by ABS within ninety (90) days after Owner had notice of or should reasonably have been expected to have had notice of the basis for such claims; and (b) arbitration or legal proceedings, if any, based on such claims or demands of whatever nature are commenced within one (1) year of the date of such notice to ABS.
29 Arbitration

Any and all differences and disputes of whatsoever nature arising out of services under these Rules shall be put to arbitration in the City of New York pursuant to the laws relating to arbitration there in force, before a board of three persons, consisting of one arbitrator to be appointed by ABS, one by the Client, and one by the two so chosen. The decision of any two of the three on any point or points shall be final. Until such time as the arbitrators finally close the hearings either party shall have the right by written notice served on the arbitrators and on an officer of the other party to specify further disputes or differences under these Rules for hearing and determination. The arbitration is to be conducted in accordance with the rules of the Society of Maritime Arbitrators, Inc. in the English language. The governing law shall be the law of the State of New York, U.S.A. The arbitrators may grant any relief other than punitive damages which they, or a majority of them, deem within the scope of the agreement of the parties, including, but not limited to, specific performance. Awards made in pursuance to this clause may include costs including a reasonable allowance for attorney’s fees and judgment may be entered upon any award made hereunder in any court having jurisdiction.
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CHAPTER 2 Guide for Certification of Cranes

SECTION 1 General

1 Scope (1 October 2013)

This Guide 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 ABS, operating in harbors and offshore.

The vessel or unit classed by ABS having an installed crane certified by ABS in accordance with Chapter 2 of this Guide will be distinguished by the additional class notation CRC.

A vessel or unit classed by ABS will be distinguished by the classification notation CRC(I) when issued an ABS Register of Lifting Appliances based upon an existing register issued by another IACS Society.

3 Submission of Plans and Design Data

3.1 General (2011)

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 electronically to ABS. However, hard copies will also be accepted.

3.3 Information to Be Submitted

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

3.3.1 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 2-2/5.21) 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.
3.3.2 Crane Machinery, Piping and Electric System (1 August 2014)

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).*

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 2-1/3.3.2iv) and 2-1/3.3.2v) above.

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

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.

ix) A list/booklet identifying all equipment of the crane in hazardous areas and the particulars of the equipment is to be submitted for review. Particulars of the equipment are to include manufacturers’ names, model designations, rating (flammable gas group and temperature class), the method of protection (flameproof, intrinsically safe, etc.), any restrictions in their use, and document of certification.

x) A declaration for the absence of Asbestos in the manufacture or packaging of all materials, components, equipment, machinery, piping systems and electrical installations is to be submitted.

* Design approval may be obtained separately by the equipment manufacturer.

5 Submission of Load Diagram of Assembled Crane

A 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 2-8/1.

7 Loading, Handling and Securing

This Guide 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.

9 Definitions

9.1 Shipboard Cranes (1 August 2014)

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 2-1/Figure 1 and 2-1/Figure 2, for sketches of typical shipboard cranes.
9.3 **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 2-1/Figure 1, for sketch of typical offshore crane.

9.5 **Heavy Lift Cranes (1 August 2014)**

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 2-1/Figures 3, 4, 5 and 6 for sketches of typical heavy lift cranes.

9.7 **Safe Working Load (SWL) (1 August 2014)**

The *Safe Working Load* for shipboard, offshore 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, etc.).

9.9 **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).

9.11 **Dead Load**

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

9.13 **Existing Cranes**

*Existing Cranes* are defined as cranes not previously certified by ABS, see 2-2/13.

9.15 **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.

9.17 **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.

9.19 **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.

9.21 **Ton**

\[ 1 \text{kN} = 1000 \text{ N} \quad 1 \text{tf} = 1000 \text{ kgf} \quad 1 \text{Ltf} = 2240 \text{ lbf} \]

9.23 **Personnel Lifting (1 November 2011)**

Lifting of Personnel may consist of:

i) Transfer of personnel between installations or vessels

ii) Access to work positions

9.25 **Boom (1 September 2012)**

An arm hinged to the revolving upper structure used for supporting the hoisting tackle at the required outreach.

9.27 **Boom Angle (1 September 2012)**

The angle to the horizontal of the longitudinal axis of the boom base section.
9.29 **Boom (Luffing) Hoist (1 September 2012)**
A hoist drum and rope reeving system used to raise and lower the boom.

9.31 **Boom Head (1 September 2012)**
The outer end of the top section of the boom.

9.33 **Drum (1 September 2012)**
A cylindrical member around which a rope is wound for lifting and lowering the load or boom.

9.35 **Dynamic Loads (1 September 2012)**
Loads introduced into the crane or its components by forces in motion.

9.37 **Gantry, Mast or “A-frame” (1 September 2012)**
A structural frame, extending above the revolving upper structure to which the boom support ropes are reeved.

9.39 **Hoist Mechanism (1 September 2012)**
A hoist drum and rope reeving system used for lifting and lowering loads.

9.41 **Jib (1 September 2012)**
An extension attached to the boom head to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset at various angles to the boom.

9.43 **Load Block, Lower (1 September 2012)**
The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

9.45 **Load Block, Upper (1 September 2012)**
The assembly of sheaves, pins and frame at the boom head.

9.47 **Boom Foot Pin (Heel Pin) (1 September 2012)**
The boom pivot point on the revolving upper structure.

9.49 **Pitch Diameter (1 September 2012)**
The diameter of a sheave or rope drum measured center to center of the rope (i.e., root diameter of sheave/drum plus diameter of the rope).

9.51 **Radius (Outreach) (1 September 2012)**
The horizontal distance from the axis of rotation to the center of the hoist line(s).

9.53 **Rope (1 September 2012)**
Wire rope unless otherwise specified

9.55 **Standing Rope (Pendant) (1 September 2012)**
A supporting rope that maintains a constant distance between the two components connected by the rope.

9.57 **Swing (1 September 2012)**
Rotation of the revolving upper structure for movement of loads in a horizontal direction about the axis of rotation.

9.59 **Whipline (Auxiliary Line) (1 September 2012)**
A secondary hoist rope system usually of a lighter load capacity than provided by the main hoist.
9.61 Pedestal *(1 September 2012)*
The supporting structure above which the swing circle mechanism and the revolving upper structure are mounted.

9.63 Reeving Diagram *(1 September 2012)*
A wire rope system where the rope travels around sheaves and drums (main and auxiliary).

9.65 Offboard Lift *(1 September 2012)*
A lift by a crane from, or to, anywhere not on the vessel/unit upon which the crane is mounted.

9.67 Onboard Lift *(1 September 2012)*
A lift by a crane from, or to, a deck of the vessel/unit upon which the crane is mounted.

9.69 Hook, Latch-type *(1 September 2012)*
A type of hook with a mechanical device to close the throat opening of the hook.

9.71 Primary Member or Component *(1 August 2014)*
A member or component whose failure would result in impairing the structural integrity of the crane and/or a control of the load.

11 Certification of Components *(1 August 2014)*
Structural, loose gear, machinery, piping and electric system components are to be certified in accordance with 2-1/Table 2.
FIGURE 1
Pedestal Mounted Rotating Cranes

Note: See 2-1/Table 1 for crane nomenclature

2-1/Figure 1 and 2-1/Table 1 are taken from API Spec 2C, *Offshore Cranes*, Sixth Edition, September 2004.
The complete document can be ordered from:
American Petroleum Institute
Publications and Distributions Section
1220 L Street, Northwest
Washington, D.C. 20005
(202) 682-8375
## TABLE 1
Crane Nomenclature

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<tr>
<td>2</td>
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<td>27</td>
<td>Whip Line or Auxiliary Hoist Drum</td>
<td>X</td>
</tr>
<tr>
<td>28</td>
<td>Whip Line or Auxiliary Hoist Rope</td>
<td>X</td>
</tr>
</tbody>
</table>

Note: "X" indicates application for type crane shown.
### TABLE 2
Structural, Loose Gear, Machinery, Piping and Electric System Components Certification (1 August 2014)

<table>
<thead>
<tr>
<th>Component (2)</th>
<th>Design Approval</th>
<th>ABS Unit Certification</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certified Safe Electrical Equipment</td>
<td>X</td>
<td></td>
<td>Type-tested and certified by a competent, independent testing laboratory for complying with IEC Publication 60079 or equivalent or ABS Type Approved.</td>
</tr>
<tr>
<td>Electric Cables</td>
<td></td>
<td></td>
<td>Testing by the manufacturers in accordance with the standards of compliance and records of test to be maintained and submitted upon request by ABS. Construction to be in accordance with the standards specified in 4-8-3/9.1 of the ABS Rules for Building and Classing Steel Vessels or ABS Type Approved.</td>
</tr>
<tr>
<td>Electric Motors ≥ 100 kW (3)</td>
<td>X</td>
<td>X</td>
<td>Test certificate furnished by the manufacturer. Testing witnessed by the Surveyor after installation of the crane.</td>
</tr>
<tr>
<td>Electric Motors &lt; 100 kW (3)</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible Hoses and Hose End Fittings</td>
<td></td>
<td>X</td>
<td>Design approved by ABS or alternatively, ABS Design Assessment Certificate (PDA) or ABS Confirmation of Type Approval (CTA).</td>
</tr>
<tr>
<td>Hoisting, Slewing, Luffing Winches/Gears ≥ 100 kW</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Hoisting, Slewing, Luffing Winches/Gears &lt; 100 kW</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic Cylinders (including Piston Rods)</td>
<td></td>
<td>X (3)</td>
<td>Cylinders are to be designed, constructed and tested in accordance with requirements of 4-6-7/3.5.5 of the ABS Rules for Building and Classing Steel Vessels. Structurally induced loads to be considered.</td>
</tr>
<tr>
<td>Internal Combustion Engines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loose Gear</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Coolers/Accumulators ≥ 6.9 bar</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Oil Coolers/Accumulators &lt; 6.9 bar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheaves</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire Ropes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1. For materials’ certification refer to Chapter 2, Section 3.
2. For components not covered by this table, refer to the appropriate sections of this Guide.
3. For primary components see 2-1/9.71.
FIGURE 2
Gantry Cranes

"U" Type Crane

"C" Type Crane

"L" Type Crane
FIGURE 3
Tub Mounted Rotating Crane

FIGURE 4
Shear Leg Crane
CHAPTER 2  Guide for Certification of Cranes

SECTION 2  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 2-1/9.1, 2-1/9.3 and 2-1/9.5. Other types of cranes will be considered on an individual basis. Except where indicated otherwise, 2-2/3 and 2-2/5 are general requirements which apply to the cranes specified in 2-2/7, 2-2/9 and 2-2/11.

1.3  Crane Structural Components (1 August 2014)

Structural components covered by this Guide 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 or lift cylinders
v)  Main and auxiliary hoist wire rope
vi) Center post, gantry, mast or “A”-frame
vii) Revolving upper structure, slew column
viii) Swing circle assembly and bolts or fastenings
ix)  Pedestal
x)  Foundation, where required as per 2-2/5.21
xi) Fasteners in load path of all critical structural components
xii) Wire rope dead-end connection

1.5 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
3 **Materials**

3.1 **Material Selection Requirements**
Material for structural members and components is to be as required in Chapter 2, Section 3.

3.3 **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 (0.24 inch) thick
- **Hollow Sections (e.g., truss boom lacings):** 4 mm (0.16 inch) thick

For less stressed members, a minimum thickness of 4 mm (0.16 in.) is to be provided.

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

3.5 **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 (0.24 in.). Crane manufacturer’s painting procedure is to be submitted for review and the finish painting to the satisfaction of the attending Surveyor. [See 2-1/3.3.1v.)]

5 **Loads and Stresses**

5.1 **Loading Conditions**

5.1.1 **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.

5.1.2 **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.

5.3 **Allowable Stress Coefficients**
The allowable stress coefficients, $S_c$, referred to herein are specified in 2-2/Table 1.
### TABLE 1
Allowable Stress Coefficient, $S_c$ (1 September 2012)

<table>
<thead>
<tr>
<th>Type of Stress</th>
<th>Shipboard &amp; Offshore Cranes</th>
<th>Heavy Lift Cranes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Pin Connected members (gross area)</td>
<td>0.45</td>
<td>0.60</td>
</tr>
<tr>
<td>Pin Connected members (net area)</td>
<td>0.33</td>
<td>0.45</td>
</tr>
<tr>
<td>Shear:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On the Cross Sectional Area Effective in Resisting Shear</td>
<td>0.30</td>
<td>0.40</td>
</tr>
<tr>
<td>Bending: (Tension and Compression on Extreme Fibers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I &amp; H Members, Hot-Rolled Built-Up &amp; Rectangular Tube</td>
<td>0.50</td>
<td>0.66</td>
</tr>
<tr>
<td>Box Type Flexural Members</td>
<td>0.45</td>
<td>0.60</td>
</tr>
<tr>
<td>Combined Stress:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined stress (Von Mises)</td>
<td>0.56</td>
<td>0.74</td>
</tr>
<tr>
<td>Combined stress (Von Mises) – FEM Fine Mesh Analysis with All Loads</td>
<td>0.64</td>
<td>0.85</td>
</tr>
</tbody>
</table>

Notes:
1. Members subjected to combined stresses are to be proportioned to satisfy requirements of 2-2/5.9.
2. For additional guidance, see AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, latest edition.
3. (1 September 2012) The bearing stress on pins is not to exceed $0.68 \times F_y$.
4. (1 September 2012) Tearing out stress = $0.23 \times F_u$, where $F_u =$ specified minimum tensile strength.

#### 5.5 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:

$$F_y = \text{specified minimum yield point or yield strength of the material}$$

For all other steel structural parts:

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

$$S_c = \text{specified in 2-2/5.3}$$

#### 5.7 Column Buckling Stresses

5.7.1 Overall Buckling (1 September 2012)

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

5.7.1(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 $C_c$:

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

$$+ \frac{3(K\ell/r)}{8C_c} - \frac{(K\ell/r)^3}{8C_c^3}$$
5.7.1(b) On the cross section of axially loaded compression members, when $K\ell/r$ exceeds $C_c$:

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

where

- $F_a$ = allowable axial compressive stress
- $E$ = modulus of elasticity
- $\ell$ = unsupported length of column
- $K$ = effective length factor which accounts for support conditions at ends of length $\ell$. For cases where lateral deflection of end supports may exist, $K$ is to be considered from Section 2, Table 2, or Section 2, Figure 2 of the ABS Guide for Buckling and Ultimate Strength Assessment for Offshore Structures latest edition, as applicable.
- $r$ = radius of gyration
- $C_c = \sqrt{\frac{2\pi^2E}{F_y}}$
- $Q$ = coefficient given in 2-2/Table 2
- $F_y$ = as defined in 2-2/5.5

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

<table>
<thead>
<tr>
<th>Type of Crane</th>
<th>Coefficient $Q$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipboard (See 2-2/7)</td>
<td>0.75</td>
</tr>
<tr>
<td>Offshore (See 2-2/9)</td>
<td>0.75</td>
</tr>
<tr>
<td>Heavy Lift (See 2-2/11)</td>
<td>1.0</td>
</tr>
</tbody>
</table>

5.7.2 Local Buckling (1 September 2012)

In addition to overall buckling as specified in 2-2/5.7.1, members are to be investigated for local buckling as indicated below when a detailed analysis is not available:

i) For tubular members (unstiffened or ring-stiffened) with $D/t > E/4.5F_y$, the local buckling stress of the member subjected to axial compression or bending moment may be taken from 4/3.3 of the ABS Guide for Buckling and Ultimate Strength Assessment for Offshore Structures.

ii) If the proportions of the cylindrical shell (unstiffened or ring-stiffened) conform to the relationship $D/t > E/4.5F_y$, the local buckling stress and the critical bending strength may be determined from 2/9.1 and 2/9.3 of the ABS Guide for Buckling and Ultimate Strength Assessment for Offshore Structures.

iii) Overall column buckling, factor $C_c$ and members subjected to combined axial and bending stresses should be further examined by substituting the critical local buckling stress and critical bending strength for $F_y$ if these are less than the yield point.

where

- $D$ = mean diameter of cylindrical shell
- $t$ = thickness of cylindrical shell

$F_y$ and $E$ are as defined in 2-2/5.5 and 2-2/5.7.1.
5.9 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:

\[
\frac{f_a}{F_a} + \frac{C_{ax}f_{bx}}{1 - \frac{f_a}{F_a}} + \frac{C_{ay}f_{by}}{1 - \frac{f_a}{F_a}} \leq 1.0
\]

and

\[
\frac{f_a}{Q(0.60F_y)} + f_{bx} + f_{by} \leq 1.0
\]

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

\[
\frac{f_a}{F_a} + f_{bx} + f_{by} \leq 1.0
\]

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 2-2/5.7)
- \( F_b \) = allowable stress due to bending, determined by multiplying the yield stress by the allowable stress coefficients specified in 2-2/Table 1, as appropriate
- \( F_e \) = Euler stress divided by a factor of safety. In the expression for \( F_e \), \( \ell_b \) 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 2-2/Table 2.
- \( C_m \) = 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.
5.11 Design Properties for Structural Members

5.11.1 General

The design section properties for a box type boom of lattice construction with tapered ends are specified in 2-2/5.11.2. Other types of members will also be considered.

5.11.2 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 2-2/Figure 1.

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

$$I_z = I_1(Z/a)^2$$

where $I_1$, is the moment of inertia at the small end of tapered portion and the distances $Z$ and $a$ are shown in 2-2/Figure 1.

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:

$$I_o = I_1(d_o/a_1)^2$$

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:

$$r = \sqrt{C I_o / A}$$

where

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

$C$ = applicable coefficient from 2-2/Table 3.

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

$CI_o$ = average moment of inertia

---

**FIGURE 1**

Box Type Boom

![Diagram of Box Type Boom](image-url)
5.13 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 2-2/5.15.2.

5.15 Swing-Circle Assembly (1 August 2014)

Swing Mechanism: The machinery involved in providing rotation of the cranes’ superstructure or derrick boom. The swing mechanism shall be capable of controlling the swing of the rated static/dynamic load under all operating conditions.

Swing-Circle Assembly: The structural member connecting the crane’s pedestal and the revolving gantry (A-frame & Back Leg) or turret structure. This member allows crane rotation and sustains the overturning and torsion moments as well as the vertical and horizontal forces resulted by the operation of the crane. The Swing-Circle Assembly may be of various designs provided by the manufacturer such as ball or roller bearing for shipboard and offshore cranes and hook roller for heavy lift cranes.

The following applies to Shipboard and Offshore Cranes, 2-2/7 and 2-2/9. For Heavy Lift Crane swing mechanisms, see 2-2/11.

5.15.1 Swing Circle Assembly

The following design items are to be considered in the analysis of the swing circle assembly defined in 2-1/9.15.

i) Loads and moments from 2-2/7 and 2-2/9

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.

5.15.2 Hold-down Bolts

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

\[
P = \frac{4M}{ND} \cdot \frac{H}{N}
\]

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
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.

5.15.3 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 2-2/Figure 2.
5.15.4 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.

5.15.5 Materials
Materials used in the swing circle mechanism are to be in accordance with Chapter 2, Section 3.

5.15.6 Pre-tensioning (1 September 2012)
The pre-tensioning of the slew ring bearing fasteners is to be indicated on a drawing submitted for review. The standard for pre-tensioning is to be identified.
The torque value may be evaluated as:

\[ T = k D P_o \]

where

- \( T \) = tightening torque, in N-cm (kgf-cm, lbf-ft)
- \( k \) = torque-friction coefficient
  - 0.2 for dry
  - 0.15 for using lubricant grease
  - value specified by the designer
- \( D \) = nominal bolt diameter, in cm (in.)
- \( P_o \) = bolt clamping load developed by tightening, in N (kgf, lbf)

Clamp load is also known as pre-load or initial load in tension on bolt
The aforementioned bolting pre-load \( P_o \) is to be account for the limits imposed by 2-2/5.15.2, i.e.:

\[ P_o < P \]

where

- \( P \) = 0.77 \times F_y \times A, in N (kgf, lbf)
- \( A \) = stress tensile area of the bolt, in cm² (in²)
- \( F_y \) = yield point (yield stress) of bolting material, in N/cm² (kgf/cm², psi)

The pre-load \( (P_o) \) resulting from the tightening must be always greater than the load applied on the most heavily loaded swing bearing bolt under the worst crane’s operating condition.

