TASNEEF
هيئة الإمارات للتصنيف
EMIRATES CLASSIFICATION SOCIETY

Amendments to the "Rules for the Classification of Ships"

Effective from 1/1/2026

Reasons of the amendments

Part A – Classification and Surveys

Chapter/Section/Paragraph amended	Reason
Ch 1, Sec 1, [1.2.1]	to introduce: • IACS PR1A (Rev.11 Nov 2024) "Procedure for Transfer of Class" • IACS PR1B (Rev.8 Nov 2024) "Procedure for Adding, Assigning, Maintaining or Withdrawing Double or Dual Class" • IACS PR1C (Rev.7 Nov 2024) "Procedure for Suspension and Reinstatement or Withdrawal of Class in Case of Surveys or Conditions of Class Going Overdue"
Ch 1, Sec 1, [1.2.1] Ch 2, Sec 1, [3.6.2] Ch 3, Sec 2, [3.1.1]	to introduce IACS PR1D (Rev.3 Nov 2024) "Procedure for Class Entry of Ships not subject to PR1A or PR1B"
Ch 1, Sec 2, [4.8.2], [4.8.3] Ch 4, Sec 10, [6.1.4], [7.2.2], [7.2.3]	to introduce more detailed survey requirements for tugs and supply vessels with the additional service features anchor handling or anchor handling stab, as a consequence of the more detailed anchor handling winches' requirements introduced in Pt E due to the entry into force of new SOLAS regulation II-1/3-13 "Lifting appliances and anchor handling winches", supported by IMO "Guidelines for anchor handling winches" in MSC.1/Circ.1662 (Prop.317)
Ch 1, Sec 2, [6.8.13](new), Tab 3 Ch 5, Sec 1, Tab 1 Ch 5, Sec 7, [13]	to introduce the new additional class notation OCCS (Onboard Carbon Capture and Storage) for ships equipped with an onboard system intended to capture carbon (or carbon dioxide) and temporarily store it onboard, for subsequent offloading or discharging to shore- based reception facilities for permanent storage (Prop. 276)
Ch 1, Sec 2, [6.14.30], Tab 3 Ch 5, Sec 1, Tab 1 Ch 5, Sec 12, [1.1.1], [19.1.1], [19.2.2]	to introduce the new additional class notation PERSONNEL LIFTING REC191 for cranes or lifting arrangements for personnel lifting that comply with the provisions in IACS Rec.191 (New, July 2025) "Lifting Appliances engaged in Personnel Handling Operations"
Ch 1, Sec 2, [6.14.76](new), Tab 3	to introduce the new additional class notations HVSC and LVSC READY (High and Low Voltage Shore Connection Ready) for ships with high (above 1.000 V) or low (less than or equal to 1.000 V) voltage systems, designed for the future installation of a shore connection system (Prop.282)
Ch 2, Sec 1, [3.2.1]	to introduce IACS PR1A (Rev.10 Oct 2024) "Procedure for Transfer of Class"
Ch 3, Sec 1, Tab 1	to add an explicit reference to IACS Rec.47 "Shipbuilding and Repair Quality Standard" in the new construction survey activities table where the TASNEEF "Guide for Welding" based on IACS Rec.47 is mentioned, for better consistency with the text of IACS UR Z23

Part B – Hull and Stability

Chapter/Section/Paragraph amended	Reason
Ch 1, Sec 1, [1.1.1] Ch 1, Sec 4(deleted)	to remove a section on calculation programs as it did not contain class requirements but simply information on the availability of TASNEEF software which is more appropriately placed elsewhere (e.g. in brochures on the TASNEEF website)
Ch 1, Sec 3, Tab 1, note (4)	references to requirements containing information on the documents to be submitted for both "equipment number calculation" and "direct force calculation for anchoring equipment" to provide clearer and more comprehensive guidance (Prop.319)
Ch 8, Sec 5, Tab 1	to correct typos
Ch 10, Sec 4, [3.1.17]	to update the list of information to be included in the towing and mooring arrangement plan in line with the requirements in: • SOLAS regulation II-1/3-8 "Towing and mooring equipment" • IMO MSC.1/Circ.1175 Rev.1 "Revised guidance on shipboard towing and mooring equipment" • IMO MSC.1/Circ.1362/Rev.2 "Unified interpretation of SOLAS Chapter II-1" • IMO MSC.1/Circ.1619 "Guidelines on the design of mooring arrangements and the selection of appropriate mooring equipment and fittings for safe mooring" • IACS UI SC212 Rev.1 "Shipboard fittings and supporting hull structures associated with towing and mooring on conventional vessels - Interpretation of the Reg. II-1/3-8 of the SOLAS as amended by Resolution MSC.474(102)" (Prop.319)
Ch 10, App 1, [1.3.2]	to correct formulas due to typos

Part C - Machinery, Systems and Fire Protection

Chapter/Section/Paragraph amended	Reason
Ch 1, Sec 1, [2.1.2](new) Ch 1, Sec 3, [1.1.2] Ch 2, Sec 14, [2.1.5](new)	to introduce IACS UI SC305 (New Dec 2024) "Single essential propulsion components and their reliability"
Ch 1, Sec 1, [2.8.1] Ch 1, Sec 4, [2.2.4] Ch 1, Sec 16, [3.2.2], [3.5.1]	to introduce IACS UR M25 (Rev.5 Dec 2024) "Astern power for main propulsion"
Ch 1, Sec 1, Tab 1	to introduce IACS UR M46 (Rev.4 Aug 2024) "Ambient conditions – Inclinations and Ship Accelerations and Motions"
Ch 1, Sec 2, [4.3.2], [4.3.5]	to introduce IACS UR M10 (Rev.5 Nov 2024) "Protection of internal combustion engines against crankcase explosions"
Ch 1, Sec 6, [2.4.10]	to introduce IACS UR M56 (Rev.4 Corr.3, Sept 2025) "Marine gears – load capacity of involute parallel axis spur and helical gears"
Ch 1, Sec 7, [2.4], [2.4.1] to [2.4.5]	to introduce IACS UR M52 (Rev.3 Nov 2024) "Length of aftmost propeller shaft bearing"
Ch 1, Sec 10, Tab 1, [20.1.1], [20.3.2](new), [20.3.3](new), [20.9](new)	to introduce the requirements for the assignment of the additional class notation OCCS (Onboard Carbon Capture and Storage) for ships equipped with an onboard system intended to capture carbon (or carbon dioxide) and temporarily store it onboard, for subsequent offloading or discharging to shore- based reception facilities for permanent storage (Prop.276)
Ch 1, Sec 10, [2.5.3] d)(new), [11.10.4] n)(new)	to introduce IACS Rec.188 (New, May 2025) "Engine fuel oil systems supplied by positive displacement fuel oil pumps" to address a US National Transportation Safety Board (NTSB) recommendation to IACS following an engine room fire aboard a passenger ferry

Ch 1, Sec 10, [2.7.3] e)(new) Ch 2, Sec 3, Tab 2	to require IPX8 protection rating for electrical components - such as solenoid valves and remote-indication devices (limit switches) - installed on remotely controlled bilge valves that are located below the bulkhead deck or may be subject to submersion (Prop.320)
Ch 1, Sec 10, [5.3.3] b)	to introduce IACS UI SC306 (New Nov 2024) “Valve piercing ship’s collision bulkhead”
Ch 1, Sec 10, [15.2.2]	to clarify that steam systems supplying cargo services (except for steam heating systems of cargo tanks intended for the carriage of asphalt solutions on asphalt tankers) are not required to be fitted with more than one boiler, while steam systems supplying essential services (other than cargo services) shall be fitted with more than one boiler, so that the steam supplied to essential services can be maintained in case of failure of any single boiler (Prop.312)
Ch 1, Sec 10, [20.8](new)	to introduce IACS UR M86 (New Nov 2024) “Monitoring and Safety Functions for Exhaust Gas Cleaning (SOx) Systems”
Ch 1, App 3, [3.6.3](new)	to introduce IACS UR P4 (Rev.8 Sep 2024) “Production and Application of Plastic Piping Systems on Ships”
Ch 1, App 15, [5.7.2]	to modify the requirements for the annular space between inner and outer pipe of double wall fuel piping in methyl/ethyl alcohol fueled ships in line with the IMO “Interim Guidelines for the Safety of Ships using Methyl/Ethyl Alcohol as Fuel” in MSC.1/Circ.1621 (Prop.309)
Ch 1, App 15, [11.1.1]	to introduce IACS UI GF21 (New Oct 2024) “CO2 fire extinguishing systems in methyl/ethyl alcohol fuelled vessels machinery spaces”
Ch 1, App 19(new)	to introduce IACS UR M85 (New Nov 2024 and Corr.1 July 2025) “Type approval testing of synthetic materials for aftmost propeller shaft bearings”
Ch 2, Sec 3, [3.7.4]	to introduce IACS Rec.187 (New, May 2025) “Internal communication equipment required in an emergency” as it contains an updated version of the interpretations of SOLAS reg. II-1/42.2 and II-1/43.2 in the withdrawn IACS UIs SC4 and SC5, which have been retained in TASNEEF Rules and are therefore now updated in line with Rec.187
Ch 2, Sec 11, [5.2.1]	to introduce IACS UI SC11 (Rev 2 Nov 2024) “Precautions against shock, fire and other hazards of electrical origin”
Ch 3, Sec 3, [1.2.2], [1.5.23], [6.12.2]	to introduce IACS UR E22 (Rev.3 Corr.1, Sept 2025) “Computer-based systems”
Ch 3, Sec 4, [4.2.2] Ch 3, Sec 5, [3.1.2]	to introduce IACS Rec.190 (New June 2025) "Recommendation for Vessel Asset Inventory for Computer-based Systems"
Ch 3, Sec 8, Tab 1	to introduce IACS UR E10 (Rev.10 Aug 2024) “Test Specification for Type Approval”

Part E – Service Notations

Chapter/Section/Paragraph amended	Reason
Ch 6, Sec 2, [6.3.2] Ch 7, Sec 2, [6.3.2], [7](new), Fig 5 to Fig 10(new) Ch 7, Sec 4, [2.3.8] Ch 8, Sec 3, [6.4](new) Ch 19, Sec 2, [8.4.5] Ch 19, Sec 4, [2.1.5] Ch 25, Sec 2, [4.3.2] Ch 25, Sec 4, [2.3.8] Ch 26, Sec 2, [4.3.2]	to introduce IACS UR F44 (Rev.3 Sept 2024) and (Rev.3 Corr.1 Mar 2025) “Fore peak ballast tanks and space arrangements on oil & chemical tankers”
Ch 7, Sec 2, [7.1.1] Ch 8, Sec 3, [6.4]	to introduce IACS UI SC211 (Rev.1 Sep 2024) "Protection of fuel oil tanks and designation of fore peak spaces" which provides

	unified interpretations to the definition of “cargo area” in SOLAS regulation II-2/3.5 and IBC Code paragraph 1.3.6, used in TASNEEF Rules where IACS UR F44 Rev.3 have been included
Ch 7, Sec 4, [4.2.2], [4.2.3]	to introduce IACS UI SC140 (Rev.4 Sept 2025) and (Rev.4 Corr.1 Nov 2025) “Secondary Means of Venting Cargo Tanks”
Ch 7, Sec 5, [8.2.1] c)(new)	to require that steam heating systems of cargo tanks intended for the carriage of asphalt solutions on asphalt tankers are to be fitted with more than one boiler, so that the steam supply to the cargo heating system can be maintained in case of failure of any single boiler (Prop. 312)
Ch 11, Sec 5, [2.2.4]	to introduce IACS Rec.187 (New, May 2025) “Internal communication equipment required in an emergency” as it contains an updated version of the interpretations of SOLAS reg. II-1/42.2 and II-1/43.2 in the withdrawn IACS UIs SC4 and SC5, which have been retained in TASNEEF Rules and are therefore now updated in line with Rec.187
Ch 14, Sec 1, Tab 1	to exempt tugs under 500 GT from the requirement for cofferdam between spaces intended for the carriage of flammable liquids and accommodations and/or service spaces, in line with the requirements of other IACS class societies for small non-SOLAS ships where a cofferdam may be impracticable due to the characteristics and dimensions of the spaces (Prop.310)
Ch 14, Sec 2, [1.1.1], [3.8.1] Ch 15, Sec 2, [1.1.6], [1.1.7], [8.3], [8.5](deleted), [8.6](deleted)	to introduce more detailed anchor handling winches’ requirements due to the entry into force of new SOLAS regulation II-1/3-13 “Lifting appliances and anchor handling winches”, supported by IMO “Guidelines for anchor handling winches” in MSC1/Circ.1662 (Prop.317)
Ch 14, Sec 2, [3.8.3](new), [5.4.1]	to recalibrate the towline breaking strength requirements to align with those of other IACS class societies, introducing requirements for all tugs and changing those for escort tugs to avoid oversizing (Prop.313)

Part F – Additional Class Notations

Chapter/Section/Paragraph amended	Reason
Ch 13, Sec 26, [4.1.4](new)	to add to the requirements for the assignment of the additional class notation EGCS-SOx the compliance with IACS UR M86 (New Nov 2024) “Monitoring and Safety Functions for Exhaust Gas Cleaning (SOx) Systems” introduced in Ch 1, Sec 10, [20.8]
Ch 13, Sec 49(new)	to introduce the requirements for the assignment of the additional class notation HVSC or LVSC READY (High or Low Voltage Shore Connection Ready) for ships with high (above 1.000 V) or low (less than or equal to 1.000 V) voltage systems, designed for the future installation of a shore connection system (Prop.282)

Part A
Classification and Surveys

Chapter 1
PRINCIPLES OF CLASSIFICATION AND CLASS NOTATIONS

TASNEEF
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EMIRATES CLASSIFICATION SOCIETY

GENERAL TERMS AND CONDITIONS
OF EMIRATES CLASSIFICATION SOCIETY – L.L.C – O.P.C (TASNEEF)
EFFECTIVE AS OF 1 APRIL 2025

DEFINITIONS

Administration	means the government of the state whose flag the Ship is entitled to fly or under whose authority the Ship is authorised to operate in the specific case.
Client	means the interested party and any other party who requires the Services.
Certificate of Classification	means a certificate of classification, issued by a Society and the certificate confirms that the vessel's structure, machinery, and equipment meet the society's specific technical rules and regulations.
Interested Party	means the party, other than the society, having an interest in or responsibility for the Ship, product, plant or system subject to classification or certification (such as the owner of the Ship and his representatives, the Ship builder, the engine builder or the supplier of parts to be tested) who requests the Services or on whose behalf the Services are requested.
Owner	means the registered owner, the Ship owner, the manager or any other party with the responsibility, legally or contractually, to keep the Ship seaworthy or in service, having particular regard to the provisions relating to the maintenance of class laid down in part a, chapter 2 of the rules for the classification of Ships or in the corresponding rules indicated in the specific rules.
Register of Ships	means a register book, also known as a Register of Ships, is a comprehensive record of vessels that are classified by a society.
Rules	means the documents below issued by the Society: a. Rules for the classification of Ships or other special units. b. Complementary rules containing the requirements for certification of products, plants, systems and other or containing the requirements for the assignment of additional class notations. c. Rules for the application of statutory rules, containing the rules to perform the duties delegated by administrations. d. Guides to carry out particular activities connected with Services. e. Any other technical document, as for example rule variations or interpretations.

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Services	means the activities described in Article 1 below, rendered by the Society upon request made by or on behalf of the Interested Party.
Ship	means ships, boats, craft and other special units, as for example offshore structures, floating units and underwater craft.
Society	means Emirates Classification Society LLC OPC and/or its affiliated entities providing the Services.
Surveyor	means technical staff acting on behalf of the society in performing the Services.
UAE	means United Arab Emirates.

ARTICLE 1

1.1 The purpose of the Society is, among others, the classification and certification of Ships and the certification of their parts and components.

1.2 The Society (a) sets forth and develops Rules; (b) publishes the Register of Ships[1]; and (c) issues certificates, statements and reports based on its survey activities.

1.3 The Society also takes part in the implementation of national and international rules and standards as delegated by various Governments.

1.4 The Society carries out technical assistance activities on request and provides special services outside the scope of classification, which is regulated by these general conditions unless expressly excluded in the particular contract.

ARTICLE 2

2.1 The Rules developed by the Society reflect the level of its technical knowledge at the time they are published. Therefore, the Society, though committed, also through its research and development services, to continuous updating, does not guarantee they meet state-of-the-art science and technology at the time of publication or that they meet the Society's or others' subsequent technical developments.

2.2 The Interested Party is required to know the Rules on the basis of which the Services are provided. With particular reference to Classification Services, special attention is to be given to the Rules concerning class suspension, withdrawal and reinstatement. In case of doubt or inaccuracy, the Interested Party is to promptly contact the Society for clarification. The Rules for Classification of Ships are published on the Society's website: www.tasneefmaritime.ae

2.3 The Society exercises due care and skill:

(a) in the selection of its Surveyors; and

(b) in the performance of its Services, taking into account the level of its technical knowledge at the time the

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Services are performed.

2.4 Surveys conducted by the Society include, but are not limited to, visual inspection and non-destructive testing. Unless otherwise required, surveys are conducted through sampling techniques and do not consist of comprehensive verification or monitoring of each component of the Ship or of the items subject to certification. The surveys and checks made by the Society, either on board Ships or with remote techniques, do not necessarily require the constant and continuous presence of the Surveyor. The Society may also commission laboratory testing, underwater inspection and other checks to qualified service suppliers, who will carry out these duties under their responsibility. Survey practices and procedures are selected by the Society based on its experience and knowledge and according to generally accepted technical standards in the sector.

ARTICLE 3

3.1 The class assigned to a Ship, like the reports, statements, certificates or any other document or information issued by the Society, reflect the discretionary opinion of the Society concerning compliance, at the time the Service is provided, of the Ship or product subject to certification, with the applicable Rules (given the intended use and within the relevant time frame).

3.2 The Society is under no obligation to make statements or provide information about elements or facts which are not part of the specific scope of the Service requested by the Interested Party or on its behalf.

3.3 No report, statement, notation on a plan, review, Certificate of Classification, document or information issued or given as part of the Services provided by the Society shall have any legal effect or implication other than a representation that, on the basis of the checks made by the Society, the Ship, structure, materials, equipment, machinery or any other item covered by such document or information meet the Rules. Any such document is issued solely for the use of the Society, its committees and clients or other duly authorised bodies and for no other purpose. Therefore, the Society cannot be held liable for any act made or document issued by other parties on the basis of the statements or information given by the Society. The validity, application, meaning and interpretation of a Certificate of Classification, or any other document or information issued by the Society in connection with its Services, are governed by the Rules of the Society, whom is the sole subject entitled to make such authentic interpretation. Any disagreement on technical matters between the Interested Party and the Surveyor in the carrying out of his functions shall be raised in writing as soon as possible with the Society, which will settle any divergence of opinion or dispute.

3.4 The classification of a Ship, or the issuance of a certificate or other document connected with classification or certification and in general with the performance of Services by the Society shall have the validity conferred upon it by the Rules of the Society at the time of the assignment of class or issuance of the certificate; in no case shall it amount to a statement or warranty of seaworthiness, structural integrity, quality or fitness for a particular purpose or service of any Ship, structure, material, equipment or machinery inspected or tested by the Society.

3.5 Any document issued by the Society in relation to its activities reflects the condition of the Ship or the subject of certification or other activity at the time of the check.

3.6 The Rules, surveys and activities performed by the Society, reports, certificates and other documents issued by

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the Society are in no way intended to replace the duties and responsibilities of other parties including, without limitation, Governments, designers, ship builders, manufacturers, repairers, suppliers, contractors or sub-contractors, Owners, operators, charterers, underwriters, sellers or intended buyers of a Ship or other product or system surveyed.

3.7 These documents and activities do not relieve such parties from any fulfilment, warranty, responsibility, duty or obligation (also of a contractual nature) expressed or implied or in any case incumbent on them, nor do they confer on such parties any right, claim or cause of action against the Society. With particular regard to the duties of the Owner, the Services undertaken by the Society do not relieve the Owner of his duty to ensure proper maintenance of the Ship and ensure seaworthiness at all times. Likewise, the Rules, surveys performed, reports, certificates and other documents issued by the Society are intended neither to guarantee the buyers of the Ship, its components or any other surveyed or certified item, nor to relieve the seller of the duties arising out of the law or the contract, regarding the quality, commercial value or characteristics of the item which is the subject of transaction.

3.8 In no case, therefore, shall the Society assume the obligations incumbent upon the above-mentioned parties, even when it is consulted in connection with matters not covered by its Rules or other documents.

3.9 In consideration of the above, and within the limits of liability under Article 5 below, the Interested Party undertakes to relieve and hold harmless the Society from any third party claim, as well as from any liability in relation to the latter concerning the Services rendered, where these are attributable to the Interested Party.

3.10 Insofar as they are not expressly provided for in these General Conditions, the duties and responsibilities of the Owner and Interested Parties with respect to the Services rendered by the Society are described in the Rules applicable to the specific Service rendered.

ARTICLE 4

4.1 Any request for the Society's Services shall be submitted in writing and signed by or on behalf of the Interested Party. Such a request will be considered irrevocable as soon as received by the Society and shall entail acceptance by the applicant of all relevant requirements of the Rules, including these General Conditions. Upon acceptance of the written request by the Society, a contract between the Society and the Interested Party is entered into, which is regulated by the present General Conditions.

