



**BUREAU
VERITAS**

Rules for the Classification of Steel Ships

NR 467

AMENDMENTS

January 2021

These sheets contain amendments within the following Sections of January 2020 issue of the *Rules for the Classification of Steel Ships*. These amendments are cumulative with Amendments July 2020.

These amendments are effective from January 1st, 2021.

Part	Volume	Chapter	Section / Appendix
Part A	<i>NR 467 A1 DT R17 E</i>	Ch 1	Sec 2
		Ch 2	Sec 2, Sec 3, App 1, App 3, App 4
		Ch 3	Sec 1, Sec 2, Sec 3, Sec 4, App 1
		Ch 4	Sec 2, Sec 5, Sec 7, Sec 8, Sec 9
		Ch 5	Sec 1, Sec 2, Sec 7, Sec 10
		Ch 6	Sec 2
Part B	<i>NR 467 B1 DT R12 E</i>	Ch 1	Sec 2
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		Ch 9	Sec 1, App 2
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GENERAL CONDITIONS

1. INDEPENDENCE 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, designer, 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 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 entering into the relevant contract for the performance of the Services.
- 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 classification or statutory certificates, attestations and reports following the Society's intervention.
- 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 classification Certificate with reference to the Rules. Classification is an appraisal given by the Society to the Client, at a certain date, following surveys by its surveyors on the level of compliance of the Unit to the Society's Rules or to the documents of reference for the Services provided. They cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.
- 2.4 "Client" means the Party and/or its representative requesting the Services.
- 2.5 "Conditions" means the terms and conditions set out in the present document.
- 2.6 "Industry Practice" means international maritime and/or offshore industry practices.
- 2.7 "Intellectual Property" means all patents, rights to inventions, utility models, copyright and related rights, trade marks, logos, service marks, trade dress, business and domain names, rights in trade dress or get-up, rights in goodwill or to sue for passing off, unfair competition rights, rights in designs, rights in computer software, database rights, topography rights, moral rights, rights in confidential information (including know-how and trade secrets), methods and protocols for Services, and any other intellectual property rights, in each case whether capable of registration, registered or unregistered and including all applications for and renewals, reversions or extensions of such rights, and all similar or equivalent rights or forms of protection in any part of the world.
- 2.8 "Parties" means the Society and Client together.
- 2.9 "Party" means the Society or the Client.
- 2.10 "Register" means the public electronic register of ships updated regularly by the Society.
- 2.11 "Rules" means the Society's classification rules and other documents. The Society's Rules 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, maritime labour certification, training activities, all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board. The Services are carried out by the Society according to the applicable referential and to the Bureau Veritas' Code of Ethics. 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.
- 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 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 Subject to the Services requested 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 enter the Unit's class in the Society's Register;
 - survey the Unit periodically in service to note whether 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.
- 3.2 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 for surveys; and (iii) inform the Society in due time of any circumstances that may affect the given appraisal of the Unit or cause to modify the scope of the Services.
- 4.2 Certificates 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.
- 4.4 The Society may at times and at its sole discretion give an opinion on a design or any technical element that would 'in principle' be acceptable to the Society. This opinion shall not presume on the final issuance of any Certificate or on its content in the event of the actual issuance of a Certificate. This opinion shall only be an appraisal made by the Society which shall not be held liable for it.

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, drawing, etc. required for the performance of the Services must be made available in due time.
- 5.2 The Client shall notify the Society of any relevant safety issue and shall take all necessary safety-related measures to ensure a safe work environment for the Society or any of its officers, employees, servants, agents or subcontractors and shall comply with all applicable safety regulations.

6. PAYMENT OF INVOICES

- 6.1 The provision of the Services by the Society, whether complete or not, involve, for the part carried out, the payment of fees thirty (30) days upon issuance of the invoice.

6.2 Without prejudice to any other rights hereunder, in case of Client's payment default, the Society shall be entitled to charge, in addition to the amount not properly paid, interests equal to twelve (12) months LIBOR plus two (2) per cent as of due date calculated on the number of days such payment is delinquent. The Society shall also have the right to withhold Certificates and other documents and/or to suspend or revoke the validity of Certificates.

6.3 In case of dispute on the invoice amount, the undisputed portion of the invoice shall be paid and an explanation on the dispute shall accompany payment so that action can be taken to solve the dispute.

7. LIABILITY

- 7.1 The Society bears no liability for consequential loss. For the purpose of this clause consequential loss shall include, without limitation:
 - Indirect or consequential loss;
 - Any loss and/or deferral of production, loss of product, loss of use, loss of bargain, loss of revenue, loss of profit or anticipated profit, loss of business and business interruption, in each case whether direct or indirect.The Client shall defend, release, save, indemnify, defend and hold harmless the Society from the Client's own consequential loss regardless of cause.
- 7.2 Except in case of wilful misconduct of the Society, death or bodily injury caused by the Society's negligence and any other liability that could not be, by law, limited, 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 Services having caused the damage. This limit applies to any liability of whatsoever nature and howsoever arising, including fault by the Society, 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 completion of 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 shall defend, release, save, 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 (including for damages arising out of or in connection with opinions delivered according to clause 4.4 above) except for those claims caused solely and completely by the gross 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 Classification 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.
- 9.3 In the event where, in the reasonable opinion of the Society, the Client is in breach, or is suspected to be in breach of clause 16 of the Conditions, the Society shall have the right to terminate the Services (and the relevant contracts associated) with immediate effect.

10. FORCE MAJEURE

- 10.1 Neither Party shall be responsible or liable 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 properly and lawfully in the possession of the Society;
 - is already in possession of the public or has entered the public domain, otherwise than through a breach of this obligation;
 - is acquired or received 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 Parties 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 Without prejudice to sub-clause 11.1, 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 by the Society for the performance of the Services including, but not limited to drawings, calculations, and reports shall remain the exclusive property of the Society.

13. ASSIGNMENT

- 13.1 The contract resulting from these Conditions cannot be assigned or transferred by any means by a Party to any 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 These Conditions shall be construed and governed by the laws of England and Wales.
- 15.2 The Parties 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 under the Rules of Arbitration of the Maritime Arbitration Chamber of Paris ("CAMP"), 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 Paris (France). The Parties agree to keep the arbitration proceedings confidential.

16. PROFESSIONAL ETHICS

- 16.1 Each Party shall conduct all activities in compliance with all laws, statutes, rules, economic and trade sanctions (including but not limited to UN sanctions and EU sanctions) 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, copyright and trademark protection, personal data protection (<https://personaldataprotection.bureauveritas.com/privacypolicy>).
- 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 Bureau Veritas' Code of Ethics. <https://group.bureauveritas.com/group/corporate-social-responsibility>

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Part C	<i>NR 467 C1 DTR12 E</i>	Ch 1	Sec 1, Sec 2, Sec 3, Sec 4, Sec 5, Sec 7, Sec 8, Sec 9, Sec 10, Sec 11, Sec 12, Sec 13, Sec 15, App 1, App 3
		Ch 2	Sec 1, Sec 3, Sec 4, Sec 7
		Ch 3	Sec 1, Sec 6
		Ch 4	Sec 1, Sec 3, Sec 5, Sec 6, Sec 9, Sec 11, Sec 12
Part D	<i>NR 467 D1 DTR12 E</i>	Ch 2	Sec 2
		Ch 4	Sec 3
		Ch 7	Sec 4, Sec 5, Sec 6, App 4,
		Ch 8	Sec 1, Sec 3, Sec 10
		Ch 9	Sec 1, Sec 4, Sec 5, Sec 7, Sec 8, Sec 11, Sec 12, Sec 13, Sec 16
		Ch 11 Ch 15	Sec 2, Sec 3, Sec 5 Sec 4, Sec 5, Sec 6
Part E	<i>NR 467 E1 DTR03 E</i>	Ch 1	Sec 1, Sec 2, Sec 3, Sec 5, App 1
		Ch 4	Sec 3
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Part F	<i>NR 467 F1 DTR12 E</i>	Ch 2	Sec 1, Sec 2, Sec 3
		Ch 3	Sec 1
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		Ch 11	Sec 2, Sec 3, Sec 5, Sec 7, Sec 8, Sec 9, Sec 13, Sec 21, Sec 23, Sec 26, Sec 30, Sec 31, Sec 32, Sec 33

Amendments to PART A

Ch 1, Sec 2, Table 1

Insert the following new row “Anchor handling” (Amendments July 2020).

Replace the rows “Escort tug”, “Salvage tug” and “Tug” as follows (Amendments July 2020):

Replace the rows “Liquefied gas carrier” and “SMART()”

Insert the following new rows “CBM”

Table 1 : List of service notations and additional service features

Service notation [ref. in Part A]	Reference	Corresponding type of ship according to Conventions and/or Codes
Additional service feature	Reference	
Anchor handling [4.8.2]	Part E, Chapter 2	Cargo ship (SOLAS, Reg I/2(g))
Escort tug [4.7.4]	Part E, Chapter 1	Cargo ship (SOLAS, Reg I/2(g))
barge combined (design bollard pull = $[T_{BP}/9,81]$ t) (design maximum braking force = $[T_{X,MAX}/9,81]$ t) (design maximum escort speed = $[V_{MAX}]$ kN) (design maximum steering force = $[T_{Y,MAX}/9,81]$ t) (standardized design bollard pull = $[T_{BP}/9,81]$ t)	Pt E, Ch 1, Sec 4 Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1	
Liquefied gas carrier [4.4.5]	Part D, Chapter 9	Tanker (SOLAS, Reg I/2(h))
([cargo type], [ship type], [Pdesign], [Tmin])	–	Gas carrier (SOLAS, Reg II-1/3.20, Reg II-2/3.25, Reg VII /11.2)
BOG-refiquefaction	Pt D, Ch 9, Sec 1, [7]	
LNG-subcooling	Pt D, Ch 9, Sec 1, [7]	
REGAS	NR 645, Sec 10	
STL-SPM	Pt D, Ch 9, Sec 1, [8]	
Salvage tug [4.7.3]	Part E, Chapter 1	Cargo ship (SOLAS, Reg I/2(g))
barge combined (design bollard pull = $[T_{BP}/9,81]$ t) (standardized design bollard pull = $[T_{BP}/9,81]$ t)	Pt E, Ch 1, Sec 4 Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1	
Tug [4.7.2]	Part E, Chapter 1	Cargo ship (SOLAS, Reg I/2(g))
barge combined (design bollard pull = $[T_{BP}/9,81]$ t) (standardized design bollard pull = $[T_{BP}/9,81]$ t)	Pt E, Ch 1, Sec 4 Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1	
OTHER ADDITIONAL SERVICE FEATURES		Remarks
CBM, [CBM] [4.17.9]	–	
SMART() [4.17.8]		Service feature to be completed between brackets by at least one of the following notations: H1 or H2 , M1 or M2 , N1 or N2

Part A

Ch 1, Sec 2, Table 2 (Amendments July 2020)

Replace rows “anchor handling” and “tug” as follows:

Table 2 : List of service notations and additional service features for offshore service vessels

Service notation [ref. in Part A]	Associated service notation [ref. in Part A]	Reference
Additional service feature	Additional service feature	Reference
Offshore support vessel [4.9.4]	anchor handling [4.8.2]	Part E, Chapter 2
	tug [4.7] (1)	Part E, Chapter 1
	(design bollard pull = $[T_{BP}/9,81]$ t) (standardized design bollard pull = $[T_{BP}/9,81]$ t)	Pt E, Ch 1, Sec 1 Pt E, Ch 1, Sec 1

Ch 1, Sec 2, [4.4.5]

Replace the fourth paragraph as follows:

The service notation is completed by the following additional service features, as applicable:

- **BOG-reliquefaction**, where the ship is fitted with a reliquefaction installation. The requirements for the assignment of this additional service feature are given in Pt D, Ch 9, Sec 1, [7]
- **LNG-subcooling**, where the ship is fitted with a cooling installation aiming at reducing the cargo temperature. The requirements for the assignment of this additional service feature are given in Pt D, Ch 9, Sec 1, [7]

- **REGAS**, where the ship is fitted with an installation for re vapourisation of the liquefied natural gas. The requirements for the assignment of this additional service feature are given in NR645, Sec 10
- **STL-SPM**, where the ship is used as re-gasification terminal and fitted forward with equipment for non permanent mooring or single buoy. The requirements for the assignment of this additional service feature are given in Pt D, Ch 9, Sec 1, [8].

Ch 1, Sec 2, [4.7.1] (Amendments July 2020)

Replace the 4th paragraph by:

These service notations are always completed by the additional service feature (**standardized design bollard pull = $[T_{BP}/9,81]$ t**).

Note 1: Ships contracted for construction before 1 July 2020 and not meeting the bollard pull test requirements for the assignment of the additional service feature (**standardized design bollard pull = $[T_{BP}/9,81]$ t**) are assigned the additional service feature (**design bollard pull = $[T_{BP}/9,81]$ t**), subject to bollard pull tests being carried out according to a procedure accepted by the Society.

The requirements for the assignment and the maintenance of this additional service feature are given respectively in Part E, Chapter 1 and Ch 4, Sec 8, [6].

Ships granted with the additional service feature (**design bollard pull = $[T_{BP}/9,81]$ t**) may be granted with the additional service feature (**standardized design bollard pull = $[T_{BP}/9,81]$ t**) after having satisfactorily carried out the bollard pull test laid down in Pt E, Ch 1, App 1.

Ch 1, Sec 2, [4.8] (Amendments July 2020)

Insert the following new requirement [4.8.2]:

4.8.2 Anchor handling vessel

The service notation anchor handling is assigned to towing vessels and/or supply vessels equipped with winches for anchor handling, having an open stern to allow the decking of anchors and an appropriate thrust to perform the intended anchor handling operations, consisting in deployment, recovering and repositioning of anchors and the asso-

ciated mooring lines of rigs or other vessels. The additional requirements of Ch 4, Sec 8, [10] and Part E, Chapter 2 are applicable to these ships.

Note 1: As a rule, the service notation **tug** is also to be assigned in combination with the service notation **anchor handling vessel**; the additional requirements of Ch 4, Sec 8, [6] and Part E, Chapter 1 are applicable to these ships

Ch 1, Sec 2, [4.9.4] (Amendments July 2020)

Replace the second item in the bulleted list by:

- **anchor handling** (as defined in [4.8.2])

Ch 1, Sec 2, [4.9] (Amendments July 2020)

Delete requirement [4.9.9].

Ch 1, Sec 2, [4.17]

Add the following new requirements [4.17.8] and [4.17.9]:

4.17.8 Smart systems

The additional service feature **SMART()** is assigned to ships fitted with computer based systems that incorporate functions for the collection, the transmission, the analysis and the visualisation of data.

These smart functions may be related to operation or maintenance of ships and may include monitoring, decision making support, remote monitoring, maintenance from shore or remote operation of systems.

The additional service feature **SMART()** is completed by at least one of the following notations:

- **H1** or **H2**, for smart functions related to hull items
- **M1** or **M2**, for smart function related to machinery items
- **N1** or **N2**, for smart functions related to navigation systems.

Examples:

SMART(H1)

SMART(M2, N2)

Granting of a notation **H1** or **H2**, **M1** or **M2** and **N1** or **N2** is subject to compliance with the requirements for the assignment of specific additional class notations and/or additional service features, as defined in NR675 "Additional service feature SMART".

Note 1: When granting the additional service feature **SMART()**, a memoranda is to be endorsed in order to record the smart functionalities considered, specifying the additional class notations, addi-

tional service features and any other digital solutions considered in the scope of the granted additional service feature **SMART()**.

The requirements for the assignment of the additional service feature **SMART()** are given in NR675.

The requirements for the maintenance of the additional service feature **SMART()** are those corresponding to:

- each additional class notation or additional service feature assigned in association with notations **H1** or **H2**, **M1** or **M2** and **N1** or **N2**.
- and/or requirements laid down in Ch 3, Sec 1, [3.3] or Sec 3, [3.6] as applicable for notations using computer based systems.

4.17.9 Condition based maintenance

The additional service features **CBM** and **[CBM]** are assigned to ships where a Planned Maintenance Survey system for machinery (PMS) is implemented and on which at least one machinery item is to be surveyed under a Condition Based Maintenance scheme, according to the requirements of Ch 2, Sec 2, [4.4] and Ch 2, App 4.

The additional service feature **[CBM]** is assigned to ships prior to an implementation survey to be carried out under the conditions specified in Ch 2, App 4, [3.2].

The additional service feature **[CBM]** is replaced by **CBM** when the implementation survey is carried out and found in order.

The requirements for the assignment and maintenance of these additional service features are given in Ch 2, App 4.

Ch 1, Sec 2, [6.8] (Amendments July 2020)

Replace requirement [6.8.15] as follows:

6.8.15 Ultra-low emission vessel (ULEV)

The additional class notation **ULEV** may be assigned to seagoing ships. The additional class notation **ULEV** may not be assigned to vessels dedicated to operations on inland waterways (including estuaries, rivers, estuary and lakes) falling into the scope of EU Regulation 2016/128.

The additional class notation **ULEV** refers to the capacity of the internal combustion engines installed on a ship to emit

gaseous pollutants and particular pollutants at a very low level at the time of assignment of the notation.

When granting the additional class notation **ULEV**, a memoranda is to be endorsed in order to record the list of engines covered, the fuel(s) with which they have been tested and their ULEV mode if any.

The requirements for the assignment and the maintenance of this notation are given respectively in Pt F, Ch 11, Sec 26 and in Ch 5, Sec 7.

Ch 1, Sec 2, [6.14]

Delete the existing requirement [6.14.19].

Replace requirement [6.14.44] as follows (Amendments July 2020):

6.14.44 Cyber security

The additional class notations **CYBER MANAGED**, **CYBER SECURE**, **CYBER MANAGED PREPARED** and **CYBER SECURE PREPARED** may be assigned to ships whose systems and equipment comply with the requirements of NR659 Rules on Cyber Security for the Classification of Marine Units.

The additional class notation **CYBER MANAGED PREPARED** may be assigned to new buildings only and corresponds to compliance, at shipyard level, with a set of requirements dealing with system integration and the management of critical equipment and remote access:

- Granting of **CYBER MANAGED PREPARED** notation does not indicate an effective control of cyber security on-board ship during service life.
- When compliance with the dedicated requirement for management, crew training and change management are met, **CYBER MANAGED PREPARED** notation may be replaced by the additional class notation **CYBER MANAGED**.

The additional class notation **CYBER MANAGED** introduces on board operations dedicated to cyber security:

- The additional class notation **CYBER MANAGED** may be assigned to new buildings or ships in-service and corresponds to compliance with a set of requirements dealing with critical equipment management, crew training, remote access and change management.
- Granting of **CYBER MANAGED** notation implies that cyber security of the ship is controlled with manual procedures, requiring human actions, a strong human

organization and a significant amount of procedures to achieve objective.

CYBER SECURE and **CYBER SECURE PREPARED** notations distinguish a way to control cyber security by means of automatic software. They require dedicated technical equipment for security:

- The additional class notation **CYBER SECURE PREPARED** may be assigned to new buildings only and corresponds to compliance, at shipyard level, with a set of requirements dealing with equipment hardening and vessel secure by design.
- When compliance with the dedicated requirement for cyber management are met, **CYBER SECURE PREPARED** notation may be replaced by the additional class notation **CYBER SECURE**.
- The additional class notation **CYBER SECURE** may be assigned to new buildings or ships in-service already granted with **CYBER SECURE PREPARED** additional class notation and corresponds to compliance with a set of requirements dealing with cyber management, equipment hardening and vessel secure by design.

In compliance with [6.1.3], the additional class notation **CYBER SECURE** and **CYBER SECURE PREPARED** are assigned a construction mark, as defined in Article [3].

The requirements for the assignment of these notations are given in NR659, Rules on Cyber Security for the Classification of Marine Units.

The requirements for the maintenance of the notations **CYBER MANAGED** and **CYBER SECURE** are given in Ch 5, Sec 10.

Add the following new requirements [6.14.50], [6.14.51] and [6.14.52]:

6.14.50 Hybrid mechanical propulsion

The additional class notation **HYBRID MECHANICAL PROPULSION** may be assigned to ships provided with a propulsion plant which combines a diesel mechanical system and an electric system.

The requirements for the assignment and the maintenance of this notation are given respectively in Pt F, Ch 11, Sec 32, and in Ch 5, Sec 10, [23].

6.14.51 Biological risk control

The additional class notations **BIORISK MANAGED** and **BIORISK SECURED** may be assigned to ships where measures improving the ability to prevent and manage an infectious disease outbreak are implemented.

The additional class notation **BIORISK MANAGED** may be assigned when an outbreak management plan is established for the ship and implemented on board.

The additional class notation **BIORISK SECURED** may be assigned when, in addition to the above-mentioned out-

break management plan, systems and arrangements are provided on board in order to support the management of an infectious disease outbreak.

The requirements for the assignment and the maintenance of these additional class notations are given respectively in Pt F, Ch 11, Sec 31 and in Ch 5, Sec 10, [22].

6.14.52 Open-hatch

The additional class notation **OPEN-HATCH** may be assigned to ships granted with the service notation **general cargo ship** intended to undertake sea voyage with one or several hatch covers not in place, as defined in Pt F, Ch 11, Sec 33.

Note 1: The additional class notation **OPEN-HATCH** can not be granted to ships assigned with the service feature **equipped for carriage of containers**.

The requirements for the assignment and maintenance of this additional class notation are given respectively in Pt F, Ch 11, Sec 33 and in Ch 4, Sec 7.

Ch 1, Sec 2, Table 3

Replace the rows “CYBER MANAGED” and “CYBER SECURE” (Amendments July 2020):

Delete the row “FATIGUE PLUS”.

Insert the following new rows “BIORISK MANAGED” “BIORISK SECURED”, “OPEN-HATCH” and “HYBRID MECHANICAL PROPULSION”:

Table 3: List of additional class notations

Additional class notation	Definition in	Reference in NR 467 or to other Rule Notes	Remarks
BIORISK MANAGED BIORISK SECURED	[6.14.51]	Part F, Ch 11, Sec 31	
CYBER MANAGED CYBER MANAGED PREPARED	[6.14.44]	NR 659	
CYBER SECURE (1) CYBER SECURE PREPARED (1)	[6.14.44]	NR 659	
OPEN-HATCH	[6.14.52]	Part F, Ch 11, Sec 33	may be assigned to ships granted with the service notation general cargo ship
HYBRID MECHANICAL PROPULSION	[6.14.50]	Part F, Ch 11, Sec 32	

Ch 2, Sec 2, [1.2.2] (Amendments July 2020)

Replace item c) by the following one:

- c) In the case of all other periodical surveys and conditions of class, extension of class may be granted until the arrival of the ship at the port of destination.

Ch 2, Sec 2, [2.1] (Amendments July 2020)

Replace requirements [2.1.5] and [2.1.6] as follows:

2.1.5 Conditions of class

A defect and/or deficiency to be dealt with in order to maintain class, within a specific period of time, is indicated as a condition of class. A condition of class is pending until it is cleared, through a survey by the attending Surveyor or upon evidence that requirements have been completed, to the satisfaction of the Society. Where it is not cleared by its limit date, the condition of class is overdue.

Condition of class may be imposed in other cases, which, in the Society’s opinion, require specific consideration.

2.1.6 Memoranda

Those defects and/or deficiencies which do not affect the maintenance of class and which may therefore be cleared at the Owner’s convenience and any other information deemed noteworthy for the Society’s convenience are indicated as memoranda. Memoranda are not to be regarded as condition of class.

Ch 2, Sec 2, [2.2.1] (Amendments July 2020)

Delete the last paragraph of the requirement.

Part A

Ch 2, Sec 2, [2.2.7]

Replace the second paragraph as follows:

For ships built under the:

- Common Structural Rules for Bulk Carriers (NR522)
- Common Structural Rules for Double Hull Oil Tankers (NR523)
- Common Structural Rules for Bulk Carriers and Oil Tankers (NR606)

- or Structural Rules for Container Ships with a length greater than 65m and contracted for construction on or after 1st July 2016,

substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a measured thickness between ($t_{\text{renewal}} + 0,5 \text{ mm}$) and t_{renewal} .

Ch 2, Sec 2, [2.2] (Amendments July 2020)

Replace requirement [2.2.17] as follows:

2.2.17 Prompt and thorough repair

A “Prompt and thorough repair” is a permanent repair completed at the time of survey to the satisfaction of the Surveyor, therein removing the need for the imposition of any associated condition of class. See also [2.11].

Ch 2, Sec 2, [2.6.2] (Amendments July 2020)

Replace the first paragraph by the following one:

For survey in cargo holds and ballast tanks, one or more of the following means for access, acceptable to the Surveyor, is to be provided:

Ch 2, Sec 2, [2.11] (Amendments July 2020)

Replace requirement [2.11.4] as follows:

2.11.4 Where the damage found on structure mentioned in [2.11.1] is isolated and of a localised nature which does not affect the ship's structural integrity, consideration may be given by the Surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity and impose a condition of class in accordance with the Rules, with a specific time limit.

Ch 2, Sec 2, [3.2] (Amendments July 2020)

Replace requirement [3.2.4] as follows:

3.2.4 According to the same conditions as in [3.2.3], a statement declaring that the class is maintained “clean and free from condition of class” may be issued by the Society when there is no pending condition of class at that date.

Ch 2, Sec 2, [3] (Amendments July 2020)

Replace Sub-article [3.4] as follows:

3.4 Status of surveys and conditions of class

3.4.1 Information given in the Certificate of Classification, ship survey status, Rules and other ship specific documents made available to the Owner, enables the Owner to identify the status of surveys and conditions of class.

3.4.2 The omission of such information does not absolve the Owner from ensuring that surveys are held by the limit dates and pending conditions of class are cleared to avoid any inconvenience which is liable to result from the suspension or withdrawal of class; see Ch 2, Sec 3.

Ch 2, Sec 2, [4.4] (Amendments July 2020)

Replace requirement [4.4.7] as follows:

4.4.7 Surveys of machinery may be carried out on a condition based maintenance (CBM) scheme basis on vessels operating on approved PMS survey system.

Ch 2, Sec 2, [6.1.2] (Amendments July 2020)

Replace the last bullet of the bulleted list by the following one:

- postponement of surveys or conditions of class.

Ch 2, Sec 2, [6.2] (Amendments July 2020)

Replace requirements [6.2.4] and [6.2.5] as follows:

6.2.4 Damages and partial or temporary repairs considered acceptable by the Surveyor for a limited period of time are the subject of an appropriate condition of class.

6.2.5 Damages or repairs required by the Surveyor to be re-examined after a certain period of time are the subject of an appropriate condition of class.

Ch 2, Sec 3, [1.2.4] (Amendments July 2020)

Replace the first bullet of the bulleted list by the following one:

- when a condition of class is not dealt with within the time limit specified, unless it is postponed before the limit date by agreement with the Society

Ch 2, App 1, [5.3] (Amendments July 2020)

Replace requirement [5.3.1] as follows:

5.3.1 Damage to components or items of machinery covered by the PMS which may affect the class is to be reported to the Society. Where applicable, a Surveyor will attend on

board, survey the damaged items and, on the basis of the survey results, decide whether conditions of class are to be imposed.

Replace requirement [5.3.3] as follows:

5.3.3 In the case of overdue condition of class or records of unrepaired damage which may affect the PMS, the relevant items are to be taken out of the PMS until the conditions of class have been fulfilled or the repairs carried out.

Part A

Ch 2, App 3, [4.2.1]

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

- criteria on hull supporting structure of shipboard fittings associated with towing and mooring, given in [4.6]
- criteria on ice strengthened structures for ships assigned with additional class notation for navigation in polar waters, given in [4.7]
- criteria on CSR ships, given in [4.8]
- criteria on container ships contracted for construction on or after 1st July 2016 with a length greater than 65 m, given in [4.9].

Ch 2, App 3, [4.2.2]

Replace the term “these four” by “above”.

Ch 2, App 3, Table 1 (Amendments July 2020)

Replace the rows “liquefied gas carrier and” “general cargo ship” by:

Table 1 : References to rule requirements related to thickness measurements

SERVICE NOTATION	TYPE OF SURVEY		
	CLASS RENEWAL	INTERMEDIATE	ANNUAL
liquefied gas carrier	Ch 4, Sec 5, [6.2], Ch 4, Sec 5, [6.3.2] and Ch 4, Sec 5, [6.5]: planning and general requirements Ch 4, Sec 5, Tab 2: measurements of elements subjected to close-up survey Ch 4, Sec 5, Tab 3: extent of systematic thickness measurements Where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor’s satisfaction, using Ch 3, Sec 3, Tab 4 as guidance	Ch 4, Sec 5, Tab 1: thickness measurements to be taken if deemed necessary by the Surveyor Where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor’s satisfaction, using Ch 3, Sec 3, Tab 4 as guidance	Ch 4, Sec 5, [2.5.2] limited to ballast tanks and when deemed necessary by the Surveyor Where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor’s satisfaction, using Ch 3, Sec 3, Tab 4 as guidance
general cargo ship	Ch 4, Sec 7, [4.1], Ch 4, Sec 7, [4.2] and Ch 4, Sec 7, [4.5]: planning and general requirements Ch 4, Sec 7, Tab 4: measurements of elements subjected to close-up survey Ch 4, Sec 7, Tab 5: extent of systematic thickness measurements Where substantial corrosion is found, the extent of thickness measurements may be increased to the Surveyor’s satisfaction, using Ch 4, Sec 7, Tab 6 as guidance	<ul style="list-style-type: none"> • Ships 15 years of age or less: Ch 4, Sec 7, Tab 2 for cargo holds Ch 4, Sec 7, Tab 3 for ballast tanks Ch 4, Sec 7, Tab 6, where substantial corrosion is found • Ships over 15 years of age: see references given for class renewal survey 	Ch 4, Sec 7, Tab 1 for cargo holds when deemed necessary by the Surveyor or where extensive corrosion exists Ch 4, Sec 7, [2.4] for ballast tanks when deemed necessary by the Surveyor or where extensive corrosion exists Ch 4, Sec 7, Tab 6 where substantial corrosion is found

Ch 2, App 3, [4]

Add the following new sub-article [4.9]:

4.9 Acceptance criteria for container ships

4.9.1 General

For ships assigned with the service notation **container ship**, contracted for construction on or after the 1st July 2016 and with a length greater than 65 m, the acceptance criteria for allowable thickness diminution of ship hull structure are given here after.

Symbols:

- $t_{as-built}$: As built thickness, in mm
 t_c : Corrosion addition, in mm, as defined in Structural Rules for container ships NR625, Ch 3, Sec 2
 $t_{vol-add}$: Thickness for voluntary addition, in mm
 t_m : Measured thickness, in mm, on one item, i.e. average thickness on one item using the various measurements taken on this same item during periodical ship's in service surveys.

4.9.2 Local corrosion

a) Renewal thickness of local structural elements:

Local structural elements include local supporting members and primary supporting members.

Steel renewal is required if the measured thickness, t_m , in mm, is less than the renewal thickness, t_{ren} , defined as:

$$t_{ren} = t_{as-built} - t_c - t_{vol-add}$$

b) Renewal area:

Areas which need to be renewed based on the renewal criteria in item a) are to be repaired with inserted material which is to have the same or greater grade and yield stress as the original, and to have a thickness, t_{repair} , in mm, not less than:

$$t_{repair} = t_{as-built} - t_{vol-add}$$

c) Alternative solutions:

When there is a substantial corrosion as defined in Ch 2, Sec 2, [2.2.7], alternative solutions may be adopted in accordance with the requirements of the Society.

4.9.3 Global corrosion

a) Application:

The longitudinal strength of the ship is to be evaluated by using the thickness of structural members measured,

renewed and reinforced, as appropriate, during class renewal surveys, for ships over 10 years of age.

b) Renewal criteria:

Hull girder strength criteria are given as detailed below:

- For deck and bottom zones:

The current hull girder section modulus at deck and bottom determined with the thickness measurements are not to be less than 90% of the section modulus calculated according to NR625, Ch 5, Sec 1 with the gross offered thickness.

Alternatively, the current sectional areas of the bottom zone and of the deck zone which are the sum of the measured item areas of the considered zones are not to be less than 90% of the sectional area of the corresponding zones determined with the gross offered thickness.

- For neutral axis zone:

The current sectional area of the neutral axis zone, which is the sum of the measured plating areas of this zone, is not to be less than the sectional area of the neutral axis zone calculated with the gross offered thickness minus $0,5 t_c$.

If the actual reduction of the gross offered thickness of all items, of a given transverse section which contribute to the hull girder strength is less than 10% for the deck and bottom zones and $0,5 t_c$ for the neutral axis zone, the hull girder strength criteria of this transverse section is satisfied and there is no need to perform calculation of the zone areas with measured thicknesses.

The gross offered thickness, t_{gr-off} , is the gross thickness provided at the newbuilding stage, which is obtained by deducting any thickness for voluntary addition from the as built thickness, as follows:

$$t_{gr-off} = t_{as-built} - t_{vol-add}$$

4.9.4 Pitting corrosion

The pitting depth is to be checked according to [4.5.1] and [4.5.2].