5.17 Pedestals and Kingposts (1 September 2012)
For Shipboard Cranes (2-2/7), pedestals and kingposts are to be designed for 75 percent of dead load plus a vertical load of 1.5 times the live load and the 2 percent of the vertical load in the athwartship direction, (horizontal load) at the boom head. The allowable stresses are not to exceed those given by 2-2/Table 1.
No doubler is allowed between the pedestal and deck plate where any tension load is anticipated.
For Heavy Lift Crane tub structure requirements, see 2-2/11.

5.19 Crane Capacity Rating Chart (1 November 2011)
For Shipboard and Heavy Lift Crane (2-2/7 and 2-2/11) approved for varying capacities, the Safe Working Load ratings are to be indicated for every increment not exceeding 1.5 m (5 ft), 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 2-5/3.11.
For Offshore Crane capacity rating chart requirements, see 2-2/9.9.
For capacity rating chart requirements of cranes used for personnel lifting, see Chapter 2, Section 9.

5.21 **Foundations and Supporting Structure (1 August 2014)**

For lifting appliances installed on vessels or offshore structures classed with ABS, 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.

The reaction forces and moments applied on the foundations and supporting structures are to be in accordance with 2-2/5.17 for shipboard cranes, 2-2/9.11 for offshore cranes, and 2-2/11 for heavy lift cranes.

5.23 **Fatigue (1 August 2014)**

Fatigue analysis for the life expectancy of the crane, performed in accordance with a recognized method, such as API Spec 2C – latest edition or F.E.M. 1.001 (3rd edition revised 1998.10.01), is to be submitted for review.

7 **Shipboard Cranes**

7.1 **General**

These requirements apply to shipboard cranes having a SWL up to 1600 kN (160 tf, 160 Ltcf). See 2-1/9.1. For additional requirements see 2-2/1, 2-2/3 and 2-2/5.

Typical shipboard cranes considered are:

i) Pedestal mounted deck cranes for handling cargo or equipment. See 2-1/Figure 1.

ii) Gantry cranes for handling containers. See 2-1/Figure 2.

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

7.3 **Design Considerations (1 August 2014)**

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. **Wind loads are to be considered, as applicable.**

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 2-2/Table 1.

- **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.

iii) 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.

7.5 **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.
9 Offshore Cranes (1 August 2014)

9.1 General
These requirements apply to offshore cranes. See 2-1/9.3. For additional requirements see 2-2/1, 2-2/3 and 2-2/5.

9.3 Design Considerations

9.3.1 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 2-2/Table 1.

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

9.3.2 Dynamic Rated Loads (1 September 2012)
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 the “API Specification for Offshore Cranes”, API Spec 2C-Latest Edition.

The applied loads are as follows:

i) **In service loads**
   - Vertical design loads
   - Horizontal design loads
   - Loads due to crane components

ii) **Out-of-service loads (as specified in 2-2/5.1.2)**

iii) **Wind, ice and seismic loads**

---

### TABLE 4 (1 September 2012)

<table>
<thead>
<tr>
<th>Wire Rope</th>
<th>SWL &lt; 100 kN (10 tf, 10 Ltf)</th>
<th>100 kN (10 tf, 10 Ltf) ≤ SWL &lt; 600 kN (60 tf, 60 Ltf)</th>
<th>600 kN (60 tf, 60 Ltf) ≤ SWL &lt; 1600 kN (160 tf, 160 Ltf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load (Main &amp; Aux.) Hoist &amp; Boom Hoist Rigging Standing Rigging and Pendants</td>
<td>5.0</td>
<td>$5 \times \frac{SWL - 100}{500}$ kN</td>
<td>$4 \times \frac{SWL - 600}{100}$ kN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$5 \times \frac{SWL - 10}{50}$ tf (Ltf)</td>
<td>$4 \times \frac{SWL - 60}{100}$ tf (Ltf)</td>
</tr>
</tbody>
</table>
9.5 Allowable Stresses

9.5.1 Static Conditions
The crane structural components are to be designed to conform to the allowable stresses resulting from the coefficient $S_c$ given in 2-2/Table 1.

9.5.2 Dynamic Conditions
The crane structural components are to be designed to conform to the allowable stresses specified in Section 5 of the “API Specification for Offshore Cranes”, API Spec 2C – latest edition.

9.7 Wire Rope Factors of Safety (1 August 2014)
The minimum factors of safety are to be in accordance with section 7.2.2.4 of API Spec 2C – latest edition for the load, auxiliary and boom hoist wires and pendants.

9.9 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 (5.0 ft) 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 2-5/3.11 and 2-8/1.

9.11 Pedestal, Kingpost and Deck Connection (1 August 2014)
For offshore cranes with dynamic rated loads (see 2-2/9.3.2), the pedestals, king posts and the deck connections are to be designed in accordance with Section 6.2 of API Spec. 2C – latest edition.

The crane pedestal, kingpost and details of attachment to the deck together with calculation indicating the maximum overturning moment, torsion moment, and the corresponding axial and radial forces at the crane/deck interface are to be submitted for review.

The allowable stresses are not to exceed those given in 2-2/9.5.2.

11 Heavy Lift Cranes

11.1 General
These requirements apply to heavy lift cranes having a Safe Working Load of not less than 1600 kN (160 tf, 160 Ltf) on the main hoist falls. See 2-1/9.5. For additional requirements, see 2-2/1, 2-2/3 and 2-2/5.

The types of heavy lift cranes considered are:

i) Tub mounted cranes

ii) Shear leg cranes

iii) Stiffleg cranes

iv) “A”-frame cranes

See 2-1/ Figures 3, 4, 5 and 6 for crane configurations. Cranes of unusual design or subject to unusual operating conditions will be specially considered.

11.3 Design Considerations (1 August 2014)
The following conditions shall apply to determine the Safe Working Loads for which the cranes are to be certified:
i) Heavy lifts are to be carried out within harbor, sheltered area or in very mild offshore environmental conditions, as specified by the crane manufacturer, with no significant dynamic loads acting on the crane. Heavy lift cranes intended to operate in any other environmental conditions are to comply with the requirements for offshore cranes. Heavy lift cranes may be certified to different SWL when operating in different environmental conditions, provided that they have approved automatic controls to limit the maximum hook load depending on the environmental conditions during operation.

ii) Actual specific design and operational parameters which include vertical impacts and side loads, loads due to maximum list and trim of the vessel, wind loads and other environmental and operational loads, as applicable. 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 2-2/Table 1:

- 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 (160 tf, 160 Ltf) the structural components supporting these loads at the boom point are to be designed in accordance with 2-2/7 for shipboard cranes.

11.5 Wire Rope Factors of Safety

The minimum factors of safety specified in 2-2/Table 5 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>
<thead>
<tr>
<th>Wire Rope</th>
<th>Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load and Boom Hoist Rigging</td>
<td>3.0</td>
</tr>
<tr>
<td>For Aux. Hoist Rigging Above 1600 kN (160 tf, 160 Ltf)</td>
<td>3.0</td>
</tr>
<tr>
<td>For Aux. Hoist Rigging Below 1600 kN (160 tf, 160 Ltf)</td>
<td>See 2-2/Table 4</td>
</tr>
<tr>
<td>Standing rigging and pendants</td>
<td>3.0</td>
</tr>
</tbody>
</table>

* 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 2-2/Table 4.

11.7 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 2-2/Table 1.

11.9 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 2-2/Table 1.

11.11 Hooks (1 September 2012)

Hooks are to be treated as structural material as specified in 2-3/1.1. Allowable stresses are not to exceed those specified in 2-2/Table 1. Furthermore, the material of the hook is to be alloy steel and produced as a forging or casting.
Material is to comply with the following Charpy V-notch impact values when tested at 10°C (18°F) below the design service temperature:

1. **Minimum average energy for three (3) Charpy tests bars:**
   - 34 Joules (25 ft-lb)

2. **Minimum Single Energy for each test:**
   - 20 Joules (15 ft-lb)

If the hook is treated as loose gear item the requirements of 2-5/1 are to be carried out.

### 11.13 Load Hooks, Ball Assemblies and Load Blocks (1 September 2012)

Load hooks, ball assemblies and load blocks are to be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of line in use. All hook and ball assemblies and load blocks are to be labeled with their rated capacity and weight. Hooks are to be equipped with latches unless the application makes the use of a latch impractical. When provided, the latch is to bridge the throat opening of the hook for the purpose of retaining slings or other lifting devices, under slack conditions.

### 13 Existing Cranes

#### 13.1 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 2-1/3.3, 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 2-5/3, 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 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.

#### 13.3 Existing Cranes with Register (1 September 2012)

For cranes having a Register issued by a recognized classification society or a recognized cargo gear organization, evidence of previous design approval and survey under construction is to be submitted. Suitable evidence of the design approval would be drawings of the arrangement and details which bear the approval stamp of the losing authority or which are specifically covered by an approval letter from the authority issuing the previous register or the previous register itself. An ABS Register of Lifting Appliance may be issued after review of above data and a proof test and examination in accordance with the requirements of 2-7/9.

### 15 Miscellaneous Requirements and Equipment

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

#### 15.1 Boom Equipment (1 September 2012)

1. **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.**
2. **Boom stops are to be provided to resist the boom from falling backwards in a high wind or sudden release of the load.**
   - **Fixed or telescoping bumper;**
   - **Shock absorbing bumper;**
   - **Hydraulic boom elevation cylinder(s);**
   - **Derrick masts shall be considered to the boom stops.**
iii) Jibs shall be restrained from backward overturning

iv) 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.

v) Booms, boom sections and jibs shall be identified and shall be used only for the purposes recommended by the designer/manufacturer.

15.3 Other Equipment (1 August 2014)

i) A load-moment or load-radius indicating device for main and auxiliary hoist is to be provided, preferably with an alarm or audible device to warn the operator of a possible overload condition.

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.

v) When installed, Overload Protection Systems are to meet the applicable requirements of a recognized industry standard. Electrical wiring and installation is to be in accordance with 2-6/3.

15.5 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 2-1/9.17.
CHAPTER 2 Guide for Certification of Cranes

SECTION 3 Materials and Welding (1 August 2014)

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 2-3/Table 1.

<table>
<thead>
<tr>
<th>Thickness in mm (in.)</th>
<th>0°C (32°F)</th>
<th>−10°C (14°F)</th>
<th>−20°C (−4°F)</th>
<th>−30°C (−22°F)</th>
<th>−40°C (−40°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t &lt; 12.5$ ($t &lt; 0.50$)</td>
<td>A,AH</td>
<td>A,AH</td>
<td>A,AH</td>
<td>A,AH</td>
<td>B (2),AH</td>
</tr>
<tr>
<td>$12.5 &lt; t \leq 20$ ($0.50 &lt; t \leq 0.79$)</td>
<td>A,AH</td>
<td>A,AH</td>
<td>A,AH</td>
<td>B,AH</td>
<td>D,DH</td>
</tr>
<tr>
<td>$20 &lt; t \leq 25$ ($0.79 &lt; t \leq 0.98$)</td>
<td>A,AH</td>
<td>A,AH</td>
<td>B,AH</td>
<td>D,DH</td>
<td>D (3),D (3)</td>
</tr>
<tr>
<td>$25 &lt; t \leq 30$ ($0.98 &lt; t \leq 1.18$)</td>
<td>A,AH</td>
<td>A,AH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>E,EH</td>
</tr>
<tr>
<td>$30 &lt; t \leq 40$ ($1.18 &lt; t \leq 1.38$)</td>
<td>A,AH</td>
<td>B,AH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>E,EH</td>
</tr>
<tr>
<td>$35 &lt; t \leq 40$ ($1.38 &lt; t \leq 1.57$)</td>
<td>A,AH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>E,EH</td>
</tr>
<tr>
<td>$40 &lt; t$ ($1.57 &lt; t$)</td>
<td>B,AH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>D,DH</td>
<td>E,EH</td>
</tr>
</tbody>
</table>

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 2-1/9.19). The design service temperature is to be indicated at an appropriate place for the crane operator’s information. For Shipboard and Heavy Lift Cranes (2-2/7 and 2-2/11) approved for varying capacities, it is to be indicated on crane capacity rating chart.

1.3 Toughness

For cranes with design service temperature of $−10°C (14°F)$ and below, primary structural members given in 2-3/9 are to be in conformity with the toughness criteria in 2-3/13.

For cranes with design service temperature above $−10°C (14°F)$, 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 2-3/13. Charpy V-Notch initial test requirements are to be in accordance with 2-1-2/11 of the ABS Rules for Materials and Welding (Part 2), except for swing circle mechanisms where the single specimen requirements are as given in 2-3/11 of this Guide.
1.5 **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 2-1-1/17 of the ABS *Rules for Materials and Welding (Part 2)* is considered as meeting this requirement.

1.7 **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.

1.9 **Other Materials**

Materials other than steel will be specially considered.

1.11 **Materials Containing Asbestos (1 August 2014)**

Installation of materials which contain asbestos is prohibited.

3 **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.

5 **Welding**

In general, welding may be in accordance with ANSI/AWS latest edition of D1.1, “Structural Welding Code – Steel” 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.

7 **Nondestructive Inspection (NDT) of Welds**

Inspection is to be in accordance with ABS *Guide for Nondestructive Inspection of Hull Welds* 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.

9 **Primary Structural Members (1 August 2014)**

The following load carrying primary structural members are to meet the requirements of 2-3/Table 1 for ABS Grade materials or of 2-3/13 for non-ABS Grade materials, and the requirements of 2-3/11, as appropriate:

- **i)** Boom or jib chord members and lacing
- **ii)** “A”-frame and back leg, mast or gantry chord members
- **iii)** Crane base (revolving frame and tub-structure) slew column
- **iv)** Load carrying beams
- **v)** Eye plates and brackets
- **vi)** Swing circle mechanism slew bearing
- **vii)** Pins and shafts
- **viii)** Pedestal foundation king post
11 Material Toughness Requirements for Swing Circle Mechanism
(1 September 2012)

Slew bearings for ship, offshore and heavy lift cranes are to comply with the following Charpy V-Notch impact values when tested at −20°C (−4°F) or at 10°C (18°F) below the design service temperature, whichever is lower:

i) Minimum Average Energy for 3 (three) Charpy Test bars: 42 J (4.3 kgf-m, 31 ft-lb)

ii) Minimum Single Energy for each test: 27 J (2.8 kgf-m, 20 ft-lb)

13 Material Toughness Requirements for Primary Structural Members of Cranes with a Minimum Design Service Temperature of −10°C (14°F) and Below (1 September 2012)

13.1 Steels up to and Including 410 N/mm² (42 kgf/mm², 60 ksi) Yield Strength

Charpy V-Notch (CVN) impact tests are required to demonstrate that steels would meet the following longitudinal CVN impact requirements. In the absence of satisfactory CVN test data, consideration will be given to steel that has appropriate supporting information, ductile to brittle transition, or statistical test data that clearly indicates the toughness of the steels will be adequate for their intended application in the crane at the minimum design service temperature.

<table>
<thead>
<tr>
<th>Yield Strength (N/mm²)</th>
<th>CVN (Longitudinal)</th>
<th>Test Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J (kgf-m, ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>235-305</td>
<td>27</td>
<td>10°C (18°F) below design service temperature</td>
</tr>
<tr>
<td>305-410</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>

13.3 Extra High Strength Steels above 410 N/mm² (42 kgf/mm², 60,000 psi) Yield Strength

Steels in the 410-690 N/mm² (42-70 kgf/mm², 60,000-100,000 psi) yield strength range are to meet the following longitudinal CVN impact requirements.

<table>
<thead>
<tr>
<th>Design Service Temperature</th>
<th>J (kgf-m, ft-lbf) at Test Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>−10°C (14°F)</td>
<td>34 (3.5, 25) at −30°C (−45°F)</td>
</tr>
<tr>
<td>−20°C (−4°F)</td>
<td>34 (3.5, 25) at −40°C (−40°F)</td>
</tr>
<tr>
<td>−30°C (−22°F)</td>
<td>34 (3.5, 25) at −50°C (−58°F)</td>
</tr>
<tr>
<td>−40°C (−40°F)</td>
<td>34 (3.5, 25) at −60°C (−76°F)</td>
</tr>
</tbody>
</table>

13.5 Cast Steels

Cast steel components which are not intended to be welded in construction or fabrication, are to comply with the following impact test requirements:

<table>
<thead>
<tr>
<th>Yield Strength (N/mm²)</th>
<th>CVN (Longitudinal)</th>
<th>Test Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J (kgf-m, ft-lbf)</td>
<td></td>
</tr>
<tr>
<td>235-305</td>
<td>24</td>
<td>10°C (18°F) below design service temperature</td>
</tr>
<tr>
<td>305-410</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>410-690</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>&gt;690</td>
<td>To be agreed with ABS</td>
<td></td>
</tr>
</tbody>
</table>
13.7 Forged Steels

Forged steel components which are not intended to be welded in construction or fabrication, are to comply with the following impact test requirements:

<table>
<thead>
<tr>
<th>Yield Strength N/mm²</th>
<th>CVN (Longitudinal)</th>
<th>Test Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>235-305</td>
<td>24-31</td>
<td>27</td>
</tr>
<tr>
<td>305-410</td>
<td>31-42</td>
<td>34</td>
</tr>
<tr>
<td>410-690</td>
<td>42-70</td>
<td>42</td>
</tr>
<tr>
<td>≥690</td>
<td></td>
<td>To be agreed with ABS</td>
</tr>
<tr>
<td>10°C (18°F) below design service temperature</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13.9 Alternative Requirements

As an alternative to the requirements in 2-3/13.1 or 2-3/13.3, one of the following may be complied with.

i) For transverse specimens, \( \frac{2}{3} \) of the energy shown for longitudinal specimens.

ii) For longitudinal specimens, lateral expansion is not to be less than 0.5 mm (0.02 in.). For transverse specimens, lateral expansion is not to be less than 0.38 mm (0.015 in.).

iii) Nil-ductility temperature (NDT) as determined by drop weight tests is to be 5°C (9°F) below the test temperature specified in 2-3/11, 2-3/13.1 or 2-3/13.3 as appropriate.

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

v) CVN tests are not required for plates with thickness less than 6 mm.
CHAPTER 2 Guide for Certification of Cranes

SECTION 4 Wire Rope

1 General (1 September 2012)

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 an ABS Technical Office. If approval is sought for any number of wraps less than five (5), a detailed stress analysis justifying such proposal is to be submitted for review. The end of the wire rope is to be effectively secured to the drum.

The hoisting and luffing steel wire ropes should be in accordance with the following:

i) Rotation resistant and fiber core ropes shall not be used for boom hoist reeving.

ii) Rotation resistant rope shall be given special care in installations, as it is easily damaged.

iii) Socketing shall be carried out as recommended by the manufacturer of the wire rope or fitting.

iv) If a load is supported by more than one part of rope, the tension in the parts is to be equalized.

v) The drum end of each rope shall be anchored by a clamp securely attached to the drum or by a socket arrangement recommended by the crane, hoist or rope manufacturer.

vi) Tie-downs (kicker devices) shall have locknuts or other provision to prevent loosening.

vii) Ropes of material other than steel may be used only in accordance with crane manufacturer’s recommendation.

3 Factors of Safety (1 November 2011)

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 2-2/7, 2-2/9 and 2-2/11. For cranes used for personnel lifting see Chapter 2, Section 9.

5 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 2-8/1.
7 **Splicing of Wire Rope (1 September 2012)**

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. Such eye splices are to be made in accordance with recommendations of the rope, crane manufacturer or qualified person. Rope thimbles are to be used in the eye. 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.

9 **Reeving Accessories (1 September 2012)**

i) Swaged, compressed, or wedge socket fittings are to be applied as recommended by the rope, crane, derrick, or fitting manufacturer.

ii) Wire rope clips used in conjunction with wedge sockets are be attached to the unloaded dead end of the rope only.