4.2 In consideration of the Services rendered by the Society, the Interested Party and the person requesting the service shall be jointly liable for the payment of the relevant fees and costs, even if the service is not concluded for any cause not pertaining to the Society. In the latter case, the Society shall not be held liable for non-fulfilment or partial fulfilment of the Services requested. In the event of non-payment of the invoice within the contractually agreed terms, the Society reserves the right to request, in addition to the full payment of the principal amount due and without the need for further formal notice, also:

(a) Late payment interest at a rate of 5% per annum, calculated from the due date of the invoice until full payment is received, in accordance with the applicable laws in the United Arab Emirates or the country from where the invoice is issued. Any applicable VAT, taxes, or statutory levies shall be borne by the Client as per the laws

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of the respective jurisdiction;

(b) full reimbursement of any costs incurred for debt recovery, including, but not limited to, legal fees, administrative expenses, and the costs of any extrajudicial actions; and

(c) any additional amount due as compensation for damages suffered as a result of the delay or non-compliance, where documented.

4.3 The contract for the classification of a Ship or for other Services may be terminated and any certificates revoked at the request of one of the parties, subject to at least 30 days' notice to be given in writing. Failure to pay, even in part, the fees due for Services carried out by the Society will entitle the Society to immediately terminate the contract and suspend the Services.

4.4 The Society may withhold, suspend or withdraw any certificate, report or service in the event of non-payment of fees due to any member of the Society by the Client in relation to the entire business relationship between any member of the Society and the Client or by any other companies belonging to the same group as the Client. This also applies when the obligation to pay rests with a builder or with the Ship's previous Owner.

4.5 For every case of termination or suspension of the contract, the fees for the activities performed until the time of the termination or of the suspension shall be owed to the Society as well as the expenses incurred in view of activities already programmed; this is without prejudice to the right to compensation due to the Society as a consequence of the termination or of the suspension.

4.6 With particular reference to Ship classification and certification, unless decided otherwise by the Society, termination of the contract implies that the assignment of class to a Ship is withheld or, if already assigned, that it is suspended or withdrawn; any statutory certificates issued by the Society will be withdrawn in those cases where provided for by agreements between the Society and the flag State.

ARTICLE 5

5.1 In providing the Services, as well as other correlated information or advice, the Society, its Surveyors, servants or agents operate with due diligence for the proper execution of the activity. However, considering the nature of the activities performed (see Article 2), it is not possible to guarantee absolute accuracy, correctness and completeness of any information or advice supplied. Express and implied warranties are specifically disclaimed.

5.2 Therefore, subject to what provided for in Article 5.3 below, and also in the case of activities carried out by delegation of Governments, neither the Society nor any of its Surveyors will be liable for any loss, damage or expense of whatever nature sustained by any person, in tort or in contract, derived from carrying out the Services.

5.3 Notwithstanding the provisions in Article 5.1 above, should any user of the Society's Services prove that he has suffered a loss or damage due to any negligent act or omission of the Society, its Surveyors, servants or agents, then the Society will pay compensation to such person for his proved loss, up to, but not exceeding, five times the amount of the fees charged for the specific Services, information or opinions from which the loss or damage derives or, if no fee has been charged, a maximum of AED5,000 (Arab Emirates Dirhams Five Thousand only).

5.4 Where the fees charged are related to a number of Services, the amount of the fees will be apportioned for the purpose of the calculation of the maximum compensation, by reference to the estimated time involved in the

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performance of the Service from which the damage or loss derives. Any liability for indirect or consequential loss, damage or expense is specifically excluded. In any case, irrespective of the amount of the fees charged, the maximum damages payable by the Society will not be more than AED 300,000 (Three Hundred Thousand Dirhams). Payment of compensation under this Article will not entail any admission of responsibility and/or liability by the Society and will be made without prejudice to the disclaimer clause contained in Article 5.

5.5 Any claim for loss or damage of whatever nature by virtue of the provisions set forth herein shall be made to the Society in writing, within the shorter of the following periods: THREE MONTHS from the date on which the Services were performed or THREE MONTHS from the date on which the damage was discovered. Failure to comply with the above deadline will constitute an absolute bar to the pursuit of such a claim against the Society.

ARTICLE 6

6.1 Any dispute, controversy, or claim arising out of or relating to these Rules, the Services of the Society, or the interpretation, breach, or termination thereof, shall first be referred to the parties' senior management for amicable resolution within thirty (30) days of written notice by either party.

6.2 If the dispute is not resolved amicably under Article 6.1, it shall be exclusively governed by and construed in accordance with the laws of the Emirate of Abu Dhabi and the applicable federal laws of the United Arab Emirates. The courts of Abu Dhabi shall have exclusive jurisdiction to settle any such dispute.

ARTICLE 7

7.1 All plans, specifications, documents and information provided by, issued by, or made known to the Society, in connection with the performance of its Services, will be treated as confidential and will not be made available to any other party other than the Owner without authorisation of the Interested Party, except as provided for or required by any applicable legislation from a competent authority. Information about the status and validity of class and statutory certificates, including transfers, changes, suspensions, withdrawals of class, conditions of class, operating conditions or restrictions issued against classed ships and other related information, as may be required, may be published on the website or released by other means, without the prior consent of the Interested Party.

7.2 Information about the status and validity of other certificates and statements may also be published on the website or released by other means, without the prior consent of the Interested Party.

7.3 Notwithstanding the general duty of confidentiality owed by the Society to its clients in Article 7.1 above, the Society's clients hereby accept that the Society will participate in the IACS Early Warning System which requires each Classification Society to provide other involved Classification Societies with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the Ship which may be the specific property of another party), to enable such useful information to be shared and used to facilitate the proper working of the IACS Early Warning System. The Society will provide its clients with written details of such information sent to the involved Classification Societies.

7.4 In the event of transfer of class, addition of a second class or withdrawal from a double/dual class, the Interested Party undertakes to provide or to permit the Society to provide the other Classification Society with all building plans and drawings, certificates, documents and information relevant to the classed unit, including its history file,

as the other Classification Society may require for the purpose of classification in compliance with the applicable legislation and relative IACS Procedure. It is the Owner's duty to ensure that, whenever required, the consent of the builder is obtained with regard to the provision of plans and drawings to the new Society, either by way of appropriate stipulation in the building contract or by other agreement.

7.5 In the event that the ownership of the Ship, product or system subject to certification is transferred to a new subject, the latter shall have the right to access all pertinent drawings, specifications, documents or information issued by the Society or which have come to the knowledge of the Society while carrying out its Services, even if related to a period prior to transfer of ownership.

ARTICLE 8

8.1 The Society shall not be obliged to perform any obligation towards the Client (including, without limitation, obligation to (a) perform, deliver, accept, sell, purchase, pay or receive money to, from or through a person or entity, or (b) engage in any other act) if this would be in violation of, inconsistent with or expose the Society to punitive measures under any United Nations resolutions and/or under any laws, regulations, decrees, ordinances, orders, demands, requests, rules or requirements of EU, United Kingdom, and/or United States of America and which relate to foreign trade controls, export controls, embargoes or international boycotts (applying, without limitation, to the financing, payment, insurance, transportation, delivery or storage of product and/or services) hereinafter referred to as "Trade Sanctions".

8.2 Recurring the above circumstances during the performance of the contract, the Society shall be entitled at its sole and absolute discretion:

(a) to immediately suspend payment or performance of the Services which are the object of the contract until such;

(b) time as the Trading Sanctions are in force;

(c) to a full disengagement from the obligation affected by the Trading Sanctions, in the event that the inability to fulfill the said obligation persists until the term provided for the fulfilment hereunder, provided that where the relevant obligation relates to payments for activities and/or Services which have already been delivered, the affected payment obligation shall remain only suspended until such time as the Trading Sanctions no longer apply to the payment ; and/or

(d) to terminate the contract, without prejudice of the Society's rights pursuant to Article 4.

ARTICLE 9

Should any part of these General Conditions be declared invalid, this will not affect the validity of the remaining provisions.

ARTICLE 10

When the Society provides its Services to a consumer - i.e. a natural person who does not act within the scope of his business or professional activity - the following provisions do not apply Article 3 (as far as the Society is solely entitled to the authentic interpretation of the Rules); Article 4, (as far as the payment of the fees is also due for Services not

concluded due to causes not attributable to the Interested Party); Article 5 (as far as the exclusion of liability is concerned), and Article 6 (as far as the jurisdiction of a Board of Arbitrators based in Abu Dhabi is concerned).

ARTICLE 11

11.1 The Society and the Interested Party shall promote safety, protect human health and environment and create safe working conditions for their personnel.

11.2 The Interested Party shall guarantee that the working environment in which the Society's Surveyor will be required to work is adequate, safe and in all respect compliant with the applicable legislation and Rules and shall adopt all necessary measures to mitigate and/or control any relevant risk.

11.3 Furthermore, in accordance with the applicable legislation and Rules, the Interested Party shall provide the Society with complete and detailed information relevant to any actual or potential specific risk existing in the work areas where the Surveyor will be required to operate and relevant to the performance of the Services as well as with any specific safety measure that the Society's Surveyor is requested to comply with.

11.4 The Society reserves not to commence and/or to suspend the Services and/or to terminate the contract, claiming compensation for any damage occurred, if it considers that the safety requirements listed in this Article are not satisfactorily met.

4.8.3 *(1/1/2026)*

The service notation **supply vessel** is assigned to ships specially intended for the carriage and/or storage of special material and equipment and/or which are used to provide facilities and assistance for the performance of specified activities.

When the above ships are primarily designed for offshore support services, the service notation **Offshore Support Vessel (OSV)** is assigned.

The service notation is to be completed by the additional service feature **oil product**, when the ship is also specially intended to carry oil products having any flash point.

The service notation is to be completed by the additional service feature **chemical product**, when the ship is also specially intended to carry chemical products having any flash point.

The service notation is to be completed by the additional service feature **standby**, when the ship is also specially intended to perform rescue and standby services for offshore installations (e.g. **supply vessel - standby**).

The service notation is completed by the additional service feature **rescue**, when the ship is specially equipped for rescue of shipwrecked persons and for their accommodation.

The service notation is completed by the additional service features:

- **anchor handling**, when the ship visibility from the bridge and equipment are specially designed for anchor handling operation; or **anchor handling stab**, when the ship is specially designed and equipped for anchor handling operation and also fulfils specific stability requirements related to this service. These additional service features are assigned to ships provided with anchor handling winches complying with SOLAS Regulation II-1/3-13, as amended by Resolution MSC 532(107).
- **Crew Transfer Vessel - CTV**, when ships are specially intended to transport technician and other personnel out to sites.
- **Dive Support Vessel - DSV**, when ships are specially intended to support the offshore diving operation.
- **heavycargo (X kN/m²)**, when the weather deck intended to support heavy cargoes fulfills the appropriate structural rule requirements. The value X indicates the maximum allowable local pressure in kN/m², which is to be greater than 10 kN/m². The requirements for the assignment of this additional service feature are given in Pt B, Ch 5, Sec 6, [4.1.1] and Part B, Chapter 7 or Part B, Chapter 8, as applicable.
- **heavyliquid (X t/m³)**, when the ship is designed with specified cargo tanks strengthened to carry heavy liquids (i.e liquids having density greater than the one of the sea water) that fulfill the appropriate structural rule requirements. The value X indicates the maximum density in t/m3 of the liquids that can be carried in the specified tanks 98% full. The requirements for the assignment of this additional service feature are given in Part B, Chapter 5 and Part B, Chapter 7 or Part B, Chapter 8, as applicable.
- **Patrol and Guard Vessel**, when ships are specially intended to patrol a coastal area or site for security, observation and defense.
- **Seismic and Geotechnical Survey Vessel - SGSV**, when ships are specially intended for the purpose of research, seismic survey and mapping at seas.
- **Windfarm Service Vessel - WSV**, when ships are specially intended to transport technician and other personnel to offshore wind farm and to support operations of wind farm maintenance and survey.

The additional requirements of Part E, Chapter 15 are applicable to these ships.

4.8.4 The service notation **fire-fighting ship** is assigned to ships specially intended and equipped for fighting fire. The additional requirements of Part E, Chapter 16 are applicable to these ships.

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

- **1** or **2** or **3**, when the ship complies with the applicable requirements of Pt E, Ch 16, Sec 3 and Pt E, Ch 16, Sec 4
- **E** when the characteristics of the fire-fighting system are not those required for the assignment of the additional service features **1**, **2** or **3**, and when the system is specially considered by the Society
- **water-spraying** when the ship is fitted with a self-protection water-spraying system complying with the applicable requirements of Pt E, Ch 16, Sec 4, [3].

4.8.5 *(1/1/2012)*

The service notation **oil recovery ship** is assigned to ships specially equipped with fixed installations and/or mobile equipment for the removal of oil from the sea surface and its retention on board, carriage and subsequent unloading. The additional requirements of Part E, Chapter 17 are applicable to these ships.

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5.2.5 The navigation notation **sheltered area** is assigned to ships intended to operate in sheltered waters , i.e. harbours, estuaries, roadsteads, bays, lagoons and generally calm stretches of water and when the wind force does not exceed 6 Beaufort scale.

5.2.6 *(1/7/2009)*
The navigation notations defined in these items [5.2.1] to [5.2.5] are those considered as "normal". Where particular cases of navigation are to be assigned which are not included among those so defined, the navigation notation **special** is assigned, followed by specified restrictions (such as the designation of the geographical area, distance from the shore and/or the most unfavourable sea conditions considered).

5.2.7 *(1/7/2009)*
The Society may assign navigation notations provided by the regulations of the flag Administration, which may be different from those defined in [5.2.1] to [5.2.6].

5.3 Operating area notations

5.3.1 The operating area notation expresses the specified area where some service units are likely to operate at sea within specific restrictions which are different from normal navigation conditions.

The operating area notation is, in principle, solely granted to working units, such as dredgers and crane pontoons.

This operating area notation is indicated after the navigation notation.

Example: **unrestricted navigation - “operating area notation”**

5.3.2 The following operating area notations may be assigned:

a) notation **specified operating area**, where the specific operating conditions which have been considered by the Society are described in an annex to the Certificate of Classification (i.e. distance from shore or from port of refuge, weather or sea conditions)

b) notation **operation service within ’x’ miles from shore**, where the operating service is limited to a certain distance from the shore.

6 Additional class notations

6.1 General

6.1.1 *(1/7/2025)*
An additional class notation expresses:

- the classification of additional equipment or specific arrangement, which has been requested by the Interested Party; or
- the classification of mandatory equipment or specific arrangement which - because of their importance - the Interested Party requests to be expressly indicated on the Certificate of Classification to provide ready evidence of the ship's compliance with the relevant mandatory class or statutory requirements.

6.1.2 *(1/7/2025)*
The assignment of such an additional class notation is subject to the compliance with:

- additional rule requirements, which are detailed in Part F of the Rules; or
- mandatory rule or statutory requirements mentioned in [6.2] to [6.14], which are detailed in other Parts of the Rules or in applicable statutory instruments.

6.1.3 Some additional class notations, due to the importance of relevant equipment or arrangements, are assigned a construction mark, according to the principles given in [3.1.2]. This is indicated in the definition of the relevant additional class notations.

6.1.4 The different additional class notations which may be assigned to a ship are listed in [6.2] to [6.14], according to the category to which they belong. These additional class notations are also listed in alphabetical order in Tab 3.

6.2 System of Trace and Analysis of Records (STAR)

6.2.1 General *(1/7/2008)*
STAR is a System of Trace and Analysis of Records integrating rational analysis with data and records from ship-in-service concerning planned inspection and ship maintenance.

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6.7.5 Noise emissions in port area outboard (NOISE-PORT-OUT(X)) and inboard (NOISE-PORT-IN(X)) *(1/1/2023)*

The additional class notations **NOISE-PORT-OUT(X)** and **NOISE-PORT-IN(X)** are assigned to ships satisfying levels of noise in port area defined in Pt F, Ch 6, Sec 4. The assessment of noise levels is only carried out through noise measurements in port area either outboard (for **NOISE-PORT-OUT(X)**) or in board (for **NOISE-PORT-IN(X)**).

The notation is completed by a number (1-100) which represents the merit level achieved for the assignment of the notation, the merit 100 corresponding to the lowest level of noise.

The notations **NOISE-PORT-OUT(X)** and **NOISE-PORT-IN(X)** are only assigned if at least merit level 1 is reached.

6.8 Pollution prevention

6.8.1 General *(1/7/2023)*

The notations dealt with under this heading are assigned to ships fitted with equipment and arrangements enabling them to reduce the pollution of the sea and/or air caused by release of solid waste and liquid and/or gaseous effluents.

The requirements for the assignment of these notations are given in Part F, Chapter 7 or in IMO documents (i.e. MARPOL Convention and MEPC Resolutions).

6.8.2 Sea pollution prevention (CLEAN-SEA) *(1/7/2006)*

The additional class notation **CLEAN-SEA** is assigned to ships provided with construction and procedural means to prevent pollution of the sea.

This is achieved by compliance with the applicable requirements of Annex I, Annex II, Annex III, Annex IV and Annex V of MARPOL Convention, relevant to ship's liquid and solid releases, as well as additional requirements related to prevention of sea pollution as follows:

- prevention of accidental pollution by means of location of fuel and lube oil tanks above the double bottom and away from ship sides
- prevention of operational pollution by means of bilge water separation and filtering, holding tanks for treated sewage and grey water
- prevention of transfer of harmful organisms and pathogens in the ballast water
- prevention of pollution by tributyltin by means of TBT free antifouling paints
- prevention of pollution by solid garbage (resulting from the compacting device and incinerators) by means of proper storage of such waste
- ship recycling.

6.8.3 Air pollution prevention (CLEAN-AIR) *(1/7/2009)*

The additional class notation **CLEAN-AIR** is assigned to ships provided with construction and procedural means to prevent pollution of the air. This is achieved by compliance with the applicable requirements of Annex VI of MARPOL Convention, as well as additional requirements related to low emissions to the air as follows:

- prevention of air pollution by exhaust gas (particles, COx, NOx, SOx) by means of low emission engines, use of low sulphur content fuels and incinerators
- use of refrigerants and fixed fire fighting means with zero ozone depleting potential and low global warming potential
- control of release of refrigerants to the atmosphere by means of leak detection and evacuation systems
- recovery of vapours emitted from cargo systems of ships carrying dangerous liquid cargoes in bulk.

Note 1: For ships with the service notation **oil tanker**, **combination carrier/OBO**, **combination carrier/OOC**, **chemical tanker**, **FLS tanker**, excluding those intended for the carriage of products having flashpoint > 60°C or **liquefied gas carrier**, the assignment of the notation **VCS** (Vapour Control System) is a prerequisite for the assignment of the notation **CLEAN-AIR**. However, the notation **VCS** may also be assigned as a single notation as described in [6.14.7].

6.8.4 Sea and air pollution prevention (GREEN PLUS - GREEN STAR 3 DESIGN - GREEN STAR 3 - GREEN STAR 3 (TOC)) *(1/7/2020)*

a) **GREEN PLUS**

The additional class notation **GREEN PLUS** is assigned to ships designed and provided with systems, components and procedural means to control and prevent the emission of polluting substances into the sea, the air and more in general the environment, in accordance with the requirements in Pt F, Ch 7, Sec 1.

b) **GREEN PLUS T**

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6.8.9 SEEMP *(1/7/2023)*

The additional class notation **SEEMP** may be assigned to ships having onboard a Ship Energy Efficiency Plan (SEEMP) required by Reg. 26 of MARPOL Annex VI, as amended by IMO Resolution MEPC.328(76), developed according to IMO Resolution MEPC.346(78) upon satisfactory verifications of the following:

- proper planning, implementation, monitoring, and self-evaluation and improvement of energy measures
- proper definition of goals and indicators (Annual Efficiency Ratio (AER), cgDIST, Energy Efficiency Operational Indicator (EEOI) or other carbon intensity indicators (CIIs))
- proper calculation of the indicators defined in the planning phase, carried out with the frequency defined in planning phase and using the data collected over the last 6 months of the ship's operations and recording
- proper recording of the energy measures implementation
- proper implementation of the procedures and tools to measure the data
- proper maintenance and calibration of the measuring devices
- presence onboard of SEEMP and record books kept up to date.

6.8.10 Ship recycling - Inventory of Hazardous Materials (HK IHM and EU IHM) *(1/7/2023)*

The additional class notations **HK IHM** and **EU IHM** may be assigned to ships complying with ship recycling requirements as follows:

- **HK IHM** to ships complying with the requirements in Pt F, Ch 7, Sec 4, [2.7] and provided with an Inventory of Hazardous Materials (IHM) developed according to IMO Resolution MEPC.269(68) "2015 Guidelines for the development of the inventory of hazardous materials".

  In application of the requirements of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009, the HK IHM provides detailed information with regard to potentially hazardous materials utilized in the construction of the ship, its equipment and systems.

  This document accompanies the ship throughout its operating life and incorporates all relevant design and equipment changes, with the final Owner delivering the document, with the ship, to the recycling facility.
- **EU IHM HK IHM** to ships complying with the requirements in Pt F, Ch 7, Sec 4, [2.7] and provided with an Inventory of Hazardous Materials (IHM) developed according to EU Regulation No 1257/2013 on Ship Recycling and relevant EMSA Guidance on the Inventory of Hazardous Materials.

6.8.11 Retention on board (ROB-x days) *(1/7/2023)*

The additional class notation **ROB-x days** may be assigned to ships having the capability to collect substances or effluents for a calculated number of consecutive days of voyage duration without any discharge of substances or effluents. The requirements for the assignment of this notation are given in Pt F, Ch 7, Sec 8.

6.8.12 Advanced wastewater treatment Plant (AWTP) *(1/7/2023)*

The additional class notation **AWTP** may be assigned to ships having a plant treating sewage and grey waters with an effluent quality complying with special requirements as follows:

- **AWTP-SA** to ships complying with the specific requirements applicable in special areas, provided in Para, 4.2 of IMO Resolution MEPC.227(64), as amended and complying with the requirements in Pt F, Ch 7, App 2, [1.3.4] for sewage treatment plant and in Pt F, Ch 7, App 2, [1.4.4] for grey water treatment plant.
- **AWTP-AL** to ships complying with Alaska specific requirements. The sewage treatment plant or grey water treatment plant is to meet the operational requirements based on the standards and test methods as detailed in ADEC Title XIV (33 CFR Part 159 Subpart E). The system performance is to be certified.
- **AWTP- SA/AL** to ships complying with both the above-mentioned specific requirements.