Ch 2, App 4, [1.1]

Add the following new requirement [1.1.5]:

1.1.5 Ships complying with the requirements of this Appendix are granted one of the notations **CBM** or **[CBM]** as defined in Ch 1, Sec 2, [4.17.9].

Part A

Ch 2, App 4, [1.4.6]

Add the following sentence at the end of the requirement:

In that case, written agreement from the OEM is to be provided to the Society.

Ch 2, App 4, [2.2]

Replace the requirement [2.2.1] by:

2.2.1 CM equipment and systems are to be approved in accordance with the Rule Note NR674 Condition Monitoring Systems.

Ch 3, Sec 1, [3.1] (Amendments July 2020)

Delete requirement [3.1.6].

Ch 3, Sec 2, [2.1] (Amendments July 2020)

Replace requirement [2.1.1] by:

2.1.1 The requirements given in Tab 1 for the survey and testing of ballast tanks, cargo holds (for dry cargo ships to which the additional requirements in Ch 4, Sec 2 and Ch 4, Sec 7 do not apply) and cargo tanks (for non-ESP tankers) are to be complied with.

Ch 3, Sec 2, Tab 1 (Amendments July 2020)

Replace the row "SALT WATER BALLAST SPACES".

Replace Table footnotes (2) and (3).

Table 1 : Intermediate survey of hull (all ships)

ITEM	Age of ship (in years at time of intermediate survey)		
	5 < age ≤ 10	10 < age ≤ 15	age > 15
BALLAST TANKS	Representative ballast tanks internally examined Thickness measurements, if considered necessary by the Surveyor See (1) (2) (3)	All ballast tanks internally examined Thickness measurements, if considered necessary by the Surveyor See (1) (3)	All ballast tanks internally examined Thickness measurements, if considered necessary by the Surveyor Tightness of inner bottom plating of cargo holds in way of double bottom ballast tanks checked, if considered necessary by the Surveyor See (1) (3)
<p>(2) If there is no hard protective coating, soft or semi-hard coating or poor coating condition, the examination is to be extended to other ballast tanks of the same type.</p> <p>(3) For ballast tanks, excluding double bottom ballast tanks, if there is no hard protective coating, soft or semi-hard coating or poor coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals. When such conditions are found in double bottom ballast tanks, the tanks in question may be examined at annual intervals.</p>			

Ch 3, Sec 3, [1.1.4]

Replace the second paragraph by:

The examinations of the hull are to be supplemented by testing and thickness measurements as required in [2.4] and [2.5], to ensure that the structural integrity remains effective.

The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deformation that may be present.

Ch 3, Sec 3, Table 2 (Amendments July 2020)

Replace the second row "Salt water ballast tanks (all types)" by:

Table 2 : Requirements for internal examination of integral (structural) tanks at class renewal survey

Tank	Age of ship (in years at time of class renewal survey)			
	Class renewal survey No.1 age ≤ 5	Class renewal survey No.2 5 < age ≤ 10	Class renewal survey No.3 10 < age ≤ 15	Class renewal survey No.4 and subsequent age > 15
Ballast tanks (all types)	all	all	all	all

Ch 3, Sec 4, [3.1] (Amendments July 2020)

Replace requirement [3.1.2] as follows:

3.1.2 In principle, no outstanding conditions of class are to exist requiring repair work to be carried out to the underwater part of the shell plating, the rudder, the propeller or the propeller shaft, unless the Society is satisfied that such repairs may be carried out while the ship is afloat.

Ch 3, App 1, [5.3.2] (Amendments July 2020)

Replace the last bullet of the bulleted list by the following one:

- dealing with the conditions of class due at the date of recommissioning or which became due during the lay-up period.

Ch 4, Sec 2, [2.3] (Amendments July 2020)

Delete requirement [2.3.2].

Ch 4, Sec 5, [4] (Amendments July 2020)

Replace Sub-article title [4.3] by:

4.3 Ballast tanks**Ch 4, Sec 5, [4.3] (Amendments July 2020)**

Replace requirement [4.3.1] as follows:

4.3.1 The requirements for survey of ballast tanks given in Tab 1 are to be complied with.

Part A

Ch 4, Sec 5 (Amendments July 2020)

Replace Table 1 by:

Table 1 : Intermediate survey of ballast tanks for liquefied gas carriers

Age of ship (in years at time of intermediate survey)		
5 < age ≤ 10	10 < age ≤ 15	age > 15
Overall survey of representative ballast tanks, selected by the attending Surveyor See (1), (2) and (3)	Overall survey of all ballast tanks See (1) and (3)	Overall survey of all ballast tanks See (1) and (3)
	Close-up survey of: - all web frames and both transverse bulkheads in a representative ballast tank (4) and (5) - the upper part of one web frame in another representative ballast tank - one transverse bulkhead in another representative ballast tank (5) See (6), (7) and (8)	Close-up survey of all web frames and both transverse bulkheads in two representative ballast tanks (4) and (5) See (6), (7) and (8)
<p>(1) If such surveys reveal no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.</p> <p>(2) If there is no hard protective coating, soft or semi-hard coating or poor coating condition, the examination is to be extended to other ballast tanks of the same type.</p> <p>(3) For ballast tanks, excluding double bottom tanks, if there is no hard protective coating, soft or semi-hard coating, or poor coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals. When such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.</p> <p>(4) Complete transverse web frame including adjacent structural members.</p> <p>(5) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure.</p> <p>(6) The extent of close-up surveys may be extended in accordance with the requirements of [6.4.3].</p> <p>(7) For areas in ballast tanks where protective coating is found to be in good condition, as defined in Ch 2, Sec 2, [2.2.14], the extent of close-up survey may be specially considered.</p> <p>(8) Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.</p>		

Replace Table title of Table 2 as follows:

Table 2 : Requirements for close-up survey of ballast tanks at class renewal survey of liquefied gas carriers

Ch 4, Sec 5, [5]

Delete sub-article [5.6].

Ch 4, Sec 5, [6.3] (Amendments July 2020)

Replace requirement [6.3.7] as follows:

6.3.7 Where provided, the condition of the corrosion prevention system of ballast tanks is to be examined.

For ballast tanks, excluding double bottom tanks, where a hard protective coating is found in poor condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as deemed necessary by the Surveyor.

When such breakdown of hard protective coating is found in double bottom ballast tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

Ch 4, Sec 5, [6.4] (Amendments July 2020)

Replace requirement [6.4.2] as follows:

6.4.2 Each class renewal survey is to include a close-up examination of sufficient extent to establish the condition of cargo tanks and ballast tanks. The minimum requirements for close-up surveys are given in Tab 2 for ballast tanks and in [6.7.3] for cargo tanks.

Ch 4, Sec 5, [6.4.4] (Amendments July 2020)

Replace the second paragraph by the following one:

For ships having independent tanks of type C, with a mid-ship section similar to that of a general cargo ship, the extent of close-up surveys of ballast tanks may be specially considered by the Society.

Ch 4, Sec 5, [6.6] (Amendments July 2020)

Replace requirement [6.6.1] as follows:

6.6.1 All boundaries of ballast tanks and deep tanks used for water ballast within the cargo area are to be pressure tested. For fuel oil tanks, the representative tanks are to be pressure tested.

Ch 4, Sec 7, [1.1.1] (Amendments July 2020)

Replace the second paragraph by:

The requirements of this Section do not apply to general dry cargo ships of double side-skin construction, with double side-skin extending for the length of the cargo area, and over the height of the cargo hold to the upper deck.

Note 1: Special consideration may also be given to ships that are of double-skin construction but with single skin in way of several frame spaces, e.g. in way of a cargo hold entrance or in way of forebody hull form at the forward end of the foremost cargo hold.

Ch 4, Sec 7, [2.1]

Add the following new requirement [2.1.3]:

2.1.3 For ships granted with the additional class notation **OPEN-HATCH**:

- confirmation that the operability and condition of the hold dewatering systems and freeing ports, if they are fitted, have been checked by the crew on a monthly

basis and recorded in the ship's log book for annual verification by the Society

- examination of the water-spray system for open-top cargo holds in accordance with the relevant requirements given in Ch 3, Sec 1, [3.4.2], item d).

Ch 4, Sec 7, [3.2] (Amendments July 2020)

Replace requirement [3.2.2] as follows:

3.2.2 The requirements for survey of ballast tanks given in Tab 3 are to be complied with.

Ch 4, Sec 7, [4.2]

Replace requirement [4.2.3] as follows (Amendments July 2020):

4.2.3 All cargo holds, ballast tanks, including double bottom tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in [4.5] and [4.6] to

ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deformation, that may be present.

Replace requirements [4.2.6] to [4.2.8] as follows (Amendments July 2020):

4.2.6 As indicated in Ch 3, Sec 3, [2.1.1], a bottom survey in dry condition is to be a part of the class renewal survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and ballast tanks are to be carried out in accordance with the applicable requirements for class renewal surveys, if not already performed.

Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

4.2.7 Where provided, the condition of the corrosion prevention system of ballast tanks is to be examined.

For ballast tanks, excluding double bottom tanks, where a hard protective coating is found in poor condition and it is not renewed, where soft or semi-hard coating has been applied, or where a hard protective coating was not applied

from time of construction, the tanks in question are to be examined at annual intervals. Thickness measurements are to be carried out as found necessary by the Surveyor.

When such breakdown of hard protective coating is found in double bottom ballast tanks and it is not renewed, where a soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurements are to be carried out.

4.2.8 Where the hard protective coating in tanks is found to be in good condition, the extent of close-up surveys and thickness measurements may be specially considered.

Add the following new requirement [4.2.9]:

4.2.9 For ships granted with the additional class notation **OPEN-HATCH**:

- examination and complete test of the hold dewatering systems to check their proper functioning

- complete inspection of the open cargo holds
- operational testing and internal examination, as required by the Surveyor, of the relevant pumps for the water-spray system for open-top cargo holds.

Ch 4, Sec 7 (Amendments July 2020)

Replace Table 3 and Table 4 by:

Table 3 : Intermediate survey of ballast tanks for general cargo ships

Age of ship (in years at time of intermediate survey)	
5 < age ≤ 10	10 < age ≤ 15
Overall survey of representative ballast tanks selected by the Surveyor See (1), (2) and (3)	Overall survey of all ballast tanks See (1) and (3)
Areas found suspect at the previous surveys are to be surveyed in accordance with the provisions indicated in [2.1.1]	Areas found suspect at the previous surveys are to be surveyed in accordance with the provisions indicated in [2.1.1]
<p>(1) If such overall survey reveals no visible structural defects, the examination may be limited to a verification that the corrosion prevention system remains efficient.</p> <p>(2) Where poor coating condition, soft or semi-hard coating, corrosion or other defects are found in ballast tanks or where a hard protective coating was not applied from the time of construction, the examination is to be extended to other ballast tanks of the same type.</p> <p>(3) In ballast tanks other than double bottom tanks, where a hard protective coating is found in poor condition and it is not renewed, where a soft or semi-hard coating has been applied or where a hard protective coating was not applied from time of construction, the tanks in question are to be examined and thickness measurements carried out as considered necessary at annual surveys.</p> <p>When such breakdown of hard protective coating is found in double bottom ballast tanks, where a soft or semi-hard coating has been applied or where a hard protective coating has not been applied, the tanks in question may be examined at annual surveys. When considered necessary by the Surveyor or where extensive corrosion exists, thickness measurements are to be carried out.</p>	

Table 4 : Requirements for close-up survey at class renewal survey of general cargo ships

Age of ship (in years at time of class renewal survey)			
Class renewal survey No.1 age ≤ 5	Class renewal survey No.2 5 < age ≤ 10	Class renewal survey No.3 10 < age ≤ 15	Class renewal survey No.4 and subsequent age > 15
Selected shell frames in one forward and one aft cargo hold and associated 'tweendeck spaces ①	Selected shell frames in all cargo holds and 'tweendeck spaces ①	All shell frames in the forward lower cargo hold and 25% of shell frames in each of the remaining cargo holds and 'tweendeck spaces including upper and lower end attachments and adjacent shell plating ①	All shell frames in all cargo holds and 'tweendeck spaces including upper and lower end attachments and adjacent shell plating ①
One selected cargo hold transverse bulkhead ②	One transverse bulkhead in each cargo hold ② Forward and aft transverse bulkheads in one side ballast tank, including stiffening system ②	All cargo hold transverse bulkheads ② All transverse bulkheads in ballast tanks, including stiffening system ②	Areas ② to ⑥ as for class renewal survey for ships between 10 and 15 years of age
	One transverse web with associated plating and framing in two representative ballast tanks of each type (i.e. topside, hopper side, side tank or double bottom tank) ③	All transverse webs with associated plating and framing in each ballast tank ③	
All cargo hold hatch covers and coamings (plating and stiffeners) ④	All cargo hold hatch covers and coamings (plating and stiffeners) ④	All cargo hold hatch covers and coamings (plating and stiffeners) ④	
	Selected areas of all deck plating and underdeck structure inside line of hatch openings between cargo hold hatches ⑤	All deck plating and underdeck structure inside line of hatch openings between cargo hold hatches ⑤	
	Selected areas of inner bottom plating ⑥	All areas of inner bottom plating ⑥	
<p>Note 1: See Fig 1, Fig 2, Fig 3 and Fig 4 for areas ①, ②, ③, ④, ⑤ and ⑥.</p> <p>① Cargo hold transverse frames.</p> <p>② Cargo hold transverse bulkhead plating, stiffeners and girders.</p> <p>③ Transverse web frame or watertight transverse bulkhead in ballast tanks.</p> <p>④ Cargo hold hatch covers and coamings. Subject to cargo hold hatch covers of approved design which structurally have no access to the internals, close-up survey/thickness measurement is to be done of the accessible parts of hatch cover structures.</p> <p>⑤ Deck plating and underdeck structure inside line of hatch openings between cargo hold hatches.</p> <p>⑥ Inner bottom plating.</p> <p>Note 2: Close-up survey of cargo hold transverse bulkheads to be carried out at the following levels:</p> <ul style="list-style-type: none"> - immediately above the inner bottom and immediately above the 'tweendecks, as applicable - mid-height of the bulkheads for holds without 'tweendecks - immediately below the main deck plating and 'tweendeck plating. 			

Ch 4, Sec 7, [4.6] (Amendments July 2020)*Replace requirement [4.6.1] as follows:*

4.6.1 All boundaries of ballast tanks and deep tanks used for water ballast within the cargo length area are to be pressure tested. For fuel oil tanks, the representative tanks are to be pressure tested.

Part A

Ch 4, Sec 8, [6.2] (Amendments July 2020)

Add the following new requirement [6.2.4]:

6.2.4 For ships granted with the additional service feature **standardized design bollard pull = $[T_{BP}/9,81] t$** , the survey is to include a new bollard pull test as defined in Pt E, Ch 1, App 1, [9].

Ch 4, Sec 8, [8.1.4]

Replace the 6th item of the bulleted list by:

- checking of fire-fighter's outfits, confirmation that they are stored in the appropriate locations, and checking of air compressor and other equipment.

Ch 4, Sec 9, [5.5.2] (Amendments July 2020)

Replace the second item of the bulleted list by the following one:

- vacuum insulated independent fuel storage tanks of type C without access openings need not be examined internally. Where fitted, the vacuum monitoring system shall be examined and records should be reviewed.

Ch 5, Sec 1, Table 1

Insert "BIORISK MANAGED, BIORISK SECURED" and "HYBRID MECHANICAL PROPULSION" in the row "Other notations".

Ch 5, Sec 2, [3.3] (Amendments July 2020)

Replace requirements [3.3.1] and [3.3.2] as follows:

3.3.1 The maintenance of the **STAR-HULL** notation is subject to the same principles as those for the maintenance of class: surveys are to be carried out by their limit dates and possible conditions of class (related to the notation) are to be dealt with by their limit dates.

The suspension of class automatically causes the suspension of the **STAR-HULL** notation.

3.3.2 Various events may lead either to imposition of a condition of class related to the **STAR-HULL** notation or to suspension of the notation itself. Some cases are given below:

- The condition of the ship is below the minimum level required for class (e.g. scantling of a hull structure below the corrosion margin). The action to be taken is either the immediate repair or the imposition of a condition of class for the class (if acceptable) and suspension of the **STAR-HULL** notation. However, in cases where the condition of class is of a minor nature, the notation may not be suspended.
- The condition of the ship is below the minimum level for the **STAR-HULL** notation, but still above the level for the class (e.g. the scantling of a hull structure is below the corrosion margin acceptable for the notation but is still above the corrosion margin). The action to be taken

is either the immediate repair or the imposition of a condition of class for the **STAR-HULL** notation (without condition of class for class).

- The Inspection and Maintenance Plan is not complied with (e.g. delays in performing the operations programmed according to the plan or the scope of inspection and/or maintenance not completely fulfilled).

The action to be taken is:

- either the immediate compliance with the requirements or the imposition of a condition of class if the non-conformity is of a minor nature or is an exceptional occurrence
- or the suspension of the **STAR-HULL** notation if the non-conformity is of a major nature or a recurrence.
- A defect or a deficiency is found in applying the IMP. The actions to be taken are the same as stated both for repair of structure/coating/equipment (first two cases above) and for the application of the IMP (third case above).
- An unexpected defect or deficiency is found or an accident occurs, i.e. not as a result of lack of maintenance or failure in the application of the IMP. The actions to be taken are the same as stated for repair of structure/coating/equipment (first two cases above).

Ch 5, Sec 7, [3.3] (Amendments July 2020)

Replace requirement [3.3.1] by:

3.3.1 At each annual and class renewal survey, the following is to be checked:

- proper operation of the NO_x Control Diagnostic (NCD) and Particulate Control Diagnostic (PCD) systems, when fitted
- proper operation of the recording of the status of the engines related to the operations in the ULEV mode

- confirmation that no modification has been carried out without prior approval of the Society on the engines covered by the **ULEV** additional class notation. In case of replacement or modification of an engine, testing as per Pt F, Ch 11, Sec 26 may be required unless otherwise duly justified and documented by the engine's manufacturer.

Ch 5, Sec 7, [3] (Amendments July 2020)

Replace Sub-article [3.4] as follows:

3.4 Continuous emission monitoring system (CEMS)

3.4.1 At each annual and class renewal survey, the following is to be checked:

- confirmation that the waste discharge and air emission parameters required to be monitored and recorded are transmitted on a regular basis via a satellite communication system to a shipowner facility ashore
- confirmation that such information is made available to the Surveyor upon request.

Ch 5, Sec 10, [1.1.1]

Add “BIORISK MANAGED, BIORISK SECURED” and “HYBRID MECHANICAL PROPULSION” in the list.

Ch 5, Sec 10, [5.1.2] (Amendments July 2020)

Replace the 7th bullet of the bulleted list by the following one:

- for ships granted with the additional class notation **DYNAPOS AM/AT-R** or **DYNAPOS AM/AT-RS**, 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. As a minimum, there should be tests of the failures of position and environmental reference systems, thrusters, power generation and distribution systems, position controls

and UPS's. Such tests are to be carried out at sea with the DP system in running condition. The results of these tests are to be recorded and kept on board.

Note 1: For ships granted with the - **DDPS** notation, reference is made to Ch 1, Sec 2, [6.14.6] and Pt F, Ch 11, Sec 6, [11]: tests to be carried out at sea may be performed by ship's crew without attendance of a Surveyor and will be reviewed digitally by a Surveyor.

Ch 5, Sec 10

Add the following new Articles [22] and [23]:

22 Biological risk control**22.1 General**

22.1.1 The requirements of this Article apply to ships which have been assigned the additional class notation **BIORISK MANAGED** or **BIORISK SECURED**, as defined in Ch 1, Sec 2, [6.14.51].

At each survey, the Owner or his representative is to declare to the attending surveyor that no changes or updates of the Outbreak Management Plan have been made since the last version that was submitted to the Society.

22.2 BIORISK MANAGED

22.2.1 Annual and class renewal survey

The annual and class renewal surveys are to include:

- verification that the Outbreak Management Plan is available on board
- verification that there is a register of PPEs and medical supplies required by the Outbreak Management Plan on board
- verification that the posters, signs and markings required by the Outbreak Management Plan are available on board
- verification that the operational records required by the Outbreak Management plan are available.

22.3 BIORISK SECURED

22.3.1 Annual survey

In addition to the requirements for **BIORISK MANAGED** given in [22.2.1], the annual survey is to include:

- verification that a means of monitoring body temperature is available on board
- verification that one totally enclosed stretcher and one totally enclosed wheel chair are available on board.

22.3.2 Class renewal survey

In addition to the requirements for annual survey given in [22.3.1], the class renewal survey is to include:

- functional testing of the ventilation arrangements for the quarantine area and for the accommodation spaces and normally manned control stations. It is to be checked that the ventilation system is functioning properly with the air filtration or alternative air disinfection system working

Ch 6, Sec 2, [1.1] (Amendments July 2020)

Delete requirement [1.1.3].

Ch 6, Sec 2, [1] (Amendments July 2020)

Delete Sub-article [1.6].

- functional testing of the means of monitoring the access to the quarantine area
- functional testing of the means of monitoring body temperature.

23 Hybrid mechanical propulsion

23.1 General

23.1.1 The requirements of this Article apply to ships which have been assigned the additional class notation **HYBRID MECHANICAL PROPULSION**, as defined in Ch 1, Sec 2, [6.14.50].

23.2 Annual survey

23.2.1 The annual survey is to include:

- confirmation of proper working of alarms and defaults and related functions and/or interfacing to the other ship systems
- test of manual switch from diesel propulsion mode to electric propulsion mode (PTI Fully electric mode and PTI Booster mode, if available)
- test of manual switch from electric propulsion mode to diesel propulsion Mode
- test of transfer of control between the different control positions.

23.3 Class renewal survey

23.3.1 In addition to the requirements of [23.2.1], the class renewal survey is to include:

- Test of automatic switch from electric propulsion mode to diesel propulsion.

Amendments to PART B

Ch 1, Sec 2, [2.1.1] (Amendments July 2020)

Replace the definition of “T” as follows:

T : Scantling draught, in m, defined in [3.7]

Ch 1, Sec 2, [3.1] (Amendments July 2020)

Replace requirements [3.1.1] and [3.1.2] as follows:

3.1.1 The rule length L is the distance, in m, measured on the waterline at the scantling draught, from the fore-side of the stem to the after side of the rudder post, or to the centre of the rudder stock where there is no rudder post. L is to be not less than 96% and need not exceed 97% of the extreme length on the waterline at the scantling draught.

3.1.2 In ships without rudder stock (e.g. ships fitted with azimuth thrusters), the rule length L is to be taken equal to 97% of the extreme length on the waterline at the scantling draught.

Ch 1, Sec 2, [3.4] (Amendments July 2020)

Replace requirement [3.4.1] as follows:

3.4.1 The moulded breadth B is the greatest moulded breadth, in m, measured amidships at the scantling draught T.

Ch 1, Sec 2, [3] (Amendments July 2020)

Replace Sub-article [3.7] as follows:

3.7 Scantling draught

3.7.1 The scantling draught T is the distance, in m, measured vertically on the midship transverse section, from the moulded base line to the waterline at which the strength requirements for the scantlings of the ships are met. It repre-

sents the full load condition and is to be not less than that corresponding the assigned freeboard.

In the case of ships with a solid bar keel, the moulded base line is to be taken as defined in [3.5.1].

Ch 2, Sec 2, [1.2]

Delete requirement [1.2.2].

Ch 2, Sec 2, [8.1.2]

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

Note 1: Machinery spaces of category A are defined in Pt C, Ch 4, Sec 1, [3.24].

Part B

Ch 4, Sec 1

Replace Table 1 by:

Table 1: Mechanical properties of hull steels

Steel grades $t \leq 100$ mm	Minimum yield stress R_{eH} , in N/mm ²	Ultimate minimum tensile strength R_m , in N/mm ²
A-B-D-E	235	400 - 520
AH32-DH32 EH32-FH32	315	440 - 570
AH36-DH36 EH36-FH36 EH36CAS1-EH36CAS2 FH36CAS1-FH36CAS2	355	490 - 630
AH40-DH40 EH40- FH40 EH40CAS1-EH40CAS2 FH40CAS1-FH40CAS2	390	510 - 660
EH47 EH47CAS1-FH47CAS2	460	570 - 720
Note 1: See NR216 Materials and Welding, Ch 2, Sec 1, [2]		

Ch 4, Sec 3, [4.4.3] (Amendments July 2020)

Replace the second paragraph by:

For a ring system, where the end bracket is integral with the web of the two connected members and the face plate runs continuously on the bracket from the web of one member to the other, the full cross section of the larger face plate of

the two members is to be maintained close to the mid-point of the bracket and gradually tapered to the smaller face plate. Butts in face plates are to be kept well clear of the bracket toes.

Ch 4, Sec 6, [4.2.1] (Amendments July 2020)

Replace the second paragraph by:

Insert plates may be replaced by doubling plates, except in the case of pillars which may also work under tension such as those in tanks. In such case, the insert plates are to comply with the requirements in Ch 4, Sec 1, [2.7] in order to prevent laminar tearing.

Ch 8, Sec 1, [4.2.1]

Replace the second item in the definition of C_S by:

- $C_S = 1,1$ for primary supporting members

Ch 8, Sec 5, [8.1.1]

Replace the last paragraph by the following one:

This manual is to be submitted to the Society for approval that the above mentioned items are contained in the OMM and that the maintenance part includes the necessary infor-

mation with regard to inspections, trouble-shooting and acceptance/rejection criteria.

Ch 8, Sec 6, [7.1.1]

Replace the last paragraph by the following one:

This manual is to be submitted to the Society for approval that the above mentioned items are contained in the OMM and that the maintenance part includes the necessary infor-

mation with regard to inspections, trouble-shooting and acceptance / rejection criteria.

Ch 9, Sec 1, [1.4]

Replace the requirements [1.4.2], [1.4.3] and [1.4.4] by:

1.4.2 The material used for rudder stocks, pintles, keys and bolts is to have a specified minimum yield stress not less than 200 N/mm².

1.4.3 The requirements relevant to the determination of scantlings contained in this Section apply to steels having a specified minimum yield stress equal to 235 N/mm².

Where the material used for rudder stocks, pintles, coupling bolts, keys and cast parts of rudders has a specified minimum yield stress different from 235 N/mm², the scantlings calculated with the formulae contained in the requirements of this Section are to be modified, as indicated, depending on the material factor k_1 , to be obtained from the following formula:

$$k_1 = \left(\frac{235}{R_{eH}} \right)^n$$

where:

R_{eH} : Specified minimum yield stress, in N/mm², of the specified steel, and not exceeding the lower of 0,7 R_m and 450 N/mm²

R_m : Tensile strength, in N/mm², of the steel used

n : Coefficient to be taken equal to:

- $n = 0,75$ for $R_{eH} > 235$ N/mm²
- $n = 1,00$ for $R_{eH} \leq 235$ N/mm².

1.4.4 Significant reductions in rudder stock diameter due to the application of steels with specified minimum yield stresses greater than 235 N/mm² may be accepted by the Society subject to the results of a check calculation of the rudder stock deformations (refer to [4.2.1]).

Ch 9, Sec 1, [5.1.4] (Amendments July 2020)

Delete the definition of "d₁".

Ch 9, Sec 1, [5.2]

Replace the requirement [5.2.3] by:

5.2.3 Push-up length of cone couplings with hydraulic arrangements for assembling and disassembling the coupling

It is to be checked that the push-up length Δ_E , in mm, of the rudder stock tapered part into the tiller boss is in compliance with the following formula:

$$\Delta_0 \leq \Delta_E \leq \Delta_1$$

where:

$$\Delta_0 = 6,2 \frac{M_{TR} \eta \gamma}{c d_M t_i \mu_A \beta} 10^{-3}$$

$$\Delta_1 = \frac{2\eta + 5}{1,8} \cdot \frac{\gamma d_0 R_{eH}}{c} 10^{-6}$$

η : Coefficient to be taken equal to:

- $\eta = 1$ for keyed connections
- $\eta = 2$ for keyless connections

c : Taper of conical coupling measured on diameter, to be obtained from the following formula:

$$c = (d_U - d_0) / \ell_c$$

t_i, ℓ_c, d_U, d_0 : Geometrical parameters of the coupling, defined in Fig 4

β : Coefficient to be taken equal to:

$$\beta = 1 - \left(\frac{d_M}{d_E} \right)^2$$

d_M : Mean diameter, in mm, of the conical bore, to be obtained from the following formula:

$$d_M = d_U - 0,5 c \ell_c$$

d_E : External boss diameter, in mm

μ_A : Coefficient to be taken equal to:

$$\mu_A = \sqrt{\mu^2 - 0,25c^2}$$

μ, γ : Coefficients to be taken equal to:

- for rudder stocks and bosses made of steel:
 - $\mu = 0,15$
 - $\gamma = 1$
- for rudder stocks made of steel and bosses made of SG iron:
 - $\mu = 0,13$
 - $\gamma = 1,24 - 0,1 \beta$

R_{eH} : Defined in [1.4.3].

Part B

Ch 9, Sec 1, [5.2.5]

Replace the definition of “ δ_0 ” by:

$$\delta_0 = 6,2 \cdot \frac{M_{TR}\eta\gamma}{d_{U,t,\mu}\beta_1} 10^{-3}$$

Ch 9, Sec 1, [5.3]

Replace requirement [5.3.1] by:

5.3.1 Taper on diameter

The taper on diameter of the cone couplings is to be in compliance with the following formulae:

- for cone couplings without hydraulic arrangements for assembling and disassembling the coupling:

$$\frac{1}{12} \leq \frac{d_U - d_0}{l_c} \leq \frac{1}{8}$$

- for cone couplings with hydraulic arrangements for assembling and disassembling the coupling (assembling with oil injection and hydraulic nut):

$$\frac{1}{20} \leq \frac{d_U - d_0}{l_c} \leq \frac{1}{12}$$

where:

d_U, l_c, d_0 : Geometrical parameters of the coupling, defined in Fig 4.

Ch 9, Sec 1, [5.3.2]

Replace the definition of “ d_E ” by:

d_E : Minimum outer dimension (diameter or width) of the solid part in way of any horizontal cross section.

Ch 9, Sec 1, [5.3.6]

Replace the definitions of “ R_{eH1} ” and “ R_{eH2} ” by:

R_{eH1} : Specified minimum yield stress R_{eH} for the steel used for key.

R_{eH2} : Specified minimum yield stress R_{eH} of the key, stock or coupling material, whichever is less.

Ch 9, Sec 1, [5.6]

Insert the following new requirement [5.6.1]:

5.6.1 The requirements [5.6.2] to [5.6.8] apply to trunk configurations which are extended below stern frame and arranged in such a way that the trunk is stressed by forces due to rudder action.

Replace the existing requirement [5.6.1] by:

5.6.1 The bending and shear stresses in the rudder trunk, in N/mm², are to be in compliance with the following formulae:

$$\sigma \leq 80 / k$$

$$\tau \leq 48 / k$$

where k is not to be taken less than 0,7.

For the calculation of the bending and shear stresses, refer to Ch 9, App 1, [1.8].

Ch 9, Sec 1, Table 5

Replace “between 60 and 70” by “greater than 60” in the third row.

Ch 9, Sec 1, Table 7 (Amendments July 2020)

Replace Table title by:

Table 7: Thickness of the vertical webs and rudder side plating welded to solid part or to rudder coupling flange

Ch 9, Sec 1

Replace Figure 4 and Figure 7 by:

Figure 4 : Geometry of cone coupling

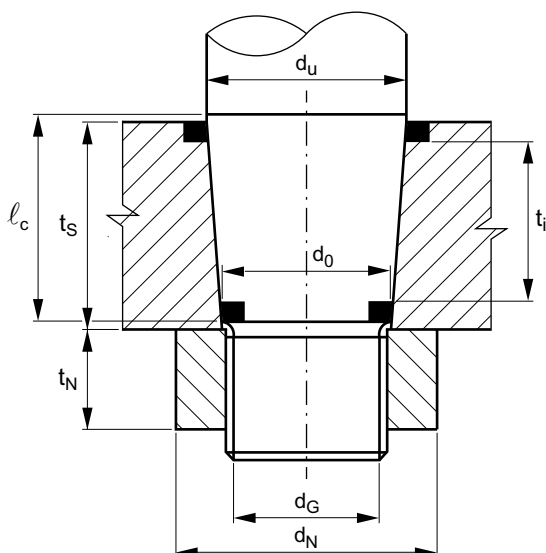
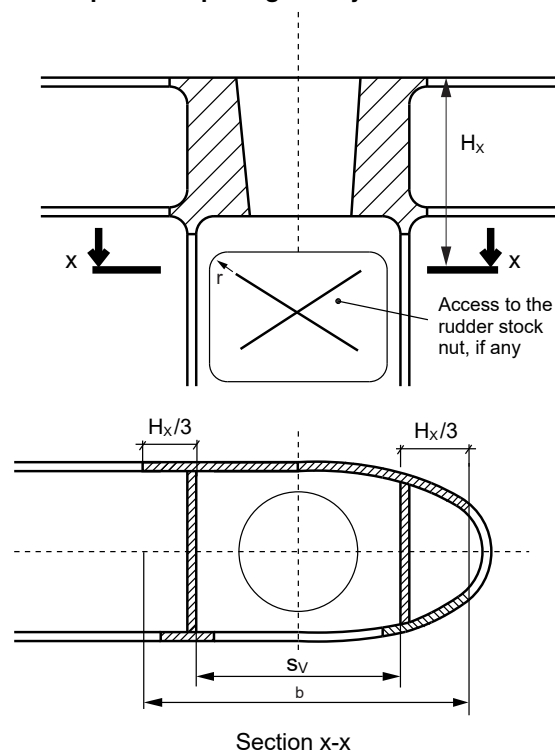


Figure 7 : Cross-section of the connection between rudder blade structure and rudder stock housing, example with opening in only one side shown



Ch 9, Sec 1, [7.1.3]

Replace the third paragraph by:

The corners of openings intended for the dismantling of pin-tle or stock nuts are to be rounded off with a radius as large as practicable.

