



Rules for the Certification of Lifting Appliances onboard Ships and Offshore Units

September 2017

**Rule Note
NR 526 DT R02 E**

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**BUREAU
VERITAS**

MARINE & OFFSHORE - GENERAL CONDITIONS

1. INDEPENDENCY OF THE SOCIETY AND APPLICABLE TERMS

- 1.1. The Society shall remain at all times an independent contractor and neither the Society nor any of its officers, employees, servants, agents or subcontractors shall be or act as an employee, servant or agent of any other party hereto in the performance of the Services.
- 1.2. The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not, in any circumstances, involve monitoring or exhaustive verification.
- 1.3. The Society acts as a services provider. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty. The Society is not and may not be considered as an underwriter, broker in Unit's sale or chartering, expert in Unit's valuation, consulting engineer, controller, naval architect, manufacturer, shipbuilder, repair or conversion yard, charterer or shipowner; none of them above listed being relieved of any of their expressed or implied obligations as a result of the interventions of the Society.
- 1.4. The Services are carried out by the Society according to the applicable Rules and to the Bureau Veritas Code of Ethics. The Society only is qualified to apply and interpret its Rules.
- 1.5. The Client acknowledges the latest versions of the Conditions and of the applicable Rules applying to the Services' performance.
- 1.6. Unless an express written agreement is made between the Parties on the applicable Rules, the applicable Rules shall be the rules applicable at the time of the Services' performance and contract's execution.
- 1.7. The Services' performance is solely based on the Conditions. No other terms shall apply whether express or implied.

2. DEFINITIONS

- 2.1. "Certificate(s)" means class certificates, attestations and reports following the Society's intervention. The Certificates are an appraisal given by the Society to the Client, at a certain date, following surveys by its surveyors on the level of compliance of the Unit to the Society's Rules or to the documents of reference for the Services provided. They cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.
- 2.2. "Certification" means the activity of certification in application of national and international regulations or standards, in particular by delegation from different governments that can result in the issuance of a certificate.
- 2.3. "Classification" means the classification of a Unit that can result or not in the issuance of a class certificate with reference to the Rules.
- 2.4. "Client" means the Party and/or its representative requesting the Services.
- 2.5. "Conditions" means the terms and conditions set out in the present document.
- 2.6. "Industry Practice" means International Maritime and/or Offshore industry practices.
- 2.7. "Intellectual Property" means all patents, rights to inventions, utility models, copyright and related rights, trade marks, logos, service marks, trade dress, business and domain names, rights in trade dress or get-up, rights in goodwill or to sue for passing off, unfair competition rights, rights in designs, rights in computer software, database rights, topography rights, moral rights, rights in confidential information (including know-how and trade secrets), methods and protocols for Services, and any other intellectual property rights, in each case whether capable of registration, registered or unregistered and including all applications for and renewals, reversions or extensions of such rights, and all similar or equivalent rights or forms of protection in any part of the world.
- 2.8. "Parties" means the Society and Client together.
- 2.9. "Party" means the Society or the Client.
- 2.10. "Register" means the register published annually by the Society.
- 2.11. "Rules" means the Society's classification rules, guidance notes and other documents. The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical minimum requirements but are not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and carefully followed at all times by the Client.
- 2.12. "Services" means the services set out in clauses 2.2 and 2.3 but also other services related to Classification and Certification such as, but not limited to: ship and company safety management certification, ship and port security certification, training activities, all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.
- 2.13. "Society" means the classification society 'Bureau Veritas Marine & Offshore SAS', a company organized and existing under the laws of France, registered in Nanterre under the number 821 131 844, or any other legal entity of Bureau Veritas Group as may be specified in the relevant contract, and whose main activities are Classification and Certification of ships or offshore units.
- 2.14. "Unit" means any ship or vessel or offshore unit or structure of any type or part of it or system whether linked to shore, river bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

3. SCOPE AND PERFORMANCE

- 3.1. The Society shall perform the Services according to the applicable national and international standards and Industry Practice and always on the assumption that the Client is aware of such standards and Industry Practice.

3.2. Subject to the Services performance and always by reference to the Rules, the Society shall:

- review the construction arrangements of the Unit as shown on the documents provided by the Client;
- conduct the Unit surveys at the place of the Unit construction;
- class the Unit and enters the Unit's class in the Society's Register;
- survey the Unit periodically in service to note that the requirements for the maintenance of class are met. The Client shall inform the Society without delay of any circumstances which may cause any changes on the conducted surveys or Services.

The Society will not:

- declare the acceptance or commissioning of a Unit, nor its construction in conformity with its design, such activities remaining under the exclusive responsibility of the Unit's owner or builder;
- engage in any work relating to the design, construction, production or repair checks, neither in the operation of the Unit or the Unit's trade, neither in any advisory services, and cannot be held liable on those accounts.

4. RESERVATION CLAUSE

- 4.1. The Client shall always: (i) maintain the Unit in good condition after surveys; (ii) present the Unit after surveys; (iii) present the Unit for surveys; and (iv) inform the Society in due course of any circumstances that may affect the given appraisal of the Unit or cause to modify the scope of the Services.
- 4.2. Certificates referring to the Society's Rules are only valid if issued by the Society.
- 4.3. The Society has entire control over the Certificates issued and may at any time withdraw a Certificate at its entire discretion including, but not limited to, in the following situations: where the Client fails to comply in due time with instructions of the Society or where the Client fails to pay in accordance with clause 6.2 hereunder.

5. ACCESS AND SAFETY

- 5.1. The Client shall give to the Society all access and information necessary for the efficient performance of the requested Services. The Client shall be the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out. Any information, drawings, etc. required for the performance of the Services must be made available in due time.
- 5.2. The Client shall notify the Society of any relevant safety issue and shall take all necessary safety-related measures to ensure a safe work environment for the Society or any of its officers, employees, servants, agents or subcontractors and shall comply with all applicable safety regulations.

6. PAYMENT OF INVOICES

- 6.1. The provision of the Services by the Society, whether complete or not, involve, for the part carried out, the payment of fees thirty (30) days upon issuance of the invoice.
- 6.2. Without prejudice to any other rights hereunder, in case of Client's payment default, the Society shall be entitled to charge, in addition to the amount not properly paid, interests equal to twelve (12) months LIBOR plus two (2) per cent as of due date calculated on the number of days such payment is delinquent. The Society shall also have the right to withhold certificates and other documents and/or to suspend or revoke the validity of certificates.
- 6.3. In case of dispute on the invoice amount, the undisputed portion of the invoice shall be paid and an explanation on the dispute shall accompany payment so that action can be taken to solve the dispute.

7. LIABILITY

- 7.1. The Society bears no liability for consequential loss. For the purpose of this clause consequential loss shall include, without limitation:
 - Indirect or consequential loss;
 - Any loss and/or deferral of production, loss of product, loss of use, loss of bargain, loss of revenue, loss of profit or anticipated profit, loss of business and business interruption, in each case whether direct or indirect.

The Client shall save, indemnify, defend and hold harmless the Society from the Client's own consequential loss regardless of cause.

- 7.2. In any case, the Society's maximum liability towards the Client is limited to one hundred and fifty per-cents (150%) of the price paid by the Client to the Society for the performance of the Services. This limit applies regardless of fault by the Society, including breach of contract, breach of warranty, tort, strict liability, breach of statute.
- 7.3. All claims shall be presented to the Society in writing within three (3) months of the Services' performance or (if later) the date when the events which are relied on were first discovered by the Client. Any claim not so presented as defined above shall be deemed waived and absolutely time barred.

8. INDEMNITY CLAUSE

- 8.1. The Client agrees to release, indemnify and hold harmless the Society from and against any and all claims, demands, lawsuits or actions for damages, including legal fees, for harm or loss to persons and/or property tangible, intangible or otherwise which may be brought against the Society, incidental to, arising out of or in connection with the performance of the Services except for those claims caused solely and completely by the negligence of the Society, its officers, employees, servants, agents or subcontractors.

9. TERMINATION

- 9.1. The Parties shall have the right to terminate the Services (and the relevant contract) for convenience after giving the other Party thirty (30) days' written notice, and without prejudice to clause 6 above.

9.2. In such a case, the class granted to the concerned Unit and the previously issued certificates shall remain valid until the date of effect of the termination notice issued, subject to compliance with clause 4.1 and 6 above.

10. FORCE MAJEURE

10.1. Neither Party shall be responsible for any failure to fulfil any term or provision of the Conditions if and to the extent that fulfilment has been delayed or temporarily prevented by a force majeure occurrence without the fault or negligence of the Party affected and which, by the exercise of reasonable diligence, the said Party is unable to provide against.

10.2. For the purpose of this clause, force majeure shall mean any circumstance not being within a Party's reasonable control including, but not limited to: acts of God, natural disasters, epidemics or pandemics, wars, terrorist attacks, riots, sabotages, impositions of sanctions, embargoes, nuclear, chemical or biological contaminations, laws or action taken by a government or public authority, quotas or prohibition, expropriations, destructions of the worksite, explosions, fires, accidents, any labour or trade disputes, strikes or lockouts

11. CONFIDENTIALITY

11.1. The documents and data provided to or prepared by the Society in performing the Services, and the information made available to the Society, are treated as confidential except where the information:

- is already known by the receiving Party from another source and is properly and lawfully in the possession of the receiving Party prior to the date that it is disclosed;
- is already in possession of the public or has entered the public domain, otherwise than through a breach of this obligation;
- is acquired independently from a third party that has the right to disseminate such information;
- is required to be disclosed under applicable law or by a governmental order, decree, regulation or rule or by a stock exchange authority (provided that the receiving Party shall make all reasonable efforts to give prompt written notice to the disclosing Party prior to such disclosure).

11.2. The Society and the Client shall use the confidential information exclusively within the framework of their activity underlying these Conditions.

11.3. Confidential information shall only be provided to third parties with the prior written consent of the other Party. However, such prior consent shall not be required when the Society provides the confidential information to a subsidiary.

11.4. The Society shall have the right to disclose the confidential information if required to do so under regulations of the International Association of Classifications Societies (IACS) or any statutory obligations.

12. INTELLECTUAL PROPERTY

- 12.1. Each Party exclusively owns all rights to its Intellectual Property created before or after the commencement date of the Conditions and whether or not associated with any contract between the Parties.
- 12.2. The Intellectual Property developed for the performance of the Services including, but not limited to drawings, calculations, and reports shall remain exclusive property of the Society.

13. ASSIGNMENT

- 13.1. The contract resulting from these Conditions cannot be assigned or transferred by any means by a Party to a third party without the prior written consent of the other Party.
- 13.2. The Society shall however have the right to assign or transfer by any means the said contract to a subsidiary of the Bureau Veritas Group.

14. SEVERABILITY

14.1. Invalidity of one or more provisions does not affect the remaining provisions.

14.2. Definitions herein take precedence over other definitions which may appear in other documents issued by the Society.

14.3. In case of doubt as to the interpretation of the Conditions, the English text shall prevail.

15. GOVERNING LAW AND DISPUTE RESOLUTION

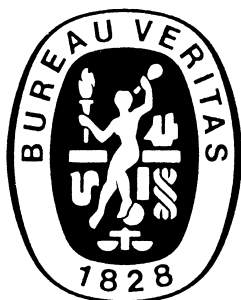
15.1. The Conditions shall be construed and governed by the laws of England and Wales.

15.2. The Society and the Client shall make every effort to settle any dispute amicably and in good faith by way of negotiation within thirty (30) days from the date of receipt by either one of the Parties of a written notice of such a dispute.

15.3. Failing that, the dispute shall finally be settled by arbitration under the LCIA rules, which rules are deemed to be incorporated by reference into this clause. The number of arbitrators shall be three (3). The place of arbitration shall be London (UK).

16. PROFESSIONAL ETHICS

- 16.1. Each Party shall conduct all activities in compliance with all laws, statutes, rules, and regulations applicable to such Party including but not limited to: child labour, forced labour, collective bargaining, discrimination, abuse, working hours and minimum wages, anti-bribery, anti-corruption. Each of the Parties warrants that neither it, nor its affiliates, has made or will make, with respect to the matters provided for hereunder, any offer, payment, gift or authorization of the payment of any money directly or indirectly, to or for the use or benefit of any official or employee of the government, political party, official, or candidate.
- 16.2. In addition, the Client shall act consistently with the Society's Code of Ethics of Bureau Veritas, <http://www.bureauveritas.com/home/about-us/ethics-and-compliance>



RULE NOTE NR 526

Rules for the Certification of Lifting Appliances onboard Ships and Offshore Units

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Chapter 3	SPECIAL APPLICATIONS
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September 2017

Unless otherwise specified, these rules apply to ships and lifting appliances for which contracts are signed after September 1st, 2017. The Society may refer to the contents hereof before September 1st, 2017, as and when deemed necessary or appropriate.

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CERTIFICATION PRINCIPLES

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SECTION 1

GENERAL

1 General

1.1 Application

1.1.1 This Rule Note is applicable to lifting appliances fitted on ships, floating supports, fixed or mobile offshore platforms, and used for:

- a) lifting in harbour or in similar conditions, i.e loading or unloading cargoes, equipment, spare parts or consumable
- b) lifting in offshore conditions for various lifting operations, exclusive of the appliances mentioned in item c)
- c) lifting in offshore conditions for launching and recovery of subsea equipment.

In addition, this Rule Note may also be used for the certification of lifting accessories and the verification of lifting pad eyes.