11 **Sheaves (1 September 2012)**

i) Sheaves grooves shall be smooth and free from surface defects which could cause rope damage. The cross-sectional radius at the bottom of the groove is to be such so as to form a saddle for the size of rope used; the sides of the groove are to be tapered outwardly to facilitate entrance of the rope into the groove. Flange corners are to be rounded and the rims should run true about the axis of rotation.

ii) All sheaves including running blocks are to be provided with guards or other suitable devices to prevent the rope from coming out of the sheave groove.

iii) Means are be provided, if necessary, to prevent chafing of the ropes.

iv) All sheave bearings are to be provided with means for lubrication. Permanently lubricated bearing are exempt from this requirement.

v) **(1 August 2014)** Sheave diameter to rope diameter ratio for crane running wire ropes shall be not less than 18. The diameter inside of the sheave groove is to be at least 6% to 8% larger than the rope diameter or is to be in accordance with a recognized standard.
CHAPTER 2  Guide for Certification of Cranes

SECTION 5  Testing of Cranes

1  Loose Gear Test

1.1  General (1 September 2012)

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>
<thead>
<tr>
<th>Article of Gear</th>
<th>Proof Load (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain, ring, hook, link, shackle or swivel</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Pulley blocks</td>
<td></td>
</tr>
<tr>
<td>Single sheave block</td>
<td>300% in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block and container spreader with safe working load up to and including 200 kN (20 tf, 20 Ltf)</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block and container spreader with safe working load over 200 kN (20 tf, 20 Ltf) up to and including 400 kN (40 tf, 40 Ltf)</td>
<td>200 kN (20 tf, 20 Ltf) in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block and spreader with safe working load over 400 kN (40 tf, 40 Ltf)</td>
<td>50% in excess of the safe working load</td>
</tr>
</tbody>
</table>

Notes

1  (1 September 2012) Alternatively, the proof tests as recommended in the latest applicable edition of the I.L.O. publication “Code of Practice on Safety and Health in Port” 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 2-5/1.3.

1.3  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 2-8/1. The safe working load SWL is to be marked on the hoist blocks.
1.5 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 2-5/3. 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 2-3/1.

3 Testing Cranes as a Unit

3.1 Test Loads

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

<table>
<thead>
<tr>
<th>SWL of Assembled Crane at the Specified Working Radius, kN (tf, Ltf)</th>
<th>Proof Load (1)</th>
<th>Offshore Cranes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shipboard and Heavy Lift Cranes</td>
<td>Original Proof Load Test (2)</td>
</tr>
<tr>
<td>Up to 200 kN (20 tf, 20 Ltf)</td>
<td>25% in excess of SWL</td>
<td>25% in excess of VL (2)</td>
</tr>
<tr>
<td>200-500 kN (20-50 tf, 20-50 Ltf)</td>
<td>50 kN (5 tf, 5 Ltf) in excess of SWL</td>
<td>50 kN (5 tf, 5 Ltf) in excess of VL (2)</td>
</tr>
<tr>
<td>Over 500 kN (50 tf, 50 Ltf)</td>
<td>10% in excess of SWL</td>
<td>10% in excess of VL (2)</td>
</tr>
</tbody>
</table>

Notes:
1. Proof load is not to be less than the overload protection (shutdown) setting of the crane.
2. VL = 0.75 × C_v × SWL, where C_v is the vertical dynamic coefficient as defined in API Spec. 2C (C_v ≥ 1.33).
3. Original Proof Load Test -- static test of the crane after installation on board prior to first use and performed within a harbor or sheltered area or in very mild environmental conditions.

3.3 Proof Testing and Inspection

Unless otherwise approved and as specified in 2-2/13, 2-7/9 and 2-8/7, 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 2-5/3.1, 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 2-2/1, the Surveyor should examine at least the following items:

i) Foundation, where required as per 2-2/5.21.
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

3.5 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.

3.7 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.

3.9 Machinery
General examination of machinery, piping and electrical equipment. See 2-6/5.

3.11 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 2-2/5.19 and 2-2/9.9.

3.13 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 2-8/1.
CHAPTER 2  Guide for Certification of Cranes

SECTION 6  Construction Standards for Crane Machinery, Piping and Electrical Systems

1 General (1 August 2014)

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 2-1/3 of this Guide. Such systems and components are to be certified in accordance with 2-1/Table 2.

3 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 4, Chapters 3, 4 and 8 and Subsection 4-6-7/3 of the ABS Rules for Building and Classing Steel Vessels. 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.

5 Inspection and Material Testing (1 August 2014)

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 2-5/3.3 for exception.

7 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.

9 Low Temperature Operation (1 August 2014)

For cranes with a Design Service Temperature at or below –10°C (+14°F), the manufacturers of the machinery systems are to demonstrate by way of testing or analysis that these systems will operate satisfactorily at the design service temperature.

The materials of primary machinery components exposed to the atmosphere are to be in accordance with the requirements indicated in 2-3/13.

(Refer to the separate ABS publication Guide for Vessels Operating in Low Temperature Environments.)
11 Rotating Machinery (1 August 2014)

Rotating machinery for cranes including internal combustion engines, electrical motors and generators are to be designed, constructed and equipped in accordance with good commercial and marine practice, unless required otherwise in Table 2-1/Table 2. 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 testing witnessed by the Surveyor after installation on the crane.

Rotating machinery is to meet the angle of inclination requirements of 4-1-1/Table 7 of the ABS Rules for Building and Classing Steel Vessels or 4-1-1/Table 1 of the ABS Rules for Building and Classing Mobile Offshore Drilling Units, as applicable.

The minimum degree of protection of rotating electrical machinery is to be in accordance with 4-8-3/Table 2 of the ABS Rules for Building and Classing Steel Vessels or 4-3-3/Table 1 of the ABS Rules for Building and Classing Mobile Offshore Drilling Units, as applicable.

Internal combustion engines having a rated power of 100 kW (135 hp) and over are to be provided with safety features as per 4-2-1/7 of the ABS Rules for Building and Classing Steel Vessels.

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.

13 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 (10 ft) from hazardous areas.

15 Fail-safe Arrangements, Safety Devices and Brakes (1 November 2011)

Fail-safe arrangements and safety devices are to be provided and are to be approved by ABS. 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 Chapter 2, Section 9.
CHAPTER 2  Guide for Certification of Cranes

SECTION 7  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 2-8/1.

3  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 ABS 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 (0.25 in.) and where special protective coatings were applied as per 2-2/3.5.

The crane manufacturer shall establish and maintain a quality control system to assure that all ABS 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 2-8/1.

Upon satisfactory proof testing after installation, a Register of Lifting Appliances may be issued which will contain the in-plant certificate and reports.
5 Initial Survey (1 May 2011)

During the Initial Survey, the original proof testing and examination should be conducted in accordance with 2-5/3 and the test conditions and results should be included in the Register of Lifting Appliances. See 2-8/1. 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 2-5/3.11.

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 2-5/3 will be required to be carried out within 30 days of delivery of the vessel or offshore unit.

7 Annual Survey (1 November 2011)

After undergoing the original test and examination required by 2-5/3, 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.

9 Retesting Survey (1 May 2011)

At intervals of five years, in addition to the requirements of the Annual Survey in 2-7/7 above, the crane is to undergo testing and examination as noted in 2-5/3. 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 ABS 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 slew 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. Bolts 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 2-5/3, the slewring 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.

11 Inspection of Wire Rope (1 September 2012)

The crane owner or operator is to establish a wire rope inspection program taking into consideration the crane type, frequency of usage, history of maintenance, wire rope manufacturer’s recommendations and crane manufacturer’s recommendations.

The crane owner or operator is to examine the wire rope, including end connections, at frequent intervals between surveys. Inspection records are to be maintained by the crane owner or operator and are to be made available to the Surveyor during surveys.

All running wire ropes are to be visually inspected at each Annual and Retesting Survey. Wire rope inspection during surveys is to be in accordance with G.5.1.2b of API RP 2D (Operation and Maintenance of Offshore Cranes) or equivalent recognized national or international standards.

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.

13 Repairs and Alterations

13.1 Crane Structure, Booms and Permanent Fittings (1 November 2011)

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 2-5/3, 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

13.3 Repairs to Loose Gear
Welding is not to be used to lengthen, alter or repair chains, hooks, links, shackles or swivels.
CHAPTER 2  Guide for Certification of Cranes

SECTION 8  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 2-7/7 and 2-7/9. 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 2-2/5.19.

3  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 2-8/1.

- Form 4 (ILO Form No. 3 or ABS Form CHG-4) – Certificate of Test and Examination of Chains, Rings, Hooks, Shackles, Swivels and Pulley Blocks.
- Form 5 (ILO Form No. 4 or ABS Form CHG-5) – Certificate of Examination and Test of Wire Rope Before Being Taken Into Use Form “G”, Form “H” or Form “J”-Load Diagram
- 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 2-8/1.

- Form 1 – Cover for Register of Lifting Appliances.
- Form 3 (ILO Form No. 2 or ABS Form CHG-3) – Certificates of Test and Examination of Cranes or Hoists and Their Accessory Gear: Before Being Taken Into Use. Retesting Surveys and Tests Associated with Repairs.
- Form 7 (ILO Part II or ABS Form CHG-7) – Certificate of Annual Thorough Examination of Gear and for Annual Inspection of Cranes. Reports covering the construction of the crane and any tests carried out at the manufacturer’s plant during construction.

5  Owner’s Overhaul and Inspection Record (1 May 2011)

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 2-7/5 and 2-7/7.
7 Repairs and Alterations

Certificates covering tests are to be inserted in the Register. See 2-8/1.

9 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 2-4/5 and 2-5/1. The wire rope and loose gear certificates are to be inserted in the Register (see 2-8/1), 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.
CHAPTER 2 Guide for Certification of Cranes

SECTION 9 Personnel Lifting (1 August 2014)

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 Guide.

3 Personnel Rated Loads (1 August 2014)
A “load chart” is to be provided specifically for Personnel Lifts. The rated load when handling personnel is not to exceed fifty percent (50%) of the SWL for non-personnel load ratings.

The load to be considered in the design and analysis of a lifting appliance dedicated to lifting of personnel is to be twice the personnel SWL.

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 and significant wave height.

5 Personnel Hoist System (1 August 2014)
The wire rope safety factor of load hoist wire rope when handling personnel shall not be less than 10.

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 hooks used for personnel lifting are to be provided with latches fitted with positive locking means, whereby inadvertent opening of the latch is prevented. A locking device and/or an arrangement which operates under a retaining spring force may not be considered as a positive locking means as the latch may inadvertently open due to vibrations during operations, due to a failure of the retaining spring, etc. The latch is not intended to support the lifted load.

7 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 2-6/15 for the rated capacity for lifting of personnel.

9 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.
11 Mode Selection for Personnel Lifting (1 August 2014)

Where the hoisting and/or luffing system is commonly used for both personnel and cargo lifts, the control station is to be equipped with a manual switch for selection between cargo and personnel lifting modes. The switch is to have a warning light continuously illuminating when personnel lift mode is activated. Means is to be provided to prevent inadvertent change between modes. Such means does not include posted instruction plates or placards.

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.

13 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.
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

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CHAPTER 3  Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 1  General

1  Scope (1 October 2013)

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

- Cargo gear as defined in 3-1/3.1
- Davits (or crane) – manual slewing type
- Engine room overhead cranes
- Monorail hoist

The vessel or unit classed by ABS having an installed cargo gear certified by ABS in accordance with Chapter 3 of this Guide will be distinguished by the additional class notation CGMV (Cargo Gear on Merchant Vessels).

A vessel or unit classed by ABS will be distinguished by the classification notation CGMV(I) when issued an ABS Register of Lifting Appliances based upon an existing register issued by another IACS Society.

3  Definitions

3.1  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.

3.3  Existing Cargo Gear

Existing Cargo Gear is defined as cargo gear not previously certified by ABS. See 3-5/1.

3.5  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.

3.7  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 3-3/5.9 and 3-4/5.7.

3.9  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.
3.11 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”.

3.13 Ton

The Guide is written in three systems of units: SI units, MKS units and US customary units.

1 kN = 1000 N, 1 tf = 1000 kgf, 1 Ltf = 2240 lbf
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 2 New Cargo Gear

1 Certification

Certification may be granted subject to survey during the construction as well as during the installation of the gear. Survey during construction may be waived for conventional masts, kingposts and booms.

3 Design

3.1 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.

3.3 Loading Conditions

The required factors of safety indicated in 3-2/5.1 and 3-2/5.3 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 tons or where the factors of safety in 3-2/5.3 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.

3.5 Column Action Effect

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

3.7 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/mm² (42 kgf/mm², 60,000 psi) is to be subject to special approval.

3.9 Minimum Thickness of Structural Members

Structural members are to be not less than 6.0 mm (0.24 in.) thick (see also 2-2/3.3).

3.11 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 3-2/5.3, 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.
3.13 **Stress Measurement**  
Results of stress measurements may be required for the assembled gear where the factors of safety from 3-2/5.3 are used in design.

3.15 **Boom Foot Lift Prevention**  
Means are to be provided to prevent the foot of the boom being accidentally lifted out of its socket.

3.17 **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 3-12/1).

5 **Safety Factors**

5.1 **Design of Cargo Gear**  
The factors of safety in 3-2/Table 1, which are to be regarded as minima, taken in association with suitable design assumptions, are to be used.

5.3 **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 3-2/Table 2, which are to be regarded as minima, will be specially considered in each case. Written approval of ABS is to be obtained prior to applying the provisions of this Paragraph for design. See also 3-2/3.3, 3-2/3.11, and 3-2/3.13.

5.5 **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 3-3/5.1 of this Guide.
### TABLE 1
Factors of Safety *(1 September 2012)*

<table>
<thead>
<tr>
<th>Component Part</th>
<th>Working Load of Assembled Gear</th>
<th>Factor of Safety based on <em>(1)</em></th>
<th>Minimum Ultimate Strength</th>
<th>Minimum Yield Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>All metal structural parts except steel booms, stayed masts, pins, and connections</td>
<td>50 kN (5 tf, 5 Ltf) or less</td>
<td>5.00 or 2.75 <em>(2)</em></td>
<td>2.75 <em>(2)</em></td>
<td>2.20 <em>(2)</em></td>
</tr>
<tr>
<td></td>
<td>150 kN (15 tf, 15 Ltf)</td>
<td>4.00 or 2.20 <em>(2)</em></td>
<td>2.20 <em>(2)</em></td>
<td>2.05 <em>(2)</em></td>
</tr>
<tr>
<td></td>
<td>600 kN (60 tf, 60 Ltf) or more</td>
<td>3.75 or 2.05 <em>(2)</em></td>
<td>2.05 <em>(2)</em></td>
<td>2.05 <em>(2)</em></td>
</tr>
<tr>
<td>Steel booms</td>
<td>100 kN (10 tf, 10 Ltf) or less</td>
<td>---</td>
<td>3.00</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>130 kN (13 tf, 13 Ltf) or more</td>
<td>---</td>
<td>2.50</td>
<td>---</td>
</tr>
<tr>
<td>Stayed masts</td>
<td>100 kN (10 tf, 10 Ltf) or less</td>
<td>5.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>130 kN (13 tf, 13 Ltf) or more</td>
<td>4.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Pins and connections</td>
<td>100 kN (10 tf, 10 Ltf) or less</td>
<td>---</td>
<td>3.00 <em>(2)</em></td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>130 kN (13 tf, 13 Ltf) or more</td>
<td>---</td>
<td>2.50 <em>(2)</em></td>
<td>---</td>
</tr>
<tr>
<td>Wire rope</td>
<td>100 kN (10 tf, 10 Ltf) or less</td>
<td>5.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>100 kN (10 tf, 10 Ltf) or more</td>
<td>See Note 4</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Manila rope <em>(3)</em></td>
<td>All</td>
<td>7.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>For running rigging</td>
<td>All</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>For fixed gear and vangs</td>
<td>All</td>
<td>5.00</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Chains</td>
<td>All</td>
<td>4.50</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Wooden structural parts</td>
<td>All</td>
<td>8.00</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**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.

\[
C = \sqrt{0.6C_s^2 + 0.4C_m^2}
\]

where

- \(C\) = required circumference of the synthetic rope, in mm (in.)
- \(C_s\) = circumference to the nearest 5 mm (1/4 in.) of a synthetic rope having a breaking strength not less than that required for manila rope based on the table.
- \(C_m\) = circumference of manila rope, in mm (in.), 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. *(1 September 2012)* Factor of Safety:

\[
5 - \frac{(SWL - 100)}{500} \quad \text{kN} \quad \text{(for SWL < 600 kN)}
\]

\[
5 - \frac{(SWL - 10)}{50} \quad \text{tf (Ltf)} \quad \text{(for SWL < 60 tf (Ltf))}
\]

For SWL ≥ 600 kN (60 tf, 60 Ltf), refer to 2-2/Table 4.
## TABLE 2
Alternative Factors of Safety

<table>
<thead>
<tr>
<th>Component Part</th>
<th>Working Load of Assembled Gear</th>
<th>Safety Factor based on (1)</th>
<th>Minimum Ultimate Strength</th>
<th>Minimum Yield Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>All metal structural parts except steel booms, stayed masts, pins, and connections</td>
<td>50 kN (5 tf, 5 Ltf) or less</td>
<td>4.45</td>
<td>or</td>
<td>2.45 (2)</td>
</tr>
<tr>
<td></td>
<td>100 kN (10 tf, 10 Ltf)</td>
<td>4.00</td>
<td>or</td>
<td>2.20 (2)</td>
</tr>
<tr>
<td></td>
<td>600 kN (60 tf, 60 Ltf) or more</td>
<td>3.35</td>
<td>or</td>
<td>1.85 (2)</td>
</tr>
</tbody>
</table>

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.
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 3 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>
<thead>
<tr>
<th>Article of Gear</th>
<th>Proof Load (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain, ring, hook, link shackle or swivel</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Pulley blocks:</td>
<td></td>
</tr>
<tr>
<td>Single sheave block</td>
<td>300% in excess of the safe working load (2)</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load up to and including 200 kN (20 tf, 20 Ltf)</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load over 200 kN (20 tf, 20 Ltf) up to and including 400 kN (40 tf, 40 Ltf)</td>
<td>200 kN (20 tf, 20 Ltf) in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheaves block with safe working load over 400 kN (40 tf, 40 Ltf)</td>
<td>50% in excess of the safe working load</td>
</tr>
</tbody>
</table>

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.

1.3 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.

1.5 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 3-12/1). The safe working load SWL is to be marked on the blocks.
1.7 **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 3-3/5. Appropriate nondestructive methods of examination will be required where visual inspection is considered to be inadequate.

3 **Wire Rope Test (1 September 2012)**

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>
<thead>
<tr>
<th>Lifting Capacity</th>
<th>Breaking Test Load for Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 kN (10 tf, 10 Ltf) or less</td>
<td>$5 \times SWL$</td>
</tr>
<tr>
<td>100 kN (10 tf, 10 Ltf) or more</td>
<td>$FS \times SWL$</td>
</tr>
</tbody>
</table>

$FS = \frac{500}{SWL}$ (for SWL < 600 kN)

$FS = \frac{50}{SWL}$ (for SWL < 60 tf (Ltf))

For SWL ≥ 600 kN (60 tf, 60 Ltf), refer to 2-2/Table 4.

This certificate is to show also size of rope, in mm (in.), 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 3-12/1).

5 **Proof Test to Gear as a Unit**

5.1 **Test Loads (1 September 2012)**

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

<table>
<thead>
<tr>
<th>Working Load of Assembled Gear</th>
<th>Proof Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 200 kN (20 tf, 20 Ltf)</td>
<td>25% in excess of SWL</td>
</tr>
<tr>
<td>200 kN (20 tf, 20 Ltf) to 500 kN (50 tf, 50 Ltf)</td>
<td>50 kN (5 tf, 5 Ltf) in excess of SWL</td>
</tr>
<tr>
<td>Over 500 kN (50 tf, 50 Ltf)</td>
<td>10% in excess of SWL</td>
</tr>
</tbody>
</table>

5.3 **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 tons and 25 degrees for loads above 10 tons, 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.

5.5 **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.
5.7 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.

5.9 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 (1 in.) high.

5.11 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 3-12/1).