Ch 9, Sec 1, [7.1]

Add the following requirement [7.1.5]:

7.1.5 Rudder horn recess

Except in way of solid parts in cast steel, the corners of the recess intended for the passage of the rudder horn heel are to be designed with a radius at least equal to 5 times the plate thickness, but in no case smaller than 100 mm.

Welding in side plate is to be avoided in or at the end of these radii.

Edges of side plate and weld adjacent to radii are to be ground smooth.

Part B

Ch 9, Sec 1, [7.3.2] (Amendments July 2020)

Replace the last paragraph by:

Where the rudder is connected to the rudder stock with a coupling flange, the thickness of the top plate which is welded in extension of the rudder coupling flange is to be not less than 1,1 times the thickness calculated above.

Ch 9, Sec 1, [7.3] (Amendments July 2020)

Replace requirement [7.3.5] as follows:

7.3.5 Thickness of side plating and vertical web plates welded to solid part or to rudder coupling flange

The thickness, in mm, of the vertical web plates welded to the solid part where the rudder stock is housed, or welded

to the rudder coupling flange, as well as the thickness of the rudder side plating under this solid part, or under the rudder coupling flange, is to be not less than the value obtained, in mm, from Tab 7.

Ch 9, Sec 1, [7.3.8]

Add the following paragraphs at the end of the requirement:

Slot-welding is to be limited as far as possible. Slot welding is not to be used in areas with large in-plane stresses transverse to the slots or in way of cut-out areas of semi-spade rudders.

When slot welding is applied, the length of the slots is to be at least 75 mm with a breadth of 2 times the rudder plate thickness t_r , in mm. The distance between ends of slots is not to be greater than 125 mm. The slots are to be fillet welded around the edges and filled with a suitable compound, e.g. epoxy putty. Slots are not to be filled with weld.

Ch 9, Sec 1, [7.5.2] (Amendments July 2020)

Replace the second and the third paragraphs by:

For the calculation of this actual section modulus, the length of the rudder cross-section equal to the length of the rudder coupling flange is to be considered.

Where the rudder plating is provided with an opening under the rudder coupling flange, the actual section modulus of the rudder blade is to be calculated in compliance with [7.4.3].

Ch 9, Sec 1, [7.5.3] (Amendments July 2020)

Replace the third and fourth paragraphs by:

The external fillet welds between the rudder blade plating and the rudder coupling flange are to be of concave shape and their throat thickness is to be at least equal to 0,5 times the rudder blade thickness.

Moreover, the rudder coupling flange is to be checked before welding by non-destructive inspection for lamination and inclusion detection in order to reduce the risk of lamellar tearing.

Ch 9, Sec 1, [7.5] (Amendments July 2020)

Replace requirement [7.5.4] as follows:

7.5.4 Thickness of side plating and vertical web plates welded to the rudder coupling flange

The thickness of the vertical web plates directly welded to the rudder coupling flange as well as the plating thickness of the rudder blade upper strake in the area of the connection with the rudder coupling flange are to be not less than the values obtained, in mm, from Tab 7.

Ch 9, Sec 1, [8.2]

Add the following requirement [8.2.5]:

8.2.5 Rudder horn plating

The thickness, in mm, of the rudder horn side plating is not to be less than:

$$t = 2,4\sqrt{Lk}$$

Ch 9, Sec 1, [10.5]

Replace requirement [10.5.3] as follows:

10.5.3 Push-up length of cone couplings with hydraulic arrangements for assembling and disassembling the coupling

It is to be checked that the push-up length Δ_E of the nozzle stock tapered part into the boss is in compliance with the following formula:

$$\Delta_0 \leq \Delta_E \leq \Delta_1$$

where:

Δ_0 : The greater of:

$$6,2 \cdot \frac{M_{TR}\eta\gamma}{c d_M t_i \mu_A \beta}$$

where:

L : Rule length as defined in Ch 1, Sec 2, [3.1]
k : Material factor as given in [1.4].

$$16 \cdot \frac{M_{TR}\eta\gamma}{c t_s^2 \beta} \cdot \sqrt{\frac{d_{NTF}^6 - d_{NT}^6}{d_{NT}^6}}$$

$$\Delta_1 = \frac{2\eta + 5}{1,8} \cdot \frac{\gamma d_0 R_{eH}}{10^6 c (1 + \rho_1)}$$

$$\rho_1 = \frac{80 \sqrt{d_{NTF}^6 - d_{NT}^6}}{R_{eH} d_M t_i^2 \left[1 - \left(\frac{d_0}{d_E} \right)^2 \right]}$$

d_{NTF}, d_{NT} : Nozzle stock diameters, in mm, to be obtained from [10.3.1], considering $k_1 = 1$

$\eta, c, \beta, d_M, d_E, \mu_A, \mu, \gamma$: Defined in [5.2.3]

t_i, d_0 : Defined in Fig 4

R_{eH} : Defined in [1.4.3].

Ch 9, App 2, [2.5.3] (Amendments July 2020)

Replace the definition "K" as follows:

- K : Coefficient to be taken equal to:
- for polyamide lines:
K = 1,2
 - for lines made in other synthetic material:
K = 1,1

Ch 11, Sec 1, [1.4] (Amendments July 2020)

Replace requirement [1.4.4] as follows:

1.4.4 Non-destructive testing operators

Non-destructive tests are to be carried out by qualified personnel, certified by recognised bodies in compliance with appropriate standards. The qualifications are to be appropriate to the specific applications.

In case of non-destructive testing carried out by an independent company from the manufacturer or shipyard, qualification of operators has to comply with the requirements set out in NR669 "Recognition of non-destructive testing suppliers".

Ch 11, Sec 1, [6.2] (Amendments July 2020)

Insert the following new requirement [6.2.2]:

6.2.2 In case of non-destructive testing carried out by an independent company from the manufacturer or shipyard, such company has to comply with the requirements set out in NR669 "Recognition of non-destructive testing suppliers".

Amendments to PART C

CHAPTER 1 - MACHINERY

Ch 1, Sec 1, [1.4]

Delete requirements [1.4.1] and [1.4.2] (Amendments July 2020).

Delete requirement [1.4.3].

Ch 1, Sec 1, [2.2] (Amendments July 2020)

Add the following new requirement [2.2.3]:

2.2.3 Non-destructive testing suppliers

In case of non-destructive testing carried out by an independent company from the manufacturer or shipyard, such company has to comply with the requirements set out in NR669 Recognition of non-destructive testing suppliers.

Ch 1, Sec 1, [2.9]

Replace requirement [2.9.1] as follows:

2.9.1 Fuel oils employed for engines and boilers are, in general, to have a flashpoint (determined using the closed cup test) of not less than 60°C, except as otherwise permitted in items a) to c) below.

- a) Fuel oils having a flashpoint of less than 60°C but not less than 43°C may be accepted:
 - in emergency generators;
 - for feeding the emergency fire pump's engines and the auxiliary machines which are not located in the machinery spaces of category A; or
 - for ships assigned with a restricted navigation notation which are not intended to comply with IMO SOLAS Convention, and provided that:

- Special precautions are taken to the Society's satisfaction including a demonstration that the temperature of spaces where fuel oil is stored or employed will remain at least 10°C below the fuel oil flashpoint at all times; and
- This arrangement is also acceptable to the Flag Authority.
- b) In cargo ships, for installations specially approved for the use of crude oil or slop as fuel for tanker boilers (reference is made to IACS requirement M 24)
- c) For installations specially approved for use of natural gas or other low-flashpoint fuel as fuel for boilers or propulsion engines, in the scope of the service features **dualfuel** or **gasfuel** as defined in Pt A, Ch 1, Sec 2, [4.13.1] and subject to the corresponding requirements.

Ch 1, Sec 2, [2]

Replace sub-article [2.7] as follows:

2.7 Control and monitoring

2.7.1 General

In addition to those of this item, the general requirements given in Part C, Chapter 3 apply.

2.7.2 Alarm

The lubricating oil system of diesel engines with a power equal to or in excess of 37 kW is to be fitted with alarms to give audible and visual warning in the event of an appreciable reduction in pressure of the lubricating oil supply.

2.7.3 Governors of main and auxiliary engines

Each engine, except the auxiliary engines for driving electric generators for which [2.7.6] applies, is to be fitted with a speed governor so adjusted that the engine does not exceed the rated speed by more than 15%.

2.7.4 Overspeed protective devices of main and auxiliary engines

In addition to the speed governor, each:

- main propulsion engine having a rated power of 220 kW and above, which can be declutched or which drives a controllable pitch propeller, and
- auxiliary engine having a rated power of 220 kW and above, except those for driving electric generators, for which [2.7.6], item f) applies,

is to be fitted with a separate overspeed protective device so adjusted that the engine cannot exceed the rated speed n by more than 20%; arrangements are to be made to test the overspeed protective device.

Equivalent arrangements may be accepted subject to special consideration by the Society in each case.

The overspeed protective device, including its driving mechanism or speed sensor, is to be independent of the governor.

2.7.5 Use of electronic governors

a) Type approval

Electronic governors and their actuators are to be type approved by the Society.

b) Electronic governors for main propulsion engines

If an electronic governor is fitted to ensure continuous speed control or resumption of control after a fault, an additional separate governor is to be provided unless the engine has a manually operated fuel admission control system suitable for its control.

A fault in the governor system is not to lead to sudden major changes in propulsion power or direction of propeller rotation.

Alarms are to be fitted to indicate faults in the governor system.

The acceptance of electronic governors not in compliance with the above requirements will be considered by the Society on a case by case basis, when fitted on ships with two or more main propulsion engines.

c) Electronic governors forming part of a remote control system

When electronic speed governors of main internal combustion engines form part of a remote control system, they are to comply with the following conditions:

- If lack of power to the governor may cause major and sudden changes in the present speed and direction of thrust of the propeller, back up power supply is to be provided;
- Local control of the engines is always to be possible even in the case of failure in any part of the automatic or remote control systems. To this purpose, from the local control position it is to be possible to disconnect the remote signal, bearing in mind that

the speed control according to [2.7.3] is not available unless an additional separate governor is provided for such local mode of control.

d) Electronic governors for auxiliary engines driving electric generators

In the event of a fault in the electronic governor system the fuel admission is to be set to "zero".

Alarms are to be fitted to indicate faults in the governor system.

The acceptance of electronic governors fitted on engines driving emergency generators will be considered by the Society on a case by case basis.

2.7.6 Governors for auxiliary engines driving electric generators

a) Prime movers for driving generators of the main and emergency sources of electrical power are to be fitted with a speed governor which will prevent transient frequency variations in the electrical network in excess of $\pm 10\%$ of the rated frequency with a recovery time to steady state conditions not exceeding 5 seconds, when the maximum electrical step load is switched on or off.

In the case when a step load equivalent to the rated output of a generator is switched off, a transient speed variation in excess of 10% of the rated speed may be acceptable, provided this does not cause the intervention of the overspeed device as required by item f).

b) At all loads between no load and rated power, the permanent speed variation is not to be more than 5% of the rated speed.

c) Prime movers are to be selected in such a way that they meet the load demand within the ship's mains and, when running at no load, can satisfy the requirement in item a) above if suddenly loaded to 50% of the rated power of the generator, followed by the remaining 50% after an interval sufficient to restore speed to steady state. Steady state conditions (see Note 1) are to be achieved in not more than 5 s.

Note 1: Steady state conditions are those at which the envelope of speed variation does not exceed $\pm 1\%$ of the declared speed at the new power.

d) Application of the electrical load in more than 2 load steps can only be allowed if the conditions within the ship's mains permit the use of those auxiliary engines which can only be loaded in more than 2 load steps (see Fig 1 for guidance on 4-stroke diesel engines expected maximum possible sudden power increase) and provided that this is already allowed for in the designing stage.

This is to be verified in the form of system specifications to be approved and to be demonstrated at ship's trials. In this case, due consideration is to be given to the power required for the electrical equipment to be automatically switched on after blackout and to the sequence in which it is connected.

This also applies to generators to be operated in parallel and where the power is to be transferred from one generator to another, in the event that any one generator is to be switched off.

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e) Emergency generator sets must satisfy the governor conditions as per items a) and b) when:

- their total consumer load is applied suddenly, or
- their total consumer load is applied in steps, subject to:
 - the total load is supplied within 45 seconds since power failure on the main switchboard
 - the maximum step load is declared and demonstrated
 - the power distribution system is designed such that the declared maximum step loading is not exceeded
 - the compliance of time delays and loading sequence with the above is to be demonstrated at ship's trials

f) In addition to the speed governor, auxiliary engines of rated power equal to or greater than 220 kW driving electric generators are to be fitted with a separate over-speed protective device, with a means for manual tripping, adjusted so as to prevent the rated speed from being exceeded by more than 15%.

This device is to automatically shut down the engine.

g) For alternating current generating sets operating in parallel, the governing characteristics of the prime movers are to be such that, within the limits of 20% and 100% total load, the load on any generating set will not normally differ from its proportionate share of the total load by more than 15% of the rated power in kW of the largest machine or 25% of the rated power in kW of the individual machine in question, whichever is the lesser.

For alternating current generating sets intended to operate in parallel, facilities are to be provided to adjust the governor sufficiently finely to permit an adjustment of load not exceeding 5% of the rated load at normal frequency.

2.7.7 Summary tables

Diesel engines installed on ships without automation notations are to be equipped with monitoring equipment as detailed in Tab 4 or Tab 5 for main propulsion, in Tab 6 for auxiliary services and in Tab 7 for emergency respectively.

For ships assigned with a restricted navigation notation, the acceptance of a reduction in the monitoring equipment required in Tab 4, Tab 5 and Tab 6 may be considered.

The alarms are to be visual and audible.

The indicators are to be fitted at a normally attended position (on the engine or at the local control station).

Ch 1, Sec 2, [4.1.4] (Amendments July 2020)

Replace the second paragraph of item e) as follows:

Propulsion engines for ships having the service notation **HSC-CAT A, HSC-CAT B, HSC, high speed craft or light ship**, high speed craft or light ship that may be used for frequent load changes from idle to full are normally to be tested with at least 500 cycles (idle - full load - idle)

using the steepest load ramp that the control system (or operation manual if not automatically controlled) permits. The duration at each end is to be sufficient for reaching stable temperatures of the hot parts.

Ch 1, Sec 2, Table 8 (Amendments July 2020)

Replace "safety valves" by "explosion relief valves" in Table footnote (6).

Ch 1, Sec 3, Table 3 and Table 5

Replace Note 1 by:

Note 1: A : to be submitted for approval

I : to be submitted for information.

Ch 1, Sec 4 and Sec 5

Replace table footnote (1) in Table 1 by:

(1) A : to be submitted for approval

I : to be submitted for information.

Ch 1, Sec 7, [1.1]

Replace requirement [1.1.1] by:

1.1.1 This Section applies to shafts, couplings, clutches and other shafting components transmitting power for main propulsion. In addition, main propulsion machinery components are to comply with the requirements listed in Table A.

Ch 1, Sec 7

Insert the following new Table A:

Table A : Rule requirements for main propulsion components

Item	Reference	
Power transmission equipment	Diesel engines	Ch 1, Sec 2
	Turbines	Ch 1, Sec 4, Ch 1, Sec 5
	Propellers	Ch 1, Sec 6
	Gear	Ch 1, Sec 8
	Thrusters	Ch 1, Sec 12
Shaft line analysis	Shaft alignment	Ch 1, Sec 7
	Torsional vibration	Ch 1, Sec 9
Additional requirements	Navigation in ice	Pt F, Ch 8, Sec 3

Ch 1, Sec 7, [2.4.2]

Add item c) in the alphanumeric list:

- c) Synthetic materials for application as oil lubricated stern tube bearings are to be of an approved type.

Ch 1, Sec 7, [2.4]

Replace requirement [2.4.4] by:

2.4.4 Grease lubricated bearings

The length of grease lubricated bearings is to be not less than 4 times the rule diameter of the shaft in way of the bearing.

Ch 1, Sec 7, [2]

Insert the following sub-article [2.6]:

2.6 Design of oil control systems for clutches

2.6.1 Separate oil systems intended for the control of clutches are to include at least two power pumps, of such a capacity as to maintain normal control with any one pump out of action.

2.6.2 In the case of propulsion plants comprising:

- more than one shaft line with the clutches fitted with their own control system, or
- one engine with an output not exceeding 220 kW

one of the pumps mentioned in [2.6.1] may be a spare pump ready to be connected to the oil control system, provided disassembling and reassembling operations can be carried out on board in a short time.

2.6.3 However, when the propulsion plant comprises one or more engines, each with an output not exceeding 220 kW, the standby or spare pump may be omitted for the clutches provided that they are so designed as to be fixed mechanically in the "clutched" position and that the capacity of the starting means ensures the number of starts required in such conditions.

Ch 1, Sec 8, Table 1 and Table 2

Replace table footnote (1) by:

- (1) A : to be submitted for approval
I : to be submitted for information.

Ch 1, Sec 9, [3.3.3] (Amendments July 2020)

Add the following new item c) in the alphanumeric list:

- c) The generating set is to show torsional vibration levels which are compatible with the allowable limits for the alternator, shafts, coupling and damper.

Ch 1, Sec 9, [3.5.3] (Amendments July 2020)

Insert the following new item b) in the alphanumeric list:

- b) The coupling selection for the generating set is to take into account the stresses and torques imposed on it by the torsional vibration of the system.

Ch 1, Sec 10, Table 1 and Table 2

Replace table footnote (1) by:

- (1) A : to be submitted for approval
I : to be submitted for information.

Ch 1, Sec 10, [2.6.4]

Replace the last paragraph of item e) by:

Fire resistance is to be demonstrated by testing in accordance with the standard specified in Tab 37.

Ch 1, Sec 10, [5.5]

Replace requirement [5.5.4] by:

5.4.4 Suction and discharge valves below the waterline

- a) *The location of the controls of any valve serving a sea inlet, a discharge below the waterline or a bilge injection system shall be so sited as to allow adequate time for operation in case of influx of water to the space, having regard to the time likely to be required in order to reach and operate such controls. If the level to which the space could become flooded with the ship in the fully loaded condition so requires, arrangements shall be made to operate the controls from a position above such level.*

A calculation is to be carried out to show that the time taken from alarm activation plus the time to reach and fully close manually operated or powered valves is less than the time taken for the influx of water to reach the control without submergence of the platform on which

the person is operating the valves. If necessary a remote control device is to be fitted above the level.

Note 1: The time it takes for the influx of water to reach the control of valves should be based on a breach in the largest diameter seawater line in the lowest location in the engine room when the ship is fully loaded.

Note 2: The time it takes to reach the sea valves should be determined based on the distance between the navigation bridge and the platform from where the valves associated with the aforementioned seawater line are manually operated (or the actuator for valves controlled by stored mechanical energy).

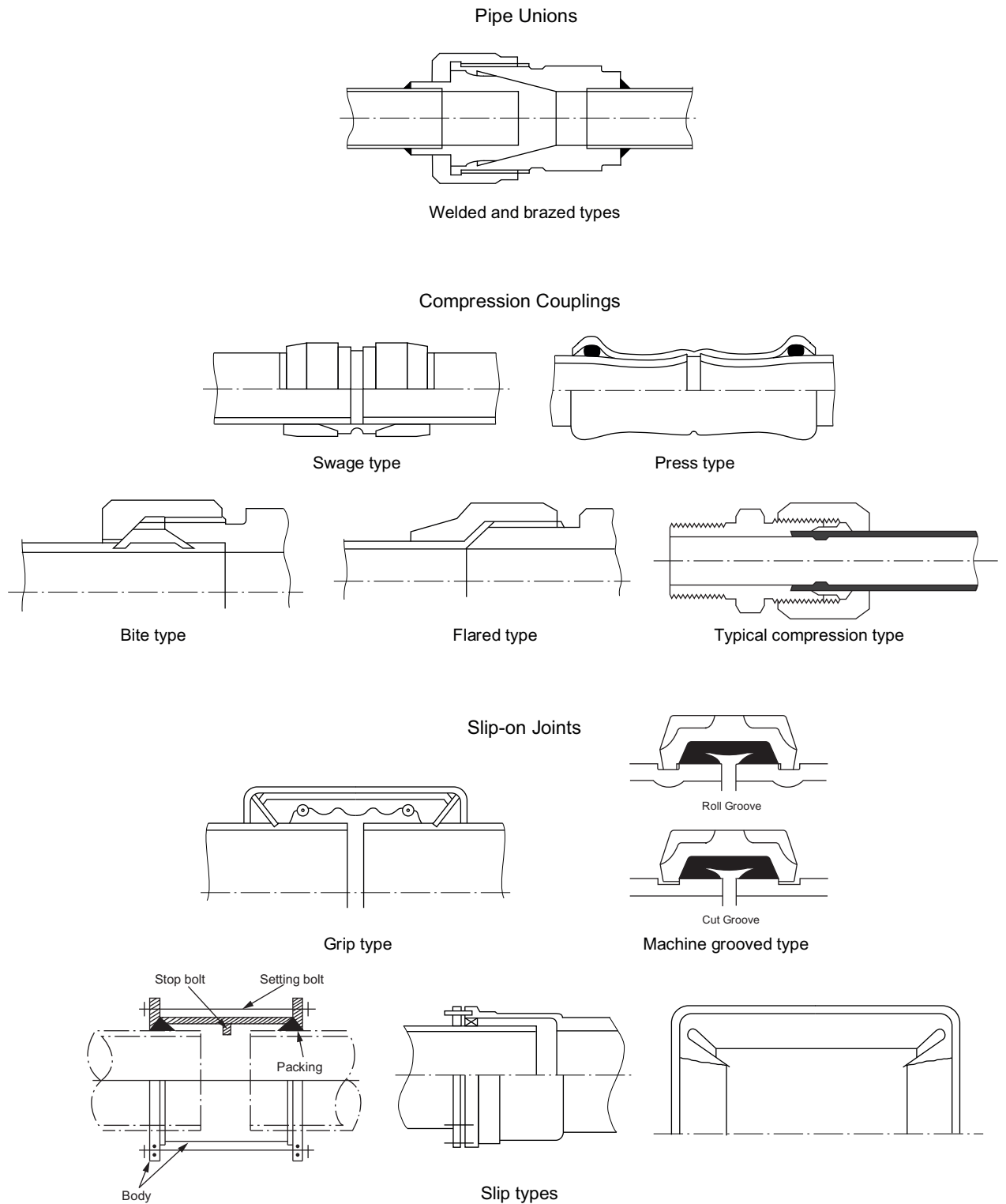
Note 3: In the event calculations are not available, 10 minutes shall be regarded as adequate time for operation unless other requirements are specified by the flag Administration.

- b) When the Administration of the State whose flag the ship is entitled to fly has issued specific rules covering flooding protection, the Society may accept such rules for classification purposes in lieu of those given in item a).

Ch 1, Sec 10 (Amendments July 2020)

Replace Figure 2 by the following one:

Figure 2 : Examples of mechanical joints



Ch 1, Sec 10, Table 5 (Amendments July 2020)

Replace in the fourth column, “Not to be used for boiler blow-down valves and pieces for connection to the shell plating” by “Not to be used for boiler blow-down valves not for associated pieces for connection to the shell plating”.

Ch 1, Sec 10, [12.4.1]

Replace item b) as follows:

b) In the case of propulsion plants comprising:

- more than one engine, each with its own lubricating pump, or
- one engine with an output not exceeding 220 kW, one of the pumps mentioned in item a) may be a

spare pump ready to be connected to the lubricating oil system, provided disassembling and reassembling operations can be carried out on board in a short time.

Ch 1, Sec 10, [12.4]

Add the following new requirement [12.4.3]:

12.4.3 Piston cooling

The requirements in [12.4.2] are also applicable to separate oil systems intended for the cooling of pistons.

Ch 1, Sec 10, [12]

Delete the sub-article [12.6].

Ch 1, Sec 10, [14.1]

Replace requirement [14.1.1] by:

14.1.1 Hydraulic installations intended for essential services

Unless otherwise specified, this Article applies to all hydraulic power installations intended for essential services as defined in Pt A, Ch 1, Sec 1, [1.2.1] and Ch 2, Sec 1, [3.2].

The hydraulic piping arrangement is also to comply with the provisions of:

- [5.10]
- Ch 1, Sec 7, [2.6] for clutches
- Ch 1, Sec 8, [2.6.2] for the blade pitch control system of controllable pitch propellers, and
- Ch 1, Sec 11, [2.6] for steering gears.

Ch 1, Sec 10, [18.5.4]

Replace items d) 4) to d) 9) by the following items d) 4) to d) 11):

4) If a urea storage tank is installed in a closed compartment, the area is to be served by an effective mechanical ventilation system of the extraction type providing not less than 6 air changes per hour. This ventilation system is to be 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. A warning notice requiring the use of such ventilation before entering the compartment is to be provided outside the compartment adjacent to each point of entry.

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 maintained in operation continuously except when the storage tank is empty and has been thoroughly ventilated.

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) The requirements specified in item 4) above also apply to closed compartments normally entered:
- when they are adjacent to the urea integral tanks and there are possible leak points (e.g. manhole, fittings) from these tanks; or
 - when the urea piping systems pass through these compartments, unless the piping system is made of steel or other equivalent material with melting point above 925°C and with fully welded joints.
- 7) 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.
- 8) 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.
- 9) Reductant tanks are to be of steel or other equivalent material with a melting point above 925°C.
Pipes/piping systems are to be of steel or other equivalent material with melting point above 925°C, except downstream of the tank valve, provided this valve is metal seated and arranged as fail-to-closed or with quick closing from a safe position outside the space in the event of fire. In such case, type approved plastic piping may be accepted even if it has not passed a fire endurance test.
Reductant tanks and pipes/piping systems are to be made with a material compatible with the reductant or coated with appropriate anti-corrosion coating.
- 10) For the protection of crew members, the ship is to have on board suitable personnel protective equipment. Eyewash are to be provided, the location and number of these eyewash stations are to be derived from the detailed installation arrangements.
- 11) Urea storage tanks are to be arranged so that they can be emptied of urea and ventilated by means of portable or permanent systems.

Ch 1, Sec 10, [20.2.1]

Replace item d) and Note 1 by:

- d) All flexible hose assemblies or expansion joints are to be satisfactorily prototype burst tested to an international standard (see Note 1) to demonstrate that they are able to withstand a pressure not less than 4 times their design pressure without indication of failure or leakage.

Note 1: The international standards (e.g. EN or SAE standards) for burst testing of non-metallic hoses require the pressure to be increased until burst without any holding period. Burst is to occur at a pressure greater than 4 times the maximum working pressure.

Ch 1, Sec 10, [20.2.2]

Replace item c) by the following one:

- c) Type approval tests are to be carried out in accordance with the prototype test programmes required in [2.6.4], including, but not limited to, the scope of testing specified in Tab 36 for metallic flexible hoses and in Tab 37 for non-metallic flexible hoses.

Ch 1, Sec 10, [20.2.3]

Replace item c) by the following one:

- c) Type approval tests are to be carried out in accordance with the prototype test programmes required in [2.6.4], including, but not limited to, the scope of testing specified in Tab 38 for metallic expansion joints and in Tab 39 for non-metallic expansion joints.

Ch 1, Sec 10, [20.4.2] (Amendments July 2020)

Replace "ISO/ISO" by "ISO" at the end of item c).

Ch 1, Sec 10, Table 41 (Amendments July 2020)

In the third row “Pipes, valves and fittings connected...”, replace the reference to “[20.4.3], b)” by the reference to “[20.5.3], b)”.

Ch 1, Sec 11, [1.1.3]

Replace the first paragraph by the following one:

In addition to those provided in this Section, steering gear systems are also to comply with the requirements of:

Ch 1, Sec 11, Table 1

Replace table footnote (2) by:

- (2) A : to be submitted for approval
- I : to be submitted for information.

Ch 1, Sec 11, [2.8]

Replace requirement [2.8.5] as follows:

2.8.5 Steering gear failure

The steering gear failures likely to cause uncontrolled movements of rudder are to be clearly identified. In the event of detection of such failure, the rudder is to stop in the

current position without manual intervention or, subject to the discretion of the Society, is to return to the midship/neutral position.

Note 1: For hydraulic locking failure, refer also to [2.8.2], item b) and [5.5.1].

Ch 1, Sec 11, [4.1] (Amendments July 2020)

Delete requirement [4.1.2].

Ch 1, Sec 11, [4] (Amendments July 2020)

Replace Sub-article [4.2] by:

4.2 Steering arrangements

4.2.1 General

The requirements in this sub-article apply to ships fitted with alternative propulsion and steering arrangements, such as but not limited to, azimuthing propulsors or water jet propulsion systems.

4.2.2 Steering arrangements for ships fitted with multiple steering-propulsion units

For a ship fitted with multiple steering-propulsion units, such as, but not limited to, azimuthing propulsors or water jet propulsion systems, each of the steering-propulsion units is to be provided with a main steering gear and an auxiliary steering gear or with two or more identical steering actuating systems in compliance with [4.2.7]. The main steering gear and the auxiliary steering gear are to be so arranged that the failure of one of them will not render the other one inoperative.

4.2.3 Steering arrangements for ships fitted with single steering-propulsion unit

For a ship fitted with a single steering-propulsion unit, the steering gear is to be provided with two or more steering actuating systems complying with [4.2.7]. A detailed risk assessment is to be submitted in order to demonstrate that in the case of any single failure in the steering gear, control system and power supply, the ship steering is maintained.

4.2.4 Design of components used in steering arrangements

All components used in steering arrangements for ship directional control are to be of sound reliable construction to the satisfaction of the Administration or recognized organizations acting on its behalf. Special consideration should be given to the suitability of any essential component which is not duplicated. Any such essential component is, where appropriate, to utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which should be permanently lubricated or provided with lubrication fittings.

4.2.5 Main steering arrangements

The main steering arrangements for ship directional control are to be:

- of adequate strength and capable of steering the ship at maximum ahead service speed which should be demonstrated
- capable of changing direction of the steering-propulsion unit from one side to the other at declared steering angle limits at an average turning speed of not less than 2,3°/s with the ship running ahead at maximum ahead service speed
- for all ships, operated by power; and
- so designed that they will not be damaged at maximum astern speed; this design requirement need not be proved by trials at maximum astern speed and declared steering angle limits.

Note 1: Declared steering angle limits are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers' guidelines for safe operation, also taking into account the ship's speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the directional control system manufacturer for each ship specific non-traditional steering mean.

Note 2: Ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (IMO Resolution MSC.137(76)) should be carried out with steering angles not exceeding the declared steering angle limits.

4.2.6 Auxiliary steering arrangements

The auxiliary steering arrangements for ship directional control are to be:

- of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency
- capable of changing direction of the ship's directional control system from one side to the other at declared steering angle limits at an average turning speed, of not less than 0.5°/s; with the ship running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; and
- for all ships, operated by power where necessary to meet the requirements of SOLAS regulation II-1/29.4.2 and in any ship having power of more than 2,500 kW propulsion power per steering-propulsion unit.

Note 1: The definition of "declared steering angle limits", set out in [4.2.5] above, applies.

Note 2: Ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (IMO Resolution MSC.137(76)) should be carried out with steering angles not exceeding the declared steering angle limits.

4.2.7 Omission of the auxiliary steering gear

- a) For a ship fitted with a single steering-propulsion unit where the main steering gear comprises two or more identical power units and two or more identical steering actuators, an auxiliary steering gear need not be fitted provided that the steering gear:
 - in a passenger ship, is capable of satisfying the requirements in [4.2.5] while any one of the power units is out of operation
 - in a cargo ship, is capable of satisfying the requirements in [4.2.5] while operating with all power units; and
 - is arranged so that after a single failure in its piping system or in one of the power units, steering capability can be maintained or speedily regained.

- b) For a ship fitted with multiple steering-propulsion units, where each main steering system comprises two or more identical steering actuating systems, an auxiliary steering gear need not be fitted provided that each steering gear:
 - in a passenger ship, is capable of satisfying the requirements in [4.2.5] while any one of the steering gear steering actuating systems is out of operation
 - in a cargo ship, is capable of satisfying the requirements in [4.2.5] while operating with all steering gear steering actuating systems
 - is arranged so that after a single failure in its piping or in one of the steering actuating systems, steering capability can be maintained or speedily regained; and
 - the above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.