1.1.2 This Rule Note does not deal with handling apparatus such as movable or lifting platform, cargo ramps, passenger and cargo lifts, lift trucks and lifeboat davits. However when application is requested, considered as possible and reasonable, this Rule Note may be used wholly or partly by the Society upon special request of the Owner or Builder for appliances not listed in [1.1.1].

1.1.3 The Rules for Steel Ships and the Rules for Offshore Units are applicable to the scantlings of the fixed parts of the lifting appliances (see Note 1) and their connections with the ship or offshore unit structure. However, they do not deal with the scantlings of movable parts of these appliances, the checking of which is outside the normal scope of classification.

Note 1: The fixed parts of lifting appliances, considered as integral part of hull, are the structures definitively connected by welding to ship hull or offshore unit structure (for instance crane pedestals, masts, derrick heel seating, etc...to the exclusion of the cranes themselves, derrick booms, ropes, rigging accessories, and, generally, any dismountable parts). However, the shrouds of the masts fixed in the ship structure are considered as fixed parts.

1.2 Scope of Bureau Veritas intervention

1.2.1 This Rule Note covers the following services relating to the appliances defined in [1.1.1]:

- a) Issuance of Class Notations (see Article [3]):
granting a ship or offshore unit, classed to the Society, one or several class notations and mark notations as per Article [3], stating that the lifting appliances are under full survey and comply with the requirements of [3.4] or [3.5].

- b) Issuance of certification (see Article [2]):

- Bureau Veritas certification of lifting appliances on the basis of the international regulations mentioned in [1.3.1] (see [2.2])
- certification of lifting appliances in accordance with special national regulations on behalf of National Authorities (see [2.3])

- c) Issuance of Cargo Gear Register (see Article [4])

- d) Various interventions at the Owner's or Builder's request as defined in Article [5], in particular:

- certification of lifting accessories, see [5.2]
- verification of lifting pad eyes, see [5.3].

1.3 Rules to be applied

1.3.1 Provisions of this Rule Note are generally in accordance with those of:

- Convention no. 32: Protection against Accidents (dockers) Convention (revised), 1932
- Convention no. 152: Occupational Safety and Health (Dock Work) Convention, 1979, and
- The relevant Recommendation no. 160 adopted by the International Labour Organization (I.L.O.)

regarding the protection of workers employed in loading and unloading ships when applied to appliances used for loading/unloading ships at harbour.

1.3.2 The provisions of this Rule Note consist in requirements which reflect either the application of:

- specific requirements of the Society
- the international regulations mentioned in [1.3.1]
- their accepted interpretation.

1.3.3 The Owners' and Builders' attention is drawn to the fact that it is their responsibility to check that the legal provisions and the national rules of the flag country of the ship or the working unit and those of the competent authorities on operational site are complied with.

1.3.4 The scantlings of constituent parts of cargo gear, specially those of loose gear, are given either in tables or by formulae. However, the components which comply with national or international standards or with specifications considered as equivalent may be accepted.

2 Certification of lifting appliances

2.1 Scope

2.1.1 The certification procedures of the lifting appliances are defined in [2.2] or [2.3], as the case may be.

2.1.2 The certification results in issuance of the Cargo Gear Register and of test certificates mentioned in [2.2] or [2.3], as the case may be.

2.1.3 The certification does not result in the granting of additional class notations. It is not mentioned in the Register of Ships of the Society.

2.2 Bureau Veritas certification

2.2.1 The certificates issued by the Society on behalf of the administrations correspond to the forms of certificates recommended by the International Labour Office for entering the appliances in the Cargo Gear Register.

2.2.2 Complete certification of a lifting appliance of a ship or an offshore unit includes:

- approval of the drawings and examination of the documents listed in Sec 2, [1]
- the test and survey certificates prior to the first use of the items of loose gear such as blocks, hooks, shackles, swivels, chain cables, rings, rigging, lifting beams, etc.
- the test and survey certificates prior to the first use of the steel wire ropes and fibre ropes
- the test and survey certificates prior to the first use of the winches
- survey of the fitting onboard in accordance with Ch 4, Sec 1, [10]
- survey and certification of the general tests prior to first use in accordance with Ch 4, Sec 1, [11]
- delivery of Bureau Veritas Cargo Gear Register.

2.2.3 The test certificates as per [2.2.2] are also used when periodical re-tests are carried out and when tests are re-performed after repair, conversions or changes in elements.

2.3 Certification in compliance with special national rules

2.3.1 It is reminded that certification of lifting appliances in compliance with specific national regulations can be delivered by the Society only when it is authorized to do so by the competent National Authorities.

2.3.2 The forms used for the test certificates and the Cargo Gear Register are those prescribed by the specific national regulations.

If the specific national regulations have not defined special forms of wording, the forms of the Society may be used. In this case, the following is to be specified:

- the precise references of the regulations to be applied
- the fact that the Surveyor of the Society acts as a competent person recognized by the Authorities concerned
- the test procedures required by the specific national regulations if different from the procedures provided on the form used for the certificate.

2.3.3 The Cargo Gear Register is delivered if the interventions specified in [4.2.1] have been carried out to the Society satisfaction, considering the special requirements of the national regulations, even if some of the above mentioned interventions are not required by the regulations to be applied. But if the specific national regulations include provisions in addition to those in [4.2.1], these provisions are to be complied with.

2.3.4 When provisions of the national regulations cannot be complied with or when their interpretation is not clear, it is the responsibility of the Owner or the Builder to take the necessary steps with the competent authorities to obtain the requested derogations or explanations, and to inform the Society accordingly.

2.3.5 The attention of Owners and Builders is drawn to the fact that the choice of the construction mark may be, in some cases, implicitly prescribed by the national regulations applied, specially when the latter require inspection of materials.

2.3.6 When the test load or the test conditions prescribed by the national regulations for the lifting appliances or their accessories are more severe than the provisions of this Rule Note, they are to be taken into account by the designer to determine the scantlings.

2.3.7 When lifting appliances already in service are concerned, and with the same reserves as those stated above, the minimum interventions required are to be equivalent to those specified in [4.2.1].

3 Classification

3.1 General

3.1.1 Ships or offshore units fitted with lifting appliances meeting the requirements of [3.4] or [3.5] may be assigned the additional class notations as mentioned in [3.2]. The conditions of assignment, maintenance and withdrawal of those class notations are given in Part A of the Rules for steel ships or Part A of the rules for offshore units.

3.1.2 Classification results in issuance of the Cargo Gear Register.

3.1.3 In accordance with the provisions of Part A, Chapter 1, of the Rules for Steel Ships or Part A, Chapter 1 of the Rules for Offshore Units, and considering the provisions in [3.3], the construction marks ,  or  are associated with the class notations listed in [3.2.1].

3.2 Class notations

3.2.1 The additional class notations are as follows:

- **ALP** for lifting appliances used at harbour and complying with Chapter 2 and Chapter 4

Note 1: In addition, derrick systems are to comply with Ch 3, Sec 4.

- **(ALP)** for lifting appliances used at harbour and complying with specified National Regulations (see [3.5])
- **ALM** for lifting appliances used in offshore conditions and complying with:
 - Chapter 2
 - Ch 3, Sec 1, [1] to Ch 3, Sec 1, [4]
 - Chapter 4
- **(ALM)** for lifting appliances used in offshore conditions and complying with specified National Regulations (see [3.5]).

The notation **ALM** may be completed by:

- **-EN** when, in addition, the lifting appliances are in compliance with additional safety requirements as per Ch 3, Sec 1, [5]
- **-SUBSEA** when, in addition, the lifting appliances are intended to be used for lifting of subsea equipment and are in compliance with Ch 3, Sec 2.

The additional class notations **ALP**, **ALM**, **ALM-EN** and **ALM-SUBSEA** may be completed by **-MR** when, in addition, the lifting appliances are intended to be used for lifting of personnel and are in compliance with Ch 3, Sec 3.

3.2.2 The additional class notations listed in [3.2.1] can be granted only if the ship or offshore unit is or will be registered in the Register of ships of the Society and, as a rule, if all the appliances for lifting comply with the criteria to grant the corresponding notations.

The criteria for granting the class notations listed in [3.2.1] are defined in [3.4] or [3.5].

3.2.3 The granting of one or several class notations **ALP** or **ALM** normally leads to the delivery of Bureau Veritas certificates on the basis of the international regulations mentioned in [1.3.1]. It results, in particular, in the issuance of the Bureau Veritas Inspection Cargo Gear Register (see [4.2]).

The Bureau Veritas Inspection Cargo Gear Register and the corresponding certificates are, in most cases, accepted internationally; however, upon special request of the Owner, additional certification in compliance with special national regulations may be delivered, provided the Society is duly authorized to do so by the relevant National Authorities. The opinion of the Society is to be required in this respect. This additional certification does not result in the granting of a special notation. As a rule, in the case of discrepancy between the requirements of the national regulations and those of this Rule Note, the most stringent of them apply. If there is a doubt, the opinion of the Society may be required.

3.3 Construction marks

3.3.1 The construction mark **✕** is assigned when the lifting appliances have been surveyed by the Society during their construction, in compliance with the procedure detailed in [3.4.1].

3.3.2 In compliance with the procedure detailed in [3.4.2], the construction mark **✕** is assigned when the supporting ship or offshore unit is classed after construction and is changing class from an IACS Society at the time of the admission to class.

3.3.3 The construction mark **●** is assigned when the procedure is in compliance with [3.4.3].

3.4 Criteria for granting ALP or ALM class notation

3.4.1 When a lifting appliance is surveyed by the Society during construction, it is submitted to the following requirements to grant the supporting ship or offshore unit one or several of the class notations **ALP** or **ALM** with the construction mark **✕**:

- approval of drawings and examination of documents required in Sec 2
- inspection at works of materials and equipment in accordance with NR 266 and Ch 4, Sec 1
- construction survey in accordance with Ch 4, Sec 1
- survey of tests at works prior to fitting onboard, in particular certification of the loose gear in accordance with Ch 4, Sec 1, [7]
- survey of fitting onboard in accordance with Ch 4, Sec 1, [10]
- survey and certification of the general tests before the appliance is put into service, in accordance with Ch 4, Sec 1, [11]
- issuance of the Bureau Veritas Cargo Gear Register.

Lifting appliances are to be submitted to examinations and periodical tests according to Ch 4, Sec 2 in order to maintain the class notations.

3.4.2 When a lifting appliance has been surveyed by an IACS Society during its construction and is requested to be admitted to class, it is subject to the following requirements to grant the supporting ship or offshore unit one or several of the class notations **ALP** or **ALM** with the construction mark **✕**:

- examination of the drawings and documents required in Sec 2 and submitted for information (see Note 1)
- examination of materials inspection certificates, construction survey attestations, test certificates at works for equipment and loose gear, and, if any, of the existing Cargo Gear Register
- survey of the lifting appliance concerned (see Note 2)
- issuance of the Bureau Veritas Cargo Gear Register (see Article [4]).

Lifting appliances are to be submitted to examinations and periodical tests according to Ch 4, Sec 2 in order to maintain the class notations.

Note 1: As a Rule, these drawings are to be marked with the stamps of the organization by which they were approved upon construction.

Note 2: The extent of this survey depends on the existing conditions of certification, on the general maintenance conditions and on the age of the lifting appliances. As a rule, general tests are not required if the existing certification for these tests (tests prior to first use and/or quinquennial renewal of tests) is valid.

3.4.3 When the procedure adopted does not comply with that detailed in [3.4.1] or [3.4.2] but the Society deems that it is acceptable for the assignment of class, the construction mark ● is assigned and the interventions to be carried out in order to grant one or several class notations **ALP** or **ALM** are as follows:

- approval of the drawings and examination of the documents required in Sec 2 (see Note 1)
- examination of the certificates delivered after testing at works of loose gear, and, possibly, of the existing Cargo Gear Register
- survey of the lifting appliance concerned (see Note 2); checking of thicknesses of structural elements is to be carried out on the lifting appliances the age of which is greater than, or equal to, 12 years
- issuance of the Bureau Veritas cargo gear register
- examinations and periodical tests according to Ch 4, Sec 2 in order to maintain the additional classification class notations.

Note 1:

- Upon agreement of the Society, the approval of drawings may not be required if proof is given that these drawings have been previously approved by a recognized organization. In such a case, the hereabove mentioned drawings and documents are to be submitted for information.
- When some drawings and documents are not available, the Society is to appreciate whether it is possible to grant the requested class notations, considering the fact that a Cargo Gear Register has possibly been delivered by a recognized organization or a National Authority. Particular measurements or controls carried out aboard, and witnessed by a Surveyor of the Society, may be required.
- The documents mentioned in [4.1.2], to be annexed to the Cargo Gear Register, are to be submitted.

Note 2: The extent of this survey is to be defined according to the state of the existing certification, the general state of maintenance and the age of the lifting appliances. As a rule, a re-testing is not required if the existing certification relating to these tests (tests prior to first use and/or quinquennial renewal of tests) is valid.

3.4.4 The classification certificate, the test certificates, the cargo gear register and its attached documents are to be kept onboard the ship or the offshore unit and available to the Surveyor of the Society at his request.

3.4.5 When the lifting appliances are built under the survey of the Society in accordance with the provisions of [3.4.1], except for the provisions regarding inspection of materials and equipment at works, one or several of the additional class notation **ALP** or **ALM** may be granted to the ship or the offshore unit.

In such a case, the Builder has to prove that the materials and equipment used comply satisfactorily with the provisions of this Rules. The Surveyor may possibly require to check it at random.