Note: Attention is drawn to the International Labor Office recommendation approved by the Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, that the proof load should be hoisted with the vessel’s normal tackle with the derrick at an angle not more than 15 degrees to the horizontal or, when this is impracticable, at the lowest practicable angle.
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 4 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 Chapter 3, Sections 2 and 3 or 5.

1.3 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.

1.5 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.

3 Design

3.1 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.

3.3 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.

3.5 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.

3.7 Angle Between Cargo Runners
The angle between the cargo runners is not to exceed 120 degrees.

3.9 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 3-12/1).

3.11 Factors of Safety
Factors of safety are to be as specified in 3-2/5.
5 Proof Test to Cargo Gear for Union Purchase

5.1 Required Tests
Before the cargo gear is placed in service, it is to be tested and examined in accordance with 3-3/5, with the addition of those items specified in the following paragraphs.

5.3 Gear Rigged for Testing
The gear is to be rigged as shown on the diagram required by 3-4/3.9.

5.5 Testing and Inspection Details
The proof load as specified in 3-3/5.1 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.

5.7 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 (1 in.) high.

5.9 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 3-4/3.9) are to be attached to the Register of Lifting Appliances (see 3-12/1).
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 5 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 3-2/3.1, 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 3-3/5, 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.

3 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 ABS Register of Lifting Appliance may be issued after review of above data and a proof test and examination in accordance with the requirements of 3-6/3.
CHAPTER 3  Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 6  Periodical Surveys

1  Annual Inspection

After undergoing the original test and examination required by 3-3/5 and 3-4/5, 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 3-12/1).

3  Retesting Survey

At intervals of five years, the cargo gear is to undergo the proof loads and examination stated in 3-3/5 and 3-4/5, 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 3-12/1).

Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and ABS is prepared to do such retesting and note it in the Register of Lifting Appliances.
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 7 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.
CHAPTER 3 Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 8 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 3-3/5 and 3-4/5 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 3-12/1).

3 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 3-3/1 and certificate furnished before being again put in use. The certificates are to be attached to the Register of Lifting Appliances (see 3-12/1).
CHAPTER 3  Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 9  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 3-3/1 and 3-3/3 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 3-12/3 kept with the Register of Lifting Appliances (See 3-12/1), identifying each article and certificate of same.
Chapter 3 Guide for Certification of Cargo Gear on Merchant Vessels

Section 10 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.

3 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.
CHAPTER 3  Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 11  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 (0.5 in.) 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.

3  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 (1100°F to 1200°F) for a period between 30 and 60 minutes. After being annealed, the article should be allowed to cool slowly.

5  Annealing Certificate
A certificate on prescribed form (see Form CHG-6 in Appendix, Section 1) 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 3-12/1).
CHAPTER 3  Guide for Certification of Cargo Gear on Merchant Vessels

SECTION 12  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 3-6/1 and 3-6/3) and repairs (see 3-8/1 and 3-8/3). 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 3-11/1. 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 3-3/1.5, 3-3/3, 3-3/5.11, 3-4/5.9, 3-8/1, 3-8/3, 3-9/1 and 3-11/5.

3  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.
# Chapter 4 Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

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SECTION 1  General

1  Scope (1 October 2013)

This Guide provides requirements for the certification of self-unloading cargo gear on vessels classed with the ABS for services on the Great Lakes.

Where the cargo gear has been reviewed and surveyed for compliance with the applicable requirements, and ABS Register of Cargo Gear will be issued as evidence of compliance with these requirements.

These requirements do not apply to conveyors, elevators and other equipment used to transfer cargo to the conveyor boom.

The vessel or unit classed by ABS for services on the Great Lakes having an installed self-unloading cargo gear certified by ABS in accordance with Chapter 4 of this Guide will be distinguished by the additional class notation CGSU (Cargo Gear Self Unloading).

A vessel or unit classed by ABS will be distinguished by the classification notation CGSU(I) when issued an ABS Register of Cargo Gear for Great Lakes Vessels based upon an existing register issued by another IACS Society.

3  Definitions

3.1 Cargo Gear

3.1.1 Conveyor Boom
The structure, which supports a conveyor belt or similar device by means of which bulk cargo is discharged.

3.1.2 Supporting Structure
The “A”-frames, elevator casings, saddles and other supporting structures to which may be attached such tackle or other device as is employed to lift, swing or otherwise position the boom defined above.

3.1.3 Auxiliary Devices
The devices employed in luffing, slewing or otherwise positioning the boom including actuators and their piping to the power units, winches and spreaders.

3.1.4 Loose Gear
Hook, ring, shackle, link, sling, lifting beam, lifting frame or any similar article of equipment by means of which a force can be transmitted to a cargo gear and which does not form an integral part of the appliance or load.

3.3 Safe Working Load of Components
The Safe Working Load, SWL, on which the design or any component part of the cargo gear is to be based is to be taken as the maximum resultant load upon the component for the design conditions assumed.
3.5 Working Load of Assembled Gear

The Working Load of Assembled Gear is the load which each complete assembly is approved to lift excluding the weight of the gear itself (i.e., the load on the conveyor). This load is the safe working load, SWL, which is to appear on the certificate of Cargo Gear Test, (see 4-5/7.11) and is to be expressed in kilogram force (pound) per running meter (foot) together with total in metric ton (long ton).

3.7 Ton

Ton means a metric ton of 1000 kgf or a long ton of 2240 lbf.
CHAPTER 4 Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 2 Structural Requirements for New Cargo Gear

1 General

The requirements in this Section apply to new cargo gear. For the initial certification of existing cargo gear, the requirements in 4-5/9 are to be complied with.

3 Plans

3.1 Design Plans

General arrangement and design plans showing a complete design with sizes, sections and the relative locations of the various members, together with rigging details, is to be submitted for approval.

They are to indicate the type or types of construction to be employed, and they are to be supplemented by stress analysis and load diagrams and by such data concerning the assumed loads, shears, moments and axial forces to be resisted by all members and their connections as may be required for a complete review of the design. The physical and chemical specifications for the materials to be used are to be indicated.

Where computers are used for the determination of stresses the input and output data, in a form which can be readily interpreted, may be submitted in lieu of stress analysis calculations.

3.3 Other Plans

Plans showing joint details, the location, type and size of all rivets, bolts and welds, are to be submitted for approval, unless all such information is included on the design plans.

3.5 Arrangement Diagram

A sketch showing the arrangement, working load of the assembled gear and indicating the approved safe working load for each component part, is to be submitted for approval and a copy inserted in the Register of Cargo Gear. See 4-1/3.3 and 4-1/3.5. Where concentrated loads are expected (i.e., in way of wash boxes, chutes, etc.) these loads are to be indicated on the diagram.

The sketch is to include a section through the conveyor boom showing the geometry of the conveyor and the volume per unit length for a range of material heights on the belt. The sketch should also show the loaded length of the boom belt.

5 Design Criteria

5.1 Standards

All cargo gear metal structural parts are to be designed with consideration being given to the provisions of 4-2/5.3, 4-2/5.5 and 4-2/5.7, as appropriate, and are to be in accordance with recognized standards listed below which are to be identified on the plans submitted for approval and in the accompanying calculations. In the application of these standards, consideration will be given to the ratio of yield point to ultimate strength of the material.
For steels having a yield point not in excess of 70 kgf/mm² (100,000 psi) the yield point for design purposes is not to be considered greater than 72% of the ultimate strength. Steels having yield points in excess of 70 kgf/mm² (100,000 psi) and aluminum alloys will be specially considered.

Design criteria such as is published in the following specifications, as they are appropriate, taken in association with suitable design assumptions as outlined in 4-2/5.3 of this Guide will be considered as “recognized standards” mentioned earlier.


5.3 Loads

The structural components of cargo gear are to be proportioned for the following loads and forces, the assumptions for which are to be indicated as required by 4-2/5.1.

5.3.1 Dead Load
The minimum dead load to be assumed in design is to consist of the weight of the structural parts and all material permanently fastened thereto or supported thereby.

5.3.2 Live Load
The minimum live load to be assumed in design is to be based on the cross sectional area of a loaded belt assuming the maximum density of material to be handled and is to be expressed in pounds or tons per running foot.

5.3.3 Impact Load
A minimum amount of 15% of the live load is to be assumed as a part of the impact load for the entire length of the boom. In addition to this load, for the non-cantilever section of the boom, a minimum amount of 5% of the applicable dead load and for the cantilever section of the boom, a minimum amount of 10% of the applicable dead load is to be assumed as a part of the impact load.

5.3.4 Longitudinal Forces
In the design of the boom structure, provision is to be made for longitudinal forces resulting from the conveyor belt pull or other pieces of machinery capable of inducing such forces.

5.3.5 Wind Forces
It is recommended that a minimum wind velocity of 27 m/sec (60 mph) be considered as a design assumption with due regard being given to the shape of the sections used in construction.

5.3.6 Lateral Forces on the Boom Structure
It is recommended that a minimum list of 2 degrees of the vessel be considered as a design assumption.

5.3.7 Ice
The additional loads as the result of icing are to be specially considered where it is specified as a design condition.

Maximum possible forces due to a combination of the appropriate loads listed above are to be used in determining the sizes of structural members.
5.5 Factors of Safety

Unless otherwise specified by the provisions of this Guide, the following safety factors are to be used:

- For chains 4.5
- For running wire rope 3.5
- For fixed wire rope 3.0
- For fiber rope
  - When intended for running rigging 7.0
  - When intended for fixed gear and vangs 5.0

5.7 Stowage Arrangement

The basic loads to be taken into account in the calculations of the saddle and supporting structure for the stowage of the self-unloading boom while in transit are as follows: Static gravitational forces, dynamic forces associated with ship motions (roll, pitch and heave), wind forces and ice.

The wind force when stowed is to be based on a 45 m/sec (100 mph) wind.

The saddle and supporting structure for the stowed self-unloading boom is to be designed to withstand the worst anticipated loading. Due consideration is to be given in selecting the location of the saddle for boom stowage.

7 Materials

7.1 General

Structural materials used in the construction of the conveyor boom, supporting structure and auxiliary devices are to be in accordance with the approved drawings and are to be certified by the producing mill as to the chemical and mechanical test results. Material is to be clearly identified by the steel manufacturer with the specification, grade and heat number and the identification maintained to the satisfaction of the attending Surveyor.

Forgings and castings forming a part of the boom or those structures for controlling or supporting the boom are to be manufactured and tested in accordance with the ABS Rules for Building and Classing Steel Vessels.

7.3 Steel

The steel is to be made by one or more of the following processes: open-hearth, basic oxygen, electric-furnace, or such other processes as may be specially approved. The mechanical properties and weldability characteristics of the steels are to be equivalent to those of the American Bureau of Shipping Structural Grade Steels and are to be in accordance with the specification of a recognized society. Other steels may be specially considered.

7.5 Aluminum

Aluminum used in the construction of conveyor booms and associated parts is generally to be of the 5000 series of aluminum alloys for welded construction. Other alloys of aluminum will be specially considered. Welding of alloy 6061-T6 will be acceptable provided that welding and heat treatment are in accordance with 2-5-A1/1.1 and Section 2-5-4, respectively, of the ABS Rules for Materials and Welding (Part 2) – Aluminum and Fiber Reinforced Plastics (FRP).
CHAPTER 4  Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 3  Loose Gear, Wire Ropes and Chains

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>
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<tr>
<th>Article of Gear</th>
<th>Proof Load</th>
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<tr>
<td>Chain, ring, hook, link shackle or swivel</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Pulley blocks:</td>
<td></td>
</tr>
<tr>
<td>Single sheave block</td>
<td>300% in excess of the safe working load (See Note)</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load up to 20 tons</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load over 20 tons up to and including 40 tons</td>
<td>20 tons in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheaves block with safe working load over 40 tons</td>
<td>50% in excess of the safe working load</td>
</tr>
</tbody>
</table>

Note: The safe working load of 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 safe working load of the block as defined in this note.

1.1.2 Examination

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 Certificate

Articles of loose gear are to have a certificate furnished by the manufacturer or recognized testing facilities. 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 of load applied and safe working load and it is to be attached to the Register of Cargo Gear required by 4-7/3.3. The safe working load, SWL, is to be marked on the blocks.

1.5 Special Lifting Devices

Special lifting devices and components built into cranes or hoisting machinery, the designs of which are submitted for approval, 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 4-5/7.
3 Wire Rope and Chain

3.1 Wire Rope Test
All wire rope of cargo gear is to have a certificate of test furnished by the manufacturer or recognized testing facilities showing that the breaking test of a sample is at least 3\(\frac{1}{2}\) times the safe working load for running ropes and at least 3 times the safe working load for fixed ropes.

If the above certificate is not available, an ABS Surveyor may witness the wire rope tests and issue the certificates.

3.3 Certificate
Above certificate is also to show size of rope in inches, number of strands, number of wires per strand, grade of wires and date of test and is to be attached to the Register of Cargo Gear required by 4-7/3.3.

3.5 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 laid down in this Paragraph.

3.7 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 defects which render it unfit for use.
CHAPTER 4  Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 4 Pressure Vessels, Piping and Electrical Systems for New Cargo Gear

1 General

The requirements in this Section apply to new cargo gear. For the initial certification of existing cargo gear, the requirements in 4-5/9 are to be complied with.

Pressure vessels, cylinders, slewing gear, piping and electrical systems in luffing and slewing systems for self-unloading cargo gear are subject to design review and survey during installation for compliance with these requirements. In addition, these pressure vessels, cylinders and gears are also subject to survey during manufacture unless they form part of an independently manufactured and assembled unit that is surveyed during manufacturing.

3 Plans to be Submitted (2011)

The following plans are to be submitted and approved before proceeding with fabrication. Plans should generally be submitted electronically to ABS. However, hard copies will also be accepted.

- General arrangement showing equipment location.
- Detailed diagrammatic plans of piping system. Hydraulic systems which form part of a standardized unit which is independently manufactured and certified and assembled need only identify the type and material of valves and fittings. For all other piping systems (shipyard installed), the plan is also to be accompanied by lists of size, wall thickness, maximum working pressure and material of all pipes and the type, size, pressure rating design basis (ANSI, JIS, etc.) and material of valves and fittings. Rating of pumps is also to be included.
- 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. Rating information of motors is also to be included.
- Details of controls, alarms and instrumentation arrangements
- Details of pressure vessels, accumulators and fluid power cylinders and attachment details.
- Slewing gear details including dimensional details, gear tooth geometry and full material specifications.

5 Design Acceptance Criteria

5.1 General

Items defined in 4-4/1 are to be designed, constructed and tested to the requirements contained in this Section and the applicable Sections of the ABS Rules for Building and Classing Steel Vessels, as indicated below. Systems which are shown to be designed, constructed and tested to other recognized standards or codes of practice (such as ANSI, ASME, IEEE, IEC, etc.) may be accepted on that basis, provided the alternative standard is not less effective than the ABS requirements.
7 Manufacture and Installation
Pressure vessels, cylinders and slewing gear covered under 4-4/1 are to be manufactured, and installed to the satisfaction of the Surveyor in accordance with approved plans and the following. Materials are to be certified by the mill and such certification verified by the Surveyor at his discretion.

9 Pressure Vessels
Pressure vessels under the scope of this Section are to comply with Part 4, Chapter 4 of the ABS Rules for Building and Classing Steel Vessels, except that material testing may be in accordance with 4-4/7 of this Guide.

11 Luffing and Slewing Gear

11.1 Cylinders
Luffing and slewing cylinders are to comply with 4-6-7/3.5.5 of the ABS Rules for Building and Classing Steel Vessels. The cylinder connections are to comply with a recognized standard. All nuts are to be positively locked. Where nuts are pre-stressed for locking purpose, a safety factor of 2.0 against loosening is to be attained without exceeding 90% of the yield strength of the material.

11.3 Slewing Gear
Slewing gear is to be designed in accordance with a recognized standard, such as AGMA.

13 Hydraulic Piping

13.1 General
Hydraulic piping systems in luffing and slewing systems are to comply with 4-6-7/3 of the ABS Rules for Building and Classing Steel Vessels. The pumps of the unit are to be provided with arrangements to prevent rotating of an inoperative pump in the opposite direction or with automatic arrangements for securing the flow through the inoperative pump.

13.3 Pipe Installation
The passage of self-unloader system hydraulic pipes through cargo holds and tanks is to be limited to only that which is necessary for operational purposes. Pipes installed within cargo holds and tanks are to be protected from mechanical damage. System connection to other hydraulic systems is subject to special consideration.

Failure in any one part of the self-unloading hydraulic system is not to cause the failure of other parts of the self-unloading system or of other vessel’s systems.

13.5 Hydrostatic Testing
The hydraulic piping is to be tested in accordance with 4-6-2/7.3.3 of the ABS Rules for Building and Classing Steel Vessels.

15 Electrical
Electrical equipment in luffing and slewing systems is to be designed, manufactured, installed and tested in accordance with Part 4, Chapter 8 of the ABS Rules for Building and Classing Steel Vessels.
17 **Hazardous Locations**

Machinery, all electrical power, control and safety devices and wiring installed in locations where a flammable atmosphere is expected to exist (as may occur in spaces for coal or grain) are to be suitable for operation in Class II (combustible dust) hazardous (classified) locations as defined in NEC (500.5).

Where essential for operation purposes, internal combustion engines may be installed in hazardous areas and such installation will be subject to special consideration. In all instances, exhaust outlets are to be outside of all hazardous areas and air intakes are to be not less than 3 m (10 ft) from hazardous areas.

19 **Fail-safe Arrangements and Safety Devices**

Fail-safe arrangements and safety devices of approved types are to be provided on the luffing and slewing equipment. A system is considered fail-safe if a component failure or loss of power supply will result in a controlled securing of the equipment or control of movement so as not to endanger personnel.

21 **Controls and Alarms**

21.1 **General**

Controls are to be provided for the safe operation of the cargo gear. These controls are to be clearly marked to show their functions. Energizing the power unit at a location other than cargo control station is not to set the gear in motion.

Where remote controls are provided for the cargo gear operation, these are also to be arranged for local operation. Control systems and monitoring systems are also to be arranged for local operation. Control systems and monitoring systems are to be independent of any other systems and, when hydraulic, are to be supplied with fluid from their own tanks.

21.3 **Monitors**

As appropriate, monitoring is to indicate system operating status (operating or not operating), availability of power, overload alarm, air pressure, electrical power or current, motor running and motor overload and brake mechanism engagement.

21.5 **Remote Shutdowns**

Remote shutdowns are to be provided outside of the power unit space so that they may be stopped in the event of fire or other emergency.
CHAPTER 4  Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 5  Tests and Surveys for Initial Certification

1  General

The requirements in 4-5/3 through 4-5/7 apply to the initial certification of all cargo gears except as modified by 4-5/9 for existing cargo gear.

3  Survey During Manufacture

Certification of conveyor boom, supporting structure and auxiliary devices as defined in 4-1/3.1 is to be subject to survey by the Surveyor at the plants of the manufacturer of component parts.

In-plant surveys of the cargo gear are required to the extent necessary for the Surveyor to determine that the details, materials, welding and workmanship are acceptable to ABS and are in accordance with the approved drawings. It is the responsibility of the primary contractor to inform the Surveyor prior to the commencement of construction, of the location of any and all sub-contractors so that the necessary surveys at the various sub-contractors may be properly carried out.

The Surveyor is to be furnished with all material test certificates. Machining and assembly of important forgings and castings are to be witnessed and reported on by the attending Surveyor.

Modifications or repairs (welding, metal spraying, weld build-up, etc.) are to be reviewed and approved by the attending Surveyor prior to commencing work and examined upon completion.

5  Manufacturer’s Quality Assurance

The Surveyor is to satisfy himself that the manufacturer, including subcontractors, of the items mentioned in 4-5/3 can, through an established and well maintained quality control, comply with all ABS requirements, including material verification, fabrication, workmanship and nondestructive testing in the production.