6.8.13 Onboard Carbon Capture and Storage (OCCS) *(1/1/2026)*

The additional class notation **OCCS** is assigned to ships equipped with an onboard system intended to capture carbon (or carbon dioxide) and temporarily store it onboard, for subsequent offloading or discharging to shore-based reception facilities for permanent storage.

The requirements for the assignment of **OCCS** additional class notation are given in Pt C, Ch 1, Sec 10, [20.9].

6.9 Refrigerating installations

6.9.1 General

The notations dealt with under this heading are relevant to refrigerating installations fitted on board ships, including machinery and storing equipment or arrangements.

In compliance with [6.1.3], these notations are assigned a construction mark, as defined in [3].

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6.13.7 PMS-CM(FDS) *(1/7/2009)*

Where a Planned Maintenance Scheme approved by the Society is implemented, and Condition Based Maintenance complying with the requirements of Pt F, Ch 12, Sec 6 relevant to the fire detection system is applied, the additional class notation **PMS-CM(FDS)** is assigned.

6.13.8 PMS-CM *(1/1/2020)*

Where a Planned Maintenance Scheme approved by the Society is implemented, and Condition Based Maintenance complying with the requirements of Pt F, Ch 12, Sec 7 relevant to individual items selected by the Owner is applied, the additional class notation **PMS-CM** is assigned.

6.14 Other additional class notations

6.14.1 Strengthened bottom - Not always afloat but safe aground (NAABSA) *(15/10/2019)*

The additional class notation **STRENGTHBOTTOM-NAABSA** may be assigned to ships built with specially strengthened bottom structures so as to be able to be loaded and/or unloaded when properly stranded.

The requirements for the assignment of this notation are given in Pt F, Ch 13, Sec 1.

6.14.2 Loading by grabs *(1/4/2006)*

a) The additional class notation **GRABLOADING** may be assigned to ships with hold tank tops specially reinforced for loading/unloading cargoes by means of grabs or buckets.

   The requirements for the assignment of this notation are given in Pt F, Ch 13, Sec 2.

   However, this does not preclude ships not assigned with this notation from being loaded/unloaded with grabs.

b) The additional class notation **GRAB [X]** may be assigned to ships with hold tank tops designed for loading/unloading cargoes by means of grabs having a maximum mass of [X] tonnes.

   The requirements for the assignment of this notation are given in Pt F, Ch 13, Sec 2 (see also Note 2).

Note 1: These additional class notations may only be assigned to ships with the service notation **general cargo ship** (intended to carry dry bulk cargoes), **bulk carrier**, **ore carrier**, **combination carrier/OBO** or **combination carrier/OOC**.

Note 2: The specific requirements for the assignment of the notation **GRAB [X]** to bulk carriers with the service feature **CSR** are given in the Common Structural Rules (Ch 1, Sec 1, [3]).

6.14.3 In-water survey

The additional class notation **INWATERSURVEY** may be assigned to ships provided with suitable arrangements to facilitate the in-water surveys as provided in Ch 2, Sec 2, [7.1.4].

The requirements for the assignment of this notation are given in Pt F, Ch 13, Sec 3.

6.14.4 Single point mooring

The additional class notation **SPM** (Single Point Mooring) may be assigned to ships fitted with a specific mooring installation.

The requirements for the assignment of this notation are given in Pt F, Ch 13, Sec 4.

These requirements reproduce the provisions of “Recommendations for Equipment Employed in the Mooring of Ships at Single Point Mooring” (3rd edition 1993), issued by OCIMF (Oil Companies International Marine Forum).

6.14.5 Container lashing equipment *(1/7/2017)*

The additional class notation **LASHING** is assigned to ships initially fitted with mobile container lashing equipment that is documented, tested and checked.

The notation **ROUTE DEPENDENT LASHING (start date - end date)** is assigned to ships initially fitted with mobile container lashing equipment that is documented, tested and checked for specific routes and for the period of year defined by the specification start date - end date.

These notation are assigned only to ships having the service notation **container ship** or the additional service feature **equipped for carriage of containers**.

The requirements for the assignment of the notations are given in Pt F, Ch 13, Sec 5.

This equipment, however, will not be verified any longer at the periodical class surveys to which the ship is submitted.

6.14.6 Dynamic positioning *(1/1/2021)*

a) The additional class notation **DYNAPOS** may be assigned to ships equipped with a dynamic positioning system.

   In compliance with [6.1.3], this notation is assigned a construction mark, as defined in [3].

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6.14.26 Self-unloading *(1/1/2013)*

The additional class notation **SELF-UNLOADING** is assigned to ships having one of the following service notations:

- **bulk carrier ESP**
- **bulk carrier ESP CSR**
- **general cargo ship**

provided with permanent on-board loading and unloading equipment which complies with the following conditions:

a) the equipment that is fitted above the deck is certified in accordance with the "Rules for loading and unloading arrangements and for other lifting appliances on board ships",

b) the equipment that is fitted inside the holds (horizontal and vertical conveyors) is certified and tested in compliance with a recognised standard.

6.14.27 Technical Advisor Service (TAS) *(1/7/2013)*

The additional class notation **TAS** is assigned to ships whose approved geometry and structural data are stored in a database in order to allow the Society to provide, through dedicated computer programs, the necessary assistance in the event of damage.

6.14.28 EFFICIENT SHIP (S, DWT) *(1/2/2014)*

The additional class notation **EFFICIENT SHIP (S, DWT**) is assigned to ships achieving a level of efficiency as required by Pt F, Ch 13, Sec 19.

The notation is completed by two numbers, between brackets, which represent the reference speed S and deadweight DWT at which the ship has been evaluated.

6.14.29 Mooring *(1/7/2014)*

The additional class notation **MOORING** is assigned to units provided with arrangements for permanent mooring (anchoring) at a certain location. The mooring arrangement is to comply with Pt F, Ch 13, Sec 21.

6.14.30 Cargo Handling and Personnel Lifting *(1/1/2026)*

The following additional class notations are assigned to a unit that is provided with crane or lifting appliances to load and unload cargoes complying with the "Rules for loading and unloading arrangements and for other lifting appliances on board ships":

- **CARGO HANDLING (H)** when the unit is provided with cranes for handling loads in harbours and in a sheltered water environment;
- **CARGO HANDLING (O)** when the unit is provided with cranes designed to operate in offshore conditions (i.e. open sea environment);
- **CARGO HANDLING (T)** when the unit is provided with cranes used for unit-to-unit handling (**transhipping operation**) of dry bulk loads in environmental conditions causing significant wave induced motions of the unit on which the crane is mounted or from which the crane is off loading;
- **CARGO HANDLING (S)** when the unit is provided with lifting appliances intended to perform subsea lifting operations at sea;
- **CARGO HANDLING (SW)** when the unit is provided with lifting appliances including the related hoisting winches intended to perform subsea lifting operations at sea.

The additional class notations **PERSONNEL LIFTING**, **PERSONNEL LIFTING ADV** ~~and~~, **PERSONNEL LIFTING ADV PLUS** and **PERSONNEL LIFTING REC191** are assigned to a unit that is provided with a crane or lifting arrangements intended to be used for personnel lifting complying with the "Rules for loading and unloading arrangements and for other lifting appliances on board ships".

6.14.31 Navigation surrounding the arabian peninsula (SAHARA) *(1/7/2014)*

The additional class notations **SAHARA** and **SAHARA** are assigned to ships complying with the requirements of Pt F, Ch 13, Sec 20, intended to operate in the areas surrounding the Arabian Peninsula:

- Arabian Gulf
- Oman Gulf
- Red Sea
- Arabian Sea along the South-East Coast of the Arabian Peninsula.

The additional class notation **SAHARA** is assigned to ships with unrestricted navigation notation.

The additional class notation **SAHARA** is assigned to ships for which navigation in the Arabian Sea along the South-East Coast of the Arabian Peninsula is limited to sea states with significant wave height not greater than 2 meters and

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6.14.70 Optimized Shaft Alignment *(15/2/2024)*

The additional class notations **Optimized Shaft Alignment (OSA)** or **Optimized Shaft Alignment and procedure (OSA-PR)** are assigned to new ships when the Shaft Alignment (configuration of the shafts and bearings relative to the centerlines of the bearings from the theoretical straight-line condition) is designed, installed, verified, and surveyed in accordance with TASNEEF "Guide for Optimized Shaft Alignment".

The requirements in the Guide are in lieu of the applicable requirements of Pt C, Ch 1, Sec 7.

The additional class notations **OSA** and **OSA-PR** are not applicable to ships equipped with azimuth thrusters or non-conventional shaft lines intended for main propulsion, or as otherwise deemed not appropriate by the Society.

6.14.71 Cyber Resilience Ready *(1/6/2024)*

The additional class notation **CS-Ready** may be assigned to ships contracted for construction before 1 July 2024 in a shipyard complying with the requirements of TASNEEF "Guide for Shipyards to assign new buildings with **CS-Ready** additional class notation".

6.14.72 VIB-MAC *(1/6/2025)*

The additional class notation **VIB-MAC** is assigned to ships whose machinery and onboard equipment comply with the vibration requirements defined in Pt F, Ch 13, Sec 47, specifying levels of vibration (to be confirmed by a measurement campaign) which suggest good working conditions for machinery in operation and sound mounting, balancing and alignment for new installations.

6.14.73 CYBER RESILIENCE *(1/7/2025)*

The additional class notation **CYBER RESILIENCE** may be assigned to ships complying with the requirements in Pt C, Ch 3, Sec 4 and having on-board systems and equipment that comply with requirements in Pt C, Ch 3, Sec 5.

6.14.74 IP-SERVICE *(1/7/2025)*

The additional class notation **IP-SERVICE** is assigned to ships constructed in compliance with the requirements of the International Code of Safety for Ships Carrying Industrial Personnel (IP Code), adopted by IMO through Resolution MSC.527(106), as amended.

6.14.75 ENHANCED ELECTRIC POWER AVAILABILITY (EEPA) *(15/10/2025)*

The additional class notation **EEPA** is assigned to passenger ships having electric propulsion, complying with Safe Return to Port requirements, and complying with the additional requirements defined in Pt F, Ch 13, Sec 48.

6.14.76 HIGH AND LOW VOLTAGE SHORE CONNECTION (HVSC AND LVSC) READY *(1/1/2026)*

The additional class notation **HVSC** or **LVSC (rated voltage, rated frequency) READY (X1, X2, X3)** is assigned to ships with High (above 1.000 V) or Low (less than or equal to 1.000 V) Voltage systems, designed for the future installation of a Shore Connection system and complying with the requirements in Pt F, Ch 13, Sec 49.

7 Other notations

7.1

7.1.1 The Society may also define other notations by means of provisional requirements and guidelines, which may then be published in the form of tentative rules.

Table 3 : List of additional class notations *(1/1/2026)*

Additional class notation	Reference for definition	Reference	Remarks
ADVANCED WASTEWATER TREATMENT PLANT (AWTP)	[6.8.12]	NA	
AIR LUBRICATION SYSTEM (AIR LUB)	[6.14.47]	Pt F, Ch 13, Sec 31	
AIR-MON	[6.14.33]	Pt F, Ch 13, Sec 22	

(1) A construction mark is added to this notation.
(2) This notation may be completed by the specific notations **-PRECOOLING**, **-QUICKFREEZE** and/or **-AIRCONT** (see [6.9.5]).
(3) This notation may be completed by the specific notations **-MIDSHIP** and **-TRANSFER** (see [6.14.7]).
(4) When ships are assigned the notations **CLEAN-SEA** and **CLEAN-AIR**, the two separate notations are superseded by the cumulative additional class notation **GREEN STAR 3 DESIGN** (see [6.8.4]).
(5) This notation may be completed by the specific features: **sequential**, **flow-through**, **dilution**.
(6) This notation may be completed by the specific notation **-HULL** (see [6.10.4]).
(7) This notation may be completed by the specific notation **Icebreaker** (see [6.11.1]).

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Additional class notation	Reference for definition	Reference	Remarks
DP PLUS	[6.14.6] b)	Pt F, Ch 13, Sec 6	
EEDI-Ph3	[6.8.8]	NA	
EEPA	[6.14.75]	Pt F, Ch 13, Sec 48	
EGCS-SOX and/or EGCS-NOX	[6.14.41]	Pt F, Ch 13, Sec 26	
EFFICIENT SHIP (S, DWT)	[6.14.28]	Pt F, Ch 13, Sec 19	
ENHANCED MAINTENANCE (EM)	[6.14.60]	Pt F, Ch 13, Sec 40	
FATIGUELIFE (Y)	[6.14.13]	NA	
FIRE	[6.14.22]	Pt F, Ch 13, Sec 17	
FIRE-AS	[6.14.22]	Pt F, Ch 13, Sec 17	
FIRE-MS	[6.14.22]	Pt F, Ch 13, Sec 17	
FIRE-MS (hot-spots)	[6.14.22]	Pt F, Ch 13, Sec 17	
FIRE-CS	[6.14.22]	Pt F, Ch 13, Sec 17	
FUEL CELL POWERED SHIP (E) **FUEL CELL POWERED SHIP (NE)**	[6.14.61]	Pt C, Ch 2, App 3	
FUEL SAMPLING	[6.14.65]	Pt F, Ch 13, Sec 44	
GRABLOADING and GRAB (X)	[6.14.2]	Pt F, Ch 13, Sec 2	
GREAT LAKES ST LAWRENCE SEAWAY	[6.14.40]	NA	
GREEN PLUS	[6.8.4] a)	Pt F, Ch 7, Sec 1	
GREEN PLUS T	[6.8.4] b)	Pt F, Ch 7, Sec 1 and Pt F, Ch 7, Sec 6	
GREEN STAR 3 DESIGN	[6.8.4] c)	Pt F, Ch 7, Sec 2	This cumulative notation supersedes the notations **CLEAN-SEA** and **CLEAN-AIR**, when both are assigned
GREEN STAR 3	[6.8.4] d)	Pt F, Ch 7, Sec 5	
GREEN STAR 3 (TOC)	[6.8.4] e)	-	
GC CARGO HANDLING	[6.8.5]	Pt F, Ch 7, Sec 6	
H2 FUELLED	[6.14.56]	Pt C, Ch 1, App 14	
H2 FUELLED READY (X1, X2, X3)	[6.14.57]	Pt F, Ch 13, Sec 38	
HELIDECK	[6.14.19]	Pt F, Ch 13, Sec 16	
HELIDECK-H	[6.14.19]	Pt F, Ch 13, Sec 16	
HYBRID PROPULSION SHIP (HYB-…)	[6.14.44]	Pt F, Ch 13, Sec 28	**(1)**
HVSC	[6.14.18]	Pt F, Ch 13, Sec 15	
HVSC-NB	[6.14.18]	Pt F, Ch 13, Sec 15	
HVSC (rated voltage, rated frequency) READY (X1, X2, X3…) **LVSC (rated voltage, rated frequency) READY (X1, X2, X3…)**	[6.14.76]	Pt F, Ch 13, Sec 49	
ICE	[6.10.5]	-	
ICE CLASS IA	[6.10.2]	Part F, Chapter 9	**(6)**
ICE CLASS IA SUPER	[6.10.2]	Part F, Chapter 9	**(6)**
ICE CLASS IB	[6.10.2]	Part F, Chapter 9	**(6)**
ICE CLASS IC	[6.10.2]	Part F, Chapter 9	**(6)**
ICE CLASS ID	[6.10.3]	Part F, Chapter 9	**(6)**
IMSBC-A	[6.14.24]	Pt F, Ch 13, Sec 18	
IMSBC-nitrate	[6.14.24]	Pt F, Ch 13, Sec 18	
IMSBC-non cohesive	[6.14.24]	Pt F, Ch 13, Sec 18	

(1) A construction mark is added to this notation.

(2) This notation may be completed by the specific notations **-PRECOOLING**, **-QUICKFREEZE** and/or **-AIRCONT** (see [6.9.5]).

(3) This notation may be completed by the specific notations **-MIDSHIP** and **-TRANSFER** (see [6.14.7]).

(4) When ships are assigned the notations **CLEAN-SEA** and **CLEAN-AIR**, the two separate notations are superseded by the cumulative additional class notation **GREEN STAR 3 DESIGN** (see [6.8.4]).

(5) This notation may be completed by the specific features: **sequential**, **flow-through**, **dilution**.

(6) This notation may be completed by the specific notation **-HULL** (see [6.10.4]).

(7) This notation may be completed by the specific notation **Icebreaker** (see [6.11.1]).

Additional class notation	Reference for definition	Reference	Remarks
INERTGAS-A	[6.14.20]	Pt C, Ch 4, Sec 1	
INERTGAS-B	[6.14.20]	Pt C, Ch 4, Sec 1	
INERTGAS-C	[6.14.20]	Pt C, Ch 4, Sec 1	
INWATERSURVEY	[6.14.3]	Pt F, Ch 13, Sec 3	
INF 1, INF 2, INF 3	[6.14.35]	NA	**(1)**
IP-SERVICE	[6.14.74]	NA	
LASHING	[6.14.5]	Pt F, Ch 13, Sec 5	
LNG FUELLED or **CNG FUELLED**	[6.14.23] a)	Pt C, Ch 1, App 7 and Pt E, Ch 9, Sec 16	
LNG FUELLED (Main) or **CNG FUELLED (Main)**	[6.14.23] b)	Pt C, Ch 1, App 7 and Pt E, Ch 9, Sec 16	
LNG FUELLED (Aux) or **CNG FUELLED (Aux)**	[6.14.23] c)	Pt C, Ch 1, App 7 and Pt E, Ch 9, Sec 16	
LNG READY (X1, X2, X3…) or **CNG READY (X1, X2, X3…)**	[6.14.37]	Pt F, Ch 13, Sec 24	
LOADINT-HUG, **LOADINT-ST1**, **LOADINT-ST2**, **LOADINT-ST3**, **LOADINT-ST4**, **LOADINT-HUG-ST1**, **LOADINT-HUG-ST2**, **LOADINT-HUG-ST3**, **LOADINT-HUG-ST4**	[6.14.67]	Pt B, Ch 11, Sec 2	
LOADINT-LAS	[6.14.67]	Pt F, Ch 13, Sec 5, [3.5]	
LPG FUELLED	[6.14.51]	Pt C, Ch 1, App 13	
MAN OVERBOARD DETECTION SYSTEM (MOB)	[6.14.43]	Pt F, Ch 13, Sec 27	
MANOVR	[6.14.10]	Pt F, Ch 13, Sec 10	
MaSS-ADS **MASS-RCM** **MASS-RCU** **MASS-FAS**	[6.14.55]	Pt F, Ch 13, Sec 37	
METHYL/ETHYL ALCOHOL FUELLED	[6.14.58]	Pt C, Ch 1, App 15	
METHYL/ETHYL ALCOHOL FUELLED READY (X1, X2, X3)	[6.14.59]	Pt F, Ch 13, Sec 39	
MLCDESIGN	[6.14.16]	Pt F, Ch 13, Sec 13	
MON-HULL	[6.6.2]	Pt F, Ch 5, Sec 1	
MON-SHAFT	[6.6.3]	Pt F, Ch 5, Sec 2	
MOORING	[6.14.29]	Pt F, Ch 13, Sec 21	
NH3 FUELLED	[6.14.52]	Pt C, Ch 1, App 13	
NH3 FUELLED READY (X1, X2, X3)	[6.14.53]	Pt F, Ch 13, Sec 35	
NOx-Tier II-x%	[6.8.6]	Pt F, Ch 7, Sec 7	
NOx-Tier III	[6.8.7]	NA	
NOISE-PORT-OUT(X) **NOISE-PORT-IN(X)**	[6.7.5]	Pt F, Ch 6, Sec 4	
OCCS	[6.8.13]	Pt C, Ch 1, Sec 10, [20.9]	

(1) A construction mark is added to this notation.

(2) This notation may be completed by the specific notations **-PRECOOLING**, **-QUICKFREEZE** and/or **-AIRCONT** (see [6.9.5]).

(3) This notation may be completed by the specific notations **-MIDSHIP** and **-TRANSFER** (see [6.14.7]).

(4) When ships are assigned the notations **CLEAN-SEA** and **CLEAN-AIR**, the two separate notations are superseded by the cumulative additional class notation **GREEN STAR 3 DESIGN** (see [6.8.4]).

(5) This notation may be completed by the specific features: **sequential**, **flow-through**, **dilution**.

(6) This notation may be completed by the specific notation **-HULL** (see [6.10.4]).

(7) This notation may be completed by the specific notation **Icebreaker** (see [6.11.1]).