3.5 Criteria for granting (ALP) or (ALM) class notations

3.5.1 Provisions of [3.4] are, as a rule, to be complied with to obtain one or several class notations **(ALP)** or **(ALM)**. However when national regulations include provisions which do not agree with those of this Rule Note, the provisions of the national regulations are normally to be applied.

3.5.2 Attention is drawn to provisions from [2.3.4] to [2.3.6] to be applied.

3.5.3 The periodical surveys are to be carried out by the Society in compliance with the requirements of the national regulations.

4 Cargo gear register

4.1 General

4.1.1 Bureau Veritas inspection cargo gear register is a document which mainly enables to:

- list all the lifting appliances of the ship or offshore unit which have been certified
- record the periodical examinations and tests required in Ch 4, Sec 2 as well as the occasional inspections or tests
- write down the possible remarks of the Surveyor
- check the certification validity for the lifting appliances concerned.

4.1.2 The following documents or equivalent are to be attached to the Inspection cargo gear register:

- general sketch showing lay-out and reference marks of the lifting appliances of the ship or offshore unit
- document showing the main characteristics of each lifting appliance (SWL, minimum and maximum working radius or load capacity chart, working area, etc.) and its working conditions (list and trim angles, maximum wind in service, sea condition, etc.), stamped by the Society
- force diagram for each lifting appliance in every working condition (different methods for hoisting, union purchase, etc.) showing the maximum forces applied to the items of loose gear and main structures
- for each lifting appliance, sketch giving useful particulars for correct reeving of ropes and position of every item of loose gear
- for each lifting appliance, list of steel wire and fibre ropes giving their characteristics (specially their minimum breaking load) and list of every item of loose gear with its SWL and its test load
- for complex or special type lifting appliance, a working and maintenance manual prepared by the Builder.

In addition to the above-detailed attachments to the cargo gear register, the manual relating to the lifting appliance is to include the following information:

- design criteria
- design standards
- list of elements heavily loaded in service
- material specifications
- construction standards
- inspection report during fabrication
- sheaves design standards
- cable specifications
- description and maintenance instruction of brake system
- design standards of pipings and electrical circuits
- diagrams of the latter
- description of safety devices
- instruction for operating, mounting, dismounting and transportation
- instruction for maintenance.

This latter manual is to be kept near the appliance it is related to.

4.2 Criteria for issuance of Bureau Veritas Cargo Gear Register

4.2.1 The appliance may be put down on Bureau Veritas cargo gear register when the following interventions are carried out to the Society's satisfaction:

- approval of the drawings and examination of the documents listed in Sec 2
- examination of the test certificates at works of the items of loose gear such as blocks, hooks, shackles, swivels, chain cables, rings, rigging, lifting beams, etc
- examination of the test certificates at works of the steel wire ropes and fibre ropes
- survey of the fitting onboard in accordance with Ch 4, Sec 1, [10]
- survey and certification of the general tests prior to first use in accordance with Ch 4, Sec 1, [11].

When lifting appliances already in service are concerned, the following interventions are carried out to the Society's satisfaction:

- examination of the drawings and documents required in Sec 2 which are to be submitted for information (see Note 1)
- examination of the certificates delivered after testing at works of loose gear, and possibly of the existing cargo gear register
- survey of the lifting appliances concerned (see Note 2).

Checking of thicknesses of structural elements is to be carried out on the lifting appliances the age of which is greater than or equal to 12 years.

Note 1:

- If the ship does not have a cargo gear register delivered by a recognized organization or a National Authority, the hereinabove mentioned drawings are to be approved by the Society.
- Upon agreement of the Society, the approval of drawings may not be required if these drawings have been previously approved by a recognized organization. In such a case, the hereinabove mentioned drawings and documents are to be submitted for information. Particular measurements or controls carried out aboard, and witnessed by a Surveyor of the Society, may be required.
- The documents mentioned in [4.1.2], to be annexed to the Cargo Gear Register, are to be submitted in any case.

Note 2: The extent of this survey is to be defined according to the state of the existing certification, the general state of maintenance and the age of the lifting appliances. As a rule, a re-testing is not required if the existing certification relating to these tests (testing prior to first use and/or quinquennial renewal of tests) is valid.

5 Various interventions

5.1 General

5.1.1 Upon special request of a Builder or the Owner, the Society may carry out complete or partial certification of a particular lifting appliance or of a special equipment. In particular, general approvals may be carried out when standardized equipment are concerned.

These requests are to specify clearly whether special regulations are to be applied. In the absence of definite instructions, the Society's own rules as stated in this Rule Note are to be applied.

5.1.2 The requests for certification of a lifting appliance or of a category of lifting appliances fitted aboard a ship or an offshore unit which is not classed with the Society are to be specially examined.

5.1.3 On ships classed or not with the Society, the Surveyors of the Society may carry out the periodical surveys required either by international regulations or by specific national regulations when the Society is authorized to do so. In addition, the Surveyor may issue certificates and stamp the cargo gear register of the ship or of the offshore unit, provided that:

- the general maintenance condition of the lifting appliances is deemed satisfactory, and
- the various existing test certificates are shown to the Surveyor, and
- the documents attached to the Register are available.

5.1.4 At the Builder's or Owner's request, the Society may, in some cases, perform verification calculations through their own processes, using for instance their structure analysis software for forces and stresses analysis.

5.1.5 Upon special request, the Surveyors of the Society may also witness particular tests, ascertain damages or repairs, or deliver attestations.

5.1.6 The above interventions normally result in issuance of technical notes, attestations or certificates, as the case may be.

5.2 Certification of lifting accessories

5.2.1 At Owner's request, loose gears used as lifting accessories may be certified in compliance with the technical provisions of Ch 2, Sec 4.

5.3 Verification of lifting pad eyes

5.3.1 At Owner's request, the Society may carry out the verification of lifting pad eyes (lifting lugs) which are permanently attached to the ship or offshore unit structure and are independent of lifting appliances (for instance in engine room), in accordance with the requirements of App 1.

5.3.2 Depending on the SWL of the lifting pad eye, the following scheme of certification generally applies:

- design assessment of the lifting pad eye and its connection with the surrounding structure
- surveys:
 - examination of material certification
 - visual inspection
 - NDT
 - testing
 - marking.

5.3.3 The verification services defined above normally result in the issuance of technical reports or attestations, as the case may be.

5.3.4 Certification of lifting pad eyes in compliance with specific national regulations may be delivered when the Society is authorized to do so by the competent National Authorities.

5.3.5 The request for verification is to specify clearly whether a specific regulation or standard is to be applied. By default the requirements of this Rule Note will apply.

5.3.6 The examination of the supporting structure of the lifting pad eye is not in the scope of this verification.

6 References

6.1 Referenced documents

6.1.1 NR 216

When reference is made to NR216, the latest version of the Rules on Materials and Welding for the Classification of Marine Units is applicable.

6.1.2 NR 266

When reference is made to NR266, the latest version of the Requirements for Survey of Materials and Equipment for the Classification of Ships and Offshore Units is applicable.

6.1.3 Rules for steel ships

When reference is made to the Rules for steel ships, the latest version of the NR467 Rules for the Classification of Steelships is applicable.

6.1.4 Rules for offshore units

When reference is made to the Rules for offshore units, the latest version of the NR445 Rules for the Classification of Offshore Units is applicable.

6.2 Definitions

6.2.1 Hinge

A hinge is a mechanical device joining two elements and allowing one to rotate without turning the other.

6.2.2 Lifting appliance

Lifting appliance is used herein to designate the whole of the elements used for suspending, raising or lowering loads or moving them from one position to another while suspended, for instance a crane and the whole of its mechanisms, etc.

6.2.3 Loose gear

Loose gear includes all items not permanently attached to the structure of the lifting appliances and which are to be tested separately in compliance with the provisions of Ch 4, Sec 1, [7].

These items may be interchanged between various lifting appliance.

Items of loose gear include the following:

- blocks
- hooks
- shackles
- swivels
- chains
- rings
- rigging screws
- slings
- lifting beams
- hand operated tackles with pitched chains, rings, hooks, shackles and swivels permanently attached to other movable items having similar use that items listed here above.

6.2.4 Minimum breaking force (MBF)

The minimum breaking force of an element is the static force, in kN, corresponding to its minimum breaking load.

6.2.5 Minimum breaking load (MBL)

The minimum breaking load of an element is the minimum mass, in tons, which causes its breaking when applied vertically.

6.2.6 Normal slewing operation

The terms normal slewing operation mean conventional handling process of a load by means of a single derrick boom or crane. According to this process, the horizontal handling phase is performed by slewing guy tackles of the derrick boom or the slewing device of the crane. (See Fig 1 to Fig 5).

6.2.7 Offlead load

An offlead load is a horizontal load at the boom tip caused by the radial displacement of the hook and/or the radial acceleration of the boom tip, including the effects of crane base inclination.

6.2.8 Pad eye

A padeye is a device which provides an attachment point to a rope or a sling using a shackle.

6.2.9 Rated pull (RP)

The rated line pull (RP) of a winch is the maximum rope tension, in kN, that the winch can haul at the relevant layer, in normal service condition.

The rated line pull is defined for a specific reeled layer which is to be specified by the Owner or the Builder. The reeled layer may be the first layer (in contact with the drum) or the outer layer.

6.2.10 Safe Working Load (SWL)

The Safe Working Load (SWL) of a lifting appliance is the maximum mass, in tons, which may be lifted vertically by this appliance at the hanging point of the load (hook or lifting ring) and which may be moved in operation.

Note 1: This mass includes the mass of any lifting accessories not permanently attached to the apparatus (lifting beam and slings for instance).

In such case, the own mass of the lifting accessories are to be deducted from the SWL in order to obtain the maximum mass which may be hung.

A lifting appliance may have several values of SWL depending on its use.

A lifting appliance is not to be used to pull obliquely any object whatever it may be (for example to shift a cargo) if this appliance has not been specially designed to do so.

The safe working load of an item of loose gear is the maximum mass, in tons, which may be borne vertically to it (see Ch 2, Sec 4 for the single sheave blocks).

6.2.11 Safe Working Force (SWF)

The Safe Working Force (SWF) of a lifting appliance is the static force, in kN, corresponding to its SWL.

The safe working force of an item of loose gear is the static force, in kN, corresponding to its SWL.

6.2.12 Sidelead load

A sidelead load is a horizontal load at the boom tip caused by the lateral displacement of the hook and/or the lateral acceleration of the boom tip, including the effects of crane base inclination.

6.2.13 Standardized equipment

Standardized equipment are equipment approved by the Society provided that the supplier proves that a prototype has been tested according to this Rule Note or has been submitted to tests considered equivalent by the Society.

6.2.14 Test loads and forces

The test load of a lifting appliance is the mass, in tons, to be applied vertically upon testing onboard the ship or offshore unit.

The test force of a lifting appliance is the static force, in kN, corresponding to its test load.

The test load of an item of loose gear is the mass, in tons, to be applied upon its separate testing when test consists in vertical application of a mass.

The test force, in kN, of an item of loose gear is either the static force corresponding to its test load or the force to be applied when test consists in application of a force.

6.2.15 Union purchase

The terms union purchase system mean handling by means of two derrick booms which remain stationary during loading and unloading: one of the derrick booms is located in way of the hatch, the other in way of the quay, the load is transferred from the one to the other only by means of two cargo runners connected together (see Fig 5).

7 Type of lifting appliances

7.1 Deck crane

7.1.1 A typical deck crane is described in Fig 1 and vocabulary is defined in Tab 1.

7.2 Derrick systems

7.2.1 Derrick rig for light lifting loads

A typical derrick rig for light lifting loads is described in Fig 2 and vocabulary is defined in Tab 2.

7.2.2 Derrick rig for medium lifting loads

A typical derrick rig for medium lifting loads is described in Fig 3 and vocabulary is defined in Tab 3.

7.2.3 Twin span tackle derrick for heavy loads

A typical twin span tackle derrick for heavy loads is described in Fig 4 and vocabulary is defined in Tab 4.

7.2.4 Union purchase rig arrangement

A typical union purchase rig arrangement is described in Fig 5 and vocabulary is defined in Tab 5.