This will include verification by the Surveyor of at least the following items:

i)  Manufacturer’s inspections are performed at appropriate stages of fabrication by a skilled inspector to an acceptable extent.

ii)  Welding procedures and welder’s qualification are fully documented.

iii)  Procedures for nondestructive testing are adequate with qualified personnel.

iv)  Procedures and facilities for required heat treatment are adequate.

v)  Other items deemed necessary by the Surveyor.
7 Initial Test of the Gear as a Unit

7.1 Load Test
After installation and before the cargo gear is placed in service, it is to be tested to a load equal to 125% of the working load of the assembled gear. The boom is to be positioned during the test to both the minimum operating angle and to an angle equal to the maximum operating angle or 10 degrees above the horizontal, whichever is less. After being tested as aforesaid, all of the 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 visually examined in place to see whether any part has been damaged or permanently deformed by the test. If any damage or deformed condition is noted, further examination and rectification is to be effected to the satisfaction of the attending Surveyor. A means of access is to be provided to facilitate the required examinations.

Surveys are to be conducted during daylight hours unless adequate artificial lighting is provided.

7.3 Operation Test
The boom is to be luffed and slewed from side-to-side without load to the limits shown on the approved plans and the leads of all cables are to be observed to ensure lack of interference with any structure. The conveying system is to be demonstrated under load.

7.5 Source of Electric Power
Power for operation of the luffing and slewing equipment during the test is to be taken through the vessel’s cables. Shore power may be used when supplied through the main switchboard.

7.7 Brakes and Fail-Safe Devices
The operation of all brakes and fail-safe devices are to be demonstrated under simulated loss of power conditions to the satisfaction of the Surveyor. A test memorandum is to be prepared outlining the cautions and procedures for proper testing of the devices.

7.9 Marking of Assembled Gear
The maximum and minimum angles to the horizontal for which the gear is designed to operate are to be indicated by markings at the boom pivot.

7.11 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 Cargo Gear required by 4-7/3.3.

7.13 Measuring Gauge
A means is to be provided for measuring the height of the material on the belt during tests together with a means of access to facilitate the required measurements. See 4-2/3.5.

7.15 Special Installations – Shuttle Booms and Cement Unloading Booms
Testing procedures for special installations such as shuttle booms and cement unloading booms are to be submitted for approval for each of those vessels having such gear, to ensure compliance with the intent of these requirements.

9 Existing Cargo Gear

9.1 Existing Cargo Gear with Recognized Register
For cargo gear having a Register issued by a recognized organization, evidence of previous design approval will be required. Suitable evidence of the design approval would be drawings of the arrangement and drawings of the arrangement and details which bear an approval stamp, or are specifically covered by an approval letter from the authority issuing the previous Register. An ABS Register of Cargo Gear may be issued after review of above data and a test and examination in accordance with the requirements of 4-6/1.3.
9.3 Existing Cargo Gear without Recognized Register

For existing cargo gear that do not have a Register issued by a recognized classification society, or a recognized cargo gear organization, submission of information as noted in 4-2/3 with verification of material, will be required. Existing cargo gear may be certified subject to satisfactory plan review, general examination, operation test including luffing, slewing, test of safety devices and proof testing of the cargo gear as a unit as required by 4-5/7. The general examination shall include visual inspection for excessive wear, damage, corrosion and fractures. Nondestructive testing or verification of material may be required at the discretion of the Surveyor. The boom slewing and luffing gear are to be examined as deemed necessary by the attending Surveyor.
CHAPTER 4 Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 6 Surveys After Initial Certification

1 Periodical Surveys

Should the Surveyor find occasion during any survey to recommend repairs or further examination, notification is to be given immediately to the Owner or his representative in order that appropriate action may be taken.

1.1 Annual Surveys

1.1.1 General

After undergoing the original test and inspection as required by 4-5/7 or 4-5/9, the cargo gear is to be surveyed annually by the Surveyor.

1.1.2 Survey Details

The following parts are to be visually examined in place at each Annual Survey. Dismantling of the gear may be required where damaged or deformed condition is noted.

i) Boom slewing tackle blocks, shackles, padeyes, rings, tables, cable connections, etc.

ii) Boom slewing and luffing cables.

iii) Boom slewing and luffing winches.

iv) Boom structure, “A”-frame and other supporting structures to which may be attached such tackle or other device as is employed to luff, swing or otherwise position the boom.

v) Gear for securing boom in stowed position.

vi) Slewng and luffing equipment including safety devices and limit switches.

vii) Valves, cocks, pipes, strainers and cylinders.

1.1.3 Access

Means of access are to be provided to facilitate the required examination.

1.1.4 Certification

Where any gear is dismantled for inspection as required by 4-6/1.1.2 or for other repairs, a report will be furnished by the Surveyor covering the surveys carried out which is to be attached to the Register of Cargo Gear as required by 4-7/3.3.
1.3 Retesting Surveys

1.3.1 General
The first Retesting Survey of new installations is to be due five (5) years from date of original installation, and subsequent Retesting Surveys at intervals of five (5) years thereafter.

1.3.2 Load Test
Before the Retesting Survey is credited, the application of a test load of at least equal to 110% of the design safe working load of the assembled gear is required. Where a test load less than 110% of the design safe working load is applied, the boom will be certified for the corresponding safe working load. A general, careful examination of all accessible parts of the assembled gear is to be carried out after the load test. Where damaged or deformed condition is noted, parts are to be further examined to determine the condition of the affected parts.

1.3.3 Close-up Examination
At each Retesting Survey, in addition to the requirements of the Annual Survey, a close-up examination of all self-unloading structure, luffing structural connections, multiple sheave blocks, spreaders, hydraulic cylinders and all other load bearing parts is to be carried out prior to crediting the Retesting Survey. Suitable safe means of access are to be provided to facilitate this close-up examination. Any load-carrying parts that display indications of damage or deformation shall be further examined as deemed necessary by the attending Surveyor.

Close-up is defined as being approximately within arm’s length of the item being examined.

The close-up examination of self-unloading structures may be carried out not more than three (3) months before or after the load test. This time span will facilitate both the requirements of close-up examination and availability of suitable load test material.

Hydraulic cylinders are to be examined under operating conditions. Associated relief and pressure control valves are to be proved operable.

1.3.4 Certification
A certificate of survey is to be furnished upon completion of Retesting Survey and is to be attached to the Register of Cargo Gear as required by 4-7/3.3.

1.3.5 Visibility
Surveys are to be conducted during daylight hours unless adequate artificial lighting is provided.

1.3.6 Year of Grace
Where the vessel has been granted a Year of Grace to complete the Classification Special Periodical and Continuous Surveys, the Cargo Gear Retesting Survey may also be granted a Year of Grace provided an examination of the gear at least equivalent to that of an Annual Survey (4-6/1.1) finds the gear satisfactory and a review of the record shows no history of problems with the gear.

The Year of Grace would extend for one year from the expiration date of the vessel’s existing Retesting Survey Certificate and the survey can be carried out a maximum of three months before the Retesting Survey due date or at the time of the Classification Year of Grace Survey.

This provision applies to vessels classed Great Lakes or Great Lakes & St. Lawrence River Service only.

3 Monthly Inspection by Vessel’s Personnel

A monthly inspection of the cargo gear is to be made by members of the vessel’s personnel as designated by the Master and a record kept of the findings of the inspection and the repairs and renewals resulting from this inspection. This record is to be in or kept with the cargo gear register.
5 Repairs

5.1 General
Renewal or damage to the conveyor boom, supporting structure or auxiliary devices which affects or may affect certification, is to be submitted by the Owners or their representatives for examination by the Surveyor.

5.3 Conveyor Boom, Supporting Structure and Auxiliary Devices
When repairs or renewals are required to be made to the booms, “A”-frames and other supporting structure, permanent fittings of cargo gear and hydraulic cylinders, the repairs are to be carried out to the satisfaction of the Surveyor. A certificate of survey is to be furnished and is to be attached to the Register of Cargo Gear as required by 4-7/3.3.

For major repairs, test and examination of particular cargo gear as may be deemed necessary are to be carried out in accordance with 4-5/7.

For minor repairs, test and examination are to be carried out in accordance with 4-5/7 except that the test load may be equal to 110% of the working load of the assembled gear. A minor repair is defined as repairs to bent boom struts or diagonal members, cracked welds, replacement of pins or normal overhaul of existing hydraulic cylinders.

5.5 Repairs to Loose Gear
When welding is used to lengthen, alter or repair items of loose gear, they are to be properly heat treated and before being again put in use, are to be adequately tested and examined in accordance with 4-3/1.1 and certificates are to be furnished. The certificates are to be attached to the Register of Cargo Gear required by 4-7/3.3.

5.7 Plans
Where major modification to the original design is involved, plans and other data as required by 4-2/3 are to be submitted for approval prior to the commencement of the work.

7 Additions to Cargo Gear
When articles of loose gear and wire rope conforming with tests in accordance with 4-3/1 and 4-3/3 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 4-7/5 kept with the Register of Cargo Gear required by 4-7/3.3, identifying each article and certificate of same. Certificates, where required, are to be placed in the Register of Cargo Gear.
CHAPTER  4  Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels

SECTION 7  Register of Cargo Gear

1  Certificates

1.1  Certificates Issued by the Surveyor
Certificates in the prescribed forms and containing the prescribed particulars with regard to the tests, examinations and surveys in 4-5/7, 4-5/9, 4-6/1.1, 4-6/1.3 and 4-6/5.3 are to be issued by the Surveyor and attached to the Register of Cargo Gear as required by 4-7/3.3.

1.3  Other Certificates
Certificates covering the loose gear test (4-3/1.1), wire rope test (4-3/3.1), repairs to loose gear (4-6/5.5) and additions to cargo gear (4-6/7) are to be supplied by the manufacturers or the Surveyor on Form CHG-4 G.L., Form CHG-5 G.L. or Form CHG-7 G.L., as the case may be. These forms are substantially those recommended by the International Labor Office and forms essentially in accordance therewith will also be accepted.

3  Register of Cargo Gear

3.1  Issuance
When all necessary certificates and records are obtained, the self-unloading cargo gear is installed aboard the vessel and proof testing is carried out to the satisfaction of the Surveyor, the Register of Cargo Gear and initial endorsement will be issued.

3.3  Availability
Every vessel is to carry a Register of Cargo Gear, which is to be open to inspection by proper authority and available for endorsement by the Surveyor at the time of periodical inspections. See 4-6/1.1 and 4-6/1.3. In it are to be kept the particulars of periodical inspections and attached to it are to be copies of certificated covering original tests to cargo gear and repairs and additions to cargo gear as required in 4-3/1.3, 4-3/3.3, 4-5/7.11, 4-6/5.5 and 4-6/7.

5  Other Records
A record is also to be kept which is to show particulars of all overhauls and replacements to cargo gear.
CHAPTER 5  Guide for Certification of Shipboard Elevators

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CHAPTER 5  Guide for Certification of Shipboard Elevators

SECTION 1  General

1 Scope (1 October 2013)

This Guide provides requirements for the certification of shipboard elevators on vessels classed with ABS. 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 Guide may be used to transport vessel’s stores and equipment.

The vessel or unit classed by ABS having an installed shipboard elevators certified by ABS in accordance with Chapter 5 of this Guide will be distinguished by the additional class notation SElev (Shipboard Elevator).

A vessel or unit classed by ABS will be distinguished by the classification notation SElev(I) when issued an ABS Register of Lifting Appliances based upon an existing register issued by another IACS Society.

3 Submission of Design Plans and Data (2011)

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 5-4/21.9).
- 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 electronically to ABS. However, hard copies will also be accepted.
5 Design Criteria

5.1 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 (0.08 in.) peak to peak of frequency \(0\) to \(25\) Hz

ii) Rolling: \(\pm 10\) degrees, period \(10\) seconds

iii) Pitching: \(\pm 5\) degrees, period \(7\) seconds

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

\[
A = 3.8 - 0.01(L - 250) \text{ m}
\]

\[
A = 12.5 - 0.01(L - 820) \text{ ft}
\]

where \(L\) is the length of the vessel in m (ft). See 5-2/21. The heaving amplitude, \(A\), need not be taken to be greater than \(3.8\) m (12.5 ft).

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: \(\pm 30\) degrees, period \(10\) seconds

ii) Pitching: \(\pm 10\) degrees, period \(7\) seconds

5.3 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 4, Chapter 9 of the ABS Rules for Building and Classing Steel Vessels).

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

5.7 Rated Speed
Generally, rated speeds for elevators are not to exceed \(60\) m (200 ft) per minute. Rated speeds for elevators of the winding drum type are not to exceed \(30\) m (100 ft) per minute (see 5-4/19.3). Other types of elevators having rated speeds in excess of \(60\) m (200 ft) per minute will be subject to special consideration.

5.9 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 following table.
<table>
<thead>
<tr>
<th>Inside Net Platform Area</th>
<th>Rated Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>m²</td>
<td>ft²</td>
</tr>
<tr>
<td>0.65</td>
<td>7.0</td>
</tr>
<tr>
<td>0.77</td>
<td>8.3</td>
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<tr>
<td>0.89</td>
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<tr>
<td>1.23</td>
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<tr>
<td>1.76</td>
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<tr>
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<td>50.0</td>
</tr>
</tbody>
</table>
CHAPTER 5 Guide for Certification of Shipboard Elevators

SECTION 2 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.

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

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

5.1 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.

5.3 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.

5.5 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.

5.5.1 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.

5.5.2 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.

5.7 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.
7 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.

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

11 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.

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

15 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.

17 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.

19 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.

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

23 Lift
Elevator, see 5-2/7.

25 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.
27  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.

29  Rated Load

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

31  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.

33  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.

35  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.

37  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.

39  Travel

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

41  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.

43  Trunk

Hoistway, see 5-2/17.
CHAPTER 5  Guide for Certification of Shipboard Elevators

SECTION 3  Materials

1  Material Standards

Materials intended for use in the construction of elevators are to be manufactured and tested in accordance with Chapters 1 and 3 of the ABS Rules for Materials and Welding (Part 2) as applicable and as limited by this Guide. Materials conforming to other recognized standards will be considered, provided they are not less effective.

3  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 Chapter 3 of the ABS Rules for Materials and Welding (Part 2) may, in general, be used without limitation.

5  Non-combustible Materials

All materials used in the construction of the hoistway, car frame and car and machine room (see 5-4/17) are to be incombustible except that material of low flame spread may be used for decorative trim within the car.
CHAPTER  5  Guide for Certification of Shipboard Elevators

SECTION  4  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 requirements.

1.3  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 (113 kgf, 250 lbf) applied at right angles at any point over an area of 102 mm (4 in.) by 102 mm (4 in.).

1.5  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 fire integrity of the hoistway enclosure is to be in accordance with 5-1-1/3 of the ABS Rules for Building and Classing Mobile Offshore Drilling Units. The hoistway is also to comply with 5-1-1/5.5 of the ABS Rules for Building and Classing Mobile Offshore Drilling Units.

1.7  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 (1 in.).

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

1.9  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.
1.11 **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 (24 in.).
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 (29.5 in.). Additionally, an unobstructed area of not less than 0.5 m² (5.4 ft²) is to be provided at the top of the enclosure for refuge space. This space is to measure not less than 600 mm (24 in.) on any side and have a height of no less than 1100 mm (43 in.) when the car has reached its maximum upward movement.

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

1.15 **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.

1.17 **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 5-7/5.1.

1.19 **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 5-4/13.13 and 5-5/17.3).

1.21 **Equipment Permitted in Hoistway**
Only equipment which forms part of the elevator installation is to be permitted on the interior of the hoistway enclosure.

1.23 **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 5-6/7.

3 **Guide Rails**

3.1 **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.

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

3.5 **Spacing of Brackets**
Guide rail brackets, suitably supported, are to be provided and are to be spaced not more than 2.4 m (8 ft) apart.

3.7 **Strength and Deflection**
Car and counterweight rails are to be capable of withstanding loads resulting from operation of the car or counterweight safeties (see 5-4/9) under test conditions, or from loads imposed by motion of the vessel as described in 5-1/5.1, without permanent deformation. Deflection of car and counterweight guide rails is not to exceed 3 mm (0.12 in.) for operation under the conditions outlined in 5-1/5.1.
5 Hoistway Doors

5.1 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.

5.3 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 5-1/5.1.

5.5 Opening of Hoistway Doors
Doors are to be openable from the hoistway interior without special tools. They are to be openable from the landing side only by a special key.

5.7 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 5-5/3.

5.9 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 (0.25 in.) thick having an area not less than 0.015 m², (24 in²) 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 m² (80 in²).

5.11 Size of Hoistway Entrances
The clear opening of each hoistway entrance is to be not less than 800 mm (31.5 in.) wide and 2030 mm (80 in.) high.

5.13 Escape Doors
In general, an emergency escape door is to be provided at every third deck, but not more than 11 m (36 ft) 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. See 5-5/3. For elevators of the direct-plunger hydraulic type, emergency doors are required only when car safeties are provided.

5.15 Location of Hoistway Entrances
Hoistway doors are not to be located with direct access to machinery spaces or hazardous areas. See Chapter 5, Section 9.

5.17 Illumination at Entrances
For lighting requirements, see 5-6/3.7.

5.19 Flooring
Deck areas at entrances to elevators are to be slip resistant.
Chapter 5 Guide for Certification of Shipboard Elevators

Section 4 Construction

7 Car Frame and Enclosure

7.1 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 5-1/5.1.

Materials other than steel may be considered for elevators for the compartments as specified in 5-4/1.7. The arrangement and details are to be submitted for review.

7.3 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.

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

7.7 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 in 5-4/5, 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 5-4/5.9.

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.

7.9 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 m² (400 in²) and is to measure not less than 400 mm (16 in.) on any side. Also refer to 5-5/17.9.

7.11 Ventilation
For ventilation requirements, see 5-7/5.3.

7.13 Illumination of Cars
For lighting requirements, see 5-6/3.1.

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

7.17 Flooring
Cars are to be provided with slip resistant flooring.
9 Car Safety

9.1 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 5-4/9.13).

9.3 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.

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

9.7 Stopping Distances and Governor Tripping Speeds
Stopping distances and governor tripping speeds are to be in accordance with the following table:

<table>
<thead>
<tr>
<th>Rated Speed</th>
<th>Maximum Governor Trip Speed</th>
<th>Maximum Stopping Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>m per minute</td>
<td>ft per minute</td>
<td>mm</td>
</tr>
<tr>
<td>38 or less</td>
<td>125 or less</td>
<td>54</td>
</tr>
<tr>
<td>45</td>
<td>150</td>
<td>63</td>
</tr>
<tr>
<td>52</td>
<td>175</td>
<td>75</td>
</tr>
<tr>
<td>60</td>
<td>200</td>
<td>84</td>
</tr>
</tbody>
</table>

9.9 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.

9.11 Car Safeties for Direct-Plunger Hydraulic Elevators
When car safeties are provided, they are to comply with 5-4/9.3 through 5-4/9.9.

9.13 Car Safeties for Rack-and-Pinion Elevators
Elevators of the rack-and-pinion type are to be provided with a safety complying with 5-4/9.3 through 5-4/9.9 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 following table:

<table>
<thead>
<tr>
<th>Rated Speed</th>
<th>Maximum Governor Trip Speed</th>
<th>Maximum Stopping Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>m per minute</td>
<td>ft per minute</td>
<td>mm</td>
</tr>
<tr>
<td>37.8 or less</td>
<td>125 or less</td>
<td>52.8</td>
</tr>
<tr>
<td>45.6</td>
<td>150</td>
<td>63.6</td>
</tr>
<tr>
<td>53.4</td>
<td>175</td>
<td>82.2</td>
</tr>
<tr>
<td>60.6</td>
<td>200</td>
<td>85.2</td>
</tr>
</tbody>
</table>
11 **Counterweights**

11.1 **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.

11.3 **Guides**
Counterweight frames are to be provided with primary and secondary guides similar to those specified for car frames (see 5-4/7.3).

11.5 **Counterweight Safety**
A safety similar in operation to those specified for elevator cars (see 5-4/9) is to be provided and mounted on the frame of each counterweight.

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

13 **Elevator Pit and Headroom**

13.1 **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.

13.3 **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.

13.5 **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.

13.7 **Strength of Pit Base**
The base of the pit is to be designed for an imposed load of not less than 5000 N/m² (510 kgf/m², 105 lbf/ft²).

13.9 **Illumination of Pit**
Each pit is to be provided with a permanent lighting fixture. See 5-6/3.9.

13.11 **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.

13.13 **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 m² (400 in²) and is to measure not less than 400 mm (16 in.) on any side. Also see 5-5/17.7.
15 Buffers

15.1 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.