- in a passenger ship, is capable of satisfying the requirements in [4.2.5] while any one of the steering gear steering actuating systems is out of operation

- in a cargo ship, is capable of satisfying the requirements in [4.2.5] while operating with all steering gear steering actuating systems

- is arranged so that after a single failure in its piping or in one of the steering actuating systems, steering capability can be maintained or speedily regained; and

- the above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.

Note 1: For the purposes of alternative steering arrangements, the steering gear power unit should be considered as defined in [1.3.4]. For electric steering gears, refer to [1.3.4]; electric steering motors should be considered as part of the power unit and actuator.

4.2.8 Case of the steering-propulsion units having a residual steering capability when propulsion power is lost

This requirement applies to steering-propulsion units having a certain proven steering capability due to ship speed also in case propulsion power has failed.

Where the propulsion power exceeds 2,500 kW per thruster unit, an alternative power supply, sufficient at least to supply the steering arrangements which complies with the requirements of [2.2.2], item b), and also its associated control system and the steering gear response indicator, is to be provided automatically, within 45 s, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power is to be used only for this purpose. In every ship of 10,000 gross tonnage and upwards, the alternative power supply is to have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min.

4.2.9 Additional requirement for ships fitted with multiple electric or electrohydraulic steering systems

For a ship fitted with multiple electric or electrohydraulic steering systems, the requirements of [2.7.2], items a), b) and c), are to be applied to each of the steering systems.

Part C

Ch 1, Sec 12, [2.2] (Amendments July 2020)

Delete requirement [2.2.7].

Ch 1, Sec 12, Table 1 to Table 3

Replace table footnote (1) by:

- (1) A : to be submitted for approval
I : to be submitted for information.

Ch 1, Sec 13, [2.3]

Replace requirements [2.3.1] and [2.3.2] by:

2.3.1 Refrigerating machinery space

- a) Ammonia refrigerating machinery is to be installed in dedicated gastight spaces, complying with items b) to e).

Ammonia plants with a quantity of ammonia not greater than 25 kg are however allowed to be located in the engine room, provided that the requirements of [2.3.2] are fulfilled.

Note 1: For fishing vessels, refer to Pt D, Ch 15, Sec 4, [21.3.1].

- b) At least two access doors are to be provided. One of these doors is to lead directly to the open deck. The doors are to open outwards and are to be self-closing.

- c) Dedicated spaces containing ammonia machinery (including process vessels) are to be fitted with:

- 1) A negative ventilation system independent of ventilation systems serving other ship spaces and having a capacity not less than 30 air changes per hour based upon the total volume of the space. Other suitable arrangements which ensure an equivalent effectiveness may be considered. Provision is to be made for starting and stopping the ventilation fans from outside the space.

Where the access to the ammonia machinery space is from an accommodation or machinery space, the ventilation of the ammonia machinery space may not be designed to keep it under negative pressure with respect to the adjacent space, provided that the access is through an airlock.

Delete requirements [2.3.3] and [2.3.4].

Ch 1, Sec 15, [3.3.2] (Amendments July 2020)

Replace item b) by the following one:

- b) The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers or propulsion/steering systems to navigate and manoeuvre

- 2) A fixed ammonia detector system with audible and visual alarms inside and outside the space. This system is also to stop the compressor when a dangerous gas concentration is reached.

- 3) Water screens above all access doors, operable manually from outside the space. Water for the water screens may be supplied from the fire pumps.

- 4) An independent bilge system.

- d) At least two sets of breathing apparatus and protective clothing are to be available outside and in the vicinity of the ammonia machinery space.

- e) Ammonia piping is not to pass through accommodation spaces.

2.3.2 Ammonia plants located in the engine room

When installation of an ammonia plant is allowed in the engine room in accordance with the provision of [2.3.1], item a), the area where the ammonia machinery is installed is to be served by a hood with a negative pressure ventilation system, having a capacity of not less than 30 air changes per hour, independent from any other ship ventilation system, so as to prevent any leakage of ammonia from dissipating into other areas in the engine room.

A water spray system is to be provided for the said area, covering the whole ammonia machinery and operable locally and from the outside of the engine room.

The provisions of items c) 2), d) and e) of requirement [2.3.1] are also to be complied with.

with one or more propellers or propulsion/steering systems inoperative, shall be available on board for the use of the Master or designated personnel

Ch 1, App 1, [10.4]

Replace requirement [10.4.3] as follows:

10.4.3 Use of results and crankshaft acceptability

In order to combine tested bending and torsion fatigue strength results in calculation of crankshaft acceptability, (see Article [7]), the Gough-Pollard approach and the maximum principal equivalent stress formulation can be applied for the following cases:

- Related to the crankpin diameter:

$$Q = \left(\sqrt{\left(\frac{\sigma_{BH}}{\sigma_{DWCT}} \right)^2 + \left(\frac{\tau_{BH}}{\tau_{DWCT}} \right)^2} \right)^{-1}$$

where:

σ_{DWCT} : Fatigue strength by bending testing

τ_{DWCT} : Fatigue strength by torsion testing.

- Related to the crankpin oil bore:

$$Q = \frac{\sigma_{DWOT}}{\sigma_v}$$

$$\sigma_v = \frac{1}{3} \sigma_{BO} \left[1 + 2 \sqrt{1 + \frac{9}{4} \left(\frac{\sigma_{TO}}{\sigma_{BO}} \right)^2} \right]$$

σ_{DWOT} : Fatigue strength by means of largest principal strength from torsion testing.

- Related to the journal diameter:

$$Q = \left(\sqrt{\left(\frac{\sigma_{BG}}{\sigma_{DWT}} \right)^2 + \left(\frac{\tau_G}{\tau_{DWT}} \right)^2} \right)^{-1}$$

σ_{DWT} : Fatigue strength by bending testing

τ_{DWT} : Fatigue strength by torsion testing.

In case increase in fatigue strength due to the surface treatment is considered to be similar between the above cases, it is sufficient to test only the most critical location according to the calculation where the surface treatment had not been taken into account.

Ch 1, App 3, Table 1 (Amendments July 2020)

Replace the reference to “Ch 1, Sec 1, [1.4.1]” by the reference to “Ch 4, Sec 1, [3.24.1]” in Table footnote (14).

CHAPTER 2 - ELECTRICITY**Ch 2, Sec 1, [2.1]**

Replace requirement [2.1.1] as follows:

2.1.1 The documents listed in Tab 1 are to be submitted.

The list of documents requested is intended as a guidance for the complete set of information to be submitted, rather than an actual list of titles.

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

Ch 2, Sec 3, [3.6.3]

Replace item b) 4) by the following one:

4) at all stowage positions for fire-fighter's outfits

Part C

Ch 2, Sec 4, [2.3] (Amendments July 2020)

Add the following new requirements [2.3.4] and [2.3.5]:

2.3.4 The rated power of the generating set is to be appropriate for its actual use. See also Ch 1, Sec 2, [1.3.2].

2.3.5 The entity responsible of assembling the generating set is to install a rating plate marked with at least the following information:

- a) the generating set manufacturer's name or mark
- b) the set serial number
- c) the set date of manufacture (month/year)

- d) the rated power (both in kW and KVA) with one of the prefixes COP, PRP (or, only for emergency generating sets, LTP) as defined in ISO 8528-1:2018
- e) the rated power factor
- f) the set rated frequency, in Hz
- g) the set rated voltage, in V
- h) the set rated current, in A
- i) the mass, in kg.

Ch 2, Sec 7, [1.4]

Replace requirement [1.4.1] as follows:

1.4.1 For Li Ion batteries of capacity above 20kWh, the requirements specified in the additional notation **BATTERY SYSTEM** in Pt F, Ch 11, Sec 21, [3] apply.

For Li Ion batteries used as emergency source or transitional source or of capacity above 20kWh, the requirements specified in the additional notation **BATTERY SYSTEM** in Pt F, Ch 11, Sec 21, [5] apply.

CHAPTER 3 - AUTOMATION

Ch 3, Sec 1, [2.1]

Replace requirement [2.1.1] as follows:

2.1.1 Before the actual construction is commenced, the Manufacturer, Designer or Shipbuilder is to submit to the Society the documents (plans, diagrams, specifications and calculations) requested in this Section.

The list of documents requested is intended as a guidance for the complete set of information to be submitted, rather than an actual list of titles.

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

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

Ch 3, Sec 6, Table 1 (Amendments July 2020)

In row "14" column "Test", replace "Radiated radio frequency" by "Electromagnetic field".

Ch 3, Sec 6, Table 2 (Amendments July 2020)

In row "14", column "Test", replace "Radiated radio frequency" by "Electromagnetic field".

In row "19", column "Other information", replace "shall" by "is to".

CHAPTER 4 - FIRE PROTECTION

Ch 4, Sec 1, Table 1

Replace table footnote (1) by:

- (1) A : to be submitted for approval
I : to be submitted for information.

Ch 4, Sec 1, [2.5.1] (Amendments July 2020)

Insert the following new items b), c), d) and e):

- | | |
|---------------------------------|---------------------------------|
| b) C-class divisions | d) Prefabricated window casings |
| c) Prefabricated sanitary units | e) Fire door control systems |

Ch 4, Sec 1, [3.27]

Replace requirement [3.27.2] as follows:

3.27.2 Oil fuel unit includes any equipment used for the preparation and delivery of oil fuel, heated or not, to boilers (including inert gas generators) and engines (including gas turbines) at a pressure of more than 0,18 N/mm². Oil fuel transfer pumps are not considered as oil fuel units.

Ch 4, Sec 1, [3] (Amendments July 2020)

Insert the following new Sub-article [3.38]:

3.38 Semi-enclosed space

3.38.1 A semi-enclosed space is a space limited by decks and/or bulkheads in such a manner that the natural conditions of ventilation in the space are notably different from those obtained on open deck.

Ch 4, Sec 1, [3.46.1]

Replace the first paragraph by the following one:

Fire damper is a device installed in a ventilation duct, which under normal conditions remains open allowing flow in the duct, and is closed during a fire, preventing the flow in the duct to restrict the passage of fire. In using the above definition the following terms may be associated:

Ch 4, Sec 1, [3.47.1]

Replace the first paragraph by the following one:

Smoke damper is a device installed in a ventilation duct, which under normal conditions remains open allowing flow in the duct, and is closed during a fire, preventing the flow in the duct to restrict the passage of smoke and hot gases. A

smoke damper is not expected to contribute to the integrity of a fire rated division penetrated by a ventilation duct. In using the above definition the following terms may be associated:

Part C

Ch 4, Sec 3, [3.1]

Replace requirement [3.1.1] as follows:

3.1.1 *A fixed fire detection and fire alarm system complying with the relevant provisions given in Ch 4, Sec 15 shall be installed in:*

- a) *periodically unattended machinery spaces of category A,*
- b) *machinery spaces of category A where:*
 - 1) *the installation of automatic and remote control systems and equipment has been approved in lieu of continuous manning of the space, and*

- 2) *the main propulsion and associated machinery, including the main sources of electrical power, are provided with various degrees of automatic or remote control and are under continuous manned supervision from a control room,*
and
- c) *enclosed spaces containing incinerators.*

For fixed fire detection and fire alarm system in unattended machinery spaces, see also Part F, Chapter 3.

Ch 4, Sec 5, [1.3.3] (Amendments July 2020)

In item b), 2), add the following paragraph at the end of the 10th bullet of the bulleted list:

Spaces dedicated to urea or sodium hydroxide solution tanks for selective catalytic reduction (SCR) systems, exhaust gas recirculation (EGR) systems or exhaust gas cleaning systems (EGCS), when separated from the engine room.

Ch 4, Sec 5, [1.3.4] (Amendments July 2020)

In item b), 2), add the following paragraph at the end of the 7th bullet of the bulleted list:

Spaces dedicated to urea or sodium hydroxide solution tanks for selective catalytic reduction (SCR) systems, exhaust gas recirculation (EGR) systems or exhaust gas cleaning systems (EGCS), when separated from the engine room.

Ch 4, Sec 5, [1.4.3] (Amendments July 2020)

In item b), 2), add the following paragraph at the end of the 7th bullet of the bulleted list:

Spaces dedicated to urea or sodium hydroxide solution tanks for selective catalytic reduction (SCR) systems, exhaust gas recirculation (EGR) systems or exhaust gas cleaning systems (EGCS), when separated from the engine room.

Ch 4, Sec 5, [1.5.2] (Amendments July 2020)

In item b), 2), add the following paragraph at the end of the 7th bullet of the bulleted list:

Spaces dedicated to urea or sodium hydroxide solution tanks for selective catalytic reduction (SCR) systems, exhaust gas recirculation (EGR) systems or exhaust gas cleaning systems (EGCS), when separated from the engine room.

Ch 4, Sec 5, [6.4]

Replace requirement [6.4.1] as follows:

6.4.1 *Ducts passing through "A" class divisions shall meet the following requirements:*

- a) *where a thin plated duct with a free cross sectional area equal to, or less than, 0,02 m² passes through "A" class divisions, the opening shall be fitted with a steel sheet sleeve having a thickness of at least 3 mm and a length of at least 200 mm, divided preferably into 100 mm on each side of the bulkhead or, in the case of a deck, wholly laid on the lower side of the decks penetrated*
- b) *where ventilation ducts with a free cross-sectional area exceeding 0,02 m², but not more than 0,075 m², pass through "A" class divisions, the openings shall be lined with steel sheet sleeves. The ducts and sleeves shall have a thickness of at least 3 mm and a length of at least 900 mm. When passing through bulkheads, this length shall be divided preferably into 450 mm on each side of the bulkhead. These ducts, or sleeves lining such ducts, shall be provided with fire insulation. The insulation shall have at least the same fire integrity as the division through which the duct passes*

Equivalent penetration protection may be provided to the satisfaction of the Society, and

- c) *automatic fire dampers shall be fitted in all ducts with a free cross-sectional area exceeding 0,075 m² that pass through "A" class divisions. Each damper shall be fitted close to the division penetrated and the duct between the damper and the division penetrated shall be constructed of steel in accordance with [6.3.4], item a) 1) and [6.3.4], item a) 2). The fire damper shall operate automatically, but shall also be capable of being closed manually from both sides of the division. The damper shall be fitted with a visible indicator which shows the operating position of the damper. Fire dampers are not required, however, where ducts pass through spaces surrounded by "A" class divisions, without serving those spaces, provided those ducts have the same fire integrity as the divisions which they penetrate. A duct of cross-sectional area exceeding 0,075 m² shall not be divided into smaller ducts at the penetration of an "A" class division and then recombined into the original duct once through the division to avoid installing the damper required by this provision.*

Ch 4, Sec 5, [6.6.1]

Replace the first paragraph in item a) by the following one:

- a) *In addition to the requirements in [6.2], [6.3] and [6.4], exhaust ducts from galley ranges shall be constructed in accordance with [6.3.4], item b) 1) and [6.3.4], item b) 2). They shall also be fitted with:*

Ch 4, Sec 6, [1.3.4]

Insert the following new item b) in the alphanumeric list:

- b) When the main water supply for other fixed fire-extinguishing systems is from the fire pumps, the total capacity of the fire pumps is to be sufficient for the simultaneous use of:
 - the minimum required number of jets of water at the required pressure from the fire main, and
 - other fixed fire-extinguishing systems primarily fed by the fire main at their required output, or likely combination thereof.

Ch 4, Sec 9, [2.1]

Insert the following new requirement [2.1.2]:

2.1.2 The number of portable equipment available at each location is to be specified.

Ch 4, Sec 11, [3.2.1] (Amendments July 2020)

Replace the second bullet of the bulleted list by the following one:

- the requirements of [3.2.7] and [3.2.8] when located on the open deck.

Part C

Ch 4, Sec 11, [3.2.5] (Amendments July 2020)

Add the following paragraph at the end of the requirement:

The boundaries between storage holds and other category A machinery spaces are to have A-60 fire integrity and the boundaries between storage holds for different fuels are to have A-30 fire integrity.

Ch 4, Sec 11, [3.2.8] (Amendments July 2020)

Replace the second paragraph by the following one:

In addition, fuel tanks are to be segregated from cargo in accordance with the requirements of the International Maritime Dangerous Goods (IMDG) Code where the fuel tanks are regarded as a class 2.1 bulk package.

Ch 4, Sec 11 [3.8] (Amendments July 2020)

Delete requirement [3.8.3]

Ch 4, Sec 11, [4.4] (Amendments July 2020)

Insert the following requirement [4.4.2]:

4.4.2 Ventilation

Enclosed hangar facilities or enclosed spaces containing refuelling installations are to be provided with mechanical ventilation as required by Ch 4, Sec 13, [2] for closed ro-ro spaces of cargo ships. Ventilation fans are to be of a non-sparking type (see Ch 4, Sec 1, [3.28]).

Ch 4, Sec 11, [4.4.2] (Amendments July 2020)

Add the following sentence at the end of the existing requirement [4.4.2]:

A reduced rate of mechanical ventilation capacity may be considered for such spaces when they are of a semi-enclosed type.

Ch 4, Sec 11, [4.5] (Amendments July 2020)

Replace requirement [4.5.3] as follows:

4.5.3 Air outlets from high fire risk spaces are to be located at least 3 m away from fuel tanks, filling stations or refuelling stations located on the open deck or in semi-enclosed spaces.

Note 1: "High fire risk spaces" means machinery spaces of category A, ro-ro spaces, cargo holds where fixed fire-fighting systems are required (See Ch 4, Sec 6, [6.1]), galleys, pantries containing cooking appliances, laundry with drying equipment, spaces in which flammable liquids or gases are stored, battery rooms and workshops.

Ch 4, Sec 11, Table 1 (Amendments July 2020)

Replace rows 1, 2, 7 and 11 as follows.

Delete Table footnote (1).

Table 2 : Space descriptions and hazardous area zones

No.	Description of spaces	Hazardous area
1	The interior of fuel tanks, any pipework or pressure-relief or other venting system for fuel, pipes and equipment containing the fuel or developing flammable gases and vapours. <ul style="list-style-type: none"> • Drainage tanks as defined in [3.5.2] are covered by this item. • Scuppers and discharges as defined in [3.5.1] are covered by this item • Overflow tanks are covered by this item 	Zone 0
2	Enclosed or semi-enclosed filling stations, refuelling stations and, storage holds and fuel handling spaces	Zone 1
7	Enclosed or semi-enclosed spaces having a direct opening into any of the spaces as identified in item 2 or item 3, unless appropriate measures are taken to prevent flammable gas from entering such spaces (protection by overpressure as per [4.3.2], airlock as per [4.3.3] or gastight door as detailed in item 11). This item does not cover areas adjacent to ventilation inlets and outlets which are covered by item 4.	Zone 1
11	Enclosed or semi-enclosed spaces having a direct opening into any of the spaces as identified in item 2 or item 3, which are separated from such space by a self-closing, substantially gastight, steel door without holding back arrangement. This item does not cover areas adjacent to ventilation inlets and outlets which are covered by item 4.	Zone 2

Ch 4, Sec 12, [2.6]

Replace requirement [2.6.6] as follows:

2.6.6 Bilge drainage pipes are not to pass through the engine room unless they are made of steel with reinforced thickness as per Ch 1, Sec 10, Tab 6 and are joined only by welding.

Ch 4, Sec 12, [2.7.2]

Replace the second paragraph by:

For solid bulk cargoes the protective clothing is to satisfy the equipment requirements specified in Appendix 1 of the IMSBC Code for the individual substances. For packaged goods the protective clothing is to satisfy the equipment

requirements specified in emergency procedures (EmS) of the Supplement to IMDG Code for the individual substances.

Ch 4, Sec 12, [2.7]

Replace requirement [2.7.4] as follows:

2.7.4 For each of the breathing apparatuses required in [2.7.3], two complete sets of air bottles are required. These spare bottles are to be in addition to the spare bottles required for fire-fighter's outfit.

Amendments to PART D

Ch 2, Sec 2, [2.2.1] (Amendments July 2020)

Replace “LASHING (restricted area)” by “LASHING (specific area)”.

Ch 4, Sec 3, [3.2] (Amendments July 2020)

Replace requirement [3.2.1] by:

3.2.1 Application

These requirements apply to ships of length greater than or equal to 150 m, intended for the carriage of bulk cargoes having dry bulk cargo density 1,0 t/m³ or above and having the service notation **bulk carrier** or **self-unloading bulk carrier ESP** where the unloading system maintains the watertightness during seagoing operations.

In **self-unloading bulk carrier ESP** with unloading systems that do not maintain watertightness, the longitudinal strength in the flooded conditions is to be considered using the extent to which the flooding may occur.

Each cargo hold is to be considered individually flooded up to the equilibrium waterline.

Ch 4, Sec 3, [3.3] (Amendments July 2020)

Replace requirement [3.3.1] by:

3.3.1 Application

These requirements apply, in lieu of those in Pt B, Ch 5, Sec 6, [9], to ships with transverse vertically corrugated watertight bulkheads, of length greater than or equal to 150 m, intended for the carriage of bulk cargoes having dry bulk cargo density 1,0 t/m³ or above and having the service notation **bulk carrier** or **self-unloading bulk carrier ESP** where the unloading system maintains the watertightness during seagoing operations.

In **self-unloading bulk carrier ESP** with unloading systems that do not maintain watertightness, the combination loads acting on the bulkheads in the flooded conditions are to be considered using the extent to which the flooding may occur.

Ch 7, Sec 4, [2.3]

Replace requirement [2.3.8] by:

2.3.8 Fore peak ballast system

The fore peak tank may be ballasted with the system serving other ballast tanks within the cargo area, provided:

- the fore peak tank is considered as a hazardous area, and the hazardous area classification is defined in accordance with Pt D, Ch 7, Sec 5
- the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this

respect, the hazardous zones distances are to be defined in accordance with Pt D, Ch 7, Sec 5

- means are provided, on the open deck, to allow measurement of flammable gas concentrations within the tank by a suitable portable instrument
- the access to the fore peak tank is direct from open deck. Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that:

- In case the enclosed space is separated from the cargo tanks by cofferdams, the access is through a gas tight bolted manhole located in the enclosed space and a warning sign is provided at the manhole stating that the fore peak tank may only be opened after:
 - it has been proven to be gas free; or
 - any electrical equipment which is not certified safe in the enclosed space is isolated.
- In case the enclosed space has a common boundary with the cargo tanks and is therefore a hazardous area, the enclosed space can be well ventilated.

Ch 7, Sec 5, Table 1

Insert a new row 17 as follows:

No.	Description of spaces	Hazardous area
17	Fore peak ballast tank not adjacent to cargo tanks, when ballasted with the system serving ballast tanks in the cargo area according to Ch 7, Sec 4, [2.3.8]	Zone 2

Ch 7, Sec 6, [3.2.2]

Replace item c) by:

c) *The foam concentrate supplied on board shall be approved by the Society based on IMO Circular MSC.1/Circ.1312 for the cargoes intended to be carried. Type B foam concentrates shall be supplied for the protection of crude oil, petroleum products and non-polar solvent cargoes. Type A foam concentrates shall be supplied for polar solvent cargoes, as listed in the table of*

chapter 17 of the IBC Code. Only one type of foam concentrate shall be supplied, and it shall be effective for the maximum possible number of cargoes intended to be carried. For cargoes for which foam is not effective or is incompatible, additional arrangements to the satisfaction of the Society shall be provided.

Ch 7, Sec 6, [3.3]

Replace requirement [3.3.3] by:

3.3.3 Isolation valves

Valves are to be provided in the foam main, and in the fire main when this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

Ch 7, App 4

Replace Appendix 4 by:

APPENDIX 4

LIST OF PRODUCTS FOR WHICH PART D, CHAPTER 8 AND IBC CODE DO NOT APPLY

1 Application

1.1 Scope of the list

1.1.1 The list set out in this Appendix includes all products to which Part D, Chapter 8 and IBC Code do not apply. Such products are allowed to be carried by ships having the service notation **FLS tanker** or, where their flash point is above 60°C, also by ships having the service notation **FLS tanker flash point > 60 °C**.

Where indicated in the list, some products are also allowed to be carried by ships having the service notation **tanker**.

1.2 Safety and pollution hazards

1.2.1

- a) *The following are products which have been reviewed for their safety and pollution hazards and determined not to present hazards to such an extent as to warrant application of the IBC Code and Part D, Chapter 8.*
- b) *Although the products listed in this Appendix fall outside the scope of the IBC Code and Part D, Chapter 8, some safety precautions are needed for their safe transportation. Relevant requirements are summarized in Tab 1.*

- c) *Some liquid substances are identified as falling into pollution category Z and, therefore, subject to certain requirements of MARPOL Annex II.*
- d) *Liquid mixtures which are assessed or provisionally assessed under Regulation 6.3 of MARPOL Annex II as falling into pollution category Z or OS, and which do not present safety hazards, may be carried under the appropriate entry in this Appendix for "Noxious or Non-Noxious liquid substances, not otherwise specified (n.o.s.)".*
- e) *The liquid substances identified as falling into pollution category OS are not subject to any requirements of MARPOL Annex II in particular in respect of:*
- *the discharge of bilge or ballast water or other residues or mixtures containing only such substances*
 - *the discharge into the sea of clean ballast or segregated ballast.*

2 List of products for which Part D, Chapter 8 and IBC Code do not apply

2.1

2.1.1 The list of products for which Part D, Chapter 8 and IBC Code do not apply is given in Tab 1. The relevant symbols and notations used in Tab 1 are given in Tab 2.

Table 1 : List of easy chemicals

Product name	Pollution category	Electrical equipment temperature class	Electrical equipment apparatus group	Flash-point (°C)	Fire protection	Service notation
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Acetone	Z	T1	IIA	-18	A	FLS
Alcoholic beverages, not otherwise specified	Z	-	-	20 to 60 (1)	A	FLS
Apple juice	OS	-	-	NF	-	T
n-Butyl alcohol	Z	T2	IIA	29	A	FLS
sec-Butyl alcohol	Z	T2	IIA	24	A	FLS
Calcium carbonate slurry	OS	-	-	NF	-	T
Clay slurry	OS	-	-	NF	-	T
Coal slurry	OS	-	-	NF	-	T
Ethyl alcohol	Z	T2	IIB	13	A	FLS
Glucose solution	OS	-	-	NF	-	T
Glycerol ethoxylated	OS	-	-	>60	-	FLS>60
Hydrogenated starch hydrolysate	OS	-	-	NF	-	T
Isopropyl alcohol	Z	T2	IIA	22	A	FLS
Kaolin slurry	OS	-	-	NF	-	T

Product name	Pollution category	Electrical equipment temperature class	Electrical equipment apparatus group	Flash-point (°C)	Fire protection	Service notation
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Lecithin	OS	–	–	NF	–	T
Maltitol solution	OS	–	–	NF	–	T
Microsilica slurry	OS	–	–	NF	–	T
Molasses	OS	–	–	>60	–	FLS>60
Noxious liquid, n.o.s. (trade name ..., contains ...) Cat. Z	Z	–	–	<60	A	FLS
Non noxious liquid, n.o.s. (trade name ..., contains ...) Cat. OS	OS	–	–	<60	A	FLS
Orange juice (concentrated)	OS	–	–	NF	–	T
Orange juice (not concentrated)	OS	–	–	NF	–	T
Potassium chloride solution (less than 26%)	OS	–	–	NF	–	T
Propylene glycol	OS	T2	–	>60	–	FLS>60
Sodium acetate solutions	Z	–	–	NF	–	T
Sodium bicarbonate solutions (less than 10%)	OS	–	–	NF	–	T
Sorbitol solution	OS	–	–	>60	–	FLS>60
Sulphonated polyacrylate solution	Z	–	–	<60	A	FLS
Tetraethyl silicate monomer/oligomer (20% in ethanol)	Z	T2	IIB	<60	A	FLS
Triethylene glycol	OS	T2	–	>60	–	FLS>60
Vegetable protein solution (hydrolysed)	OS	–	–	NF	–	T
Water	OS	–	–	NF	–	T
(1) Composition dependent						

Table 2 : Symbols and notations used in the list of easy chemicals

Items	Column	Comments
Product name	(a)	Gives the alphabetical name of the products
Pollution category	(b)	The letter Z refers to the pollution category Z as defined in MARPOL Annex II. The symbol OS means that the product was evaluated and found to fall outside the pollution categories X, Y and Z defined in MARPOL Annex II
Electrical equipment temperature class	(c)	The symbols T1 to T6 refer to the electrical equipment temperature classes defined in IEC Publication 60079-20-1:2010
Electrical equipment apparatus group	(d)	The symbols IIA, IIB and IIC refer to the electrical equipment apparatus groups defined in IEC Publication 60079-20-1:2010
Flash point	(e)	NF: non-flammable product
Fire protection	(f)	The letters A, B, C and D refer to the following fire-extinguishing media determined to be effective for certain products: A : Alcohol-resistant foam (or multi-purpose foam) B : Regular foam, encompasses all foams that are not of an alcohol-resistant type, including fluoro-protein and aqueous-film-forming foam (AFFF) C : Water spray D : Dry chemical (powder)
Service notation	(g)	The symbols FLS, FLS>60 and T are defined as follows: FLS : Means that the product is allowed to be carried by a ship having the service notation FLS tanker FLS>60 : Means that the product is allowed to be carried by a ship having the service notation FLS tanker, flash point > 60°C T : Means that the product is allowed to be carried by a ship having the service notation tanker

Part D

Ch 8, Sec 1, [1.1.3]

Replace "the latest edition of MEPC.2/Circ." by "the current MEPC.2/Circular".

Ch 8, Sec 1, Table 3

Replace Note 1 by:

Note 1: A : to be submitted for approval
I : to be submitted for information.

Ch 8, Sec 3, [5.1]

Replace requirement [5.1.3] by:

5.1.3 Fore peak ballast system

IBC CODE REFERENCE: Ch 3, 3.5.1

The fore peak tank can be ballasted with the system serving other ballast tanks within the cargo area, provided:

- the fore peak tank is considered as a hazardous area, and the hazardous area classification is defined in accordance with Pt D, Ch 8, Sec 10
- the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this respect, the hazardous zones distances are to be defined in accordance with Pt D, Ch 8, Sec 10
- means are provided, on the open deck, to allow measurement of flammable gas concentrations within the tank by a suitable portable instrument

- the access to the fore peak tank is direct from open deck. Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that:
 - In case the enclosed space is separated from the cargo tanks by cofferdams, the access is through a gas tight bolted manhole located in the enclosed space and a warning sign is provided at the manhole stating that the fore peak tank may only be opened after:
 - it has been proven to be gas free; or
 - any electrical equipment which is not certified safe in the enclosed space is isolated.
 - In case the enclosed space has a common boundary with the cargo tanks and is therefore a hazardous area, the enclosed space can be well ventilated.

Ch 8, Sec 10, Table 1

Insert a new row 17 as follows:

No.	Description of spaces	Hazardous area
17	Fore peak ballast tank not adjacent to cargo tanks, when ballasted with the system serving ballast tanks in the cargo area according to Ch 8, Sec 3 [5.1.3]	Zone 2

Ch 8, Sec 10, Table 2

Replace row 7 as follows:

No.	Description of spaces	Hazardous area
7	Cofferdams and permanent (for example, segregated) ballast tanks adjacent to cargo tanks, fore peak ballast tank when ballasted with the system serving ballast tanks in the cargo area according to Ch 8, Sec 3 [5.1.3].	Zone 2

Ch 9, Sec 1, [4.1] (Amendments July 2020)

Delete requirement [4.1.21].

Ch 9, Sec 1, Table 2

Replace Note 1 by:

Note 1: A : to be submitted for approval
I : to be submitted for information.

Ch 9, Sec 1

Insert the following Article [7]:

7 Additional service features BOG-reliquefaction and LNG-subcooling**7.1 General****7.1.1 Application**

The service notation **Liquefied gas carrier** is to be completed by the following additional service features indicating which systems are installed on board the ship to control the cargo tank pressure without losing cargo volume during navigation:

- a) The additional service feature **BOG-reliquefaction** is assigned, in accordance with Pt A, Ch 1, Sec 2, [4.4.5], to liquefied gas carriers equipped with a reliquefaction installation complying with the requirements of Ch 9, Sec 7, [3]
- b) The additional service feature **LNG-subcooling** is assigned, in accordance with Pt A, Ch 1, Sec 2, [4.4.5], to liquefied gas carriers equipped with a cooling installation aiming at reducing the cargo temperature and complying with the requirements of Ch 9, Sec 7, [6].

Ch 9, Sec 4, [6.2.6] (Amendments July 2020)

Replace item c) of the alphanumeric list by:

c) *the design and construction of the heating system shall be included in the approval of the containment system by the Society.*

With reference to application of a) to c), the following requirements are to be considered:

- Heating system is to be such that, in case of a single failure of a mechanical or electrical component in any part of the system, heating can be maintained at not less than 100% of the theoretical heat requirement.
- Where the above requirements are met by duplication of the system components, i.e., heaters, glycol circulation pumps, electrical control panel, auxiliary boilers etc., all electrical components of at least one

of the systems are to be supplied from the emergency source of electrical power.