Figure 1 : Deck crane

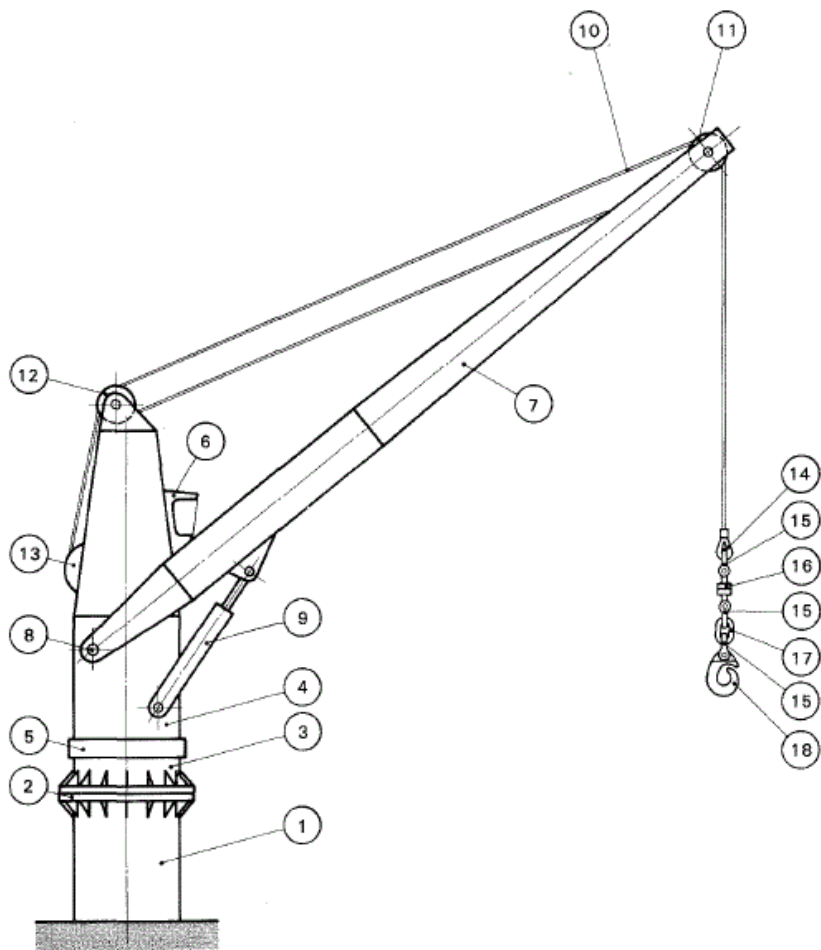


Table 1 : Deck crane

1	Crane pedestal (or crane column, or crane post)	7	Jib (or crane boom)	13	Cargo winch
2	Bolted connection	8	Jib heel pin or boom heel pin	14	Rope terminal (thimble)
3	Fixed lower structure	9	Luffing (or topping) cylinder	15	shackle
4	Superstructure (or crane body, or revolving superstructure)	10	Cargo runner (or hoisting rope, or lifting rope)	16	Swivel
5	Slewing ring	11	Jib head built-in cargo sheaves	17	Link
6	Driving cab	12	Crane top built-in cargo sheaves	18	Cargo hook (C-hook, or Liverpool hook)

Figure 2 : Derrick rig for light lifting loads

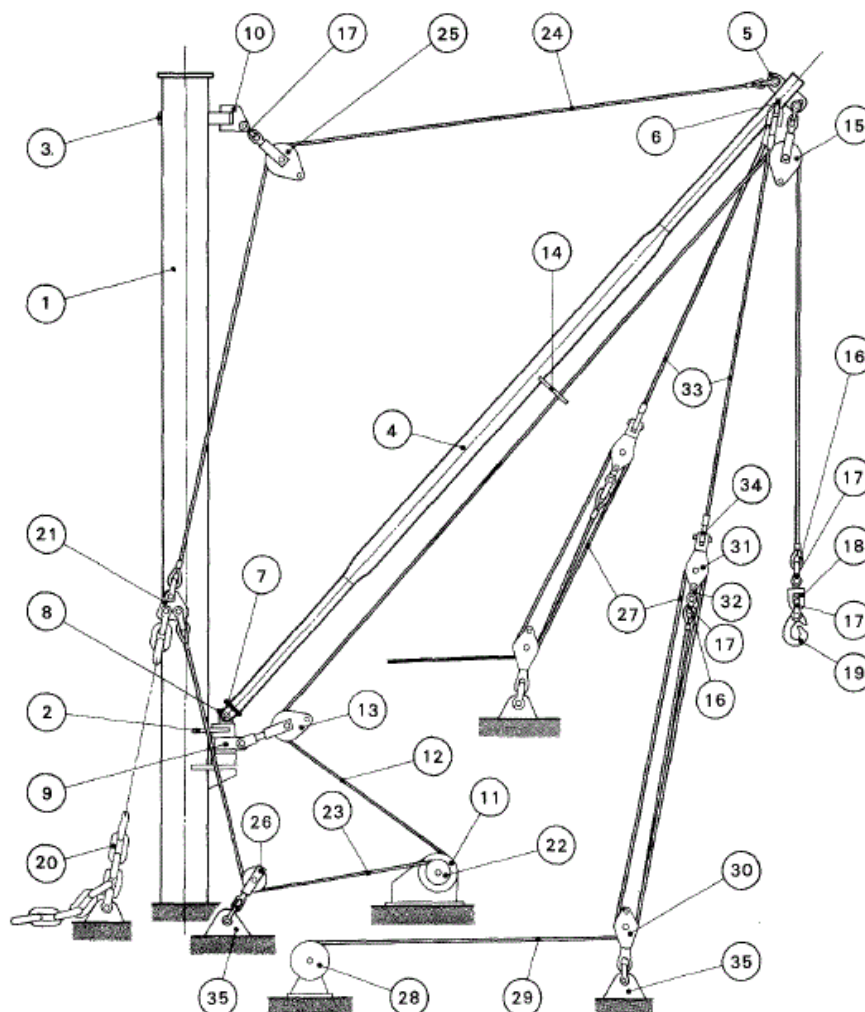


Table 2 : Derrick rig for light lifting loads

1	Mast (or derrick post)	13	Derrick heel cargo lead block	25	Mast head span block
2	Gooseneck seating (or gooseneck bearing bracket)	14	Cargo runner guide	26	Deck topping lead block (may be a snatch block)
3	Mast head span bearing bracket	15	Derrick head cargo block	27	Slewing guy tackles (or vang tackles)
4	Derrick boom	16	Thimble (heart thimble)	28	slewing winch (or guy winch)
5	Derrick head fitting for cargo block and span rope	17	Shackle	29	Slewing guy rope
6	Derrick head slewing guy fitting	18	Swivel	30	Lower slewing guy block
7	Derrick heel fitting	19	Cargo hook (D-hook or Liverpool hook)	31	Upper slewing guy block
8	Gooseneck	20	Span chain	32	Becket
9	Derrick heel cargo lead block bearing	21	Topping triangle plate	33	Slewing guy pendants (or vang pendants)
10	Span trunnion	22	Declutchable cargo winch warping end (used for topping with no load)	34	Thimble (solid thimble)
11	Cargo winch	23	Topping rope (not used under load)	35	Deck eyeplates
12	Cargo runner (or cargo rope, or hoisting rope, or lifting rope, or cargo fall)	24	Fixed (or standing) span rope		

Figure 3 : Derrick rig for medium lifting loads

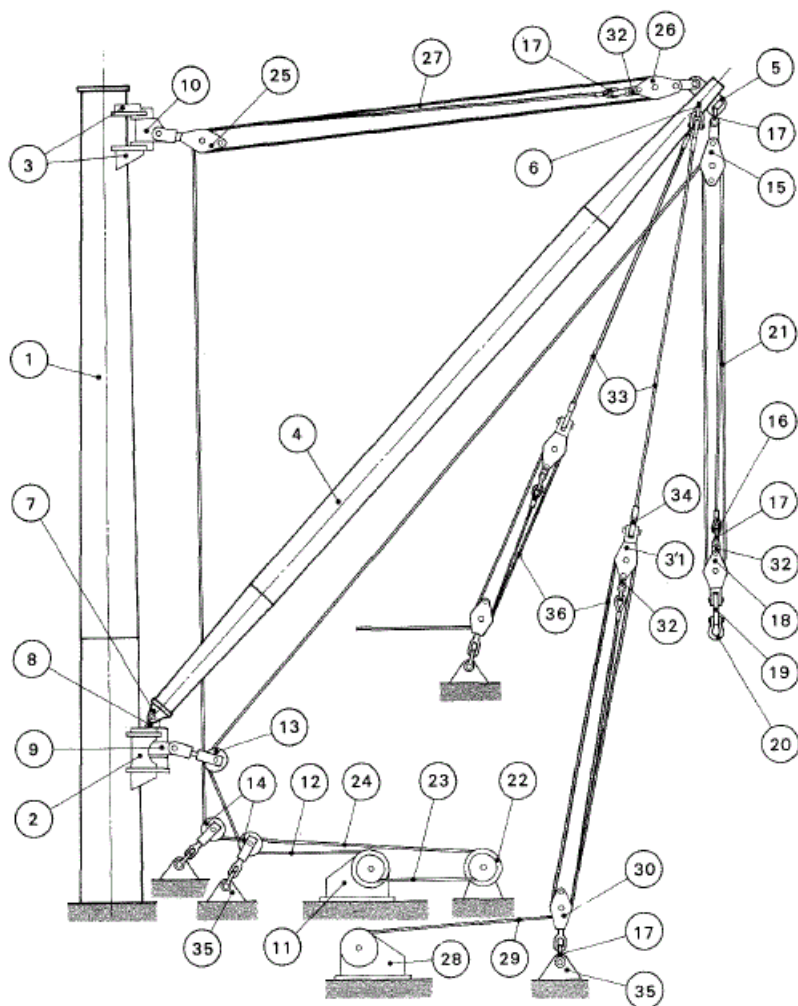


Table 3 : Derrick rig for medium lifting loads

1	Mast (or derrick post)	13	Derrick heel cargo lead block	25	Mast head span (purchase) block (or lower span (purchase) block)
2	Gooseneck seating (or gooseneck bearing bracket)	14	Deck lead blocks	26	Derrick head span (purchase) block (or lower span (purchase) block)
3	Mast head span bearing bracket	15	Upper cargo (purchase) block (or derrick head cargo (purchase) block)	27	Span tackle
4	Derrick boom	16	Thimble (heart thimble)	28	Slewing winch (or guy winch)
5	Derrick head fitting for cargo block and span rope	17	Shackle	29	Slewing guy rope
6	Derrick head slewing guy fitting	18	Lower cargo clock (or lower cargo purchase block)	30	Lower slewing guy block
7	Derrick heel fitting	19	Link eyeplate	31	Upper slewing guy block
8	Gooseneck	20	Bow shackle (or cargo shackle)	32	Becket
9	Derrick heel cargo lead block bearing	21	Cargo tackle	33	Slewing guy pendants (or vang pendants)
10	Span trunnion	22	Indirectly powered topping winch (not used under load)	34	Thimble (solid thimble)
11	Cargo winch	23	Messenger rope (or topping winch driving rope)	35	Deck eyeplates
12	Cargo runner (or cargo rope, or hoisting rope, or lifting rope, or cargo fall)	24	Fixed (or standing) span rope	36	Slewing guy tackles (or vang tackles)

Figure 4 : Twin span tackle derrick for heavy loads

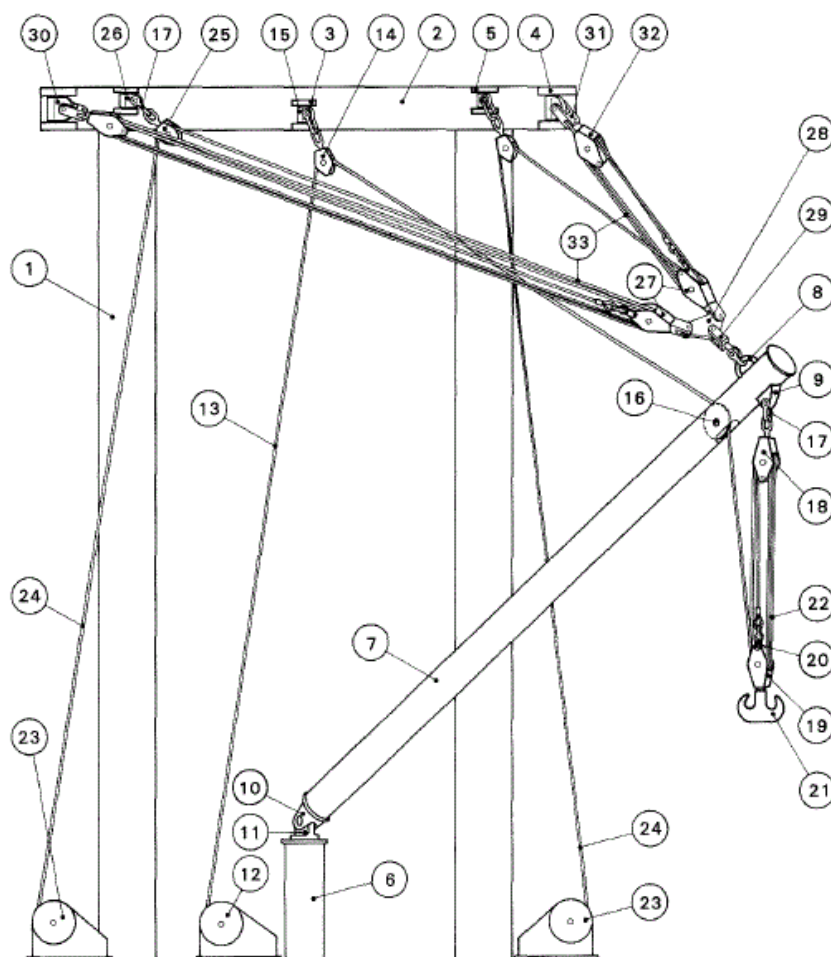


Table 4 : Twin span tackle derrick for heavy loads

1	Portal mast (or portal derrick post)	12	Cargo winch	23	Span winches (used also for slewing motions)
2	Cross tree (or upper transverse beam)	13	Cargo runner (or cargo rope, or hoisting rope, or lifting rope, or cargo fall)	24	Span ropes
3	Mast head cargo lead block bearing bracket	14	Mast head cargo lead block	25	Mast head span lead block
4	Mast head span bearing bracket	15	Cargo lead block trunnion	26	Span lead block trunnion
5	Mast head span lead block bearing bracket	16	Derrick head built-in sheave	27	Derrick head span (purchase) block (or lower span (purchase) block)
6	King post	17	shackles	28	Span triangle plate
7	Heavy derrick boom	18	Upper cargo (purchase) block (or derrick head cargo (purchase) block)	29	Swivel
8	Derrick head span fitting	19	Lower cargo block (or lower cargo purchase block)	30	Span block trunnion
9	Derrick head cargo fitting	20	Becket	31	Double connecting fork
10	Derrick heel fitting	21	Ramshorn hook	32	Mast head span (purchase) block (or upper span (purchase) block)
11	Gooseneck trunnion	22	Cargo tackle	33	Span/slewing tackles

Figure 5 : Union purchase rig arrangement

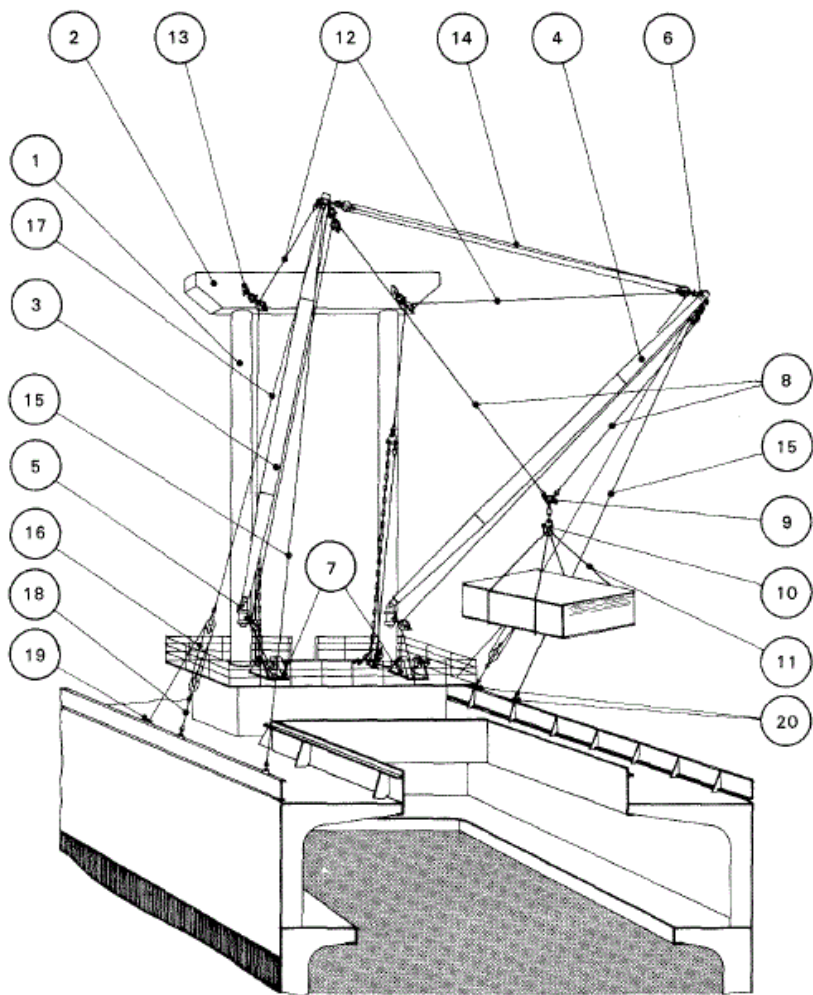


Table 5 : Union purchase rig arrangement

1	Portal mast (or portal derrick post)	8	Cargo runners (or married falls)	15	Preventer (or standing) guys
2	Cross tree (or upper transverse beam	9	Cargo triangle plate	16	Slewing guy tackles (or vang tackles)
3	Derrick boom positioned over the hatch (inboard boom)	10	Cargo hook	17	Upper slewing guy pendants
4	Derrick boom positioned outside the ship (outboard boom)	11	slings	18	Lower slewing guy pendants
5	Derrick heel gooseneck fitting	12	Fixed (or standing) span ropes	19	Belaying (or horn) cleat
6	Derrick head fitting	13	Mast head span fitting	20	Deck eyeplates
7	Cargo winches	14	Schooner guy tackle (or boom head guy tackle)		

SECTION 2

DOCUMENTS TO BE SUBMITTED

1 General

1.1 Application

1.1.1 When requested according to certification or classification as per Sec 1, the drawings and documents listed in Article [2] are to be submitted for approval, unless otherwise specified.

1.1.2 Plans are to include all the data necessary for their interpretation, verification and approval.

1.1.3 The Society reserves the right to request the submission of additional documents in the case of non-conventional design or if it is deemed necessary for the evaluation of the system, equipment or components.

2 Lifting appliances

2.1 General

2.1.1 The following drawings and documents are to be submitted:

- a) for information, general sketch of the ship localizing the lifting appliances and showing the working areas of each of them.
- b) for approval, the load charts showing the operating limitations due to outreach and wind speeds.
- c) for approval, rigging drawings showing clearly the reeving of the ropes and the number of parts in purchase tackles.

All the items of loose gear are to be marked and numbered on these drawings. The type of the blocks used (blocks with plain bearings or roller-bearings) is to be specified.

- d) the description of the loads and their distribution in each structural elements of the lifting appliance are to be submitted for information. The maximum forces determined in the various elements are to be described schematically for each lifting appliance on a sketch regarded as the force diagram.

The force diagrams mentioned above are clearly to show the maximum forces applied to all the loose gear items.

- e) for approval, drawings of structural parts of lifting appliances: structure carrying the luffing tackle and the hinged pin of the jib, jib structure, structure of crane post.

The scantlings and the steel grade of the connecting bolts with the crane post are to be specified. The relevant calculations of the Manufacturer are to be attached to these drawings, for information. When calculations

have been computed, they are to be supplied both with computer data and with sufficient explanations to allow to check the calculation process.

Upon special request, a general approval of a standardized production may be granted by the Society to the Manufacturer.

The material specifications are to be shown on construction drawings.

- f) for approval, list of steel wire and fibre ropes giving construction type, nominal diameter, minimum breaking load and the reference standard.

The metal cross-sectional area of the wire ropes used for shrouds and stays is also to be specified.

- g) for approval, list of all items of loose gear, marked in accordance with the drawings requested in item b) specifying the SWL and the test load of each item.

The construction drawings of items of loose gear as per Sec 1, [6.2.3] and of the other stationary or movable accessories for which no separate test is asked are not required if their scantlings comply with national or international standards, or with approved specifications. In such a case, the standards used are to be specified and the corresponding elements are to be designated according to these standards with mention of steel grade. Upon special request, a general approval of the standards of the Manufacturers may be granted by the Society. The drawings showing specially designed elements are to be submitted for approval in each particular case.

- h) for approval, description of the electrical installations and hydraulic systems as listed in Ch 2, Sec 7, [1.3].
- i) for approval, description of safety devices (limit switches, overload cut-out devices, alarms, etc.).

2.2 Derrick systems

2.2.1 For derrick systems, in addition to the requirements of [6.2.1], the following drawings, documents and information are to be submitted:

- in addition to [2.1.1], item c), the minimum topping angle of the derrick booms is to be mentioned on forces diagrams for approval
- in addition to [2.1.1], item d), the following drawings are to be submitted for approval:
 - Construction drawings of the masts (derrick posts) giving every detail needed to check their scantlings. For complicated type structures, relevant computerized calculations may be required.
 - Construction drawings of the derrick booms.
 - Drawings of structural parts of structure carrying the luffing tackle and the hinged pin of the boom, boom structure, structure of mast.

2.3 Winches

2.3.1 Specifications of winches

Construction drawings of winches are not required when standardized production is concerned, provided references of use in service are supplied to the Society satisfaction.

When prototype is concerned, a technical file is to be submitted for information. This file is to include a detailed technical specification, an operating manual, a general drawing, the constructional drawings of the main items and complete calculations of the Manufacturer. The test programme contemplated is to be submitted for approval.

APPENDIX 1

VERIFICATION OF LIFTING PAD EYES

1 General

1.1 Principles

1.1.1 At Owner's request, the Society may carry out the verification of lifting pad eyes in accordance with Sec 1, [5.3].

1.2 Documentation to be submitted

1.2.1 The following documents are to be submitted:

- design specification for information
- construction drawings for approval
- description of location, SWL and loading direction for information.

2 Design assessment

2.1 General

2.1.1 The lifting pad eye design and structural scantling is to comply with the requirements of Ch 2, App 3, with the design load P_L defined in Tab 1.

Note 1: Alternatively, the design may be based on a recognised standard for pad eyes subject to the agreement of the Society.

Table 1 : Design load P_L for lifting pad eyes

SWL of the pad eye in t	Design load P_L in kN
$SWL \leq 3$	20,0 SWL
$3 < SWL < 20$	17,5 SWL
$SWL \geq 20$	15,0 SWL

3 Scope of survey

3.1 Pad eyes with SWL less than or equal to 1t

3.1.1 Pad eyes with SWL less than or equal to 1t are subject to the following requirements:

- examination of material certificates
- visual inspection by attending Surveyor
- Surveyor's on the spot evaluation of pad eyes scantling
- either individual marking or group marking of the pad eyes in accordance with [3.4.1].

3.2 Pad eyes with SWL greater than 1t and less than or equal to 3t

3.2.1 Pad eyes with SWL greater than 1t and less than or equal to 3t are subject to the following:

- examination of material certificates
- visual inspection by attending Surveyor
- proof load test: either 100% load test and sample NDT or sample load test and 100% NDT (see [4.1.2])
- either individual marking or group marking of the pad eyes in accordance with [3.4.1].

3.3 Pad eyes with SWL greater than 3t

3.3.1 Pad eyes with SWL greater than 3t are subject to following:

- examination of material certificates
- visual inspection by attending Surveyor
- individual proof load test
- individual NDT
- individual marking.

3.4 Group marking

3.4.1 When group marking is applied then a common sign-board is to be installed in each room/space with several identical pad eyes. In case of pad eyes with different SWL in the same room/space, individual marking (for instance a colour distinguishing system) for the pad eyes shall be applied.

4 Testing

4.1 Proof load test

4.1.1 Where proof load testing of pad eyes is required as per Article [3], the proof load is to be according to Tab 2.

4.1.2 For standardized pad eyes with $SWL \leq 3t$, sample testing may be carried out in subject to the agreement of the Society.

Table 2 : Proof loads of pad eyes

SWL of the pad eye, in t	Proof load, in t
$SWL \leq 20$	1,25 SWL
$20 < SWL < 50$	SWL+5
$SWL \geq 50$	1,10 SWL

DESIGN ASSESSMENT

SECTION 1	GENERAL ARRANGEMENT, STRUCTURAL ARRANGEMENT AND MATERIAL
SECTION 2	DESIGN LOADS AND LOADING CASES
SECTION 3	STRUCTURAL ASSESSMENT
SECTION 4	LOOSE GEAR AND REMOVABLE ACCESSORIES
SECTION 5	ROPES
SECTION 6	WINCHES
SECTION 7	ELECTRICAL INSTALLATIONS AND HYDRAULIC SYSTEMS
SECTION 8	CONTROL AND SAFETY SYSTEMS
APPENDIX 1	LOADS DUE TO WIND ON STRUCTURES
APPENDIX 2	EFFICIENCIES OF SHEAVES AND TACKLES
APPENDIX 3	PAD EYE DESIGN

SECTION 1

GENERAL ARRANGEMENT, STRUCTURAL ARRANGEMENT AND MATERIAL

1 General arrangement

1.1 Means of access

1.1.1 All lifting appliances and equipment are to be provided with means of access.

1.1.2 Vertical and slightly sloped ladders (angle of slope with the vertical $< 15^\circ$) may be provided with single rungs 25 mm minimum in diameter (circular section rungs) or 22 x 22 mm² minimum in section (square section rungs).

Vertical ladders over 3 m in height are to be provided with guard hoops.

1.1.3 Ladders whose angle of slope with the vertical exceeds 15° are to be fitted either with steps or with pairs of rungs, the clear gap of twin rungs being 5 cm maximum.

Such ladders are to be provided with suitable hand-rails.

1.1.4 Ladder uprights are to extend 1 m at least above landing platform.

1.1.5 Catwalks and landings are to be fitted with guard-rails 1 m in height minimum and manrope at mid-height.

1.1.6 Access ladders and catwalks are to be firmly secured at sufficiently close intervals.

1.1.7 Handrails are to resist to a load of 75 kg at mid span.

1.1.8 Handrails, for lifting appliances intended for use in offshore conditions are to be fitted with 2 intermediate rails.

The height of the foot plate is to be not less than 150 mm.

1.1.9 A free distance of at least 0,60 m is to be left between lifting appliances and surrounding buildings of the support-unit or installation, when they move or rotate.

In the cases when this last provision cannot be complied with, access to these open spaces is to be prevented.

1.1.10 Means of access which are not entirely in accordance with the requirements of this Section may be accepted subject to special examination by the Society.

1.2 Means of escape

1.2.1 Crane operator's cabins are to be provided with emergency escape and their structure are to be fire resistant.

2 Materials

2.1 General

2.1.1 The requirements of this Article are based on a design temperature not less than -10°C . Other cases are to be subject to special consideration of the Society.

2.1.2 The materials used to manufacture the fixed parts of the lifting appliances, and their connections with the ship structure (crane posts, masts, seatings, etc.), as well as those used locally to reinforce this structure, are to comply with the requirements of NR216 Materials and Welding.

However, the use of materials complying with international or national standards and the characteristics of which are equivalent to those required by NR216 Materials and Welding may be accepted by the Society on a case by case basis.

2.1.3 The use of steel with very high mechanical characteristics is to be examined by the Society on a case by case basis.

In such a case, a detailed technical specification stating the manufacturing process, mechanical and chemical characteristics, utilization conditions (ability for welding and forming) and the possible heat-treatments is to be submitted to the Society.

2.1.4 Materials used for manufacturing primary elements of high capacity lifting appliances such as heavy derrick booms, jibs and main load carrying structures of cranes and gantry-cranes, lifting beams, are to comply with NR216 Materials and Welding.

However the materials used for manufacturing elements other than those as per [2.1.2] may be chosen according to international or national standards or to approved specifications. The selection of materials is to be submitted to the Society for acceptance.

2.1.5 No component part of a lifting appliance and no accessory is to be manufactured in wrought iron.

2.1.6 The use of non-ferrous or synthetic materials is to be especially examined by the Society.

2.2 Steel plates and sections

2.2.1 Steel plates and sections used to manufacture structural components of lifting appliances covered by the present Rule Note are normally in steel grades as defined in NR216 Materials and Welding. Their minimum yield stress is as follows:

- 235 N/mm² for ordinary hull steel grades A, B, D or E
- 315 N/mm² for high tensile steel grades AH32, DH32 or EH32
- 355 N/mm² for high tensile steel grades AH36, DH36 or EH36.

The above values are valid for thicknesses up to 100 mm.

2.2.2 The steel grades to be used for manufacturing structural elements as per [2.2.1] (plate welded structures or tubes made out of welded rolled up plates) are defined in Tab 1 according to the plate thicknesses.

Table 1 : Steel grades for plates

Plate thickness e, in mm	Hull steel grade
e ≤ 20	A or AH
20 < e ≤ 25	B or AH
25 < e ≤ 40	D or DH
40 < e	E or EH

2.2.3 As a rule, the requirements in [2.2.2] are applicable to sections (angle bars, flat bars, etc.) which form the load carrying structures and to those used to stiffen plates when they contribute to the general structural strength.

2.2.4 Steel grades of seamless pipes and welded pipes are to be selected based on the same principles as those given for plates and opened sections.

2.2.5 The specifications of the materials used are to be shown on the construction drawings submitted for approval. Failing this, the steel used would be supposed to be normal strength hull steel grade A, as defined in NR216 Materials and Welding.

2.2.6 When plates of thickness e are cold formed, the folding radius r is not to be, as a rule, lower than the following value:

- when ordinary hull steel is concerned:
 $r = 2,5\ e$
- when high tensile steel is concerned:
 $r = 3,0\ e$

2.2.7 When plates are highly stressed in the through thickness direction, the Society may require, in special cases, the use of plates of grade Z quality complying with Ch 2, Sec 1 of NR216 Materials and Welding in order to minimize the risk of lamellar tearing.

2.3 Welding

2.3.1 Selection of materials in welded construction takes into account:

- the degree of importance in the whole structure of the considered element
- the design temperature of the element
- the thickness of the element
- the stress relieving treatment performed after welding.

2.3.2 Hull steel grades to be used for structural part supporting the appliance and welded to the ship structure are to be selected in accordance with the Rules for Steel Ships or the Rules for Offshore Units as relevant.

2.3.3 Structure is usually to be considered as not being stress relieved.

2.4 Steel forgings

2.4.1 The provisions of Ch 2, Sec 3, of NR216 Materials and Welding apply to steel forgings.

2.4.2 The minimum guaranteed values for tensile strength and yield stress are to be specified on the drawings submitted for approval. Other characteristics are to comply with the requirements of Ch 2, Sec 3 of NR216 Materials and Welding.

2.4.3 The chemical composition and especially the carbon content of the forged parts intended to form a welded assembly are especially defined in Ch 2, Sec 3 of NR216 Materials and Welding.

2.5 Steel castings

2.5.1 The provisions of Ch 2, Sec 4, of NR216 Materials and Welding apply to steel castings.

2.5.2 The minimum guaranteed values for tensile strength and yield stress are to be specified on the drawings submitted for approval. Other characteristics are to comply with the requirements of Ch 2, Sec 4 of NR216 Materials and Welding.

2.5.3 The chemical composition and especially the carbon content of the steel castings intended to form a welded assembly are especially defined in Ch 2, Sec 4 of NR216 Materials and Welding.

2.5.4 Highly stressed steel castings are to be submitted to appropriate non-destructive examination.

2.6 Iron castings

2.6.1 The provisions of Ch 2, Sec 5, of NR216 Materials and Welding apply to iron castings, considering the particulars of [2.6.2] to [2.6.4].

2.6.2 As a rule, the use of grey iron, malleable iron or spheroidal graphite cast iron with either combined ferritic/perlitic structure or perlitic structure is allowed only for manufacturing block sheaves or low stressed elements of secondary importance.

2.6.3 The use of spheroidal graphite cast iron (SG iron) instead of cast steel may be accepted by the Society, provided that:

- concerned part is not intended to be part of a welded assembly
- requirements of NR216 Materials and Welding for SG irons are complied with
- tensile properties are specified on the drawing submitted for approval.

2.6.4 As a rule, welding is forbidden on iron castings, even for repair of casting defects.

2.7 Bolting

2.7.1 When standardized bolts are used for load carrying connections in the manufacturing of lifting appliances, the screws and nuts are to be of the steel quality grades defined in Tab 2 in accordance with the requirements of the ISO 898. For the screws, this table specifies also the tensile strength R and the minimum yield stress R_e which are to be taken into account in strength calculations.

2.7.2 In a bolt (screw + nut), the quality grade mark of the nut is to be the one corresponding to the first figure of the designation symbol of the quality grade mark of the screw, assuming the nut is of normal height (0,8 times the nominal diameter of the screw).

2.7.3 The designation symbol of the steel quality grade mark is to be indicated on each screw and nut used.

2.7.4 For assemblies with prestressed high strength bolts, the quality grade marks of the screws are to be 8.8 or 10.9 and the quality grade marks of the nuts 8 or 10 respectively. The quality of the washers are to be appropriate to the quality grade marks of the screws and nuts.

Screw threading is to be obtained by rolling, exclusive of any other process.

An attestation for conformity of the bolts and screws with recognized national or international standards may be required.

Note 1: Applications for use of bolts with screws of 12.9 quality grade mark will be subject to special consideration.

3 Structural arrangement

3.1 General

3.1.1 As a rule, the crane structures are to be strengthened locally by means of additional stiffeners, transverse web plates, connecting brackets or by local increase in thickness in way of the concentrated applied forces and at places subjected to concentrated stresses due to discontinuity in shape.

3.1.2 As far as possible, strength continuity of the structural parts subjected to tensile stresses is to be ensured by continuous plates or by butt welding. Strength continuity of such structures by means of fillet welds on transverse plate is to be avoided. Use of Z quality plate is recommended for such transverse plate (see [2.2.7]).

In accordance with the above, the crane pedestal structures are to be continuous through the uppermost attachment deck, unless otherwise accepted by the Society.

3.1.3 Drain holes or other draining arrangements are to be provided in the structural parts where sea water or rain may stagnate.

All the structural parts are to be designed to allow inspections and are to be accessible for painting except when small dimensions make it impossible. In the latter case, closed and watertight constructions are to be provided.

3.2 Secondary structure

3.2.1 Secondary structures (cabins, access, etc.) are to be designed in order to:

- resist climatic and live loads to which they are submitted
- bear control and safety devices needed for functioning of the appliance
- ensure protection and safety of personnel.

Table 2 : Steel quality grade marks for screws and nuts

Quality grade marks for screws	6.8	8.8	10.9	12.9
Tensile strength of screws, in N/mm ²	600	800	1 000	1 200
Yield stress (minimum) of the screws, in N/mm ²	480	640	940	1 080
Quality grade marks for nuts	6	8	10	12
Note 1: Alternatively, other steel quality grades defined by national standards may be accepted.				

3.2.2 The structure of the appliance is to be such that in case of accident, the operator remains safe and can use a safe escape.

3.2.3 Finally, it is emphasized that escape routes are to be designed according to the general scheme of the escape routes of the supporting unit or installation.

3.2.4 Operator's cabins are to be of metal and substantial design.

3.2.5 Dangerous parts of the appliance (running gear, open wire conductors, etc.) are to be efficiently guarded.

3.3 Minimum thickness

3.3.1 Thickness of crane pedestals is to be not less than that defined in Tab 3 with respect to the SWL of the crane.

3.3.2 Thickness of the component plates of the load carrying structural parts of the cranes is to be not less than 6 mm.

When tubular structures are concerned, tube thickness is to be not less than 4 mm (except for crane pedestals, the minimum thickness of which is given in Tab 3).

Table 3 : Minimum thickness of crane pedestals

SWL, in t	Minimum thickness e_{min} , in mm
$SWL \leq 1$	6,0
$1 < SWL < 5$	$3/8 (SWL + 15)$
$SWL \geq 5$	7,5

3.4 Diameter/thickness ratio for crane pedestals of circular cross-section

3.4.1 For crane pedestals of circular cross-section, D/e ratio between the external diameter D, in mm, and the thickness e, in mm, of each considered cross-section is not to exceed either 150 nor the value given in Tab 4 according to the SWL of the crane and the design yield stress R_e , in N/mm², of the crane pedestal as defined in [2.3.1].

3.4.2 Cranes with SWL above 160 t which are not in accordance with the requirements of Tab 4.

3.4.3 For structural elements of circular cross-section (exclusive of crane pedestals), D/e ratio is not to exceed 2/3 of the value required in [3.4.1].

3.4.4 When the maximum combined stress σ_{cb} , defined by the strength criteria as per Sec 3, [2.3.1], is lower than the allowable stress ηR_e given in Sec 3, [2.3.1], D/e ratio from Tab 4 may be increased in ratio:

$$\frac{\eta R_e}{\sigma_{cb}}$$

Table 4 : Crane pedestals of circular cross-section: D/e ratio

SWL, in t	D/e ratio
$SWL \leq 5$	$\frac{23500}{R_e}$
$5 < SWL < 160$	$\frac{47000SWL}{R_e(SWL + 5)}$
$SWL \geq 160$	$\frac{45600}{R_e}$

3.5 Width/thickness ratio of plane walls

3.5.1 Ratio b/e between the width b, in mm, of an unstiffened plane wall (or spacing between the stiffeners of this wall) and its thickness e, in mm, is to be not greater than:

$$\frac{b}{e} \leq \frac{720}{\sqrt{R_e}}$$

3.5.2 When the maximum combined stress σ_{cb} defined by the strength criteria as per Sec 3, [2.3.1] is lower than the allowable stress ηR_e (see Sec 3, [2.3.1]), the b/e ratio may be taken equal to the following maximum value:

$$\frac{b}{e} \leq \frac{900}{\sqrt{R_e}} \sqrt{\frac{\eta R_e}{\sigma_{cb}}} \quad \text{when } \sigma_{cb} \leq 0,63 \eta R_e$$

$$\frac{b}{e} \leq \frac{1610}{\sqrt{R_e}} \sqrt{1 - 0,8 \frac{\sigma_{cb}}{\eta R_e}} \quad \text{when } \sigma_{cb} > 0,63 \eta R_e$$

Ratio b/e is not to exceed 100.

3.5.3 If the requirements as per [3.5.1] to [3.5.2] do not entirely comply with the strength of plates and associated stiffeners, local buckling is to be justified by calculations, to the satisfaction of the Society (see Sec 3, [2.5]).

3.6 Local scantlings of attachment decks

3.6.1 As a rule, the local thickness, in mm, of the decks on which the pedestal is attached is to be not less than:

$$1,2 E \frac{235}{\sqrt{R_{e(d)}}}$$

where:

- E : Local spacing, in m, of the deck stiffeners
- $R_{e(d)}$: Minimum yield stress, in N/mm², of the deck plate steel.

3.6.2 In addition, for crane pedestals of circular cross-section, the local thickness, in mm, of the upper and lower attachment decks is to be not less than the greatest of the two values t_2 and t_3 :

$$t_2 = 0,8 e \frac{D}{H} \frac{R_{e(c)}}{R_{e(d)}}$$

$$t_3 = 0,5 e$$

where:

- e, D : Thickness, in mm, and external diameter, in m, respectively, of the pedestal at the uppermost deck level
- $R_{e(c)}, R_{e(d)}$: Minimum values of the yield stress, in N/mm², of, respectively, the pedestal plate and the deck plate
- H' : Clear height, in m, between the two attachment decks.

The value of t_2 is given assuming that the crane is attached in the middle of a deck area. If the crane is attached to a free edge of deck or connected to it by large brackets, the value of t_2 as obtained here-above is to be multiplied by two.

If the crane is fixed to a strip of deck of length ℓ_d , in m, both sides of which are free and at a distance d, in m, from the farthest end of this strip of deck, the value t_2 is to be multiplied by $2d/\ell_d$ ratio.

3.6.3 In some cases, checking of the scantlings of the attachment decks by direct calculations may be required, considering the provisions of Sec 3, [4.2].

3.6.4 When the thickness of the attachment decks is not sufficient to meet the requirements given in [3.6.1] to [3.6.3], a thick plate is to be inserted in the deck plating. The dimensions of this inserted plate are not to be lower than twice the dimensions of the cross-section of the crane pedestal. As a rule, use of doubling plates is not permitted.

3.6.5 In addition to the provisions as per [3.6.1] to [3.6.4] and with respect to the longitudinal strength of the ship and to the local stress concentrations, the Society may require local increase of deck thickness and/or fitting of a diaphragm plate inside the crane pedestal where the latter is passing through the deck.

SECTION 2

DESIGN LOADS AND LOADING CASES

1 Data

1.1 General

1.1.1 Scantlings of shipboard lifting appliances are to be calculated taking into account the static and dynamic loads applied under contemplated operating conditions.

1.1.2 Strength calculations of the various components of cranes are to be made under operating conditions taking into account the forces due to:

- SWL as per Ch 1, Sec 1, [6.2.10] increased by the dead weight of the lower purchase block and permanent attachments provided to hook loads (hook, shackle, permanent lifting beam, spreader or similar lifting aid, etc.)
- dead weight of crane structure and accessories
- ship’s static list and trim
- dynamic amplification factor due to operating conditions
- vertical dynamic effect due to hoisting of load (the effects of vertical accelerations due to lifting motions and the effects of vertical oscillations due to snatch and putting down of load are assumed to be included in the vertical dynamic effect)
- in addition to the above, and depending on the type of appliance, other significant effects are to be taken into account (for example, horizontal tangential acceleration due to slewing motion). Radial (centrifugal) acceleration due to slewing motion may be disregarded in case of slewing crane.

1.1.3 Operating conditions and main characteristics of cranes are to be specified, in particular:

- duty category depending on kind and rate of service contemplated
- SWL or diagram of lifting capacity according to jib radius
- maximum permissible list and trim angles
- dead weight of crane component parts and position of respective centres of gravity, in particular weight of lower purchase block and hook, weight of crane jib and weight distribution over jib length, weight of counter-balance, if applicable, and total weight of crane
- hoisting speed
- horizontal tangential acceleration at jib head with crane at maximum radius due to slewing motion, or, alternatively, angular slewing speed and minimum braking time
- maximum wind speed authorized during operation
- type of block sheaves (sheaves with plain or roller bearings)
- dynamic amplification factor.

1.1.4 Efficiency of sheaves and tackles is to be taken into account as specified in App 2, [1.2] and App 2, [1.3] to determine the maximum forces in hoisting and topping ropes.

1.2 Duty category

1.2.1 General

The nature and the intensity of intended crane duty are taken into account by increasing the design loads considered in calculations (excluding wind loads) and also by providing minimum block sheaves diameter.

Depending on the nature of their duty and the rate of operation, the lifting appliances are divided into four duty categories:

- category I: appliances very seldom used at their nominal capacity
- category II: appliances regularly used for loading and unloading cargoes and frequently operated at less than 75% of their nominal capacity.
- category III: appliances extensively used for loads approaching their maximum capacity.
- category IV: appliances used for heavy duty with loads approaching their maximum capacity or for special lifting operations.

Examples of duty categories and associated duty coefficients for harbour lifting and offshore lifting are given for guidance in [1.2.2] and [1.2.3].

When the lifting appliance is granted with several categories of duty, the category of duty associated to a particular hook is defined according to the type of service of this particular hook.

1.2.2 Duty categories and coefficients for harbour lifting (still water)

Examples of duty categories for harbour lifting are provided in the following list:

- category I: cranes intended for the handling of spare parts, stores or equipment.
- category II: multi-purpose cranes, appliances intended for the handling of flexible hoses onboard oil tankers or of discharging equipment onboard gas carriers or onboard ships carrying dangerous chemicals.
- category III: appliances intended for the handling of containers when their lifting capacity is approximately that of the weight of containers handled.
- category IV: grab appliances used for handling of loose or granulated products.

The associated duty coefficients Ψ_0 are given in Tab 1.

Table 1 : Coefficient Ψ_0 (harbour)

Duty categories	Ψ_0
I	1,00
II	1,03
III	1,06
IV	1,25

1.2.3 Duty categories and coefficients for offshore lifting

Examples of duty categories for offshore lifting are provided in the following list:

- category I: gantries handling Blow Out Preventers (BOP).
- category II: main cranes of offshore work units, main and auxiliary hooks.
- category III: whip hook, supply cranes on fixed or mobile platforms.
- category IV: grab appliances.

The associated duty coefficient Ψ_0 is given in Tab 2.

Table 2 : Coefficient Ψ_0 (offshore)

Category of duty	Ψ_0
I	1,00
II	1,06
III	1,12
IV	1,20

1.3 Dead weights

1.3.1 Builders and manufacturers are to state the dead-weights which are to be considered in the calculations.

1.3.2 For usual low capacity lifting appliances, the weight of the cargo tackle may be disregarded to determine the maximum tension in the cargo runner.

1.4 Secondary structure

1.4.1 Secondary structure (cabins, decks) are to sustain the dead loads, live loads and climatic effects.

Dead loads and live loads are given under the responsibility of the designer.

The operating load on decks or platforms is not to be taken less than 400 kg/m².

Environmental conditions to be considered are the same as those considered for main structures.

2 Influence of self motions

2.1 General

2.1.1 Influence of appliances self motion is described by mean of Ψ coefficients:

- Ψ_G factors express the effects on dead weights of acceleration/decelerations due to motions, such as revolving and luffing for cranes or sudden start/stop with bumping for travelling gantries
- Ψ_C factors express in particular acceleration/deceleration effects of functional motions of hoisted load.

2.1.2 For cranes, Ψ_{GX} , Ψ_{GY} , Ψ_{GZ} , Ψ_{CX} , Ψ_{CY} and Ψ_{CZ} may be evaluated as indicated in [2.2] and [2.1.3].

2.1.3 Influence of hoisting motion

- Besides, Ψ_{CZ} may be evaluated as follows:

$$\Psi_{CZ} = 1 + 0,3 a V$$

where:

a : For structures supported by ropes or hydraulic jacks (cranes):

$$a = 1$$

For rigid structures (gantries or overhead travelling cranes):

$$a = 2$$

V : Maximum hoisting speed of service load, in m/s, which is to be taken neither greater than 1,0 nor less than:

- when $a = 1$:

$$- V = 0,50 \text{ when } P \leq 50 \text{ t}$$

$$- V = \frac{P + 100}{6P} \text{ when } 50 \text{ t} < P < 100 \text{ t}$$

$$- V = 0,333 \text{ when } P \geq 100 \text{ t}$$

- when $a = 2$:

$$V = 0,25$$

- $\Psi_{GZ} = 1$

Note 1: Maximum hoisting speed of service load V will be specially considered for heavy lift cranes (i.e. cranes with SWL equal to or greater than 160t)

2.2 Influence of slewing motion of cranes

2.2.1 The effect of horizontal tangential accelerations due to slewing (starting and braking), on service loads and crane jib are to be considered.

2.2.2 If acceleration γ_0 , in m/s², at the jib head is unknown, the following value is to be applied:

$$\gamma_0 = \frac{2\pi N x_0}{60 t}$$

where:

x_0 : Maximum radius, in m, of the crane (see Fig 1)

N : Maximum slewing speed, in r/min, at maximum radius x_0

t : Braking time, in s, of slewing motion when the crane withstands the SWL corresponding to radius x_0 .

Acceleration γ_{Gi} affecting jib dead weight may be determined as follow for $x_i = x_1$:

$$\gamma_{Gi} = \gamma_0 \frac{x_i}{x_0}$$

where x_i is the distance, in m, between the centre of gravity of the dead weight of item no.i and the vertical crane axis (see Fig 1).

Note 1: In case that N and t are not available, γ_0 is to be taken as 0.6 m/s² with the jib at maximum radius.

2.2.3 The horizontal tangential and radial accelerations effect on crane's jib and SWL may be taken into account by considering the following dynamic coefficients:

$$\Psi_{GXi} = \frac{\pi^2 N^2}{30^2} x_i 10^{-1}$$

$$\Psi_{GYi} = \frac{1}{g} \gamma_{Gi}$$

$$\Psi_{CX} = \Psi_{GX}$$

$$\Psi_{CY} = \frac{1}{g} \gamma_0$$

3 Influence of external conditions

3.1 General

3.1.1 Influence of external operation conditions is described by mean of α coefficients:

- α_G factors express the effects on dead weights of accelerations due to ship motion and accelerations in contemplated environment/sea state
- α_c factors express in particular influence of environmental conditions on hoisted load.

3.1.2 α_{CX} , α_{CY} on the one hand and α_{GX} , α_{GY} , α_{GZ} on the other hand may be calculated as per [3.4] on the basis of:

- $\lambda_s = \sqrt{\ell^2 + \theta^2}$
where ℓ and θ are respectively static list and trim angles as per [3.2]
- α_{CZ} coefficient (see [3.3]).

3.2 List and trim

3.2.1 Lifting appliances are to be designed to operate safely in the following possible conditions, as a minimum, for harbour operations:

- trim of $\pm 2^\circ$
- list of $\pm 5^\circ$

whatever the position of the load.

3.2.2 Values different from those defined for list and trim angles may possibly be accepted by the Society provided that special arrangements are made to ensure that they are not exceeded in operation and provided suitable instructions are attached to the ship's Cargo Gear Register.

3.3 Vertical dynamic amplification factors

3.3.1 For shipboard cranes performing in harbour conditions, the vertical dynamic amplification factor, α_{CZ} is to be taken equal to 1.

Factor α_{GZ} may be evaluated as:

$$\alpha_{GZ} = 0,55 + 0,45 \alpha_{CZ}$$

3.4 Horizontal dynamic amplification factors

3.4.1 Factors α_{CX} and α_{CY} may be evaluated as the maximum value of:

$$\alpha_{1CX} = \sin(\lambda_s) (0,75 + 0,25 \alpha_{CZ})$$

$$\alpha_{2CX} = \sin(\lambda_s) + 0,30 (\alpha_{CZ} - 1)$$

$$\alpha_{1CY} = \sin(\lambda_s) (0,75 + 0,25 \alpha_{CZ})$$

$$\alpha_{2CY} = \sin(\lambda_s) + 0,30 (\alpha_{CZ} - 1)$$

Factors α_G depend on same parameters as factors α_C .

For the other lifting appliances, for normal operating conditions and for a preliminary design, α_{GX} and α_{GY} may be evaluated as:

$$\alpha_{GX} = \sin(\lambda_s) + 0,15 (\alpha_{CZ} - 1)$$

$$\alpha_{GY} = \sin(\lambda_s) + 0,15 (\alpha_{CZ} - 1)$$

4 Loading cases

4.1 General

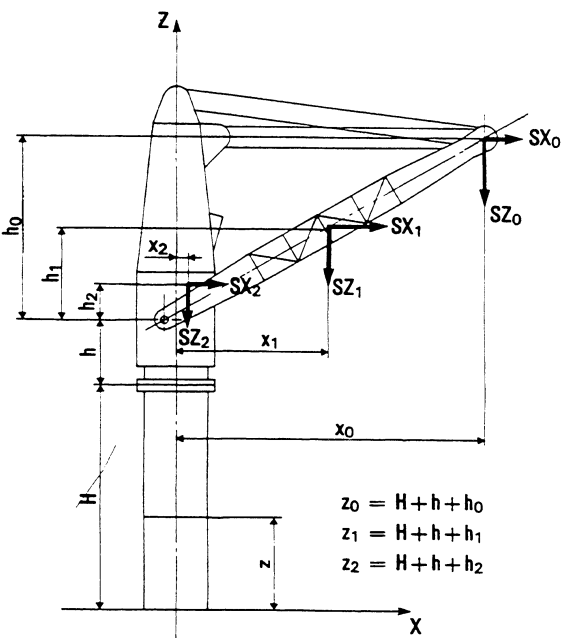
4.1.1 Directions of loads to be considered are defined in relation to a system of orthogonal axes (X, Y, Z) related to the lifting appliance axes X and Z defining longitudinal vertical plane.

For cranes, for example, axes X and Z define a vertical plane where jib axis is included as per Fig 1.

4.1.2 Types of loading to be considered:

- Type SX: forces acting along X axis
- Type SY: forces acting along Y axis
- Type SZ: forces acting along Z axis
- Type SV: forces due to maximum permissible wind (may be evaluated as per App 1).

Figure 1 : Main dimensions loads and axes



4.1.3 The global loading cases without considering the wind effect are stated as following:

- On hoisting point
 - vertical load SZ_0 , in kN:

$$SZ_0 = \alpha_{CZ} \Psi_{CZ} (F + G_0) \text{ along Z}$$
 - horizontal loads SX_0 and SY_0 , in kN:

$$SX_0 = [\alpha_{CX} + \Psi_{CX} + (\Psi_{CZ} - 1) \sin \lambda] (F + G_0) \text{ along X}$$

$$SY_0 = [\alpha_{CY} + \Psi_{CY} + (\Psi_{CZ} - 1) \sin \lambda] (F + G_0) \text{ along Y}$$
 where $\lambda = \lambda_s$
- On dead weight of item no.i
 - vertical load SZ_i , in kN:

$$SZ_i = (\alpha_{GZ} * \Psi_{GZ}) G_i \text{ along Z}$$
 - horizontal loads SX_i and SY_i , in kN:

$$SX_i = (\alpha_{GX} + \Psi_{GX_i}) G_i \text{ along X}$$

$$SY_i = (\alpha_{GY} + \Psi_{GY_i}) G_i \text{ along Y}$$

where:

α_C and α_G : Dynamic amplification factors describing environmental operating conditions (see Article [3])

Ψ_C and Ψ_G : Dynamic amplification factors describing influence of appliance's self motions (see Article [2])

F : SWF corresponding to SWL, in kN

G_0 : Additional force equal to the weight of lower cargo purchase block and permanent attachments provided to hang the load, in kN (see [1.1.2])

G_i : Static dead weight of item no.i of the lifting appliance, in kN.

4.2 Loading cases

4.2.1 Scantlings of crane components are to be determined taking into account the most severe results of loading cases defined in Tab 3, under service conditions and with respect to loads as per [4.1].

4.2.2 In each loading case defined in [4.2.1] the efficiency of sheaves and tackles in the hoisting and lowering conditions is to be considered see [1.1.4].