15.3 Spring Buffers
15.3.1 Stroke
The stroke of the buffer spring is to be in accordance with the following:

<table>
<thead>
<tr>
<th>Rated Car Speed</th>
<th>Minimum Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>m per minute</td>
<td>ft per minute</td>
</tr>
<tr>
<td></td>
<td>mm</td>
</tr>
<tr>
<td>30 or less</td>
<td>100 or less</td>
</tr>
<tr>
<td>30.6 to 45</td>
<td>101 to 150</td>
</tr>
<tr>
<td>45.6 to 60</td>
<td>151 to 200</td>
</tr>
</tbody>
</table>

15.3.2 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.

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

15.5 Oil Buffers
15.5.1 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/s² (32.2 ft/s²). Peak retardation is not to exceed 24.5 m/s² (80.5 ft/s²).

15.5.2 Load Rating
The minimum load rating is to be not greater than the total weight of the car plus 686 N (70 kgf, 154 lbf) 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.

15.5.3 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.

15.7 Buffers for Direct-Plunger Hydraulic Elevators
Elevators of the direct-plunger hydraulic type are to be provided with car buffers complying with 5-4/15.1 through 5-4/15.5, 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/s² (32.2 ft/s²). 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.
17 **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 5-6/3.3). Only equipment directly associated with the operation of the elevator is to be located in the machine room.

19 **Driving Machines**

19.1 **Traction Driving Machines**

Driving machines of the traction type may be driven by electric or hydraulic motors and are to have a rated speed not exceeding 60 m (200 ft) per minute. Traction drive elevators are to be fitted with a device to cause the elevator to stop and keep it stopped in the event that a start is initiated but the lift does not rotate, or the car (or counterweight) is stopped in downward movement by an obstacle which causes the ropes to slip on the driving sheave. The device is to function within a time not to exceed the lesser of 45 seconds or the time for traveling the full travel plus 10 seconds, with a minimum of 20 seconds if the full travel time is less than 10 seconds. The device is not to affect operation from the top inspection station or electric recall operation, if any.

19.3 **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 (550 kgf, 1200 lbf). 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 (50 ft) per minute and a travel not exceeding 12.5 m (40 ft). Winding drum machines are to have positive means of removing power from the machine in the event of over-travel. See also 5-5/7.

19.5 **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 4-6-7/3 of the ABS Rules for Building and Classing Steel Vessels 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 (20 ft) 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 5-5/7.

19.7 **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.

19.9 **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.

19.11 **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 (41 kgf, 90 lbf). A metal plate with instructions for operation of the device is to be permanently mounted in the elevator machine room.
19.13 **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 (2 in.)

ii) 10 for cast iron or other metals having an elongation of less than 14% in a length of 50 mm (2 in.)

The load to be used to determine the factor of safety is the total weight of the elevator plus the rated load.

19.15 **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.

19.17 **Other Arrangements**

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

21 **Hoisting Ropes**

21.1 **General**

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

21.3 **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.

21.5 **Diameter of Ropes**

Minimum diameter for hoisting ropes is to be 9.5 mm (0.375 in.). Outer wires of ropes are to be not less than 0.6 mm (0.024 in.) in diameter.

21.7 **Factor of Safety**

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

<table>
<thead>
<tr>
<th>Rope Speed</th>
<th>Minimum Factor of Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>m per minute</td>
<td>ft per minute</td>
</tr>
<tr>
<td>15.2</td>
<td>50</td>
</tr>
<tr>
<td>22.2</td>
<td>75</td>
</tr>
<tr>
<td>30.0</td>
<td>100</td>
</tr>
<tr>
<td>37.2</td>
<td>125</td>
</tr>
<tr>
<td>45.0</td>
<td>150</td>
</tr>
<tr>
<td>52.2</td>
<td>175</td>
</tr>
<tr>
<td>60.0</td>
<td>200</td>
</tr>
</tbody>
</table>

21.9 **Wire Rope Data**

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

- Number of ropes
- Diameter, in mm (in.)
- Manufacturer’s rated breaking strength per rope, in kN (kg, lb)
A data tag is to be provided for each set of ropes with the following information:

- Diameter, in mm (in.)
- 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.

21.11 **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.

21.13 **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.
CHAPTER 5 Guide for Certification of Shipboard Elevators

SECTION 5 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.

1.3 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.

3 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.

5 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 (150 ft) 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.

7 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.

9 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 5-4/13.11).

11 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.
13 **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.

15 **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.

17 **Means of Escape**

17.1 **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.

17.3 **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 5-4/5.13. This ladder is to be accessible also from the escape hatch of the car required by 5-4/7.9.

17.5 **Car Escape Ladder**

A ladder is to be provided for entering the car through the emergency hatch in the car roof (see 5-4/7.9). 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.

17.7 **Headroom Escape Hatch**

The escape hatch required by 5-4/13.13 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.

17.9 **Car Escape Hatch**

The escape hatch required by 5-4/7.9 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 5-4/7.9 in cars for crew only is to be fitted with a mechanical latch-type lock with handles on both inside and outside.

17.11 **Safety Circuit**

Opening of the escape hatches referred to in 5-5/17.7 and 5-5/17.9 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.

17.13 **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
CHAPTER 5  
Guide for Certification of Shipboard Elevators

SECTION 6  
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 4, Chapter 8 of the ABS Rules for Building and Classing Steel Vessels. 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.

3 Lighting

3.1 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 (5 ft-candles). Lighting fixtures are to be shock resistant of a type suitable for elevator service.

3.3 Machine Room

The machine room is to have normal illumination by more than one light to an intensity of not less than 54 lux (5 ft-candles).

3.5 Hoistway

Permanently installed lighting fixtures are to be provided in the hoistway at every escape door (see 5-4/5.13).

3.7 Elevator Landings

Elevator landings are to be illuminated to an intensity of not less than 50 lux (5 ft-candles). 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.

3.9 Pit

The hoistway pit is to be illuminated to an intensity of not less than 100 lux (10 ft-candles) 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.

5 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.

7 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.
9  Communication

9.1  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.

9.3  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.
CHAPTER 5 Guide for Certification of Shipboard Elevators

SECTION 7 Piping and Ventilation

1 Piping

All hydraulic, control and other piping is to comply with the applicable requirements of Part 4, Chapter 6 of the ABS Rules for Building and Classing Steel Vessels.

3 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.

5 Ventilation

5.1 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.

5.3 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.
CHAPTER 5 Guide for Certification of Shipboard Elevators

SECTION 8 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

3 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 5-8/Table 1, 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

5 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 (kgf, lbf), 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 5-4/21.9
- Manufacturer’s name and date of installation
## TABLE 1
Shipboard Elevator – Periodic Test Requirements

### Annual Survey

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

### Second or Third Annual Survey (Hydraulic elevator only)

<table>
<thead>
<tr>
<th>No.</th>
<th>Testing Items</th>
<th>Test Pressure</th>
<th>Confirmation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I1</td>
<td>Unexposed portions of pistons</td>
<td>NL</td>
<td>Visual inspection – wear or corrosion</td>
</tr>
<tr>
<td>I2</td>
<td>Pressure vessels</td>
<td>1.5P</td>
<td>Visual inspection and endurance for 1 min.</td>
</tr>
</tbody>
</table>

### 5-Year Retesting Survey

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

Notes:
- **R** = Rated load
- **P** = Working pressure
- **RVS** = Relief valve setting pressure
CHAPTER 5 Guide for Certification of Shipboard Elevators

SECTION 9 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 Chapter 5, Sections 1 through 8. Elevators installed in other hazardous locations will be subject to special consideration.

3 Design Review
Plans and design data supplemental to that required by 5-1/3 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

5 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.

7 Electrical Installation
The electrical installation is subject to special consideration but in general is to comply with the requirements of Part 4, Chapter 8 of the ABS Rules for Building and Classing Steel Vessels. 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 mm² (0.009 in²) cross sectional area (No. 10 AWG).
CHAPTER 6  Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

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CHAPTER 6 Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

SECTION 1 General

1 Scope (1 October 2013)

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

The vessel or unit classed by ABS having an installed stern, bow and sideport ramps and moveable platforms (decks) certified by ABS in accordance with Chapter 6 of this Guide will be distinguished by the additional class notation RMP (Ramps and Moveable Platforms).

A vessel or unit classed by ABS will be distinguished by the classification notation RMP(I) when issued an ABS Register of Lifting Appliances based upon an existing register issued by another IACS Society.

3 Submission of Design Plans and Data

3.1 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.

3.3 Moveable Platforms (Decks) (2011)

Plans should generally be submitted electronically to ABS. However, hard copies 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.

If moveable platforms (decks) are arranged in ro-ro spaces, similar drawings of ramps for vehicle loading are to be submitted.
CHAPTER 6 Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

SECTION 2 Design Criteria

1 General

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

3 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) 3-2/5.5 of Chapter 3, “Guide for Certification of Cargo Gear on Merchant Vessels” of this Guide.

ii) 3-2-3/Table 1, Equation C of the ABS Rules for Building and Classing Steel Vessels (Steel Vessel Rules) for platform decks in enclosed cargo spaces.

iii) 3-2-3/5.17 of the Steel Vessel Rules for forklift trucks.

iv) 3-2-3/7.1 and 3-2-3/7.3 of the Steel Vessel Rules for decks of higher-strength material.

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

vi) 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 2-2/5.7, 2-2/5.9 and 2-2/5.11 of Chapter 2, “Guide for Certification of Cranes” of this Guide.

vii) 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 ABS through an independent analysis, unless specifically requested by the submitter.

5 Moveable Platforms (Decks)

5.1 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) For uniform cargo loading, use plating thickness required by 3-2-3/Table 1, Equation C of the Steel Vessel Rules for platforms decks in enclosed cargo spaces.

iii) For vehicles, use plating thickness required by 3-2-15/13.7, 3-2-3/5.17 and 3-2-3/7.3 of the Steel Vessel Rules for forklift trucks on hatch covers.

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.
5.3 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\(^2\) (1415 kg/cm\(^2\), 20,160 psi).

\[ ii \] Maximum allowable shear stress for beams and girders 10.5 kN/cm\(^2\) (1055 kg/cm\(^2\), 15,000 psi).

\[ iii \] Maximum allowable bearing stress for beams and girders 21.0 kN/cm\(^2\) (2150 kg/cm\(^2\), 30,600 psi).

\[ iv \] Maximum allowable resisting tearing failure for beams and girders 12.0 kN/cm\(^2\) (1225 kg/cm\(^2\), 17,400 psi).
CHAPTER 6 Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

SECTION 3 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>
<thead>
<tr>
<th>Article of Gear</th>
<th>Proof Load (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain, ring, link shackle or swivel</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Single sheave block</td>
<td>300% in excess of the safe working load (2)</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load up to and including 20 tons</td>
<td>100% in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheave block with safe working load over 20 tons up to and including 40 tons</td>
<td>20 tons in excess of the safe working load</td>
</tr>
<tr>
<td>Multiple sheaves block with safe working load over 40 tons</td>
<td>50% in excess of the safe working load</td>
</tr>
</tbody>
</table>

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.

1.3 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.

1.5 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 3-12/1). The safe working load SWL is to be marked on the blocks.
1.7 **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 6-3/5. Appropriate nondestructive methods of examination will be required where visual inspection is considered to be inadequate.

3 **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>
<thead>
<tr>
<th>Lifting Capacity in Tons</th>
<th>Breaking Test Load for Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 or less</td>
<td>$5 \times SWL$</td>
</tr>
<tr>
<td>13 or more</td>
<td>$4 \times SWL$</td>
</tr>
</tbody>
</table>

For gear with capacities between 10 and 13 tons, intermediate values of factors of safety may be used. This certificate is to show also size of rope, in mm (in.), 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 3-12/1).

5 **Proof Test to Gear as a Unit**

5.1 **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>
<thead>
<tr>
<th>Working Load of Assembled Gear in Tons</th>
<th>Proof Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20</td>
<td>25% in excess</td>
</tr>
<tr>
<td>20-50</td>
<td>5 tons in excess</td>
</tr>
<tr>
<td>Over 50</td>
<td>10% in excess</td>
</tr>
</tbody>
</table>

5.3 **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 (3.3 feet) 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.
5.5  **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.

5.7  **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.

5.9  **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.

5.11  **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.

5.13  **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 (1 in.) 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.

5.15  **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 3-12/1).
CHAPTER 6  Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

SECTION 4  Periodical Surveys

1  Annual Inspection

After undergoing the original test and examination required by 6-3/5, 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 3-12/1).

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.

iv) If corrosion is noted on the ramp, movable platform or portable ramp structures including hinges and supporting structure then thickness measurements are to be taken to determine extent of corrosion and results submitted to an ABS Engineering office for assessment.

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

3  Retesting Survey

At intervals of five years, in addition to the applicable requirements of the Annual Survey in 6-4/1, the lifting devices of ramps, moveable platforms (decks) and portable ramps are to undergo the proof loads and examination stated in 6-3/5 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 3-12/1).

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 ABS is prepared to do such retesting and note it in the Register of Lifting Appliances.
CHAPTER 6  Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)

SECTION 5  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 6-3/5. Certificates covering tests are to be attached to Register of Lifting Appliances (see 3-12/1).

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 6-3/1 and certificate furnished before being again put in use. The certificates are to be attached to the Register of Lifting Appliances (see 3-12/1).

3  Addition of New Gear and Wire Rope
When articles of loose gear and wire rope conforming with tests in accordance with 6-3/1 and 6-3/3 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 3-12/3 kept with the Register of Lifting Appliances (See 3-12/1), identifying each article and certificate of same.

5  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.

7  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.

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

11  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 (0.5 in.) or less, once at least in every six months.
All other chains and gear in general use, once at least every 12 months.
13 **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 (1100°F to 1200°F) for a period between 30 and 60 minutes. After being annealed, the article should be allowed to cool slowly.

15 **Annealing Certificate**

A certificate on prescribed form (see Form CHG-6 in Appendix, Section 1) 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 3-12/1).
APPENDIX

Samples of ABS Register of Lifting Appliances and Register of Cargo Gear

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SECTION 1  American Bureau of Shipping Register of Lifting Appliances ....... 148

SECTION 2  American Bureau of Shipping Register of Cargo Gear
(for Great Lakes Vessels)................................................................. 182
APPENDIX

Samples of ABS Register of Lifting Appliances and Register of Cargo Gear

SECTION 1 American Bureau of Shipping Register of Lifting Appliances

Section 1 of the Appendix applies to the latest editions of the “Guide for Certification of Cranes”, the “Guide for Certification Cargo Gear on Merchant Vessels” and the “Guide for Certification of Stern, Bow and Sideport Ramps and Moveable Platforms (Decks)” (Chapters 2, 3 and 6 of the ABS Guide for Certification of Lifting Appliances, respectively), as appropriate.
# American Bureau of Shipping

## Register of Lifting Appliances

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This Register when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 or Subchapter I-A and 29 CFR 1918.11.
INSTRUCTIONS

1. Before being taken into use all cranes, winches, hoists, derrick booms, derrick and mast bands, goose necks, eye bolts, and all other permanent attachments to the derricks, masts and decks, used in hoisting or lowering, shall have been tested and examined by a competent person. (See Sections 3, 4, 5, and 8 of Chapter 3, “Guide for Certification of Cargo Gear on Merchant Vessels” and Sections 2, 4, 5, and 8 of Chapter 2, “Guide for Certification of Cranes” of the ABS Guide for Certification of Lifting Appliances.) THE PARTICULARS OF THESE PROOF TESTS AND EXAMINATIONS MUST BE ENTERED IN PART I OF THIS REGISTER AND A CERTIFICATE IN THE APPROPRIATE FORM COVERING SUCH TESTING AND EXAMINATION MUST BE ATTACHED TO THIS REGISTER. (See Chapter 3, Section 12 and Chapter 2, Section 8 of the ABS Guide for Certification of Lifting Appliances.) (For winches and derricks, Certificate Form CHG-2, should be used, and for cranes or hoists, Certificate Form CHG-3.)

2. All derricks and permanent attachments, including bridle chains, to the derrick, mast and deck, used in hoisting or lowering, must be inspected by a competent person once in every 12 months, and proof tested and examined by a competent person once at least in every five years.* (See Chapter 3, Section 6 of the ABS Guide for Certification of Lifting Appliances) THE PARTICULARS OF THE ANNUAL INSPECTIONS MUST BE ENTERED IN PART II OF THIS REGISTER AND A CERTIFICATE IN FORM CHG-7 COVERING SUCH INSPECTIONS MUST BE ATTACHED TO THIS REGISTER. The particulars of such retesting and examinations must be entered in Part I of this Register and a certificate in Form CHG-2 covering such retesting and examination must be attached to this Register.

3. All cranes, winches, and hoists must be thoroughly examined by a competent person once at least in every 12 months and proof tested and examined by a competent person once at least in every five years.* (See Chapter 2, Section 7 of the ABS Guide for Certification of Lifting Appliances.) THE PARTICULARS OF THE ANNUAL INSPECTIONS MUST BE ENTERED IN PART II OF THIS REGISTER AND A CERTIFICATE IN FORM CHG-7 COVERING SUCH INSPECTIONS MUST BE ATTACHED TO THIS REGISTER. The particulars of such retesting and examinations must be entered in Part I of this Register and a certificate in Form CHG-3 covering such testing and examination must be attached to this Register.

4. All chains, rings, hooks, shackles, swivels or pulley blocks used in hoisting or lowering, and all wire ropes shall have been tested and examined by a competent person before being taken into use; (see Chapter 3, Section 3 and Chapter 2, Section 5 of the ABS Guide for Certification of Lifting Appliances); also, all chains, rings, hooks, shackles or swivels used in hoisting or lowering which have been lengthened, altered or repaired by welding shall, before being again taken into use, be adequately tested and re-examined by a competent person (see Chapter 3, Section 8 and Chapter 2, Section 8 of the ABS Guide for Certification of Lifting Appliances.) A CERTIFICATE IN FORM CHG-4 OR CHG-5, AS THE CASE MAY BE, SHOWING SUCH TEST AND EXAMINATION, MUST BE ATTACHED TO THIS REGISTER.

5. In the case of cargo gear used on lifting machinery driven by power, all half-inch (12.5 mm) and smaller chains, rings, hooks, shackles and swivels in general use, if made of wrought iron, shall be annealed under the supervision of a competent person once at least in every 6 months, and all other such cargo gear once at least in every 12 months. In the case of cargo gear used solely on lifting machinery worked by hand the above periods shall be 12 months and 2 years, respectively. (See Chapter 3, Section 11 of the ABS Guide for Certification of Lifting Appliances.) A CERTIFICATE IN FORM CHG-6 IN RESPECT OF SUCH HEAT TREATMENT MUST BE ATTACHED TO THIS REGISTER, AND THE PARTICULARS ENTERED IN PART III OF THE REGISTER (see Chapter 3, Sections 12 & 13 of the ABS Guide for Certification of Lifting Appliances.).

6. If the requirement of heat treatment does not apply to chains made of malleable cast iron, and chains, rings, hooks, shackles and swivels made of steel, all such chains, etc., must be thoroughly examined by a competent person once at least in every 12 months (see Chapter 3, Section 6 and Chapter 2, Section 7 of the ABS Guide for Certification of Lifting Appliances.) CERTIFICATE IN FORM CHG-7 MUST BE ATTACHED TO THIS REGISTER, AND THE PARTICULARS EXTENDED IN PART II OF THE REGISTER.

7. The following classes of gear are exempt from heat treatment subject to the provision that such gear shall be thoroughly examined by a competent person once at least in every 12 months (see Chapter 3, Section 6 and Chapter 2, Section 7 of the ABS Guide for Certification of Lifting Appliances):
   - Plate link chains; Pitched chains; Rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks or weighing machines; Hooks and swivels having ball bearings or other case-hardened parts; Bordeaux connections and gear constructed of steel.
   - Plate link chains; Pitched chains; Rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks or weighing machines; Hooks and swivels having ball bearings or other case-hardened parts; Bordeaux connections and gear constructed of steel.
   - Plate link chains; Pitched chains; Rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks or weighing machines; Hooks and swivels having ball bearings or other case-hardened parts; Bordeaux connections and gear constructed of steel.
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   - Plate link chains; Pitched chains; Rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks or weighing machines; Hooks and swivels having ball bearings or other case-hardened parts; Bordeaux connections and gear constructed of steel.
   - Plate link chains; Pitched chains; Rings, hooks, shackles and swivels permanently attached to pitched chains, pulley blocks or weighing machines; Hooks and swivels having ball bearings or other case-hardened parts; Bordeaux connections and gear constructed of steel.