Additional class notation	Reference for definition	Reference	Remarks
OSA **OSA-PR**	[6.14.70]	Pt C, Ch 1, Sec 7 TASNEEF Guide for Optimized Shaft Alignment	
PERSONNEL LIFTING, **PERSONNEL LIFTING ADV**, **PERSONNEL LIFTING ADV PLUS**, **PERSONNEL LIFTING REC191**	[6.14.30]	TASNEEF Rules for loading and unloading arrangements and for other lifting appliances on board ships	
PERSONS WITH REDUCED MOBILITY (PMR-ITA)	[6.14.48]	Pt F, Ch 13, Sec 32	
PMA	[6.14.14]	NA	
PMS	[6.13.2]	Pt F, Ch 12, Sec 1	
PMS-CM(PROP)	[6.13.3]	Pt F, Ch 12, Sec 2	
PMS-CM(HVAC)	[6.13.4]	Pt F, Ch 12, Sec 3	
PMS-CM(CARGO)	[6.13.5]	Pt F, Ch 12, Sec 4	
PMS-CM(ELE)	[6.13.6]	Pt F, Ch 12, Sec 5	
PMS-CM(FDS)	[6.13.7]	Pt F, Ch 12, Sec 6	
PMS-CM	[6.13.8]	Pt F, Ch 12, Sec 7	
POLAR CLASS	[6.11.1]	Part F, Chapter 10	**(7)**
REDUCED WEIGHT OF ANCHOR (RW) AND **SUPER REDUCED WEIGHT OF ANCHOR (SRW)**	[6.14.62]	NA	
REF-CARGO	[6.9.2]	Pt F, Ch 8, Sec 2	**(1) (2)**
REF-CONT	[6.9.3]	Pt F, Ch 8, Sec 3	**(1) (2)**
REF-STORE	[6.9.4]	Pt F, Ch 8, Sec 4	**(1) (2)**
REMOTE SURVEYABLE SHIP (REMOTE)	[6.14.50]	Pt F, Ch 13, Sec 34	
RETENTION ON BOARD (ROB-X DAYS)	[6.8.11]	Pt F, Ch 7, Sec 8	
RISK MITIGATION (...)	[6.14.32]	NA	
ROUTE DEPENDENT LASHING (start date - end date)	[6.14.5]	Pt F, Ch 13, Sec 5	
☪ **SAHARA** **SAHARA**	[6.14.31]	Pt F, Ch 13, Sec 20	
SEEMP	[6.8.9]	NA	

(1) A construction mark is added to this notation.

(2) This notation may be completed by the specific notations **-PRECOOLING**, **-QUICKFREEZE** and/or **-AIRCONT** (see [6.9.5]).

(3) This notation may be completed by the specific notations **-MIDSHIP** and **-TRANSFER** (see [6.14.7]).

(4) When ships are assigned the notations **CLEAN-SEA** and **CLEAN-AIR**, the two separate notations are superseded by the cumulative additional class notation **GREEN STAR 3 DESIGN** (see [6.8.4]).

(5) This notation may be completed by the specific features: **sequential**, **flow-through**, **dilution**.

(6) This notation may be completed by the specific notation **-HULL** (see [6.10.4]).

(7) This notation may be completed by the specific notation **Icebreaker** (see [6.11.1]).

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Part A

Classification and Surveys

Chapter 2

ASSIGNMENT, MAINTENANCE, SUSPENSION AND WITHDRAWAL OF CLASS

SECTION 1 ASSIGNMENT OF CLASS

1 General

1.1 Main cases of assignment of class

1.1.1 Assignment of class *(1/2/2021)*

Class is assigned to a ship upon a survey, with the associated operations, which is held in order to verify whether it is eligible to be classed on the basis of the Rules of the Society (see Ch 1, Sec 1, [1.3.2]). This may be achieved through:

- the completion of the new building, during which a survey has been performed, or
- the completion of the new building, during which the survey has been carried out according to IACS Procedural Requirement PR 1B when the Society's class is assigned under double class or dual class regime with another QSCS Classification Society, or
- a survey carried out according to the IACS Procedural Requirement PR 1A, when ships change class from one QSCS Classification Society (see Note 1) to the Society or
- a survey carried out according to the IACS Procedural Requirement PR 1B, when the Society's class is added to a ship already in class with another QSCS Classification Society, or
- a survey carried out according to the IACS Procedural Requirement PR1D, when ships change class from one non-QSCS Classification Society (see Note 1) to the Society or is not classed at all.

Note 1: The obligations of the Procedural Requirements PR1A, PR1B and PR1D apply as pertinent to QSCS Classification Societies.

1.1.2 Reassignment of class *(1/1/2015)*

Reassignment of class is that part of the process of classification consisting in all the steps aimed at issuing a Certificate of Classification to a ship previously classed with the Society but which had the class withdrawn.

Four cases are considered for reassignment of class:

a) ship in service classed by another QSCS Classification Society,

b) ship in service not classed by another QSCS Classification Society,

c) ship no longer in service since the withdrawal of the class by the Society,

d) ship no longer in service since the withdrawal of the class by another Society, QSCS or not.

2 New building procedure

2.1 Ships surveyed by the Society during construction

2.1.1 When a ship is surveyed by the Society during construction, it is to comply with those requirements of the Rules which are in force and applicable depending on the class of the ship, taking into account the provisions of Ch 1, Sec 1, [2.2].

2.1.2 The Society:

- approves the plans and documentation submitted as required by the Rules
- proceeds, if required, with the appraisal of the design of materials and equipment used in the construction of the ship and their inspection at works
- carries out surveys or obtains appropriate evidence to satisfy itself that the scantlings and construction meet the rule requirements in relation to the approved drawings
- attends tests and trials provided for in the Rules
- assigns the construction mark ✠; refer to Ch 1, Sec 2, [3.2.1].

2.1.3 The Society defines in specific Rules which materials and equipment used for the construction of ships built under survey are, as a rule, subject to appraisal of their design and to inspection at works, and according to which particulars.

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c) the Society is to perform review and approval of plans based on its own class Rules. As a minimum scope, the approval of the plans listed in Ch 3, Sec 1, Tab 3 is required by the Society to verify compliance with its applicable classification Rules. The Society is to record the written documentary evidence of the above-mentioned plans which were approved as complying with the Society's own Rules or with other requirements confirmed acceptable in accordance with its own Rules;

d) the Society is to perform the survey during fabrication, construction and testing of the vessel based on its own classification Rules;

e) Certification of materials and components of manufacturers is to be carried out by the Society in accordance with its own classification Rules;

f) the Society is to issue its certificate of classification in accordance with its own classification Rules for the ship upon satisfactory completion of new construction survey process; and

g) records in relation to the above-mentioned paragraphs are maintained, demonstrating achievement of the requirements in the items covered by the services performed, as well as the effective operation of the quality system.

3 Ships classed after construction

3.1 General

3.1.1 *(1/7/2019)*

When an Owner applies to the Society for a ship already in service to be admitted to class, the application will be processed differently depending on whether the ship is:

- classed with a QSCS Classification Society and in full compliance with all applicable and relevant IACS Resolutions, or
- classed with a QSCS Classification Society but not in full compliance with all applicable and relevant IACS Resolutions, or
- not classed with a QSCS Classification Society, or
- not classed at all.

3.2 Transfer to the Society's class of a ship in service classed by another QSCS Classification Society and in full compliance with all applicable and relevant IACS Resolutions (IACS PR 1A)

3.2.1 Documentation to be submitted and design assessment *(1/1/2026)*

As a rule, the minimum documentation to be supplied for filing purposes is listed hereinafter. The Society may carry out a design assessment on a case-by-case basis (additional documentation may be requested).

a) Main plans:
   1) general arrangement,
   2) capacity plan,
   3) hydrostatic curves,
   4) loading manual where required,
   5) damage stability calculation, where required.

b) Hull structure plans:
   1) midship section,
   2) scantling plan,
   3) decks,
   4) shell expansion,
   5) transverse bulkheads,
   6) rudder and rudder stock,
   7) hatch covers,
   8) for CSR ships, plans showing, for each structural element, both as-built and renewal thicknesses and any thickness for "voluntary addition".

c) Machinery plans:
   1) machinery arrangement,

2) intermediate, thrust and screw shafts,
3) propeller,
4) main engines, propulsion gears and clutch systems (or Manufacturer's make, model and rating information),
5) for steam turbine ships: main boilers, superheaters and economisers (or Manufacturer's make, model and rating information) and steam piping,
6) bilge and ballast piping diagram,
7) wiring diagram,
8) steering gear system piping and arrangements and steering gear (or Manufacturer's make and model information),
9) torsion vibration calculations for ships less than two years old,
10) plans for flexible couplings and/or torque limiting shafting devices in the propulsion line shafting (or Manufacturer's make, model and rating information), for ships assigned with one of the ice additional class notations described in Ch 1, Sec 2, [6.10.2],
11) pumping arrangements at the forward and after ends, drainage of cofferdams and pump rooms for oil tankers.

d) Plans required for ships assigned one of the additional class notations for Automated Machinery Systems:
1) instrument and alarm list,
2) fire alarm system,
3) list of automatic safety functions (e.g. slowdowns, shutdowns, etc),
4) function testing plan.

e) Additional Documents required for approval of Alternative Design and Arrangements:
1) Additional Documents required for approval of Alternative Design and Arrangements.

f) Additional plans/documents required for passenger ships:
1) fire control drawings
2) drawings of structural fire protection (including passive fire protection)
3) HVAC line diagrams and ducting arrangements
4) in case of ro-ro passenger ships, plans and documents related to fixed and movable ramps.

Alternative technical data may be accepted by the Society in lieu of specific items of the listed documentation not available at the time of the transfer of class.

3.2.2 Basic conditions of IACS Procedural Requirement No. 1A *(1/7/2020)*

This Procedural Requirement is applicable, unless stated otherwise, to ships of over 100 GT of whatever type, self-propelled or not, restricted or unrestricted navigation, except for "inland waterway" ships.

The age of the ship considered in the procedure for transfer of class is the age calculated from the date of delivery to the "Date Request for class was received" in IACS Form G Part A - Survey Status Request.

The obligations of the Procedural Requirement continue to apply when a ship's class is suspended by the losing Society and for 6 months following withdrawal of a ship's class by the losing Society.

Cases concerning ships of 100 GT or less are dealt with by the Society on a case-by-case basis.

Whenever the Society is requested by an Owner to accept a ship in service into class:

a) the relevant surveys specified in Ch 3, Sec 2, [1.1.2] are to be satisfactorily completed for entry into class;

b) for ships less than 15 years of age, an Interim Certificate of Classification can be issued only after the Society has completed all overdue surveys and all overdue conditions of class previously issued against the ship as specified to the Owner by the losing Society;

c) for ships 15 years of age and over, an Interim Certificate of Classification can be issued only after the losing Society has completed all overdue surveys and all overdue conditions of class previously issued against the ship;

d) any outstanding conditions of class are to be dealt with by their due dates;

e) the principles given in a), b) and c) above apply to any additional conditions of class issued against the ship arising from surveys which were not included in the initial survey status provided to the Society by the losing Society because the surveys were carried out in close proximity to the request for transfer of class. If received after the issuance of the Interim Certificate of Classification by the Society and overdue, such additional conditions of class are to be dealt with at the first port of call by the relevant Society depending on the age of the ship;

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d) when the Owner is advised that one of the Societies involved in double or dual class arrangement is suspending or withdrawing class. he is to inform the remaining Society of the action taken by the other Society without delay;

e) copies of the plans listed in [3.2.1] are to be provided to the Society as a prerequisite to obtaining a full term Certificate of Classification. If the Owner is unable to provide all of the required plans, the Society requests that the Owner authorise the first Society to transfer copies of such of these plans as it may possess directly to and upon request from the Society, with the advice that the first Society will invoice the Society and the Society may, in turn, charge the associated costs to the Owner.

3.5.3 Conditions of IACS Procedural Requirement No. 1B, preventing issue of the Interim Certificate of Classification *(1/7/2020)*

Prior to issuing an Interim Certificate of Classification on the date of the ship's delivery, the Society is:

a) obtain from the Owner, a written request for entry into the Society's class at ship's delivery, containing an authorisation for the Society to obtain a copy of the first Certificate of Classification from the first Society; and

b) obtain the first Certificate of Classification from the Headquarters of the first Society or one of its designated control or management centres or from the attending Surveyor at the builder's yard, including any outstanding conditions of class and information normally contained in the classification status;

c) carry out and satisfactorily complete all relevant surveys specified in Ch 3, Sec 2, [2.2.1].

3.5.4 Limitations of IACS Procedural Requirement No. 1B for the Certificate of Classification *(1/1/2008)*

Prior to final entry into its class, the Society is obligated to obtain plans and information in accordance with the requirements of [3.2.1].

3.5.5 Surveys *(1/1/2008)*

The Surveyor:

a) checks that the outcome of the design assessment (if any), survey instructions and the first Certificate of Classification or an attachment to the first Certificate of Classification and/or a class survey record from the first Society are available,

b) surveys the ship to check that it complies with the outcome of the design assessment (if any) and with the requirements of Ch 3, Sec 2, [2.2.1].

3.5.6 Interim Certificate of Classification *(1/7/2020)*

Upon satisfactory completion of the survey for assignment of class, the Surveyor issues to the Owner an interim Certificate of Classification valid not more than 5 months, provided that the conditions in [3.5.2] to [3.5.5] are met. This certificate indicates the class notations.

The certificate is issued with a Survey Endorsement Sheet where all outstanding conditions of class and significant memoranda are recorded; class notations requested by the Owner and not assigned due to pending items are clearly indicated together with the relevant pending items.

3.5.7 Certificate of Classification *(1/7/2020)*

Upon satisfactory review of the survey reports, the Society issues to the Owner the Certificate of Classification valid for the whole period of class, provided that the conditions in [3.5.2] to [3.5.5] are met. The certificate indicates the class notations.

All outstanding conditions of class, significant memoranda and pending items for class notations not assigned are made available in the ship status.

3.6 Ships in service classed with a QSCS Classification Society but not in full compliance with all applicable and relevant IACS Resolutions or not classed with a QSCS Classification Society or not classed at all (PR1D)

3.6.1 General *(1/7/2019)*

In the case of a ship:

- classed with a QSCS Classification Society but not in full compliance with all applicable and relevant IACS Resolutions; or,
- not classed with a QSCS Classification Society; or,
- not classed at all,

the requirements of [3.6.2] to [3.6.10] apply.

3.6.2 Documentation to be submitted and design assessment *(1/1/2026)*

As a rule, the minimum documentation to be supplied is listed hereinafter. The Society will carry out a plan appraisal before the Interim Certificate of Classification is issued:

a) Main plans:
   1) general arrangement,
   2) capacity plan,
   3) loading manual, where required, which is to contain, as a minimum, loading cases, calculations of still water bending moments, and relevant documents, particulars of loading calculator and instruction booklet as per the Society's requirements, according to the case,
   4) hydrostatic curves and stability documentation, as applicable (refer to Part B, Chapter 3),
   5) damage stability calculations, where required.

b) Hull structure plans:
   1) midship section,
   2) scantling plans,
   3) profile and decks plan,
   4) shell expansion,
   5) watertight bulkheads, transverse and longitudinal (if any),
   6) rudder and rudder stock,
   7) hatch covers,
   8) for CSR ships, plans showing, for each structural element, both as-built and renewal thicknesses and any thickness for "voluntary addition".

c) Machinery plans:
   1) engine room general arrangement,
   2) diagram of fuel- (transfer, service), bilge-, ballast-, lubricating oil-, cooling-, steam- and feed-, general service and starting compressed air piping,
   3) intermediate, thrust- and screw shafts,
   4) propeller,
   5) main engines, propulsion gears and clutch systems (or Manufacturer make, model and rating information),
   6) for steam turbine vessels, main boilers, superheaters and economisers (or Manufacturer make, model and rating information) and steam piping,
   7) drawings of boilers and air receivers,
   8) drawings of steering gear systems, piping and arrangements and steering gear Manufacturer make and model information,
   9) torsional vibration calculations as per conditions laid down in Pt C, Ch 1, Sec 9; such documents are required only for ships less than 2 years old or for older ships the propelling system of which has been modified during the two years preceding the classification.

d) Electrical installation plans and wiring diagrams:
   1) master plan of power distribution, lighting and emergency power circuits,
   2) single line diagram of networks and switchboards,
   3) location and arrangement of electrical equipment in hazardous areas.

e) Additional requirements for vessels with ice class notation:
   1) plans for flexible couplings and/or torque limiting shafting devices in the propulsion line shafting (or manufacturer make, model and rating information).

f) Additional plans required for oil tankers:
   1) pumping arrangement at the forward and after ends and drainage of cofferdams and pump rooms.

g) Additional plans required in order to assign unattended machinery space notation:
   1) instrument and alarm list;
   2) fire alarm system;
   3) list of automatic safety functions (e.g. slowdowns, shutdowns, etc.);

4) function testing plan.

Alternative technical data may be accepted by the Society in lieu of specific items of the listed documentation not available at the time of the transfer of class.

Additional documentation may be required according to Flag Administration requirements.

In cases where the vessel has been previously classed by the Society, the submission of the plans may be specially considered subject to confirmation that no alteration or modification has been made to the vessel since the withdrawal of the class by the Society.

In cases where the vessel has been previously classed by the Society or a~~nother~~ QSCS Classification Society, the extent of the plan appraisal may be specially considered subject to confirmation that no alteration or modification has been made to the vessel.

3.6.3 Basic conditions of IACS Procedural Requirement PR1D *(1/7/2019)*

IACS Procedural Requirement PR1D contains procedures and requirements pertaining to class entry of ships not subject to IACS Procedural Requirement PR1A or IACS Procedural Requirement PR1B and is applicable, unless stated otherwise, to ships in service classed with a QSCS Classification Society but not in full compliance with all applicable and relevant IACS Resolutions or not classed with a QSCS Classification Society or not classed at all, of over 100 GT of whatever type, self-propelled or not, restricted or unrestricted service, except for "inland waterway" vessels.

Cases concerning ships of 100 GT or less are dealt with by the Society on a case-by-case basis.

Cases concerning ships to which the class is reassigned are to be dealt with according to [5].

Whenever the Society is requested by an Owner to accept a ship in service into class:

a) the relevant surveys specified in Ch 3, Sec 2, [3.1.2] are to be satisfactorily completed for entry into class;

b) the copies of the plans listed in [3.6.2] are to be provided to the gaining Society as a prerequisite to obtaining an Interim or Full Term Certificate of Class;

c) required plan appraisal is to be satisfactorily completed for entry into class.

3.6.4 Conditions of IACS Procedural Requirement PR1D, preventing issue of the Interim Certificate of Classification *(1/7/2020)*

Prior to issuing an Interim Certificate of Classification, the Society is to obtain a written request to class the vessel from the Owner.

The Society cannot issue an Interim Certificate of Classification, or other documents enabling the ship to trade under its classification:

a) until all required surveys specified in Ch 3, Sec 2, [3.1.2] have been completed,

b) until the appraisal of the plans listed in [3.6.2] as required by the Society to verify compliance with its applicable classification Rules, has been carried out. Where issues remain outstanding, the Society may impose a condition of class for a limited period in accordance with Sec 2, [2.14],

c) before giving the opportunity to the flag Administration to provide any further instructions within 3 working days, in compliance with the requirements of Art. 10.5 of Regulation (EC) No 391/2009.

3.6.5 Surveys *(1/1/2015)*

The Surveyor:

a) checks that the outcome of the plan appraisal and survey instructions are available,

b) surveys the ship to check that it complies with the outcome of the plan appraisal and with the requirements of Ch 3, Sec 2, [3.1.2],

c) attends tests and trials provided for in the Rules.

3.6.6 Interim Certificate of Classification *(1/7/2020)*

Upon satisfactory completion of the survey for assignment of class, the Surveyor issues to the Owner an Interim Certificate of Classification valid not more than 5 months. This certificate indicates the class notations.

The certificate is issued with a Survey Endorsement Sheet where all outstanding conditions of class and significant memoranda are recorded; class notations requested by the Owner and not assigned due to pending items are clearly indicated together with the relevant pending items.

3.6.7 Certificate of Classification *(1/7/2020)*

Upon satisfactory review of the survey reports, the Society issues to the Owner the Certificate of Classification valid for the whole period of class. The certificate indicates the class notations.

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Part A

Classification and Surveys

Chapter 3

SCOPE OF SURVEYS (all ships)

SECTION 1 SURVEY FOR NEW CONSTRUCTION

1 Hull

1.1 General

1.1.1 Scope *(1/7/2016)*

The scope of this Article [1] includes the following main activities:

a) Examination of the parts of the ship covered by classification Rules and by applicable statutory regulations for hull construction, to obtain appropriate evidence that they have been built in compliance with the Rules and regulations, taking account of the relevant approved drawings.

b) Appraisal of the manufacturing, construction, control and qualification procedures, including welding consumables, weld procedures, weld connections and assemblies, with indication of relevant approval tests.

c) Witnessing inspections and tests as required in the classification Rules used for ship construction including materials, welding and assembling, with specification of the items to be examined and/or tested, the methods (e.g. by hydrostatic, hose or leak testing, non-destructive examination, verification of geometry) and who is to carry out such inspections and tests.

Appraisal of materials and equipment used for ship construction and their inspection at works is not included in this Article [1]. Details of requirements for hull and machinery steel forgings and castings and for normal and higher strength hull structural steel are given in Pt D, Ch 2, Sec 3, Pt D, Ch 2, Sec 4 and Pt D, Ch 2, Sec 1, [2] respectively. Acceptance of these items is verified through the survey process carried out at the Manufacturer's works and the issuing of the appropriate certificates.

In addition to above, for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10 (Goal-based ship construction standards for bulk carriers and oil tankers), see also Sec 2.

1.2 Definitions

1.2.1 Hull structure *(1/1/2008)*

The hull structure (see Note 1) is defined as follows:

a) hull envelope including all internal and external structures,

b) superstructures, deckhouses and casings,

c) welded foundations, e.g. main engine seatings,

d) hatch coamings, bulwarks,

e) all penetrations fitted and welded into bulkheads, decks and shell,

f) the fittings of all connections to decks, bulkheads and shell, such as air pipes and ship side valves - all items of ILLC 1966, as amended,

g) welded attachments to shell, decks and primary members, e.g. crane pedestals, bitts and bollards, but only as regards their interaction on the hull structure.

Note 1: A glossary of hull terms and hull survey terms can be found in IACS Recommendation 82.

1.2.2 Documents *(1/1/2008)*

Reference to documents also includes electronic transmission or storage.