4.2.3 When calculations taking into account the maximum permissible wind in service condition are required, generally only loading case N° II needs to be considered with wind in same direction as SY type loads, that is, along Y axis.

Table 3 : Loading cases

Loading case No.	Combination of loads (see (1))
I _a	$\Psi_0 (SZ + SX)$
I _b	$\Psi_0 (SZ - SX)$
II	$\Psi_0 (SZ + SY)$
(1) For the direction of loads considered, in particular SX type loads, see Fig 1. Note 1: The duty coefficient Ψ_0 is not to be applied on wind loads (SV), when considered.	

SECTION 3

STRUCTURAL ASSESSMENT

1 General

1.1 Application

1.1.1 This Section provides requirements for the verification of the structural scantling of the lifting appliance.

2 Stability and strength criteria

2.1 General

2.1.1 Based on the loads and loading cases defined in Sec 2 determination of forces and stresses applied on constituent parts of cranes is carried out in order to ascertain whether sufficient safety is ensured with respect to the following risks:

- functional instability of crane jib (danger of jack-knifing, i.e. risk of inopportune jib-raising)
- exceeding the yield stress of materials used
- loss of stability due to overall or local buckling of structures or local buckling of plates.

2.1.2 Structures are safe with respect to risks of excessive yielding and of overall or local buckling (see [2.1.5]) when strength criteria defined in [2.3] are complied with.

2.1.3 Structures are safe with respect to local buckling of plate panels when constructional arrangements defined in Sec 1, [3.5] are complied with.

If, exceptionally, the above arrangements are not satisfied, safety with regard to local buckling is to be checked according to the criteria defined in [2.5].

2.1.4 Strength criteria defined in the present Article are applicable only if overall tests of cranes are carried out in compliance with Ch 4, Sec 1. Should more severe testing be required by National Authorities, scantlings are to be determined accordingly. It is to be noted that especially in this case, compliance with structural arrangements as per Sec 1 would not be considered sufficient to guarantee construction safety.

2.1.5 Note that “buckling” refers to beams and is used to indicate the loss of elastic stability of an entire structure but it is also used to indicate the loss of elastic stability of a sub-structure or a part thereof.

For instance, the strength of a crane jib partly made of two separate lattice legs (see Fig 1) is to be checked with respect to:

- a) buckling of the entire jib structure
- b) individual buckling of the sub-structure consisting of one leg, taking into account additional stresses due to the buckling of the entire jib structure
- c) local buckling of a constituent member of the leg, taking into consideration both the buckling of the entire jib and the buckling of the leg.

The compressive stress σ_c (to be multiplied by the buckling coefficient ω , see [2.4.3]) for the structure “a” of the entire jib is calculated on the basis of the overall compressive force applied on the jib.

The compressive stress σ_c for the structure “b” of the jib leg is calculated on the basis of the compressive force applied on the considered jib leg, determined according to the overall compressive force and bending moments applied on the jib, that is, according to the jib heel pin response to the forces applied.

The compressive stress σ_c for the constituent member “c” is calculated on the basis of the compressive force applied on this member, determined according to the compressive force and bending moments applied on the jib heel.

The here before verifications are only indicated as examples and need not be performed unless they are found necessary due to the slenderness ratio of the element concerned and due to the calculated compression stresses.

2.2 Check of functional stability of crane jib

2.2.1 The risk of inopportune raising of the crane jib (jack-knifing) exists mainly for cranes in which the lifting rope is reeved in one or several parts of rope between the jib head and the upper part of the crane, thus relieving the luffing force required to maintain the jib in a balanced position in the vertical plane.

If there is such a danger, then verifications required in [2.2.2] or [2.2.3], as applicable, are to be made.

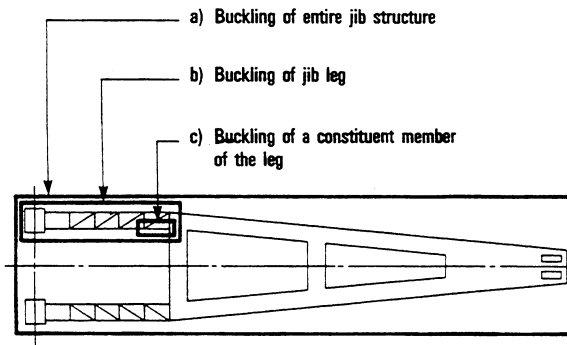
2.2.2 For rope supported jib cranes, it is to be checked that the tension in the luffing tackle remains positive for loading case I_b , replacing loading SX_0 by loading SX'_0 so that:

$$SX'_0 = \left(1 + \frac{0,047}{\Psi_x}\right) SX_0$$

Note 1: For the application of the present requirement the value of Ψ_x , determined as per Sec 2, [2.1.2], is to be taken not less than:

- 1,25 when $P \leq 20$ t
- $1 + 5 / P$ when $20 \text{ t} < P < 50 \text{ t}$
- 1,10 when $P \geq 50 \text{ t}$.

Figure 1 : Verification with respect to buckling



Normally, this calculation is to be made with the jib at the minimum radius (maximum topping angle) and taking into consideration the efficiency of the lifting tackle sheaves in the "hoisting" condition.

In a number of special cases, calculations may nevertheless have to be made under different conditions, to the satisfaction of the Society.

2.2.3 For hydraulic jack supported jib cranes it is to be checked, taking into account the requirements of [2.2.2], that the thrust in the luffing jack remains positive.

An exemption to this requirement is, however, possible if the Builder can prove that with the existing arrangements there is no danger of jack-knifing of the jib and they are such that if a pulling force is applied to the jack instead of a compressive force, there is no danger of false manoeuvre.

2.3 Strength criteria

2.3.1 Symbols

The following symbols are used for the stresses, in N/mm², calculated in a particular point:

- σ_t : Normal tensile stress due to an overall tensile force: $\sigma_t \geq 0$
- σ_c : Normal compressive stress due to an overall compressive force: $\sigma_c \leq 0$
- σ_f : Normal bending stress due to a bending moment:
- when tensile stress: $\sigma_f \geq 0$
 - when compressive stress: $\sigma_f \leq 0$
- τ : Total tangential shear stresses due to shear forces and torsional moment:
- $$\tau = \tau_x + \tau_y + \tau_0$$

These stresses are determined by classical calculation methods of strength of materials, within the elastic field.

2.3.2 Safety factor

The safety factor, η , is defined as follow:

- for calculation of load carrying structures (crane pedestal excluded) see Tab 1
- for calculation of crane pedestal (see [3.1]):
 - $\eta = 0,63$ for loading cases specified in Sec 2
 - $\eta = 0,71$ when effects of wind permitted in service are taken into account
 - $\eta = 0,5$ for overhead cranes

Table 1 : Safety factor η

	Load combination	η
1	Regular loads as specified in Sec 2 without wind	0,67
2	Regular loads as specified in Sec 2 combined with effects of wind permitted in service	0,75
3	Exceptional loads	0,90

2.3.3 Yield strength

The design yield strength, R_e , in N/mm², is to be taken equal to:

$$R_e = \min\left(R_{e0,2}, \frac{R_t}{1,2}\right)$$

where $R_{e0,2}$ is the yield stress at 0,2% strain and R_t is the tensile strength.

2.3.4 Allowable stress - tensile and bending load

The following strength criterion is to be complied with in each considered cross-section of structures or structure components which are not subject to an overall compressive force:

$$\sqrt{(\sigma_t + \sigma_f)^2 + 3\tau^2} \leq \eta R_e$$

2.3.5 Allowable stress - compressive and bending load

Structural components subject to an overall compressive force are to comply with the following strength criteria at point(s) M corresponding to the middle of the effective length of buckling (see Fig 3):

- when $\sigma_f \leq 0$ (1)

$$\sqrt{(\omega\sigma_c + \sigma_f)^2 + 3\tau^2} \leq \eta R_e$$
- when $\sigma_f > 0$ (2)

$$\sqrt{[\sigma_c(2 - \omega) + \sigma_f]^2 + 3\tau^2} \leq \eta R_e$$
- when $\sigma_f < 0$ (3)

$$\sqrt{\left(\sigma_c \left[1 + \frac{v'}{v}(\omega - 1)\right] + \sigma_f\right)^2 + 3\tau^2} \leq \eta R_e$$

where:

- ω : Buckling coefficient specified in [2.4.3]
- v : Distance, in mm, from the neutral axis of the considered cross-section, to the farthest point of this section
- v' : Distance, in mm, between neutral axis and the point opposite to the one at distance v (see Fig 2).

Verification of criterion (1) is sufficient when the section under consideration is symmetrical with respect to neutral axis or when the bending moment compresses the farthest point at distance v in case of asymmetrical section.

Criteria (2) and (3) are to be checked in case of asymmetrical section only when the bending moment compresses the point at distance v' . (Criterion (1) is then not applicable in such a case).

The points of the cross-section (at distance v or v') subject to the combined stress specified by strength criteria (1), (2) or (3) are indicated in Fig 2.

Strength criteria (1), (2) and (3) can be applied at any point at a distance x , in m, from the end of the buckling length (see Fig 3) by replacing ω with:

$$1 + (\omega - 1) \sin \left| \frac{180x}{\ell} \right|$$

where:

ℓ : Buckling length, in m. defined in [2.4.1].

Figure 2 : Asymmetrical cross-section

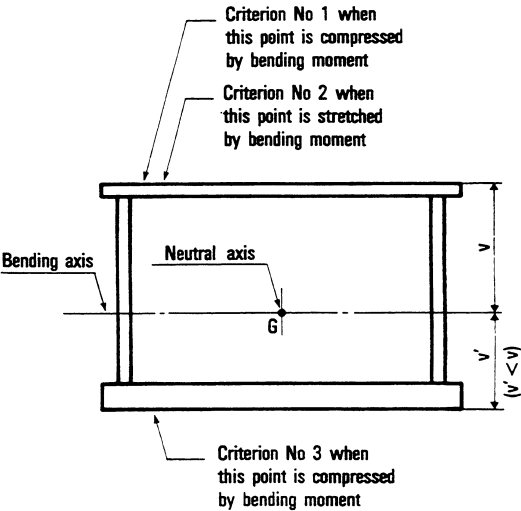
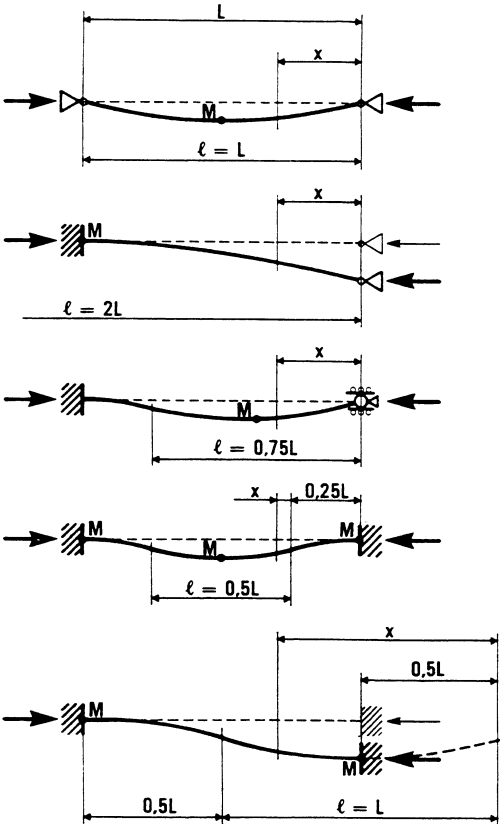


Figure 3 : Effective length of buckling



2.4 Calculation of buckling coefficient for beams

2.4.1 Effective length of buckling

The effective length of buckling ℓ is defined in Fig 3 with respect to the length L of the component under consideration.

2.4.2 Slenderness ratio

Slenderness ratio of the beam is equal to the following value:

$$\lambda = 100 \ell \sqrt{\frac{S}{I}}$$

where:

ℓ : Buckling length, in m, defined in [2.4.1]

I : Moment of inertia, in cm^4 , of the considered cross-section

S : Cross sectional area, in cm^2 .

2.4.3 Buckling coefficient

The buckling coefficient ω is determined with the following formula:

$$\omega = B + \sqrt{B^2 - A}$$

where:

$$A = 112,8 \times 10^{-6} \lambda^2 \frac{R_e}{235}$$

$$B = 0,5(A + 1) + \zeta(\sqrt{A} - 0,2)$$

with:

R_e : Design yield stress, in N/mm^2 , defined in [2.3.1]

λ : Slenderness ratio defined in [2.4.2]

where:

$\lambda < 30 (235/R_e)^{1/2}$, $\omega = 1$ may be applied

ζ : For closed cross-section beams (tubes, box beams, etc.):

$$\zeta = 0,1$$

For open cross-section beams (lattice beams, angle bars, I, T or U-shape sections, etc.):

$$\zeta = 0,17$$

For convenience, the values of ω for closed cross section beams are listed in Tab 2 and those for open cross-section beams in Tab 3. These ω values are calculated with a slenderness ratio λ' corrected according to the yield stress R_e of the steel used:

$$\lambda' = \lambda \sqrt{\frac{R_e}{235}}$$

2.5 Verification of plate panels against buckling

2.5.1 As a rule, the verifications of plane plate panels are only required when the structural arrangement as per Sec 1 are not complied with.

In such a case, strength against buckling of plane plate panels and of their possible stiffening is to be proved by relevant calculations which can be made in accordance with applicable provisions of Part B, Ch 7, Sec 1, [5] of the Rules for Steel Ships.