8. The Register must be produced on demand by any person authorized for the purpose by the U.S. Department of Labor in accordance with Sec. 1918.12(a) of the Safety and Health Regulations for Longshoring (CFR 29 - Part 1918). The Register should be preserved for at least 5 years after the date of the last entry. Note: “Competent person” is defined on each certificate. On the reverse side of the certificates will be found the particulars of tests pertaining to each.

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

This Register of Lifting Appliances is issued in connection with Chapter 3, “Guide for Certification of Cargo Gear on Merchant Vessels” and Chapter 2, “Guide for Certification of Cranes” of the American Bureau of Shipping publication Guide for Certification of Lifting Appliances. On page four, the certification requirements or standards used in the design of the crane or cargo gear are to be entered. Also, where special materials are used in construction, the chemical composition, physical properties and any other pertinent information are to be entered. The Register is divided into four parts for the purpose of recording or containing the following:

PART I - In this Part the Surveyors are to fill in the required information with respect to the Original and Retesting proof tests and examination of the cargo gear and cranes. Entries covering tests associated with repairs as noted in Chapter 3, Section 8 and Chapter 2, Section 8 of the Guide for Certification of Lifting Appliances should also be noted in this Part.

PART II - In this Part the Surveyors are to fill in the required information with respect to the Annual Inspection of the cargo gear and cranes.

PART III - A record shall be kept in this Part of the Register covering the Annealing of Wrought Iron Gear as required by Chapter 3, Section 11 of the Guide for Certification of Lifting Appliances.

PART IV - In this Part, there shall be inserted the various certificates of tests and inspections; force diagrams, cargo gear or crane arrangement and marking data, and replacement certificates.
I. CERTIFICATION IS BASED ON THE FOLLOWING REQUIREMENTS (Standards).

II. NOTES OF SPECIAL MATERIALS FOR THE PRINCIPAL STRUCTURAL PARTS WITH ANY SPECIAL INFORMATION REGARDING WELDING PROCEDURES

1. Cargo Gear, Masts, Kingposts or other Supporting Structures:

2. Crane A-Frame, Mast or Gantry, Swing Circle Assembly Bolts, Crane Pedestal or Tub Structure:

3. Cargo Gear, Booms, End Fittings, Pins and Gooseneck:

4. Crane Boom Chords, Lacing Members, End Connections and Pins:

Other Components:

Note: Special materials noted above should be verified by reference to detail drawings prior to undertaking repairs or ordering replacement materials.
PART I

PERIODICAL SURVEYS

ORIGINAL AND RETESTING PROOF TESTS AND EXAMINATIONS,
AND TESTS ASSOCIATED WITH REPAIRS

THIS IS TO CERTIFY that the lifting appliances listed below have been surveyed and found in a satisfactory condition unless otherwise noted under Remarks. (If all of the lifting appliances are inspected at one time, it will suffice to so indicate below; however, if this is not the case, each article or unit inspected should be listed.)

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<th>DATE OF SURVEY</th>
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<th>SIGNATURE OF SURVEYOR</th>
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### Part I (continued)  
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PART II
PERIODICAL SURVEYS
ANNUAL INSPECTIONS

THIS IS TO CERTIFY that the lifting appliances listed below have been inspected and found in a satisfactory condition. (If all of the lifting appliances on the vessel or offshore structure are inspected at one time, it will suffice to so indicate; otherwise, each article or assembled unit inspected should be listed below.)

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<table>
<thead>
<tr>
<th>DESCRIPTION AND LOCATION OF LIFTING APPLIANCES</th>
<th>DATE OF SURVEY</th>
<th>NO. OF VALID RETEST CERTIFICATE</th>
<th>SIGNATURE OF SURVEYOR</th>
<th>REMARKS</th>
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</table>
Offshore Structure or Vessel’s Name

**Part II (continued)**

**Annual Inspections**

<table>
<thead>
<tr>
<th>DESCRIPTION AND LOCATION OF LIFTING APPLIANCES</th>
<th>DATE OF SURVEY</th>
<th>NO. OF VALID RETEST CERTIFICATE</th>
<th>SIGNATURE OF SURVEYOR</th>
<th>REMARKS</th>
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<table>
<thead>
<tr>
<th>DESCRIPTION AND LOCATION OF LIFTING APPLIANCES</th>
<th>DATE OF SURVEY</th>
<th>NO. OF VALID RETEST CERTIFICATE</th>
<th>SIGNATURE OF SURVEYOR</th>
<th>REMARKS</th>
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CHG-1
Offshore Structure or Vessel’s Name _____________________________________________

**PART III**

**RECORD OF ANNEALING OF WROUGHT IRON GEAR**

<table>
<thead>
<tr>
<th>DESCRIPTION OF GEAR ANNEALED</th>
<th>NO. OF CERTIFICATE</th>
<th>DATE OF ANNEALING</th>
<th>SIGNATURE OF SURVEYOR</th>
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<tr>
<td>DESCRIPTION OF GEAR ANNEALED</td>
<td>NO. OF CERTIFICATE</td>
<td>DATE OF ANNEALING</td>
<td>SIGNATURE OF SURVEYOR</td>
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</table>
PART IV

CERTIFICATES of tests, examinations and inspections as follows, are to be attached behind this sheet:

a. Certificate of Test of Loose Gear.

b. Certificate of Test of Wire Rope.


d. Certificate of Proof Test to Gear as a Unit.
   1) For Original Test.
   2) For Retesting Surveys.*
   3) In association with repairs.

e. Certificate of Annual Inspections.

f. Force diagrams, gear arrangement and marking data, and replacement gear certificates.

g. Crane capacity rating chart (see 2-2/5.19 and 2-2/9.9 of the ABS Guide for Certification of Lifting Appliances).

Note: The name of the offshore structure or vessel should be noted at the top of each certificate issued.

* Attention is called to the Owner that certain Administrations require the Retesting Survey at four year intervals, and ABS is prepared to do such testing and note it in the Register of Lifting Appliances.
CERTIFICATE OF TEST AND EXAMINATION OF WINCHES, DERRICKS AND ACCESSORY GEAR:
BEFORE BEING TAKEN INTO USE, OR RETESTING SURVEYS OR TESTS ASSOCIATED WITH REPAIRS

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 and 29 CFR 1918.11.

<table>
<thead>
<tr>
<th>(1) Situation and description of machinery and gear with distinguishing number or mark (if any)</th>
<th>(2) Angle to the horizontal of derrick boom while the load was applied (degrees)</th>
<th>(3) Proof load applied (tons)</th>
<th>(4) Safe working load at design angle* (tons)</th>
</tr>
</thead>
</table>

(Delete as applicable)

- All Annual Survey requirements were dealt with in the course of the Retesting Survey.
- The above testing was carried out after repairs to the Cargo Gear listed on the certificate.
- Cargo gear was examined in accordance with the current Chapter 3, "Guide for Certification of Cargo Gear on Merchant Vessels" of the ABS Guide for Certification of Lifting Appliances. A post test examination was made of Gooseneck assemblies and loose gear and all considered satisfactory.
- Cargo gear was examined in accordance with the current Chapter 3, "Guide for Certification of Cargo Gear on Merchant Vessels" of the ABS Guide for Certification of Lifting Appliances. A post test examination was made of loose gear and considered satisfactory.

5. Name and address of association witnessing the test and making the examination: American Bureau of Shipping
   Houston, Texas, U.S.A.


I certify that on the ___ day of January, the above machinery, together with accessory gear, was tested by a competent person in a manner set forth on the reverse side of this certificate; that a careful examination of the said machinery and gear by a competent person after the test showed that it had withstood the proof load without injury or permanent deformation; and that the safe working load of the said machinery and gear is as shown in Column 4.

(Date) - Surveyor

* NOTE: When the test angle is less than the lowest angle approved in association with the design, the design angle will be stated here.

CHG-2 In substantial agreement with I.L.O. Form No. 2
INSTRUCTIONS

Every winch with the gear accessory thereto (including derricks, goosenecks, eye plates, eyebolts, or other attachments) shall be tested with a proof load that shall exceed the safe working load as follows:

<table>
<thead>
<tr>
<th>Safe Working Load</th>
<th>Proof Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20 tons</td>
<td>25 percent in excess.</td>
</tr>
<tr>
<td>20 - 50 tons</td>
<td>5 tons in excess.</td>
</tr>
<tr>
<td>Over 50 tons</td>
<td>10 percent in excess.</td>
</tr>
</tbody>
</table>

The proof load shall be lifted with the ship’s normal tackle with the derrick at an angle which should not be more than 15 degrees to the horizontal, or when this is impracticable, at the lowest practicable angle. The angle at which the test was made should be stated in the certificate of test. After the proof load has been lifted, it should be swung as far as possible in both directions.

As a general rule, all tests should be carried out in this way by dead load, and no exceptions should be allowed in the case of gear on new ships. In the case of replacements or renewals, however, spring or hydraulic balances may be used where dead loads are not available. Where a spring or hydraulic balance is used it shall be accurate and the test should not be regarded as satisfactory unless the indicator remains constant for a period of at least five minutes. After being tested as aforesaid, all lifting machinery, with the whole of the gear accessory thereto shall be examined to see whether any part has been injured or permanently deformed by the test.

The safe working load shown in Column 4 is applicable only to a swinging derrick. When using fixed derricks, such as “union purchase” rigs, the safe working load should as a general rule be reduced; in any case, it should be determined with due regard to the actual conditions of use.

In the case of heavy derricks, care should be taken that the appropriate shrouds and stays are rigged.

NOTE: The expression “ton” normally means a British Long Ton of 2240 lbs, which is equal to 1.01605 metric ton. If metric tons or pounds are used, this should be noted in Column 3 on page one (1). (1 pound = 0.4536 kg).

For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or other recognized certificating agency.

CERTIFICATE OF TEST AND EXAMINATION OF CRANES OR HOISTS AND THEIR ACCESSORY GEAR:
BEFORE BEING TAKEN INTO USE, OR RETESTING SURVEYS OR TESTS ASSOCIATED WITH REPAIRS

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91, Subchapter I-A and 29 CFR 1918.11.

<table>
<thead>
<tr>
<th>Name of ship on which machinery is fitted</th>
<th>Class Number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>(1) Situation and description of the lifting appliance with distinguishing number or mark (if any)</th>
<th>(2) For jib cranes radius at which the proof load was applied</th>
<th>(3) Proof load applied (tons)</th>
<th>(4) Safe working load (for jib cranes at radius shown in Column 2) (tons)</th>
</tr>
</thead>
</table>

5. **Name and address of association witnessing the test and making the examination:**
American Bureau of Shipping
Houston, Texas, U.S.A.

6. **Position of signatory in association:** Surveyor to American Bureau of Shipping.

I certify that on the [day of January], the above lifting appliance(s), together with accessory gear, was tested by a competent person in a manner set forth on the reverse side of this certificate; that a careful examination of the said machinery and gear by a competent person after the test showed that it had withstood the proof load without injury or permanent deformation; and that the safe working load of the said machinery and gear is as shown in Column 4.

(Date) ________________________________ - Surveyor

CHG-3

In substantial agreement with I.L.O. Form No. 2
INSTRUCTIONS

Every crane and other hoisting machine, with accessory gear, shall be tested with a proof load which shall exceed the safe working load or rated load as follows:

<table>
<thead>
<tr>
<th>Safe Working Load</th>
<th>Proof Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 20 tons</td>
<td>25 percent in excess.</td>
</tr>
<tr>
<td>20 - 50 tons</td>
<td>5 tons in excess.</td>
</tr>
<tr>
<td>Over 50 tons</td>
<td>10 percent in excess.</td>
</tr>
</tbody>
</table>

The proof load shall be lifted and swung as far as possible in both directions. If the jib of the crane has a variable radius, it should be tested with a proof load, as defined above, at the maximum, minimum and intermediate radii of the jib. For testing subsequent to the original test, in the case of hydraulic cranes where, owing to the limitation of pressure, it is impossible to lift the proof load, it will be sufficient to lift the greatest possible load.

After being tested, each crane or hoist, with the whole of the gear accessory thereto, shall be examined to see whether any part has been damaged or permanently deformed by the tests.

NOTE: The expression “ton” normally means a British Long Ton of 2240 lbs, which is equal to 1.01605 metric ton. If metric tons or pounds are used, this should be noted in Column 3 on page one (1). (1 pound = 0.4536 kg).

For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or other recognized certificating agency.
## CERTIFICATE OF TEST AND EXAMINATION OF CHAINS, RINGS, HOOKS, SHACKLES, SWIVELS AND PULLEY BLOCKS

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 or Subchapter I-A and 29 CFR 1918.11

<table>
<thead>
<tr>
<th>(1) Distinguishing number or mark (if any)</th>
<th>(2) Description of gear*</th>
<th>(3) Number tested</th>
<th>(4) Date of test</th>
<th>(5) Proof load applied (tons)</th>
<th>(6) Safe working load (tons)</th>
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</table>

* The dimension of the gear, the type of material of which it is made (indicating the carbon content of the gear made of steel) and, where applicable, the heat treatment received in manufacture should be stated (unless Form CHG-6 is used for the purpose).

(7) Name and address of maker or supplier

(8) Name and address of public service, association, company or firm making the test and examination

(9) Position of signatory in public service, association, company or firm

I certify that on the _____ day of _____, _____, the above gear, was tested and examined by a competent person in the manner set forth on the reverse side of this certificate; that the examination showed that said gear withstood the proof load without injury or deformation; and that the safe working load of the said gear is as shown in Column 6.

(Signature)

(Date)

NOTE: For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or a responsible and technically qualified employee of the manufacturer of the gear certificated or of a recognized testing laboratory or company.
INSTRUCTIONS

Chains, rings, shackles and other loose gear (whether accessory to a machine or not) shall be tested with a proof load equal to that shown against the article in the following table:

<table>
<thead>
<tr>
<th>Article of gear</th>
<th>Proof load</th>
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<tbody>
<tr>
<td>Chain, ring, hook or swivel</td>
<td>100 percent in excess of the safe working load.</td>
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<tr>
<td>Pulley blocks:</td>
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<tr>
<td>Single-sheave block</td>
<td>300 percent in excess of the safe load.</td>
</tr>
<tr>
<td>Multiple-sheave block with safe working load up to and including 20 tons</td>
<td>100 percent in excess of the safe working load.</td>
</tr>
<tr>
<td>Multiple-sheave block with safe working load over 20 tons up to and including 40 tons</td>
<td>20 tons in excess of the safe working load.</td>
</tr>
<tr>
<td>Multiple-sheave block with safe working load over 40 tons</td>
<td>50 percent in excess of the safe working load.</td>
</tr>
<tr>
<td>Pitched chains used with hand-operated pulley blocks and rings, hooks, shackles, or swivels permanently attached thereto</td>
<td>50 percent in excess of the safe working load.</td>
</tr>
<tr>
<td>Hand-operated pulley blocks used with pitched chains and rings, hooks, shackles or swivels permanently attached thereto</td>
<td>50 percent in excess of the safe working load.</td>
</tr>
</tbody>
</table>

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

NOTE: The expression “ton” normally means a British Long Ton of 2240 lbs, which is equal to 1.01605 metric ton. If metric tons or pounds are used, this should be noted in Column 5 on page one (1). (1 pound = 0.4536 kg)...
CERTIFICATE OF EXAMINATION AND TEST OF WIRE ROPE BEFORE BEING TAKEN INTO USE

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91, Subchapter I-A and 29 CFR 1918.11.

Name and address of maker or supplier of rope

Circumference / diameter* of rope

Length of wire

Number of strands

Number of wires per strand

Lay and core type

Quality / material / grade of wire

Date of test of sample of rope

Load at which sample broke

Safe working load, subject to any stated qualifying conditions such as minimum pulley diameter; direct tensile load, etc.

Name and address of public service, association, company or firm making the examination and test

Position of signatory in public service, association, company or firm making the examination and test

I certify that the above particulars are correct, and that the examination and test was carried out by a competent person.

(Signature)

(Date)

NOTE: For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or a responsible and technically qualified employee of the manufacturer of wire rope or of a recognized testing laboratory or company.

* Delete what does not apply.

CHG-5 In substantial agreement with I.L.O. Form No. 4
INSTRUCTIONS

A sample of the wire rope is to be tested to destruction. Refer to the appropriate sections of Chapter 3, “Guide for Certification of Cargo Gear on Merchant Vessels” and Chapter 2, “Guide for Certification of Cranes” of the ABS Guide for Certification of Lifting Appliances, for wire rope safety factors.

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of ABS, its committees, its clients or other authorized entities. This Certificate is a representation only that the structure, item of material, equipment, machinery or any other item covered by this Certificate has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping who shall remain the sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.
Certificate No. ________________________________

CERTIFICATE OF HEAT TREATMENT OF CHAINS, RINGS, HOOKS, SHACKLES AND SWIVELS
WHICH REQUIRE SUCH TREATMENT

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91, Subchapter I-A and 29 CFR 1918.11.

<table>
<thead>
<tr>
<th>(1) Distinguishing number or mark</th>
<th>(2) Description of gear*</th>
<th>(3) Number of certificate of test and examination</th>
<th>(4) Number heat-treated</th>
<th>(5) Date of heat treatment</th>
<th>(6) Nature of heat treatment given</th>
<th>(7) Defects found at inspection after heat treatment</th>
</tr>
</thead>
</table>

* 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) Name and address of public service, association, company or firm carrying out the heat treatment and inspection

__________________________________________________________________________________________________

(9) Position of signatory in public service, association, company or firm ______________________________________

__________________________________________________________________________________________________

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.

(Date) ____________________________ (Signature) ____________________________

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.

For requirements as to heat treatment, see reverse side.

CHG-6 In substantial agreement with I.L.O. Form No. 6
INSTRUCTIONS

ANNEALING

Chains (other than bridle chains attached to derricks or masts), rings, hooks, shackles and swivels made of wrought iron, used in hoisting or lowering, shall be annealed at the following intervals:

<table>
<thead>
<tr>
<th>Item Description</th>
<th>If used on lifting machinery driven by power</th>
<th>If used solely on lifting machinery worked by hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Half-inch (12.5 mm) and smaller chains, rings, hooks, shackles and swivels in general use</td>
<td>6 months</td>
<td>12 months</td>
</tr>
<tr>
<td>All other chains, rings, hooks, shackles and swivels in general use</td>
<td>12 months</td>
<td>2 years</td>
</tr>
</tbody>
</table>

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 1100° and 1200°F for a period between thirty and sixty minutes. After being annealed, the article should be allowed to cool slowly.

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of ABS, its committees, its clients or other authorized entities. This Certificate is a representation only that the structure, item of material, equipment, machinery or any other item covered by this Certificate has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping who shall remain the sole judge thereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.
Certificate No. ________________________________

CERTIFICATE OF ANNUAL THOROUGH EXAMINATION OF GEAR THAT DOES NOT REQUIRE TO BE PERIODICALLY HEAT-TREATED, AND FOR ANNUAL INSPECTION OF CARGO GEAR OR CRANES.

This Certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91, Subchapter I-A and 29 CFR 1918.11.

Name of unit or vessel on which lifting appliance is fitted

<table>
<thead>
<tr>
<th>(1) Distinguishing number, marks or location</th>
<th>(2) Description of gear*</th>
<th>(3) Number &amp; Date of Certificate of Test and Examination</th>
<th>(4) Condition found and Repairs effected</th>
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(Delete as appropriate)
- Cargo gear was examined in accordance with the current Chapter 3, "Guide for Certification of Cargo Gear on Merchant Vessels" of the ABS Guide for Certification of Lifting Appliances.
- Crane(s) was/were examined in accordance with the current Chapter 2, "Guide for Certification of Cranes" of the ABS Guide for Certification of Lifting Appliances.
- Crane(s) was/were examined in accordance with the current Chapter 2, "Guide for Certification of Cranes" of the ABS Guide for Certification of Lifting Appliances and in accordance with the American Petroleum Institute (API) "Recommended Practice for operation and Maintenance of Offshore Cranes" API RP 2D First Edition (October 1972).