1.2.3 Survey methods *(1/7/2016)*

The survey methods which the Surveyor is directly involved in are as follows:

a) Patrol is defined as the act of checking on an independent and unscheduled basis that the applicable processes, activities and associated documentation of the shipbuilding functions identified in Tab 1 continue to conform to classification and statutory requirements.

b) Review is defined as the act of examining documents in order to determine traceability and identification, and to confirm that processes continue to conform to classification and statutory requirements.

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Table 1 : New construction survey activities *(1/1/2026)*

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1	Welding:								
1.1	Welding consumables	Approved by Society separately at the Manufacturer's	Review approval status and patrol, verify storage, handling and treatment in accordance with Manufacturer's requirements	Pt D, Ch 5, Sec 2		Consumable specification and approval status	Not required	Identify consumables against approved list	
								Verify temporary and permanent storage facilities	E.g. kept dry, covered, where applicable heated
								Verify traceability	E.g. random batch number checking
1.2	Welder qualification	Qualified welders	Review of welder certification and patrol	- Guide for Welding - IACS Rec.47		Shipyard's records with individual's identification	Not required	Verify welder qualification standard, e.g. class or recognised standard approval	
								Verify welder approved for weld position	
								Verify validity of qualification certificate	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.3	Welding - mechanical properties (welding procedures)	All weld joint configurations, positions and materials to be covered by weld procedures approved by the Society or by another QSCS Classification Society available	Review and patrol	Pt D, Ch 5, Sec 4		Approved weld procedure specification and welding plan relevant to the ship project or process	Not required	Verify procedures are available at relevant workstations	
		The Society witnesses all new weld procedure qualification tests carried out in the shipyard whenever the Society is surveying in the shipyard	Witness					Verify weld procedure records have been approved and cover all weld processes and positions in accordance with classification or recognised standards and are available for the Surveyor's reference	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.3a	Welding equipment	Correctly calibrated and maintained	Patrol and review			Shipbuilder's maintenance and calibration records	Not required	Verify condition of machinery and equipment	
								Verify machines are calibrated by appropriate staff	
								Verify calibration carried out in accordance with Manufacturer's recommendations	
								Verify calibration in accordance with maintenance schedule	
1.3b	Welding environment	Satisfactory environment	Patrol	- Guide for welding - IACS Rec.47			Not required	Verify welding areas clean, dry, well lit	
								Confirm relevant measures taken for any pre- or post- heat treatment, drying of surfaces prior to welding	
								Confirm shielding gases, fluxes protected	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.3c	Welding	Sufficient number of skilled supervisors	Review and Patrol	- Guide for welding - IACS Rec.47 - Rules for carrying out non-destructive examinations of welding				Verify supervision is effective	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.4	Welding-surface discontinuities	Substantially free from significant indications, satisfactory profile and size	Visual examination, surface detection techniques, review of documents and patrol of operator	- Guide for welding - IACS Rec.47 - Rules for carrying out non-destructive examinations of welding		Shipbuilder's and recognised standards and Rules as applicable, welding and NDE plans, NDE reports, operator qualifications	Not required	Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure	
								Verify NDE carried out in accordance with approved plans where applicable	
								Verify suitability of NDE methods	
								Verify operators suitably qualified, particularly where subcontractors have been employed	
								Verify NDE is carried out according to the acceptable process	
								Review NDE records	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.5	Welding - embedded discontinuities	NDE is to be carried out by qualified operators capable of ensuring that welds are substantially free from significant indications	Radiography and ultrasonic testing, review of documents and patrol of operator, examination of films	- Guide for Welding - IACS Rec.47 - Rules for carrying out non-destructive examinations of welding		Shipbuilder's and recognised standards and Rules as applicable, welding and NDE plans, NDE reports, operator qualifications	Not required	Identify workstations where NDE is carried out, e.g. panel line butt welds, castings into hull structure	
								Verify NDE carried out in accordance with approved plans, where applicable	
								Verify suitability of NDE methods	
								Verify operators suitably qualified, particularly where subcontractors have been employed	
								Verify that records have been completed and in accordance with recognised standards, e.g. IQI and sensitivity recorded	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
1.5 Cont'd	Welding - embedded discontinuities							Verify that reports and radiographs have been evaluated correctly by the shipbuilder. Systematic review of radiographs carried out by the Surveyor	
								Verify equipment calibration is satisfactory and in accordance with Manufacturer's and recognised standards and requirements	
								Verify NDE is carried out according to the acceptable process	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
2	Steel preparation and fit up:								
2.1	Surface preparation, marking and cutting	Traceability and acceptability of material, check of steel plates and profiles, material type, scantling identification, testing marks	Patrol	- Guide for welding - IACS Rec.47		Material certificates, shipbuilder's marking/cutting production documents at the work stage - documents retained at the facility	Not required	Verify stockyard storage satisfactory	
								Verify material traceability, e.g. stamping identification against material certification, archiving of records	
								Verify transfer marking after treatment line	
								Verify standard of shotblasting and priming	
								Verify suitability of primer	
								Verify that steel grades can be identified	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
2.1 Cont'd	Surface preparation, marking and cutting							Verify machinery is adjusted to stay within the Society's or Manufacturer's recommendations	
								Verify accuracy of marking and cutting	
								Verify storage of piece parts	
2.2	Straightening	Maintain material properties. Acceptance of forming method against improper deformations	Patrol and review	- Guide for welding - IACS Rec.47		Recognised standards, approved procedures	Not required	Verify that straightening processes are approved for the grade and type of steel, e.g. thermo mechanical control process (tmcp), Z plate	
								Verify that plates and sections are within recognised tolerances	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
2.3	Forming	Maintain material properties. Acceptance of forming method against improper deformations	Patrol	- Guide for welding - IACS Rec.47		Shipbuilder's procedure for hot forming	Not required	Verify that temperature control is exercised by the operator	
								Verify that suitable methods of temperature control are available when forming special steels and materials	
								Verify that forming processes are acceptable	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
2.4	Conformity with alignment/fit-up/gap criteria	Check alignment/fit-up/gap against reference standards	Patrol	- Guide for welding - IACS Rec.47		Shipbuilder's and recognised standards and Rules as applicable	Not required	Verify the processes to ensure satisfactory fit-up and alignment at all workstations	
								Verify that edge preparations are re-instated where lost during fitting operations	
								Verify remedial procedures are in place to compensate for wide gaps and alignment deviations	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
2.5	Conformity for critical areas, when defined, with alignment/fit-up or weld configuration	Check alignment/fit-up/gap against approved drawings	Witness and review	- Guide for welding - IACS Rec.47		Shipbuilder's and recognised standards and Rules as applicable, approved plan or standard, builder's records	Approved plans of critical areas, if applicable	Verify that the information relevant to the latest approved drawings is available at the workstations	
								Verify the processes to ensure satisfactory fit-up and alignment at all workstations	
								Verify that edge preparations are re-instated where lost during fitting operations	
								Verify remedial procedures are in place to compensate for wide gaps and alignment deviations	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
3	Steelwork process, e.g. sub-assembly, block, grand and mega block assembly, pre-erection and erection, closing plates	Compliance with approved drawings, visual examination of welding and material, check of alignment and deformations	Patrol of the process and witness of the completed item	- Guide for welding - IACS Rec.47		Approved plans, shipbuilder's inspection records, shipbuilder's and recognised standards and Rules as applicable, construction plan (steelwork sub-division)		Verify that the information relevant to the latest approved drawings is available at the workstations	
								Verify that correct weld sizes have been adopted	
								Verify operation of the welding processes at the different work stages is satisfactory	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
3 Cont'd	Steelwork process, e.g. sub-assembly, block, grand and mega block assembly, pre-erection and erection, closing plates							Verify that piece parts are identifiable	
								Verify that fit-ups are within recognised tolerances	
								Verify that correct welding requirements specified in reference 1 of this table have been adopted	
								Verify processes for closing plates are acceptable	
								Confirm that steelwork is in accordance with the approved plan	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
4	Remedial work and alteration	Welding, check against deformation, alignment	Review records and witness	- Guide for welding - IACS Rec.47		Permanent record of shipyard surveyable item		Verify that records have been maintained of significant deviations from the approved plans, for situations such as mis-cut openings, re-routing outfit items	
								Verify that all deviations brought to the attention of the Society by the shipbuilder are acceptable	
5	Tightness testing, including leak and hose testing, hydropneumatic testing	Absence of leaks	Review and witness of the test	Pt B, Ch 12, Sec 3	Reg. II-1/11 of SOLAS as amended	Approved tank testing plan, shipbuilder's inspection records	Approved tank testing plan	Confirm that tank testing is carried out in accordance with the approved plan	
								Confirm the methods used to carry out leak testing	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
5 Cont'd	Tightness testing, including leak and hose testing, hydropneumatic testing							Confirm that correct test pressures maintained for leak, hose and hydro and hydropneumatic testing are satisfactory	
								Verify that adequate records of the tank testing have been maintained	
6	Structural testing	Structural adequacy of the design	Review and witness of the test	Pt B, Ch 12, Sec 3	Reg. II-1/11 of SOLAS as amended	Approved tank testing plan, shipbuilder's inspection records	Approved tank testing plan	Confirm that tank testing is carried out in accordance with the approved plan	
								Confirm that correct test pressures maintained for testing are satisfactory	
								Verify that adequate records of the tank testing have been maintained	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
7	Corrosion protection systems, e.g. coatings, cathodic protection, impressed current, except for coating system subject to PSPC	Salt water ballast tanks with boundaries formed by the hull envelope, and also bulk carrier hold internal surfaces, coamings and hatch covers are to have an efficient protective coating. Safety aspects of cathodic systems to be dealt with separately.	Review and report on builder's & Manufacturer's documentation	Pt B, Ch 11, Sec 1 and Pt E, Ch 4, Sec 3, [11]	Reg. II-1/3-2 of SOLAS as amended	Manufacturer's and builder's specification	Corrosion protection specifications	Verify that applied coatings are approved and review records of application	
								Verify that adequate records have been maintained and copied to the ship construction file	
	Application Antifouling Systems		Review		AFS Convention	Painting specification	Paint specification and Mfq declaration	Verify that adequate records have been maintained and copied to the ship construction file	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
7.1	Application of protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers subject to PSPC	Monitor implementation of the coating inspection requirements	Patrolling and review	UI SC223.	Reg. II-1/3-2 of SOLAS as amended	Signed and Verified Tripartite Agreement	Coating technical file	Verify that applied coatings are approved and review records of application in accordance with Chapter 7 of Annex to MSC.215(82).	
8	Installation, welding and testing of the following:								
8.1	Hatch covers	Tightness and securing	Witness	Pt B, Ch 12, Sec 3	Reg. 13-14-15 and 16 of ILLC '66	Approved tank testing plan, shipbuilder's inspection records	Details required, structural drawings	Confirm leak test of hatch covers	
								Confirm operation and securing test	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
8.2	Doors and ramps integral with the shell and bulkheads	Tightness and securing	Witness	Pt B, Ch 12, Sec 3	Reg. II-1/18 of SOLAS as amended; Reg. 12 and 21 of ILLC '66	Approved tank testing plan, shipbuilder's inspection records	Details required	Confirm leak test	
								Confirm operation and securing test	
								Confirm safety device operation	
								Ensure correct maintenance logs/manuals supplied with the ship construction file	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
8.3	Rudders	Fitting	Witness	Pt B, Ch 12, Sec 3		Approved plan, shipbuilder's inspection records	Details required, structural drawings	Confirm alignment and mounting and fitting up to the connection to the tiller	
								Confirm function test	
								Verify fitting of pintles and all securing bolts	
								Verify all fit-up records including all clearances maintained and placed into ship construction file	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
8.4	Forgings and castings	Compliance with approved drawings, visual examination of welding and material, check alignment and deformations	Patrol of the process and witness of the completed item	Pt D, Ch 2, Sec 3 and Pt D, Ch 2, Sec 4		Approved plans, shipbuilder's inspection records, shipbuilder's and recognised standards and Rules as applicable, construction plan (steelwork sub-division)	Copies of certificates of forgings and castings	Verify castings and forgings against material certificate	
								Verify that correct welding and fit-up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify that material certificates are included in the ship construction file	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
8.5	Appendages							Verify that correct welding and fit-up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
8.6	Equipment forming the watertight and weathertight integrity of the ship, e.g. overboard discharges, air pipes, ventilators	Tightness and securing	Witness		Reg. II-1/16 and Reg II-1/16-1 of SOLAS as amended; Reg. 17-18-19-20-22-23 of ILLC '66	Approved tank testing plan, shipbuilder's inspection records	Details required	Verify that correct welding and fit-up requirements specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify compliance with Load line Convention 1966 as amended - i.e. all fittings in accordance with the record of freeboard assignment	
				Pt C, Ch 1, Sec 10				Verify air pipes, vents etc. closing devices are approved type	
								Verify material certificates for overboard discharges, where applicable	
								Verify record of freeboard assignment and all material certificates included in the ship construction file	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
9	Freeboard marks and draught marks	Within allowable tolerances and in accordance with the freeboard assignment	Witness		Reg. 4- 5- 6- 7 and 8 of ILLC '66		Details required	Verify freeboard marks in accordance with load line assignment	
								Verify draught marks in accordance with the agreed tolerances specified by the builder unless more onerous flag State requirements	
10	Principal dimensions	Within allowable tolerances	Review and witness	- Guide for welding - IACS Rec.47		Details required		Verify principal dimensions in accordance with recognised standards	
								Verify dimensions included in ship construction file	
11	Safety Construction certification	No outstanding imperfections or defects	Witness		Reg I/7 or Reg. I/10 of SOLAS as amended, as appropriate			Verify that Administration requirements have been incorporated into the hull structure	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
12	watertight cable transit seal systems	compliance with approved drawings, visual examination of fitting, check alignment and securing	patrol of the process and witness of the completed item		Reg. II-1/13 and 13-1 of SOLAS as amended	shipbuilder's inspection records, manufacturer's specification	Cable Transit Seal Systems Register	Verify that correct welding and fit up requirements, including as specified in reference 1, 2.4 and 2.5 of this table have been adopted	
								Verify watertight cable transit seal systems have been installed in accordance with the manufacturer's requirements and are type approved	
								Verify the format and content of the Register to confirm it contains a list of the watertight cable transits, applicable cable transit information and sections to maintain in-service maintenance and survey records.	

No.	Shipbuilding quality control function	Survey Requirements for Classification	Survey Method required for Classification	Society Rule reference	Statutory requirements and relevant reference	Documentation available to Surveyor during construction	Documentation for Ship Construction File	Specific activities	Society proposals for the project
								Verify that, where specified, appropriate specialized tools have been used	

2 Requirements for Tankers and Bulk Carriers subject to SOLAS Chapter II-1 Part A-1 Regulation 3-10

2.1 Examination and test plan for newbuilding activities

2.1.1 Plans to be provided *(1/7/2016)*

The shipbuilder is to provide plans of the items which are intended to be examined and tested in a document known as the Survey Plan, taking into account the ship type and design. This Survey Plan shall be reviewed at the time of the kick off meeting, and are to include:

a) a set of requirements, including specifying the extent and scope of the construction survey(s) and identifying areas that need special attention during the survey(s), to ensure compliance of construction with mandatory ship construction standards including:
   1) Types of surveys (visual, non-destructive examination, etc.) depending on location, materials, welding, casting, coatings, etc.
   2) Establishment of a construction survey schedule for all assembly stages from the kick-off meeting, through all major construction phases, up to delivery.
   3) Inspection/survey plan, including provisions for critical areas identified during design approval.
   4) Inspection criteria for acceptance.
   5) Interaction with shipyard, including notification and documentation of survey results.
   6) Correction procedures to remedy construction defects.
   7) List of items that would require scheduling or formal surveys.
   8) Determination and documentation of areas that need special attention throughout ship's life, including criteria used in making the determination.

b) a description of the requirements for all types of testing during survey, including test criteria.

2.2 Design Transparency

2.2.1 *(1/7/2023)*

For ships subject to compliance with IMO Res. MSC.287(87), IMO Res. MSC.290(87), IMO Res. MSC.454(100) and IMO MSC.1/Circ.1343, readily available documentation is to include the main goal-based parameters and all relevant design parameters that may limit the operation of the ship.

2.3 Ship Construction File (SCF)

2.3.1 Classification items *(1/7/2021)*

A Ship Construction File (SCF) with specific information on how the functional requirements of the Goal-based Ship Construction Standards for Bulk Carriers and Oil Tankers have been applied in the ship design and construction is to be

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SECTION 2 SURVEY FOR ASSIGNMENT OF CLASS OF A SHIP IN SERVICE

1 Surveys required by IACS Procedural Requirement PR1A

1.1 Transfer to the Society's class of a ship in service classed by another QSCS Classification Society and in full compliance with all applicable and relevant IACS Resolutions

1.1.1 General *(1/7/2020)*

Surveys for assignment of class may be credited as periodical surveys for maintenance of class, provided that the losing Society is a QSCS Classification Society as defined in Ch 2, Sec 1, [1.1.1]. In this case, all conditions of class due for compliance at that periodical survey are to be complied with.

1.1.2 Surveys *(1/7/2024)*

Notwithstanding the records indicating that all surveys are up-to-date, a survey for assignment of class is held by the Society, the extent of which is based on the age of the ship and the losing Society's class status as follows:

a) Hull:

1) for ships less than 5 years of age the survey takes the form of an annual survey;
2) for ships between 5 and 10 years of age the survey includes an Annual Survey and inspection of a representative number of ballast spaces;
3) for ships of 10 years of age and above but less than 20 years of age, the survey includes an Annual Survey and inspection of a representative number of ballast spaces and cargo spaces. For gas carriers, in lieu of the internal inspection of cargo spaces, the following applies:
   - inspection of surrounding ballast tanks and void spaces, including external inspection of independent cargo tanks and associated supporting systems as far as possible;
   - review of cargo log books and operational records to verify the correct functioning of the cargo containment system.

   For oil tankers (including product carriers), and chemical tankers of 10 years of age and above but less than 15 years of age, in lieu of the internal inspection of cargo tanks not fitted with internal stiffening and framing, inspections of surrounding ballast tanks, void spaces and deck structure are to be applied;
4) for ships provided with the Additional Service Feature "ESP" which are 15 years of age and above but less than 20 years of age, the survey has the scope of a class renewal survey or an intermediate survey, whichever is due next;
5) for all ships which are 20 years of age and above, the survey has the scope of a class renewal survey (this is also applicable to ships having their hull under continuous survey);
6) in the context of applying items 4) and 5) above, if dry-docking of the ship is not due at the time of transfer, consideration can be given to carrying out an underwater examination in lieu of dry-docking;
7) in the context of applying items 4) and 5), as applicable, the anchors and anchor chain cables ranging and gauging for vessels over 15 years of age is not required to be carried out as part of the class entry survey unless the class entry survey is being credited as a periodical survey for maintenance of class.

   If the class entry survey is to be credited as a periodical survey for maintenance of class, consideration may be given by the gaining society to the acceptance of the anchors and anchor chain cables ranging and gauging carried out by the losing society provided they were carried out within the applicable survey window of the periodical survey in question;
8) in the context of applying items 1) to 6) above, as applicable:
   - if the class entry survey is to be credited as a periodical survey for maintenance of class, consideration may be given by the Society to the acceptance of thickness measurements taken by the losing society provided they were carried out within the applicable survey window of the periodical survey in question;
   - if the class entry survey is not to be credited as a periodical survey for maintenance of class, consideration may be given by the Society to the acceptance of thickness measurements taken by the losing society provided they were carried out within 15 months prior to completion of the class entry survey when it is within

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2.1.3 Surveys for dual class ships *(1/7/2007)*

Notwithstanding the records indicating that all surveys are up-to-date, a survey for assignment of class is held by the Society, the extent of which is that of an annual survey as a minimum.

2.2 Addition of the Society's class to a ship surveyed during construction by another QSCS Classification Society and in full compliance with all applicable and relevant IACS Resolutions, at ship's delivery

2.2.1 General *(1/1/2008)*

A survey for adding the Society's class at ship's delivery is to be held by the Society, the extent of which is that of an annual survey as minimum.

3 Surveys required by IACS Procedural Requirement PR1D

3.1 Ships in service classed with a QSCS Classification Society but not in full compliance with all applicable and relevant IACS Resolutions or not classed with a QSCS Classification Society or not classed at all

3.1.1 General *(1/1/2026)*

In this case, the class of the ship will be assigned upon a preliminary review of the documentation listed in Ch 2, Sec 1, [3.6.2] and subsequent satisfactory completion of the surveys, the extent and scope of which are given below.

Where the vessel has, during any portion of the five years prior to the request for classification being received, been previously classed by:

a) the Society, or

b) a QSCS Classification Society ~~subject to verification of compliance with QSCS~~

and has not been subject to alteration or modification since class was withdrawn, the survey requirements may be specially considered but are not to be less than:

- all overdue surveys and overdue conditions of class, for vessels previously classed with the Society;
- the surveys required by IACS Procedural Requirement PR1A as per [1.1.2], for vessels previously classed with a QSCS Classification Society ~~subject to verification of compliance with QSCS~~ and full in compliance with all applicable and relevant IACS Resolutions.

3.1.2 Surveys *(1/1/2015)*

The minimum extent and scope of the class entry survey is to be based on the age and type of the ship as follows:

a) class renewal survey of hull, including thickness measurements

b) class renewal survey of machinery, inclusive of pressure vessel survey(s), as applicable

c) bottom survey in dry condition

d) tailshaft survey(s)

e) main boiler survey(s) and auxiliary boiler survey(s), as applicable.

f) in addition all other periodical surveys should be performed together with those inspections which are linked to specific service notations and/or additional class notations and/or special installations the ship is provided with.

The Society may request further examinations, tests and measurements, including but not limited to material testing, non-destructive testing, hydraulic and hydrostatic tests and sea trials.

4 Reassignment of class

4.1 Surveys

4.1.1 *(1/1/2015)*

The survey for reassignment of class consists of an admission to class survey, the consistency of which is determined by the Society on a case by case basis. Account may be taken of any periodical surveys held in the former period of class with the Society

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Part A
Classification and Surveys

Chapter 4
SCOPE OF SURVEYS IN RESPECT OF THE DIFFERENT SERVICES OF SHIPS

SECTION 10 OTHER SERVICE NOTATIONS

1 General

1.1

1.1.1 *(1/1/2022)*

The requirements of this Section are applicable to ships to be assigned one of the following service notations, and given in the Articles specified below:

- **container ship**, or **ship equipped for the carriage of containers**, in [2]
- **livestock carrier**, in [3]
- **FLS tanker**, in [4]
- dredging units, i.e. ships with the service notations **dredger**, **hopper dredger**, **hopper unit**, **split hopper unit**, **split hopper dredger**, in [5]
- **tug**, **salvage tug**, **escort tug**, in [6]
- **supply vessel**, in [7]
- **fire-fighting ship**, in [8]
- **oil recovery ship**, in [9]
- **cable laying unit**, in [10]
- **fishing vessel**, in [11]
- **pipe laying unit**, in [12]
- **research ship**, in [13]
- **cement carrier**, in [14]
- **asphalt tanker**, in [15]
- **compressed natural gas carrier**, in [16]
- **barge, with the additional service features - accommodation, -oil**, **-liquefied gas**, **-LNG bunker**, **-chemical**, in [17]
- **oil carrier, palm oil carrier**, in [18]
- **transhipping unit, transhipping floating terminal**, in [19]
- **sugar carrier**, in [20]
- **fly ash carrier**, in [21]
- **ships with additional service feature BC**, in [22]
- **ships with additional service feature BC-XII**, in [23]
- **well stimulation**, in [24]
- **car carrier with additional service feature H-CNG**, in [25]
- **marine mobile desalination unit**, in [26]
- **offshore support vessel**, in [27]
- **wind turbine installation vessel**, in [28].

1.1.2 These requirements are additional to those given in Chapter 3, according to the relevant surveys.

1.1.3 *(1/7/2015)*

When the service notation **special service**, as per Ch 1, Sec 2, [4.12.1], is assigned, regardless of whether any additional survey requirements are indicated in the annex to the Certificate of Classification, the Annual Survey and the Renewal Survey are, in any case, to include the examination, to the extent deemed necessary by the Surveyor, of the equipment and arrangements on the basis of which the service notation has been assigned.

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The electrical insulation resistance of the electrical equipment and circuits terminating in or passing through the dangerous zones is to be tested; however, in cases where a proper record of testing is maintained, consideration may be given to accepting recent test readings effected by the ship's personnel.

4.6.6 Inert gas system

If an inert gas system such as that installed on board oil tankers is fitted, the requirements given Sec 3, [5.2] for intermediate survey and in Sec 3, [7.2] for class renewal survey of oil tankers are to be complied with.

5 Dredging units

5.1 Annual survey

5.1.1 The survey is to include the following items, as far as required or fitted, according to the service notation of the ship:

- for **split hopper unit**, **split hopper dredger**, visual examination, as far as practicable, of superstructure hinges and blocks, deck hinges, hydraulic jacks and associated piping systems and alarms
- for **dredger**, **hopper dredger**, **split hopper dredger:**
  - visual examination, as far as practicable, of attachments of suction piping and lifting systems to the structure and external examination of piping in dredging machinery spaces for absence of corrosion and leakage
  - checking the condition of the dredging machinery space and related equipment with regard to electrical shocks, protection from rotating machinery, fire and explosion hazards.

5.2 Class renewal survey

5.2.1 The survey is to include the following items, as far as required or fitted, according to the service notation of the ship:

- for **hopper dredger**, **hopper unit**, visual examination of hopper bottom doors or valves and accessories, such as hinges, actuating rods, hydraulic systems, with dismantling as deemed necessary by the Surveyor
- for **split hopper unit**, **split hopper dredger**, visual examination, as far as practicable, of superstructure hinges and blocks, deck hinges, hydraulic jacks and associated piping systems and alarms, with dismantling and/or further checks as deemed necessary by the Surveyor
- for **dredger**, **hopper dredger**, **split hopper dredger:**
  - visual examination, as far as practicable, of attachments of suction piping and lifting systems to the structure and external examination of piping in dredging machinery spaces for absence of corrosion and leakage
  - checking the condition of the dredging machinery space and related equipment with regard to electrical shocks, protection from rotating machinery, fire and explosion hazards.

6 Tug, salvage tug, escort tug

6.1 Annual survey

6.1.1 *(1/1/2020)*

The survey is to include as far as practicable and applicable, a general examination of the towing hook with relevant unhooking device or a general examination of the towing winch, the emergency release system and stop buttons thereto, the relevant control stations and indications on the bridge for all power supply and/or pressure levels related to the normal operation of the emergency release system.

Furthermore where a towing winch is fitted the survey is to confirm the availability on board of the performance capabilities and operating instructions as well as the alternative source of energy for the emergency release system.

6.1.2 In addition to [6.1.1] above, for **salvage tug**, the availability and satisfactory condition of specific equipment as required in Pt E, Ch 14, Sec 2, [4] is to be verified.

6.1.3 For **tug - barge combined**, an examination of the accessible parts of the connection system is to be carried out.

6.1.4 *(1/1/2026)*

In addition to [6.1.1] above, for **tug** assigned with the additional service features **anchor handling** or **anchor handling stab**, the survey is to include~~:~~ the examinations required in [7.2].

a) ~~a general external examination of the anchor handling winch and foundations, as fitted~~

b) ~~a function test of the winch, to the extent deemed necessary by the Surveyor.~~
~~The Manufacturer's recommendations are to be taken into account.~~

6.2 Class renewal survey

6.2.1 *(1/1/2020)*
The survey is to include:

- checking the condition of the connection of the towing hook or towing winch to the structure, including related reinforcements of the structure
- checking the external condition of the towing hook; when applicable, a no-load test of the unhooking device is to be carried out
- checking the external condition of the towing winch; test of proper working condition of the emergency release system is to be carried out. At this purpose suitable strong point fitted on deck can be used
- examination and, as far as practicable, test of the alternative source of energy to verify that normal operation of the emergency release system can be sustained under dead-ship conditions.

6.2.2 *(1/7/2004)*
In addition to [6.2.1] above, for **salvage tug**, the survey is to include:

- a check and working test of specific equipment as required in Pt E, Ch 14, Sec 2, [4]
- checking of the satisfactory condition of the towing line(s).

6.2.3 For **tug - barge combined**, a visual examination of components of the connection system is to be carried out, completed by thickness measurements and non-destructive tests as deemed necessary by the Surveyor. A connection/disconnection test is to be carried out, including a check of related remote control, safety and alarm devices.

6.2.4 *(1/7/2022)*
In addition to [6.2.1] above, for tug assigned with the additional service features anchor handling or anchor handling stab, the survey is to include a function test of emergency release systems.

7 Supply vessel

7.1 Supply vessel - Oil product or Supply vessel - Chemical product

7.1.1 General

The additional survey items for annual survey, intermediate survey and class renewal survey are applicable only to ships having the service notation **supply vessel** assigned the additional service features **oil product** or **chemical product**.

7.1.2 Annual survey - Hull items

a) Weather decks
The survey is to include:

- examination of cargo tank openings, including gaskets, covers, coamings and screens
- examination of cargo tank pressure/vacuum valves and flame screens
- examination of flame screens on vents to all bunker, oily ballast and oily slop tanks
- examination of cargo, bunker, ballast and vent piping systems, including remote control valves, safety valves and various safety devices, as well as vent masts and headers
- confirmation that wheelhouse doors and windows, sidescuttles and windows in superstructure and deckhouse ends facing the cargo area are in satisfactory condition
- confirmation that pumps, valves and pipelines are identified and distinctively marked.

b) Cargo pump rooms and pipe tunnels
The survey is to include:

- examination of all pump room bulkheads and pipe tunnels (if any) for signs of oil or chemical product leakage or fractures and, in particular, the sealing arrangements of penetrations in pump room bulkheads
- examination of the condition of all piping systems, in cargo pump rooms and pipe tunnels (if any)
- examination of the bilge and ballast arrangements and confirmation that pumps and pipelines are identified.

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All safety valves on cargo piping and of cargo tanks are to be dismantled for examination, adjusted and, as applicable, resealed.

c) Cargo pump rooms

All cargo pump room boundaries are to be generally examined. All gas-tight shaft sealing devices are to be examined. The bottom of cargo pump rooms is to be presented clean for the examination of stripping devices and gutters.

7.1.7 Class renewal survey - Cargo machinery items

a) Pumps

Ballast and stripping pumps are to be internally examined and prime movers checked. A working test is to be carried out.

Maintenance records of cargo pumps are to be made available to the Surveyor.

b) Cargo heating system

The apparent satisfactory condition of the cargo heating system such as clamping, external condition of piping is to be verified and, if deemed necessary by the Surveyor, the system is to be pressure tested.

c) Remote controls

An operating test of the emergency remote control of pumps and valves and of automatic closing valves is to be carried out.

d) Electrical equipment in dangerous zones

A general examination of the electrical equipment and cables in dangerous zones such as cargo pump rooms and areas adjacent to cargo tanks is to be carried out for defective and non-certified safe type electrical equipment, non-approved lighting and fixtures, and improperly installed or defective or dead-end wiring.

The electrical insulation resistance of the electrical equipment and circuits terminating in or passing through the dangerous zones is to be tested; however, in cases where a proper record of testing is maintained, consideration may be given to accepting recent test readings effected by the ship’s personnel.

7.2 Supply vessel - Anchor handling or Supply vessel - Anchor handling stab

7.2.1 General *(1/7/2011)*

The additional survey items for annual survey and class renewal survey are applicable only to ships having the service notation **supply vessel** assigned the additional service features **anchor handling** or **anchor handling stab**.

7.2.2 Annual Survey *(1/1/2026)*

The survey is to include:

a) ~~a general external examination of the anchor handling winch and foundations, as fitted~~

- a visual examination of equipment frames and foundations, including related reinforcements of ship's structure
- a thorough examination of winch, including drum, end flanges, reduction gears, brakes, hydraulic and electric systems supplemented, if necessary, by other suitable means or measures
- a general examination and function test of associated anchor handling equipment: wire stoppers (i.e. shark jaw, karm fork, guide pins) and stern roller
- a visual examination of the wire rope or chain cable for its integrity
- ~~b)~~ a function test of the winch, ~~to the extent deemed necessary by the Surveyor.~~ including braking system and clutch, taking into account ~~T~~the Manufacturer's recommendations ~~are to be taken into account.~~
- a general examination and function test of the winch emergency release and stoppers emergency release systems, and examination of their main and secondary controls
- for ship with additional service feature anchor handling stab, a general examination of the winch monitoring systems.

7.2.3 Class renewal survey *(1/1/2026)*

In addition to the requirements in [7.2.2], the class renewal survey is to include:

- an examination of the integrity of winch components' condition, by disassembly and other appropriate methods, as deemed necessary
- a visual examination of winch drum weak link or similar arrangement
- a function test of the winch emergency release system~~s is to be carried out.~~ under load; at this purpose suitable strong point fitted on deck can be used
- a winch static load test, as deemed necessary, taking into account the Manufacturer's recommendations.

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Part A

Classification and Surveys

Chapter 5

SCOPE OF SURVEYS RELATED TO ADDITIONAL CLASS NOTATIONS

SECTION 1 GENERAL

1 General

1.1

1.1.1 The purpose of this Chapter is to give details on the scope of surveys of specific equipment and systems fitted on board the ship, which are covered by an additional class notation. Unless otherwise specified in Ch 1, Sec 2, [6], the scope of these surveys provides the requirements to be complied with for the maintenance of the relevant additional class notation.

1.1.2 These specific requirements are additional to those laid down in Chapter 3 and Chapter 4. These surveys are to be carried out at intervals as described in Ch 2, Sec 2, as far as possible concurrently with the surveys of the same type, i.e. annual, intermediate or class renewal survey.

1.1.3 The equipment and systems are also to be submitted to occasional survey whenever one of the cases indicated in Ch 2, Sec 2, [11] occurs.

1.1.4 Where specific requirements are given in this Chapter for the class renewal survey, they are additional to the applicable requirements for the annual survey.

1.1.5 For the assignment of the additional class notations, ships are to be submitted to an admission to class survey as described in Ch 2, Sec 1, [2] and Ch 2, Sec 1, [3] for new and existing installations, respectively, as applicable.

2 Additional class notations subject to additional surveys

2.1

2.1.1 The specific requirements detailed in this Chapter are linked to the additional class notation(s) assigned to the ship. Where a ship has more than one additional class notation, the specific requirements linked to each additional class notation are applicable as long as they are not contradictory.

2.1.2 Tab 1 indicates which additional class notations are subject to specific requirements, and in which Section and/or Article they are specified.

Table 1 : Additional class notations for which specific survey requirements are applicable *(1/1/2026)*

Additional class notation	Section or Article applicable in this Chapter	Type of surveys affected by these specific requirements	Remarks
STAR **STAR-HULL** **STAR-MACH**	Sec 2	See Remarks	The scope and periodicity of surveys are stipulated by specific requirements given in Pt F, Ch 1, Sec 1, [5] and Pt F, Ch 1, Sec 2, [4]
Availability of machinery: **AVM-APS** **AVM-IAPS** **AVM-DPS** **AVM-IPS**	Sec 3	annual survey class renewal survey	
Automated machinery systems: **AUT-UMS** **AUT-CCS** **AUT-PORT**	Sec 4	annual survey class renewal survey	

Additional class notation	Section or Article applicable in this Chapter	Type of surveys affected by these specific requirements	Remarks
Integrated ship systems: **SYS-NEQ** **SYS-NEQ-1** **SYS-COM** **SYS-IBS**	Sec 5	annual survey class renewal survey	
Monitoring equipment: **MON-HULL** **MON-SHAFT**	Sec 6	annual survey class renewal survey tailshaft survey	
Pollution prevention **CLEAN-SEA** **CLEAN-AIR** **GREEN PLUS** **GREEN PLUS T** **GREEN STAR 3** **GREEN STAR 3 DESIGN** **GREEN STAR 3 (TOC)** **GC CARGO HANDLING** **SEEMP** **HK IHM and EU IHM** **ROB-x days** **AWTP** **OCCS**	Sec 7	annual survey class renewal survey	
Refrigerating installations **REF-CARGO** **REF-CONT** **REF-STORE**	Sec 8	annual survey class renewal survey	
Navigation in ice environment **ICE CLASS IA SUPER** **ICE CLASS IA** **ICE CLASS IB** **ICE CLASS IC** **ICE CLASS ID** **ICE** **POLAR CLASS**	Sec 9	class renewal survey	
PMS **PMS-CM(PROP)** **PMS-CM(HVAC)** **PMS-CM(CARGO)** **PMS-CM(ELE)** **PMS-CM(FDS)**	See Remarks	See Remarks	The scope and periodicity of surveys are stipulated by specific requirements given in Part F, Chapter 12
WINTERIZATION	Sec 10	annual survey	

Additional class notation	Section or Article applicable in this Chapter	Type of surveys affected by these specific requirements	Remarks
HELIDECK **HELIDECK H**	Sec 11	annual survey class renewal survey	
Other notations **STRENGTHBOTTOM-NAABSA** **GRABLOADING - GRAB [X]** **SPM** **LASHING and ROUTE DEPENDENT LASHING** **DYNAPOS** **DP PLUS** **VCS** **COVENT** **CARGOCONTROL** **COAT-WBT** **DIVINGSUPPORT** **HVSC** **HVSC-NB** **FIRE** **SELF-UNLOADING** **TAS** **EFFICIENT SHIP (S,DWT)** **MOORING** **CARGO HANDLING (H), CARGO HANDLING (O), CARGO HANDLING (T), CARGO HANDLING (S), CARGO HANDLING (SW) AND PERSONNEL LIFTING,** **PERSONNEL LIFTING ADV,** **PERSONNEL LIFTING ADV PLUS,** **PERSONNEL LIFTING REC191** **SAHARA, SAHARA** **COMF-NOISE, COMF-VIB, COMF-NOISE (DP), COMF-VIB (DP), COMF- NOISE (MM), COMF-VIB (MM), COMF-NOISE-PLUS,** **DOLPHIN QUIET SHIP,** **DOLPHIN TRANSIT SHIP** **RISK MITIGATION (…)** **AIR MON** **DANGEROUS GOODS** **INF 1, INF 2, INF 3** **INERTGAS A, INERTGAS B, INERTGAS C** **LNG FUELLED, CNG FUELLED** **LNG FUELLED (Main), CNG FUELLED (Main)** **LNG FUELLED (Aux), CNG FUELLED (Aux)** **MAN OVERBOARD DETECTION SYSTEM** **CYBER RESILIENCE EXISTING SHIPS** **DIGITAL SHIP (ADC)** **AIR LUBRICATION SYSTEM** **PERSONS WITH REDUCED MOBILITY (PMR-ITA)** **BIOSAFE SHIP** **REMOTE SURVEYABLE SHIP (REMOTE)** **SUSTAINABLE SHIP** **MARITIME AUTONOMOUS SURFACE SHIPS (MASS)** **ENHANCED MAINTENANCE (EM)** **CARGO PIPING PROTECTED (CPP)** **NOISE-PORT-OUT(X)** **NOISE-PORT-IN(X)** **COATING PERFORMANCE STANDARD IN CARGO OIL TANKS (CPS-COT)** **DIGITAL SHIP (D)** **FUEL SAMPLING** **WIND ASSISTED PROPULSION SYSTEM (WAPS)** **LOADINT-LAS** **ULTRA LOW EMISSION VESSEL (ULEV)**	Sec 12	As applicable in accordance with the related Articles in Sec 12	

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SECTION 7 POLLUTION PREVENTION

1 General

1.1 Application

1.1.1 *(1/7/2023)*

The requirements of this Section apply to ships which have been assigned one of the following additional class notations related to pollution prevention systems, as described in Ch 1, Sec 2, [6.8]:

CLEAN-SEA

CLEAN-AIR

GREEN PLUS

GREEN PLUS T

GREEN STAR 3

GREEN STAR 3 DESIGN

GREEN STAR 3 (TOC)

GC CARGO HANDLING

SEEMP

HK IHM and EU IHM

ROB-x days

AWTP

1.1.2 *(1/7/2006)*

When the **GREEN STAR 3 DESIGN** notation is assigned, the survey requirements of [2] and [3] are to be complied with.

2 CLEAN-SEA

2.1 Annual and class renewal survey

2.1.1 *(1/7/2012)*

The survey is, as far as applicable, to include:

a) Certificates and documents
- confirmation that the IOPP certificate is valid
- confirmation that the "International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk" or the "International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk" (ICOF CHE Certificate), as applicable, is valid
- confirmation that the "International Sewage Pollution Prevention Certificate" (ISPP Certificate) is valid
- confirmation that the "International Anti Fouling System Certificate" (AFS Certificate) or statement of compliance is valid
- confirmation that an approved SOPE Plan or SMPE Plan, as applicable, is available on board
- verification of the proper updating of the sewage record book
- confirmation that an approved Ballast Water Management Plan is available on board and verification of the proper updating of the ballast water record book
- confirmation that an approved Garbage Management Plan is available on board and verification of the proper updating of the garbage record book
- confirmation that the Ship Environmental Management Plan is available on board
- verification that an officer, defined as Ship Environmental Manager, is in service on board
- confirmation that the special list or manifest or a detailed stowage plan related to the harmful substances carried is available on board

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9 SEEMP

9.1 Annual survey

9.1.1 *(1/7/2023)*
The Owner or his representative is to declare to the attending Surveyor that no significant alterations have been made without the prior approval of the Society.

9.1.2 *(1/7/2023)*
The annual survey is to include verification of:

a) proper recording of the energy measures implementation

b) proper implementation of the procedures and tools to measure the data

c) proper maintenance and calibration of the measuring devices

d) presence onboard of SEEMP and record books kept up to date.

10 Ship recycling - Inventory of Hazardous Materials (HK IHM and EU IHM)

10.1 Annual survey

10.1.1 *(1/7/2023)*
The Owner or his representative is to declare to the attending Surveyor that no significant alterations have been made without the prior approval of the Society.

10.1.2 *(1/7/2023)*
The annual survey is to include verification of availability on board of updated Inventory of Hazardous Materials (IHM).

11 Retention on board (ROB-x days)

11.1 Annual survey

11.1.1 *(1/7/2023)*
The annual survey is to include review of the entry in the pertinent record books to confirm that the frequency of discharge of substances or effluents is consistent with the consecutive x days of voyage duration without any discharge.

12 Advanced wastewater treatment Plant (AWTP)

12.1 Annual survey

12.1.1 *(1/7/2023)*
The annual survey is to include:

a) verification that the treatment plant is certified to comply with the requirements mentioned in Ch 1, Sec 2, [6.8.12]

b) visual examination of the treatment plant, including piping and fittings.

13 OCCS - Onboard Carbon Capture and Storage

13.1 Annual survey

13.1.1 *(1/1/2026)*
The annual survey is to include:

a) Documents

- Confirmation that the records of operation, maintenance and monitoring of the OCCS plant are properly maintained and cover capture, liquefaction and storage operations.
- Verification that the crew familiarization and training with respect to OCCS operation, emergency actions and hazards are documented.
- Confirmation that any modifications to the OCCS system have been submitted for approval and properly recorded on board.

b) General arrangement and segregation

- Examination of the location of the OCCS machinery spaces, capture units and CO_2 storage tanks to verify no modifications have been made.
- Verification that access, lighting and ventilation of spaces containing OCCS equipment remain satisfactory.

c) Piping systems and components

- Visual examination of CO_2 and solvent piping systems, supports and insulation for satisfactory condition and absence of leaks or corrosion.
- Confirmation that pressure gauges, thermometers and differential-pressure instruments are fitted and operational.
- Verification that insulation of high temperature piping are in place and in proper operating condition.
- Verification that pressure relief valves are in place and in proper operating condition.
- Verification that exhaust lines of safety valves or similar piping are in place and in proper operating condition.

d) CO_2 storage tanks and associated equipment as per Pt A, Ch 4, Sec 6, [3] as applicable.

- External examination of CO_2 storage tanks.
- Verification that temperature and pressure control arrangements for the tanks operate as designed.
- Examination, as far as practicable, of drainage and leak detection arrangements in the spaces or areas adjacent to the tanks.

e) Ventilation and gas detection

- Testing of the operation of the ventilation systems serving OCCS machinery spaces, CO_2 tank spaces and solvent storage spaces.
- Test of the gas detection system, if any, for the vapours of the solvents and of other solutions as result of the CO_2 capture process chemical reaction.

f) Operational condition and functional tests

- Confirmation, as far as practicable, of the correct functioning of OCCS system.

g) Chemical carbon solvent arrangements

- Confirming that requirements for storage are met, for the aqueous solution of sodium hydroxide (NaOH) or calcium hydroxide (Ca(OH)2), for OCCS system which use them as chemical carbon solvents.

13.2 Renewal survey

13.2.1 *(1/1/2026)*

The renewal survey is to include the following verifications in addition to those due for the annual survey;

- Verification of the structural condition of foundations and supports for OCCS equipment and tanks.
- Examination of the internal condition of CO_2 storage tanks in bulk and connected spaces as per Pt A, Ch 4, Sec 6, [7] as applicable.
- Testing of the complete pressure and temperature control systems of the CO_2 tanks and verification of redundancy, where required, of essential control and monitoring equipment.
- Functional tests of the full ventilation and gas-detection systems, including alarms and automatic responses.
- Verification of calibration of safety valves.
- Examination, as far as practicable, of the internal condition of chemical treatment fluid storage tanks and connected spaces. Alternative inspection techniques to confirm the integrity of the tank may be considered.

SECTION 12 OTHER NOTATIONS

1 General

1.1

1.1.1 *(1/1/2026)*

The requirements of this Section apply to ships which have been assigned one of the following additional class notations described in Ch 1, Sec 2, [6.14]:

STRENGTHBOTTOM-NAABSA

GRABLOADING

GRAB [X]

SPM

LASHING and ROUTE DEPENDENT LASHING

DYNAPOS

DP PLUS

VCS

COVENT

CARGOCONTROL

COAT-WBT

DIVINGSUPPORT

HVSC-NB, HVSC

FIRE

SELF-UNLOADING

TAS

EFFICIENT SHIP (S, DWT)

MOORING

CARGO HANDLING (H), CARGO HANDLING (O), CARGO HANDLING (T), CARGO HANDLING (S), CARGO HANDLING (SW) AND PERSONNEL LIFTING, PERSONNEL LIFTING ADV, PERSONNEL LIFTING ADV PLUS, PERSONNEL LIFTING REC191

SAHARA, SAHARA

COMF-NOISE, COMF-VIB, COMF-NOISE (DP), COMF-VIB (DP), COMF-NOISE (MM), COMF-VIB (MM), COMF-NOISE-PLUS, DOLPHIN QUIET SHIP, DOLPHIN TRANSIT SHIP

RISK MITIGATION

AIR MON

DANGEROUS GOODS

INF 1, INF 2, INF 3

INERTGAS A, INERTGAS B, INERTGAS C

LNG FUELLED, LNG FUELLED (Main), LNG FUELLED (Aux)

CNG FUELLED, CNG FUELLED (Main), CNG FUELLED (Aux)

MAN OVERBOARD DETECTION SYSTEM

CYBER RESILIENCE EXISTING SHIPS

DIGITAL SHIP (ADC)

AIR LUBRICATION SYSTEM

PERSONS WITH REDUCED MOBILITY (PMR-ITA)

BIOSAFE SHIP

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Alternatively, in situ inspection, using acceptable techniques, will be considered by the Society when requested by the interested parties.

18.2.3 *(1/7/2014)*

As far as practicable, the surveyor is to determine the general condition of the mooring system including cables, chains, fiber ropes, fittings, fairleads, connections and equipment.

Particular attention is to be given to the following:

- cable or chain in contact with fairleads, etc,
- cable or chain in way of winches and stoppers
- cable or chain in way of the splash zone
- cable or chain in the contact zone of the sea bed
- damage to mooring system
- extent of marine growth
- condition and performance of corrosion protection.

18.2.4 *(1/7/2014)*

Wire rope anchor cables are to be examined. If cables are found to contain broken, badly corroded or bird caging wires they are to be renewed.

Chain cables are to be examined. Maximum acceptable diminution of anchor chain in service will normally be limited to a two per cent reduction from basic chain diameter. (Basic chain diameter can be taken as the diameter, excluding any design corrosion allowance, which satisfies the Rule requirement for minimum factors of safety).

18.2.5 *(1/7/2014)*

The windlasses or winches are to be examined.

18.2.6 *(1/7/2014)*

Structure in way of anchor racks and anchor cable fairleads is to be examined.

19 CARGO HANDLING AND PERSONNEL LIFTING

19.1 General

19.1.1 *(1/1/2026)*

Cargo handling systems covered by the additional class notation **CARGO HANDLING (H), CARGO HANDLING (O), CARGO HANDLING (T), CARGO HANDLING (S), CARGO HANDLING (SW)** are those, but not limited to, having the configuration of a:

- crane
- slewing crane
- gantry travelling crane
- portal cranes
- swinging jib crane
- deck cargo jib crane
- container crane
- fixed crane with derrick or retractable jib
- A-frame crane.

Crane or lifting arrangements covered by the additional class notations **PERSONNEL LIFTING, PERSONNEL LIFTING ADV** ~~and~~, **PERSONNEL LIFTING ADV PLUS** and PERSONNEL LIFTING REC191 are those intended to be used for personnel lifting which complies with the "Rules for loading and unloading arrangements and for other lifting appliances on board ships or other similar units".

19.2 Annual survey

19.2.1 *(1/7/2014)*

The Owner or his representative is to declare to the attending Surveyor that no significant alterations have been made without the prior approval of the Society.

19.2.2 *(1/1/2026)*

The annual survey is to include:

- an examination of the instruction/installation manual to verify the layout of the complete system and confirm correspondence to the actual system(s) fitted on board
- verification that maintenance of the system(s) has been carried out according to the Manufacturer's instructions and schedules
- examination of the structural parts, including bolts and welds, of the cargo handling system, such as foundations, columns, fixed structure of the crane, arm, jib, jib heel pins, jib slewing rings, fixed sheaves, blocks, axle pins and housings
- examination of hydraulic cylinders, winches (electrical and/or hydraulically driven), driving motors and related attachments
- examination of the electrical systems, switchboard, etc.
- examination of the components and loose gears, such as shackle, links, rings, hooks, etc, in order to verify their satisfactory condition of maintenance
- examination of all cables (spans, runners, maneuvering cables) with particular attention to their ends and terminal fittings
- verification and test of the alarm and safety devices
- a running test of the system in order verify the satisfactory working and operation conditions.
- verification of compliance with the requirements in Chapter 7 of the "Rules for loading and unloading arrangements and for other lifting appliances on board ships or other similar units" in case of **PERSONNEL LIFTING, PERSONNEL LIFTING ADV ~~and~~, PERSONNEL LIFTING ADV PLUS and PERSONNEL LIFTING REC191** notations.

19.3 Renewal survey

19.3.1 *(1/7/2014)*

The requirements for annual surveys in [19.2] are to be complied with.

19.3.2 *(1/7/2014)*

- Working test of the hydraulic oil system(s), as applicable, pertaining to the cargo handling system(s)
- insulation tests of all electrical equipment of the crane(s)
- overload test is to be performed with test loads as shown in Tab 1.

  The winch of the system is to be able to raise a test load of at least 1.1 P and to support the full test load even if it cannot raise it.

  When due to the pressure valve setting, hydraulic cranes cannot raise the full test load, a smaller test load may be accepted but in no case is it to be less than 1.1P.

  For variable load-radius cranes, the jib is to be tested with the above-mentioned test load, for maximum and minimum jib outreach. For cranes or similar lifting appliances having variable working load as a function of the luffing, the most severe testing conditions resulting from the diagrams of the approved forces are to be considered both for structures and fittings.

  During the test, it is necessary to verify that each gear tooth is subjected to stress.

  For travelling cranes, the test load is to be traversed slowly over the full length of the track.

  The suspended load is to be as lateral as possible, and it is to be tested for working on both port and starboard sides of the ship.

  Following the overload test, the crane is to be subjected to testing of the brakes for all movements at maximum speed with suspended load. For cranes slewing over a range of 360°, the slewing test includes two complete turns from starting position.

  All limit switches are to be tested.

Table 1 *(1/7/2014)*

Working load P, in kN	Test load, in kN
$P \leq 200$	1,25 P
$200 < P \leq 500$	P + 50
$P > 500$	1,10 P

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Part B

Hull and Stability

Chapter 1

GENERAL

SECTION 1 APPLICATION

1 General

1.1 Structural requirements

1.1.1 *(1/1/2026)*

Part B contains the requirements for determination of the minimum hull scantlings, applicable to all types of seagoing monohull displacement ships of normal form, speed and proportions, made in welded steel construction, except for bulk carriers and oil tankers, for which the requirements in the "Common Structural Rules for Bulk Carriers and Oil Tankers" apply. These requirements are to be integrated with those specified in Part E, for any individual ship type, and in Part F, as applicable, depending on the additional class notations assigned to the ships.

For ships with the notations **bulk carrier ESP CSR** and **oil tanker ESP CSR,** the above-mentioned Common Structural Rules apply as appropriate with the addition of the following requirements:

- ~~Sec 4 - as regards the calculation programs~~
- Ch 3, Sec 1, Ch 3, Sec 2, Ch 3, App 1 and Ch 3, App 2 - for the requirements concerning Intact Stability
- Ch 5, Sec 1, [2.1.4] - for the direct calculations of hull girder wave induced loads in the case of ships with scantling length greater than 350 m
- Ch 5, Sec 6, [2.2] and [2.3] - for the calculation of impact pressures in tanks in the case of resonance
- Ch 9, Sec 1, [4.2] - for the bow impact pressure, only in case the applicable formulation in "Common Structural Rules for Bulk Carriers and Oil Tankers" is found to be out of its scope of application
- Ch 9, Sec 7, [1.3] - for the materials of the hatch covers
- Ch 10, Sec 1 and Ch 10, App 1 - for the requirements concerning rudders
- Ch 10, Sec 4, as applicable - for the requirements concerning ship equipment
- Ch 10, App 2 - for the requirements concerning mooring lines for ships with EN > 2000
- Ch 10, App 3 - for the requirements concerning direct mooring analyses
- Ch 11, Sec 2, [4] - for the requirements concerning the loading instruments
- Ch 12, Sec 3, [1], [2] and [3] - for the requirements concerning testing.

1.1.2 The requirements of Part B, Part E and Part F apply also to those steel ships in which parts of the hull, e.g. superstructures or movable decks, are built in aluminium alloys.

1.1.3 Ships whose hull materials are different than those given in [1.1.2] and ships with novel features or unusual hull design are to be individually considered by the Society, on the basis of the principles and criteria adopted in the Rules.

1.1.4 The strength of ships constructed and maintained according to the Rules is sufficient for the draught corresponding to the assigned freeboard. The scantling draught considered when applying the Rules is to be not less than that corresponding to the assigned freeboard.

1.1.5 Where scantlings are obtained from direct calculation procedures which are different from those specified in Chapter 7, adequate supporting documentation is to be submitted to the Society, as detailed in Sec 3.

1.2 Limits of application to lifting appliances

1.2.1 The fixed parts of lifting appliances, considered as an integral part of the hull, are the structures permanently connected by welding to the ship's hull (for instance crane pedestals, masts, king posts, derrick heel seatings, etc., excluding cranes, derrick booms, ropes, rigging accessories, and, generally, any dismountable parts). The shrouds of masts embedded in the ship's structure are considered as fixed parts.

1.2.2 The fixed parts of lifting appliances and their connections to the ship's structure are covered by the Rules, even when the certification (especially the issuance of the Cargo Gear Register) of lifting appliances is not required.

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SECTION 3 DOCUMENTATION TO BE SUBMITTED

1 Documentation to be submitted for all ships

1.1 Ships built under the Society's supervision

1.1.1 Plans and documents to be submitted for approval

The plans and documents to be submitted to the Society for approval are listed in Tab 1. This list is intended as guidance for the complete set of information to be submitted, rather than an actual list of titles.

The above plans and documents are to be supplemented by further documentation which depends on the service notation and, possibly, the additional class notation (see Pt A, Ch 1, Sec 2) assigned to the ship, as specified in [2].

Structural plans are to show details of connections of the various parts and, in general, are to specify the materials used, including their manufacturing processes, welded procedures and heat treatments. See also Ch 12, Sec 1, [1.6].

1.1.2 Plans and documents to be submitted for information *(1/7/2011)*

In addition to those in [1.1.1], the following plans and documents are to be submitted to the Society for information:

- general arrangement
- capacity plan, indicating the volume and position of the centre of gravity of all compartments and tanks
- lines plan
- hydrostatic curves
- lightweight distribution
- towing and mooring arrangement plan, containing the information specified in Ch 10, Sec 4, [3.1]
- list of dangerous goods intended to be carried, if any.

In addition, when direct calculation analyses are carried out by the Designer according to the rule requirements, they are to be submitted to the Society.

1.1.3 Number of copies

The number of copies to be submitted for each plan or document is to be agreed with the Society on a case by case basis depending on the specific conditions under which plan approval and supervision during construction are organised. However, it is generally equal to:

- 3 for plans and documents submitted for approval
- 2 for plans and documents submitted for information.

2 Further documentation to be submitted for ships with certain service notations or additional class notations

2.1 General

2.1.1 Depending on the service notation and, possibly, the additional class notation (see Pt A, Ch 1, Sec 2) assigned to the ship, other plans or documents may be required to be submitted to the Society, in addition to those in [1.1]. They are listed in [2.2] and [2.3] for the service notations and additional class notations which require this additional documentation.

However, the additional documentation relevant to a service notation or an additional class notation may be required also for ships to which it is not assigned, when this is deemed necessary by the Society on the basis, inter alia, of the ship service, the structural arrangements, the type of cargo carried and its containment.

2.2 Service notations

2.2.1 The plans or documents to be submitted to the Society are listed in Tab 2.

2.3 Additional class notations

2.3.1 The plans or documents to be submitted to the Society are listed in Tab 3.

Table 1 : Plans and documents to be submitted for approval for all ships *(1/1/2026)*

Plan or document	Containing also information on
Midship section Transverse sections Shell expansion Decks and profiles Double bottom Pillar arrangements Framing plan Deep tank and ballast tank bulkheads, wash bulkheads	Class characteristics Main dimensions Minimum ballast draught Frame spacing Contractual service speed Density of cargoes Design loads on decks and double bottom Steel grades Location and height of air vent outlets of various compartments Corrosion protection Openings in decks and shell and relevant compensations Boundaries of flat areas in bottom and sides Details of structural reinforcements and/or discontinuities Bilge keel with details of connections to hull structures
Loading manual and loading instruments	See Ch 11, Sec 2, [3]
Watertight subdivision bulkheads Watertight tunnels	Openings and their closing appliances, if any
Fore part structure	Location and height of air vent outlets of various compartments
Transverse thruster, if any, general arrangement, tunnel structure, connections of thruster with tunnel and hull structures	
Aft part structure	Location and height of air vent outlets of various compartments
Machinery space structures Foundations of propulsion machinery and boilers	Type, power and r.p.m. of propulsion machinery Mass and centre of gravity of machinery and boilers
Superstructures and deckhouses Machinery space casing	Extension and mechanical properties of the aluminium alloy used (where applicable)
Bow doors, stern doors and inner doors, if any, side doors and other openings in the side shell	Closing appliances Electrical diagrams of power control and position indication circuits for bow doors, stern doors, side doors, inner doors, television system and alarm systems for ingress of water
Hatch covers, if any	Design loads on hatch covers Sealing and securing arrangements, type and position of locking bolts Distance of hatch covers from the summer load waterline and from the fore end
Movable decks and ramps, if any	
Windows and side scuttles, arrangements and details	
Scuppers and sanitary discharges	
Bulwarks and freeing ports	Arrangement and dimensions of bulwarks and freeing ports on the freeboard deck and superstructure deck
Rudder and rudder horn **(1)**	Maximum ahead service speed

(1) Where other steering or propulsion systems are adopted (e.g. steering nozzles or azimuth propulsion systems), the plans showing the relevant arrangement and structural scantlings are to be submitted. For azimuth propulsion systems, see Ch 10, Sec 1, [11].

(2) Apply to ships of 500 gross tonnage and upwards.

(3) Apply to ships of 80 m or more in length, where the height of the exposed deck in way of the item is less than 0,1L or 22 m above the summer load waterline, whichever is the lesser.

(4) For documents to be submitted see the requirements in Ch 10, Sec 4, [2~~.1.4~~] and Pt E, Ch 13, Sec 2, [12~~.1.6~~].

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SECTION 4 CALCULATION PROGRAMS

1 Program for the Rule based scantling

1.1 General

1.1.1 Computer programs dealing with rule checking are available. The Society may be contacted in order to have information on these programs and associated hardware and operating system requirements.

1.2 LEONARDO HULL

1.2.1 *(1/7/2005)*

The LEONARDO HULL program performs the rule scantling check of plating and ordinary stiffeners at any transverse section along the ship's hull, primary supporting members and associated shell plating in various hull portions.

1.2.2 *(1/7/2005)*

In particular, LEONARDO HULL makes it possible to:

- calculate the transverse section geometric properties
- carry out the hull girder strength checks, including ultimate strength
- carry out all the rule strength checks of:
  - strakes
  - longitudinal and transverse ordinary stiffeners
  - strakes and ordinary stiffeners of transverse bulkheads.
- verification and finite element analysis of hull structure, including automatic generation of part of the finite element model and load case generation. Scantling criteria verification, in accordance with the Rules, are automatically performed.

1.2.3 *(1/7/2005)*

LEONARDO HULL also calculates the steel renewal thicknesses based on rule scantlings and permits the re-assessment of ships in service.

1.3 BULK

1.3.1 The BULK program is designed to assess, according to the IACS Unified Requirements adopted in the Rules, the structural strength of transverse corrugated bulkheads and double bottoms of new and existing bulk carriers to which these requirements apply.

Part B

Hull and Stability

Chapter 8

SHIPS LESS THAN 90 M IN LENGTH

SECTION 5 PRIMARY SUPPORTING MEMBERS

Symbols

For symbols not defined in this Section, refer to the list at the beginning of this Chapter.

p_S : Still water pressure, in kN/m^2, see [3.4.2] and [3.4.4]

p_W : Wave pressure, in kN/m^2, see [3.4.2] and [3.4.4]

p_{SF}, p_{WF}: Still water and wave pressures, in kN/m^2, in flooding conditions, defined in Ch 8, Sec 1, [5.8]

σ_{X1} : Hull girder normal stress, in N/mm^2, defined in [3.4.5]

s : Spacing, in m, of primary supporting members

ℓ : Span, in m, of primary supporting members, measured between the supporting members, see Ch 4, Sec 3, [4.1]

h_W : Primary supporting member web height, in mm

b_p : Width, in m, of the plating attached to the primary supporting member, for the yielding check, as defined in Ch 4, Sec 3, [4.2]

w : Net section modulus, in cm^3, of the primary supporting member, with an attached plating of width b_p, to be calculated as specified in Ch 4, Sec 3, [4.3]

A_{Sh} : Net shear sectional area, in cm^2, of the primary supporting member, to be calculated as specified in Ch 4, Sec 3, [4.3]

m : Boundary coefficient, to be taken equal to:

- m = 10 in general
- m = 12 for bottom and side girders

$$\chi = \left(1 + 50\frac{\ell}{h_W}\right)^3$$

1 General

1.1 Application

1.1.1 Ships less than 65 m in length *(1/7/2003)*

For ships less than 65 m in length, the criteria in App 1 may be used for the strength check of primary supporting members, as an alternative to those contained in this Section.

1.1.2 Analysis criteria

The requirements of this Section apply for the yielding and buckling checks of primary supporting members and analysed through an isolated beam structural model.

1.1.3 Direct calculations

Direct calculations may be required by the Society when deemed necessary on the basis of the ship's structural arrangement and load conditions. When required, these analyses are to be carried out according to the applicable requirements in Ch 7, Sec 3, Ch 7, App 1 or Ch 7, App 2.

1.2 Net scantlings

1.2.1 As specified in Ch 4, Sec 2, [1], all scantlings referred to in this section are net, i.e. they do not include any margin for corrosion.

The gross scantlings are obtained as specified in Ch 4, Sec 2.

1.3 Partial safety factors

1.3.1 The partial safety factors to be considered for checking primary supporting members are specified in Tab 1.

2 Minimum net thicknesses

2.1 General

2.1.1 The net thickness of plating which forms the webs of primary supporting members, with the exception of double bottom girders and floors for which specific requirements are given in [2.2], is to be not less than the lesser of:

- the value obtained, in mm, from the following formula:

  $t_{MIN} = (3,7 + 0,015Lk^{1/2})\, c_T$

- the thickness of the attached plating

where c_T is a coefficient equal to:

$$c_T = 0,7 + \frac{3\ T}{L} \quad \text{for } L \le 25m$$

$$c_T = 0,85 + \frac{2\ T}{L} \quad \text{for } 25\ m < L \le 40m$$

$$c_T = 1,0 \quad \text{for } L > 40m$$

c_T may not be taken greater than 1,0.