- Where duplication of the primary source of heat, e.g., oil-fired boiler is not feasible, alternative proposals can be accepted such as an electric heater capable of providing 100% of the theoretical heat requirement provided and supplied by an individual circuit arranged separately on the emergency switchboard. Other solutions may be considered towards satisfying the requirements of [6.2.6] provided a suitable risk assessment is conducted to the satisfaction of the Society. The requirement of the previous bullet point continues to apply to all other electrical components in the system.

Ch 9, Sec 4, [7.2.1] (Amendments July 2020)

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

The applicability of the expression "For dome-to-shell connections only" is clarified as follows:

- Welded corners (i.e. corners made of weld metal) are not to be used in the main tank shell construction, i.e. corners between shell side (sloped plane surfaces parallel to hopper or top side inclusive if any) and bottom or top of the tank, and between tank end transverse bulkheads and bottom, top or shell sides (sloped plane surfaces inclusive if any) of the tank. Instead, tank corners which are constructed using bent plating aligned with

the tank surfaces and connected with in-plane welds are to be used.

- Tee welds can be accepted for other localised constructions of the shell such as suction well, sump, dome, etc. where tee welds of full penetration type are also to be used.

Note 1: This requirement is applicable to independent tanks of type A or type B, primarily constructed of plane surfaces. This includes the tank corners which are constructed using bent plating which is aligned with the tank surfaces and connected with in-plane welds.

Part D

Ch 9, Sec 4, [7.2.2] (Amendments July 2020)

Add the following paragraphs at the end of the requirement:

This requirement is applicable to type C independent tanks including bi-lobe tanks, primarily constructed of curved surfaces fitted with a centreline bulkhead.

The applicability of the expression "Other edge preparations" is clarified as follows:

Cruciform full penetration welded joints in a bi-lobe tank with centreline bulkhead can be accepted for the tank structure construction at tank centreline welds with bevel preparation subject to the approval of the Society, based on the results of the tests carried out at the approval of the welding procedure.

Ch 9, Sec 4, [7]

Replace Sub-article title [7.3] by:

7.3 Design for gluing and other joining processes

Ch 9, Sec 5, [12.1.4] (Amendments July 2020)

Replace Note 1 and Note 2 as follows:

Note 1: The expression "a thermal insulation system as required to minimize heat leak into the cargo during transfer operations" means that properties of the piping insulation are to be taken into consideration when calculating the heat balance of the containment system and capacity of the pressure/temperature control system.

Note 2: The expression "cargo piping systems shall be provided with a thermal insulation system as required... to protect personnel from direct contact with cold surfaces" means that surfaces of cargo piping systems with which personnel is likely to contact

under normal conditions are to be protected by a thermal insulation, with the exception of the following examples:

- surfaces of cargo piping systems which are protected by physical screening measures to prevent such direct contact
- surfaces of manual valves, having extended spindles that protect the operator from the cargo temperature, and
- surfaces of cargo piping systems whose design temperature (to be determined from inner fluid temperature) is above minus 10°C.

Ch 9, Sec 5, [12.1.5]

Delete Note 1 and add the following paragraph at the end of the requirement:

A protective coating is to be applied on cargo pipes made in 304L and located on the open deck. Cargo pipes made in 316L are not required to be coated.

Ch 9, Sec 5, [13.3] (Amendments July 2020)

Replace requirement [13.3.1] as follows:

13.3.1 General

Each type of valve intended to be used at a working temperature below -55°C shall be subject to the following type tests:

- *each size and type of valve shall be subjected to seat tightness testing over the full range of operating pressures for bi-directional flow and temperatures, at intervals, up to the rated design pressure of the valve. Allowable leakage rates shall be to the requirements of the Society. During the testing, satisfactory operation of the valve shall be verified*
- *the flow or capacity shall be certified to a recognized standard for each size and type of valve*

Note 1: For pressure relief valves (PRVs) that are subject to requirement of Ch 9, Sec 8, [2.1.7], the flow or capacity are to be certified by the Society.

For other types of valves, the manufacturer is to certify the flow properties of the valves based on tests carried out according to recognized standards.

- *pressurized components shall be pressure tested to at least 1,5 times the rated pressure, and*
- *for emergency shutdown valves, with materials having melting temperatures lower than 925°C, the type testing shall include a fire test to a standard acceptable to the Society.*

Note 2: Refer to SIGTTO Publication on "The Selection and Testing of Valves for LNG Applications".

Note 3: "Emergency shutdown valves, with materials having melting temperatures lower than 925°C" does not include an emergency shutdown valve in which components made of materials having melting temperatures lower than 925°C do not contribute to the shell or seat tightness of the valve.

Ch 9, Sec 7, [8.1.1] (Amendments July 2020)

Replace Note 3 as follows:

Note 3: Interpretation of this requirement is that any non-static component (e.g. pump, compressor, fan) is to be duplicated in such a way that a single failure of one of these components will not impair the performance of the pressure/temperature control system. Static components such as piping or heat exchanger are not necessarily to be duplicated: no redundancy is required for piping and

heat exchangers having an operational margin (+25% capacity). With reference to item c), a single heat exchanger without margin (i.e. designed for 100% capacity) may also be not duplicated if another means of pressure/temperature control is provided with a capacity that is at least equivalent to the missing 25% capacity for the heat exchanger.

Ch 9, Sec 8, [2.1.3] (Amendments July 2020)

Delete item d) of the alphanumeric list.

Ch 9, Sec 11, [1.2]

Add the following rule requirement [1.2.6]:

1.2.6 When the ship is fitted with a total flooding high expansion foam system protecting the engine-room (to comply with Pt C, Ch 4, Sec 6, [3.1.1], item b) and Pt C, Ch 4, Sec 6, [4.2.1]) and the emergency fire pump is intended to supply sea water to this system and to the water-spray system in pursuance of [1.3.6], then, the emergency fire pump is to be sized to cover the foam system for dealing with an engine-room fire, when the main fire pumps are disabled. On the basis of the principle of dealing with one

single fire incident at a time, the emergency fire pump does not need to be sized to cover all three systems above (i.e. water spray, hydrants and foam) at the same time and only needs to be sized to cover the most demanding area and required systems, as follows:

- the foam system + two hydrants; or
- the water spray system + two hydrants;

whichever is greater.

Ch 9, Sec 11, [1.3.2] (Amendments July 2020)

Replace Note 1 as follows:

Note 1: The survival crafts on board including remote survival crafts required by SOLAS III/31.1.4 facing the cargo area are to be protected by a water-spray system taking into consideration cargo area extension for fire-fighting purposes as stated in [1.1.5].

Remote liferafts located in areas covered by water-spray protection as required in item f) may be considered as adequately protected.

Ch 9, Sec 11, [1.3.5] (Amendments July 2020)

Add the following Note 1 at the end of item a) of the alphanumeric list:

Note 1: The expression "two complete athwartship tank groupings" means any two groups of tanks where one group is defined as tanks located in transverse direction from ship side to ship side. Where there is only one cargo tank occupying a hold space from ship side to ship side, it will be considered as a "grouping" for the purpose of this requirement.

"Any two complete athwartship tank groupings" represents an area equal to the combined area of the two largest tank groupings including any gas process units within these areas.

Ch 9, Sec 11, [1.3]

Replace requirement [1.3.6] by:

1.3.6 *The boundaries of superstructures and deckhouses normally manned, and lifeboats, liferafts and muster areas facing the cargo area, shall also be capable of being served by one of the fire pumps or the emergency fire pump, if a fire in one compartment could disable both fire pumps.*

If all the fire pumps supplying the water spray system (for covering the superstructures and deckhouses) may be disabled due to a fire in any one compartment; then the emergency fire pump is to be sized to cover:

- the water spray system for the boundaries of the superstructures and deckhouses, and lifeboats, liferafts and muster areas facing the cargo area; and
- two fire hydrants as required by [1.2.2].

Note 1: The term "fire pumps" where not qualified by the word "emergency" refers to the fire pumps required in accordance with Pt C, Ch 4, Sec 6 [1.2.6], item b).

Note 2: The expression "fire in one compartment" means a compartment provided with A-class boundaries in which is located the fire pump(s), or the source of power of the fire pump(s), serving the water-spray system in accordance with [1.3.5].

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Ch 9, Sec 11, [1.3.8] (Amendments July 2020)

Add the following paragraph at the end of the requirement:

Where fuel oil tanks are installed at the after end of the aftermost hold space or at the forward end of the forwardmost hold space instead of cofferdams as allowed for in Ch 9, Sec 3,

[1.1.3] and Ch 9, Sec 3, [1.1.4], the weather deck area above these tanks is to be regarded as a “cargo area” for the purpose of applying this requirement.

Ch 9, Sec 11, [1.4.9] (Amendments July 2020)

Add the following paragraph at the end of the requirement:

Testing arrangements are to involve the discharge using dry chemical powder from all monitors and hand hose lines on board but it is not required that there is a full discharge of the installed quantity of dry powder. This testing can also be used to satisfy the requirement that the piping is free of obstructions, in lieu of blowing through with dry air all the

distribution piping. However, after the completion of this testing, the system, including all monitors and hand hose lines, are to be blown through with dry air but only for the purpose of the system subsequently being clear from any residues of dry chemical powder.

Ch 9, Sec 11, [1.5.2] (Amendments July 2020)

Replace reference to “FSS Code” by “Pt C, Ch 4, Sec 15”.

Ch 9, Sec 12, [1.2]

Replace requirements [1.2.8] to [1.2.10] as follows:

1.2.8 In particular, the discharges from ventilation systems which may contain hazardous vapours are to be located not less than 8 m from the nearest air intake or opening to accommodation, service and control station spaces or other safe spaces, and from all possible sources of ignition.

1.2.9 Ventilation intakes and outlets and openings of accommodation spaces, control stations and other gas-safe spaces are to be located in a designated safe area and at least 3 m from any hazardous area.

1.2.10 The air inlets and discharges of the ventilation systems are to be situated so that recirculation of the vented vapours does not occur and are to be arranged at a distance from each other in the horizontal direction of not less than 3 m.

Ch 9, Sec 13, [2.1.2] (Amendments July 2020)

Replace the second paragraph by:

In order to assess whether or not only one level gauge is acceptable in relation to the aforesaid sentence, the expression “can be maintained” means that any part of the level gauge other than passive parts can be overhauled while the cargo tank is in service.

Ch 9, Sec 16, [4.1] (Amendments July 2020)

Add the following new requirement: [4.1.6] as follows:

4.1.6 Classes of gas fuel piping systems

a) Purpose of the classes of piping systems

Piping systems are subdivided into three classes, denoted as class I, class II and class III, for the purpose of acceptance of materials, selection of joints, heat

treatment, welding, pressure testing and the certification of fittings.

b) Determination of the classes of piping systems

Piping classes I, II and III for gas fuel piping are to be determined in accordance with the provisions of Tab 1.

Ch 9, Sec 16

Add the following Table 1:

Table 1: Classes of gas fuel piping systems

Piping system	Design conditions		Class of the gas piping		Class of the outer pipe (1)
	Design pressure	Design temperature	Single wall arrangement	Double wall arrangement (inner pipe)	
Vent pipes (2)	p = 5 bar (3)	any	Class III	Class III	Class III
	p > 5 bar and p ≤ 10 bar (4)	any	Class II	Class III	Class III
	p > 10 bar (4)	any	Class I	Class II	Class III
Gas fuel pipes	p = 10 bar (5)	any	Class I	Class II	Class II
	p > 10 bar	any	Class I	Class I	Class II

(1) The design pressure of the outer pipe or duct of fuel systems is to comply with Ch 9, Sec 5, [4.1.4]
(2) Applies to all vent pipes and open-ended pipes, including:

- discharge lines from thermal relief valves (see Ch 9, Sec 5, [5.3.3])
- venting lines from master gas valves (see [4.6.1])
- purging lines from engines and other gas consumers

(3) The design pressure of vent pipes is not to be taken less than 5 bar. See Ch 9, Sec 5, [4.1.1]
(4) The design pressure of the vent pipe is not to be less than the maximum expected pressure, which is to be justified
(5) The design pressure is not to be taken less than 10 bar. See Ch 9, Sec 5, [4.1.1].

Ch 9, Sec 16, [4] (Amendments July 2020)

Replace Sub-article title [4.4] as follows:

4.4 Requirements for gas fuel supply with pressure greater than 1 MPa**Ch 9, Sec 16, [4.4.3]**

Add the following paragraph at the end of the requirement:

In fuel gas piping systems of design pressure greater than the critical pressure, the tangential membrane stress of straight section of pipe or ducting is to be in accordance with requirement [11.4.1].

Ch 9, Sec 16, [4.4] (Amendments July 2020)

Add the following requirements [4.4.7] to [4.4.10]:

4.4.7 Fuel piping in machinery spaces

Gas fuel piping may pass through or extend into machinery spaces or gas-safe spaces other than accommodation spaces, service spaces and control stations provided that they fulfil one of the following conditions:

- a) The system complies with [4.3.1], and in addition, with items 1) to 3) below:
 - 1) The pressure in the space between concentric pipes is monitored continuously. Alarm is to be issued and the automatic valves specified in [4.5.1] (hereafter referred to as "interlocked gas valves") and the master gas fuel valves specified in [4.6] (hereafter referred to as "master gas valves") are to be closed before the pressure drops to below the inner pipe pressure (however, an interlocked gas valve connected to the vent outlet is to be opened).
 - 2) The construction and strength of the outer pipes are to comply with the requirements of Ch 9, Sec 5.
 - 3) It is to be so arranged that the inside of the gas fuel supply piping system between the master gas valve and the engine is automatically purged with inert gas when the master gas valve is closed; or

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b) The system complies with [4.3.1], and, in addition, with items 1) to 4) below:

- 1) The materials, construction and strength of protection pipes or ducts and mechanical ventilation systems are to be sufficiently durable against bursting and rapid expansion of high pressure gas in the event of gas pipe burst.
- 2) The capacity of mechanical ventilating systems is to be determined considering the flow rate of gas fuel and construction and arrangement of protective pipes or ducts, as deemed appropriate by the Society.
- 3) The air intakes of mechanical ventilating systems are to be provided with non-return devices effective for gas fuel leaks. However, if a gas detector is fitted at the air intakes, this requirement may be dispensed with.
- 4) The number of flange joints of protective pipes or ducts is to be minimised; or

c) Alternative arrangements to those given in a) and b) will be specially considered by the Society based upon an equivalent level of safety.

4.4.8 Pipe joints

Joints on the entire length of the gas fuel supply lines are to be butt-welded joints with full penetration and to be fully radiographed, except where specially approved by the Society.

4.4.9 Non-welded pipe joints

Pipe joints other than welded joints at the locations specifically approved by the Society are to comply with the appropriate standards recognised by the Society, or with joints whose structural strength has been verified through test analysis as deemed appropriate by the Society.

4.4.10 Post-weld heat treatment

For all butt-welded joints of high pressure gas fuel supply lines, post-weld heat treatment is to be performed depending on the kind of material.

Ch 9, Sec 16, [4.7.1] (Amendments July 2020)

Replace reference to “[7.4]” by reference to “[4.3]”.

Ch 9, Sec 16, [7] (Amendments July 2020)

Replace Sub-article title [7.2] as follows:

7.2 Gas fuel supply to engines with fuel injection pressure greater than 1 MPa

Delete Sub-article [7.3]

Replace the existing Sub-article title [7.4] as follows:

7.4 Shut-off of gas fuel supply with pressure greater than 1 MPa

Replace the existing Sub-article title [7.5] as follows:

7.5 Emergency stop of dual fuel engines with fuel injection pressure greater than 1 MPa

Ch 11, Sec 2, [2.1.4]

Delete the last paragraph.

Ch 11, Sec 3, [4.2.1]

Replace the second item in the definition of C_s by:

- $C_s = 1,1$ for primary supporting members

Ch 11, Sec 5, [2.2.3]

Replace item a) 6) by the following one:

- 6) at all stowage positions for fire-fighter's outfits

Ch 15, Sec 4, Table 1

Delete "four copies" in the table footnote (1).

Ch 15, Sec 4, Table 2

Replace table footnote (1) by:

- (1) A = to be submitted for approval
I = to be submitted for information.

Ch 15, Sec 5, [2.1]

Replace requirement [2.1.1] by:

2.1.1 The documents listed in Tab 1 are to be submitted.
The list of documents requested is intended as a guidance for the complete set of information to be submitted, rather than an actual list of titles.
The Society reserves the right to request the submission of additional documents regarding unconventional design or

where deemed necessary for the evaluation of the system, equipment or components.

Where the length is less than 24 m, the Society may give exemptions to the documents to be submitted.

Ch 15, Sec 6, [7.1.9]

Replace "fuel oil unit" by "oil fuel unit".

Amendments to PART E

Ch 1, Sec 1, [1.1.1] (Amendments July 2020)

Replace the second paragraph by the following one:

These service notations are always completed by the additional service feature **standardized design bollard pull** = $[T_{BP}/9,81] t$, where the design Bollard Pull T_{BP} is defined in [2.1].

Ch 1, Sec 1, [2.8]

Replace requirement [2.8.1] by:

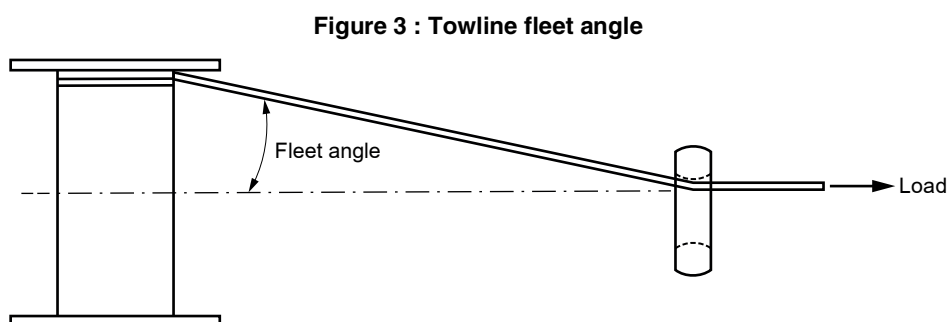
2.8.1 Emergency release system refers to the mechanism and associated control arrangements that are used to release the load on the towline in a controlled manner under both normal and blackout conditions.

Ch 1, Sec 1, [2.8] (Amendments July 2020)

Delete requirement [2.8.3].

Ch 1, Sec 1 (Amendments July 2020)

Replace Figure 3 by the following one:



Ch 1, Sec 2, [2.3] (Amendments July 2020)

Replace requirement [2.3.2] by:

2.3.2 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 [2.3.3])
- the hydrodynamic resistance of the hull (tow-tripping, see [2.3.4]).

Ch 1, Sec 3, [2.3.1] (Amendments July 2020)

Replace the term “moulded draught” by “scantling draught”.

Ch 1, Sec 3, [2.7.4]

Replace items a) 6) and a) 7) by:

6) Emergency release of the towline is to be possible in the event of a blackout. For this purpose, where additional sources of energy are required, such sources are to comply with item 7) below.

7) The sources of energy required by item 6) are to be sufficient to achieve the most onerous of the following conditions (as applicable):

- sufficient for at least three attempts to release the towline (i.e. three activations of the emergency release system). Where the system provides energy for more than one winch it is to be sufficient for three activations of the most demanding winch connected to it.

- Where the winch design is such that the drum release mechanism requires continuous application of power (e.g. where the brake is applied by spring tension and released using hydraulic or pneumatic power) sufficient power is to be provided to operate the emergency release system (e.g. hold the brake open and allow release of the towline) in the event of a blackout for a minimum of five minutes. This may be reduced to the time required for the full length of the towline to feed off the winch drum at the load specified in item 5) if this is less than five minutes.

Replace items b) 1) and b) 2) by:

1) Emergency release operation is to be possible from the bridge and from the winch control station on deck. The winch control station on deck is to be in a safe location.

A position in close proximity to the winch is not regarded as “safe location”, unless it is documented

that the position is at least protected against towline break or winch failure.

- 2) The emergency release control is to be located close to an emergency stop button for winch operation, if provided, and both are to be clearly identifiable, clearly visible, easily accessible and positioned to allow safe operability.

Delete items b) 10) and b) 11).

Replace item c) 2) by the following items c) 2), c) 3) and c) 4):

- 2) The performance capabilities, as well as instructions for operation, of the emergency release system are to be documented by the manufacturer and made available on board the ship on which the winch has been installed.
- 3) Instructions for surveys of the emergency release system are to be documented by the manufacturer,

agreed by the Society and made available on board the ship on which the winch has been installed.

- 4) Where necessary for conducting the annual and special surveys of the winch, adequately sized strong points are to be provided on deck.

Ch 1, Sec 5, [2.1] (Amendments July 2020)

Replace requirement [2.1.1] by:

2.1.1 The design bollard pull is to be verified by means of a bollard pull test performed in accordance with Ch 1, App 1.

Replace requirement [2.1.4] by:

2.1.4 The bollard pull test is to be carried out in the presence of a Surveyor of the Society. The test procedure location and conditions (see Ch 1, App 1, [3]) are to be agreed with the Society.

Ch 1, App 1

Add the following new Appendix 1:

APPENDIX 1 BOLLARD PULL TRIALS

1 General

1.1 Purpose

1.1.1 The purpose of this Appendix is to:

- ensure that the reported bollard pull figure represents the realistic performance of the vessel that can be met in service conditions at an acceptable level of accuracy, irrespective of the specific conditions met during the execution of the bollard pull trial that are known to affect the vessel's performance
- facilitate a repeatable performance figure in accordance with clear definitions.

1.2 Application

1.2.1 This Appendix applies to ships with multiple propulsors, with or without nozzles.

1.2.2 This Appendix does not apply to the following ships:

- ships whereby propulsors are mounted under a large flat bottom (e.g. specialised ships with multiple thrusters for dynamic positioning operation)
- single propulsor towing vessels.

2 General requirements

2.1 Bollard pull trial

2.1.1 A bollard pull trial is a full scale test with a vessel to determine the horizontal towline force which the main propulsion systems can generate at a vessel speed equal to zero knots.

The bollard pull trial is to be executed in unrestricted and calm water, without external influences such as wind and current. One end of the towline is to be attached to a dedicated towing point on the vessel (e.g. towing winch or hook) and the other end is to be attached to an external strongpoint (fixed bollard ashore, seabed secured anchor or otherwise). The towline force is to be measured by a calibrated load cell which is normally fitted between the towline and the external strongpoint. The engine power at which the bollard pull trial is executed is to be measured and reported in conjunction with the steady state line pull.

2.2 Bollard pull trial conditions

2.2.1 The vessel's bollard pull is the towing force provided by the specified propulsors, recorded as being maintained in a steady state condition for a duration of not less than 5 minutes and performed at rated power as defined in [2.3.1] at a speed through water of zero knots.

2.2.2 The operating profile for the bollard pull trial condition is to represent normal service conditions, such that sufficient auxiliary power is available for normal and safe operation of the vessel.

2.2.3 Engine speed and brake power are to be measured simultaneously with towline force during the bollard pull trial and are to be reported on the test report (see [8]).

2.2.4 Bollard pull trials conducted in hybrid mode, whereby batteries or other supplementary power devices are used to provide additional power for a limited period of time, are to be separately listed as "Hybrid Bollard Pull (HBP)", and have an associated time of validity for each operational mode of such HBP.

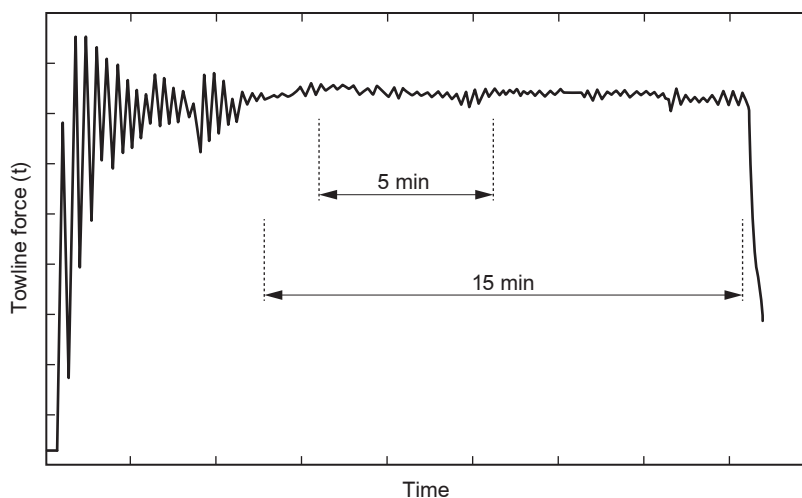
2.3 Engine rating

2.3.1 The bollard pull trial is to be performed up to the maximum power of the engines which is available in service. Maximum power means:

- For marine diesel and/or gas engines: The maximum brake power that the engine can deliver in service, and that corresponds to the power recorded during 100% load testing at the Factory Acceptance Tests of the engine.
- For electric propulsion machines: Design power for normal service conditions defined for the electric motor, specified on the motor name plate.
- For Hybrid propulsion systems (diesel or gas mechanical propulsion with electrical power take-in):
The sum of the power defined in item a) and item b) above for all propulsion machines.
- In case the design power of the propeller is less than the maximum power of the engine(s), the maximum power is to be taken as the design power of the propeller.

2.3.2 The engine speed is to be within the Original Equipment Manufacturer (OEM) specified speed range, which is to be consistent with the type approval of the engine and the certification of the propulsion train (e.g. Torsional Vibration Calculations).

Figure 1 : Schematic representation of towline force as a function of time during bollard pull trial



2.3.3 The available output power has to match the conditions stated in [2.2.2].

2.3.4 The propulsion and engine configuration used during the bollard pull trial is to be stated on the certificate. This includes a specification of the power generation systems (output of engines / fuel cells / battery banks etc.), propulsion motors (mechanical, electrical, hybrid) and propulsion systems (number of propellers, use of (retractable) thrusters etc.) used during the bollard pull trial.

2.4 Steady state phase

2.4.1 The steady state phase of the bollard pull trial is the time interval during which a steady towline force is measured. The steady state phase represents the highest consecutive 5 minute period, logged as per [4.4] during a 15 minute trial under effectively constant trial conditions stated in this trial test procedure. The definition of the highest consecutive 5 minutes period is to be in accordance with [7.2].

2.4.2 The 15 minute trial window starts after the initial build up and subsidence in line tension of associated dynamic effects, as shown in Fig 1. During this period only small changes in steering angles associated with maintenance of vessel position are permitted. Strong sway motions are to be avoided.

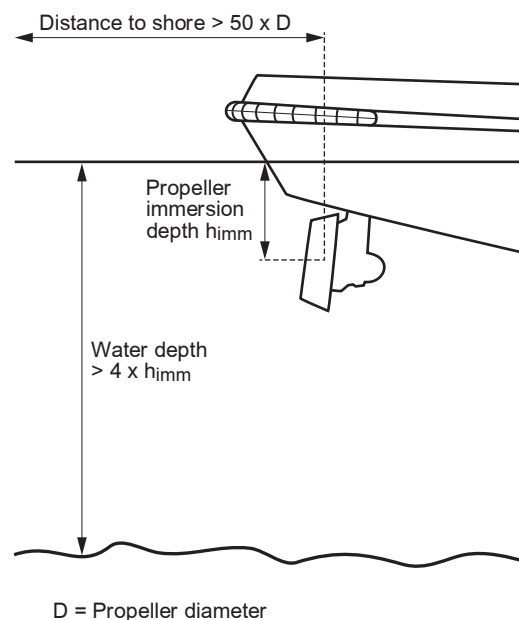
2.4.3 In Hybrid mode (Diesel/Diesel-Electric power plus that available from the batteries) the available battery power for propulsion might decrease during the execution of the bollard pull trial. In this case the reported bollard pull is to be defined by calculating the mean power and towline force over a period of 5 minutes as minimum, and noted down as a separate entry in the bollard pull certificate as 'Hybrid Bollard Pull (HBP)' with an associated maximum time for which that HBP rating is valid in service. The designed power availability duration is to be provided by the designer of the propulsion system.

3 Requirements for the trial site

3.1 Water depth and radius

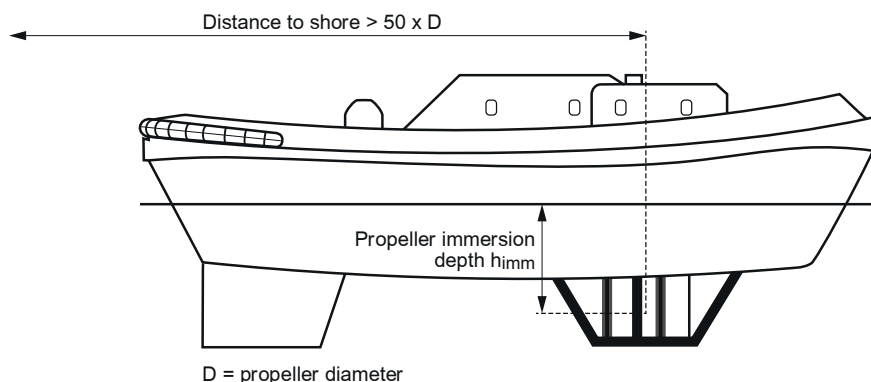
3.1.1 The minimum total water depth, which is to be maintained at least in a radius of 2 times the ship's length around the towing vessel, is 4 times the propeller immersion depth (h_{imm}).

Figure 2 : Definition of propeller immersion depth and ship to shore distance



3.1.2 The propeller immersion depth is the distance between the water surface and the centre of the propulsion unit, as indicated in Fig 2. For propulsion systems with vertical axis, the centre line of the jet-stream is used, i.e. the middle of the blades as indicated in Fig 3.

Figure 3 : Definition of immersion depth and ship to shore distance for a propulsion system with vertical axis



3.1.3 The water depth during the trial is to be recorded on the bollard pull trial report.

3.2 Ship to shore distance

3.2.1 The minimum distance between quay and centre of the propeller closest to shore is 50 times the propeller diameter to avoid water circulation affecting the bollard pull.

3.3 Current

3.3.1 The current speed is to be less than 0,5 knots from the bow or sides. If the current is approaching the vessel from the stern, the current is to be less than 0,3 knots. When the bollard pull trial is performed with side current, the towing vessel is to be allowed to shift position by letting it move with the current and not to steer against it, while maintaining heading relative to the towline. It is not allowed to fix the position of the towing vessel by cables, other vessels or other means. Bow thrusters may be used to hold position if this does not negatively affect the power available for main propulsion, see also [6.1.1].

3.4 Water density

3.4.1 Water density is to be recorded on the bollard pull trial report. No corrections for water density are to be applied.

3.5 Waves

3.5.1 The bollard pull trial is to be conducted in calm water conditions as far as possible. In any case, the maximum significant wave height encountered during the bollard pull trial is not to exceed 0,5 m. No corrections for waves are to be applied.

3.6 Wind

3.6.1 Transverse wind may cause sway movements that have to be compensated by applying rudder. This may degrade vessel bollard pull performance. Wind speed during the bollard pull trial is to be as low as possible but not more than 10m/s (5 Beaufort scale).

3.7 Outside temperature

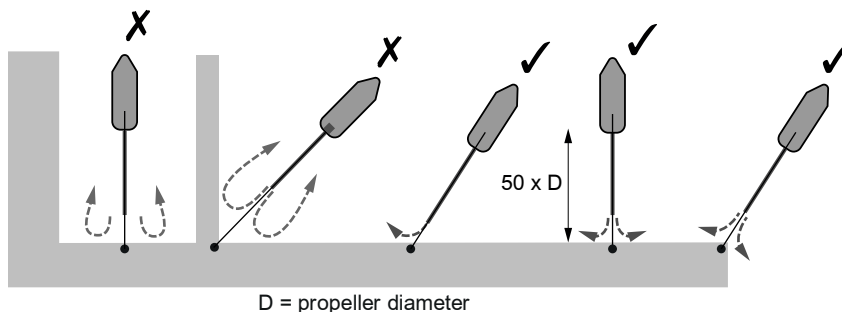
3.7.1 It is recommended to perform trials in non-tropic conditions (air temperature < 45°C, water temperature < 32°C) to avoid engine performance degradation. No corrections for environmental conditions are to be applied.

Note 1: It is recommended to log relevant engine parameters during the trials.

3.8 Towline

3.8.1 A torsion-free towline (e.g. synthetic) is recommended to ensure that the load cell measures, as intended, in direct tension.

Figure 4 : Positioning of the vessel during bollard pull trials



3.9 Vessel orientation relative to the quay

3.9.1 The heading relative to the quay side (assuming solid quay sides) is to be chosen such that propeller wash can freely move without being re-directed in the direction of the vessel. Towing is not to be done in enclosed harbours, as recirculation is more likely to occur, resulting in unsteady performance. Minimum line length, water depth and associated radius are to be observed. Fig 4 presents examples of acceptable and unacceptable vessel orientations relative to the quay.

4 Instrumentation

4.1 Load cell

4.1.1 The load cell is to be installed between the strongpoint and towline, either on board or on shore. The load cell is to have a digital output and be capable of sampling at a rate of 1 Hz or faster.

4.1.2 To maximise accuracy the following conditions are to be met:

- The load cell calibration and certificate is not to be older than 12 months and is to be provided with the bollard pull certificate. The calibration procedure of the load cell is to be in accordance with the requirements stated in [4.1.3].
- The load cell is to have an uncertainty in accordance with an ISO 7500-1 Class 1 machine, which is to be stated on the load cell calibration certificate.
- When a steel stranded wire is used during the bollard pull trial, the load cell is to be proven to be torsion insensitive in accordance to the requirements in [4.1.4].
- Spacer rings are to be installed between load cell and shackle ears as indicated in Fig 5 to avoid misalignments during testing. Spacer rings are plastic rings specially made to fill the gaps between shackle ears and load cell, and thus centrally align the load cell.
- Shackle pins are to be free from surface imperfections such as dents or bend.
- The towline is to be connected first to a shackle, which is consecutively connected to a second shackle that holds the load cell (see Fig 5).

- When a load pin shackle is used, a centralising bobbin as indicated in Fig 6 is to be used in order to ensure correct alignment, in addition to additional shackles. The towline is not to be connected directly to the load shackle.
- The load cell / load shackle and connected shackles are not to touch the quayside edge or ground (see Fig 7) to avoid misalignment, bending and corresponding offsets in measurements. The shackles denoted by 'Additional Shackles' in Fig 5 are allowed to touch the ground if not possible otherwise.
- The test is to be conducted at the same temperature as during the calibration of the load cell, within a tolerance of $\pm 10^{\circ}\text{C}$. If this condition cannot be fulfilled, the load cell is to be certified to be suitable for the temperature during the trial.
- The load cell is to be set to zero prior to the trial, when the towline is not yet connected and free from any load. After the trial, when the load cell is free from any load, the reading is to be checked again.

Figure 5 : Recommended load cell arrangement with spacer rings and additional shackles

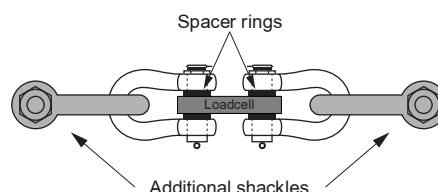


Figure 6 : Recommended load shackle arrangement with centralising bobbin and shackles

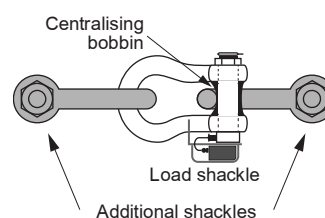


Figure 7 : Load cell touching ground, causing bending moments and misalignment of the load cell

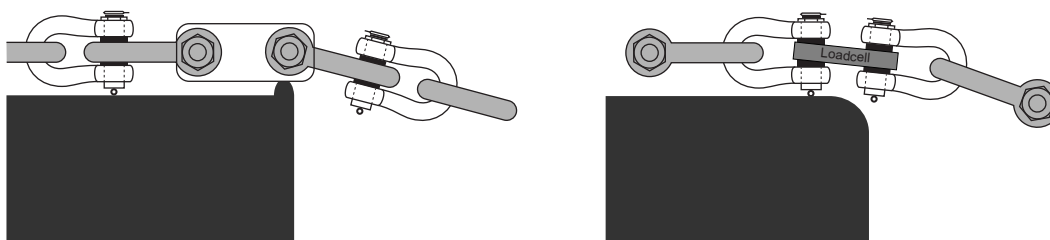
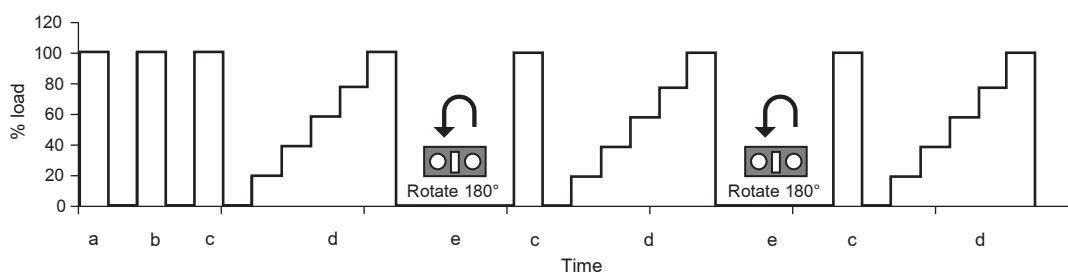


Figure 8 : Schematic of calibration procedure according to ISO 7500-1



4.1.3 Load cell calibration requirements

Load cells are to be calibrated according to ISO 7500-1 (“standard calibration”). The load cell is to be calibrated with the same shackle pin diameter as it is used during bollard pull testing. If calibration is done on a horizontal calibration machine, spacer rings are to be used to improve alignment.

Fig 8 presents a schematic of the calibration procedure, which consists of the following steps in chronological order:

- pre-load to the maximum of the load cell's scale
- pre-load to the maximum of the load cell's scale
- pre-load to the maximum of the load cell's scale
- stepwise load increase comprising at least five discrete force levels at equal intervals between 20% and 100% of the maximum range of the scale
- rotation of the load cell by 180 degrees, around the X, Y or Z axis and a rotation of the shackle pins connected with the load cell by 30 degrees
- repetition of steps c- e for two more times.

For each discrete force, the arithmetic mean of the values obtained for each series of measurements is to be calculated. From these mean values, the relative accuracy error and the relative repeatability error are to be calculated. The preload runs are to be omitted.

4.1.4 Torsional insensitivity

When a steel stranded wire is used during the bollard pull trial, the load cell is to be proven to be torsional insensitive to a torsion value T, in kN.m, of at least:

$$T = C_1 \cdot BP_{design} \cdot D_{line}$$

Where:

BP_{design} : Vessel's design bollard pull at 100% engine load, in kN

C_1 : Towline wire torsion factor ($c_1 = 0,07$ for 6/36 steel stranded wires, unless documented otherwise)

D_{line} : Diameter of the towline, in m.

The insensitivity of the load cell is to be proven by the load cell manufacturer by means of systematic tests. When a rotation resistant rope is used (e.g. some synthetic ropes), this requirement is not applicable.

4.2 Engine speed measurement

4.2.1 The engine speed is to be continuously measured using a pickup sensor or via the engine control system of the engine's manufacturer and recorded digitally during the trial.

4.3 Power measurement

4.3.1 Engine brake power is to be measured using a dedicated shaft torque / engine speed measurement system for first and second ships of a series. Torque measurement systems based on strain gauges are most common, but other techniques, e.g. using optical deflection measurement, are also allowed. Engine speed can be measured using an optical or magnetic pickup sensor.

4.3.2 The power measurement is to represent engine brake power as tested during shop tests. For third and further of series the engine control system can be used provided its accuracy has been verified based on the first two vessels of a series. The dedicated shaft torsion/engine speed sensor reading is leading for the engine power.

4.3.3 The uncertainty of the engine power measurement should be according to ITTC standard 7.5-04-01-01.1 (total bias uncertainty +/-2%).

4.3.4 Shaft material properties, i.e. the G-Modulus, are to be fully described and documented by the Shipbuilder. If no certificate based on an actual shaft torsional test is available, a G-Modulus of 82400 N/mm² is to be used for regular shaft steel.

Figure 9 : Power measurement on a diesel direct propulsion arrangement

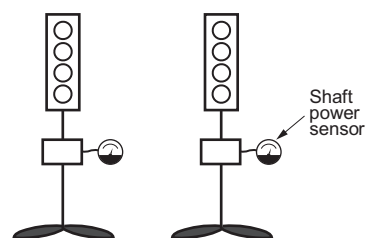


Figure 10 : Power measurement on a geared diesel direct propulsion arrangement with PTO (declutched)

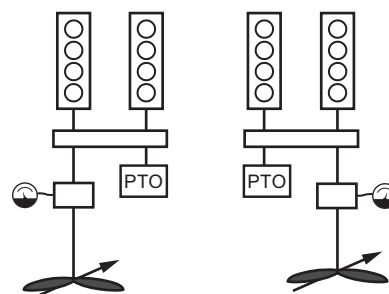


Figure 11 : Power measurement on a Hybrid propulsion arrangement

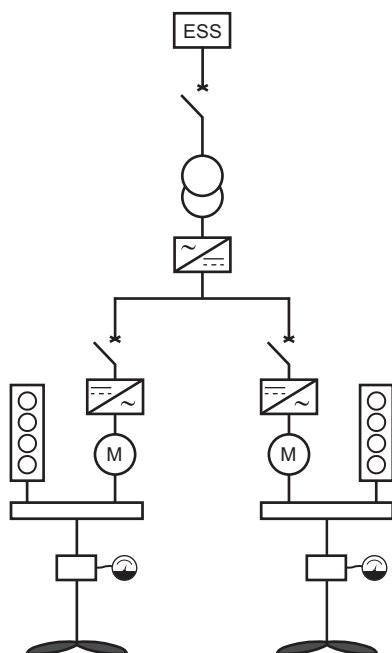
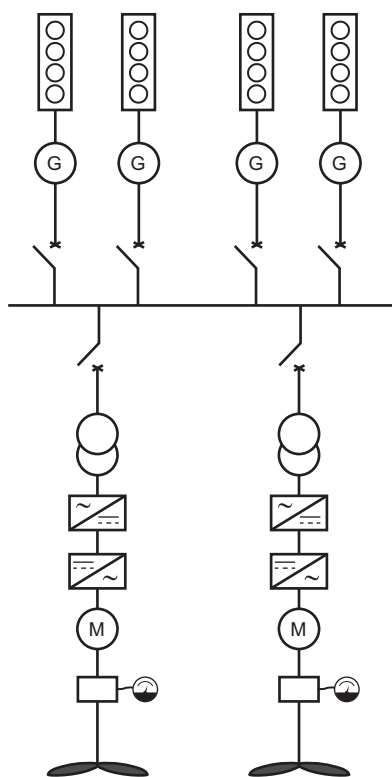


Figure 12 : Power measurement on a Diesel-Electric propulsion arrangement



4.3.5 If power cannot be measured directly on the engine's output shaft, it may be calculated by measuring power on the propeller shaft and correcting for power losses between engine flywheel and measurement point. These losses are to be confirmed by their respective manufacturer and stated in the trial report. Suggested measurement locations for various propulsion configurations are included in Note 1.

Note 1: The objective of the power measurement is to measure engine brake power. For ships with a diesel direct propulsion layout (see Fig 9), the shaft power measurement system can be installed directly on the output shaft of the engine, as close to the engine as possible to avoid shaft losses.

For ships with multiple engines coupled to a gearbox (see Fig 10), where there is insufficient space between main engine and gearbox to install a shaft power meter shaft power is to be measured on the propeller shaft. If a PTO is installed, it is to be declutched or unloaded. Auxiliaries connected to the gearbox or PTO that are necessary for the normal operation of the engine such as cooling or oil circulation pumps are to remain operational during the test. The main engine brake power is to be calculated by calculating the gearbox losses and adding them to the measured shaft power.

For ships with a hybrid propulsion system (see Fig 11), where both an electric motor and combustion engine provide power to a single shaft, the combined power is to be measured. Both the combustion engine and PTI are not to run at a rating higher than 100% load.

For diesel electric ships (see Fig 12) the design power of the electric motor is the limiting factor for power output. The brake power of the electric motor is to be determined using a power measurement system on the output shaft. If this is not possible, the power to the electric motor is to be determined with a power spectrum analyser or other means.

4.3.6 In case carbon shafts are used and no steel section is available for the installation of a power measurement system, the engine rating during the bollard pull trial is to be determined on a case by case basis with the parties involved. Without a direct measurement of the shaft brake power, no power is to be reported on the trial certificate.

4.3.7 The power meter zero setting is to be done according to its maker's instructions prior to the trials.

4.4 Data logging

4.4.1 The readings of the towline force, engine speed and shaft torque are to be recorded continuously and automatically on a digital system with a sample frequency of at least 1 Hz in order to capture the natural fluctuations in the forces. A higher sampling rate is recommended to identify measurement errors and dynamic effects more clearly. Each load cell reading is to be tagged with a time stamp and synchronised with the power measurements on the vessel.

4.4.2 Measurement is to commence prior to the bollard pull trial, so that the steady state phase and no-load reading can be identified during post processing of the data.

4.4.3 The following data are to be recorded at the beginning of the trial: Draft and trim, wind, waves, current, water depth, water density, distance to quay, fuel quality, towline diameter, length, and material. If conditions vary during the test, the variances at completion of the trial are also to be recorded.

5 Trial preparation

5.1 Draught and trim

5.1.1 The draught and trim of the towing vessel are to be representative for typical service conditions and are to be stated on the certificate.

5.2 Propellers

5.2.1 The propellers used during the trial are to be the same as used for service conditions. It is strongly recommended to clean/polish the propellers immediately before trials, as blade roughness and fouling negatively affects thrust and power efficiency.

5.3 Fuel

5.3.1 The fuel used during the trial is to be representative for the normal service operation of the vessel. The fuel type and calorific value are to be stated on the certificate.

6 Trial execution

6.1 General

6.1.1 During the trial a visual observation of the load cell reading on the bridge is recommended, so that the commencement of the steady state phase can be judged. Minimal sway motion is recommended to avoid performance drops. The use of a bow thruster is allowed to maintain position during the trial, when this does not affect the power available to the main propulsion system. Stern side thrusters are not to be used unless it is demonstrated that they do not affect the inflow velocity.

6.1.2 At least four power settings are to be tested between 25% and 100% load: maximum power in accordance with [2.3.1], 85%, 60% and 40% of the rated power are recommended.

6.2 Steps to be performed

6.2.1 The following steps are to be performed for the bollard pull trial:

- Make sure the load cell, wireless indicator, test location and environmental conditions are according to the requirements stated in this Appendix.
- Tare the load cell (set to zero) prior to the test when the load cell and shackles are not yet connected.
- Connect load cell and towline. Slowly put tension on the towline. Ensure correct alignment of the load cell and shackles. Re-align when necessary.
- Increase tension on the towline until the maximum power, as defined in [2.3.1] is reached. Check power rating using the engine shaft power meter.
- When the vessel has a stable position and heading and line fluctuations are constant, start a 15 minute run recording the towline force, power and engine speed.

f) Reduce power to other engine ratings (85%, 60% and 40% recommended). When the vessel is stable and line fluctuations are constant, start measurement. The minimum measurement period is hereby 5 minutes. A longer period (15 min) is recommended to capture a more stable performance.

g) Repeat steps b) to f) for the other direction of towing (stern / bow) if applicable.

6.2.2 During the test a log sheet is to be filled in. Minimum reporting requirements are listed in Article [8].

7 Data analysis

7.1 Validation of recorded data

7.1.1 The logged towline force is to be plotted on a time scale and evaluated for measurement errors, outliers and to identify the steady state period. The towline force is to have a smooth, sinusoidal character as a function of the mass-spring system behaviour of the towline and vessel. If the data quality is poor, indicated by stepwise data, missing data and large non-periodic fluctuations, the bollard pull trial is to be repeated.

7.2 Identification of steady state performance

7.2.1 The determination of the highest consecutive 5 minute period of stationary performance is to be performed after the trial using the logged data. The calculation of the average bollard pull over the 5 minute period is performed using a normal arithmetic average over the selected period (using at least 300 consecutive data points). Clear outliers due to sensor errors are to be removed prior to calculation of the average. The average of the propulsion power and engine speed is to be determined over the same 5 minute data period.

8 Reporting

8.1 Trial report requirements

8.1.1 The bollard pull test certificate is to be accompanied with a trial report. The report is to contain at least the following information:

- characteristics of the vessel, propulsion system and main engines/propulsion motors, including Original Equipment manufacturer (OEM)-defined consecutive periods of available maximum power
- the propulsion and engine configuration used during the bollard pull trial. This includes a specification of the power generation systems (output of engines / fuel cells / battery banks etc.), propulsion motors (mechanical, electrical, hybrid) and propulsion systems (number of propellers, use of retractable thrusters etc.) used during the bollard pull trial
- used method of power measurement and used mechanical/electrical efficiency if applicable
- fuel characteristics
- location, water depth and line length during the trial

- environmental characteristics: ambient temperature, wave height, water density, wind and current speed and direction relative to the vessel
- towline and load cell-shackle arrangement
- calibration certificate of load cell
- log sheet with results of each 5 minute trial, including power, engine speed and line pull for all tested load cases
- name and contact information for persons performing and witnessing the trial on behalf of shipyard, owner and main component manufacturers
- for re-evaluation trials at part-load operation: the original bollard pull - shaft power curve including the measured points at part load, and the calculation method to derive to the resulting extrapolated bollard pull at maximum power.

9 Part load bollard pull re-evaluation trials

9.1 Application

9.1.1 A new bollard pull trial is required:

- for class renewal; or
- in case of overhaul or alteration of the engines and/or propulsion system.

In those cases where a suitable bollard is unavailable, e.g. because the available bollard has an insufficient safe working load, bollard pull trials may be performed at reduced load. These trials are no substitute for full bollard pull trials, but can be used to evaluate the validity of previous test results performed at 100% load. This Article lists the prerequisites for such trials, the test and analysis procedure.

9.2 Trial overview

9.2.1 A full-range bollard pull trial as described in [6] provides a bollard pull versus shaft power performance curve over the complete power range. This curve is to be evaluated in the performance re-evaluation trials at part load. The performance re-evaluation is to be done in three steps:

- Step 1: The capabilities of the engines after overhaul are evaluated, by testing each individual prime mover separately at the highest power the engine can deliver (in compliance with [2.3]). The engine power is hereby logged.
- Step 2: A bollard pull trial is performed at the maximum safe working load of the bollard with all prime movers in operation, but at part load.
- Step 3: The measured bollard pull is compared with the original performance curve of the vessel. If the measurement results are within $\pm 3\%$ the original curve, the original curve is still valid and can be intersected at the combined maximum power measured in step 1. If the deviations are larger the curve is to be shifted accordingly.

9.3 Prerequisites

9.3.1 Bollard Pull Performance Re-evaluation Trials are only valid when the following conditions are met:

- Bollard pull trials have been performed in the past where a minimum of 4 power settings have been tested between 25% and 100% rated power according to this Appendix, whereby delivered power is measured using a dedicated power measurement system on the drive shafts.
- The maximum rated power of each prime mover can be tested separately. For ships with combinator mode and father/son arrangement, a temporary change in engine speed-pitch may be necessary to avoid overloading the engine when testing one engine per shaft.
- The same propeller and nozzles as during the initial full load bollard pull trial are in place.
- The propellers are re-conditioned (polished) to the same condition as for the initial full load bollard pull trial according to the relevant ISO propeller class or similar.
- The propeller nozzles have no surface damage and are in the same condition as for the initial full load bollard pull trial.
- A bollard is available with a safe working load that exceeds the power rating of each individual prime mover, so that the maximum power of each prime mover can be safely tested. For example, for tugs with a father/son engine arrangement, with two engines providing 60% / 40% of the total available power, the bollard is to be strong enough to hold the bollard pull obtained at 60% of the total available power.

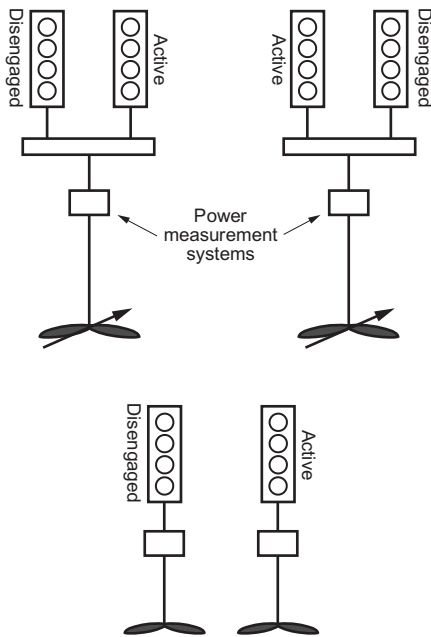
9.3.2 If the above conditions cannot be met, normal bollard pull trials according to Article [6] are to be performed.

9.4 Step 1: Evaluation of engine power

9.4.1 The engine capability of each prime mover is determined by loading the engine up to 100% load in a bollard pull setup (zero ship speed). The following procedure is to be followed:

- Tare the shaft power measurement system according to manufacturer recommendations
- Make sure the test location and environmental conditions are according to the requirements stated in this Appendix
- Slowly put tension on the towline
 - for vessels with multiple prime movers per propeller: engage one prime mover per shaft. Operate both shafts for symmetric operation (see Fig 13, left arrangement)
 - for vessels with 2 propellers and two engines: disengage one propulsion unit so only one propeller is in operation. The other propeller may weather vane or stand still (see Fig 13, right arrangement)
 - for vessels with multiple propellers: engage one prime mover

Figure 13 : Propulsion configurations for individual engine performance testing



- d) Increase power up to the power as stated in [2.3]
- e) Stabilise vessel and start a 5 minute power measurement. Bollard pull is not measured. For ships with one propeller in operation strong rudder usage may be necessary to stabilize vessel
- f) Repeat step c) and d) to test the other prime movers
- g) Calculate the total power capacity, P_{Total} , of the main engines using:

$$P_{Total} = \frac{\sum_{i=1}^n P_{ME(i)}}{\eta_{gear}}$$

Where:

- P_{Total} : Total available power for all prime movers combined
- P_{ME} : Engine power for each 'i' prime mover as obtained in step (d) and (e)
- η_{gear} : Gearbox efficiency ($\eta_{gear} = 1$ when there is no gearbox between measurement system and engine output shaft). The same gearbox efficiency as used during the new-build bollard pull trials is to be used.

9.5 Step 2: Re-evaluation of propulsion efficiency

9.5.1 The propulsion efficiency curve (towline force versus shaft power) is to be evaluated at the maximum safe working load of the bollard. The following procedure is to be followed:

- a) Make sure the load cell, wireless indicator, test location and environmental conditions are according to the requirements stated in this Appendix.
- b) Tare the load cell prior to the test when the load cell and shackles are not yet connected.

- c) Ensure correct alignment of the load cell and shackles. Re-align when necessary.
- d) Engage all engines and propellers and increase power until towline tension has reached maximum safe working load of bollard.
- e) When the vessel is stable and line fluctuations are constant, start a 15 minute run recording the bollard pull, power and engine speed in accordance with the procedure documented in [6].
- f) Reduce power to 40% of the total available power. When the vessel is stable and line fluctuations are constant, start a new 15 minute run recording the bollard pull, power and engine speed.
- g) Repeat above steps for astern operation if applicable.
- h) Plot measurement results in the original propulsion efficiency curve.

Steps a) to f) are to be performed in accordance with the normal procedures and environmental restrictions as documented in this Appendix.

9.6 Step 3: Re-evaluation of bollard pull capability at available power

9.6.1 The offset between the measured data points and the original performance is to be assessed through the towline pull ratio, α_{BP} :

$$\alpha_{BP} = \frac{BP_{Evaluate}}{BP_{original}}$$

Where

- $BP_{Evaluate}$: Bollard pull-power performance curve obtained during re-evaluation trials, (see [9.5])
- $BP_{Original}$: Original Bollard pull-Power performance curve from full power trials.

To obtain the bollard pull at P_{Total} either the original performance curve is used, or the curve is first shifted:

- a) if $0,97 < \alpha_{BP} < 1,03$ the original BP-Power curve is used to intersect the new bollard pull capability at P_{Total} , as shown in Fig 14
- b) if $\alpha_{BP} > 1,03$, it is to be demonstrated that the applicable hull structure and stability requirements are complied with
- c) if $\alpha_{BP} < 0,97$, the curve is shifted vertically by multiplying the curve with α_{BP} to match the data points, as depicted in Fig 15.

If P_{Total} is more than the highest power rating from the original BP-trial, the bollard pull is determined from the highest rating from the original BP-trial. No extrapolation beyond the original curve is allowed.

For tests in ahead direction the curve for ahead trials is to be used; for astern trials the curve for astern direction.

9.7 Presentation of results

9.7.1 The original Shaft power - Bollard pull curve including its measurement points, and the method to derive to the resulting extrapolated bollard pull at rated power, is to be clearly documented.

Figure 14 : Procedure for estimating bollard pull at P_{Total} from part load trials

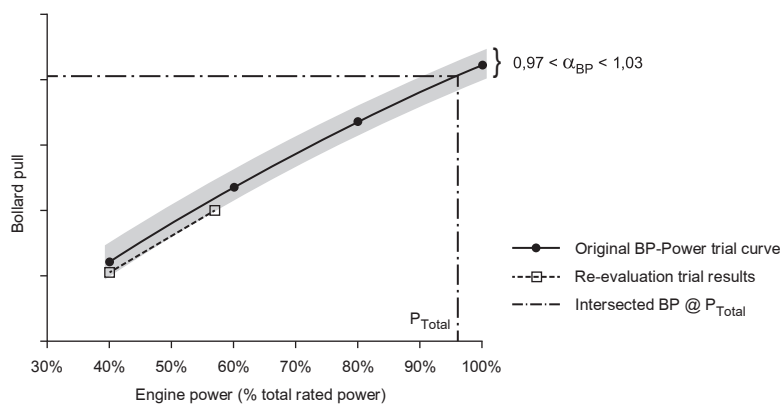
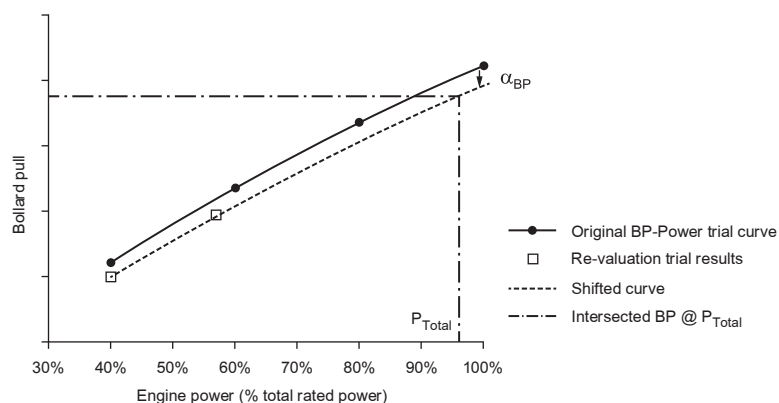


Figure 15 : Procedure for estimating bollard pull at P_{Total} when $\alpha_{BP} < 0,97$



Ch 4, Sec 3, Table 1

Replace the table head and ninth row by:

Table 1 : Documents to be submitted

No.	Description of the document (1)	I/A (2)
9	Specification and plan showing the location of fire-fighter's outfits and the location and capacity of the air compressor	A

Ch 4, Sec 3, Table 4

Replace the Table title by:

Table 4 : Number of fire-fighter's outfits

Ch 4, Sec 3

Replace Article 7 by:

7 Fire-fighter's outfits

7.1 Number and characteristics

7.1.1 The ship is to be fitted with fire-fighter's outfits in accordance with Tab 4.

Note 1: The number of fire-fighter's outfits required in Tab 4 is the minimum total number of fire-fighter's outfits on-board. Fire-fighter's outfits provided for compliance with e.g. SOLAS II-2/10 may also be counted in this number.

7.1.2 The air breathing apparatuses, protective clothing and electric safety lamps constituting parts of fire-fighter's outfits are to be of a type approved by the Society.

7.1.3 Breathing apparatuses are to be of the self-contained type. They are to have a capacity of at least 1200 litres of free air.

At least one spare air bottle is to be provided for each apparatus.

7.1.4 The fire-fighter's outfits are to be stored in a safe position readily accessible from the open deck.

Ch 8, Sec 3, [5.3.1]

Replace item b) by:

- b) horizontal penetration measured inboard from the side of the ship perpendicularly to the centre line at the summer load waterline level: 1,5 m.

Amendments to PART F

Ch 2, Sec 1, [1.2]

Replace requirements [1.2.5] and [1.2.6] by:

1.2.5 Active components

Active component means any component of the main propulsion and auxiliary propulsion system that transmits or transfers energy by mechanical, thermal or chemical means such as fans, pumps, heat exchangers or compressors, including their monitoring and control systems.

Pipes, manually controlled valves and tanks are not to be considered as active components.

Electric cables are to be considered as active components.

1.2.6 System failure

A system failure means any failure of an active component which is necessary for the operation of a propulsion system or power generation plant, including their auxiliary systems.

Only a single failure of the systems defined in [1.2.1] to [1.2.4] needs to be considered.

Ch 2, Sec 1, Table 1

Replace table footnote (1) by:

- (1) A : to be submitted for approval
I : to be submitted for information.

Ch 2, Sec 2, [1.1]

Replace requirement [1.1.3] by:

1.1.3 The additional suffix **NS** may be added to the additional class notation **AVM-DPS** when the ship is intended for normal operation with one propulsion system out of service and designed in accordance with the provisions of [4]. The availability of electric production is not covered by this additional suffix.

Ch 2, Sec 2, [1.2]

Insert the following new requirement [1.2.6]:

1.2.6 System failure

A system failure means any failure of any component of a propulsion system, steering system or power generation plant, including their auxiliary and control systems.

Components such as pipes or electric cables are also to be considered.

Only single failure needs to be considered.

Ch 2, Sec 2, [2.1]

Replace requirement [2.1.1] by:

2.1.1 Principle

Ships having the additional class notation **AVM-DPS** are to be fitted with:

- at least two propulsion systems and two steering systems so designed and arranged that, in case of any failure as defined in Ch 2, Sec 2, [1.2.6] affecting such systems or their auxiliary services, there remains sufficient propulsion and steering capabilities to operate the ship in safe conditions, as defined in [2.2.1]

- an electrical power plant so designed that in case of any failure as defined in Ch 2, Sec 2, [1.2.6] in the plant, there remains enough electrical power to maintain simultaneously:
 - sufficient propulsion and steering capability to operate the ship in safe conditions, as defined in [2.2.1]
 - the availability of safety systems.

Ch 2, Sec 2, [2.2]

Replace requirement [2.2.3] as follows:

2.2.3 Where a propulsion system becomes inoperative due to a failure as indicated in [2.2.2] above, the following conditions are to be satisfied:

- other propulsion systems that were in operation before the failure are not to be affected by the failure. In particular there should be no significant modification of the power or rotational speed of the concerned prime mover
- other propulsion systems that were not in operation before the failure are to be maintained available (heat-

ing and prelubrication) so as to allow restarting of a propulsion system within 45 seconds after the failure.

Note 1: The blackout recovery time is excluded, however restarting time for propulsion system in case of blackout is not to exceed 120 seconds.

- safety precautions for the failed propulsion system are to be taken, such as shaft blocking.

This is to be demonstrated during the sea trials.

Ch 2, Sec 2, [2.3] (Amendments July 2020)

Replace requirement [2.3.1] as follows:

2.3.1 The steering machinery is to consist of at least two independent steering systems, each one complying with the following provisions:

- Pt C, Ch 1, Sec 11, [2] in the case of a standard arrangement with rudder and steering gear, and in particular the requirement of Pt C, Ch 1, Sec 11, [2.2.1] relating to the performance of the steering gear

- Pt C, Ch 1, Sec 11, [4] in the case of rotatable thrusters.

Note 1: Other types of combined propulsion and steering systems (such as waterjets or cycloidal propellers) will be given special consideration.

Ch 2, Sec 3, [1.1]

Replace requirement [1.1.3] by:

1.1.3 The additional suffix **NS** may be added to the additional class notation **AVM-IPS** when the ship is intended for normal operation with one propulsion system out of service

and designed in accordance with the provisions of [4]. The availability of electric production is not covered by this additional suffix.

Ch 2, Sec 3, [1.2]

Replace requirement [1.2.6] by:

1.2.6 System failure

A system failure means any failure of any component of a propulsion system, steering system or power generation plant, including their auxiliary and control systems.

Components such as pipes or electric cables are also to be considered.

Only single failure needs to be considered.

Ch 3, Sec 1, [1.1.1], Note 1 (Amendments July 2020)

Replace reference to “Pt C, Ch 1, Sec 1, [1.4.2]” by reference to “Pt C, Ch 4, Sec 1, [3.23.1]”.

Ch 3, Sec 1, [3.2] (Amendments July 2020)

Replace requirement [3.2.4] as follows:

3.2.4 An automatic fire detection system is to be fitted in machinery spaces of category A, as defined in Pt C, Ch 4, Sec 1, [3.24.1], intended to be unattended.

Ch 3, Sec 1, [3.4]

Replace requirement [3.4.3] by:

3.4.3 In addition to the requirements provided in this Section, the location of controls of any valve serving a sea inlet, a discharge below the waterline or a bilge injection system is to comply with Pt C, Ch 1, Sec 10 [5.5.4].

Ch 9, Sec 1, Table 2 (Amendments July 2020)

Replace the row “CLEANSHIP CLEANSHIP SUPER” as follows:

Table 2 : Required certificates

Notations	Certificate	Applicable Rules and Regulations
CLEANSHIP CLEANSHIP SUPER	IOPP certificate (1)	Annex I of MARPOL 73/78, Appendix II
	Type approval certificate of: <ul style="list-style-type: none"> • 15 ppm bilge separator • 15 ppm bilge alarm 	IMO Resolution MEPC.107(49): <ul style="list-style-type: none"> • Part 1 of the Annex • Part 2 of the Annex
	ISPP certificate (1)	Annex IV of MARPOL 73/78, Appendix
	Type approval certificate of the sewage system	IMO Resolution MEPC.227(64) as amended by IMO Resolution MEPC.284(70)
	Type approval certificate of the incinerator (2)	<ul style="list-style-type: none"> • IMO Resolution MEPC.244(66) • Annex VI of MARPOL 73/78, Appendix IV
	IAPP certificate (1)	<ul style="list-style-type: none"> • Annex VI of MARPOL 73/78, Appendix I • IMO Resolution MEPC.194(61)
	EIAPP certificates of diesel engines (3) (4)	NOx Technical Code 2008, Appendix I
	SOx emission compliance certificate Certificate of unit approval for exhaust gas cleaning system (5)	IMO Resolution MEPC.259(68)
	IAFS certificate or Declaration on Anti-fouling system	International Convention on the control of Harmful and Anti-fouling systems, 2001, Annex 4, Appendices 1 and 2

Ch 11, Sec 2, [2.1.1] (Amendments July 2020)

Replace the definition of “ t_G ” by the following one:

t_G : Additional net thickness for taking account of grab impacts, to be taken equal to 3,5 mm. For inner bottom plating, where no continuous

wooden ceiling is fitted, t_G includes the 2 mm required in Pt B, Ch 7, Sec 1, [2.4.1] or NR600, as applicable.

Part F

Ch 11, Sec 3, [1.2.1]

Replace the last paragraph by:

Moreover, a specific detailed plan showing the systems to be adopted when the ship is floating in order to assess the slack between pintles and gudgeons is to be submitted to the Society for approval.

Ch 11 Sec 5, [1.1.5] and [1.1.6] (Amendments July 2020)

Replace “LASHING (restricted area)” by “LASHING (specific area)”.

Ch 11 Sec 5, [1.2.1] and [1.2.3] (Amendments July 2020)

Replace “LASHING (restricted area)” by “LASHING (specific area)”.

Ch 11, Sec 7, Sec 8 and Sec 9

Replace table footnote (1) of Table 1 by:

- (1) A : to be submitted for approval
- I : to be submitted for information.

Ch 11, Sec 13, [2.1.1] (Amendments July 2020)

Replace the first paragraph by the following one:

2.1.1 Oil fuel tanks are to be located above the moulded line of the bottom shell plating nowhere less than the distance h as specified below:

Ch 11, Sec 21, Tab 1 (Amendments July 2020)

Replace the row “9” as follows:

Table 1 : Documents to be submitted

No.	A/I (1)	Document	Document details
9	I	Reports related to test programs for type approval, gas analysis, factory test and onboard tests	

Ch 11, Sec 21, [3.1.1] (Amendments July 2020)

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

Note 1: The risk of release of toxic or explosive gases is to be assessed based on the gas analysis performed during the battery pack prototype testing, as required by [5.3.4].

Ch 11, Sec 21, [3.1.2] (Amendments July 2020)

Replace the first paragraph by the following one:

It should not be possible to have sea water entering battery compartment under normal operating conditions.

Ch 11, Sec 21, [3.1] (Amendments July 2020)

Replace requirement [3.1.5] by the following one:

3.1.5 Fire protection

a) For the purpose of Part C, Chapter 4, battery rooms are to be regarded as:

- auxiliary machinery spaces of moderate fire risk i.e. cat(11) on passenger ships carrying more than 36 passengers
- other machinery spaces i.e. cat(7) on other ships

The boundary between two battery rooms is to have at least A-0 fire integrity.

In addition, the safety measures detailed in item b) to item d) are to be applied.

b) The boundaries between battery rooms containing Lithium-type batteries and machinery spaces of category A

are to have A-60 fire integrity. The boundaries between battery rooms containing Lithium-type batteries and other rooms are to have the fire integrity required between a machinery space of category A and that other room.

c) A fixed fire detection system complying with the requirements of Pt C, Ch 4, Sec 15, [8] is to be provided in battery rooms. Combined heat and smoke detection is to be installed in battery rooms for Lithium-type batteries.

d) Battery rooms are to be fitted with a fixed fire-extinguishing system according to Pt C, Ch 4, Sec 6, [3.1]. This system is to be compatible with the technology of the battery employed, according to the battery manufacturer specification.

Ch 11, Sec 21, [3.2.5] (Amendments July 2020)

Replace the last bullet of the bulleted list by the following one:

- risk for external ingress (fire, fluid leakage, fire-fighting water...).

Ch 11, Sec 21, [5.1] (Amendments July 2020)

Replace requirement [5.1.3] as follows:

5.1.3 Prototype tests

The following items, at least, are to be checked:

- a) External short circuit
- b) Impact / Crush
- c) Drop

d) Thermal abuse / Thermal cycling

e) Overcharge

f) Forced discharge

g) Internal short circuit

h) Insulation tests (High voltage test and insulation resistance test)

Ch 11, Sec 21, [5.3] (Amendments July 2020)

Insert the following new requirement [5.3.4]:

5.3.4 Gas analysis

The types and quantities of gases released by the cell when submitted to the propagation/internal test required in [5.3.3], item a) are to be measured and recorded. This gas

analysis will be used as an input for the risk analysis required in [3.2.4] and the design of the battery compartment, see [3.1].

Ch 11, Sec 21, [5.3.4] (Amendments July 2020)

Add the following Note 2 in the existing requirement [5.3.4]:

Note 2: When this test is impractical at the factory, the following alternative may be considered:

- a calculation based on a method validated by tests is to be submitted to the Society, and
- Proper working of the cooling circuit is to be checked after installation onboard, see [5.3.6].

Ch 11, Sec 21, [5.3.5] (Amendments July 2020)

Add the following new item at the end of the bulleted list, in the existing requirement [5.3.5]:

- Temperature rise test in order to check the proper working of the cooling circuit, when direct cooling is provided and when the cooling test has not been performed during factory acceptance tests, see [5.3.5], Note 2.

Ch 11, Sec 23, [2.4] (Amendments July 2020)

Replace requirement [2.4.3] by the following one:

2.4.3 In addition to [2.4.1], for testing purpose, the speed of the chain cable during hoisting of the anchor and cable is to be measured over 37,5 m of chain cable and initially with at least 120 m of chain and the anchor submerged and hanging free. The mean speed of the chain cable during hoisting of the anchor from the depth of 120 m to the depth of 82,5 m is to be at least 4,5 m/min.

Where the available water depth is insufficient, an equivalent test method, compensating the missing hanging chain weight, is to be submitted for special examination by the Society. In case the test method is not considered equivalent, the maximum water depth associated to the additional class notation **UNSHeltered ANCHORING** is to be limited to the tested depth and specified in a memoranda.

Ch 11, Sec 26

Replace Section 26 by:

SECTION 26

ULTRA-LOW EMISSION VESSEL (ULEV)

Symbols

n	: Engine speed, in r/min
n_{hi}	: Engine high speed, i.e. highest engine speed where 70% of the maximum power occurs
n_{lo}	: Engine low speed, i.e. lowest engine speed where 50% of the maximum power occurs
n_{max}	: 100% speed for the corresponding test cycle
P	: Engine power, in kW
P_{max}	: Maximum power in kW as designed by the engine manufacturer.

1 General

1.1 Scope

1.1.1 This Section applies to ships fitted with internal combustion engines having the capacity to emit gaseous pollutants and particular pollutants at a very low level at the time of assignment of **ULEV** additional class notation. The engines may have the capacity to emit a low level of pollutants in a specific operating mode only, hereafter referred to as "ULEV Mode".

The assignment of **ULEV** additional class notation as defined in Pt A, Ch 1, Sec 2, [6.8.15] is based on the information provided for each engine according to the requirements of this Section.

When granting **ULEV** additional class notation, a memorandum is to be endorsed in order to record the list of engines covered, the fuel(s) with which they have been tested and their ULEV mode if any.

1.2 Application

1.2.1 Engines

All internal combustion engines installed on board are to be in compliance with the requirements of this Section, except:

- engines intended to be used only for emergencies, or solely to power any device or equipment intended to be used only for emergencies on the ship on which it is installed, or engines installed in lifeboats intended to be used only for emergency
- engines with a power equal to or less than 19kW, other than:
 - main propulsion engines; and
 - engines driving electric generators including emergency generator.

1.2.2 ULEV additional class notation may be assigned to sea-going ships. The requirements of this Section do not apply to vessels dedicated to operations on inland waterways (including estuaries, rivers, estuary and lakes) falling into the scope of EU Regulation 2016/1628.

1.2.3 ULEV additional class notation may be assigned to new constructions or to ships in service as long as the engines installed on board, defined in [1.2.1], comply with the requirements of this Section.

Table 1 : Documents to be submitted

No.	Item	I/A
1	For each engine: Engine particulars, including exhaust after-treatment system particulars (e.g. Data sheet with general engine information, details of parameters, including engine components, settings and fuel specifications, that may influence the emissions of pollutants, Project Guide, Marine Installation Manual or installation recommendations)	I
2	If applicable, diagram of the reagent dosing system and associated control system	I
3	For each engine: Emission monitoring system specification, if applicable	I
4	For each engine or parent engine: Emission test program	I
5	For each engine or parent engine: Emission test report	A
6	For each engine's test report: If applicable, definition of the engine family and parent engine, and justification for the selection of the parent engine	A
7	For each engine: Accreditation certificate of the testing laboratory or other document showing compliance with [4.2.2]	I
8	For each engine: Engine maintenance manual, including after-treatment system maintenance manual	I
9	List of all engines installed on board including their purpose and serial number	A
10	General arrangement of the engine, exhaust piping and exhaust after-treatment system on the leadership, if applicable, and on the ULEV sistership	I

Note 1: I: For information; A: For approval

1.3 Documents to be submitted

1.3.1 The documents listed in Tab 1 are to be submitted:

- Documents 1 to 8, as applicable, for each engine, including the after-treatment system if installed
- Documents 9 and 10, as applicable, for the whole ship.

2 Definitions

2.1

2.1.1 “Auxiliary engine” means an engine that does not directly or indirectly provide propulsion.

2.1.2 “Emission control system” means any device, system or element of design that controls or reduces emissions.

2.1.3 “Engine type” means a group of engines which do not differ in essential engine characteristics.

2.1.4 “Engine family” means a manufacturer's grouping of engine types which, through their design, have similar exhaust emission characteristics, and respect the applicable emission limit values.

2.1.5 “Engine operating mode” means a configuration of the engine control system.

2.1.6 “Gaseous pollutants” means the following pollutants in their gaseous state emitted by an engine: carbon monoxide (CO), total hydrocarbons (HC) and oxides of nitrogen (NO_x); NO_x being nitric oxide (NO) and nitrogen dioxide (NO₂), expressed as NO₂ equivalent.

2.1.7 “Internal combustion engine” or “engine” includes, where they have been installed, the emission control system and the communication interface (hardware and messages) between the engine's electronic control unit(s) and any other powertrain or machinery control unit necessary to comply with the requirements of this notation.

2.1.8 “NO_x Control Diagnostic system (NCD)” means a system on board the engine which has the capability of detecting a NO_x Control Malfunction, and identifying its likely cause by means of information stored in computer memory.

2.1.9 “Parent engine” means an engine type selected from an engine family in such a way that its emissions characteristics are representative of that engine family.

2.1.10 “Particle number” or “PN” means the number of solid particles emitted by an engine with a diameter greater than 23 nm.

2.1.11 “Particulate Control Diagnostic system (PCD)” means a system on board the engine which has a capability of

detecting a Particulate Control Malfunction and identifying its likely cause by means of information stored in computer memory.

2.1.12 “Particulate matter” or “PM” means the mass of any material in the gas emitted by an engine that is collected on a specified filter medium after diluting the gas with clean filtered air so that the temperature does not exceed 325 K (52°C).

2.1.13 “Particulate pollutants” means any matter emitted by an engine that is measured as PM or PN.

2.1.14 “Propulsion engine” means any engine other than an auxiliary engine.

2.1.15 “ULEV sister ship” means a sister ship as defined in Pt B, Ch 1, Sec 2, [3.23.1]. Especially, it means that the engines and emission control system types and arrangement on board are identical to that on the leader ship.

3 Requirements for ULEV additional class notation

3.1 Requirements for the engines

3.1.1 Engine testing and design

Compliance with the requirements of [3.2] is to be demonstrated through testing of an engine type as per [4].

Note 1: Engines type-approved in the scope of EU regulation 2016/1628 may be accepted without further testing, provided that satisfactory documentation is submitted to the Society.

3.1.2 Testing on a parent engine may be accepted to demonstrate that the whole engine family complies with the requirements of [3.2]. For this purpose, the parent engine is to be selected by the engine manufacturer, such that the parent engine incorporates those features that will most adversely affect the pollutant emission level. This engine, in general is to have the highest gaseous and particulate pollutant emission level among all of the engines in the engine family.

Parent engine and engine family are to be defined taking into account the emission control system where fitted.

3.1.3 It may be considered by the Society that satisfactory measurements performed on the leader ship cover the engines installed on an ULEV sister ship, provided the engines, exhaust lines and emission control systems are documented as identical to the types of the ULEV sister ship.

3.2 Emission levels

3.2.1 The emissions of each engine installed on board are to be shown to remain below the thresholds given in Tab 2, based on measurements as detailed in [4]:

Table 2 : Maximum emission levels for ULEV additional class notation

Power range (1)	CO	HC (2)	NO _x	PM mass	PN
kW	g/kWh				#/kWh
110 ≤ P < 130	5,00	(HC + NO _x ≤ 5,40)	0,14	–	–
130 ≤ P < 300	3,50	1,00	2,10	0,10	–
P ≥ 300	3,50	0,19	1,80	0,015	10 ¹²
<p>(1) P is the engine power, in kW</p> <p>(2) For gas fuelled engines and dual fuel engines in gas mode, the maximum allowable HC emission level is to be taken as the lower of:</p> <ul style="list-style-type: none"> • 6,19 and • 0,19 + (9 × GER)) <p>Where GER is the average gas energy ratio over the test cycle defined in [4.2.5].</p>					

3.3 Emission control monitoring

3.3.1 NO_x control diagnostic

Electronically controlled engines using electronic control either to determine both the quantity and timing of injecting fuel; or to activate, de-activate or modulate the emission control system used to reduce NO_x are to be equipped with a NO_x Control Diagnostic system (NCD) able to identify the NO_x control malfunctions and their likely causes.

The NCD system is to conclude within 60 minutes of engine operation whether a detectable malfunction is present and, in this case, it is to trigger a visual alarm in the engine control room. It is to be possible to identify which malfunction has been detected.

The NCD system is to record each NO_x control malfunction under a specific code and store it in the onboard computer.

Note 1: A NO_x control malfunction is an attempt to tamper with the NO_x control system of an engine or a malfunction affecting that system that might be due to tampering. NO_x control malfunctions include:

- Impeded exhaust gas recirculation (EGR) valve, and
- Failures of the NO_x Control Diagnostic (NCD) system.

3.3.2 NO_x reagent monitoring

When the NO_x control emission includes the use of a reagent, the following parameters are to be monitored:

- level of reagent in the reagent tank
- reagent quality or concentration, or NO_x concentration
- interruption of reagent dosing.

Inadequate values of these parameters are to trigger a distinct visual alarm in the engine control room. Related incidents are to be recorded in the onboard computer.

3.3.3 Particulate control diagnostic

Engines fitted with a particulate after-treatment system are to be equipped with a Particulate Control Diagnostic system (PCD) able to identify the particulate after-treatment system malfunctions.

In cases where the NO_x control system and the particulate control system share the same physical components (e.g.

same substrate, same exhaust gas temperature sensor), these components may be monitored by the NO_x Control Diagnostic system only.

The PCD system is to conclude within the periods of engine operation detailed in Tab 3 whether a detectable malfunction is present and, in this case, it is to trigger a visual alarm in the engine control room. It is to be possible to identify which malfunction has been detected.

The PCD system is to record each particulate control malfunction under a specific code and store it in the onboard computer.

Note 1: A Particulate Control Malfunction is an attempt to tamper with the particulate after-treatment system of an engine or a malfunction affecting the particulate after-treatment system that might be due to tampering. Particulate Control Malfunctions include the types detailed in Tab 3.

Table 3 : Particulate after-treatment system malfunction types and corresponding period within which they are to be detected

Malfunction type	Period of engine operation within which the malfunction is to be detected and stored
Removal of the particulate after-treatment system	60 minutes of non-idle engine operation
Loss of function of the particulate after-treatment system	240 minutes of non-idle engine operation
Failures of the PCD system	60 minutes of engine operation

3.4 ULEV Mode

3.4.1 Engines with several operating modes are to comply with the requirements of [3.2] in at least one operating mode. The operating mode complying with the requirements of [3.2] is hereafter referred to as “the ULEV mode”.

3.4.2 The ULEV mode is to be clearly identified in the engine manual and/or shipboard manual and it is to be possible to record when the engine is operating in the ULEV mode or not.

4 Emission measurements

4.1 Pollutants to be measured

4.1.1 The brake specific emissions of the following pollutants, in g/kWh, are to be measured over the test cycle defined in [4.2.5]:

- Oxides of nitrogen, NO_x
- Hydrocarbons, expressed as total hydrocarbons, HC or THC
- Carbon monoxide, CO
- Particulate matter, PM
- Particle number, PN
- Carbon dioxide, CO₂.

Note 1: Carbon dioxide emissions are to be measured for information only.

4.2 Measurements

4.2.1 General

Measurements of the required pollutants are to be carried out according to the requirements of ISO 8178 series or to similar recognized standards or measurement methodologies deemed acceptable by the Society.

4.2.2 Measurements are to be carried out by a testing laboratory holding an accreditation certificate to ISO/IEC 17025 covering testing methods for the measurement of the required pollutants, which is issued by a national accreditation body.

Note 1: Measurements carried out by, or under the responsibility of, an organisation or body designated as a technical service as defined by EU Regulation 2016/1628 may also be accepted.

4.2.3 Measurements may be carried out on board or at a testing facility.

4.2.4 Measurements of each of the required pollutants are to be carried out during the same trial. Each engine subject to measurement is to be tested separately.

4.2.5 Cycle definition

B-Type test cycles as detailed in ISO 8178-4 are to be applied according to the type and operational speed of each engine, as defined in Tab 4.

Table 4 : B-type ISO 8178 test cycles to be applied

	Variable speed engine	Constant speed engine
Propulsion engine	E3	E2
Auxiliary engine	C1	D2

4.2.6 As a complement, for electronically controlled engines using electronic control to determine both the quantity and timing of injecting fuel or using electronic control to activate, de-activate or modulate the emission control system used to reduce NO_x, emission measurements are to be carried out at control points chosen randomly within the engine control area detailed in [4.5]. The number of control points is detailed in Tab 5.

The brake specific emissions of NO_x, HC, CO, PM and PN measured at each individual control point are not to exceed the limits given in Tab 2, multiplied by 2.

Table 5 : Number of control points according to the purpose and operation of the engine

	Variable speed engine	Constant speed engine
Propulsion engine	2	1
Auxiliary engine	3	1

4.2.7 Crankcase emissions

All crankcase emissions, including emissions normally routed into the exhaust after-treatment system and emissions normally discharged to the ambient atmosphere, are to be routed into the emissions sampling system for measurement purposes. Alternatively crankcase emissions may be added by calculation.

4.3 Fuel specification

4.3.1 For oil-fuelled engines, emission measurements as per [4.2] are to be carried out with the engine running on a fuel complying with ISO 8217 and with the engine manufacturer's specification.

4.3.2 For engines fuelled with natural gas, emission measurements as per [4.2] are to be carried out with the engine running successively on the reference fuels G_R and G₂₀, without any manual readjustment to the engine fuelling system between the two tests. One adaptation run is permitted after the change of the fuel. The composition of the reference fuels G_R and G₂₀ are detailed in Tab 6 and Tab 7.

Note 1: In case where the reference fuels G_R and G₂₀ are not available, emission measurements carried out with the engine running on two fuels with a composition different from that of G_R or G₂₀ may be accepted provided that:

- The gas fuel compositions comply with the specification of the engine manufacturer, and
- The impact of the composition of the gas fuel is properly documented based on e.g. test reports and engineering analysis, to the satisfaction of the Society.

Table 6 : Composition of the reference fuel G_R

Property	Unit	min.	max.
Molar fraction of methane	mol %	84	89
Molar fraction of ethane	mol %	11	15
Molar fraction of other components (N ₂ , C ₂₊ , other inert components)	mol %	–	1
Mass concentration of sulphur	mg/m ³	–	10

Table 7 : Composition of the reference fuel G₂₀

Property	Unit	min.	max.
Molar fraction of methane	mol %	99	100
Molar fraction of nitrogen	mol %	–	–
Molar fraction of other components (C ₂ , C ₂₊ , other inert components)	mol %	–	1
Mass concentration of sulphur	mg/m ³	–	10

4.3.3 For engines fuelled with other fuels, emission measurements as per [4.2] are to be carried out with the engine running on fuels complying with the requirements of ISO 8178-5 or of a similar recognized standard deemed acceptable by the Society.

4.3.4 The fuel composition and properties are to be detailed in the test report.

4.4 Deterioration factors

4.4.1 The values measured according to [4.2] are to be multiplied by the deterioration factors detailed in Tab 8 for the purpose of demonstrating compliance with the emission limits given in [3.2.1].

These deterioration factors need not be applied if the pollutant emission measurements are carried out on engines and after-treatment systems that have already been used for more than 10 000 hours.

Table 8 : Deterioration factors for ULEV additional class notation

Pollutant	CO	HC	NO _x	PM	PN
Deterioration factor	1,3	1,3	1,15	1,05	1,0

4.4.2 Alternatively, case-by-case deterioration factors may be established based on a suitable testing program accounting for ageing of the engine and exhaust after-treatment system during 10 000 hours.

Figure 1 : Control area for variable speed auxiliary engines

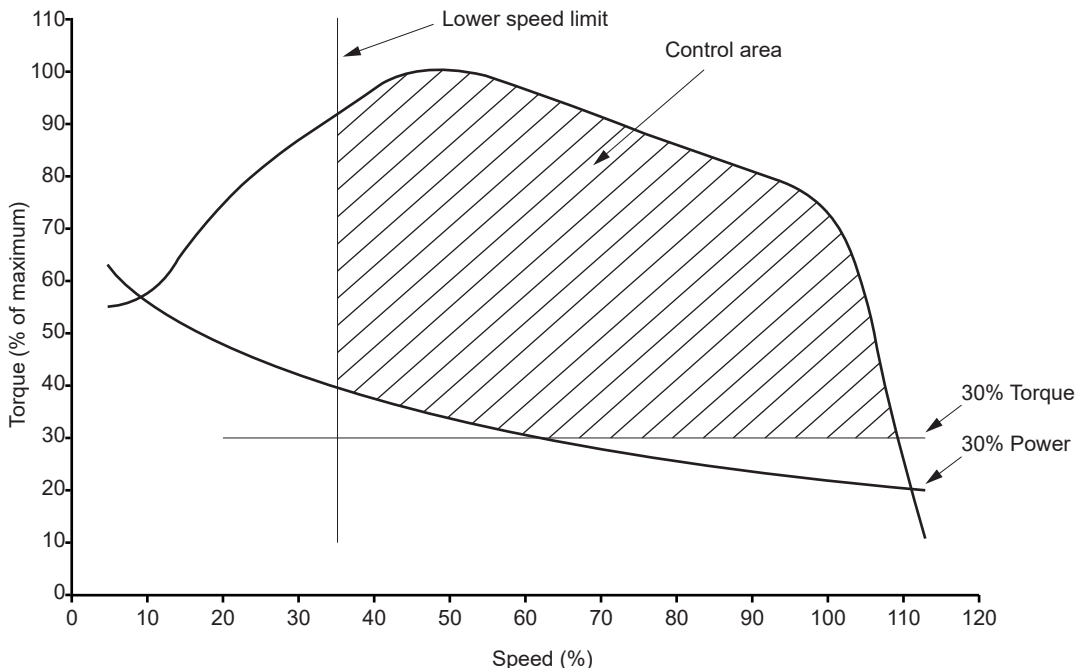
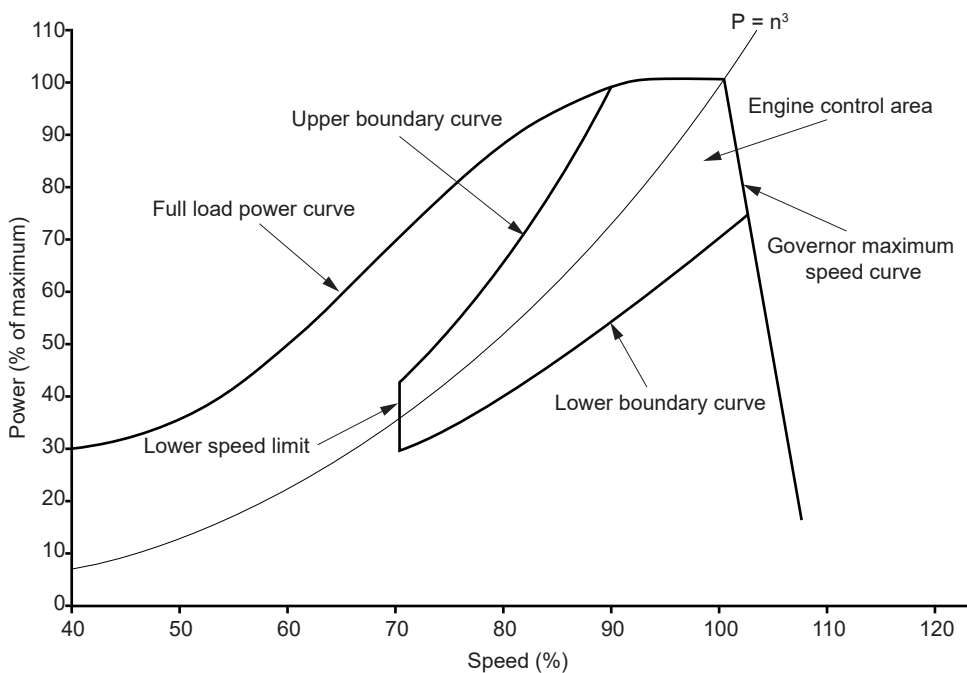


Figure 2 : Control area for variable speed propulsion engine



4.5 Control areas

4.5.1 Control area for variable speed auxiliary engines

The control area for variable speed auxiliary engines is delimited by the following curves (See Fig 1):

- upper torque limit:
engine full load torque curve
- lower torque limit:
30% of maximum torque
- lower speed limit:
 $n_{lo} + 0,15 \times (n_{hi} - n_{lo})$
- upper speed limit:
 n_{hi}
- points below 30% of maximum net power are excluded from the control area.

In addition, for engines with maximum net power < 300kW and for particulate matter only, the following areas are excluded from the control area:

- if $n_C < 2\,400$ r/min, points to the right of or below the line formed by connecting the points of 30% of maximum torque or 30% of maximum net power, whichever is greater, at n_B and 70% of maximum net power at n_{hi}
- if $n_C \geq 2\,400$ r/min, points to the right of the line formed by connecting the points of 30% of maximum torque or 30% of maximum net power, whichever is greater, at n_B , 50% of maximum net power at 2400 r/min, and 70% of maximum net power at n_{hi}

where:

$$n_B = n_{lo} + 0,5 \times (n_{hi} - n_{lo})$$

$$n_C = n_{lo} + 0,75 \times (n_{hi} - n_{lo})$$

4.5.2 Control area for variable speed propulsion engines

The control area for variable speed propulsion engines is defined as follows (See Fig 2):

- lower speed limit:
 $0,7 \times n_{max}$
- upper boundary curve:
 $P/P_{max} = 1,45 (n/n_{max})^{3,5}$
- lower boundary curve:
 $P/P_{max} = 0,7 \times (n/n_{max})^{2,5}$
- upper power limit:
full load power curve
- upper speed limit:
maximum speed permitted by governor.

4.5.3 Control area for constant speed propulsion and auxiliary engines

The control area for constant speed engines is defined as:

- speed: 100%
- torque range: between 50% and 100% of the torque corresponding to the engine maximum power.

5 Onboard surveys

5.1 Initial survey

5.1.1 An onboard survey is to be undertaken by the Surveyor before granting **ULEV** additional class notation in order to check that the general arrangement and engine particulars are consistent with the submitted documents. In particular, the proper operation of the NCD and PCD systems including the associated alarms and the proper operation of recording of the status of engines when operated in the ULEV mode are to be checked in the presence of the Surveyor.

Ch 11, Sec 30, [3.7.9] (Amendments July 2020)

Replace item a) of the alphanumeric list by the following one:

a) Loading conditions

The following loading conditions are to be considered:

FH : Loading condition defined in NR625, Ch 4, Sec 8, [4.1] with any one cargo hold flooded up to the maximum flooding level.

BLF : Loading condition defined in NR625, Ch 4, Sec 8, [4.1] under the assumption that the water contained in the cargo hold when flooded has been drained and transferred to the holding tanks detailed in [3.7.6].

Ch 11, Sec 30, [3.7.10]

Replace item c) as follows:

c) Direct strength analysis

In addition to the requirements of NR625, Chapter 7, cargo hold structural strength analysis is to be carried out in the loading condition detailed in Tab 6. The weight of immersed containers may be reduced by 30% of the buoyancy acting on each container considered

empty. The analysis is to verify that stress levels are within the acceptance criteria for yielding and that buckling capability of plates and stiffened panels are within the acceptance criteria for buckling. The AC-3 acceptance criteria are to be applied.

Chapter 11

Add the following new Section 31, Section 32 and Section 33:

SECTION 31

BIOLOGICAL RISK MANAGEMENT (BIORISK)

1 General

1.1 Application

1.1.1 This Section applies to ships where measures intended to prevent and manage infectious disease outbreaks on board have been implemented.

Ships complying with the requirements of this Section may be granted one of the following additional class notations:

- **BIORISK MANAGED** when an outbreak management plan has been established and implemented on board the ship, as described in [2].
- **BIORISK SECURED** when, in addition to the requirements applicable for **BIORISK MANAGED**, permanent systems, arrangements and fixed or portable equipment, retained as risk control measures, as required by [3] are provided on board.

1.2 Documents to be submitted

1.2.1 The documents listed in Tab 1 are to be submitted.

2 BIORISK MANAGED

2.1 Biological risk assessment

2.1.1 A biological risk assessment is to be carried out in order to identify the risks to the crew and passengers with regards to reasonably foreseeable infectious diseases that may occur on board the ship. The risk assessment is to involve medical experts and is to be carried out according to a method from recognized standards accepted by the Society (e.g. ISO 31010), involving a risk identification process as well as the definition of relevant risk control measures covering possible failures at each step of the chain of events (avoid embarking contaminated goods or persons, detection of suspect cases, prevention of further contamination, evacuation or treatment of confirmed cases). The risk assessment is to cover the operations under normal conditions as well as the case of an outbreak developing on board. When relevant the risk control measures are to be commensurate with the current epidemic situation onshore.

2.1.2 The risk assessment report is to list the guidance documents used to prepare the risk assessment.

Note 1: Guidance documents may include NI 673 "Guidelines for Management of COVID-19 and Infectious Diseases" issued by the Society. Other recognized guidelines may be considered.

Table 1 : Documents to be submitted

No.	I/A (1)	Document
Documents to be submitted for the additional class notation BIORISK MANAGED		
1	I	Outbreak Management Plan, including the associated set of procedures, protocols and instructions
2	I	Risk assessment report
3	I	Specification of the type, quantity and storage locations of PPEs
4	I	Signs, posters and marking specification, describing the type and foreseen location of these items
Supplementary documents to be submitted for the additional class notation BIORISK SECURED		
5	I	General arrangement plan showing the location, extent and arrangement of the quarantine area
6	A	Details of the means of monitoring the accesses of the quarantine area required in [3.2.3]
7	A	Details of the means of communication required in [3.2.5]
8	A	Diagram of the natural and mechanical ventilation systems, showing: <ul style="list-style-type: none"> • the location of the inlets and outlets to the quarantine area, other accommodation spaces and normally manned control stations • means for air filtration or disinfection, where provided
9	A	Details of the means for air filtration or disinfection, where provided, including testing and approval references
10	A	Specification of the means to monitor body temperature required in [3.4.2]
(1) A: To be submitted for approval I: To be submitted for information		

2.1.3 The adopted risk control measures and provisions are to be described in appropriate documents and implemented on board.

2.2 Outbreak Management Plan

2.2.1 An Outbreak Management Plan describing the measures and procedures applied to prevent and to respond to an outbreak developing on board, is to be established based on the risk assessment required in [2.1]. The documents used as references to define the Plan are to be listed in the Outbreak Management Plan.

2.2.2 The Outbreak Management Plan and the corresponding procedures are to be permanently available on board.

2.2.3 In general, at least the following items are expected to be covered in the Outbreak Management Plan, as appropriate and commensurate to the concerned ship:

- description of responsibilities to manage the Outbreak Management Plan
- resources and personnel needed
- means of information and communication, including relevant signage for circulation and crowd management
- conditions for embarkation and disembarkation of crew passengers and other persons
- physical distancing
- personal hygiene, hand washing
- cleaning and disinfection of facilities
- food and other essential supply, storage and distribution
- water supply
- onboard services and supplies
- personal protective equipment
- heating, ventilation and air conditioning systems
- health screening on board
- waste management
- Medical supplies and equipment, including oxygen supplies and storage location
- Areas dedicated to the storage of relevant supplies
- Areas to be dedicated to specific outbreak management operations (e.g. suspected cases isolation, health screening etc.) when such operations are to be carried out.