* In regard to gear not required to be periodically heat treated, the dimensions of the gear, the type of material of which it is made, and the heat treatment received in manufacture should be stated.

5. Name and address of association making the examination: American Bureau of Shipping.

Port of Survey ________________________________


I certify that on the ______ day of ______, the above lifting appliance(s) was/were thoroughly examined by a competent person and that no defects affecting its/their safe working condition were found other than those indicated and corrected as noted in Column 4.

(Date) ________________________________ - Surveyor

NOTE: For list of gear not required to be treated and definition of thorough examination, see reverse side.

For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or other recognized certificating agency.

CHG-7 In substantial agreement with I.L.O. Part II
INSTRUCTIONS

Gear not required to be heat treated, but required to be thoroughly examined by a competent person once at least in every twelve months:

- Plate-link chains.
- Pitched chains.
- Rings, hooks, shackles, and swivels permanently attached to pitched chains, pulley blocks or weighing machines.
- Hooks and swivels having ball bearings or other case-hardened parts.
- Bordeaux connections.
- Gear constructed of steel.

NOTE: “Thorough examination” refers to a visual examination, supplemented (if necessary) by other means, such as a hammer test, carried out as carefully as conditions permit in order to arrive at a reliable conclusion as to the safety of the parts examined; if necessary for the purposes, parts of the machines or gear must be dismantled.

Example Load Diagrams

**FORM "C" LOAD DIAGRAM**

- Indicates rope size and construction.
- Frame number.
- Hook load.

**FORM "D" LOAD DIAGRAM**

- Indicates rope size and construction.
- Frame number.
- Hook load.

*Note:* The S.W.L. to be marked on the blocks should be indicated on this diagram.

*Note:* The S.W.L. to be marked on the blocks should be indicated on this diagram.

*Note:* This form for guidance only and may be modified for adaptation to requirements of a particular design.
Appendix  Samples of ABS Register of Lifting Appliances and Register of Cargo Gear
Section 1  American Bureau of Shipping Register of Lifting Appliances

FORM "E"
LOAD DIAGRAM

D.B.  S.W.L.

S.B.  S.W.L.

R

R

R

D.B.  S.W.L.

S.B.  S.W.L.

S.B.  S.W.L.

D.B.  S.W.L.

Lw

Lw

R

R

HOOK LOAD

NOTE: THE S.W.L. TO BE MARKED ON THE BLOCKS SHOULD BE INDICATED ON THIS DIAGRAM

FRAME NO.

FORM E - 1273

THIS FORM FOR GUIDANCE ONLY AND MAY BE MODIFIED FOR ADAPTATION TO REQUIREMENTS OF A PARTICULAR DESIGN
INDICATE ROPE SIZE AND CONSTRUCTION

NOTE: THE S.W.L. TO BE MARKED ON THE BLOCKS SHOULD BE INDICATED ON THIS DIAGRAM

FORM "F" LOAD DIAGRAM

FORM F - 12/73

THIS FORM FOR GUIDANCE ONLY AND MAY BE MODIFIED FOR ADAPTATION TO REQUIREMENTS OF A PARTICULAR DESIGN
Appendix Samples of ABS Register of Lifting Appliances and Register of Cargo Gear

Section 1 American Bureau of Shipping Register of Lifting Appliances

Form "G" LOAD DIAGRAM

SEE CERTIFICATE NO. (No. of Form CHG-3 A Certificate to be entered at time of unit tests) FOR THE APPROVED CONDITIONS FROM THE ATTACHED LOAD CHART WHICH HAVE BEEN SURVEYED AND TESTED AS A UNIT AFTER INSTALLATION ON BOARD THE (crane manufacturer to enter name of vessel).

THE ATTACHED LOAD CHART INDICATES THE APPROVED HOOK SAFE WORKING LOADS AND THE APPROVED RIGGING ARRANGEMENTS WHICH MAY BE CERTIFICATED UNDER THE REQUIREMENT OF THE AMERICAN BUREAU OF SHIPPING.

WHERE SHEAVES ARE BUILT INTO THE STRUCTURE THEY SHALL BE TREATED AS STRUCTURAL PARTS AND NEED NOT BE TESTED AND CERTIFICATED AS LOOSE GEAR.

THE S.W.L. TO BE MARKED ON THE BLOCKS SHOULD BE INDICATED ON THIS DIAGRAM.

FORM "H" - 1/77

FRAME NO.

S.W.L. = SAFE WORKING LOAD
S.B. = SINGLE BLOCK
D.B. = DOUBLE BLOCK
T.B. = TRIPLE BLOCK
R = RESULTANT BLOCK
Lw = LINE PULL TO THE WINCH

THIS FORM FOR GUIDANCE ONLY AND MAY BE MODIFIED FOR ADAPTATION TO REQUIREMENTS OF A PARTICULAR DESIGN.
Form "H" LOAD DIAGRAM

SEE CERTIFICATE NO. (No. of Form CHG-3 A Certificate to be entered at time of unit tests) FOR THE APPROVED CONDITIONS FROM THE ATTACHED LOAD CHART WHICH HAVE BEEN SURVEYED AND TESTED AS A UNIT AFTER INSTALLATION ON BOARD THE [crane manufacturer to enter name of vessel].

THREE SHEAVES
SINGLE SHEAVE

INDICATE ROPE SIZE AND CONSTRUCTION

T.B. S.W.L.
R

D.B. S.W.L.
R

HOOK LOAD

TWO SHEAVES
SINGLE SHEAVE

HOOK LOAD

Lw
(R)

R

Lw

(1) THE ATTACHED LOAD CHART INDICATES THE APPROVED HOOK SAFE WORKING LOADS AND THE APPROVED RIGGING ARRANGEMENTS WHICH MAY BE CERTIFICATED UNDER THE REQUIREMENT OF THE AMERICAN BUREAU OF SHIPPING.

(2) WHERE SHEAVES ARE BUILT INTO THE STRUCTURE THEY SHALL BE TREATED AS STRUCTURAL PARTS AND NEED NOT BE TESTED AND CERTIFICATED AS LOOSE GEAR.

(3) THE S.W.L. TO BE MARKED ON THE BLOCKS SHOULD BE INDICATED ON THIS DIAGRAM.

(4) S.W.L. = SAFE WORKING LOAD
S.B. = SINGLE BLOCK
D.B. = DOUBLE BLOCK
T.B. = TRIPLE BLOCK
R = RESULTANT BLOCK
Lw = LINE PULL TO THE WINCH

FRAME NO.

(FORM "H" - 1/77)

THIS FORM FOR GUIDANCE ONLY AND MAY BE MODIFIED FOR ADAPTATION TO REQUIREMENTS OF A PARTICULAR DESIGN
Form "J" LOAD DIAGRAM

**See Certificate No. (No. of Form CHG-3 A Certificate to be entered at time of unit test) for the approved conditions from the attached load chart which have been surveyed and tested as a unit after installation on board the (crane manufacturer to enter name of vessel).**

(1) The attached load chart indicates the approved hook safe working loads and the approved rigging arrangements which may be certificated under the requirement of the American Bureau of Shipping.

(2) Where sheaves are built into the structure they shall be treated as structural parts and need not be tested and certificated as loose gear.

(3) The S.W.L. to be marked on the blocks should be indicated on this diagram.

(4) S.W.L. = Safe Working Load
S.B. = Single Block
D.B. = Double Block
T.B. = Triple Block
R = Resultant Block
Lw = Line Pull to the Winch

This form for guidance only and may be modified for adaption to requirements of a particular design.
APPENDIX

Samples of ABS Register of Lifting Appliances and Register of Cargo Gear

SECTION 2 American Bureau of Shipping Register of Cargo Gear (for Great Lakes Vessels)

Section 2 of this Appendix applies to the latest edition of the “Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels” (Chapter 4 of the ABS Guide for Certification of Lifting Appliances).
REGISTER OF CARGO GEAR

NUMBER OF REGISTER BOOK  

DATE OF ISSUE  

PORT OF ISSUE  

NAME OF VESSEL  

PORT OF REGISTRY  

IMO/OFFICIAL NUMBER  

OWNER  

ADDRESS  

This Register when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 and 29 CFR 1918.11.

CHG-1 GL
REGISTER OF CARGO GEAR
ON
SELF-UNLOADING GREAT LAKES VESSELS

INSTRUCTIONS

1. This Register of Cargo is issued in connection with Chapter 4, “Guide for Certification of Self-Unloading Cargo Gear on Great Lakes Vessels” of the ABS Guide for Certification of Lifting Appliances and is to be kept available for inspection of proper authority and endorsement by the Surveyor at the time of inspections.

2. The Register is divided into three parts for the purpose of recording the following information:

   - **PART I** - The Surveyors are to fill in the required information with respect to the original load tests and examination of the vessel’s cargo gear in accordance with 4-5/7, “Initial Test to the Gear as a Unit” and with respect to Annual and Special Inspections of the cargo gear on the vessel in accordance with 4-6/1.1 and 4-6/1.2.

   - **PART II** - A record shall be kept in this section of the monthly inspection of the cargo gear made by the vessel’s personnel as required by 4-6/3.

   - **PART III** - In this part, there shall be inserted the following certificates of tests, examinations and inspections:
     
     a. Certificate of Test of Loose Gear. Form CHG-4-GL

     b. Certificate of Test of Wire Rope. Form CHG-5-GL

     c. Certificate of Initial Test and Examination, or Tests Associated with Repairs. Form CHG-3-GL

     d. Certificate of Annual Examinations and Special Inspections. Form CHG-7-GL

   On the reverse side of the above mentioned certificates will be found the particulars of tests pertaining to each.
NOTES ON SPECIAL MATERIALS FOR THE PRINCIPAL STRUCTURAL PARTS

Masts, “A”-Frames or Supporting Structures: -

Booms: -

Other Structural Parts: -

CHG-1 GL
Vessel’s Name

PART I

INITIAL TEST AND SUBSEQUENT ANNUAL AND SPECIAL
INSPECTION CERTIFICATES

THIS IS TO CERTIFY that the gear listed below has been surveyed and found in satisfactory condition unless otherwise noted under Remarks. (If all of the gear is surveyed at the same time, it will suffice to so indicate below; however, if this is not the case, each article or unit inspected should be listed.)

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<th>DESCRIPTION AND LOCATION OF GEAR</th>
<th>DATE OF SURVEY</th>
<th>NO. OF CERTIFICATE</th>
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<th>REMARKS</th>
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CHG-1 GL
Vessel's Name

## PART II

**RECORD OF MONTHLY INSPECTION BY VESSEL’S PERSONNEL**

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**PART II**

**RECORD OF MONTHLY INSPECTION BY VESSEL'S PERSONNEL**

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</tbody>
</table>

SAMPLE ONLY
NOT TO BE USED
PART III

CERTIFICATES of tests, examinations and inspections are to be inserted behind this sheet.

CHG-1 GL
Test Certificate No. __________________________

CERTIFICATE OF INITIAL TEST AND EXAMINATION OF SELF-UNLOADING CARGO GEAR ON GREAT LAKES VESSELS, AND TESTS ASSOCIATED WITH REPAIRS AND RETESTING SURVEY

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91.

Name of ship on which cargo gear is fitted __________________________ Class Number ______

<table>
<thead>
<tr>
<th>Description and Location of Cargo Gear</th>
<th>Angle to the horizontal of the boom at which the proof load was applied</th>
<th>Test load applied</th>
<th>Safe working load (S.W.L.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
</tbody>
</table>

5. Issuance for completion of Special Inspection: YES ______ NO ______

6. Issuance in association with repairs only: YES ______ NO ______

NOTE:
(a) Downgrading S.W.L. in association with repair load test will require subsequent load testing of 125% prior to restoration of design S.W.L.
(b) Wash box fitted: YES ______ NO ______ S.W.L. assumes wash box empty.

7. For commencement of Special Inspection of Cargo Gear see Report No. __________________________ dated __________

REMARKS

This Certificate valid until: __________________________

8. Name and address of association witnessing the test and making the examination: American Bureau of Shipping Houston, Texas, U.S.A.

Port of Survey __________________________


I certify that on the ______ day of January ______, the above cargo gear was tested by a competent person in a manner set forth on the reverse side of this certificate; that a careful examination of the said machinery and gear by a competent person after the test showed that it had withstood the test load without damage or deformation; and that the safe working load of said machinery and gear is as shown in Column 4.

(Date) __________________________ - Surveyor

CHG-3 GL In substantial agreement with I.L.O. Form No. 2
INSTRUCTIONS

After installation or major repair and when the cargo gear is placed in service it shall be initially tested to a load equal to 125% of the working load of the assembled gear, for subsequent Special Inspections and for minor repairs it shall be tested to a load equal to 110% of the working load of the assembled gear. A general, careful examination of all accessible parts of the assembled gear is to be carried out after the load test. Where damaged or deformed condition is noted, parts are to be further examined to determine the condition of the affected parts.

NOTE: The expression “ton” means a ton of 2240 lbs unless stated otherwise. Load is to be recorded in pounds per running foot of conveyor an also in total tons.

For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or other recognized certificating agency.

For additional requirements of the American Bureau of Shipping see 4-5/7, 4-6/1 and 4-6/5 of Chapter 4, “Guide for Certification of Self-unloading Cargo Gear on Great Lakes Vessels” of the ABS Guide for Certification of Lifting Appliances.”
CERTIFICATE OF TEST AND EXAMINATION OF CHAINS, RINGS, HOOKS, SHACKLES, SWIVELS AND PULLEY BLOCKS

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 or Subchapter I-A and 29 CFR 1918.11.

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distinguishing number or mark (if any)</td>
<td>Description of gear*</td>
<td>Number tested</td>
<td>Date of test</td>
<td>Test load applied (tons)</td>
<td>Safe working load (tons)</td>
</tr>
</tbody>
</table>

* The dimension of the gear, the type of material of which it is made (indicating the carbon content of the gear made of steel) and, where applicable, the heat treatment received in manufacture should be stated.

(7) Name and address of maker or supplier

(8) Name and address of public service, association, company or firm making the test and examination

(9) Position of signatory in public service, association, company or firm

I certify that on the __________ day of __________________________, the above gear was tested and examined by a competent person in the manner set forth on the reverse side of this certificate; that the examination showed that the said gear withstood the test load without injury or deformation; and that the safe working load of the said gear is as shown in Column 6.

(Signature) ____________________________________________

(Date) ________________________________________________

NOTE: For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or a responsible and technically qualified employee of the manufacturer of the gear certificated or of a recognized testing laboratory or company.

CHG-4 GL In substantial agreement with I.L.O. Form No. 3
INSTRUCTIONS

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

<table>
<thead>
<tr>
<th>Article of Gear</th>
<th>Proof Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain, ring, hook, link shackle or swivel</td>
<td>100% in excess of the safe working load.</td>
</tr>
<tr>
<td>Pulley blocks:</td>
<td></td>
</tr>
<tr>
<td>Single-sheave block</td>
<td>300% in excess of the safe working load.</td>
</tr>
<tr>
<td>(See Note)</td>
<td></td>
</tr>
<tr>
<td>Multiple sheave block with safe working load up to</td>
<td>100% in excess of the safe working load.</td>
</tr>
<tr>
<td>and including 20 tons</td>
<td></td>
</tr>
<tr>
<td>Multiple sheave block with safe working load over 2</td>
<td>20 tons in excess of the safe working load.</td>
</tr>
<tr>
<td>tons up to and including 40 tons</td>
<td></td>
</tr>
<tr>
<td>Multiple sheave blocks with safe working load over</td>
<td>50% in excess of the safe working load.</td>
</tr>
<tr>
<td>40 tons</td>
<td></td>
</tr>
</tbody>
</table>

Note: The safe working load of 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 safe working load of the block as defined in this note.

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

Note: The expression "ton" normally means a ton of 2240 lbs, unless stated otherwise.

Refer to the appropriate sections of Chapter 4, "Guide for Certification of Self-Unloading Cargo Gear on Great Lakes Vessels" of the ABS Guide for Certification of Lifting Appliances.
### CERTIFICATE OF EXAMINATION AND TEST OF WIRE ROPE BEFORE BEING TAKEN INTO USE

This certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91 or Subchapter I-A and 29 CFR 1918.11.

<table>
<thead>
<tr>
<th>Name and address of maker or supplier of rope</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Circumference / diameter* of rope</td>
<td></td>
</tr>
<tr>
<td>Length of wire</td>
<td></td>
</tr>
<tr>
<td>Number of strands</td>
<td></td>
</tr>
<tr>
<td>Number of wires per strand</td>
<td></td>
</tr>
<tr>
<td>Lay and core type</td>
<td></td>
</tr>
<tr>
<td>Quality / material / grade of wire</td>
<td></td>
</tr>
<tr>
<td>Date of test of sample of rope</td>
<td></td>
</tr>
<tr>
<td>Load at which sample broke</td>
<td></td>
</tr>
<tr>
<td>Safe working load, subject to any stated qualifying conditions such as minimum pulley diameter; direct tensile load, etc.</td>
<td></td>
</tr>
<tr>
<td>Name and address of public service, association, company or firm making the examination and test</td>
<td></td>
</tr>
<tr>
<td>Position of signatory in public service, association, company or firm making the examination and test</td>
<td></td>
</tr>
</tbody>
</table>

I certify that the above particulars are correct, and that the examination and test was carried out by a competent person.

(Signature)  
(Date)  

NOTE: For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or a responsible and technically qualified employee of the manufacturer of wire rope or of a recognized testing laboratory or company.

* Delete what does not apply.

CHG-5 GL  
In substantial agreement with I.L.O. Form No. 4
INSTRUCTIONS

A sample of the wire rope is to be tested to destruction. Refer to the appropriate sections of Chapter 4, "Guide for Certification of Self-Unloading Cargo Gear on Great Lakes Vessels" of the ABS Guide for Certification of Lifting Appliances.
Certificate No. ________________________________

**CERTIFICATE OF ANNUAL THOROUGH EXAMINATION OF CARGO GEAR ON SELF-UNLOADING GREAT LAKES VESSELS.**

This Certificate when properly executed by a competent person is accepted by the Government of the United States of America as being in accordance with the requirements of 46 CFR Part 91.

Name of ship on which cargo gear is fitted

<table>
<thead>
<tr>
<th>Description and Location of Gear</th>
<th>Number and date of Certificate of last test and examination (Form CHG 3 G.L.)</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

**REMARKS**

Name and address of association witnessing the test and making the examination: American Bureau of Shipping Houston, Texas, U.S.A.

Port of Survey ________________________________

Position of signatory in association: Surveyor to American Bureau of Shipping.

I certify that the above cargo gear was thoroughly examined by a competent person and that no defects affecting its safe working condition were found other than those indicated and corrected as noted under remarks.

(Date) ________________________________ - Surveyor

**NOTE:** For the purpose of this certificate a competent person is defined as a Surveyor of a Classification Society or other recognized certificating agency.

CHG-7 GL In substantial agreement with I.L.O. Form Part I.
INSTRUCTIONS

The following parts are to be visually examined in place at each Annual Inspection. Dismantling of the gear may be required where damaged or deformed condition is noted.

1. Boom slewing tackle blocks, shackles, padeyes, rings, tables, cable connections, etc.
2. Boom slewing and luffing cables.
3. Boom slewing and luffing winches.
4. Boom structure, “A” frame and other supporting structures to which may be attached such tackle or other device as is employed to luff, swing, or otherwise position the boom.
5. Gear for securing boom in stowed position.
6. Slewing and luffing equipment including safety devices and limit switches.
7. Valves, cocks, pipes, strainers, and cylinders

NOTE: This Certificate evidences compliance with one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of ABS, its committees, its clients or other authorized entities. This Certificate is a representation only that the structure, item of material, equipment, machinery or any other item covered by this Certificate has met one or more of the Rules, guides, standards or other criteria of American Bureau of Shipping. The validity, applicability and interpretation of this Certificate is governed by the Rules and standards of American Bureau of Shipping who shall remain the sole judge hereof. Nothing contained in this Certificate or in any Report issued in contemplation of this Certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied.