Rules for the Classification of Steel Ships

NR 467

AMENDMENTS

January 2018

These sheets contain amendments within the following Sections of July 2017 issue of the *Rules for the Classification of Steel Ships*.

These amendments are effective from January 1st, 2018.

Part	Volume	Chapter	Section / Appendix
Part A	*NR 467 A1 DT R14 E*	Ch 1	Sec 2
		Ch 3	Sec 7
		Ch 4	Sec 1, Sec 2, Sec 3, Sec 5, Sec 8, Sec 9
		Ch 5	Sec 1, Sec 10
Part B	*NR 467 B1 DT R09 E*	Ch 2	Sec 3
		Ch 3	Sec 1, App 2, App 3
		Ch 4	Sec 3
		Ch 5	Sec 1, Sec 3, Sec 5, Sec 6
		Ch 7	Sec 2, Sec 3, Sec 4, App 2
		Ch 8	Sec 2, Sec 6, Sec 9, Sec 10
		Ch 9	Sec 1
		Ch 11	Sec 1, Sec 2, Sec 3

Continued page 3

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 con tract'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 appraisement 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 proto cols 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 appraisement 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. 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 to 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. PROFESSIONNAL 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/

Continued from page 1

Part	Volume	Chapter	Section / Appendix
Part C	*NR 467 C1 DT R09 E*	Ch 1	Sec 2, Sec 10, Sec 11
		Ch 2	Sec 3, Sec 11, Sec 12
		Ch 4	Sec 1, Sec 5, Sec 12
Part D	*NR 467 D1 DT R09 E*	Ch 1	Sec 2
		Ch 7	Sec 1, Sec 2, Sec 4, Sec 6
		Ch 8	Sec 3, Sec 5, Sec 7
		Ch 9	Sec 4, Sec 6, Sec 8, Sec 13, Sec 16, App 1
		Ch 11	Sec 3, Sec 5
		Ch 12	Sec 3, Sec 4
		Ch 13	Sec 2
		Ch 14	Sec 2
		Ch 15	Sec 3
Part E	*NR 467 E1 DT R01 E*	Ch 1	Sec 1, Sec 2, Sec 3
		Ch 2	Sec 2, Sec 3
		Ch 4	Sec 4
		Ch 8	Sec 1, Sec 3, Sec 4
		Ch 9	Sec 1, Sec 3, Sec 4
		Ch 11	Sec 4
Part F	*NR 467 F1 DT R09 E*	Ch 3	Sec 1
		Ch 4	Sec 3
		Ch 8	Sec 2, Sec 3
		Ch 9	Sec 2
		Ch 11	Sec 6, Sec 11, Sec 15, Sec 20

Amendments to PART A

Ch 1, Sec 2, Table 1

*Replace the rows "**dualfuel** or **gasfuel**", "**SPxxx**", "**Liquefied gas carrier**" and "**POLAR-CAT**":*

*Add the rows "**FSRU**", "**Liquefied gas carrier - FSRU**" and "**SW-Registry**":*

*Add the rows "**heavycargo**" and "**nonhomload**" to the row "**Self-unloading bulk carriers ESP**":*

Replace table footnote (2):

Table 1 : List of service notations and additional service features

Service notation [ref. in Part A] / **Additional service feature**	Reference	Corresponding type of ship according to Conventions and/or Codes
FSRU [4.16.9]	NR 645	
Liquefied gas carrier [4.4.5]	Part D, Chapter 9	Tanker (SOLAS, Reg I/2(h))
REGAS	NR 645, Sec 10	Gas carrier (SOLAS, Reg II-1/3.20, Reg II-2/3.25, Reg VII /11.2)
STL-SPM	Pt D, Ch 9, Sec 1, [7]	
Liquefied gas carrier - FSRU [4.16.9]	NR 645	
Self-unloading bulk carrier ESP [4.3.6]	Part D, Chapter 4	Cargo ship (SOLAS, Reg I/2(g))
heavycargo [AREA1, X1 kN/m² - AREA2, X2 kN/m² - ...] [4.17.4]	Pt B, Ch 5, Sec 6	Bulk carrier (SOLAS, Reg IX/1.6, Reg XII/1)
nonhomload **(3)**	–	
OTHER ADDITIONAL SERVICE FEATURES		Remarks
dualfuel or **gasfuel** [4.13.1]	Rule Note NR 529 or Part D, Chapter 9	Service feature to be completed by one of the following notations: **(LNG), (CNG)** or **(LPG)**
SPxxx [4.17.1]	–	
POLAR CAT-A, **POLAR CAT-B**, **POLAR CAT-C** [4.17.3]	Rule Note NR 527	Mandatory for ships operating in polar waters (as defined in SOLAS and MARPOL)
SW-Registry [4.17.5]	Pt C, Ch 3, Sec 3	
(2) Additional indications: for **BC-A**: **(holds a, b, .., ... may be empty)** and **(Block-loading)** if applicable; for **BC-A** or **BC-B** and if x.y is less than 3 t/m³: **(maximum cargo density x.y t/m³)**; for **BC-A**, **BC-B** or **BC-C**: **(no MP)** if applicable.		

Ch 1, Sec 2, [4.3.2]

Add the following item at the end of the second bulleted list:

- the additional service feature **BC-A** is completed by the notation **(Block-loading)** when the ship is intended to operate in alternate block load condition, according to Common Structural Rules for Bulk Carriers and Double Hull Oil Tankers (Rule Note NR606), Pt 1, Ch 1, Sec 1, [3.2.1]. The requirements for **(Block-loading)** notation are defined in NR606, Pt 1, Ch 4, Sec 8, [4.2.3].

Ch 1, Sec 2, [4.3.6]

Add the following paragraph at the end of the requirement:

The service notation **self-unloading bulk carrier ESP** may be completed by the additional service feature **heavycargo** or **nonhomload** defined in [4.2.2].

Ch 1, Sec 2, [4.4.5]

Replace the first item of the bulleted list:

- **REGAS**, where the ship is fitted with an installation for revaporisation of the liquefied natural gas. The requirements for the assignment of this additional service feature are given in NR645, Sec 10

Ch 1, Sec 2, [4.4.6]

Replace the second paragraph:

The additional requirements of Ch 4, Sec 5 and Rule Note NR620 LNG Bunkering Ship are applicable to these ships.

Ch 1, Sec 2, [4.9]

Replace the fourth paragraph of requirement [4.9.2]:

Offshore construction barges fitted with legs are granted with the additional service feature **- self elevating**, when found in compliance with the relevant requirements of NR534 Rules the classification of self-elevating units - jack-ups and liftboats. The requirements for the maintenance of the notation are given in NR445 Rules for the Classification of Offshore Units, Part A, Chapter 2, as applicable.

Replace the third paragraph of requirement [4.9.3]:

Offshore construction vessels fitted with legs are granted with the additional service feature - **self elevating**, when found in compliance with the relevant requirements of NR534 Rules the classification of self-elevating units - jack-ups and liftboats. The requirements for the maintenance of the notation are given in NR445 Rules for the Classification of Offshore Units, Part A, Chapter 2, as applicable.

Replace the third paragraph of requirement [4.9.4]:

Offshore support vessels fitted with legs are granted with the additional service feature - **self elevating**, when found in compliance with the relevant requirements of NR534 Rules the classification of self-elevating units - jack-ups and liftboats. The requirements for the maintenance of the notation are given in NR445 Rules for the Classification of Offshore Units, Part A, Chapter 2, as applicable.

Replace the last paragraph of requirement [4.9.7]:

The requirements for the assignment and maintenance of this notation are given respectively in Part E, Chapter 12 and in Ch 4, Sec 8, [19].

Ch 1, Sec 2, [4.13]

Replace requirement [4.13.1]:

4.13.1 The service notation is to be completed by one of the following additional service features, as applicable:

- **dualfuel** for ships fitted with engines or gas turbines using both gas and fuel oil as fuel
- **gasfuel** for ships fitted with engines or gas turbines using only gas as fuel.

The additional service features are to be completed by one of the following notations:

- **(LNG)**, when the ship uses natural gas as fuel, stored in liquefied form
- **(CNG)**, when the ship uses compressed natural gas as fuel
- **(LPG)**, when the ship uses liquefied petroleum gas as fuel, in liquefied or gaseous form.

Gas means methane, ethane, propane, butane or a mixture thereof.

The requirements for the assignment of these additional service features are given in:

- Pt D, Ch 9, Sec 1, [1.1.6] for gas carriers
- NR529 Gas-Fuelled Ships, for ships using liquefied natural gas as fuel (**(LNG)** notation) or compressed natural gas as fuel (**(CNG)** notation)
- NI 647 LPG-fuelled ships for ships using liquefied petroleum gas as fuel (**(LPG)** notation).

The additional requirements of Ch 4, Sec 9 are applicable to these ships, except gas carriers using their cargo as fuel, for which the applicable requirements are given in Ch 4, Sec 5.

Ch 1, Sec 2, [4.16]

Replace the third paragraph of requirement [4.16.1]:

An additional service feature may be specified after the notation (e.g. **special service-training**, **special service-fish factory**) to identify the particular service in which the ship is intended to trade. The scope and criteria of classification of such units are indicated in a memoranda.

Replace the eighth paragraph of requirement [4.16.3]:

Ships with service notation **yacht** or **charter yacht** are assigned a navigation notation as listed in Pt A, Ch 1, Sec 3, [2.4] of NR500, Rules for the Classification and the Certification of Yachts.

Replace requirement [4.16.4]:

4.16.4 Crew boats

The service notation **crew boat** is assigned to ships less than 500 GT, dedicated to transport of offshore personnel from harbours to moored offshore installations or ships, proceeding in the course of their voyage not more than four hours at operational speed from a place of refuge, and meeting the requirements of Rule Note NR490, Rules for the Classification of Crew Boats.

Ships which do not fulfil the minimum speed criteria given in Sec 1, [1] of NR490 are not to be assigned the above service notation.

Ch 1, Sec 2, [4.16.8]

Insert the following fourth paragraph:

The service notation **semi-submersible cargo ship** is always completed by the additional class notation **SDS**.

Ch 1, Sec 2, [4.16.9]

Delete the last item of the bulleted list of existing requirement [4.16.9].

Ch 1, Sec 2, [4.16]

Insert the following new requirement [4.16.9]:

4.16.9 FSRUs

The requirements for the assignment of a service notation for Floating Storage Regasification Units (FSRUs) are given in Rule Note NR645 Rules for the Classification of Floating Storage Regasification Units.

The following service notations may be assigned to FSRUs, as relevant:

- **Liquefied gas carrier - FSRU**, when the floating unit is designed to operate as a regasification unit with the possibility of trading LNG in a navigation mode
- **FSRU**, when the floating unit is designed to operate as a regasification unit permanently moored without trading LNG.

Note 1: typical notations to be assigned to complete the service notations are described in NR645.

The requirements for the maintenance of these notations are given in NR645 and in:

- Ch 4, Sec 5, for units granted with **Liquefied gas carrier - FSRU** notation
- NR445 Rules for the Classification of Offshore Units, for units granted with **FSRU** notation,

as applicable.

Ch 1, Sec 2, [4.17.1]

Replace the last paragraph:

The additional service feature **SPxxx** is to be completed by the additional service feature **SRTP** when:

- **xxx** is greater than 240 and
- L_{LL} as defined in Pt B, Ch 1, Sec 2, [3.2] is greater than or equal to 120 m or the ship includes three or more main vertical zones as defined in Pt C, Ch 4, Sec 1, [3.25].

Ch 1, Sec 2, [4.17]

Add the following new requirement [4.17.5]:

4.17.5 Computerized systems

The additional service feature **SW-Registry** is assigned to ships contracted for construction on or after 1st July 2017, provided with a software registry meeting the related requirements laid down in Pt C, Ch 3, Sec 3 for the assignment and those laid down in Ch 3, Sec 1 and Ch 3, Sec 3 for the maintenance of the software registry.

This additional service feature **SW-Registry** is assigned to existing ships provided with a software registry in compliance with the related requirements laid down in Pt C, Ch 3, Sec 3; requirements for the maintenance of the notation are indicated in Ch 3, Sec 1 and Ch 3, Sec 3.

Ch 1, Sec 2, Table 3

*Replace the row "**GAS-PREPARED**":*

*Add the row "**STABLIFT**":*

Table 3 : List of additional class notations

Additional class notation	Definition in	Reference in NR 467 or to other Rule Notes	Remarks
GAS-PREPARED **GAS-PREPARED ( )**	[6.14.36]	Rule Note NR 627	between brackets, the notation may be completed by one, more or all of the following notations: **S**, **P**, **ME-DF**, **AE, B**
STABLIFT	[6.14.43]	Pt E, Ch 8, Sec 3	

Ch 1, Sec 2, [6.14.11]

Replace the first paragraph:

The additional class notation **SDS** may be assigned to ships for which a damage buoyancy, subdivision and stability file has been examined and found to satisfy the requirements given in Pt B, Ch 3, Sec 3 or those required for granting the service notation, when applicable.

Ch 1, Sec 2, [6.14.36]

Replace the last item of the first bulleted list by the following two items:

- **AE**, when the auxiliary engines are either of the dual fuel type, or designed for future conversion to dual-fuel operation
- **B**, when the oil-fired boilers are either of the dual fuel type, or designed for future conversion to dual fuel operation.

Ch 1, Sec 2, [6.14.37]

Replace the second paragraph:

The requirements for the assignment and maintenance of this notation are given respectively in Pt F, Ch 11, Sec 21 and Ch 5, Sec 10.

Ch 1, Sec 2, [6.14.41]

Replace the third paragraph:

The requirements for the assignment and maintenance of this notation are given respectively in Pt F, Ch 11, Sec 22 and Ch 5, Sec 10.

Ch 1, Sec 2, [6.14]

Add the following new requirement [6.14.42]:

6.14.42 STABLIFT

The additional class notation **STABLIFT** may be assigned to ships engaged in lifting operations at sea and equipped for that purpose with one or several lifting equipment, having their residual stability during lifting operations checked and complying with the stability requirements specified in Pt E, Ch 8, Sec 3.

Ch 3, Sec 7, [3.2]

Add the following new requirements [3.2.10], [3.2.11] and [3.2.12]:

3.2.10 The SCF shall be reviewed, at the time of new building, in accordance with the requirements of [3.2.2] and [3.2.3] and the normal storage location shall be distinguished.

Note 1: "Reviewed" means the examination of the SCF that is carried out by the Surveyor, at the end of the newbuilding process, in order to confirm that:

- drawings and documents required under [3.2]
- the possible additional drawings/documents provided by the shipyard, as per the Ship Construction File (SCF) list of drawings/documents

are present in the copies of the SCF stored on board and in the ashore archive.

The "review" is not to be intended as an assessment of the drawings/documents in order to verify their compliances with the applicable Rules/Regulations.

3.2.11 For the SCF stored on board ship, the Surveyor is to verify that the information is placed on board the ship, upon completion of ship construction.

3.2.12 For the SCF stored on shore archive, the Surveyor is to verify that the information is stored on shore archive by examining the list of information included on shore archive, upon completion of ship construction.

Ch 4, Sec 1, Table 1

*Replace the row "**liquefied gas carrier**":*

Table 1 : Service notations and/or additional service features for which specific requirements are applicable

Service notation and/or additional service feature assigned	Section or Article applicable in this Chapter	Type of surveys affected by these specific requirements	Remarks
liquefied gas carrier **liquefied gas carrier - FSRU**	Ch 4, Sec 5	annual survey intermediate survey class renewal survey	

Ch 4, Sec 2, [1.2]

Replace requirement [1.2.6]:

1.2.6 For bulk carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10:

- on completion of the survey, the surveyor is to verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place
- for the SCF stored on board ship, the Surveyor is to examine the information on board ship. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification of the ship structures, the Surveyor is also to verify that the updated information is kept on board the ship. If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey
- for the SCF stored on shore archive, the Surveyor is to examine the list of information included on shore archive. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification of the ship structures, the Surveyor is also to verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship. If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

Ch 4, Sec 3, [1.2]

Replace requirement [1.2.6]:

1.2.6 For oil tankers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10:

- on completion of the survey, the Surveyor is to verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.
- for the SCF stored on board ship, the Surveyor is to examine the information on board ship. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification of the ship structures, the Surveyor is also to verify that the updated information is kept on board the ship. If the updating of the SCF onboard is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey
- for the SCF stored on shore archive, the Surveyor is to examine the list of information included on shore archive. In cases where any major event, including, but not limited to, substantial repair and conversion, or any modification of the ship structures, the Surveyor is also to verify that the updated information is stored on shore archive by examining the list of information included on shore archive or kept on board the ship. If the updating of the SCF Supplement ashore is not completed at the time of survey, the Surveyor records it and requires confirmation at the next periodical survey.

Ch 4, Sec 5, [1.1.1]

Add the following items at the end of the bulleted list:

- **liquefied gas carrier - FSRU**
- **LNG bunkering ship.**

Ch 4, Sec 8, [1.1.1]

Add the following items at the end of the bulleted list:

- **diving systems**, in Article [18]
- **pipe laying**, in Article [19].

Ch 4, Sec 8, [11.1.1]

Replace the first item of the bulleted list:

- general examination of the connections of sheaves, drums and tensioners to the structure

Ch 4, Sec 8

Add the following new Article [19]:

19 Pipe laying ship

19.1 Annual survey

19.1.1 The annual survey is to include:

- verification of the presence onboard of the operating manual as defined in Pt E, Ch 12, Sec 1.
- inspection of the structural arrangement and scantlings of the foundations of the pipe laying equipment.

19.2 Class renewal survey

19.2.1 In addition to the requirements of annual survey, the class renewal survey is to include:

- load tests in accordance with the pipe laying equipment testing program.

Chapter 4

Replace Section 9:

SECTION 9 GAS-FUELLED SHIPS

1 General

1.1 Application

1.1.1 The requirements of this Section apply to all self-propelled ships, other than those covered by Ch 4, Sec 5, which utilize gas or other low flash points fuels as a fuel for propulsion prime mover/auxiliary power generation arrangements and associated systems, or which have been assigned one of the following additional service features:

- **gasfuel**
- **dualfuel**

1.1.2 These requirements are in addition to those laid down in Ch 3, Sec 1, [3.2.1], Ch 3, Sec 3, [3.1.1], Ch 3, Sec 3, [3.2.3], and Ch 3, Sec 6 as applicable.

These survey requirements do not cover fire protection, fire-fighting installation, and personnel protection equipment.

2 Annual survey - Hull items

2.1 General

2.1.1 The following requirements are to be verified during the survey of the fuel storage, fuel bunkering system and fuel supply system.

2.1.2 The logbooks and operating records are to be examined with regard to correct functioning of the gas detection systems, fuel supply/gas systems, etc. The hours per day of the reliquefaction plant, gas combustion unit, as applicable, the boil-off rate, and nitrogen consumption (for membrane containment systems) are to be considered together with gas detection records.

2.1.3 The manufacturer/builder instructions and manuals covering the operations, safety and maintenance requirements and occupational health hazards relevant to fuel storage, fuel bunkering, and fuel supply and associated systems for the used of the fuel, are to be confirmed as being aboard the vessel.

2.2 Gas related spaces, fuel preparation and handling rooms and piping

2.2.1 The survey is to include:

- examination of portable and fixed drip trays and insulation for the protection of the ship's structure in the event of a leakage
- examination of electrical bonding arrangements in hazardous areas, including bonded straps where fitted.

2.3 Fuel storage, bunkering and supply systems

2.3.1 The following requirements are to be examined, so far as applicable. Insulation need not to be removed, but any deterioration or evidence of dampness is to be investigated.

2.3.2 For fuel storage, the survey is to include:

- external examination of the storage tanks including secondary barrier if fitted and accessible
- general examination of the fuel storage hold place
- internal examination of tank connection space
- external examination of tank and relief valves
- verification of satisfactory operation of tank monitoring system
- examination and testing of installed bilge alarms and means of drainage of the compartment
- testing of the remote and local closing of the installed main tank valve.

2.3.3 For fuel bunkering system, the survey is to include:

- examination of bunkering stations and the fuel bunkering system
- verification of the satisfactory operation of the fuel bunkering control, monitoring and shutdown systems.

2.3.4 For fuel supply system, during working condition as far as practicable, the survey is to include:

- verification of the satisfactory operation of the fuel supply system control, monitoring and shutdown systems
- testing of the remote and local closing of the master fuel valve for each engine compartment.

3 Annual survey - Gas fuel machinery items

3.1 Control, monitoring and safety systems

3.1.1 The survey is to include:

- confirmation that gas detection and other leakage detection equipment in compartments containing fuel storage, fuel bunkering, and fuel supply equipment or components or associated systems, including indicators and alarms are in satisfactory operating condition
- verification that recalibration of the gas detection systems is done in accordance with the manufacturer's recommendations.
- verification of the satisfactory operation of the control, monitoring and automatic shutdown systems as far as practicable of the fuel supply and bunkering systems
- operational test, as far as practicable, of the shutdown of ESD protected machinery spaces.

3.2 Fuel handling piping, machinery and equipment

3.2.1 The survey is to include:

- examination, as far as practicable, of piping, hoses, emergency shutdown valves, relief valves, machinery and equipment for fuel storage, fuel bunkering, and fuel supply such as venting, compressing, refrigerating, liquefying, heating, cooling or otherwise handling the fuel
- examination of the means for inerting
- confirmation, as far as practicable, of the stopping of pumps and compressors upon emergency shutdown of the system.

3.3 Ventilating systems

3.3.1 The survey is to include:

- examination of the ventilation system, including portable ventilating equipment where fitted, is to be made for spaces containing fuel storage, fuel bunkering, and fuel supply units or components or associated systems, including air locks, pump rooms, compressor rooms, fuel preparation rooms, fuel valve rooms, control rooms and spaces containing gas burning equipment
- operational test, as far as practicable, of alarms, such as differential pressure and loss of pressure, where fitted.

3.4 Hazardous areas

3.4.1 The survey is to include:

- examination of electrical equipment and bulkhead/deck penetrations including access openings in hazardous areas, for continued suitability for their intended service and installation area.

4 Intermediate survey

4.1 General

4.1.1 In addition to the applicable requirements of the annual surveys, the intermediate survey is also to include:

- random test of gas detectors, temperature sensors, pressure sensors, level indicators, and other equipment providing input to the fuel safety system, to confirm their satisfactory operating condition
- verification of the proper response of the fuel safety system upon fault conditions.

5 Class renewal survey - Hull items

5.1 General

5.1.1 The class renewal survey is to include, in addition to the requirements of the annual surveys, examinations, tests and checks of sufficient extent to ensure that the fuel installations are in satisfactory condition and fit for intended purpose for the new period of class to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

5.2 Fuel handling and piping

5.2.1 All piping for fuel storage, fuel bunkering, and fuel supply such as venting, compressing, refrigerating, liquefying, heating, storing, burning or otherwise handling the fuel and liquid nitrogen installations are to be examined.

5.2.2 Removal of insulation from the piping and opening for examination may be required.

5.2.3 Where deemed suspect, a hydrostatic test to 1,25 times the maximum allowable relief valve setting (MARVS) for the pipeline is to be carried out.

5.2.4 After reassembly, the complete piping is to be tested for leaks.

5.2.5 Where water cannot be tolerated and the piping cannot be dried prior to putting the system into service, the surveyor may accept alternative fluids or alternative means of testing.

5.3 Fuel valves

5.3.1 All emergency shutdown valves, check valves, block and bleed valves, master gas valves, remote operating valves, isolating valves for pressure relief valves in the fuel storage, fuel bunkering, and fuel supply piping systems are to be examined and proven operable.

5.3.2 A random selection of valves is to be opened for examination.

5.4 Pressure relief valves

5.4.1 Fuel storage tank pressure relief valves

The survey is to include:

- opening for examination, adjustment and function test of the pressure relief valves for the fuel storage tanks
- if the tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, replacement of such non-metallic membranes.

5.4.2 Fuel supply and bunkering piping pressure relief valves

The survey is to include:

- opening for examination, adjustment and function test of a random selection of pressure relief valves for the fuel supply and bunkering piping
- where a proper record of continuous overhaul and retesting of individually identifiable relief valves is maintained, consideration will be given to acceptance on the basis of opening, internal examination, and testing of a representative sampling of valves, including each size and type of liquefied gas or vapor relief valve in use, provided there is logbook evidence that the remaining valves have been overhauled and tested since crediting the previous class renewal survey.

5.4.3 Pressure/vacuum relief valves

The survey is to include:

- opening, examination, test and readjustment as necessary, depending on their design, of the pressure/vacuum relief valves, rupture disc and other pressure relief devices for interbarrier spaces and hold spaces.

5.5 Fuel storage tanks

5.5.1 Fuel storage tanks are to be examined in accordance with an approved survey plan.

5.5.2 Liquefied gas fuel storage tanks are to be examined based on a survey/inspection plan, in which requirements for the survey of liquefied gas fuel containment systems are to be in accordance with the requirements laid down in Ch 4, Sec 5, [6.7] and Ch 4, Sec 5, [6.8.4], except as noted below:

- the tank insulation and tank support arrangements shall be visually examined. Non-destructive testing may be required if conditions raise doubt to the structural integrity
- vacuum insulated independent fuel storage tanks of type C need not be examined internally. Where fitted, the vacuum monitoring system shall be examined and records should be reviewed.

6 Class renewal survey - Gas fuel machinery items

6.1 Fuel handling equipment

6.1.1 Fuel pumps, compressors, process pressure vessels, inert gas generators, heat exchangers and other components used in connection with fuel handling are to be examined according to the requirement of Part A, Chapter 3 or Ch 4, Sec 3, [7.3], as applicable.

6.2 Electrical equipment

6.2.1 The survey is to include:

- examination of electrical equipment to include the physical condition of electrical cables and supports, intrinsically safe, explosion proof, or increased features of electrical equipment
- function testing of pressurized equipment and associated alarms
- testing of systems for de-energizing electrical equipment which is not certified for use in hazardous areas
- electrical insulation resistance test of the circuit terminating in, or passing through, the hazardous zones and spaces is to be carried out.

6.3 Safety systems

6.3.1 Gas detectors, temperature sensors, pressure sensors, level indicators, and other equipment providing input to the fuel safety system are to be tested to confirm satisfactory operating condition.

6.3.2 Proper response of the fuel safety system upon fault conditions is to be verified.

6.3.3 Pressure, temperature and level indicating equipment are to be calibrated in accordance with the manufacturer's requirements.

Ch 5, Sec 1, Table 1

*Add in the last row "Other notations", the additional class notation "**ELECTRIC HYBRID**".*

Ch 5, Sec 10, [1.1.1]

*Add the additional class notation "**ELECTRIC HYBRID**" in the list.*

Ch 5, Sec 10, [5.1.2]

Add the following items at the end of the bulleted list:

- confirmation that the DP system has been maintained in accordance with applicable parts of the Rules and is found in good working condition
- test of all important systems and components to document the ability of the DP vessel to keep position after single failures associated with the assigned equipment class and to validate the FMEA and operations manual
- verification that DP system tests carried out and results are recorded and kept on board.

Ch 5, Sec 10, [5.1]

Add the following new requirement [5.1.3]:

5.1.3 Every time a defect is discovered and corrected or an accident occurs which affects the safety of the DP vessel, or whenever significant repairs of alterations are made, a survey is to be carried out.

After such survey, tests are to be carried out to demonstrate full compliance with the applicable provisions of the Rules, as necessary.

The type of tests carried out and results are to be recorded and kept on board.

Ch 5, Sec 10, [5.2.6]

Replace the first paragraph:

5.2.6 A complete test of all systems and components and the ability to keep position after single failures associated with the assigned equipment class is to be carried out. The type of tests carried out and results should be recorded and kept on board. The operational tests are to include:

Ch 5, Sec 10, [17.1.1]

Replace the second item of the bulleted list:

- **CBRN-WASHDOWN**

Ch 5, Sec 10, [17.3.2]

Replace the last item of the bulleted list:

- For ships assigned with the additional class notation **CBRN-WASHDOWN**, functioning test of the pre-wet ing and wash down system, including verification that all external surfaces are properly covered, verification of water drainage and verification of section valve remote operation.

Ch 5, Sec 10

Add the following new Article [18]:

18 ELECTRIC HYBRID

18.1 General

18.1.1 The requirements of this Article apply to ships which have been assigned the additional class notation **ELECTRIC HYDBRID** as defined in Ch 1, Sec 2, [6.14.41].

18.2 Annual survey

18.2.1 The survey is to include:

- verification of proper working of monitoring systems
- verification of proper working of alarms and defaults and related functions and/or interfacing to the other ship systems
- disconnection of the ESS in different operating modes, and automatic start of stand by source, as necessary
- test of the fire detection of the battery compartment
- test of the gas detection system of the battery compartment
- examination of the fire-extinguishing system of the battery compartment as applicable in accordance with the relevant requirements given in Ch 3, Sec 1, [3.4]
- verification that accessibility for common maintenance and devices for battery overhaul, if any, are maintained.

18.2.2 In addition to the requirements [18.2.1], for **PM** mode, the survey is to include:

- increasing load steps, as far as practicable. The ESS is to deliver power to the grid, to compensate for the load steps. In case of continuous load, the load is to be gradually transferred to the running diesel engine. The load is to be shared equally between the diesel engines (see Pt C, Ch 2, Sec 4, [2.2.5])
- additional increasing load steps, with load dependant start of a stand-by main generating set activated, as far as practicable.

18.2.3 In addition to the requirements of [18.2.1], for **PB** mode, the survey is to include:

- failure of one generator and automatic connection of the ESS
- failure of one generator and ESS autonomy measurement (starting of the stand by generator is blocked)
- automatic start of a stand by source in case of failure of the ESS or low state of charge of the ESS.

18.2.4 In addition to the requirements of [18.2.1], for **ZE** mode, the survey is to include:

automatic start of a stand by source in case of failure of the ESS or low state of charge of the ESS.

18.3 Class renewal survey

18.3.1 In addition to the requirements given in [18.2.1] for annual survey the following requirements are to be complied with:

- verification of the quality of the power supply in the different modes
- examination of the fire-extinguishing system as applicable in accordance with the relevant requirements given in Ch 3, Sec 3, [3.8].

18.3.2 In addition to the requirements of [18.3.1], for **PM** mode, the survey is to include:

confirmation of the capacity of the batteries by verification of the proper operation of the ESS during 6 hours at least in normal working condition ; however, where proper record is maintained, consideration may be given to accepting recent records effected by the ship's personnel. The ESS state of charge is not to be less than 80% at the end of the 6 hours period. A load analysis curve corresponding to this period is to be submitted for information. This document is to detail the total electrical production on board, the main generating sets electrical production and the ESS electrical production (with charging and discharging cycles).

18.3.3 In addition to the requirements of [18.3.1], for **ZE** mode, the survey is to include:

load discharge test with ESS autonomy measurement up to ESS state of charge low level.

Amendments to PART B

Ch 2, Sec 3, [3.1.1]

Add service notation "self-unloading bulk carrier ESP," before "ore carrier ESP".

Ch 3, Sec 1, [1]

Replace sub-article [1.3]:

1.3 Application to ships having additional class notation STABLIFT

1.3.1 Ships having additional class notation **STABLIFT** are to comply, in addition to the applicable requirements of this Chapter, with the requirements of Pt E, Ch 8, Sec 3.

Ch 3, App 2, [1.2.5]

Add "self-unloading bulk carrier ESP," before "ore carrier ESP" in the 4th and 5th paragraphs.

Ch 3, App 3, [1.1.1]

Replace "L_S as defined in [1.2.4]" by "L_{LL} as defined in Ch 1, Sec 2, [3.2]".

Ch 4, Sec 3, [3.1]

Replace requirement [3.1.1]:

3.1.1 Stiffener not perpendicular to the attached plating

Where the stiffener is not perpendicular to the attached plating, the actual net section modulus w, in cm^3, and net shear area A_{sh}, in cm^2 may be obtained, from the following formula:

$w = w_0 \sin \varphi_w$

$A_{sh} = A_0 \sin \varphi_w$

where:

w_0 : Actual net section modulus, in cm^3, of the stiffener assumed to be perpendicular to the plating

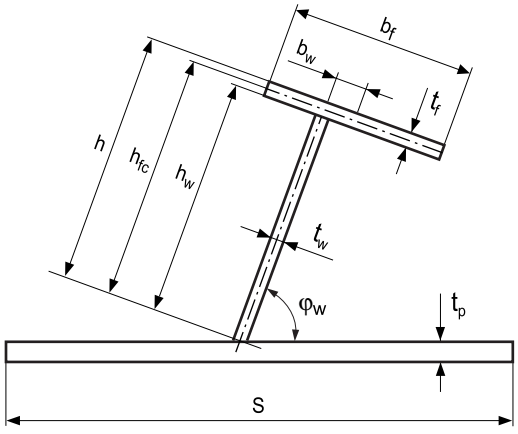
A_0 : Actual net shear area, in cm^3, of the stiffener assumed to be perpendicular to the plating

φ_w : Angle, in degree, between the attached plating and the web of the stiffener, measured at mid-span of the stiffener (see Fig A).

Ch 4, Sec 3

Insert Figure A:

Figure A: Dimensions of a built section



Ch 4, Sec 3 [3.4]

Replace requirement [3.4.3]:

3.4.3 Plastic section modulus

The actual net effective plastic section modulus Z_{pl} of a transverse or longitudinal ordinary stiffener, in cm^3, is given by the formula in item a) or item b), depending on:

- the cross-sectional area of the attached plate A_p
- the net cross-sectional area of the ordinary stiffener:
  $A_w' + A_f$

where:

A_p : Net cross-sectional area of the attached plate, in cm^2, taken equal to:

$$A_p = 10\, t_p\, s$$

A_f : Net cross-sectional area of the stiffener flange, in cm^2, taken equal to:

$$A_f = \frac{b_f\, t_f}{100}$$

A_w' : Net cross-sectional area of the stiffener web, in cm^2, taken equal to:

$$A_w' = \frac{h_w\, t_w}{100}$$

a) When $A_p \geq A_w' + A_f$, the plastic neutral axis PNA is assumed to be tangent to the uppermost edge of the attached plate.

$$Z_{pl} = \frac{A_p'\, x_p + A_w'\, x_w + A_f\, x_f}{10}$$

where:

A_p' : Net cross-sectional area of the stiffener, in cm^2, taken equal to:

$$A_p' = A_w' + A_f$$

x_p : Distance, in mm, between the centre of gravity of area A_p and PNA, taken equal to:

$$x_p = \text{Min}\left(\frac{A_w' + A_f}{20\, s}\, ;\, \frac{t_p}{2}\right)$$

x_w : Distance, in mm, between the centre of gravity of area A_w' and PNA, taken equal to:

$$x_w = \frac{h_w \sin\varphi_w}{2}$$

x_f : Distance, in mm, between the centre of gravity of area A_f and PNA, taken equal to:

$$x_f = h_{fc} \sin\varphi_w - b_w \cos\varphi_w$$

h_{fc} : Height, in mm, of the stiffener, measured up to the centre of the flange area, see Fig A

b_w : Distance, in mm, from the mid-thickness plane of the stiffener web to the centre of the flange area, see Fig A

φ_w : As defined in [3.1.1].

b) When $A_p < A_w' + A_f$ the plastic neutral axis PNA is located at a distance z_a above the attached plate, in mm, given by:

$$z_a = \frac{(100\, A_f + h_w\, t_w - 1000\, t_p\, s)\, \sin\varphi_w}{2\, t_w}$$

$$Z_{pl} = \frac{(A_p\, x_p + A_{wa}\, x_{wa} + A_{wb}\, x_{wb} + A_f\, x_f)}{10}$$

where:

x_p : Distance, in mm, between the centre of gravity of area A_p and PNA, taken equal to:

$$x_p = z_a + \frac{t_p}{2}$$

A_{wa} : Net cross-sectional area, in cm^2, of the part of the stiffener located above PNA, taken equal to:

$$A_{wa} = \left(h_w - \frac{z_a}{\sin\varphi_w}\right)\frac{t_w}{100}$$

x_{wa} : Distance, in mm, between the centre of gravity of area A_{wa} and PNA, taken equal to:

$$x_{wa} = \left(h_w - \frac{z_a}{\sin\varphi_w}\right)\frac{\sin\varphi_w}{2}$$

A_{wb} : Net cross-sectional area, in cm^2, of the part of ordinary stiffener located below the PNA, taken equal to:

$$A_{wb} = \frac{t_w\ z_a}{100\ \sin\varphi_w}$$

x_{wb} : Distance, in mm, between the centre of gravity of area A_{wb} and PNA, taken equal to:

$$x_{wb} = \frac{z_a}{2}$$

x_f : Distance, in mm, between the centre of gravity of area A_f and PNA, taken equal to:

$$x_f = h_{fc}\sin\varphi_w - b_w\cos\varphi_w - z_a$$

φ_w : As defined in [3.1.1].

Ch 5, Sec 1, [2.4.3]

Add "self-unloading bulk carrier ESP," before "ore carrier ESP" at the end of the requirement.

Ch 5, Sec 1, [2.5.2]

Replace "bulk carrier or bulk carrier ESP" by "bulk carrier, bulk carrier ESP or self-unloading bulk carrier ESP" in the 2nd paragraph

Ch 5, Sec 3, Table 3

Add ",self-unloading bulk carrier ESP" after "bulk carrier ESP".

Ch 5, Sec 5, [1]

Delete sub-article [1.2].

Ch 5, Sec 5, [2.1]

Delete requirement [2.1.2].

Ch 5, Sec 5

Add the following new Article [3]:

3 Exposed decks

3.1 Application

3.1.1 The pressures defined in [3.2] for exposed decks are to be considered independently of the pressures due to dry uniform cargoes, dry unit cargoes or wheeled cargoes, if any, as defined in Ch 5, Sec 6, [4], Ch 5, Sec 6, [5] and Ch 5, Sec 6, [6] respectively.

3.2 Sea pressures on exposed decks

3.2.1 Still water pressure

The still water pressure on exposed decks is to be taken equal to $10.\varphi_1.\varphi_2$, where φ_1 is defined in Tab 2 and φ_2 in Tab 4.

3.2.2 Green sea loads

The wave pressure on exposed decks due to green sea is obtained from the formulae in Tab 4 and Tab 5.

Ch 5, Sec 5

Add the following new Article [4]:

4 Sea chests

4.1 Design pressure

4.1.1 The pressure to be considered for the scantling of sea chests is the maximum between:

- sea pressure as calculated in Articles [1] and [2] for sides and bottom
- pressure defined by the designer to consider the hazard of an overpressure due to the inlet grating cleaning system, to be taken not less than 200 kN/m².

Ch 5, Sec 6, [4.1]

Replace requirement [4.1.2]:

4.1.2 Ships with the additional service feature heavycargo

For ships with the additional service feature **heavycargo [AREA1, X1 kN/m² - AREA2, X2 kN/m² - ....]** (see Pt A, Ch 1, Sec 2, [4.2.2]), the values of p_S, in kN/m², are to be specified by the Designer for each AREAi, according to [4.1.1], and introduced as Xi values in the above service feature.

Ch 5, Sec 6, Table 10

Replace the row "Still water":

Table 10 : Accommodation still water and inertial pressures

Ship condition	Load case	Still water pressure p_S and inertial pressure p_W, in kN/m²
Still water		The value of p_S is to be defined by the Designer, without being taken less than the values in Tab 11, depending on the type of the accommodation compartment.

Ch 5, Sec 6, Table 11

Rename Table 11 into "Minimum still water deck pressure in accommodation compartments".

Ch 5, Sec 6, Table 12

Replace the row "Still water" by:

Table 12: Machinery still water and inertial pressures

Ship condition	Load case	Still water pressure p_S and inertial pressure p_W , in kN/m²
Still water		The value of p_S is to be defined by the Designer, without being taken less than 10 kN/m².

Ch 5, Sec 6, Table 14

Add ",self-unloading bulk carrier ESP" after "bulk carrier ESP".

Ch 7, Sec 2, [4.4]

Delete requirement [4.4.2].

Ch 7, Sec 2

Delete Figure 6 and Figure 7.

Ch 7, Sec 3, [7.2]

Add the following new requirement [7.2.7]:

7.2.7 Contact pressure

At connexions between pillars and decks, it is to be checked that the contact pressure σ_C, in N/mm^2, is in compliance with the following formula:

$\sigma_C \leq 0,8\ R_{eH}$

where:

$$\sigma_C = 10\frac{F_A}{A_C}$$

with:

F_A : Compression axial load in the pillar, in kN

A_C : Contact area between the pillar and the deck structural members, in cm^2

R_{eH} : Smallest of the assembled elements yield stress, in N/mm^2.

Ch 7, Sec 4, Tab 4

Replace α definition in Note 1:

α : Angle, in degrees, between the horizontal plane and the surface of the hull structure to which the calculation point belongs

Ch 7, Sec 4, Table 9

Add "self-unloading bulk carrier ESP" after "bulk carrier ESP".

Ch 7, App 2, [2.1]

Replace the first paragraph of requirement [2.1.1] by:

2.1.1 For ships greater than 170 m in length, finite element models, built according to Ch 7, App 1, [3.4] or Ch 7, App 3, [2], are to be adopted in accordance with Ch 7, Sec 3, Tab 1.

Ch 7, App 2, [2.2.1]

Replace "200 m" by "170 m" in requirements [2.2.1].

Ch 8, Sec 2, [4.2.1]

Replace the P_{SI} formula:

$$P_{SI} = 100\frac{h_{SL}^2 - (z - T_1)^2}{T_{RZ}^2 \tan\beta}$$

Ch 8, Sec 2, [4.2.1]

Add C_W definition as follows:

C_W : Waterplane coefficient, as defined in Pt B, Ch 5, Sec 2, [3.3.1].

Ch 8, Sec 2, [6.5]

Replace requirement [6.5.1]:

6.5.1 In single screw ships, the thickness of the propeller shaft bossing, over the whole shaft bearing length and included in the propeller post, is to be not less than 60% of the thickness b required in [6.3.2] for bar propeller posts with a rectangular section.

Ch 8, Sec 6, [2.1.1]

Rename requirement [2.1.1] into "Design forces in intact ship conditions".

Ch 8, Sec 6, [2.1]

Add the following new requirement [2.1.2]:

2.1.2 Design pressure in damaged ship conditions

In damaged ship conditions, where doors are located partly or totally below the deepest equilibrium waterline, the scantlings of plating, ordinary stiffeners, primary supporting members and securing and supporting devices are to be obtained according to [3] and [4] considering the following external design pressures, in kN/m^2:

- points at or below the deepest equilibrium waterline:

  $p_S = \rho\, g\, d_F$

  $p_W = 0{,}6\, \rho g h_1 e^{\frac{-2\pi(d_F)}{L}}$

- points above the deepest equilibrium waterline:

  $p_S = 0$

  $p_W = 0{,}6\, \rho\, g\, (h_1 - d_F)$, without being taken less than 0.

where:

d_F : Distance, in m, from the calculation point to the deepest equilibrium waterline.

The deepest equilibrium waterlines are to be provided by the Designer under his own responsibility.

h_1 : Reference values of the ship relative motions in the upright ship condition, defined in Ch 5, Sec 3, [3.3]

Note: flooding partial safety factors are to be considered for plating and ordinary stiffeners assessment.

Ch 8, Sec 6, [3.3.3]

Replace the first paragraph:

3.3.3 Scantlings of primary supporting members are generally to be verified through direct strength calculations on the basis of the design forces in [2] and the strength criteria in Ch 8, Sec 5, [5.1.1] and Ch 8, Sec 5, [5.1.2].

Ch 8, Sec 6, [4.2.1]

Replace reference to "Ch 8, Sec 5, [6.1.1]" by "Ch 8, Sec 5, [5.1.1]".

Ch 8, Sec 6, [4.2]

Replace the requirement [4.2.3]:

4.2.3 The arrangement of securing and supporting devices in way of these securing devices is to be designed with redundancy so that, in the event of failure of any single securing or supporting device, the remaining devices are capable of withstanding the reaction forces without exceeding by more than 20% the allowable stresses defined in [5.1.1] for normal or damaged conditions.

Ch 8, Sec 6, [5.1.1]

Add the following paragraph at the end of the requirement:

In case of damaged ship conditions assessment, the above allowable stresses are to be increased by 20%.

Ch 8, Sec 9, [1.8.3]

Replace in the second paragraph the reference to "NR 184: Rules for the construction and certification of lifting appliances" by "NR 526, Rules for the classification of lifting appliances onboard ships and offshore units".

Ch 8, Sec 10, [3.3]

Replace the requirement [3.3.2]:

3.3.2 Design loads

The design load is to be determined in accordance with the applicable requirements of Ch 8, Sec 4, [2].

In damaged ship conditions, where windows or sidescuttles are located below the deepest equilibrium waterline, the design pressure p, in kN/m^2, is to be taken equal to:

$p = p_S + p_W$

where:

p_S : Still water pressure, taken equal to:

$p_S = \rho\, g\, d_F$

p_W : Wave pressure, taken equal to:

$p_W = 0,6 \rho g h_1 e^{\frac{-2\pi(d_F)}{L}}$

d_F : Distance, in m, from the calculation point to the deepest equilibrium waterline.

The deepest equilibrium waterlines are to be provided by the Designer under his own responsibility.

h_1 : Reference values of the ship relative motions in the upright ship condition, defined in Ch 5, Sec 3, [3.3]

Ch 9, Sec 1, [5.3]

Replace the requirement [5.3.4]:

5.3.4 Lower rudder stock end

The lower rudder stock end is to be fitted with a threaded part having a core diameter, d_G, in mm, not less than (see Fig 4):

$d_G = 0,65\, d_U$

where:

d_U : Rudder stock diameter, in mm, as defined in Fig 4.

This threaded part is to be fitted with an adequate slogging nut efficiently locked in rotation.

The contact length t_i, in mm, of the rudder stock coupling cone inserted in the massive part (see Fig 4), deduction made of the chamfers and sealing ring grooves (oil grooves may be disregarded), is to be such that:

$t_i \geq 1,5\, d_U \sqrt{k_1}$

where:

k_1 : Material factor of the massive part.

When the foreseen contact surface ratio between the rudder stock and the massive part is greater than 70%, a lower t_i/d_U ratio may be accepted, on a case-by-case basis, provided that the contact percentage is proportionally higher, without however being taken less than 1,2.

The dimensions of the slogging nut are recommended to be as follows (see Fig 4):

- outer diameter: $d_N \geq \text{Max}\,(1,2\, d_0\,;\, 1,5\, d_G)$
- thickness: $t_N \geq 0,60\, d_G$

where:

d_0 : As defined in Fig 4.

These dimensions and the core diameter d_G of the lower rudder stock end are given for guidance only, the determination of the adequate scantlings being left to the Designer.

Ch 9, Sec 1, [10.1]

Replace the requirement [10.1.2]:

10.1.2 Nozzles normally consist of a double skin cylindrical structure stiffened by ring webs and other longitudinal webs placed perpendicular to the nozzle.

One of the ring webs is to be fitted in way of the axis of rotation of the nozzle.

Ch 9, Sec 1, [10.1]

Insert the following new requirement [10.1.3]:

10.1.3 The section modulus W_N, in cm^3, of the nozzle double skin profile (half nozzle cross section) around its neutral axis parallel to the center line, is not to be less than:

$$W_N = n\, d^2\, b\, V_{AV}^2$$

where:

d : Inner diameter of nozzle, in m

b : Length of nozzle, in m

n : Coefficient taken equal to:

- 1,0 for steering nozzles
- 0,7 for fixed nozzles.

Ch 11, Sec 1, [2.3]

Replace the requirement [2.3.8]:

2.3.8 Throat thickness of welds connecting ordinary stiffeners with primary supporting members

The throat thickness t_T of fillet welds connecting ordinary stiffeners and collar plates, if any, to the web of primary supporting members is to be not less than the value obtained, in mm, from the following formula:

$$t_T = \frac{4k(\gamma_{S2}p_S + \gamma_{W2}p_W)s\ell\left(1 - \frac{s}{2\ell}\right)(1 - k_1)}{u + v\left(\frac{c + 0{,}2d}{b + 0{,}2d}\right)}$$

without being taken less than the value obtained from the following formula:

$$t_T = 0{,}27\, f_{yd}\, t + 0{,}7\, g$$

where:

k : Material factor of the steel used, defined in Ch 4, Sec 1, [2.3]

p_S, p_W : Still water and wave pressure, respectively, in kN/m^2, acting on the ordinary stiffener, defined in Ch 7, Sec 2, [3.3.2]

γ_{S2}, γ_{W2} : Partial safety factors defined in Ch 7, Sec 2, [1.2.1]

k_1 : Coefficient depending on the connection of the primary supporting member web with the ordinary stiffener, taken equal to:

- $k_1 = 0$, when there is no primary supporting member web stiffener in way of the ordinary stiffener
- the value defined in Ch 4, Sec 3, [4.7.2], when there is a primary supporting member web stiffener in way of the ordinary stiffener

b,c,d,u,v: Main dimensions, in mm, of the cut-out shown in Fig 6. In case of different radius between the upper and the lower part, c is to be taken equal to the greatest one.

f_{yd} : Correction factor taking into account the yield strength of the weld deposit:

$$f_{yd} = \left(\frac{1}{k}\right)^{0,5}\left(\frac{235}{\sigma_{weld}}\right)^{0,75}$$

without being taken less than 0,707

σ_{weld} : Minimum yield stress of the weld deposit. σ_{weld} is not to be less than:

- 305 N/mm^2 for welding of normal strength steels
- 375 N/mm^2 for welding of higher strength steels having a yield strength from 265 to 355 N/mm^2
- 400 N/mm^2 for welding of higher strength steels having a yield strength of 390 N/mm^2

k : Material factor of the steel used, defined in Ch 4, Sec 1, [2.3]

t : Gross thickness, in mm, of the thinner plate in the considered assembly

g : Allowance for fillet weld gap, to be taken equal to 2 mm, unless otherwise specified.

Further requirements are specified in Ch 11, Sec 2.

Ch 11, Sec 2, [2.5.1]

Add ",self-unloading bulk carrier ESP" after "bulk carrier ESP".

Chapter 11

Replace Section 3:

SECTION 3 TESTING

1 Testing procedures of watertight compartments

1.1 Application

1.1.1 These test procedures are to confirm the watertightness of tanks and watertight boundaries, and the structural adequacy of tanks forming a part of the watertight subdivisions of ships. These procedures may also be applied to verify the weathertightness of structures and shipboard outfitting.

The tightness of all tanks and watertight boundaries of ships during new construction and ships relevant to major conversions or major repairs is to be confirmed by these test procedures prior to the delivery of the ships.

Note 1: Watertight subdivision means the transverse and longitudinal subdivisions of the ship required to satisfy the subdivision requirements of SOLAS Chapter II-1.

Note 2: Major repair means a repair affecting structural integrity.

1.1.2 Testing procedures of watertight compartments for SOLAS Ships are to be carried out in accordance with requirements [1.4.1] to [1.9.1], unless:

a) the shipyard provides documentary evidence of the shipowner's agreement to a request to the Flag Administration for an exemption from the application of SOLAS Chapter II-1, Regulation 11, or for an equivalency agreeing that the content of [1.10] is equivalent to SOLAS Chapter II-1, Regulation 11; and

b) the above-mentioned exemption/equivalency has been granted by the responsible Flag Administration.

1.1.3 All gravity tanks and other boundaries required to be watertight or weathertight are to be tested in accordance with these procedures and proven tight and structurally adequate as follows:

- gravity tanks for their tightness and structural adequacy
- watertight boundaries other than tank boundaries for their watertightness
- weathertight boundaries for their weathertightness.

Note 1: Gravity tank means a tank that is subject to vapour pressure not greater than 70 kPa.

1.1.4 Testing of structures not listed in Tab 2 or Tab 3 is to be specially considered by the Society.

1.2 General

1.2.1 Tests are to be carried out in the presence of a Surveyor at a stage sufficiently close to the completion of work, with all the hatches, doors, windows, etc., installed and all the penetrations including pipe connections fitted, and before any ceiling and cement work is applied over the joints. Specific test requirements are given in [1.6] and Tab 2. For the timing of the application of coating and the provision of safe access to joints, see [1.7], [1.8] and Tab 4.

1.3 Definitions

1.3.1 Structural test

A structural test is a test to verify the structural adequacy of tank construction. This may be a hydrostatic test or, where the situation warrants, a hydropneumatic test.

1.3.2 Leak test

A leak test is a test to verify the tightness of a boundary. Unless a specific test is indicated, this may be a hydrostatic/hydropneumatic test or an air test. A hose test may be considered to be an acceptable form of leak test for certain boundaries, as indicated by footnote **(3)** of Tab 2.

1.3.3 Each type of structural and leak test is defined in Tab 1.

1.4 Structural test procedures

1.4.1 Type and time of test

Where a structural test is specified in Tab 2 and Tab 3, a hydrostatic test in accordance with [1.6.1] is acceptable. Where practical limitations (strength of building berth, light density of liquid, etc.) prevent the performance of a hydrostatic test, a hydropneumatic test in accordance with [1.6.2] may be accepted instead.

A hydrostatic or hydropneumatic test for the confirmation of structural adequacy may be carried out while the ship is afloat, provided the results of a leak test are confirmed to be satisfactory before the ship is set afloat.

1.4.2 Testing schedule for new construction and major structural conversion or repair

a) tanks which are intended to hold liquids, and which form part of the watertight subdivision of the ship, shall be tested for tightness and structural strength as indicated in Tab 2 and Tab 3

b) tank boundaries are to be tested from at least one side. The tanks for the structural test are to be selected so that all the representative structural members are tested for the expected tension and compression

c) watertight boundaries of spaces other than tanks may be exempted from the structural test, provided that the boundary watertightness of the exempted spaces is verified by leak tests and inspections. The tank structural test is to be carried out and the requirements from item a) to item b) are to be applied for ballast holds, chain lockers, and for a representative cargo hold in case of cargo holds intended for in-port ballasting

d) tanks which do not form part of the watertight subdivision of the ship, may be exempted from structural testing provided that the boundary watertightness of the exempted spaces is verified by leak tests and inspections.

1.5 Leak test procedures

1.5.1 For the leak tests specified in Tab 2, tank air tests, compressed air fillet weld tests and vacuum box tests, in accordance respectively with [1.6.3], [1.6.5] and [1.6.6], or their combinations, are acceptable. Hydrostatic or hydropneumatic tests may be also accepted as leak tests, provided [1.7], [1.8] and [1.9] are complied with. Hose tests, in accordance with [1.6.3], are also acceptable for items 14 to 17 referred to in Tab 2, taking footnote **(3)** into account.

1.5.2 Air tests of joints may be carried out at the block stage, provided that all work on the block that may affect the tightness of a joint is completed before the test. The application of the leak test for each type of welded joint is specified in Tab 4. See also [1.7.1] for the application of final coatings, [1.8] for the safe access to joints, and Tab 4 for the summary.

1.6 Test methods

1.6.1 Hydrostatic test

Unless another liquid is approved, hydrostatic tests are to consist in filling the space with fresh water or sea water, whichever is appropriate for testing, to the level specified in Tab 2 or Tab 3. See also [1.9].

In case where a tank is intended for cargoes having a density higher than the density of the liquid used for the test, the testing pressure height is to be adjusted is to simulate the actual loading as far as practicable.

All the external surfaces of the tested space are to be examined for structural distortion, bulging and buckling, any other related damage, and leaks.

1.6.2 Hydropneumatic test

Hydropneumatic tests, where approved, are to be such that the test condition, in conjunction with the approved liquid level and supplemental air pressure, simulates the actual loading as far as practicable. The requirements and recommendations in [1.6.4] for tank air tests apply also to hydropneumatic tests. See also [1.9].

All the external surfaces of the tested space are to be examined for structural distortion, bulging and buckling, any other related damage, and leaks.

1.6.3 Hose test

Hose tests are to be carried out with the pressure in the hose nozzle maintained at least at $2 \cdot 10^5$ Pa during the test. The nozzle is to have a minimum inside diameter of 12 mm and to be at a perpendicular distance from the joint not exceeding 1,5 m. The water jet is to impinge upon the weld.

Where a hose test is not practical because of possible damage to machinery, electrical equipment insulation, or outfitting items, it may be replaced by a careful visual examination of the welded connections, supported where necessary by means such as a dye penetrant test or an ultrasonic leak test, or equivalent.

1.6.4 Tank air test

All boundary welds, erection joints and penetrations including pipe connections are to be examined in accordance with approved procedures and under a stabilized pressure differential above atmospheric pressure not less than $0{,}15 \cdot 10^5$ Pa, with a leak-indicating solution (such as soapy water/detergent or a proprietary solution) applied.

A U-tube having a height sufficient to hold a head of water corresponding to the required test pressure is to be arranged. The cross-sectional area of the U-tube is not to be less than that of the pipe supplying air to the tank. Arrangements involving the use of two calibrated pressure gauges to verify the required test pressure may be accepted taking into account the provisions in F5.1 and F7.4 of IACS Recommendation 140, "Recommendation for Safe Precautions during Survey and Testing of Pressurized Systems".

A double inspection of the tested welds is to be carried out. The first inspection is to be made immediately upon application of the leak indication solution; the second one is to be made approximately four or five minutes after, in order to detect those smaller leaks which may take time to appear.

1.6.5 Compressed air fillet weld test

In this air test, compressed air is injected from one end of a fillet welded joint, and the pressure verified at the other end of the joint by a pressure gauge. Pressure gauges are to be arranged so that an air pressure of at least $0{,}15 \cdot 10^5$ Pa can be verified at each end of any passage within the portion being tested.

Note 1: Where a leak test is required for fabrication involving partial penetration welds, a compressed air test is also to be carried out in the same manner as to fillet weld where the root face is large, i.e. 6-8 mm.

1.6.6 Vacuum box test

A box (vacuum testing box) with air connections, gauges and an inspection window is placed over the joint with a leak-indicating solution applied to the weld cap vicinity. The air within the box is removed by an ejector to create a vacuum of $0{,}20 \cdot 10^5$ to $0{,}26 \cdot 10^5$ Pa inside the box.

1.6.7 Ultrasonic test

An ultrasonic echo transmitter is to be arranged on the inside of a compartment, and a receiver on the outside. The watertight/weathertight boundaries of the compartment are scanned with the receiver, in order to detect an ultrasonic leak indication. Any leakage in the sealing of the compartment is indicated at a location where sound is detectable by the receiver.

1.6.8 Penetration test

For the test of butt welds or other weld joints, a low surface tension liquid is applied on one side of a compartment boundary or a structural arrangement. If no liquid is detected on the opposite sides of the boundaries after the expiration of a defined period of time, this indicates tight-

ness of the boundaries. In certain cases, a developer solution may be painted or sprayed on the other side of the weld to aid leak detection.

1.6.9 Other test

Other methods of testing may be considered by the Society upon submission of full particulars prior to the commencement of the tests.

1.7 Application of coating

1.7.1 Final coating

For butt joints welded by means of an automatic process, the final coating may be applied at any time before completion of a leak test of the spaces bounded by the joints, provided that the welds have been visually inspected with care, to the satisfaction of the Surveyor.

The Surveyors reserve the right to require a leak test prior to the application of a final coating over automatic erection butt welds.

For all the other joints, the final coating is to be applied after the completion of the joint leak test. See also Tab 4.

1.7.2 Temporary coating

Any temporary coating which may conceal defects or leaks is to be applied at the same time as for a final coating (see [1.7.1]). This requirement does not apply to shop primers.

1.8 Safe access to joints

1.8.1 For leak tests, a safe access to all joints under examination is to be provided. See also Tab 4.

1.9 Hydrostatic or hydropneumatic tightness test

1.9.1 In cases where the hydrostatic or hydropneumatic tests are applied instead of a specific leak test, the examined boundaries are to be dew-free, otherwise small leaks are not visible.

1.10 Non-SOLAS ships and SOLAS Exemption/Equivalent Ships

1.10.1 Testing procedures are to be carried out in accordance with the requirements [1.4.1] to [1.9.1] in association with the following alternative procedures for [1.4.2] and alternative test requirements for Tab 2.

1.10.2 The tank boundaries are to be tested from at least one side. The tanks for structural test are to be selected so that all representative structural members are tested for the expected tension and compression.

1.10.3 Structural tests are to be carried out for at least one tank of a group of tanks having structural similarity (i.e. same design conditions, alike structural configurations with only minor localised differences determined to be acceptable by the attending Surveyor) on each vessel provided all other tanks are tested for leaks by an air test. The acceptance of leak testing using an air test instead of a structural test does not apply to cargo space boundaries adjacent to other compartments in tankers and combination carriers or to the boundaries of tanks for segregated cargoes or pollutant cargoes in other types of ships.

1.10.4 Additional tanks may require structural testing if found necessary after the structural testing of the first tank.

1.10.5 Where the structural adequacy of the tanks of a vessel were verified by the structural testing required in Tab 2, subsequent vessels in the series (i.e. sister ships built from the same plans at the same shipyard) may be exempted from structural testing of tanks, provided that:

a) water-tightness of boundaries of all tanks is verified by leak tests and thorough inspections are carried out.

b) structural testing is carried out for at least one tank of each type among all tanks of each sister vessel.

c) additional tanks may require structural testing if found necessary after the structural testing of the first tank or if deemed necessary by the attending Surveyor.

For cargo space boundaries adjacent to other compartments in tankers and combination carriers or boundaries of tanks for segregated cargoes or pollutant cargoes in other types of ships, the provisions of paragraph [1.10.3] shall apply in lieu of item b).

1.10.6 Sister ships built (i.e. keel laid) two years or more after the delivery of the last ship of the series, may be tested in accordance with [1.10.5] at the discretion of the Classification Society, provided that:

a) general workmanship has been maintained (i.e. there has been no discontinuity of shipbuilding or significant changes in the construction methodology or technology at the yard, shipyard personnel are appropriately qualified and demonstrate an adequate level of workmanship as determined by the Classification Society); and

b) an NDT plan is implemented and evaluated by the Classification Society for the tanks not subject to structural tests. Shipbuilding quality standards for the hull structure during new construction are to be reviewed and agreed during the kick-off meeting. Structural fabrication is to be carried out in accordance with IACS Recommendation 47, "Shipbuilding and Repair Quality Standard", or a recognised fabrication standard which has been accepted by the Classification Society prior to the commencement of fabrication/construction. The work is to be carried out in accordance with the Rules and under survey of the Classification Society.

2 Miscellaneous

2.1 Watertight decks, trunks, etc.

2.1.1 *After completion, a hose or flooding test is to be applied to watertight decks and a hose test to watertight trunks, tunnels and ventilators.*

2.2 Steering nozzles

2.2.1 Upon completion of manufacture, the nozzle is to be subjected to a leak test.

Table 1 : Types of test

Test types	Procedure
Hydrostatic test (leak and structural)	The space to be tested is filled with a liquid to a specified head
Hydropneumatic test (leak and structural)	Combination of a hydrostatic test and an air test, the space to be tested being partially filled with liquid and pressurized with air
Hose test (leak)	Tightness check of the joint to be tested by means of a jet of water, the joint being visible from the opposite side
Air test (leak)	Tightness check by means of an air pressure differential and a leak-indicating solution. It includes tank air tests and joint air tests, such as compressed air fillet weld tests and vacuum box tests
Compressed air fillet weld test (leak)	Air test of fillet welded tee joints, by means of a leak indicating solution applied on fillet welds
Vacuum box test (leak)	A box over a joint with a leak indicating solution applied on the welds. A vacuum is created inside the box to detect any leaks
Ultrasonic test (leak)	Tightness check of the sealing of closing devices such as hatch covers, by means of ultrasonic detection techniques
Penetration test (leak)	Check, by means of low surface tension liquids (i.e. dye penetrant test), that no visual dye penetrant indications of potential continuous leakages exist in the boundaries of a compartment

Table 2 : Test requirements for tanks and boundaries

Item	Tank or boundaries to be tested	Test type	Test head or pressure	Remarks
1	Double bottom tanks **(4)**	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)** • bulkhead deck	
2	Double bottom voids **(5)**	leak	See [1.6.4] to [1.6.6], as applicable	Including pump room double bottom and bunker tank protection double hull required by MARPOL Annex I
3	Double side tanks	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)** • bulkhead deck	
4	Double side voids	leak	See [1.6.4] to [1.6.6], as applicable	
5	Deep tanks other than those listed elsewhere in this Table	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)**	
6	Cargo oil tanks	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)** • top of tank plus setting of any pressure relief valve **(2)**	
7	Ballast holds of bulk carriers	leak and structural **(1)**	The greater of: • top of the overflow • top of cargo hatch coaming	
8	Peak tanks	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)**	After peak to be tested after installation of stern tube

Item	Tank or boundaries to be tested	Test type	Test head or pressure	Remarks
9	a) Fore peak spaces with equipment	leak	See [1.6.3] to [1.6.6], as applicable	
	b) Fore peak voids	leak	See [1.6.3] to [1.6.6], as applicable	
	c) Aft peak spaces with equipment	leak	See [1.6.3] to [1.6.6], as applicable	
	d) Aft peak voids	leak	See [1.6.4] to [1.6.6], as applicable	After peak to be tested after installation of stern tube
10	Cofferdams	leak	See [1.6.4] to [1.6.6], as applicable	
11	a) Watertight bulkheads	leak **(8)**	See [1.6.3] to [1.6.6], as applicable **(7)**	
	b) Superstructure end bulkheads	leak	See [1.6.3] to [1.6.6], as applicable	
12	Watertight doors below freeboard or bulkhead deck	leak **(6) (7)**	See [1.6.3] to [1.6.6], as applicable	
13	Double plate rudder blades	leak	See [1.6.4] to [1.6.6], as applicable	
14	Shaft tunnels clear of deep tanks	leak **(3)**	See [1.6.3] to [1.6.6], as applicable	
15	Shell doors	leak **(3)**	See [1.6.3] to [1.6.6], as applicable	
16	Weathertight hatch covers and closing appliances	leak **(3) (7)**	See [1.6.3] to [1.6.6], as applicable	Hatch covers closed by tarpaulins and battens excluded
17	Dual purpose tank/dry cargo hatch covers	leak **(3) (7)**	See [1.6.3] to [1.6.6], as applicable	In addition to the structural test in item 6 or item 7
18	Chain lockers	leak and structural	Head of water up to top of chain pipe	
19	L.O. sump tanks and other similar tanks/spaces under main engines	leak **(9)**	See [1.6.3] to [1.6.6], as applicable	
20	Ballast ducts	leak and structural **(1)**	The greater of: • ballast pump maximum pressure • setting of any pressure relief valve	
21	Fuel oil tanks	leak and structural **(1)**	The greater of: • top of the overflow • 2,4 m above top of tank **(2)** • top of tank plus setting of any pressure relief valve **(2)** • bulkhead deck	

(1) See [1.4.2], item b).

(2) The top of a tank is the deck forming the top of the tank, excluding any hatchways.

(3) Hose test may be also considered as a medium of the leak test. See [1.3.2].

(4) Including the tanks arranged in accordance with the provisions of Ch 2, Sec 2, [3.1.4].

(5) Including the duct keels and dry compartments arranged in accordance with the provisions of SOLAS, Regulations II-1/11.2 and II-1/9.4 respectively, and/or the oil fuel tank protection and pump room bottom protection arranged in accordance with the provisions of MARPOL Annex I, Chapter 3, Part A, Regulation 12A and Chapter 4, Part A, Regulation 22, respectively.

(6) Where watertightness of watertight doors has not been confirmed by a prototype test, a hydrostatic test (filling of the watertight spaces with water) is to be carried out. See SOLAS Regulation II-1/16.2 and MSC/Circ.1176.

(7) As an alternative to the hose test, other testing methods listed in [1.6.7] to [1.6.9] may be acceptable, subject to adequacy of such testing methods being verified. See SOLAS Regulation II-1/11.1. For watertight bulkheads (item 11 a)), alternatives to the hose test may be used only where the hose test is not practicable.

(8) A structural test (see [1.4.2]) is also to be carried out for a representative cargo hold in case of cargo holds intended for in-port ballasting. The filling level required for the structural test of such cargo holds is to be the maximum loading that will occur in-port, as indicated in the loading manual.

(9) Where L.O. sump tanks and other similar spaces under main engines intended to hold liquid form part of the watertight subdivision of the ship, they are to be tested as per the requirements of Item 5, Deep tanks other than those listed elsewhere in this table.

Table 3 : Additional test requirements for special service ships/tanks

Item	Type of ship/tank	Structure to be tested	Type of test	Test head or pressure	Remarks
1	Liquefied gas carriers	Integral tanks	leak and structural	See Pt D, Ch 9, Sec 4	
		Hull structure supporting membrane or semi-membrane tanks	See Pt D, Ch 9, Sec 4		
		Independent tanks type A			
		Independent tanks type B			
		Independent tanks type C			
2	Edible liquid tanks	Independent tanks	leak and structural **(1)**	The greater of: • top of the overflow • 0,9 m above top of tank **(2)**	
3	Chemical carriers	Integral or independent cargo tanks	leak and structural **(1)**	The greater of: • 2,4 m above top of tank **(2)** • top of tank plus setting of any pressure relief valve **(2)**	An appropriate additional head is to be considered where a cargo tank is designed for the carriage of cargoes with specific gravities greater than 1,0

(1) See [1.4.2], item b).

(2) Top of tank is deck forming the top of the tank excluding any hatchways.

Table 4 : Application of leak test, coating, and provision of safe access for the different types of welded joints

Type of welded joints		Leak test	Coating **(1)**		Safe access **(2)**	
			Before leak test	After leak test but before structural test	Leak test	Structural test
Butt	Automatic	not required	allowed **(3)**	not applicable	not required	not required
	Manual or semi-automatic **(4)**	required	not allowed	allowed	required	not required
Fillet	Boundary including penetrations	required	not allowed	allowed	required	not required

(1) Coating refers to internal (tank/hold) coating, where applied, and external (shell/deck) painting. It does not refer to shop primer.

(2) Temporary means of access for verification of the leak test.

(3) The condition applies provided that the welds have been visually inspected with care, to the satisfaction of the Surveyor.

(4) Flux Core Arc Welding (FCAW) semi-automatic butt welds need not be tested, provided careful visual inspections show continuous and uniform weld profile shape, free from repairs, and the results of NDT show no significant defects.

Amendments to PART C

CHAPTER 1

Ch 1, Sec 2, [4.3.3], item c) 4)

Replace reference to "[4.3.3]" by a reference to "item c) 3)".

Ch 1, Sec 10, [6.1]

Add the following new requirement [6.1.2]:

6.1.2 Application to ships having the additional service feature SPxxx or SPxxx-capable

Ships having the additional service feature **SPxxx** or **SPxxx-capable** are to comply, in addition to the applicable requirements of this article, with the requirements of Pt D, Ch 11, Sec 4, [1], considering special personnel as passengers.

Ch 1, Sec 10, [6.7.1]

Delete item c) of the alphanumeric list.

Ch 1, Sec 10, [6.12.1]

Add service notation "self-unloading bulk carrier ESP" before "ore carrier ESP".

Ch 1, Sec 10, [18.5.4]

Replace item c):

c) Storage and use of substances mentioned in IMDG Code

1) In case substances mentioned in IMDG Code are used in exhaust gas treatment systems, drainage and/or bilge pumping of compartments where such systems are located is to be separated from ship bilge system. Retention of potential leakages using coaming devices associated to spill kits is to be implemented. Drainage directly to the sea is to be avoided as far as possible.

2) Treatment products tanks are not to be contiguous with tanks containing sea water, fresh water, fuel, lubricating tanks. A ventilated cofferdam between treatment product tanks and above mentioned tanks is an acceptable solution. Necessity of ventilation is to be considered on case by case basis, with relevant risk analysis.

Treatment products tanks are not to be located in category A machinery spaces unless a specific risk analysis is submitted to the Society for approval.

Treatment products tanks when located adjacent to or within a compartment used for other purposes are to be surrounded by coamings delimitating space fitted with a high level alarm. Bilge system of this compartment may be connected to ship bilge system. In this case, arrangements are to be made to isolate remotely this bilge suction and an alternative fixed pumping system, remotely controlled, is to be installed in order to pump liquid contained in compartment bilge and inside area delimited by coamings to chemical substance to bunkering station.

3) For compartment containing treatment products tanks a risk analysis is to be provided, taking into account normal or abnormal operating conditions (failure, fluid

leakage, fire) regarding human health and damage to essential equipment contained in compartment.

4) Toxic or flammable product pipes, which, if damaged, would allow the product to escape from a tank, are to be fitted with a quick closing valve directly on the tank, capable of being closed from a safe position outside the compartment involved.

5) Overflow pipes of product tanks are to be led to a specific tank dedicated for one kind of product. If several treatment tanks exist for a same product, overflow tank may be common.

6) Sounding pipes and air pipes are to end in an open space above freeboard deck. Means in order to prevent water entry through these pipe ends in any circumstances are to be provided.

7) Filling systems for treatment products are to be located in places where no interference with other ship activities would happen. In case interference is unavoidable, risk analysis is to be provided in order to evaluate occurrence and level of danger for crew and passengers if any.

Filling systems are to fulfil same requirements as in [11.4.2]. Drainage of coamings if any and outlet of safety valves are to be led to a tank designed for that purpose.

8) In case substances covered by IEC standards 60092-502 or -506 are used, requirements regarding electric installations, dangerous areas and ventilation mentioned in these standards are to be applied and a specific risk analysis is to submitted.

9) Piping systems involved in process are not to pass through accommodations, control stations and service spaces.

10) Ventilation of compartments where treatment substances are stored or used somehow is to be separated from any ventilation systems. It has to be provided with mechanical means of ventilation. Common ventilation with other compartments may be accepted on case by case basis subject to risk analysis.

11) Additional requirements about retention of treatment water on board are to be fulfilled in case **CLEANSHIP** notation is granted.

Ch 1, Sec 10, [18.5.4]

Insert the following new item d):

d) Storage and use of SCR reductants

1) The following requirements apply to urea/water solutions.

For other reductants falling under the scope of IMDG Code like aqueous ammonia or anhydrous ammonia, following conditions should be fulfilled:

- It is to be demonstrated that the use of urea based reductant is not practicable and in case of the anhydrous ammonia, that the use of aqueous ammonia is not practicable either

  Note 1: It is reminded that use of anhydrous ammonia may need the agreement of the Flag Administration.
- A risk based analysis is to be provided regarding the loading, carriage and use of the product
- Requirements mentioned in item c) are to be fulfilled.

2) The storage tank is to be arranged so that any leakage will be contained and prevented from making contact with heated surfaces. All pipes or other tank penetrations are to be provided with manual closing valves attached to the tank. Tank and piping arrangements are to be approved.

3) The storage tank may be located in the engine room.

4) If a urea storage tank is installed in a closed compartment, the area is to be served by an effective mechanical supply and exhaust ventilation system providing not less than 6 air changes per hour which is independent from the ventilation system of accommodation, service spaces, or control stations. The ventilation system is to be capable of being controlled from outside the compartment and is to be maintained in operation continuously except when the storage tank is empty and has been thoroughly air purged. If the ventilation stops, an audible and visual alarm shall be provided outside the compartment adjacent to each point of entry and inside the compartment, together with a warning notice requiring the use of such ventilation.

Alternatively, where a urea storage tank is located within an engine room a separate ventilation system is not required when the general ventilation system for the space is arranged so as to provide an effective movement of air in the vicinity of the storage tank and is to be maintained in operation continuously except when the storage tank is empty and has been thoroughly air purged.

5) Each urea storage tank is to be provided with temperature and level monitoring arrangements. High and low level alarms together with high and low temperature alarms are also to be provided.

6) Where urea based ammonia solution is stored in integral tanks, these tanks are to be coated with appropriate anti-corrosion coating and cannot be located adjacent to any fuel oil and fresh water tank.

7) The reductant piping and venting systems are to be independent of other ship service piping and/or systems. Reductant piping systems are not to be located in accommodation, service spaces, or control stations. The vent pipes of the storage tank are to terminate in a safe location on the weather deck and the tank venting system is to be arranged to prevent entrance of water into the urea tank.

8) Urea storage tanks are to be arranged so that they can be emptied of urea, purged and vented.

Ch 1, Sec 11, [1.1.2]

Replace the bulleted list:

- as a passenger ship, when xxx is greater than 240
- as a cargo ship, when xxx is less than or equal to 240.

Ch 1, Sec 11, [2.3.1]

Add the following paragraph at the end of item b):

The two independent steering gear control systems are to be

- so arranged that a mechanical or electrical failure in one of them will not render the other one inoperative, and
- in accordance with [2.3.3]

Add the following Note 1 at the end of the requirement:

Note 1: The term "Steering gear control system" is to be understood to cover "the equipment required to control the steering gear power actuating system".

Ch 1, Sec 11, [2.3]

Add the following new requirement [2.3.3]:

2.3.3 Installation

a) Duplicated steering gear control systems with their associated components are to be separated as far as practicable.

b) Wires, terminals and the components for duplicated steering gear control systems installed in units, control boxes, switchboards or bridge consoles are to be separated as far as practicable.

Where physical separation is not practicable, separation may be achieved by means of a fire-retardant plate.

c) All electrical components of the steering gear control systems are to be duplicated. This does not require duplication of the steering wheel or steering lever.

d) If a joint steering mode selector switch (uniaxial switch) is employed for both steering gear control systems, the connections for the control systems are to be divided accordingly and separated from each other by an isolating plate or air gap.

e) In the case of double follow-up control, the amplifier is to be designed and fed so as to be electrically and mechanically separated. In the case of non-follow-up control and follow-up control, it is to be ensured that the follow-up amplifier is protected selectively.

f) Control circuits for additional control systems, e.g. steering lever or autopilot, are to be designed for all-pole disconnection.

g) The feedback units and limit switches, if any, for the steering gear control systems are to be separated electrically and mechanically connected to the rudder stock or actuator separately.

Ch 1, Sec 11, [2.4]

Add the following new requirement [2.4.6]

2.4.6 Additional requirements for ships of 70 000 gross tonnage and above

In ships of 70,000 gross tonnage and upwards, the main steering gear shall comprise two or more identical power units complying with the provisions of [2.4.2].

Ch 1, Sec 11, [2.7.7]

Rename the requirement [2.7.7] into "Installation".

Delete items c) to i).

CHAPTER 2

Ch 2, Sec 3, [2.3.21]

Delete "equal to or".

Ch 2, Sec 3, [3.4.4]

Delete "equal to or".

Ch 2, Sec 11, [6.5.2]

Add the following paragraph at the end of the requirement:

For natural ventilation, the available inlet and outlet duct free cross-sectional area S, in mm^2, is deemed sufficient provided it complies with following criteria:

$S \geq 2,8\ Q$

Otherwise, the dimensioning of the natural ventilation is to be considered on a case-by-case basis depending on the actual ducting arrangement. Detailed calculations may be required for this purpose.

Ch 2, Sec 12, [2.6]

Replace requirement [2.6.2]:

2.6.2 The connections are to be adequately close together and are to have a resistance less than 0,1 Ω.

CHAPTER 4

Ch 4, Sec 1, [2.3]

Replace requirement [2.3.2]:

2.3.2 Ships having the additional service feature **SPxxx** or **SPxxx-capable** are to comply with the requirements of this chapter, considering the ship:

- as a cargo ship, when xxx is not more than 60
- as a passenger ship carrying not more than 36 passengers, when xxx is not more than 240 but greater than 60
- as a passenger ship carrying more than 36 passengers, when xxx is greater than 240.

Ch 4, Sec 5, [1.3.4]

Add the following item g) at the end of the alphanumeric list:

g) A navigation locker that can only be accessed from the wheelhouse should be considered as a control station with respect to the provisions of Tab 3 and the bulkhead separating the wheelhouse and such a locker should have fire integrity of at least "B-0" class.

Ch 4, Sec 5, [1.4.3]

Add the following item d) at the end of the alphanumeric list:

d) A navigation locker that can only be accessed from the wheelhouse should be considered as a control station with respect to the provisions of Tab 5 and the bulkhead separating the wheelhouse and such a locker should have fire integrity of at least "B-0" class.

Ch 4, Sec 5, [1.5.2]

Add the following item i) at the end of the alphanumeric list:

i) A navigation locker that can only be accessed from the wheelhouse should be considered as a control station with respect to the requirements in Tab 7 and the bulkhead separating the wheelhouse and such a locker should have fire integrity of at least "B-0" class.

Ch 4, Sec 12, [5.1.2]

Add the following paragraph at the end of the requirement:

Such a water-based fire-fighting system shall have:

- *a pressure gauge on the valve manifold;*
- *clear marking on each manifold valve indicating the spaces served;*
- *instructions for maintenance and operation located in the valve room; and*
- *a sufficient number of drainage valves to ensure complete drainage of the system.*

Amendments to PART D

Ch 1, Sec 2, [5]

Delete sub-article [5.2].

Ch 7, Sec 1, [1.1.3]

Replace item b) of the alphanumeric list:

b) Departures from these requirements are given for ships that have the service notation **oil tanker-flash point > 60°C** and are intended only for the carriage of bulk cargoes at a temperature below and not within 15°C of their flash point.

Ch 7, Sec 2, [2.1]

Replace requirement [2.1.4]:

2.1.4 *Cargo pump rooms, cargo tanks, slop tanks and cofferdams are to be positioned forward of machinery spaces. However, oil fuel bunker tanks need not be forward of machinery spaces.*

Cargo tanks and slop tanks are to be isolated from machinery spaces by cofferdams, cargo pump rooms, oil bunker tanks or ballast tanks.

Pump-rooms containing pumps and their accessories for ballasting those spaces situated adjacent to cargo tanks and slop tanks and pumps for oil fuel transfer are to be considered as equivalent to a cargo pump room within the context of this article provided that such pump rooms have the same safety standard as that required for cargo pump rooms. Pump rooms intended solely for ballast or oil fuel transfer, however, need not comply with the requirements of Ch 7, Sec 6, [4.2].

The lower portion of the pump room may be recessed into machinery spaces of category A to accommodate pumps, provided that the deck head of the recess is in general not more than one third of the moulded depth above the keel, except that in the case of ships of not more than 25000 tonnes deadweight, where it can be demonstrated that for reasons of access and satisfactory piping arrangements this is impracticable, the Society may permit a recess in excess of such height, but not exceeding one half of the moulded depth above the keel.

Note 1: Pump rooms intended solely for ballast transfer need not comply with the requirements of Ch 7, Sec 4, [3.5.2]. The requirements of Ch 7, Sec 4, [3.5.2] are only applicable to the pump rooms, regardless of their location, where pumps for cargo, such as cargo pumps, stripping pumps, pumps for slop tanks, pumps for COW or similar pumps are provided.

"Similar pumps" includes pumps intended for transfer of fuel oil having a flashpoint of less than 60°C. Pump-rooms intended for transfer of fuel oil having a flashpoint of not less than 60°C need not comply with the requirements of Ch 7, Sec 4, [3.5.2].

Ch 7, Sec 2, [3.7]

Replace requirement [3.7.1]:

3.7.1 *Means are to be provided to keep deck spills away from the accommodation and service areas. This may be accomplished by providing a permanent continuous coaming of a height of at least 300mm, extending from side to side.*

Where gutter bars are installed on the weather decks of oil tankers in way of cargo manifolds and are extended aft as far as the aft bulkhead of superstructures for the purpose of containing cargo spills on deck during loading and discharge operations, the free surface effects caused by containment of a cargo spill during liquid transfer operations or of boarding seas while underway are to be considered with respect to the vessel's available margin of positive initial stability (GMo).

Where the gutter bars installed are higher than 300 mm, they are to be treated as bulwarks with freeing ports arranged in accordance with Pt B, Ch 8, Sec 10, [6] and provided with effective closures for use during loading and discharge operations. Attached closures are to be arranged in such a way that jamming is prevented while at sea, enabling the freeing ports to remain effective.

On ships without deck camber, or where the height of the installed gutter bars exceeds the camber, and for oil tankers having cargo tanks exceeding 60% of the vessel's maximum beam amidships regardless of gutter bar height, gutter bars may not be accepted without an assessment of the initial stability (GMo) for compliance with the relevant intact stability requirements taking into account the free surface effect caused by liquids contained by the gutter bars.

Ch 7, Sec 4, [3.5]

Replace requirement [3.5.2]:

3.5.2 Measures to prevent explosions

The provisions of [3.5.2] do not apply to ships having one of the following service notations:

- **oil tanker, flash point > 60°C**
- **oil tanker, asphalt carrier**
- **FLS tanker, flash point > 60°C**,

except where the cargo is carried at a temperature within 15°C of its flash point.

a) Where cargo pumps, ballast pumps and stripping pumps are driven by a machine which is located outside the cargo pump room, the following arrangements are to be made:

1) drive shafts are to be fitted with flexible couplings or other means suitable to compensate for any misalignment

2) the shaft bulkhead or deck penetration is to be fitted with a gas-tight gland of a type approved by the Society. The gland is to be efficiently lubricated from outside the pump room and so designed as to prevent overheating. The seal parts of the gland are to be of material that cannot initiate sparks. The glands are to be constructed and fitted in accordance with the relative rules for fittings attached to watertight bulkheads, and if a bellows piece is incorporated in the design, it should be pressure tested before fitting.

3) Temperature sensing devices are to be fitted for bulkhead shaft glands, bearings and pump casings. A continuous audibleand visual alarm signal shall be automatically effected in the cargo control room or the pump control station.

b) To discourage personnel from entering the cargo pump room when the ventilation is not in operation, the *lighting in the cargo pump room is to be interlocked with ventilation such that ventilation is to be in operation to energise the lighting.*

Failure of the ventilation system is not to cause the lighting to go out.

Where the lighting in cargo pump rooms can be commonly used as the emergency lighting, this lighting should be interlocked with the ventilation systems. However, this interlock should not prevent operation of the emergency lighting in case of loss of the main source of electrical power.

c) A system for continuously monitoring the concentration of hydrocarbon gases is to be fitted. Sampling points or detector heads are to be located in suitable positions in order that potentially dangerous leakages are readily detected. Sequential sampling is acceptable as long as it is dedicated for the pump room only, including exhaust ducts, and the sampling time is reasonably short. Detection positions are the zones where air circulation is reduced (e.g. recessed corners). *When the hydrocarbon gas concentration reaches a pre-set level, which shall not be higher than 10 per cent of the lower flammable limit (LFL), a continuous audible and visual alarm signal shall be automatically effected in the pump room, engine control room, cargo control room and navigation bridge to alert personnel to the potential hazard.*

d) All pump rooms are to be provided with bilge level monitoring devices together with appropriately located alarms or bilge high level alarms.

High liquid level in the bilges is to activate an audible and visual alarm in the cargo control room and on the navigation bridge.

Ch 7, Sec 4, [7.2]

Insert new requirement [7.2.1]:

7.2.1 *In every tanker of 10 000 gross tonnage and upwards, the main steering gear shall comprise two or more identical power units complying with the provisions of Pt C, Ch 1, Sec 11, [2.4.2].*

Replace item b) of the existing requirement [7.2.1]:

b) the main steering gear is to comprise either:

1) two independent and separate power actuating systems, each capable of meeting the requirements of Pt C, Ch 1, Sec 11, [2.2.1]; The two independent power actuating systems are to be so arranged that a mechanical or electrical failure in one of them will not render the other one inoperative, and be in accordance with Pt C, Ch 1, Sec 11, [2.3.3]. or

2) at least two identical power actuating systems which, acting simultaneously in normal operation, are to be capable of meeting the requirements of Pt C, Ch 1, Sec 11, [2.2.1]. Where necessary to comply with this requirement, interconnection of hydraulic power actuating systems is to be provided. Loss of hydraulic fluid from one system is to be capable of being detected and the defective system automatically isolated so that the other actuating system or systems remain(s) fully operational

Ch 7, Sec 4, [7.3.3], item a), 1)

Replace the reference to "Pt, C, Ch 1, Sec 11, [2.1.1]" by "Pt, C, Ch 1, Sec 11, [2.2.1]".

Ch 7, Sec 4, [7.3.4], item e), 1)

Replace the reference to "Pt, C, Ch 1, Sec 11, [2.1.1]" by "Pt, C, Ch 1, Sec 11, [2.2.1]".

Ch 7, Sec 6, [4.2]

Replace requirement [4.2.2]:

4.2.2 Design and arrangement of the fire-extinguishing system

a) Where required by [4.2.1], *each cargo pump-room is to be provided with one of the following fixed fire-extinguishing systems operated from a readily accessible position outside the pump-room. Cargo pump-rooms are to be provided with a system suitable for machinery spaces of category A.*

1) A carbon dioxide fire-extinguishing system complying with the provisions of Pt C, Ch 4, Sec 14, [4] and with the following:

- *the alarms giving audible warning of the release of fire-extinguishing medium are to be safe for use in a flammable cargo vapour/air mixture,*
- *a notice is to be exhibited at the controls stating that due to the electrostatic ignition hazard, the system is to be used only for fire extinguishing and not for inerting purposes.*

2) A high-expansion foam system complying with the provisions of Pt C, Ch 4, Sec 14, [5.2], provided that the foam concentrate supply is suitable for extinguishing fires involving the cargoes carried.

3) A fixed pressure water-spraying system complying with the provisions of Pt C, Ch 4, Sec 14, [6].

b) Where the extinguishing medium used in the cargo pump-room system is also used in systems serving other spaces, the quantity of medium provided or its delivery rate need not be more than the maximum required for the largest compartment.

Ch 8, Sec 3, [1.1]

Replace requirement [1.1.2]:

1.1.2 Chain lockers

IBC CODE REFERENCE: Ch 3, 3.1.2

The chain locker is to be arranged outside the hazardous areas defined in Ch 8, Sec 10 and at least 10 m measured horizontally from any vent outlet of a controlled tank venting system.

Ch 8, Sec 5, [2]

Replace sub-article [2.3]:

2.3 Non-destructive testing of welded joints

2.3.1

IBC CODE REFERENCE: Ch 5, 5.2.5

a) Butt welded joints of pipes and accessories are to be submitted to radiographic examination. A minimum of 10% of the welded joints are to be selected at random in agreement with the Surveyor. The selected joints are to be tested over their full length. The Surveyor may require to extend the number of joints to be tested depending on the results of the inspection.

b) All butt welded joints of pipes and accessories are to be submitted to liquid penetrant examination or equivalent method over their full length.

c) Relaxation of the above requirements may be considered by the Society on a case-by-case basis for pipes welded at workshops. However, this only applies to ships exclusively intended to carry cargoes with minor fire risk.

Ch 8, Sec 5, [7.2]

Rename sub-article [7.2] into "Inspection and testing"

Rename requirement [7.2.1] into "Testing of materials"

Replace requirement [7.2.2]:

7.2.2 Inspection of welded joints

Where required in Ch 8, Sec 5, Tab 2, welded joints are to be subjected to the examinations specified in Pt C, Ch 1, Sec 10, [3.6]the requirements of Pt C, Ch 1, Sec 10, [3.6.3] are not applicable for chemical carrier cargo piping and are to be replaced by those of Ch 8, Sec 5, [2.3.1]).

Replace requirement [7.2.5]:

7.2.5 Certification

Inspection, tests and certification requirements for cargo piping and other equipment fitted in the cargo area are given in Tab 2.

Ch 8, Sec 7, [1.1.3]

Replace "45°C" by "90°C".

Ch 9, Sec 4, [2.4.1]

Add the following Note 1:

Note 1: The "liquid level" given in Fig 1 is considered at the maximum allowable filling level in the cargo tank.

Ch 9, Sec 4, Table 5

Insert the Row "Fine mesh finite element model":

Table 5 : Type A primary supporting members - Resistance partial safety factor

Type of three dimensional model	Resistance partial safety factor γ_R	
	used with P_{IGC}	used for general case of yielding check **(1)**
Fine mesh finite element model	1,10	1,15

Ch 9, Sec 6, Table 4 and Table 5

Replace the Note 8 in Table 4 by:

Note 8: The impact test of austenitic stainless steel is required only for service temperature less than –105°C.

Replace the Note 6 in Table 5 by:

Note 6: The impact test of austenitic stainless steel is required only for service temperature less than –105°C.

Ch 9, Sec 8, [4.1.1], item b)

Insert the following Note 1 in the definition of A:

Note 1: L_{min}, for non-tapered tanks, is the smaller of the horizontal dimensions of the flat bottom of the tank. For tapered tanks, as would be used for the forward tank, L_{min} is the smaller of the length and the average width.

- For prismatic tanks whose distance between the flat bottom of the tank and bottom of the hold space is equal to or less than $L_{min}/10$, A is to be taken equal to the external surface area minus flat bottom surface area
- For prismatic tanks whose distance between the flat bottom of the tank and bottom of the hold space is greater than $L_{min}/10$, A is to be taken equal to the external surface area.

Ch 9, Sec 13, [3.1.2]

Replace reference to [3.1.1] by [2.1.1].

Ch 9, Sec 13, [3.1.6]

Insert the following Note 1 at the end of the requirement:

Note 1: The expression "each dry docking" is considered to be the survey of the outside of the ship's bottom required for the renewal of the Cargo Ship Safety Construction Certificate and or the Cargo Ship Safety Certificate.

Ch 9, Sec 13, [5.1.2]

Delete requirement [5.1.2].

Ch 9, Sec 13, [7.2]

Insert the following requirement [7.2.3]:

7.2.3 The temperatures are to be continuously recorded at regular intervals. Audible and visual alarms are to be automatically activated when the hull steel temperature approaches the lowest temperature for which the steel has been approved.

Ch 9, Sec 16, [1.1]

Add the following requirement [1.1.2]:

1.1.2 Liquefied gas carriers using LPG as fuel are to comply with the requirements of Article [9] and with NI 647 LPG-fuelled ships, as applicable.

Ch 9, App 1, [1.2.2]

Rename requirement [1.2.2] into "Accelerations for type C tanks".

Ch 9, App 1, [1.2]

Add the following new requirement [1.2.3]:

1.2.3 Accelerations for type A tanks

The inertial liquid pressure is to be calculated considering ship accelerations in the three directions.

The dimensionless acceleration a_β is to be obtained, for an arbitrary direction (β_X, β_Y), in accordance with Fig 1, in which the wave longitudinal, transverse and vertical accelerations a_X, a_Y and a_Z, respectively, are calculated from the formula in [1.2.1].

Note 1: For analysis based on three-dimensional models, several load cases are to be considered. For each load case, the pressures are to be calculated for each finite element of the tank boundary with a given direction (β_X, β_Y).

The choice and number of load cases considered is to be to the satisfaction of the Society with respect to maximising the inertial liquid pressure on each element of the tank boundary.

Ch 11, Sec 3, [6]

Delete sub-article [6.2].

Ch 11, Sec 5, [1]

Add the following sub-article [1.3]:

1.3 Flooding detection systems for passenger ships carrying 36 or more persons

1.3.1 *A flooding detection system for watertight spaces below the bulkhead deck is to be provided based on IMO MSC.1/Circ.1291.*

Ch 12, Sec 3, [6]

Delete sub-article [6.4].

Ch 12, Sec 4, [1]

Add the following sub-article [1.4]:

1.4 Flooding detection systems for passenger ships carrying 36 or more persons

1.4.1 *A flooding detection system for watertight spaces below the bulkhead deck is to be provided based on IMO MSC.1/Circ.1291.*

Ch 12, Sec 4, [3.4]

Insert the following new requirement [3.4.5]:

3.4.5 The minimum required degree of protection for socket outlets installed in vehicle spaces is IP56.

Ch 13, Sec 2

Replace the third Row "dredging over 15 miles from shore":

Table 1 : Coefficient n_D in dredging situation

Operating area	n_D	Associated H_S , in m		
		L ≤ 110 m	110 m < L ≤ 150 m	150 m < L ≤ 180 m
dredging over 15 miles from shore	1	$H_S \leq 2,5$	$H_S \leq 3,0$	$H_S \leq 3,5$

Ch 14, Sec 2

Delete Figure 1 and Figure 2.

Ch 14, Sec 2, [2]

Replace sub-article [2.2]:

2.2 Additional intact stability criteria for ships with service notation pontoon - crane

2.2.1 Ships assigned with the service notation **pontoon-crane** are to comply with the stability criteria during lifting operations specified in Pt E, Ch 8, Sec 3, in addition to those in [2.1].

Ch 14, Sec 2, [4.1]

Replace requirement [4.1.3]:

4.1.3 Ships with service notation pontoon - crane

For ships with the service notation **pontoon - crane** having length greater than 65 m, the hull girder strength is to be checked, when the lifting appliance is operated, in accordance with the requirements of Pt E, Ch 8, Sec 4.

Ch 14, Sec 2, [5.3]

Replace requirement [5.3.1]:

5.3.1 Structural assessment

The foundations of the lifting equipment, the devices for stowage during transit and the connecting bolts between the lifting equipment and the foundations are to comply with the requirements of Pt E, Ch 8, Sec 4.

Delete requirement [5.3.2].

Ch 15, Sec 3, [3]

Add sub-article [3.4]:

3.4 Arrangement for hull and superstructure openings

3.4.1 Door sills

The height of the sill of the doors is to be not less than:

- 600 mm above the working deck
- 300 mm above the deck of the lower tier of superstructures.

For doors protected from the direct impact of waves, except for those giving direct access to machinery spaces, the height of the sill may be taken not less than:

- 380 mm above the working deck
- 150 mm above the deck of the lower tier of superstructures.

Amendments to PART E

Ch 1, Sec 1

Replace Table 1:

Table 1 : Applicable requirements

Item		Greater than or equal to 500 GT	Less than 500 GT
Ship arrangement	L ≥ 90 m	• Part B	• NR566
	L < 90 m	• NR600	• NR566
Hull	L ≥ 90 m	• Part B • Ch 1, Sec 3	• Part B • Ch 1, Sec 3
	L < 90 m	• NR600	• NR600
Stability		• Part B • Ch 1, Sec 2	• NR566 • Ch 1, Sec 2
Machinery and cargo systems		• Part C	• NR566
Electrical installations		• Part C	• NR566
Automation		• Part C	• NR566
Fire protection, detection and extinction		• Part C	• NR566 • Article [3]
Note 1: NR566: Hull Arrangement, Stability and Systems for Ships less than 500 GT NR600: Hull Structure and Arrangement for the Classification of Cargo Ships less than 65 m and Non Cargo Ships less than 90 m.			

Ch 1, Sec 1

Add the following new Article [3]:

3 Fire safety

3.1 Suppression of fire

3.1.1 Fire pumps

For tugs assigned with the operating area notation **operating within 5 miles from shore**, the portable fire pump required in NR566, Ch 4, Sec 5, [2.2.3] may be omitted.

3.1.2 Fixed fire-extinguishing system

Tugs assigned with the operating area notation **operating within 5 miles from shore** may considered as ships of less than 12 m operating in **coastal area** or **sheltered area** according to NR566, Ch 4, Sec 5, [4.2].

Ch 1, Sec 2, [2.1]

Replace requirements [2.1.2] to [2.1.4]:

2.1.2 Additional intact stability criteria

All the loading conditions reported in the trim and stability booklet which are intended for towing operations are also to be checked in order to investigate the ship's capability to withstand the effect of the transverse heeling moments induced by the combined action of the towline force and the thrust vector (self-tripping, see [2.1.3]), and induced by the hydrodynamic resistance of the hull (tow-tripping, see [2.1.4]).

2.1.3 Self-tripping

A tug may be considered as having sufficient stability to withstand the self-tripping heeling moment if the following condition is complied with (see Fig 1):

$A \geq B$

where:

A : Area, in m·rad, contained between the righting arm and the heeling arm curves, measured from the heeling angle θ_C to the heeling angle θ_D

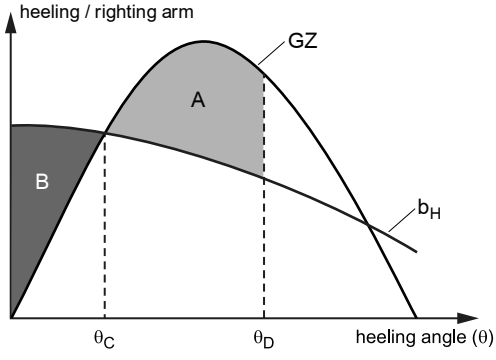
B : Area, in m.rad, contained between the heeling arm and the righting arm curves, measured from zero heel ($\theta = 0$) to the heeling angle θ_C

θ_C : Heeling angle of equilibrium, corresponding to the first intersection between heeling and righting arms curves

θ_D : Heeling angle, to be taken as the lesser of:

- heeling angle corresponding to the second intersection between heeling and righting arm curves
- the angle of downflooding.

Figure 1: Heeling and righting arms curves



The self-tripping heeling arm curve is to be calculated as follows:

$b_H = \Sigma b_{Hi}$

where:

b_{Hi} : Heeling arm induced by one thruster or group of thrusters i, in m, calculated as follows:

$$b_{Hi} = \frac{T_{BPi} c_i (h_i \cos\theta - r \sin\theta)}{9{,}81 \Delta}$$

T_{BPi} : Amount of thrust, in kN, generated by one thruster or group of thrusters i. The sum of all the individual thrusts is to be equal to the design Bollard Pull, as defined in Ch 1, Sec 1, [2.1].

h_i : Vertical distance, in m, between the towing point (fairlead, staple, towing hook or equivalent fitting) and the horizontal centreline of the propulsion unit or group of units i, as relevant for the considered towing situation

r : Transverse distance, in m, between the centreline and the towing point (fairlead, staple, towing hook or equivalent fitting), to be taken equal to zero when the towing point is fixed at the vessel's centreline.

c_i : Coefficient to be taken equal to:

- $c = 0{,}90 / (1 + d_i / L_{LL})$ for a group of 2 azimuthing thrusters, but is in no case to be taken less than:
  - 0,70 for ASD tugs towing over the stern and tractor tugs towing over the bow
  - 0,50 for ASD tugs towing over the bow and tractor tugs towing over the stern, respectively
- $c = 1 / (1 + d_i / L_{LL})$ for a single azimuthing thruster
- c = 0,50 for non-azimuth propulsion unit or group of units

Δ : Loading condition displacement, in tons

θ : Angle of heel, in degrees

d_i : Longitudinal distance, in m, between the towing point (fairlead, staple, towing hook or equivalent fitting) and the vertical centreline of the propulsion unit or group of units i, as relevant for the considered towing situation

L_{LL} : Load line length, in m, defined in Pt B, Ch 1, Sec 2, [3.2].

2.1.4 Tow-tripping

A tug may be considered as having sufficient stability to withstand the tow-tripping heeling moment if the first intersection between the righting arm curve and the tow-tripping heeling arm curve for tow-tripping occurs at an angle of heel less than the angle of downflooding.

The tow-tripping heeling arm curve is to be calculated as follows:

$$b_H = \frac{C_1 C_2 \gamma V^2 A_p (h \cos\theta - r \sin\theta + C_3 T)}{19{,}62 \Delta}$$

where:

C_1 : Lateral traction coefficient, taken equal to:

$$C_1 = 2{,}8\left(\frac{L_s}{L_{pp}} - 0{,}1\right)$$

without being taken lower than 0,1 and greater than 1

L_s : Longitudinal distance, in m, from the aft perpendicular to the towing point

L_{pp} : Length between perpendiculars, in m

C_2 : Angle of heel correction for C_1, taken equal to:

$$C_2 = \left(\frac{\theta}{3\theta_d} + 0{,}5\right)$$

without being taken lower than 1

θ_d : Angle to deck edge, in deg, taken equal to:

$$\theta_d = \text{atan}\left(\frac{2f}{B}\right)$$

f : Freeboard amidships, in m

γ : Specific water density, in t/m^3, to be taken equal to 1,025

V : Lateral velocity, in m/s, to be taken equal to 2,57 (5 knots)

A_p : Lateral projected area, in m^2, of the underwater hull

C_3 : Distance from the center of A_p to the waterline as a fraction of the draught related to the heeling angle, taken equal to:

$$C_3 = \left(\frac{\theta}{\theta_d}\right) 0,26 + 0,3$$

without being taken lower than 0,5 and greater than 0,83

T : Loading condition draught, in m

h : Vertical distance, in m, from the waterline to the towing point.

Ch 1, Sec 3

Replace Table 2:

Table 2 : Design loads for equipments used for towing operations and supporting structures

Service notation	Operating area notation	T_{BP}, in kN	DL, in kN
tug	**operating within 5 miles from shore**	$T_{BP} \leq 200$	$2\ T_{BP}$
		$200 < T_{BP} < 800$	$[(2600 - T_{BP}) / 1200]\ T_{BP}$
		$T_{BP} \geq 800$	$1,5\ T_{BP}$
tug / salvage tug / escort tug	–	$T_{BP} \leq 400$	$2,5\ T_{BP}$
		$400 < T_{BP} < 1000$	$[(3400 - T_{BP}) / 1200]\ T_{BP}$
		$T_{BP} \geq 1000$	$2\ T_{BP}$
Note 1: The DL takes into consideration dynamic effects through the application of the dynamic amplification factor (DAF) (see also Ch 1, Sec 1, [2.3]).			

Ch 1, Sec 3

Replace Table 3:

Table 3 : Design Loads for equipment used for escort operations and supporting structrures

$T_{ESC,MAX}$, in kN	DL, in kN	
	General case	Escort tugs assigned with the operating area notation **escort service limited to non-exposed waters**
≤ 500	$3\ T_{ESC,MAX}$	$2,4\ T_{ESC,MAX}$
$500 < T_{ESC,MAX} \leq 1000$	$[(2000 - T_{ESC,MAX}) / 500]\ T_{ESC,MAX}$	$[(2000 - T_{ESC,MAX}) / 625]\ T_{ESC,MAX}$
> 1000	$2\ T_{ESC,MAX}$	$1,6\ T_{ESC,MAX}$
Note 1: The DL takes into consideration dynamic effects through the application of the Dynamic Amplification Factor (DAF) (see also Ch 1, Sec 1, [2.3]).		

Ch 1, Sec 3, [2.6]

Replace requirement [2.6.2]:

2.6.2 Number of anchors

The number of anchors depends on the service notation and optional operating area notation, the propulsion arrangement and the application of a fixed fire-fighting installation. In general, the recommended number of anchors and chain cables is shown in Tab 1.

A reduction of the number of anchors and chain cables may be accepted as depicted in Tab 1 if the following conditions, based on redundancy principles, are complied with:

- the tug is equipped with at least twin propulsion, of which each main engine can maintain sufficient propulsion power to safely return to berth. For this purpose, the main engines should be able to run self-supporting, i.e. independent of generator sets intended for auxiliary power, unless these are able to run parallel and, in case of black-out, have automatic starting and connecting to switchboard within 45 seconds
- a single failure, except fire, is not to cause total propulsion failure
- a fixed fire fighting installation is provided.

It may be considered by the tug builder and operator to apply a spare anchor as an alternative to a second bower anchor. In such case special provisions, such as a crane and suitable storage space for the spare anchor, are to be present on board and the weight and dimensions of the anchor are to be such that it can be handled swiftly. For tugs with the operating area notation **operating ≤ 4 h from a place of refuge**, effectively operating in a fixed and limited area, the spare anchor may be stored ashore.

Ch 1, Sec 3, [2.7.2]

Replace the reference to “Table 3” by a reference to “Table 2”.

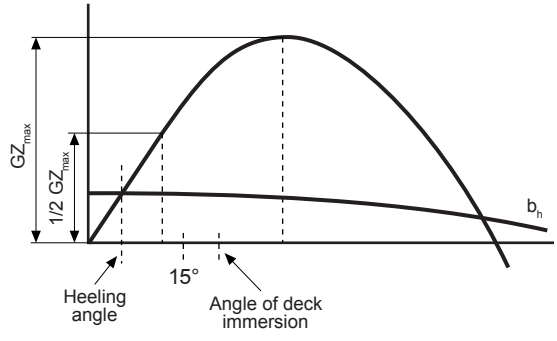
Ch 2, Sec 2, [2.3.1]

Delete “assumed to be constant” from the fourth paragraph.

Ch 2, Sec 2, Figure 7

Replace Figure 7:

Figure 7 : Heeling and righting arm curves



Ch 2, Sec 2, [2]

Replace sub-articles [2.5] and [2.6]:

2.5 Information to be displayed

2.5.1 Information stating the maximum allowed tension in the wire, as well as the corresponding angle α, in accordance with the calculations performed for each loading condition, are to be communicated to the vessel's crew and displayed next to the control desk or at any location where the navigator on duty can easily see the information from his command post.

The displayed information is to be under the form of diagrams, prepared so that the master can easily determine the maximum tension that can be applied to the vessel, as a function of the angle α, for a given value of trim and displacement (or draught), so as to satisfy the stability criteria (see Fig 9).

2.6 Stability booklet

2.6.1 The following information is to be included in the stability booklet in addition to the information required in Pt B, Ch 3, App 2:

- where ballasting or de-ballasting is applied before anchor handling operations, a sufficient number of loading conditions representing this operation is to be submitted, taking into account the relevant free surface effects
- calculation of the maximum heeling moment and corresponding maximum tension is to be provided, for every loading condition intended for anchor handling operations, satisfying the criteria of [2.4].

  The interval between two values of angle α is not to exceed 5° when α is less than 50° and 10° when α is from 50° up to 90°.

  The results are to be given in tables (see Tab 1 completed by Fig 8) and diagrams (see Fig 9) showing the maximum tension (corresponding to the maximum acceptable heeling moment) as a function of angle α, provided for the draught (or displacement) and trim values covering the intended anchor handling operations (values before application of the tension).

  The maximum permissible tension tables and curves may be omitted from the stability booklet provided one of the two following instrument is installed on board:

  - a software checking the intended or actual tension on the basis of the maximum permissible tension curves, or
  - a software performing direct stability calculations to check compliance with the criteria given in [2.4], for a given loading condition (before application of the tension force), a given tension and a given wire position (defined by angles α and β,see Fig 2).

Ch 2, Sec 2

Replace Figure 8 by the following Figure 8 and Figure 9:

Figure 8: Example of the operational, cautionary and stop work zones illustration

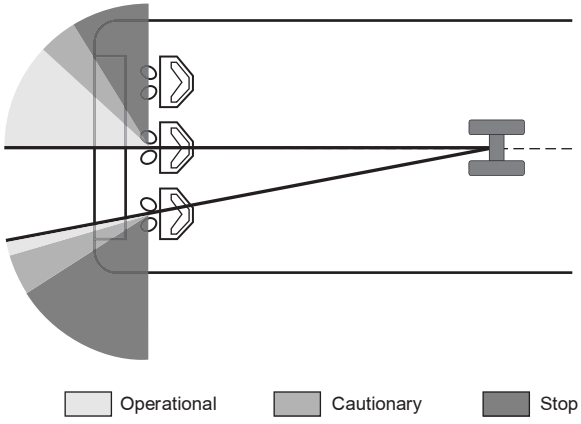
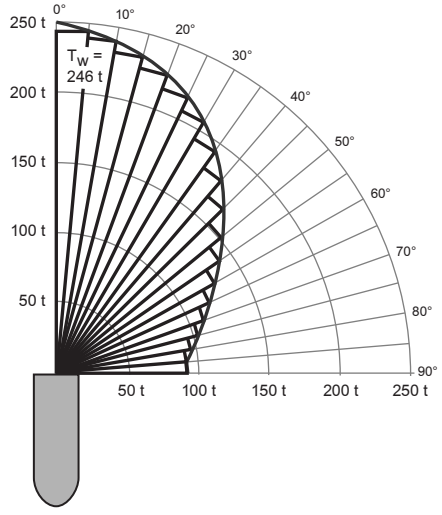


Figure 9: Example of permissible tension sector diagram



Ch 2, Sec 2

Add the following Table 1:

Table 1 : Example of permissible wire tension table

Table of permissible wire tension Tw (in tonnes) (Rated line pull = 600 t; Brake holding load = 700 t)																					
	Wire horizontal angle α (deg)																				
	0			10			20			30			45			60			90		
Trim (m)	–0,5	0	0,5	–0,5	0	0,5	–0,5	0	0,5	–0,5	0	0,5	–0,5	0	0,5	–0,5	0	0,5	–0,5	0	0,5
Wire between the centerline guide pins																					
Draft = 4,8 m	700	700	700	700	700	690	625	580	540	460	460	435	290	290	290	190	190	190	165	165	165
	Operational zone			Operational zone			Operational zone			Operational zone			Cautionary zone			Stop zone			Stop zone		
Draft = 5,8 m	700	700	700	700	700	690	655	600	550	430	485	435	285	285	310	190	180	200	170	165	170
	Operational zone			Operational zone			Operational zone			Operational zone			Cautionary zone			Stop zone			Stop zone		
Draft = 6,8 m	700	635	520	700	635	520	645	575	510	550	485	415	355	355	305	230	240	220	200	205	200
	Operational zone			Operational zone			Operational zone			Operational zone			Cautionary zone			Stop zone			Stop zone		
Wire between the outer guide pins																					
Draft = 4,8 m	545	500	465	480	435	405	385	380	350	300	300	300	215	215	215	170	170	170	165	165	165
	NA			Operational zone			Cautionary zone			Stop zone			Stop zone			Stop zone			Stop zone		
Draft = 5,8 m	575	520	465	500	455	405	360	390	350	275	300	300	220	210	240	180	175	190	170	165	170
	NA			Operational zone			Cautionary zone			Stop zone			Stop zone			Stop zone			Stop zone		
Draft = 6,8 m	555	480	410	500	435	370	440	385	330	365	340	295	260	270	235	210	215	200	200	205	200
	NA			Operational zone			Cautionary zone			Stop zone			Stop zone			Stop zone			Stop zone		

Note 1:

- Trim is negative by the bow. Interpolate between drafts only. For intermediate trim values, use lower permissible tension.
- Table is for planning and monitoring anchor handling operation. Specific loading conditions may be required for each anchor move.
- Trim should be minimized or by bow for anchor moves where high wire tensions are expected.
- Wire horizontal angle is relative to vessel's centerline. For intermediate angle values, use the higher table value.

Note 2:

- NA indicates where the angle of tow wire is not geometrically possible (i.e. at centerline in the case of wire going through outer guide pins). Permissible tensions are provided for reference only.
- If wire angle falls into the "Cautionary zone" and the wire tension exceeds the permissible value, corrective actions are required.
- If wire angle falls into the "Stop zone" and the wire tension exceeds the permissible value, operations are to be stopped and tension in the line is to be reduced.
- If planned wire tension exceeds the permissible values of the "Operational zone", additional calculations are required. Operations should not be planned for high angles.

Note 3: Vessel loading must be in accordance with the approved stability booklet and include assumed margins.

Ch 2, Sec 3, [2.3.1]

Replace the first bulleted list:

- in way of anchor handling winch:
  DL = max (1,5 T_{BP}; 1,5 RP; BHL)
- in way of guide pins:
  DL = max (2 SWL; 1,5 RP; BHL)
- in way of wire stopper:
  DL = max (2 SWL; 1,5 RP; BHL)
- in way of stern roller:
  DL = max (2 SWL;1,5 RP; BHL)

Ch 4, Sec 4, [2.1]

Replace requirement [2.1.3]:

2.1.3 On ships granted with the additional service feature **water spraying**:

- the provisions of [2.1.1] or [2.1.2] need not apply, and
- all exterior boundaries are to be made of steel, and
- aluminium may be accepted as an alternative to steel. No additional fire insulation is required in this case.

Ch 8, Sec 1, [1.1]

Delete requirement [1.1.2].

Chapter 8

Replace Section 3:

SECTION 3 STABILITY AND SUBDIVISION

Symbols

LCG : Longitudinal centre of gravity
TCG : Transversal centre of gravity
VCG : Vertical centre of gravity.

1 General

1.1 Application

1.1.1 *The provisions of this Section are to be applied to operations involving the lifting of the ship's own structures or for lifts in which the maximum heeling moment due to the lift is greater than that given in the following:*

$$M_L = 0,67 \cdot \Delta \cdot GM \cdot \left(\frac{f}{B}\right)$$

Where:

M_L : *Threshold value for the heeling moment, in t.m, induced by the lifting equipment and load in the lifting equipment.*

GM : *Initial metacentric height, in m, with free surface correction, including the effect of the lifting equipment and load in the lifting equipment.*

f : *Minimum freeboard, in m, measured from the upper side of the weather deck to the waterline.*

B : *Moulded breadth of the ship, in m.*

Δ : *Displacement of the ship, including the lift load, in t.*

The stability criteria of this Section also apply to ships which are engaged in lifting operations where no transverse heeling moment is induced and the increase of the ship's vertical centre of gravity (VCG) due to the lifted weight is greater than 1%.

The calculations are to be completed at the most unfavourable loading conditions for which the lifting equipment shall be used.

1.1.2 This Section provides additional stability criteria to be met during lifting operations in exposed or in non-exposed waters.

1.2 Definitions

1.2.1 Ships engaged in lifting operations

Ship engaged in lifting operation means a ship engaged in an operation involving the raising or lowering of objects using vertical force by means of winches, cranes, a-frames or other lifting devices.

Note 1: Fishing vessels are not included in the definition of lifting operations.

1.2.2 Exposed / non-exposed waters

For the purpose of this Section, waters that are not exposed are those where the environmental impact on the lifting operation is negligible. Otherwise, waters are to be considered exposed. In general, waters that are not exposed are calm stretches of water, i.e. estuaries, roadsteads, bays, lagoons; where the wind fetch is six nautical miles or less.

Note 1: Wind fetch is an unobstructed horizontal distance over which the wind can travel over water in a straight direction.

1.3 Loading conditions

1.3.1 *The stability criteria stated in this Section shall be satisfied for all loading conditions intended for lifting and with the hook load at the most unfavourable positions. For each loading condition, the weight and centre of gravity of the load being lifted, the lifting appliance, and counter ballast, if any, should be included. The most unfavourable position may be obtained from the load chart and is chosen at the position where the total of the transverse and vertical moment is the greatest. Additional loading conditions corresponding to various boom positions and counter ballast with different filling level, if applicable, may need to be checked.*

1.3.2 *In lifting operations involving a lifting appliance such as a crane, derrick, sheerlegs or any other similar lifting device:*

- *the magnitude of the lifted load (P_L) shall be the maximum allowed static load at a given outreach of the lifting appliance*
- *the transverse distance (y) is the transverse distance between the point at which the vertical load is applied to the lifting appliance and the ship centreline in the upright position*
- *the vertical height of the load (KG_{load}) is taken as the vertical distance from the point at which the vertical load is applied to the lifting appliance to the baseline in the upright position*
- *the change of centre of gravity of the lifting appliance(s) need to be taken into account.*

1.3.3 *In lifting operations not involving a lifting appliance consisting of a crane, derrick, sheerlegs, a-frame or similar, which involve lifting of fully or partially submerged objects over rollers or strong points at or near a deck-level:*

- *the magnitude of the lifted load (P_L) shall be the winch brake holding load*
- *the transverse distance (y) is the transverse distance between the point at which the vertical load is applied to the ship and the ship centreline in the upright position*
- *the vertical height of the load (KG_{load}) is taken as the vertical distance from the point at which the vertical load is applied to the ship to the baseline in the upright position.*

1.4 Trim and stability booklet

1.4.1 *Loading conditions reflecting the operational limitations of the ship, while engaged in lifting shall be included in the stability booklet.*

Use of counter ballast, if applicable, shall be clearly documented, and the adequacy of the ships stability in the event of the sudden loss of the hook load shall be demonstrated.

1.4.2 *The following information is to be included in the trim and stability booklet in addition to the information required in Part B, Chapter 3:*

a) Maximum heeling moment for each direction of lift/inclination as a function of the counter-ballast heeling moment, if used, the draught, and vertical centre of gravity.

b) Where fixed counter ballast is used the following information shall be included:
- *mass of the fixed counter ballast*
- *centre of gravity (LCG, TCG, VCG) of the fixed counter ballast.*

c) Loading conditions over the range of draughts for which lifting operations may be conducted with the maximum vertical load of the lift. Where applicable, righting lever curves for both before and after load drop should be presented for each loading condition.

d) Limitations on cranes operation including permissible heel angles.

e) operational limitations, such as:
- *maximum safe working load (SWL)*
- *maximum radius of operation of all derricks and lifting appliances*
- *maximum load moment*
- *environmental condition affecting the stability of the ship.*

f) Instructions related to normal operations, including use of counter-ballast.

g) Instructions such as ballasting/de-ballasting procedures to righting the ship following an accidental load drop.

h) identification of critical down-flooding openings.

i) recommendations on the use of roll reduction systems.

j) drawing of the crane showing the weight and centre of gravity, including heel/trim limitations established by the crane manufacturer.

k) a crane load chart, with appropriate de-ratings for wave height.

l) Load chart for lifting operations covering the range of operational draughts related to lifting and including a summary of the stability results.

m) A crane specification manual provided by the manufacturer shall be submitted separately for information.

n) the lifting appliance load, radius, boom angle limit table, including identification of offlead and sidelead angle limits and slewing angle range limits and reference to the ship's centreline.

o) a table that relates the ship trim and heel to the load, radius, slewing angle and limits, and the offlead and sidelead limits.

p) procedures for calculating the offlead and sidelead angles and the ship VCG with the load applied.

q) if installed, data associated with a Load Moment Indicator system and metrics included in the system.

r) if lifting appliance (crane) offlead and sidelead determine the maximum ship equilibrium angle, the stability booklet should include a note identifying the lifting appliance as the stability limiting factor during lifting operations.

s) information regarding the deployment of (stability) pontoons to assist a lifting operation, if fitted.

The information listed above may be included in other ship specific documentation on board the ship. In that case, a reference to these documents shall be included in the stability booklet.

1.5 Model tests or direct calculations

1.5.1 *Model tests or direct calculations, performed in accordance with a methodology acceptable to the Society, that demonstrate the survivability of the ship after sudden loss of hook load, may be allowed as an alternative to complying with the requirements of [2.3] or [3.2.3], provided that:*

- *the effects of wind and waves are taken into account, and*
- *the maximum dynamic roll amplitude of the ship after loss of load will not cause immersion of unprotected openings.*

1.6 Operational procedures against capsizing

1.6.1 *Ships should avoid resonant roll conditions when engaged in lifting operations.*

1.7 Guidance on wind force

1.7.1 The curves of wind heeling moments may be drawn for wind forces calculated by the following formula:

$F = 0,5\ C_S\ C_H\ P\ V^2\ A$

where:

F : Wind force, in N

C_S : Shape coefficient depending on the shape of the structural member exposed to the wind (refer to Tab 1)

C_H : Height coefficient depending on the height above sea level of the structural member exposed to wind (refer to Tab 2)

P : Air specific mass (1,222 kg/m^3)

V : Wind speed, in m/s

A : Projected area of the exposed surface of the structural member in either the upright or the heeled condition, in m^2.

1.7.2 Wind forces are to be considered in the transversal direction relative to the ship axis and the value of the wind speed is to be taken as follows:

a) In general, a minimum wind speed of 10 m/s (20 knots) is to be used for normal working conditions.

b) When the ship is limited in operation, the maximum wind velocity is to be clearly stated in the crane utilization manual.

1.7.3 In calculating the projected areas to the vertical plane, the area of surfaces exposed to wind due to heel or trim such as under decks surfaces, etc., are to be included using the appropriate shape factor. Open truss work may be approximated by taking 30% of the projected block area of both the front and back section, i.e., 60% of the projected area of one side. In the case of columns, the projected areas of all columns is to be included.

1.7.4 The lever for the wind heeling moment is to be taken vertically from the centre of the lateral resistance or, if available, the centre of hydrodynamic pressure, of the underwater body to the centre of pressure of the areas subject to wind loading. When the installation is fitted with dynamic positioning system, the thrusters effect in [1.7.7] is to be considered.

1.7.5 The curve of wind heeling moments may be assumed to vary as the cosine function of ship heel (see Fig 1).

1.7.6 Wind heeling moments derived from wind tunnel tests on a representative model of the ship may be considered as alternatives to the method given in [1.7.1] to [1.7.5]. Such heeling moment determination is to include lift and drag effects at various applicable heel angles.

1.7.7 Thrusters effect

When deemed necessary, for ships on which dynamic positioning is installed, the thrusters negative effect on stability is to be taken into account.

Table 1 : Shape coefficient C_s

Shape	C_S
Spherical	0,40
Cylindrical	0,50
Large flat surface (hull, deckhouse, smooth underdeck areas)	1,00
Drilling derrick	1,25
Wires	1,20
Exposed beams and girders under deck	1,30
Small parts	1,40
Isolated shapes (crane, beam, etc.)	1,50
Clustered deckhouses or similar structures	1,10

Table 2 : Height coefficient C_H

Height above sea level, in m	C_H
0 - 15,3	1,00
15,3 - 30,5	1,10
30,5 - 46,0	1,20
46,0 - 61,0	1,30
61,0 - 76,0	1,37
76,0 - 91,5	1,43
91,5 - 106,5	1,48
106,5 - 122,0	1,52
122,0 - 137,0	1,56
137,0 - 152,5	1,60
152,5 - 167,5	1,63
167,5 - 183,0	1,67
183,0 - 198,0	1,70
198,0 - 213,5	1,72
213,5 - 228,5	1,75
228,5 - 244,0	1,77
244,0 - 259,0	1,79
above 259	1,80

2 Intact stability

2.1 General stability criteria

2.1.1 The stability criteria included herein, or the criteria contained in [2.2], [2.3] or [3], as applicable, is to be satisfied for all loading conditions intended for lifting with the lifting appliance and its load at the most unfavourable positions.

For the purpose of this Section, the lifting appliance, its load(s) and their centre of gravity (COG) should be included in the displacement and centre of gravity of the ship, in which case no external heeling moment/heeling lever is applied.

2.1.2 For the loading conditions stated in [1.3], the following intact stability criteria are to be complied with:

a) The equilibrium heeling angle φ_1 shall not be greater than the maximum static heeling angle for which the lifting device is designed and which has been considered in the approval of the loading gear.

b) during lifting operations in non-exposed waters, the minimum distance between the water level and the highest continuous deck enclosing the watertight hull, taking into account trim and heel at any position along the length of the ship, shall not be less than 0,50 m.

c) during lifting operations in exposed waters, the residual freeboard shall not be less than 1,00 m or 75% of the highest significant wave height H_S, in (m), encountered during the operation, whichever is greater.

2.2 Lifting operations conducted under environmental and operational limitations

2.2.1 *For lifting conditions carried out within clearly defined limitations set forth in a), the intact criteria set forth in b) may be applied instead of the criteria included in [2.1]:*

a) The limits of the environmental conditions should specify at least the following:

- *the maximum significant wave height*
- *the maximum wind speed (1 minute sustained at 10 m above sea level), see guidance in [1.7]*

The limits of the operational conditions should specify at least the following:

- *the maximum duration of the lift*
- *limitations in ship speed*
- *limitations in traffic/traffic control*

b) The following stability criteria apply with the lifted load is at the most unfavourable position:

- *the corner of the highest continuous deck enclosing the watertight hull shall not be submerged*
- $A_{RL} \geq 1,40 \times A_{HL}$

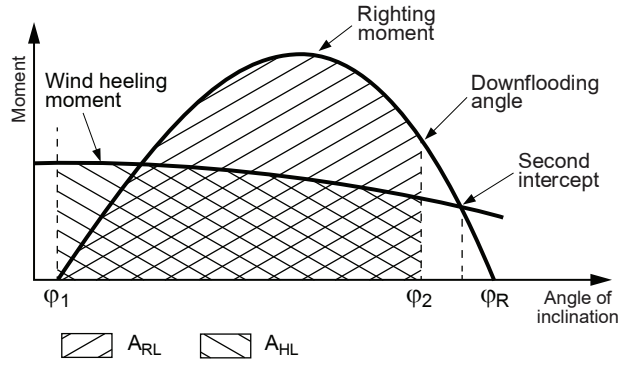
  Where:

  A_{RL} : *The area under the net righting lever curve, corrected for crane heeling moment and for the righting moment provided by the counter ballast if applicable, extending from the equilibrium heeling angle, φ_1, to the angle of down flooding, φ_F, the angle of vanishing stability, φ_R, or the second intersection of the righting lever curve with the wind heeling lever curve, whichever is less, see Fig 1.*

  A_{HL} : *The area below the wind heeling lever curve due to the wind force applied to the ship and the lift at the maximum wind speed specified in a), see Fig 1.*

c) The area under the net righting lever curve from the equilibrium heel angle, φ_1, to the down flooding angle, φ_F, or 20°, whichever is less, shall be at least 0,03 m rad.

Figure 1 : Intact criteria under Environmental and Operational limitations



2.3 Intact stability criteria in the event of sudden loss of the lifted load

2.3.1 *A ship engaged in a lifting operation and using counter ballasting should be able to withstand the sudden loss of the hook load, considering the most unfavourable point at which the hook load may be applied to the ship (i.e. largest heeling moment).*

In this case, the following intact stability criteria are to be complied with in addition to those in [2.1] and [2.2].

2.3.2 *For this purpose, the area on the side of the ship opposite to the lift (Area 2) is to be greater than the residual area on the side of the lift (Area 1), as shown in Fig 2, by an amount given by the following:*

- *Area 2 > 1,4 × Area 1, for lifting operations in waters that are exposed*
- *Area 2 > 1,0 × Area 1, for lifting operations in waters that are not exposed*

Where:

GZ_1 : *net righting lever (GZ) curve for the condition before loss of crane load, corrected for crane heeling moment and for the righting moment provided by the counter ballast if applicable.*

GZ_2 : *net righting lever (GZ) curve for the condition after loss of crane load, corrected for the transverse moment provided by the counter ballast if applicable.*

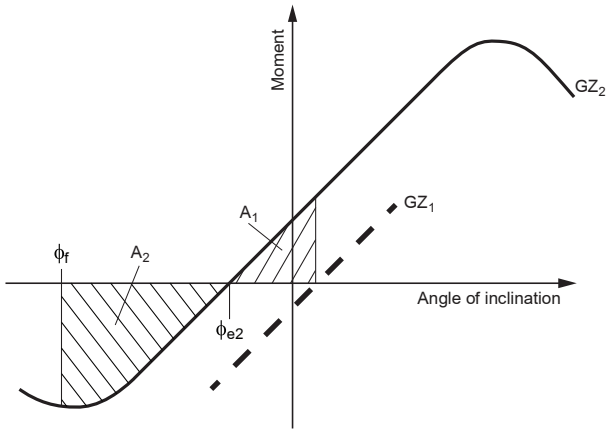
φ_{e2} : *the angle of static equilibrium after loss of crane load.*

φ_f : *the angle of down-flooding or the heel angle corresponding to the second intersection between heeling and righting arm curves, whichever is less.*

The term "net righting lever" means that the calculation of the GZ curve includes the ship's true transverse centre of gravity as function of the angle of heel.

Note 1: When, after the loss of the lifted load, the ship still heels to the same side, there is no need to comply with above criteria.

Figure 2 : Righting moment curve after sudden loss of load



3 Intact stability - alternative method

3.1 General

3.1.1 *The criteria in this Article may be applied to a ship engaged in a lifting operation, as an alternative to the criteria in [2.1] to [2.3], as applicable.*

For the purpose of this section and the alternative stability criteria set out in [3.2], the lifted load which causes the ship to heel is translated for the purpose of stability calculation to a heeling moment/heeling lever which is applied on the righting lever curve of the ship.

3.1.2 *The heeling moment applied to the ship due to a lift and the associated heeling lever should be calculated using the following formulae:*

$$HM_\varphi = P_L \cdot y \cdot \cos\varphi$$

$$HL_\varphi = HM_\varphi / \Delta$$

where:

HM_φ : *heeling moment, in t.m, due to the lift at* φ

P_L : *vertical load, in t, of the lift, as defined in [1.4.2]*

y : *transverse distance, in m, of the lift, metres, as defined in [1.4.2]*

φ : *angle of heel*

HL_φ : *heeling lever, in m, due to the lift at* φ

Δ : *displacement, in t, of the ship with the load of the lift.*

3.2 Alternative stability criteria

3.2.1 *The equilibrium heel angle* φ_e *referred to in this Article means the angle of first intersection between the righting lever curve and the heeling lever curve.*

3.2.2 *During the lifting operation, the following stability criteria apply:*

a) the residual righting area below the righting lever and above the heeling lever curve between φ_e *and the lesser of 40° or the angle of the maximum residual righting lever should not be less than:*

- *0,080 m rad, if lifting operations are performed in waters that are exposed, or*
- *0,053 m rad, if lifting operations are performed in waters that are not exposed.*

b) in addition, the equilibrium angle is to be limited to the lesser of the following:

- *10 degrees*
- *the angle of immersion of the highest continuous deck enclosing the watertight hull*
- *the lifting appliance allowable value of trim/heel (data to be derived from sidelead and offlead allowable values obtained from manufacturer).*

3.2.3 *For application of the criteria contained in [2.3] involving the sudden loss of load of the lift in which counter-ballast is used, the heeling levers that include the counter-ballast should be calculated using the following formulae (see Fig 3) :*

$$CHL_1 = \frac{(P_L \cdot y - CBM)}{\Delta} \cos\varphi$$

$$CBHL_2 = \frac{CBM \cdot \cos\varphi}{\Delta - P_L}$$

Where:

CBM : *the heeling moment, in t.m, due to the counter-ballast*

CHL_1 : *combined heeling lever, in m, due to the load of the lift and the counter-ballast heeling moment at the displacement corresponding to the ship with the load of the lift*

$CBHL_2$: *heeling lever, in m, due to the counter-ballast heeling moment at the displacement corresponding to the ship without the load of the lift.*

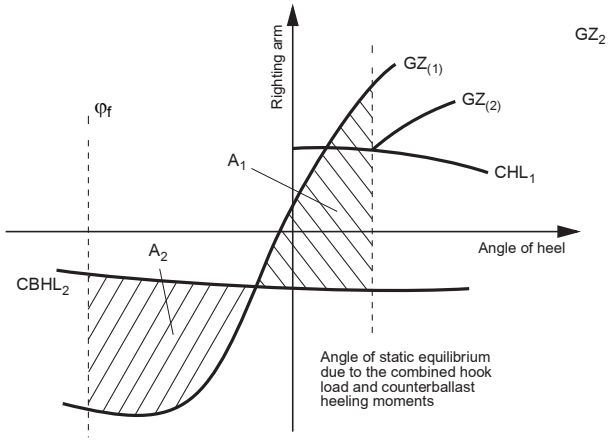
For this purpose, the area on the side of the ship opposite from the lift (Area 2) in Fig 3 should be greater than the residual area on the side of the lift (Area 1) by an amount given by the following:

Area 2 – Area 1 > K

where

- *K = 0,037 m.rad, for a lifting operation in waters that are exposed, and*
- *K = 0,0 m.rad, for a lifting operation in waters that are not exposed.*

Figure 3 : Alternative criteria - sudden loss of load



4 Additional intact stability criteria for crane overload test

4.1 General

4.1.1 Intact stability check during crane overload testing may be deemed necessary.

As guidance, ships which have onboard cranes of significant size compared to the ship general particulars or/and in case the intact stability particulars during normal crane operations are deemed marginal, the residual intact stability during crane overload test is to be checked and is in principle not to be less than that required by [2.1] and [2.3] as applicable.

5 Alternative damage stability for lifting operations for ships where additional class notation SDS is assigned

5.1 Application

5.1.1 The damage stability criteria specified in this Article may apply to ships operating within a field such as a windfarm and within the limiting conditions as defined in [5.1.2], in lieu of the damage stability criteria applicable as per Pt B, Ch 3, Sec 3, subject to Society agreement.

5.1.2 These alternative damage stability criteria may be applied when the following conditions are satisfied:

- the ship is operating in an area subject to fully controlled traffic (e.g. wind farm)
- maximum wave significant height and wind speed is limited

5.2 Data to be submitted

5.2.1 The following data are to be submitted:

- limits of the environmental conditions:
  - the maximum significant wave height
  - the maximum wind speed (1 minute sustained at 10 m above sea level)
- limits of the operational conditions:
  - the maximum duration of the lift
  - limitations in ship speed
  - limitations in traffic/traffic control

5.3 Extent of damage

5.3.1 The following extent of damage is to be assumed to occur between effective watertight bulkheads:

a) vertical extent: from the baseline upwards without limit

b) horizontal penetration measured inboard from the side of the ship perpendicularly to the centre line: 1,5 m.

5.3.2 The distance between effective watertight bulkheads or their nearest stepped portions which are positioned within the assumed extent of horizontal penetration are not to be less than 3 m; where there is a lesser distance, one or more of the adjacent bulkheads are to be disregarded.

5.3.3 Where damage of a lesser extent than defined in [5.3.1] results in a more severe condition, such lesser extent is to be assumed.

5.3.4 All piping, ventilation systems, trunks, etc., within the extent of damage referred to in [5.3.1] are to be assumed to be damaged. Positive means of closure are to be provided at watertight boundaries to prevent the progressive flooding of other spaces which are not managed.

5.4 Alternative damage stability criteria

5.4.1 The following stability criteria in the final stage of flooding are to be complied with:

- The final waterline is to be below the lower edge of any opening through which progressive flooding may occur.
- The equilibrium heeling angle is to be less than 15 degrees, or 17 degrees if no deck immersion occurs
- the righting lever curve is to have a range of positive stability of at least 16° and the GZ max is not to be less than 0.12 m within this range
- unprotected openings are not to become immersed within the prescribed minimum range of positive stability unless the space in question has been included as a floodable space in calculations for damage stability.

Ch 8, Sec 4, [2.3]

Replace requirement [2.3.3]:

2.3.3 Torsional moment

When deemed necessary, the hull girder strength is to be checked against still water torsional moments induced by lifting operations.

Ch 9, Sec 1, [1.1.1]

Add the following item at the end of the bulleted list:

- the additional class notation **SDS**, as defined in Pt A, Ch 1, Sec 2, [6.14.11], in compliance with the damage stability requirements specified in Ch 9, Sec 3.

Ch 9, Sec 3, [1]

Insert the following sub-article [1.1]:

1.1 Additional class notation SDS

1.1.1 Semi-submersible cargo ships are to be assigned the additional class notation **SDS**, as defined in Pt A, Ch 1, Sec 2, [6.14.11] and are to comply with the requirements for damage stability specified in:

- Article [4] for transit conditions
- Article [6] for temporary submerged conditions.

Ch 9, Sec 3, [4.1]

Replace requirement [4.1.1] as follows:

4.1.1 For assignement of the additional class notation **SDS**, semisubmersible cargo ships are to comply with the applicable requirements of Pt B, Ch 3, Sec 3 taking into account the provisions of:

- [4.2] for the buoyancy of cargo
- [4.3] for type B freeboard
- [4.4] for reduced freeboard.

Ch 9, Sec 3, [4.3.1]

Replace Note 1 and Note 2 in requirement [4.3.1] as follows:

Note 1: When the criteria on the maximum allowable vertical centre of gravity (KG) are not met, compliance with Pt B, Ch 3, App 4 may be considered as an alternative subject to acceptance by the Society. Special agreement from the Administration should also be granted.

Note 2: When the buoyancy of the cargo is taken into account, the damage stability is to comply with the requirements of Pt B, Ch 3, App 4 and the provisions specified in [4.2].

Ch 9, Sec 3, [4.4]

Replace requirement [4.4.1] as follows:

4.4.1 For ships which have been assigned reduced freeboard as permitted by Regulation 27 of the International Convention on Load Lines, damage stability is to comply with the requirements specified in Pt B, Ch 3, App 4, taking into account [4.4.2], [4.4.3] and the provisions of IACS UI LL65.

Therefore, compliance with the requirements in [4.3.1] is not required.

Note 1: When the buoyancy of the cargo is taken into account, the damage stability is to comply with the the provisions specified in [4.2].

Ch 9, Sec 3, [6.1]

Insert the following requirement [6.1.1]:

6.1.1 For the assignment of the additional class notation **SDS**, the requirements of the present Article are to be complied with in lieu of Part B, Ch 3, Sec 3.

Ch 9, Sec 3, [7.2]

Replace requirement [7.2.1] as follows:

7.2.1 Criteria

The reserve buoyancy at maximum submerged draft is to be assessed.

The reserve buoyancy volume, i.e. the volume with weathertight integrity above the maximum submerged waterline, is to be at least 4,5% higher than the submerged volume.

The reserve buoyancy ratios of the fore end and aft end structures considered separately are to be at least 1,5% higher than the submerged volume.

Ch 9, Sec 4, [1.1]

Replace requirement [1.1.1] as follows:

1.1.1 This Section provides specific requirements for:

- structural assessment of semi-submersible cargo ships in temporary submerged conditions
- ballast tanks pressure when using overflow tanks.

Ch 9, Sec 4, [1]

Insert the following sub-article [1.2]:

1.2 Internal ballast pressure when using overflow tanks

1.2.1 In order to limit the pressure head in the tanks, the cargo ship may be fitted with an overflow system.

When overflow tanks complying with the relevant provisions of Ch 9, Sec 5 are installed, the pressure head may be taken at the top of the overflow tank instead of the top of the air pipe.

Ch 9, Sec 4, [2.1]

Insert the following requirement [2.1.1]:

2.1.1 Structural assessment is to be performed according to the applicable requirements of Part B, Chapter 7 for the two following conditions:

- navigation conditions, considering the draught T and the navigation coefficient n
- temporary submerged conditions, considering the draught T_S and the navigation coefficient n_S.

Ch 9, Sec 4, [3]

Insert the following sub-article [3.3]:

3.3 Ship motions and accelerations

3.3.1 The ship motions and accelerations during temporary submerged conditions are to be obtained in accordance with Pt B, Ch 5, Sec 3 using the navigation coefficient n_S.

Ch 9, Sec 4, [3.4]

Delete requirement [3.4.3].

Ch 9, Sec 4, [5.1.1]

Replace the term "hull girder loads" by "design loads" in the first paragraph.

Ch 11, Sec 4, [2.3.1]

Delete "or equal to" in the first item of the bulleted list.

Ch 11, Sec 4

Replace Table 1:

Table 1: Applicable requirements for notation SPxxx-capable

Item	Reference requirement	Provisions to be applied depending on the total number of persons on board (POB) **(1)**		
		POB < 240		240 ≤ POB
Arrangement	• Pt B, Ch 2, Sec 1, [1.1] • Pt B, Ch 2, Sec 1, [6.1.2] • Pt B, Ch 2, Sec 2, [1.1]	• Pt B, Ch 2, Sec 1, [1] to Pt B, Ch 2, Sec 1, [5], • Pt B, Ch 2, Sec 2, considering the industrial personnel as crew		• Pt B, Ch 2, Sec 1, [1] to Pt B, Ch 2, Sec 1, [5] • Pt D, Ch 11, Sec 2, • Pt B, Ch 2, Sec 2 considering the industrial personnel as passengers
Stability	Pt B, Ch 3, Sec 1, [1.2]	• Part B, Chapter 3 • Pt D, Ch 11, Sec 3, [2.3.14] considering the industrial personnel as crew		• Part B, Chapter 3 • Pt D, Ch 11, Sec 3 considering the industrial personnel as passengers
	• Pt B, Ch 3, Sec 3, [1.2.1] • Pt B, Ch 3, Sec 3, [4.1.2] • Pt B, Ch 3, App 2, [1.2.14]	• Pt B, Ch 3, Sec 3 • Pt D, Ch 11, Sec 3, [2.3] (except Pt D, Ch 11, Sec 3, [2.3.12]), considering the industrial personnel as passengers, and where A is not to be less than: - for POB ≤ 60: 0,8 R - for 60 < POB < 240: linear interpolation between 0,8 R and R		• Pt B, Ch 3, Sec 3 • Pt D, Ch 11, Sec 3, [2.3] considering the industrial personnel as passengers, and where A is not to be less than R
		POB ≤ 60	60 < POB ≤ 240	240 < POB
Machinery and systems	Pt C, Ch 1, Sec 10, [6.1.2]	Pt D, Ch 11, Sec 4, [1], considering industrial personnel as passengers		
	Pt C, Ch 1, Sec 11, [1.1.2]	Pt C, Ch 1, Sec 11, considering the ship as a cargo ship		Pt C, Ch 1, Sec 11, considering the ship as a passenger ship
Electrical installations and automation	Pt C, Ch 2, Sec 3, [3.6.3], item g)	For ships having a length greater than 50m		
	Pt C, Ch 2, Sec 3, [2.3.21]	–	Pt D, Ch 11, Sec 5, [2]	
	Pt C, Ch 2, Sec 3, [3.4]	–	Pt D, Ch 11, Sec 5, [1.2.1]	
Fire protection, detection and extinction	Pt C, Ch 4, Sec 1, [2.3.2]	Part C, Chapter 4, considering the ship as a cargo ship	Part C, Chapter 4, considering the ship as a passenger ship carrying not more than 36 passengers	Part C, Chapter 4, considering the ship as a passenger ship carrying more than 36 passengers
(1) POB in the total number of persons on board, indicated as xxx in the **SPxxx-capable** additional service feature				

Amendments to PART F

Ch 3, Sec 1, [3.2]

Replace requirement [3.2.2]:

3.2.2 *Means are to be provided to detect and give alarms at an early stage in case of fires:*

- *in boiler air supply casing and exhausts (uptakes), and*
- *in scavenging air belts of propulsion machinery*

unless the Society considers this to be unnecessary in a particular case.

Especially, it is deemed unnecessary to provide means to detect fires at an early stage and give alarms in the following cases:

- For boilers with no inherent fire risk in the air supply casing, i.e. boilers with no heat exchangers (e.g. rotary heat exchangers) having surfaces exposed alternately to air and flue gas.
- For boilers with no inherent fire risk in the flue gas uptake, i.e. boilers with no heat exchangers using flue gases as the heating medium e.g. air/water preheaters or economisers.

Note 1: "flue gas" means exhaust gas from boiler furnace.

Insert the following new requirement [3.2.3]:

3.2.3 Location of fire detectors for boilers

The means to detect and give alarms at an early stage in cases of fires in boiler air supply casing and exhausts are to be located at a representative location:

- Either in the air supply casing or in the fuel gas uptake for boilers with heat exchangers having surfaces exposed alternatively to air and flue gas.
- In the flue gas uptake for boilers with heat exchangers using flue gases as the heating medium e.g. air/water preheaters or economisers.

Ch 4, Sec 3, [1.1.1]

Add the following paragraph at the end of the requirement:

The additional class notation **SYS-COM** is not applicable to ships fitted with remote control capabilities (autonomous level 2 or higher according to NI641 Autonomous Shipping).

Ch 4, Sec 3, [1.1]

Replace requirement [1.1.2]:

1.1.2 The purpose of this Section is to enhance, by means of a risk based approach, the safety and security of technical solutions of communications onboard ship used for:

- data transfer from ship to shore (e.g. engine monitoring systems)
- remote monitoring and troubleshooting from shore
- onboard access to communication infrastructure located ashore
- data transfer from shore to ship, e.g. chart services or software updates.

The requirements of this Section apply to the network and related communication systems used for one or more of the functions listed above.

Typical SYS-COM architecture and its boundaries are illustrated in Fig 1.

Replace requirement [1.1.6]:

1.1.6 Data transfer from shore to ship, for remote control of systems onboard ship is not permitted through SYS-COM network. Remote monitoring and maintenance is allowed and is to be secured according to the requirements of this Section.

Ch 4, Sec 3, [1.2.3]

Insert the following item in the bulleted list:

- Bureau Veritas - BV SW200 Cybersecurity guidelines for software development and assessment

Ch 4, Sec 3, [1.3]

Insert the following new requirement [1.3.2]:

1.3.2 Controlled network

A controlled network is any network that has been designed to operate such that it does not pose any security risks to any of its connected network nodes, as defined in IEC 61162-460. For the purpose of this Section, SYS-COM network is considered as the controlled network.

Ch 4, Sec 3, Table 1

Replace "network" by "controlled network" in Row 6 and Row 9.

Ch 4, Sec 3, [3.1]

Replace "network" by "controlled network" in requirements [3.1.1], [3.1.3] and [3.1.9].

Replace requirements [3.1.2] and [3.1.8]:

3.1.2 All connections with "other networks" are to use VPN through a gateway. All data exchanged with an uncontrolled network are to be encrypted to protect from security attacks, by using a strong encryption method.

3.1.8 In the controlled network, in order to maintain a high level of communication process availability in case of failure, fall-back arrangement is to be provided in order to enable transmission of critical data, defined by the Owner.

Ch 4, Sec 3, [3.2]

Replace "communication equipment" by "controlled network equipment" in requirement [3.2.1].

Replace "The communication systems are" by "The controlled network is" in requirement [3.2.2].

Replace "communication system" by "controlled network" in requirement [3.2.3].

Ch 4, Sec 3, [3.3]

Replace "communication system" by "controlled network" in requirements [3.3.1], [3.3.2], [3.3.3], [3.3.5], [3.3.6] and [3.3.7].

Replace "communication equipment" by "controlled network equipment" in requirement [3.3.8].

Replace requirement [3.3.9]:

3.3.9 Means and procedures are to be provided to immediately disconnect the controlled network communication system in case of attack or failure. The controlled network is to be regularly tested onboard by authorized people, the result is to be registered.

Ch 4, Sec 3, [3.4]

Replace "communication system" by "controlled network" in requirements [3.4.1] and [3.4.2].

Replace requirement [3.4.3] by the following requirements [3.4.3] and [3.4.4]:

3.4.3 A security risk analysis on the controlled network and its immediate environment is to be performed by an independent third party recognised by the Society and it is to include:

- environment
- data assurance (including authentication, properties, integrity, confidentiality, availability)
- network and systems
- human factor
- policies and procedures governing the use of the controlled network
- external threats and internal threats.

3.4.4 The security risk analysis is to:

- identify threats
- identify vulnerabilities
- assess and evaluate the risk
- develop protection and detection measures
- establish contingency plan.

Replace existing requirement [3.4.5]:

3.4.5 Any exchange through the controlled network, regarding end-to-end industrial process safety, is to be protected with a malware protection solution. The malware protection solution is to be updated on a regular basis.

Delete existing requirement [3.4.6].

Ch 4, Sec 3, [3.5]

Add the following paragraph at the end of requirement [3.5.2]:

Remote session is to be activated by authorized personnel onboard only. The list of authorized personnel is to be integrated in the remote software and available onboard as onshore.

Replace requirements [3.5.4] and [3.5.5]:

3.5.4 The communication endpoint onboard ship is to be authenticated by digital certificates, through a method compliant with the results of the security risk analysis.

3.5.5 Factory default account and the passwords are not to be hard-coded and not left to their default value. If possible, unused default accounts and services are to be deleted. It has to be clearly defined in the operational manual, e.g. routers and switches.

Ch 4, Sec 3

Add the following Article 5

5 Security recommendations

5.1

5.1.1 In order to minimize the security risks and mitigate the threats for both onboard (technology, process and people) and also shore support center, the following good practices are recommended:

a) If personnel onboard are allowed to bring their own devices (BYOD) on board to access the ships' system or network, policies and procedures should address their control, use, and how to protect vulnerable data, such as through network segregation.

b) Physical security (physical access to critical systems) should be part of security policy onshore as well as on board and procedure be available onboard (see IMO ISPS code).

c) The communication endpoint onshore should be secured to prevent malicious attacks on communication endpoints onboard ship.

d) Critical software firmware and application of the controlled network and other network (including operational systems) can be developed and tested according to a recognised methodology.

Note 1: See BV SW-100 and BV SW-200 defined in [1.2.3].

e) Testing of the controlled network and other network may be performed on regular basis in order to uncover new vulnerabilities.

Note 2: Example of testing methods are given in Tab 1, item 9.

f) An emergency security plan is to be prepared and available in the bridge and machinery room.

g) An internal training and quality procedure to be in place to insure that operators of the systems and crew are aware of their cyber security duties.

h) The establishment of an information security management system (ISMS) according to the requirements of ISO/IEC 27001 is recommended.

Ch 8, Sec 2, [4]

Insert the following new sub-article [4.1]

4.1 Gross scantlings

4.1.1 All scantlings referred to in this Article are gross, i.e. they include margin for corrosion and abrasion.

Ch 8, Sec 2, [6.1]

Replace requirement [6.1.1]:

6.1.1 The scantlings of the rudder post, rudder stock, pintles, steering gear, etc. as well as the capacity of the steering gear are to be determined according to Pt B, Ch 9, Sec 1 in the two following conditions:

- Maximum ahead service speed
- Reference speed indicated in Tab 10, with the coefficients r_1 and r_2, as defined in Pt B, Ch 9, Sec 1, [2.1.2], taken equal to 1,0 irrespective of the rudder type profile.

Within the ice strengthened zone, the thickness of rudder plating and diaphragms is to be not less than that required for the shell plating of the stern region.

Ch 8, Sec 3, Table 4 and Table 5

Replace in the row "Load case 5", "60% of F_b or F_f, whichever is greater" by:

"60% of F_b or 60% of F_f, whichever is greater".

Ch 8, Sec 3, [3]

Add the following sub-article [3.6]:

3.6 Test and certification for propellers

3.6.1 Requirements mentioned in Pt C, Ch 1, Sec 8, [4] are to be referred to. Additionally, material tests mentioned in [1.3] and [2.2.1] are to be undertaken.

Ch 9, Sec 2, [2.9]

Add the following new requirement [2.9.5]:

2.9.5 Urea solutions used for SCR systems

The storage tank is to be protected from excessively high or low temperatures applicable to the particular concentration of the solution. Depending on the operational area of the ship, this may necessitate the fitting of heating and/or cooling systems. The physical conditions recommended by applicable recognized standards (such as ISO 18611-3) are to be taken into account to ensure that the contents of the aqueous urea tank are maintained to avoid any impairment of the urea solution during storage.

Ch 11, Sec 6, [1]

Replace sub-article [1.2] and [1.3]:

1.2 Definitions

1.2.1 Active failure concerns all failures which have an immediate effect either on the operation of the installations or on the monitoring circuits.

1.2.2 Activity-Specific Operating Guidelines (ASOG) means guidelines on the operational, environmental and equipment performance limits for the location and specific activity.

1.2.3 Alarm devices: visual and audible signals enabling the operator to immediately identify any failure of the positioning system.

1.2.4 Bus-tie breaker means a device connecting/disconnecting switchboard sections ("closed bus-tie(s)" means connected).

1.2.5 Computer system means a system consisting of one or more computers and associated hardware, software and their interfaces.

1.2.6 Consequence analysis means a software function continuously verifying that the vessel will remain in position even if the worst-case failure occurs.

1.2.7 Dynamic positioning control station (DP control station) means a workstation designated for DP operations, where necessary information sources, such as indicators, displays, alarm panels, control panels and internal communication systems are installed (this includes: DP control and independent joystick control operator stations, required position reference systems, Human Machine Interface (HMI), manual thruster levers, mode change systems, thruster emergency stops, internal communications).

1.2.8 Dynamic Positioning operation (DP operation) means using the DP system to control at least two degrees of freedom in the horizontal plane automatically.

1.2.9 Dynamically positioned vessel (DP vessel) means a unit or a vessel which automatically maintains its position and/or heading (fixed location, relative location or predetermined track) by means of thruster force.

1.2.10 Environment: environmental conditions include wind, current and waves. Ice loads are not taken into account.

1.2.11 Failure means an occurrence in a component or system that causes one or both of the following effects:

- loss of component or system function; and/or
- deterioration of functional capability to such an extent that the safety of the vessel, personnel or environment protection is significantly reduced.

1.2.12 Failure Modes and Effects Analysis (FMEA) means a systematic analysis of systems and sub-systems to a level of detail that identifies all potential failure modes, down to the appropriate sub-system level, and their consequences.

1.2.13 FMEA proving trials means the test program for verifying the FMEA.

1.2.14 Hidden failure means a failure that is not immediately evident to operations or maintenance personnel and has the potential for failure of equipment to perform an on-demand function, such as protective functions in power plants and switchboards, standby equipment, backup power supplies or lack of capacity or performance.

1.2.15 Joystick system means a system with centralised manual position control and manual or automatic heading control.

1.2.16 Loss of position and/or heading means that the vessel's position and/or heading is outside the limits set for carrying out the DP activity in progress.

1.2.17 Position keeping means maintaining a desired position and/or heading or track within the normal excursions of the control system and the defined environmental conditions (e.g. wind, waves, current, etc.).

1.2.18 Power management system means a system that ensures continuity of electrical supply under all operating conditions.

1.2.19 Redundancy means the ability of a component or system to maintain or restore its function when a single failure has occurred. Redundancy can be achieved, for instance, by the installation of multiple components, systems or alternative means of performing a function.

1.2.20 Time to safely terminate (operations) means the amount of time required in an emergency to safely cease operations of the DP vessel.

1.2.21 Worst-Case Failure Design Intent (WCFDI) means the specified minimum DP system capabilities to be maintained following the worst-case failure. The worst-case failure design intent is used as the basis of the design. This usually relates to the number of thrusters and generators that can simultaneously fail.

1.2.22 Worst-Case Failure (WCF) means the identified single fault in the DP system resulting in maximum detrimental effect on DP capability as determined through the FMEA.

1.3 Dynamic positioning sub-systems

1.3.1 The installation necessary for dynamically positioning a vessel comprises, but is not limited to, the following sub-systems:

- power system, i.e. all components and systems necessary to supply the DP-system with power
- thruster system, i.e. all components and systems necessary to supply the DP-system with thrust force and direction
- DP-control system, i.e. all control components and systems, hardware and software necessary to dynamically position the vessel.

1.3.2 Power system means all components and systems necessary to supply the DP system with power. The power system includes but is not limited to:

- prime movers with necessary auxiliary systems including piping, fuel, cooling, pre-lubrication and lubrication, hydraulic, pre-heating, and pneumatic systems
- generators
- switchboards
- distribution systems (cabling and cable routing)
- power supplies, including uninterruptible power supplies (UPS), and
- power management system(s) (as appropriate).

1.3.3 Thruster system means all components and systems necessary to supply the DP system with thrust force and direction. The thruster system includes:

- thrusters with drive units and necessary auxiliary systems including piping, cooling, hydraulic, and lubrication systems, etc.
- main propellers and rudders if these are under the control of the DP system
- thruster control system(s)
- manual thruster controls, and
- associated cabling and cable routing.

1.3.4 Dynamic Positioning control system (DP control system) means all control components and systems, hardware and software necessary to dynamically position the vessel. The DP control system consists of the following:

- computer system/joystick system
- sensor system(s)
- control stations and display system (operator panels)
- position reference system(s)
- associated cabling and cable routing, and
- networks.

Ch 11, Sec 6, [1.4.4]

Replace reference to [1.2.6] by a reference to [1.2.19].

Ch 11, Sec 6, [1.4.6]

Add "see Article [9]" at the end of the requirement.

Ch 11, Sec 6, [2.2.1]

Replace the first paragraph:

The environmental conditions to be considered in the analysis are normally defined by the Owner for the intended service of the unit. However, for symbol **R** assignment, the following situations are to be considered:

Ch 11, Sec 6, [2.3.2]

Replace the first item of the bulleted list:

- environmental forces (e.g. wind, currents)

Ch 11, Sec 6, Table 1

Delete Row 1 and Row 12.

Replace Rows 4, 7, 8, 20 and 23 as follows.

Add the following Row 24:

Table 1: Documents to be submitted

No.	I/A **(1)**	Documents to be submitted
4	A	Diagram of the environmental limit conditions (also called capability plot) for the conditions defined in the specification and at least with all thrusters running and selected in DP, and the worst case failure.
7	A	Single line diagram and specification of the cables between the different equipment units (power, control, display)
8	A	Electrical power balance
20	A **(2)**	Analysis of consequences of single failures in accordance with rule requirements in the form of a failure mode and effect analysis (FMEA).
23	I	Operating manual of the positioning system including: - description of the equipment - maintenance guide - emergency procedures.
24	I	Vessel-specific DP-operation manuals

Ch 11, Sec 6, [2]

Replace sub-article [2.4]:

2.4 Failure mode and effects analysis

2.4.1 For installation intended to be assigned the notation **DYNAPOS AM/AT-R** and **DYNAPOS AM/AT-RS** an FMEA is to be carried out. This is a systematic analysis of systems and subsystems to the level of detail required to demonstrate that no single failure as defined in [3.2] will cause a loss of position and/or heading and is to establish worst-case failure design intent.

2.4.2 The analysis is to show the level of redundancy of each sub-system as well as the consequences of possible common mode failures.

2.4.3 This analysis is to be kept updated and is to be available on board.

Ch 11, Sec 6, [3.1]

Replace requirement [3.1.1]:

3.1.1 The DP-vessel is to be operated in such a way that the worst-case failure, as determined in [2.4.1], can occur at any time without causing a breach of acceptable excursion criteria set for loss of position and/or heading for equipment classes 2 and 3.

Ch 11, Sec 6, [3.1.2]

Replace the term “failure” by “worst-case failure”.

Ch 11, Sec 6, [3.2.1] and [3.2.3]

Replace the term "loss of position" by "loss of position and/or heading".

Ch 11, Sec 6, [3.2]

Replace requirement [3.2.2]:

3.2.2 For **DYNAPOS AM/AT R**, equipment class 2 is required. A loss of position and/or heading is not to occur in the event of a single failure in any active component or system. Common static components may be accepted in systems which will not immediately affect position keeping capabilities upon failure (e.g. ventilation and seawater systems not directly cooling running machinery). Normally such static components will not be considered to fail under reserve that they are built and installed in accordance with the rules of classification of the ship. Single failure criteria include, but are not limited to:

- any active component or system (generators, thrusters, switchboards, communication networks, remote-controlled valves, etc.); and
- any normally static component (cables, pipes, manual valves, etc.) that may immediately affect position keeping capabilities upon failure or is not properly documented with respect to protection.

Ch 11, Sec 6, [4.1]

Replace requirements [4.1.2] and [4.1.3] by the following requirements [4.1.2] to [4.1.5]:

4.1.2 In order to meet the single failure criteria given in [3.2], redundancy of components will normally be necessary as follows:

- for equipment class 2 (for symbol **R**), redundancy of all active components
- for equipment class 3 (for symbol **RS**), redundancy of all components and A-60 physical separation of the components.

For equipment class 3, full redundancy of the control system may not always be possible (e.g., there may be a need for a single change-over system from the main computer system to the backup computer system). Non-redundant connections between otherwise redundant and separated systems may be accepted provided that these are operated so that they do not represent a possible failure propagation path during DP operations. Such connections are to be kept to the absolute minimum and made to fail to the safest condition. Failure in one system is in no case to be transferred to the other redundant system.

4.1.3 Redundant components and systems are to be immediately available without needing manual intervention from the operators and with such capacity that the DP operation can be continued for such a period that the work in progress can be terminated safely. The transfer of control is to be smooth and within acceptable limitations of the DP operation(s) for which the vessel is designed.

4.1.4 If external forces from mission-related systems (cable lay, pipe lay, mooring, etc.) have a direct impact on DP performance, the influence of these systems are to be considered and factored into the DP system design. Where available from the DP system or equipment manufacturer, such data inputs are to be provided automatically to the DP control system. Additionally, provisions are to be made to provide such data inputs into the DP control system manually. These systems and the associated automatic inputs are to be subject to analysis, as specified in [2.4], and surveys and testing specified in [8.2].

The analysis of the consequences of anchor line breaks or thruster failure is to be carried out according to the operational situation.

4.1.5 For symbol **R** or **RS** assignment, hidden failure monitoring is to be provided on all devices where the FMEA shows that a hidden failure will result in a loss of redundancy.

Ch 11, Sec 6, [4.2.5]

Add ", including, but not limited to, overloading and short circuits." at the end of requirement.

Ch 11, Sec 6, [4.2.6]

Replace reference to "Ch 3, Sec 2, [1.1.2]" by a reference to "[4.1.2]".

Ch 11, Sec 6, [4.2]

Replace requirement [4.2.7] by the following requirements [4.2.7] to [4.2.9]:

4.2.7 For equipment classes 2 (symbol **R**) and 3 (symbol **RS**), the following applies:

- The power available for position keeping is to be sufficient to maintain the vessel in position after worst-case failure as per [3.2.1]. The automatic power management system is to be capable of:
  - enabling quick supply of active power to consumers in all operating conditions including generator failure or change of thruster configuration
  - monitoring power sources and informing the operator about desirable configuration changes such as starting or stopping of generators
  - providing automatic change-over of a generating set in case of detected failure; this required capability mainly applies to normal operating conditions. It is to be possible to maintain a proper balance between power demand and power generating configuration, in view of achieving efficient operation with sufficient reserve to avoid blackout
  - providing black-out prevention fonction (automatic load shedding of non-essential services and/or limitation of absorbed power).
- Adequate redundancy of the power management system is to be provided.

  The power management system is also to have a black-out prevention function.
- In addition, the following may be required of the automatic power management system:
  - assessment of priority criteria in regard to load shedding
  - suitable automatic power limitations. For instance, gradation may be required to allow safe achievement of essential functions before circuit-breaker opening. Proportional cutbacks may be adequately implemented: static rectifier tripping, thrust command limits, etc.
  - any automatic limitation is to activate warning devices. Override arrangements are to be fitted at the operator's disposal
  - implementation of suitable delays in connecting load consumers so as to enable switching on of additional power sources or load shedding.

4.2.8 Alternative energy storage (e.g. batteries and flywheels) may be used as sources of power to thrusters as long as all relevant redundancy, independence and separation requirements for the relevant notation are complied with. For equipment classes 2 and 3 (symbol **R** or **RS**), the available energy from such sources may be included in the consequence analysis function, required in [4.8.4], when reliable energy measurements can be provided.

4.2.9 Sudden load changes resulting from single faults or equipment failures is not to create a blackout.

Ch 11, Sec 6, [4.3]

Delete requirement [4.3.2].

Ch 11, Sec 6, [4.4]

Replace requirements [4.4.4] and [4.4.5] by the following requirements [4.4.4] to [4.4.7]:

4.4.4 For symbol **R** and **RS** assignment, attention is drawn to the requirements stated in [3.2.2] and [3.2.3].

4.4.5 The thruster system is to provide adequate thrust in longitudinal and lateral directions, and provide yawing moment for heading control.

4.4.6 The values of thruster force used in the consequence analysis required in [4.8.4] are to be corrected for interference between thrusters and other effects which would reduce the effective force.

4.4.7 For **DYNAPOS SAM** and **DYNAPOS AM/AT**, an UPS is to be provided for the control of power and propulsion system defined above. To this end, for a system granted symbols R or RS, the number of UPS systems is to be in accordance with the result of the FMEA analysis. Unless otherwise justified, 2 UPS systems are to be provided for symbol R. For symbol RS, 3 UPS systems are to be installed, one being located in a separate room.

Ch 11, Sec 6, [4.5]

Delete requirement [4.5.1].

Add the following new requirement [4.5.4]:

4.5.4 Each thruster on a DP system is to be capable of being remote-controlled individually, independently of the DP control system.

Ch 11, Sec 6, [4.6]

Replace requirement [4.6.2]:

4.6.2 Failure of a thruster system including pitch, azimuth or speed control is to trigger an alarm, and is not to cause an increase in thrust magnitude or change in thrust direction.

Add the following requirement [4.6.4]:

4.6.4 Individual thruster emergency stop systems is to be arranged in the DP control station. For equipment classes 2 (symbol **R**) and 3 (symbol **RS**), the thruster emergency stop system is to have loop monitoring. For equipment class 3, the effects of fire and flooding are to be considered.

Ch 11, Sec 6, Table 2

Replace Row "Main switchboard" and the Table note 1:

Table 2: System configuration for main power supply and propulsion systems

Equipment class	1	2	3
Additional class notation **DYNAPOS**	**SAM** or **AM/AT**	**AM/AT R**	**AM/AT RS**
Main switchboard	According to SOLAS and the present Rules	1 with bus tie circuit breaker(s) 2 or more circuits equally distributed	2 or more switchboards, with bus tie circuit-breakers normally open, located in separate rooms
Note 1: Redundant is to be understood as defined in [1.2.19].			

Ch 11, Sec 6, [4]

Replace sub-articles [4.7] and [4.8]:

4.7 DP Control system

4.7.1 In general, the DP-control system is to be arranged in a DP-control station where the operator has a good view of the vessel's exterior limits and the surrounding area.

4.7.2 The DP-control station is to display information from the power system, thruster system and DP-control system to ensure that these systems are functioning correctly. Information necessary to safely operate the DP system is to be visible at all times. Other information is to be available at the request of the operator.

4.7.3 Display systems, and the DP-control station in particular, are to be based on sound ergonomic principles which promote proper operation of the system. The DP-control system is to be arranged for easy selection of the control mode, i.e. manual, joystick, or automatic DP control of thrusters, propellers and rudders. The active mode is to be clearly displayed. The following principles apply to the display system:

- segregation of redundant equipment to reduce the possibility of common mode failure occurrence
- ease of access for maintenance purposes
- protection against adverse effects from environment and from electrical and electromagnetic disturbances.

4.7.4 For equipment classes 2 and 3, operator controls are to be designed so that no single inadvertent act on the operator's panel can lead to a loss of position and/or heading.

4.7.5 Alarms and warnings for failures in all systems interfaced to and/or controlled by the DP-control system are to be audible and visual. A permanent record of their occurrence and of status changes is to be provided together with any necessary explanations. The alarm list is given for information in Tab 4.

4.7.6 The DP-control system is to prevent failures being transferred from one system to another. The redundant components are to be so arranged that any failed component or components can be easily isolated, so that the other component(s) can take over smoothly with no loss of position and/or heading.

4.7.7 It is to be possible to control the thrusters manually, by individual levers and by an independent joystick, in the event of failure of the DP control system. If an independent joystick is provided with sensor inputs, failure of the main DP control system is not to affect the integrity of the inputs to the independent joystick.

4.7.8 The software is to be produced in accordance with an appropriate international quality standard recognised by the Society.

4.7.9 As far as concerns control stations, the following requirements are to be met:

- where several control stations are provided, control is only to be possible from one station at a time, adequate interlocking devices are to be fitted and indication of the station in control is to be displayed at each control station
- alarm and control systems concerning the same function are to be grouped together (position reference system, propulsion, power generation)
- where inadvertent activation of commands may jeopardise the unit's safety, these commands are to be protected (light cover, double triggering or other equivalent devices or procedures)
- a two-way voice communication facility, independent of the unit's general system, is to be provided between the main control station and the following spaces: navigating bridge, engine room and engine control station, other control stations, responsible officer's accommodation, other control locations specific to the task of the unit
- Equipment that should be located at the DP control station includes, but is not limited to:
  - DP control and independent joystick control operator stations
  - manual thruster levers
  - mode change systems
  - thruster emergency stops
  - internal communications, and
  - position reference systems' HMI, when considered necessary.

4.7.10 A dedicated UPS is to be provided for each DP control system (i.e. minimum one UPS for equipment class 1, two UPSs for equipment class 2 and three UPSs for equipment class 3) to ensure that any power failure will not affect more than one computer system and its associated components. The reference systems and sensors are to be distributed on the UPSs in the same manner as the control systems they serve, so that any power failure will not cause loss of position keeping ability. An alarm is to be initiated in case of loss of charge power. UPS battery capacity is to provide a minimum of 30 minutes operation following a main supply failure. For equipment classes 2 and 3, the charge power for the UPSs supplying the main control system is to originate from different power systems.

4.8 Computers

4.8.1 For equipment class 1 (symbol **SAM** or **AM/AT**), the DP-control system need not be redundant.

4.8.2 For equipment class 2 (symbol **R**), the DP-control system is to consist of at least two independent computer systems. Common facilities such as self-checking routines, alignment facilities, data transfer arrangements and plant interfaces are not to be capable of causing the failure of more than one computer system. An alarm is to be initiated if any computer fails or is not ready to take control.

4.8.3 For equipment class 3 (symbol **RS**), the DP-control system is to consist of at least two independent computer systems with self-checking facilities. Common facilities such as self-checking routines, alignment facilities, data transfer arrangements and plant interfaces are not to be capable of causing failure of more than one computer system. In addition, one backup DP-control system should be arranged. An alarm is to be initiated if any computer fails or is not ready to take control.

4.8.4 For equipment classes 2 (symbol **R**) and 3 (symbol **RS**), the DP-control system is to include a software function, normally known as "consequence analysis", which continuously verifies that the vessel will remain in position even if the worst-case failure occurs. This analysis is to verify that the thrusters, propellers and rudders (if included under DP control) that remain in operation after the worst-case failure can generate the same resultant thruster force and moment as required before the failure. The consequence analysis is to provide an alarm if the occurrence of a worst-case failure would lead to a loss of position and/or heading due to insufficient thrust for the prevailing environmental conditions (e.g. wind, waves, current, etc.). For operations which will take a long time to safely terminate, the consequence analysis is to include a function which simulates the remaining thrust and power after the worst-case failure, based on input of the environmental conditions. Manual input of weather trend or forecast might be possible, in order to integrate relevant meteorological data in the system, if available.

4.8.5 Redundant computer systems are to be arranged with automatic transfer of control after a detected failure in one of the computer systems. The automatic transfer of control from one computer system to another is to be smooth with no loss of position and/or heading.

4.8.6 For equipment class 3 (symbol **RS**), the backup DP-control system is to be in a room, separated by an A-60 class division from the main DP-control station. During DP-operation, this backup control system is to be continuously updated by input from at least one of the required sets of sensors, position reference system, thruster feedback, etc., and to be ready to take over control. The switchover of control to the backup system is to be manual, situated on the backup computer, and is not to be affected by a failure of the main DP control system. Main and backup DP control systems are to be so arranged that at least one system will be able to perform automatic position keeping after any single failure.

4.8.7 Each DP computer system is to be isolated from other onboard computer systems and communications systems to ensure the integrity of the DP system and command interfaces. This isolation may be effected via hardware and/or software systems and physical separation of cabling and communication lines. Robustness of the isolation is to be verified by analysis and proven by testing. Specific safeguards are to be implemented to ensure the integrity of the DP computer system and prevent the connection of unauthorised or unapproved devices or systems.

4.8.8 For dynamic positioning control systems based on computer, it is to be demonstrated that the control systems work properly in the environmental conditions prevailing on board ships and offshore platforms. To this end, the DP-control systems are to be submitted to the environmental tests defined in Pt C, Ch 3, Sec 6, with special consideration for E.M.I. (Electromagnetic interference).

Ch 11, Sec 6, [4]

Add the following sub-article [4.9]:

4.9 Independent joystick system

4.9.1 A joystick system independent of the automatic DP control system is to be arranged. The power supply for the independent joystick system (IJS) is to be independent of the DP control system UPSs. An alarm is to be initiated upon failure of the IJS.

4.9.2 The independent joystick system is to have automatic heading control.

Ch 11, Sec 6, [5.1]

Replace requirement [5.1.1]:

5.1.1 As a general rule, a dynamic positioning installation is to include at least two independent reference systems:

- for **SAM** notation assignment, only one reference system is required
- For equipment class 1 (symbol **SAM** or **AM/AT**), at least two independent position reference systems are to be installed and simultaneously available to the DP control system during operation
- for equipment classes 2 (symbol **R**) and 3 (symbol **RS**), at least three independent position reference systems are to be installed and simultaneously available to the DP-control system during operation
- position reference systems are to be selected with due consideration to operational requirements, both with regard to restrictions caused by the manner of deployment and expected performance in the working situation
- when two or more position reference systems are required, they are not all to be of the same type, but based on different principles and suitable for the operating conditions, in order to avoid external common cause failure modes.

Ch 11, Sec 6, [5.2]

Replace requirements [5.2.1] and [5.2.2]:

5.2.1 The position reference systems are to produce data with adequate accuracy and repeatability for the intended DP-operation.

5.2.2 Visual and audible alarms are to be activated when the unit deviates from the set heading or from the working area determined by the operator. The performance of position reference systems is to be monitored and warnings provided when the signals from the position reference systems are either incorrect or substantially degraded.

Ch 11, Sec 6, [5.3]

Replace requirement [5.3.3]:

5.3.3 When the signals from the position reference system are likely to be altered by the movement of the unit (rolling, pitching), a correction of the position is to be made. For this purpose, a vertical reference unit of appropriate characteristics with regard to the expected accuracy of position measurement is to be provided. The VRS is to be multiplied in number for assignment of notations **R** and **RS**, as per Tab 3.

Ch 11, Sec 6, [5.5.2]

Replace the last item of the bulleted list:

- sensors for equipment classes 2 and 3 and sensors used for the same purpose connected to redundant systems are to be arranged independently so that failure of one will not affect the others.

Ch 11, Sec 6

Replace Table 3:

Table 3: Configuration for reference systems, vessel sensors and computers

Equipment class	1	1	2	3
DYNAPOS class notations	**SAM**	**AM/AT**	**AM/AT R (1)**	**AM/AT RS (1)**
Number of control computers	1	1	2	3, one of them connected to the backup control station
Manual control: joystick, with automatic heading	may be fitted	Yes	Yes	Yes
One man operating the DP system	Yes	Yes	Yes	Yes
Position reference system	1	2 **(2)**	3 **(2)**	3, one of them connected to the backup control station **(2)**
Vertical reference system	1	1	3	3, one of them connected to the backup control station
Wind sensor	1	1	3	3, one of them connected to the backup control station
Gyro	1	2	3	3, one of them connected to the backup control station

(1) When the **DYNAPOS** notation is supplemented by **-EI**, reference is made to Tab 7.

(2) When two or more position reference systems are required, they are not all to be of the same type, but based on different principles and suitable for the operating conditions.

Ch 11, Sec 6, [5.5]

Replace requirements [5.5.3] and [5.5.4]:

5.5.3 For equipment class 3 (symbol **RS**), one of each type of sensor is to be connected directly to the backup control system and is to be separated by an A-60 class division from the other sensors. If the data from these sensors is passed to the main DP control system for their use, this system is to be arranged so that a failure in the main DP control system cannot affect the integrity of the signals to the backup DP control system.

5.5.4 When an equipment class 2 or 3 (for symbols **R** and **RS**), DP-control system is fully dependent on correct signals from vessel sensors, then these signals are to be based on three systems serving the same purpose (i.e., this will result in at least three heading reference sensors being installed).

Ch 11, Sec 6, [6]

Replace sub-article [6.1]:

6.1 Cables and piping systems

6.1.1 For equipment class 2 (symbol **R**), the piping systems for fuel, lubrication, hydraulic oil, cooling water and pneumatic circuits and the cabling of the electric circuits essential for the correct functioning of the DP-system are to be located with due regard to fire hazards and mechanical damage.

6.1.2 For equipment class 3 (symbol **RS**):

- Redundant piping systems (i.e., piping for fuel, cooling water, lubrication oil, hydraulic oil and pneumatic circuits etc.) are not to be routed together through the same compartments. Where this is unavoidable, such pipes may run together in ducts of A-60 class, the termination of the ducts included, which are effectively protected from all fire hazards except that represented by the pipes themselves.
- Cables for redundant equipment or systems are not to be routed together through the same compartments. Where this is unavoidable, such cables may run together in cable ducts of A-60 class, the termination of the ducts included, which are effectively protected from all fire hazards except that represented by the pipes themselves. Cable connection boxes are not allowed within such ducts.

6.1.3 For equipment classes 2 (symbol **R**) and 3 (symbol **RS**), systems not directly part of the DP-system but which, in the event of failure, could cause failure of the DP-system (common fire suppression systems, engine ventilation systems, heating, ventilation and air conditioning (HVAC) systems, shutdown systems, etc.) are also to comply with the relevant requirements of these Rules.

Ch 11, Sec 6, [6.2]

Replace requirement [6.2.6]:

6.2.6 Transverse fixed axis thrusters, if used, are to be capable, for notation **AM/AT**, of providing sufficient thrust in the contemplated range of speed of the unit.

Ch 11, Sec 6, [7]

Replace sub-article [7.1]:

7.1 General

7.1.1 The following operational conditions are to be fulfilled.

7.1.2 Before every DP-operation, the DP-system is to be checked according to an applicable vessel specific "location" checklist(s) and other decision support tools, such as ASOG, in order to make sure that the DP system is functioning correctly and that it has been set up for the appropriate mode of operation.

7.1.3 During DP-operations, the system should be checked at regular intervals according to the applicable vessel-specific watch-keeping checklist.

7.1.4 DP-operations necessitating equipment classes 2 or 3 should be terminated when the environmental conditions (e.g. wind, waves, current, etc.) are such that the DP-vessel will no longer be able to keep position if the single failure criterion applicable to the equipment class should occur. In this context, deterioration of environmental conditions and the necessary time to safely terminate the operation are also to be taken into consideration. This should be checked by way of environmental envelopes if operating in equipment class 1 and by way of an automatic means (e.g. consequence analysis) if operating with equipment classes 2 or 3.

7.1.5 The necessary operating instructions, etc., are to be kept on board.

7.1.6 DP capability polar plots are to be produced to demonstrate position keeping capacity for fully operational and post worst-case single failure conditions. The capability plots are to represent the environmental conditions in the area of operation and the mission-specific operational condition of the vessel.

7.1.7 The following checklist, test procedures, trials and instructions are to be incorporated into the vessel-specific DP-operation manuals:

- location checklist, see [7.1.2]
- watch-keeping checklist, see [7.1.3]
- DP-operating instructions, see [7.1.5]
- initial and periodical (5-year) tests and procedures
- annual tests and procedures
- example of tests and procedures after modifications and non-conformities
- blackout recovery procedure
- list of critical components
- examples of operating modes
- decision support tools such as ASOG
- capability plots.

7.1.8 Reports of tests and records of modifications or equivalent are to be kept on board and made available during periodical inspections.

Ch 11, Sec 6, [8.2]

Delete requirement [8.2.4].

Replace requirements [8.2.2], [8.2.3] and [8.2.6]:

8.2.2 Test program of these trials is to be submitted in advance to the Society.

8.2.3 The initial survey is to include a complete test of all systems and components and the ability to keep position and heading after single failures associated with the assigned equipment class. For equipment classes 2 (symbol **R**) and 3 (symbol **RS**), the findings of the FMEA analysis required in [2.4] are to be confirmed by FMEA proving trials.

8.2.6 The final test reports of dock and sea trials are to be submitted.

Ch 11, Sec 6, [10.2.2]

Replace the reference to "[4.7.7]" by (new) "[4.9]".

Ch 11, Sec 11, [5.2.2]

Replace the first paragraph:

The weight distribution of the ice accretion is to be considered on the full length of the ship from the exposed deck and the decks above, including the sides, as follows:

Ch 11, Sec 15, [4.3.4]

Replace item b) of the alphanumeric list:

b) Tankers of 4000 GT and upwards need an independent foam main, arranged along the centre line as a single line with foam outlet branches to both port and starboard arranged just aft of each monitor. At least two foam mixing units and two foam concentrate pumps are to be provided, placed together with the storage tank for foam concentrate in a dedicated room. Foam concentrate sufficient for 30 minutes of continuous foam production are to be stored onboard. Two foam monitors at each side of the accommodation front and monitors covering the cargo manifold are to be remote-controlled from the bridge or from another safe area with a good visibility to the monitors coverage area.

Ch 11, Sec 15, [4.3.6]

Replace "20000 DWT" by "8000 DWT".

Ch 11, Sec 20, [1.2.1]

Add the following paragraph at the end of the requirement:

The following chapters of CAP 437 are applicable, except where it refers to operational procedures or training, and where applicable for design and safety equipment on the unit:

- Chapter 3 Helicopter landing areas – Physical characteristics
- Chapter 4 Visual aids
- Chapter 5 Helideck rescue and fire fighting facilities
- Chapter 7 Helicopter fuelling facilities – Systems design and construction
- Chapter 9 Helicopter landing areas on vessels
- Chapter 10 Helicopter winching areas on vessels and on wind turbine platforms.

Move Forward with Confidence

Marine & Offshore
92937 Paris La Defense Cedex - France
Tel: + 33 (0)1 55 24 70 00 – Fax: + 33 (0)1 55 24 70 25
Website: http//www.veristar.com
Email: veristarinfo@bureauveritas.com