2.2.4 The Outbreak Management Plan and the corresponding set of procedures and instructions are to be reviewed and updated by the Owner on a regular basis, as necessary.

2.2.5 Where risk control measures include specific supplies or non-permanent equipment to be made available on board, their type and description, quantities, availability, locations, as well as provisions for user's training, user's instructions and storage conditions are to be included in the Outbreak Management Plan and documents. They are to be stored on board in properly identified locations.

2.3 Personnel Protective Equipment (PPE)

2.3.1 Personal Protective Equipment are to be available on board, including:

- face mask covering the mouth and nose
- surgical masks
- plastic apron or impermeable gown
- standard, non-sterile gloves, as well as cleaning gloves. Both types are to be available in various sizes.
- goggles or visors.

2.3.2 The type and quantity of PPEs is to result from the risk assessment and is to be available on board as defined in the Outbreak Management Plan.

2.4 Signs and marking

2.4.1 The following equipment is to be available on board, as defined in the Outbreak Management Plan:

- posters with hygiene and physical distancing recommendations
- circulation and crowd management signage.

The type, quantity and location of those signs and markings are to be as defined in the Outbreak Management Plan.

3 Additional requirements for BIORISK SECURED

3.1 General

3.1.1 The additional class notation **BIORISK SECURED** may be assigned to ships complying with the requirements of this article in addition to those defined for the additional class notation **BIORISK MANAGED**.

3.1.2 Compliance with the requirements of this article may be achieved through a specific configuration of doors, ventilation systems, or other systems, provided this configuration complies with the requirements of Part C, Chapter 4, especially regarding means of escape (Pt C, Ch 4, Sec 8) and ventilation (Pt C, Ch 4, Sec 5, [6]), as applicable.

3.2 Quarantine area

3.2.1 A quarantine area is to be arranged, or ready to be arranged, on board, consisting of a number of cabins where infected persons or persons suspected to be infected may be isolated. The size of the quarantine area is to be coherent with the ship operational profile and the procedures set out in the Outbreak Management Plan.

In case the quarantine area is not a permanently arranged area, the Outbreak Management Plan is to include provisions for making the quarantine area available in case of an outbreak.

3.2.2 Ventilation

A mechanical ventilation system of the extraction type, capable of providing at least 10 air changes per hour in each cabin, is to be provided in the quarantine area.

The required air flow may be achieved through air recirculation within a given cabin provided:

- air recirculation is done through a filter with a particulate matter efficiency ePM1 of at least 50% according to ISO EN 16890-1 or at least 50% over the 0.3µm - 1µm range; and
- at least 2 fresh air changes per hour are ensured.

Each space in the quarantine area is to be provided with a dedicated exhaust duct not serving any other space, unless the air is filtrated through a high efficiency particulate air (HEPA) filter realizing a collection efficiency H13 according to EN 1822-1 or a collection efficiency of 99.97% of particles of 0,3 µm or greater. Enthalpy wheels may be fitted on such exhaust ducts provided that:

- the enthalpy wheel is capable of being stopped when the area is used as a quarantine area; and
- it is demonstrated that no air leakage will occur between the supply and the exhaust in this configuration.

Exhaust air from the cabins of the quarantine area is to be led directly outside to a location at least 6 m away from areas normally accessible to passengers or crew. This distance is to be measured from the centre of the exhaust outlet. This distance may not be applied provided the air outlet is equipped with a HEPA filter realizing a collection efficiency H13 relevant section of Part F, Chapter 3 if an AUT additional class notation is to be granted to the ship. or a collection efficiency of 99,97% of particles of 0,3 µm or greater, or with an alternative disinfection system. Documentation supporting the efficiency of the alternative disinfection system is to be submitted to the Society.

3.2.3 Access

- a) Washing stations are to be provided at each access to the quarantine area with means to wash hands and sufficient room for the storage of clean and soiled materials and for doning medical gowns.

A hydro-alcoholic gel dispenser or a basin with water and soap may be accepted as means to wash hands.

- b) Direct access to an open deck or to a side shell door is to be provided from the quarantine area, so that an infected person can be evacuated without entering other parts of the ship.

The corridor serving any cabin in the quarantine area and access therefrom to the open deck or to the side shell door is to have a sufficient width to permit the passage of the enclosed stretcher and totally enclosed wheelchair required by [3.4.3].

- c) Means of monitoring access to the quarantine area are to be provided. An alarm, a CCTV system, or other alternative system covering all accesses to the quarantine area may be accepted for this purpose.

3.2.4 Cabin arrangement

- a) Each cabin in the quarantine area is to be provided with an individual sanitary unit including at least toilets, a handwash basin and a shower or bathtub.
- b) Each cabin in the quarantine area is to have a self-closing door.

3.2.5 Means of communication

- a) A means for the quarantined person to contact assistance is to be available in each cabin of the quarantine area. Fixed internal telephone, portable devices or other alternative means, may be accepted for this purpose.
- b) Means are to be available in each cabin of the quarantine area for the crew or medical staff to check the condition of each quarantined person without entering the cabin. Video monitoring, telephone communication or other alternative means may be considered for this purpose.

3.3 Ventilation of accommodation spaces and normally manned control stations

3.3.1 Supply air for accommodation spaces and normally manned control stations is to be either:

- a) Directly taken from the outside, possibly through enthalpy wheels; or
- b) Filtrated with a particulate matter efficiency ePM1 of at least 50% according to ISO EN 16890-1 or at least 50% over the 0,3 µm – 1 µm range; or
- c) Otherwise disinfected, e.g. through Ultraviolet Germicidal Irradiation (UVGI) or other alternative disinfection system. Documentation supporting the efficiency of the alternative disinfection system is to be submitted to the Society.

3.3.2 When UVGI system is used, installation in the upper part of the room is not allowed. UVGI lamps may be either incorporated into room air-recirculation units or part of a duct irradiation system. In both cases, the functioning parameters of the system are to be adjusted, taking into account the air flow, in order to provide UV-C rays at the relevant wavelength for the targeted pathogen and sufficient irradiation time to inactivate it.

3.3.3 Air inlets for accommodation spaces and normally manned control stations are to be located at least 3 m away from air outlets from these spaces or from similar spaces and at least 10 m away from air outlets from the quarantine area.

These distances are to be measured from the center of the concerned air inlet or outlet.

These distances may not be applied when the concerned air inlet or outlet is equipped with filters or alternative disinfection system according to [3.3.1] item b) or c).

3.3.4 In public spaces designed to accommodate more than 50 persons, a mechanical ventilation system capable of providing at least 6 air changes per hour is to be provided. The required air flow may be partially achieved through air recirculation inside the space in accordance with [3.3.1] item b) or item c). Alternatively, a ventilation system capable of providing 4.5 fresh air changes per hour may be accepted.

The ventilation system may be fitted with an air flow regulation system allowing to operate it with a lower rate of air changes when found acceptable according to the Outbreak Management Plan.

3.4 Other equipment

3.4.1 Internal communication

A means allowing to organize crew meetings through videoconference is to be available on board. It is to be possible to connect to this system from:

- a) the wheelhouse; and
- b) the engine control room; and
- c) at least one crew public space.

3.4.2 Means to monitor body temperature

Means to monitor the body temperature of the crew and passengers on a regular basis are to be available on board. Either fixed or portable equipment may be accepted for this purpose.

3.4.3 At least one totally enclosed stretcher and one totally enclosed wheelchair are to be available on board.

4 On board testing

4.1 Initial survey

4.1.1 An initial survey is to be carried out on board prior to granting the additional class notation **BIORISK MANAGED** or **BIORISK SECURED**.

4.1.2 The initial survey is to include:

- a) Verification that the Outbreak Management Plan and associated documents are available on board.
- b) Verification that the PPEs, signs, marking and medical supplies required by the Outbreak Management Plan are available on board.

4.1.3 In addition to the requirements of [4.1.2], the initial survey for the additional class notation **BIORISK SECURED** is to include:

- a) Functional testing of the ventilation arrangements for the quarantine area, as required by [3.2.2], and for the accommodation spaces and normally manned control stations, as required by [3.3]. It is to be checked that the ventilation system is functioning properly with the air filtration or alternative air disinfection system working.
- b) Functional testing of the means of monitoring the access to the quarantine area.
- c) Verification of availability of the means of communication for the quarantine area.
- d) Verification of availability of the means of monitoring body temperature.
- e) Verification of availability of stretcher and wheelchair.

SECTION 32

HYBRID MECHANICAL PROPULSION

Symbols

ESS : Electrical Storage System

PTI : Power Tank In

PTO : Power Tank Off.

1 General

1.1 Application

1.1.1 The additional class notation **HYBRID MECHANICAL PROPULSION** may be assigned in accordance with Pt A, Ch 1, Sec 2, [6.14.50] to ships provided with a propulsion plant which combines a diesel mechanical propulsion system and an electric propulsion system.

1.1.2 In hybrid propulsion, the diesel mechanical propulsion system and the electric propulsion system may be used separately or together.

Hybrid propulsion configuration offers a higher flexibility and efficiency of the propulsion system, over a range of operating modes, for slow speed operation up to boosting mode.

1.1.3 In addition to the additional class notation **HYBRID MECHANICAL PROPULSION**, the additional notation **ELECTRIC HYBRID** may be granted to the ship when an ESS is used and the ship complies with the requirements of Ch 11, Sec 22.

1.2 Definitions

1.2.1 PTI Fully electric mode

This mode describes the functionality of an electrical rotating machine used as motor for propulsion and working alone, i.e. with the diesel engine stopped.

1.2.2 PTI Booster mode

This mode describes the functionality of an electrical rotating machine used as motor for propulsion and working in parallel to the diesel propulsion engine.

1.2.3 PTO Mode

This mode describes the functionality of an electrical rotating machine used as a generator. A part of the energy generated in the main engine is taken off by the generator to produce electricity as an alternative to the generating sets. This mode is also called shaft generator mode.

1.3 Documents to be submitted

1.3.1 The documents listed in Tab 1 are to be submitted.

Table 1 : Documents to be submitted

No.	I/A (1)	Documents
1	I	General description of the propulsion systems with their different operating modes
2	I	Operation manual of the hybrid propulsion system
3	I	Operating procedure to switch from one propulsion system to an other one
4	A	Power balance in diesel propulsion mode Power balance in PTI fully electric mode Power balance in PTI booster mode, if any
5	A	List of alarms and defaults
(1) A : For approval I : For Information		

2 System design

2.1 Propulsion systems

2.1.1 The propulsion arrangements defined in Fig 1 are accepted. Batteries may be considered instead of diesel generators. Other arrangements may be considered on a case by case basis.

2.1.2 The following propulsion modes are to be made available:

- diesel propulsion mode
- PTI Fully electric mode.

Note 1: For the purpose of granting the additional class notation **HYBRID MECHANICAL PROPULSION**, the PTI Booster mode is considered as optional.

2.1.3 As a general principle, the diesel propulsion mode is considered as the main propulsion mode and has priority over the electric propulsion mode.

2.2 Electric Production systems

2.2.1 If the electric motor can work as a generator, it may be accepted as forming part of the main source of electrical power, provided it complies with Pt C, Ch 2, Sec 3, [2.2.12].

2.2.2 In PTI fully electric mode and in addition to [2.2.1], it is not required to have a main source of electrical power complying with Pt C, Ch 2, Sec 3, [2], when the rotating machine is reversible and can work in PTI mode or PTO mode (see Fig 2), provided that:

- the main source of electrical power complies with Pt C, Ch 2, Sec 3, [2.2], in diesel propulsion mode; and
- upon loss of power of one generator, the rotating machine used in PTI mode switches automatically to PTO mode and connects to the main switchboard in less than 30 sec.

2.2.3 Where the number of generators in service is intended to vary according to operating conditions, the installation is to include automatic start, synchronising, connecting and load sharing.

2.2.4 A longer time than defined in [2.2.2] may be accepted provided that the ship is granted with the additional class notation **ELECTRIC HYBRID (PB)** (see Ch 11, Sec 22). For this particular case, the autonomy of the ESS in PB mode is to be twice the time necessary to switch from electric motor to shaft alternator (see Fig 3).

2.3 Diesel propulsion systems

2.3.1 The diesel propulsion system is to comply with the requirements of:

- Pt C, Ch 1, Sec 2
- Pt C, Ch 1, Sec 9
- the relevant section of Part F, Chapter 3 if an **AUT** additional class notation is to be granted to the ship.

Figure 1 : Propulsion arrangements

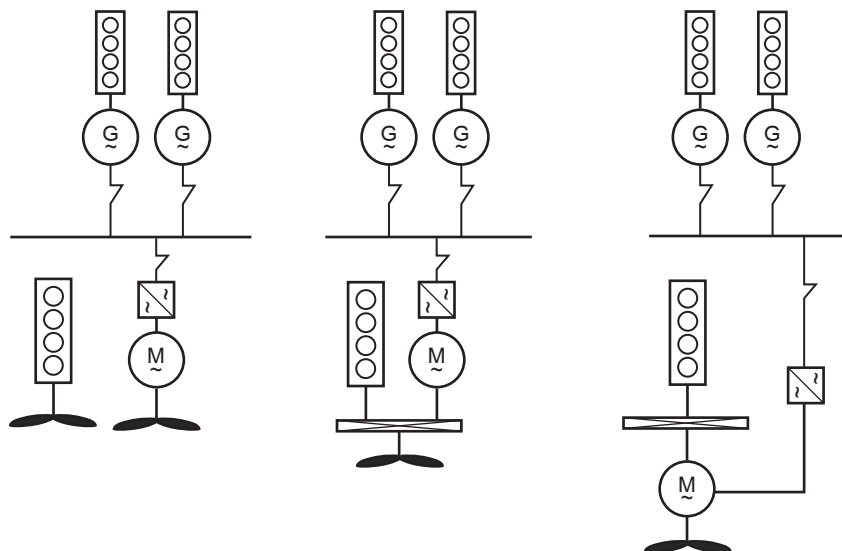


Figure 2 : Specific arrangement of electrical production with PTO mode

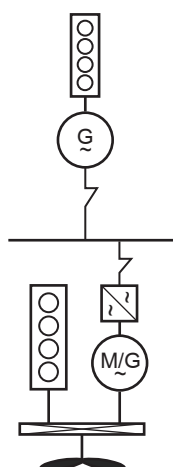
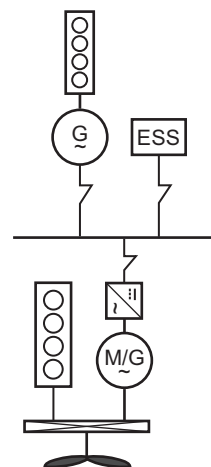


Figure 3 : Electrical production with ESS



2.4 Electrical propulsion systems

2.4.1 The electric propulsion system is to allow the ship to proceed at a reference speed in the reference weather conditions, taking into account the foreseen operational area and operational profile. Both the reference speed and the reference weather conditions are to be defined by the Owner.

2.4.2 The electric propulsion system is to comply with Pt C, Ch 2, Sec 14 and relevant section of Part F, Chapter 3 if an AUT additional class notation is to be granted to the ship.

2.4.3 When compliance with [2.4.2] is not fulfilled, the switch over from the electric propulsion mode to diesel propulsion mode is to be done in less than 45 sec.

In addition, and as a minimum, the electric propulsion is to be in accordance Pt C, Ch 2, Sec 14, [4].

2.5 Combined diesel and electric propulsion systems

2.5.1 In the case of diesel engines and electric motors acting in parallel on the propeller, provisions are to be made to allow isolating the electric motors from the reduction gear (for instance by mean of a clutch or bolted link). In case of failure of the electric motor, it is to be possible to isolate the electric motor from the reduction gear and start the diesel engine in less than 30 minutes.

3 Control of propulsion machinery

3.1 Remote control from navigating bridge of the propulsion machinery

3.1.1 Arrangements are to be made to allow each propulsion mode to be started from the navigating bridge.

3.1.2 It is to be possible to control separately each propulsion mode (diesel propulsion mode, PTI fully electric mode, PTI booster mode, if any) along all the propulsion power range.

3.1.3 Functionalities are to be provided in the navigation bridge to set the diesel propulsion engine in stand-by mode (diesel engine started, running, not clutched).

3.1.4 The type of propulsion in use is to be clearly indicated at each control position.

3.1.5 The control may be performed by:

- a single lever combining the diesel propulsion mode, PTI fully electric mode, PTI booster mode if any
- two levers, one for the PTI fully electric mode, one for the diesel propulsion mode.

3.1.6 Emergency stops required in Pt C, Ch 3, Sec 2, [4.2.7] are to be independent and separated for both propulsion systems. Two separate buttons, installed close to each other, are required.

3.1.7 The propulsion control system is to ensure that the shaft power does not exceed the limit for which it has been designed (see Pt C, Ch 1, Sec 6 to Pt C, Ch 1, Sec 9).

3.2 Local control of the propulsion machinery

3.2.1 The diesel and PTI fully electric modes are to be provided with direct local controls. The direct local control is to be independent from the remote control circuits, and to take over any remote control.

3.3 Switch over from one propulsion type mode to another one

3.3.1 The switch over from one propulsion to the other one is to be feasible from the navigation bridge. It is not to necessitate any human intervention in the machinery.

3.3.2 The switch over is to require a limited number of actions on the control system. Starting of the auxiliaries necessary for each propulsion mode (cooling, lubricating, etc...) is to be automatic.

When transferring the propulsion mode from one type to an other one (for instance from diesel mode to PTI fully electric mode), no significant alteration of the propeller thrust is to occur.

3.3.3 When only 1 lever is used to control the propulsion, the propulsion mode is to switch automatically from PTI fully electric mode to diesel propulsion mode when the propulsion power request exceeds the capacity of the PTI fully electric mode.

3.3.4 When 2 levers are used to control the propulsion, the propulsion mode is to switch automatically from PTI fully electric mode to diesel propulsion mode when the diesel propulsion lever is used.

3.3.5 It is to be possible to switch manually from one propulsion mode to the other one locally.

3.3.6 The local control is to have priority over the remote control. The principles of control transfer, as specified in Pt C, Ch 3, Sec 2 are applicable for both propulsion modes.

3.4 Displays and alarms

3.4.1 In addition to the monitoring required in Pt C, Ch 3, Sec 2, the following information is to be displayed at each control position:

- indication that diesel propulsion engine is running
- indication that electric propulsion motor is running
- indication of the diesel engine ready to start
- indication of the electrical motor ready to start
- indication of the diesel engine in "stand-by" mode.

4 Testing

4.1 Onboard tests

4.1.1 The following propulsion modes are to be tested:

- PTI fully electric propulsion mode and PTI booster mode, if available, according to Pt C, Ch 1, Sec 15, [3.9]
- diesel propulsion mode, according to Pt C, Ch 1, Sec 15, [3.5].

4.1.2 The following tests are to be carried out on the control system:

- a) Proper working of alarms and defaults and related functions and/or interfacing to the other ship systems
- b) Manual switch from diesel propulsion mode to PTI fully electric mode and to PTI booster mode, if available
- c) Manual switch from PTI fully electric propulsion mode and from PTI booster mode, if available, to diesel propulsion mode
- d) Transfer of control between the different control positions
- e) Automatic switch from PTI fully electric propulsion mode to diesel propulsion Mode (see [3.3.3] and [3.3.4]).

SECTION 33 OPEN-HATCH

1 General

1.1 Application

1.1.1 The additional class notation **OPEN-HATCH** may be assigned, in accordance with Pt A, Ch 1, Sec 2, [6.14.52] to ships granted with the service notation **general cargo ship** and complying with the requirements of the present Section.

1.1.2 This Section specifies the applicable requirements for general cargo ships intended to undertake sea voyage with one or several hatch covers not in place.

1.1.3 For any sea voyage undertaken with one or several hatch covers not in place, Administration is to grant an exemption to the International Load Line Convention.

1.1.4 If there is any conflict between the requirements of this Section and statutory requirements or conditions imposed by the Administration, the latter takes precedence. Refer to Pt A, Ch 1, Sec 1, [4.1.3].

1.2 Definitions

1.2.1 Maximum sustained speed

Maximum service speed taking into account speed loss due to resistance increase in regular waves. Voluntary speed loss is not taken into consideration.

1.2.2 Minimum ship manoeuvring speed

Minimum speed which maintains directional control and which is consistent with the operating characteristics of the ship.

1.2.3 Green water

Sea water other than spray shipped aboard the ship under normal operating conditions.

2 Freeboard

2.1 General

2.1.1 Minimum freeboard is to be determined by seakeeping characteristics and stability. The following information, obtained by means of model tests and calculations according to the procedure in Article [5], are to be submitted to the Society for information:

- measured data for the maximum hourly rate of ingress of green water, in m^3/hour , likely to be shipped into each cargo hold
- evaluation of the adequacy of the discharge rates from cargo hold freeing ports (if they are fitted).

2.1.2 The maximum hourly rate of ingress of green water in any one open hold determined from model testing according to the procedure in Article [5] is not to exceed the hatch opening area S , in m^2 , multiplied by 0,4 m/hour.

2.1.3 A conventional geometrical freeboard and minimum bow height are to be calculated assuming that hatch covers are fitted. The freeboard and bow height assigned to the ship is not to be less than the equivalent geometrical freeboard determined from the International Convention on Load Lines, 1966, as amended.

2.1.4 All seasonal freeboards are to be omitted unless the minimum geometrical freeboard and corresponding seasonal freeboards for which the ship is eligible (assuming hatch covers fitted) are greater than the freeboard for which the model tests were satisfactorily carried out. In that case, the minimum geometrical freeboard and the corresponding seasonal freeboards greater than the freeboard for which the model tests were carried out are to be assigned.

2.1.5 The minimum freeboard and minimum bow height assigned to the ship are not to be less than those corresponding to the model test conditions.

3 Stability

3.1 Intact stability without water ingress

3.1.1 The stability of the ship in all loading conditions, with no water ingress in the cargo hold, is to meet the requirements of Pt B, Ch 3, Sec 2 considering the top of hatch coamings as downflooding points.

3.1.2 Where cargo hold freeing ports are fitted, they are to be considered closed for the purpose of determining the flooding angle, provided that the reliable and effective control of closing of these freeing ports is satisfactory to the Society.

3.2 Intact stability considering water ingress

3.2.1 The factor S_{final} calculated according to Pt B, Ch 3, App 3, [1.6.4] for the ship in intact condition, with water trapped in the cargo hold, is not to be less than 1 under the following conditions:

- The ship in intact condition before water ingress is loaded at maximum draught for open hatch condition taking into account the maximum allowable vertical center of gravity (VCG) resulting from intact and damage stability criteria.
- The cargo hold is to be filled with the volume of water V , in m^3 , accumulated for 3 hours, and taken equal to (considering a cargo hold permeability of 0,95):

$$V = 3 (R_{\text{CW}} + R_{\text{TR}} \cdot S)$$

where:

- R_{GW} : maximum hourly rate of green water (in $m^3/hour$) shipped in seagoing conditions as established by the comprehensive model testing (see procedure in Article [5])
- R_{TR} : tropical rainfall hourly rate, taken equal to 0,1 m/hour
- S : hatch opening area, in m^2 .

3.2.2 For the condition with flooded holds and an intact ship, the free surfaces may be determined as follows:

- the hold(s) are loaded with cargo but the free surface is to be calculated as if the hold(s) is(are) empty
- the seawater enters the cargo hold and does not pour out during heeling
- the maximum value of the free surface moment between the filling limits envisaged in the cargo hold is to be taken into account. As an alternative, the correction to righting lever is suggested to be on the basis of real shifting moment of water in the virtual empty cargo hold. As guidance, the method described in Pt B, Ch 3, Sec 2, [4.7.3] may be applied.

3.2.3 Calculations are to be performed for intermediate phases of hold flooding, each phase comprising an accumulated height of water of 0,25 m until the height corresponding to the volume of water accumulated and calculated according to [3.2.1], item b) is reached.

3.3 Damage Stability

3.3.1 Ships assigned with the notation **OPEN-HATCH** are to comply with the subdivision and damage stability criteria of Pt B, Ch 3, Sec 3, considering the top of hatch coamings as downflooding points.

4 Hull

4.1 Hull girder strength

4.1.1 The hull girder strength is to be checked according to the requirements in Part B, Chapter 6, replacing the design still water bending moments $M_{SW,H}$ and $M_{SW,S}$ as defined in Pt B, Ch 5, Sec 2, [2.2.1] by the specific values corresponding to intact flooded conditions provided by the Designer.

5 Procedure of model tests

5.1 General

5.1.1 The model test procedure / programme is to be submitted to the Society for information prior model tests are carried out.

5.1.2 The Society may require additional tests.

5.1.3 The model experiments are to be carried out in long-crested, irregular waves. The Pierson-Moskovitz, JONSWAP, or Bretschneider wave spectrum generated for the purpose of these experiments are to have a significant wave height of 8,5 m at the most unfavourable realistic wave period (zero crossing) as determined by calculation or previous testing experience.

5.1.4 For ships operating in restricted areas only, other spectra duly indicated on the model test programme may be accepted by the Society.

5.1.5 The effect of wind generated spray need not be simulated during the tests.

5.1.6 The model experiments are to be carried out for at least the following wave directions based on International Towing Tanks Conference conventions:

- following seas ($0^\circ / 360^\circ$)
- quarter following seas ($45^\circ / 315^\circ$)
- beam seas ($90^\circ / 270^\circ$)
- quarter head seas ($135^\circ / 225^\circ$)
- head seas (180°).

5.1.7 The model experiments are to be carried out for at least the following speeds:

- maximum sustained speed in head seas and quarter head seas
- minimum ship manoeuvring speed in quarter following seas and following seas
- zero ship speed (dead ship condition) in beam seas.

5.1.8 The model experiments are to be carried out with a self-propelled, unrestrained model without the necessity to change course. The time period of each experiment is to correspond to at least one hour real time.

5.1.9 The loading condition used for the tests is to correspond at least to the maximum loaded draught with level trim. If operational trim values differ substantially from level trim, additional trim values are to be included in the model test programme.

5.1.10 The vertical center of gravity (VCG) value selected is to correspond to the actual value most likely to be encountered during the ship's service for the draught close to the maximum loaded draught. If VCG values which may be expected during the operation of the ship differ substantially from this selected VCG value, additional VCG values are to be included in the model test programme.

5.1.11 For each test condition, the cargo hold which ships most water is to be determined by preliminary tests for each combination of heading, trim and VCG. In running tests for the full duration specified in [5.1.8], this least favourable hold is to be simulated as having no cargo, whilst other cargo holds (each cargo hold as a separate entity) may be simulated as completely fully loaded. Cargo such as unit cargo is not to be used as a mean to prevent shipping of water into an empty hold by being stacked outboard of the open hold as some sort of protecting wall. Rain covers for the open holds is not to be simulated in the model tests.

5.1.12 In addition to the usual measured parameters (ship motions, ship speed, relative motions, rudder angles, etc.), the volume of water entering all open cargo holds are to be measured for each experiment. The quantities of water taken aboard the model are to be removed and measured after each test run so that the metacentric height, moment of inertia and displacement are not appreciably disturbed by any accumulation of water during the testing programme.

5.1.13 Where freeing ports are fitted, an additional model test to comply with [2.1.1] is to be conducted at a draught which corresponds to the condition of the ship fully loaded with cargo and open holds flooded to the static equilibrium level with freeing ports open. A hold permeability of 70% by volume is to be assumed. Tests are to be conducted at zero speed in beam seas.

5.1.14 The Society may require an observer to witness the tests. A comprehensive report is to be submitted to the Society for information.

6 Ship arrangement

6.1 Hold bilge dewatering system and freeing ports

6.1.1 The bilge pumping system is to have a required capacity to pump the greater of:

- the maximum hourly rate of green water shipped in sea-going conditions as established by the comprehensive model testing specified according to the procedure in Article [5] combined with a rainfall of 100 mm/hour regardless of the installation of rain covers
- the amount of shipped green water measured during the seakeeping model tests according to the procedure in Article [5] for the dead ship condition in beam seas, multiplied by safety factor 2
- four-thirds of the amount of water required for fire-fighting purposes in the largest hold
- an amount equal to the capacity required for ships with closed cargo holds.

6.1.2 The pumping of hold bilges is to be possible by at least three bilge pumps.

6.1.3 At least one of these pumps is to have a capacity of not less than the required capacity as defined in [6.1.1] and is to be dedicated to bilge and ballast service only. It is to be located in such a way that it will not be affected by a fire or other casualty in the space containing the pumps required in [6.1.4] or the space containing the main source of power. Moreover, it is to be supplied from the emergency source of power as required in Pt C, Ch 2, Sec 3, [2.3].

6.1.4 The combined output of at least two further pumps is not to be less than the required capacity as defined in [6.1.1]. These pumps are to be supplied from the main source of electrical power required by Pt C, Ch 2, Sec 3, [2.2], or any other source of power independent of the emergency source of power as required in Pt C, Ch 2, Sec 3, [2.3].

6.1.5 The bilge pumping system, including the piping system, is to incorporate sufficient redundancy features so that the system is fully operational and capable of dewatering the hold spaces at the required capacity in the event of failure of any one system component.

6.1.6 The bilge pumping system is to be arranged to be effective within the limiting angles of inclination required for the emergency source of electrical power by Pt C, Ch 2, Sec 2, [1.6], and bilge wells are to be readily accessible for cleaning.

6.1.7 All open cargo holds are to be fitted with high bilge level alarms. The alarms are to annunciate in the machinery spaces and the manned control location and be independent of bilge pump controls.

6.1.8 If the loss of suction prevents the proper functioning of the bilge system, special measures to prevent this are to be considered, as for instance, the installation of level indicators.

6.1.9 Open cargo hold drain wells are to be designed to ensure unobstructed discharge of water and easy access for cleaning under all conditions.

6.1.10 Where tween decks are fitted and form wells, ample provisions are to be made for rapidly freeing the tween decks from water and for draining them through evenly distributed openings. The minimum freeing port area on the tween decks fitted along the holds are to be calculated in accordance with Pt B, Ch 8, Sec 10, [6], considering the height of the bulkwark h_B as the mean height between the tween deck and the top of hatch coaming.

6.1.11 If provided, freeing ports are to be fitted on both sides of each open cargo hold, subject to the following:

- the number, size and location of the freeing ports on each side of each open hold is to be sufficient to prevent the accumulation of water above the level defined in [5.1.13]
- efficient means of closure to prevent the accidental ingress of water are to be provided. Such means are to be operated from above the freeboard deck. In the case of a ship operating in areas where icing is likely to occur, these arrangements are to be suitable to enable the ports to operate efficiently under such conditions.

7 Fire protection

7.1 Fire insulation

7.1.1 Open hatch cargo holds are to be considered as enclosed cargo holds for the purpose of applying Part C, Chapter 4, except that no fire division is required between an open hatch cargo hold and open deck, notwithstanding the requirements of Pt C, Ch 4, Sec 5, [1.4].

7.1.2 The fire detection system is to be designed and arranged to account for the specific hold configuration and ventilation arrangement.

7.2 Water-spray system

7.2.1 Open hatch cargo holds are to be protected by a fixed water spray system complying with the requirements of the present sub-article.

7.2.2 The water-spray system is to be subdivided into sections, with each section consisting of a ring-line at deck level covering a complete cargo hold.

7.2.3 The system is to be capable of spraying water into the cargo hold from deck level downward.

7.2.4 The water spray system is to be capable of spraying the outer vertical boundaries of any one cargo hold and of cooling the adjacent structure. The uniform application density is to be not less than 1,1 litres/min/m².

7.2.5 At least one dedicated fire extinguishing pump for the hold water spray system is to be provided, with a capacity sufficient to serve any one open hatch cargo hold. The pump is to be installed outside the open hatch area.

Failure of any one dedicated pump is not to result in a reduction of the water flow capacity by more than 50%. In addition, the spray patterns in the open hatch cargo holds in this configuration are to ensure a uniform water application. In the case of a single dedicated water spray pump, this may be achieved by an interconnection to an alternative means of pumping from the weather deck. The interconnection valve is to be located outside the open hatch area and is to remain easily accessible in case of a fire in this area.

7.2.6 Water spray nozzles are to be of an approved type.

7.3 Dangerous goods

7.3.1 Open hatch cargo holds intended for the carriage of dangerous goods are to comply with the requirements of Pt C, Ch 4, Sec 12 considering the hold as an enclosed cargo space not specifically designed for the carriage of freight containers, but intended for the carriage of dangerous goods in packaged form, including goods in freight containers and portable tanks. The hold is not to be considered as a weather deck.

8 Testing

8.1 Onboard tests

8.1.1 Water-spray system

The water-spray system is to be checked for leakage at normal operating pressure and to undergo an operational test. The testing is to include verification of the functionality of the drainage arrangements.

8.1.2 Hold dewatering system

A functional test of the hold dewatering system is to be carried out.



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