Table 1 : Primary supporting members - Partial safety factors *(1/7/2011)*

Partial safety factors covering uncertainties regarding:	Symbol	Yielding check		Buckling check of pillars (see [4.1])
		General (see [3.4] and [3.5])	Watertight bulkhead primary supporting members **(1)** (see [3.6])	
Still water hull girder loads	γ_{S1}	Not applicable	Not applicable	~~1,00~~Not applicable
Wave hull girder loads	γ_{W1}	Not applicable	Not applicable	~~1,15~~Not applicable
Still water pressure	γ_{S2}	1,00	1,00	1,00~~Not applicable~~
Wave pressure	γ_{W2}	1,20	1,05	1,15~~Not applicable~~
Material	γ_m	1,02	1,02	1,02
Resistance	γ_R	1,02 in general 1,15 for bottom and side girders	1,02 **(2)**	1,50

(1) Applies also to primary supporting members of bulkheads or inner side which constitute boundary of compartments not intended to carry liquids.

(2) For primary supporting members of the collision bulkhead, γ_R =1,25

2.2 Double bottom

2.2.1 The net thickness of plating which forms primary supporting members of the double bottom is to be not less than the values given in Tab 2.

3 Yielding check

3.1 General

3.1.1 The requirements of this Article apply for the yielding check of primary supporting members subjected to lateral pressure or to wheeled loads and, for those contributing to the hull girder longitudinal strength, to hull girder normal stresses.

3.1.2 The yielding check is also to be carried out for primary supporting members subjected to specific loads, such as concentrated loads.

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Part B

Hull and Stability

Chapter 10

HULL OUTFITTING

SECTION 4 EQUIPMENT

Symbols

EN : Equipment Number defined in [2.1],

σ_{ALL} : allowable stress, in N/mm^2, used for the yielding check in [4.9.7], [4.10.7], [4.11.2] and [4.11.3], to be taken as the lesser of:

- $\sigma_{ALL} = 0,67\ R_{eH}$
- $\sigma_{ALL} = 0,40\ R_m$

R_{eH} : minimum yield stress, in N/mm^2, of the material, defined in Ch 4, Sec 1, [2]

R_m : tensile strength, in N/mm^2, of the material, defined in Ch 4, Sec 1, [2].

1 General

1.1 General

1.1.1 The requirements in [2] to [4] apply to temporary mooring of a ship within or near harbour, or in a sheltered area, when the ship is awaiting a berth, the tide, etc.

Therefore, the equipment complying with the requirements in [2] to [4] is not intended for holding a ship off fully exposed coasts in rough weather or for stopping a ship which is moving or drifting.

1.1.2 The equipment complying with the requirements in [2] to [4] is intended for holding a ship in good holding ground, where the conditions are such as to avoid dragging of the anchor. In poor holding ground the holding power of the anchors is to be significantly reduced.

1.1.3 It is assumed that under normal circumstances a ship will use one anchor only.

1.1.4 *(1/7/2024)*

The Equipment Number (EN) formulae for anchoring equipment as given in [2.1.2] and Pt E, Ch 14, Sec 2, [3.7.1] are based on an assumed maximum current speed of 2,5 m/s, maximum wind speed of 25 m/s and a minimum scope of chain cable of 6, the scope being the ratio between length of chain paid out and water depth. For ships with an equipment length, as defined in [2.1.2], greater than 135 m, alternatively the required anchoring equipment can be considered applicable to a maximum current speed of 1,54 m/s, a maximum wind speed of 11 m/s and waves with maximum significant height of 2 m.

1.1.5 *(1/7/2024)*

In addition to planned anchoring for normal operations, anchoring equipment is also important for ship safety in emergency situations such as loss of manoeuvrability, unscheduled repairs and other unexpected situations.

1.1.6 *(1/7/2024)*

The anchoring equipment required in this Section applies to self-propelled vessels over 100GT, except for:

a) inland navigation vessels

b) military vessels

c) government ships operated for non-commercial purposes

d) high speed and light crafts

e) yachts.

1.1.7 *(1/7/2024)*

The anchoring equipment required in this Section applies to vessels with unrestricted service. The requirements given in [3.2.4], Pt D, Ch 4, Sec 1, [1], [3.3.1], Pt A, Ch 3, Sec 5, [2.2.6], and [3.9] apply to vessels with restricted service area.

1.1.8 *(1/7/2024)*

Unrestricted service means a vessel engaged on international voyages, and not bounded by any limitations on operating environment reflected in vessel class notation.

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Equipment number EN A < EN ≤ B		Stockless anchors		Stud link chain cables for anchors			
		N	Mass per anchor, in kg	Total length, in m	Diameter, in mm		
A	B				Q1	Q2	Q3
11500	12400	2	35500	770,0			147,0
12400	13400	2	38500	770,0			152,0
13400	14600	2	42000	770,0			157,0
14600	16000	2	46000	770,0			162,0

2.1.3 Equipment Number for ships with inclined superstructure front bulkhead *(1/1/2022)*

For ships with navigation notation other than unrestricted navigation and having superstructures with the front bulkhead with an angle of inclination aft, the Equipment Number EN is to be obtained from the following formula:

$EN = \Delta^{2/3} + 2\,(a\,B + \Sigma b_N\,h_N \sin\theta_N + S_{fun}) + 0{,}1\,A$

where:

Δ, a, h_N, A and S_{fun}:as defined in [2.1.2],

θ_N : angle of inclination aft of each front bulkhead, shown in Fig 8,

b_N : greatest breadth, in m, of each tier n of superstructures or deckhouses having a breadth greater than B/4.

Fixed screens or bulwarks 1,5 m or more in height are to be regarded as parts of houses when determining h and A. In particular, the hatched area shown in Fig 8 is to be included.

2.1.4 *(1/7/2024)*

For ships of length less than 90m, alternative methodology using direct force calculation for anchoring equipment described in App 4 may be used.

3 Equipment

3.1 Shipboard fittings and supporting hull structures

3.1.1 Application *(1/7/2018)*

Ships are to be provided with arrangements, equipment and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associated with the normal operations of the ship.

The requirements of [3.1] apply to ships of 500 gross tonnage and upwards; in particular they apply to bollards, bitts, fairleads, stand rollers, chocks used for normal mooring of the ship and similar components used for normal towing of the ship. For emergency towing arrangements, the requirements in [4] are to be applied. Normal towing means towing operations necessary for manoeuvring in ports and sheltered waters associated with the normal operations of the ship.

For ships, not subject to Regulation 3-4 of Chapter II-1 of SOLAS Convention, but intended to be fitted with equipment for towing by another ship or a tug, the requirements designated as 'other towing' are to be applied to design and construction of those shipboard fittings and supporting hull structures.

Requirements of [3.1] is not applicable to design and construction of shipboard fittings and supporting hull structures used for special towing services defined as:

- Escort towing: Towing service, in particular for laden oil tankers or LNG carriers, required in specific estuaries. Its main purpose is to control the ship in case of failures of the propulsion or steering system. It should be referred to local escort requirements and guidance given by, e.g., the Oil Companies International Marine Forum (OCIMF); for the requirements of shipboard fittings and supporting hull structures of ships with service notation **escort tug** , see Pt E, Ch 14, [2] and [4].
- Canal transit towing: Towing service for ships transiting canals, e.g. the Panama Canal. It should be referred to local canal transit requirements.
- Emergency towing for tankers: Towing services to assist tankers in case of emergency. For emergency towing arrangements of ships which are to comply with Regulation 3-4 of Chapter II-1 of SOLAS Convention, the requirements in [4] are to be applied.

The supporting hull structures are constituted by that part of the ship's structure on/in which the shipboard fitting is placed and which is directly submitted to the forces exerted on the shipboard fitting. The supporting hull structures of capstans, winches, etc used for normal or other towing and mooring operations are also covered by [3.1].

Other components such as capstans, winches, etc are not covered by this item. Any weld or bolt or equivalent device connecting the shipboard fitting to the supporting structure is part of the shipboard fitting and if selected from an industry standards subject to that standard applicable to this shipboard fitting.

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Normal stress is the sum of bending stress and axial stress. No stress concentration factors being taken into account;

b) for strength assessment by means of finite element analysis:

- Von Mises stress: 1,0 R_{eH}

For strength assessment by means of finite element analysis the mesh is to be fine enough to represent the geometry as realistically as possible. The aspect ratios of elements are not to exceed 3. Girders are to be modelled using shell or plane stress elements. Symmetric girder flanges may be modelled by beam or truss elements. The element height of girder webs must not exceed one-third of the web height. In way of small openings in girder webs the web thickness is to be reduced to a mean thickness over the web height. Large openings are to be modelled. Stiffeners may be modelled by using shell, plane stress, or beam elements. The mesh size of stiffeners is to be fine enough to obtain proper bending stress. If flat bars are modeled using shell or plane stress elements, dummy rod elements are to be modelled at the free edge of the flat bars and the stresses of the dummy elements are to be evaluated. Stresses are to be read from the centre of the individual element. For shell elements the stresses are to be evaluated at the mid plane of the element.

R_{eH} is the specified minimum yield stress of the material.

3.1.16 Safe Working Load (SWL) *(1/1/2022)*

The Safe Working Load (SWL) is the safe load limit of shipboard fittings used for mooring purpose

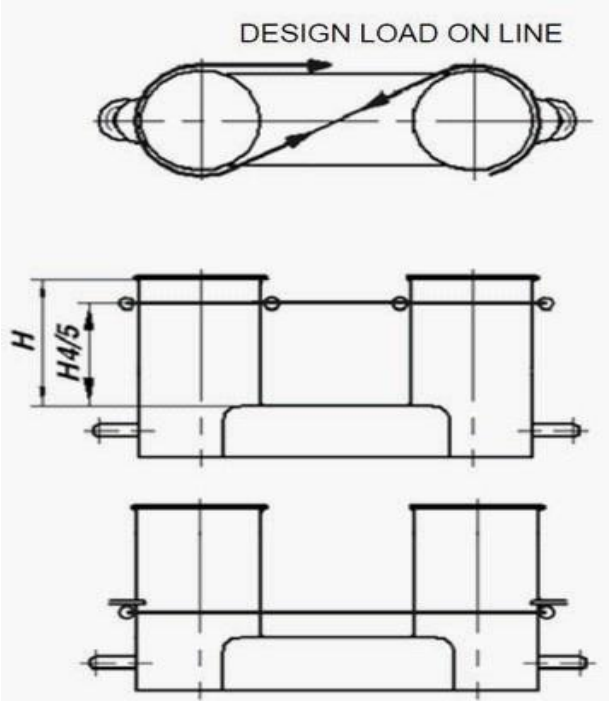
Unless a greater SWL is requested by the applicant according to [3.1.14], the SWL is not to exceed the Ship Design Minimum Breaking Load according to Tab 4 and App 2 (see notes in [3.1.14]).

The SWL, in t, of each shipboard fitting is to be marked (by weld bead or equivalent) on the deck fittings used for towing. For fittings intended to be used for both, towing and mooring, TOW, in t, according to [3.1.10] is to be marked in addition to SWL.

The above requirements on SWL apply for the use with no more than one mooring line.

The towing and mooring arrangement plan mentioned in [3.1.17] is to define the method of use of mooring lines.

Figure 6 : Attachment point of the mooring line *(1/7/2018)*



3.1.17 Towing and mooring arrangement plan *(1/1/2026)*

The SWL and TOW for the intended use for each shipboard fitting is to be noted in the towing and mooring arrangement plan available on board for the guidance of the Master. It is to be noted that TOW is the load limit for the towing purpose and SWL that for mooring purpose. If not otherwise chosen, for towing bitts it is to be noted that TOW is the load limit for a towing line attached with eye-splice.

Information provided on the plan is to include in respect of each shipboard fitting:

- location on the ship;

- fitting type;
- SWL/TOW;
- purpose (mooring/normal (harbour) towing/other towing); and
- manner of applying towing or mooring line load including limiting fleet angle i.e. angle of change in direction of a line at the fitting.

Furthermore, information provided on the plan is to include:

- the arrangement of mooring lines showing the number of lines (N),
- the Ship Design Minimum Breaking Load (MBL_{SD}).
- the length of the mooring lines
- the acceptable environmental conditions (refer for minimum conditions to App 2) for the recommended Ship Design Minimum Breaking Load for ships with Equipment Number EN > 2000:
  - 30 second mean wind speed from any direction, see App 2, [1.4.2],
  - maximum current speed acting on bow or stern (±10°).
- the maximum brake holding load of the mooring winches
- the diameter D of each fitting in contact with the mooring lines
- the LDBF permissible range (100% - 105% of the Ship Design Minimum Breaking Load).

All the information listed is to be incorporated into the pilot card in order to provide the pilot with proper information on normal (harbour) towing and other towing operations.

3.2 Anchors

3.2.1 General *(1/7/2007)*

The anchoring arrangement is to be such as to prevent the cable from being damaged and fouled. Adequate arrangements are to be provided to secure the anchor under all operational conditions.

The scantlings of anchors are to be in compliance with the following requirements.

Anchors are to be manufactured according to approved plans or recognised standards and are to be tested as indicated in Pt D, Ch 4, Sec 1, [1].

3.2.2 Ordinary anchors

The required mass for each anchor is to be obtained from Tab 1.

The individual mass of a main anchor may differ by ±7% from the mass required for each anchor, provided that the total mass of anchors is not less than the total mass required in Tab 1.

The mass of the head of an ordinary stockless anchor, including pins and accessories, is to be not less than 60% of the total mass of the anchor.

Where a stock anchor is provided, the mass of the anchor, excluding the stock, is to be not less than 80% of the mass required in Tab 1 for a stockless anchor. The mass of the stock is to be not less than 25% of the mass of the anchor without the stock but including the connecting shackle.

3.2.3 High and super high holding power anchors

High holding power (HHP) and super high holding power (SHHP) anchors, i.e. anchors for which a holding power higher than that of ordinary anchors has been proved according to Pt D, Ch 4, Sec 1, [1], do not require prior adjustement or special placement on the sea bottom.

Where HHP or SHHP anchors are used as bower anchors, the mass of each anchor is to be not less than 75% or 50%, respectively, of that required for ordinary stockless anchors in Tab 1.

The mass of SHHP anchors is to be, in general, less than or equal to 1500 kg.

3.2.4 Installation of the anchors on board *(1/7/2018)*

The bower anchors are to be connected to their cables and positioned on board ready for use.

3.2.5 Test for high holding power anchors approval *(1/7/2018)*

For approval and/or acceptance as a HHP anchor, comparative tests are to be performed on various types of sea bottom. Such tests are to show that the holding power of the HHP anchor is at least twice the holding power of an ordinary stockless anchor of the same mass.

The holding power test load is to be less than or equal to the proof load of the anchor, specified in Pt D, Ch 4, Sec 1, [1.6].

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APPENDIX 1 CRITERIA FOR DIRECT CALCULATION OF RUDDER LOADS

Symbols

ℓ_{10}, ℓ_{20}, ℓ_{30}, ℓ_{40} : lengths, in m, of the individual girders of the rudder system

ℓ_{50} : length, in m, of the solepiece (see Fig 4)

J_{10}, J_{20}, J_{30}, J_{40} : moments of inertia about the x axis, in cm^4, of the individual girders of the rudder system having lengths ℓ_{10}, ℓ_{20}, ℓ_{30}, ℓ_{40}. For rudders supported by a solepiece only, J_{20} indicates the moment of inertia of the pintle in the sole piece

J_{50} : moment of inertia about the z axis, in cm^4, of the solepiece (see Fig 4)

C_R : rudder force, in N, acting on the rudder blade, defined in Sec 1, [2.1.1]

C_{R1}, C_{R2}: rudder forces, in N, defined in Sec 1, [2.2.3]

E : Young's modulus, in N/m^2

$E = 2{,}06\ 10^{11}\ N/m^2$

G : Shear elasticity modulus, in N/m^2

$G = 7{,}85\ 10^{10}\ N/m^2$

1 Criteria for direct calculation of the loads acting on the rudder structure

1.1 General

1.1.1 Application *(1/7/2024)*

The requirements of this Appendix apply to the following types of rudders:

- spade rudders (see Fig 1)
- spade rudders with trunk (see Fig 2 and Fig 3)
- 2 bearing rudders with solepiece (see Fig 4)
- 2 bearing semi-spade rudders with rudder horn (see Fig 5)
- semi-spade rudders with 2-conjugate elastic support (see Fig 9)

The requirements of this Appendix provide the criteria for calculating the following loads:

- bending moment M_B in the rudder stock
- support forces F_A
- bending moment M_R and shear force Q_R in the rudder body

1.1.2 Load calculation *(1/7/2016)*

The loads in [1.1.1] are to be calculated through direct calculations depending on the type of rudder.

They are to be used for the stress analysis required in:

- Sec 1, [4], for the rudder stock
- Sec 1, [6], for the rudder pintles and the pintle bearings
- Sec 1, [7] for the rudder blade
- Sec 1, [8] for the solepiece and the rudder trunk.

1.2 Data for the direct calculation

1.2.1 Forces per unit length *(1/7/2016)*

The force per unit length p_R (see Fig 1) acting on the rudder body is to be obtained in N/m, from the following formula:

$$p_R = \frac{C_R}{1_{10}}$$

1.2.2 Moments and forces *(1/7/2024)*

For spade rudders, the results of direct calculations carried out in accordance with [1.1.2] may be expressed in an analytical form. The loads in [1.1.1] may therefore be obtained from the following formulae (See Fig 1):

- maximum bending moment M_B in the rudder stock, in N.m:

$$M_B = C_R\left(\ell_{20} + \frac{\ell_{10}(2C_1 + C_2)}{3(C_1 + C_2)}\right)$$

where C_1 and C_2 are the lengths, in m, defined in Fig 1

- support forces, in N:

$$F_{A3} = \frac{M_B}{\ell_{30}}$$

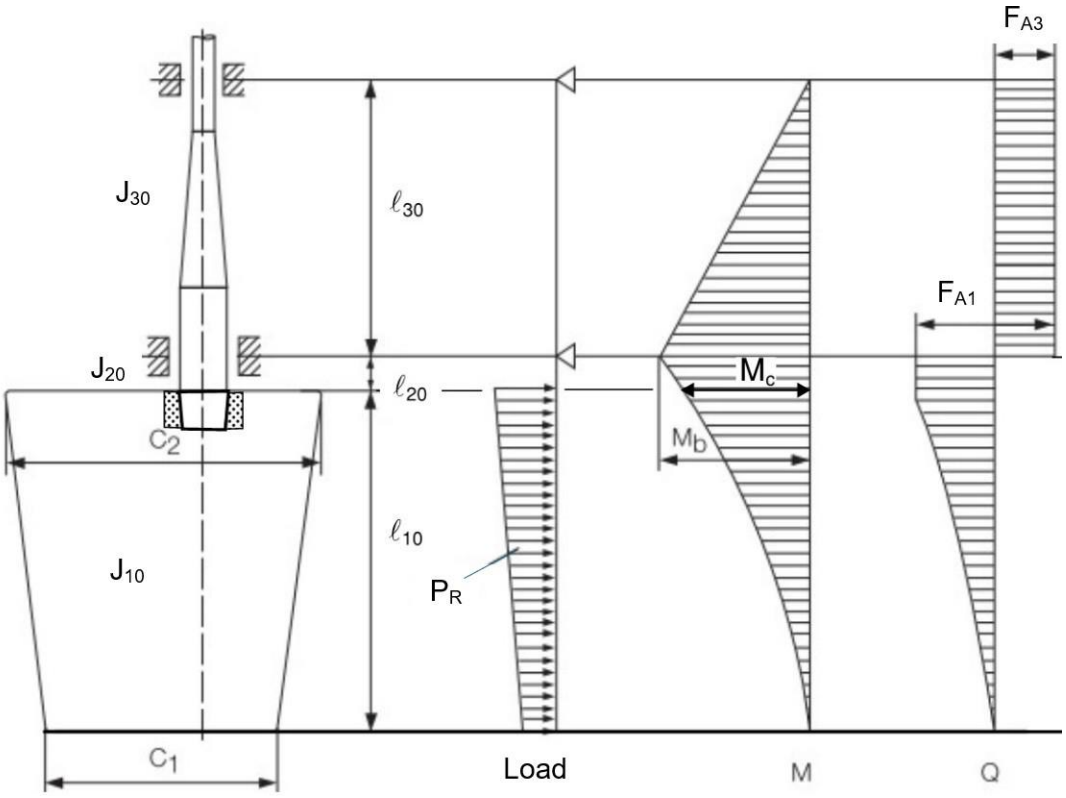
$$F_{A1} = C_R + F_{A3}$$

- maximum shear force in the rudder body, in N:

$Q_R = C_R$

The maximum moment, M_C, in top of the cone coupling as shown in Fig 1 is applicable for the connection between the rudder and the rudder stock.

Figure 1 : Spade rudders *(1/7/2024)*



1.3 Spade rudders with trunk

1.3.1 Force per unit length *(1/7/2016)*

The force per unit length p_R (see Fig 2 and Fig 3) acting on the rudder body is to be obtained, in N/m, from the following formula:

$$p_R = \frac{C_R}{\ell_{10} + \ell_{20}}$$

1.3.2 Moments and forces *(1/7/2024)*

For a spade rudder with trunk extending inside the rudder, the strength is to be checked against the following two cases:

a) pressure applied on the entire rudder area

b) pressure applied only on rudder area below the middle of neck bearing.

The moments and forces for the two cases defined above may be determined according to Fig 2 and Fig 3 respectively

Figure 2 : Full rudder force $C_R = C_{R1}+C_{R2}$ and total rudder torque $Q_R = Q_{R1} + Q_{R2}$ with rudders stock bending moment $M_b = M_{CR2} - M_{CR1}$ *(1/7/2024)*

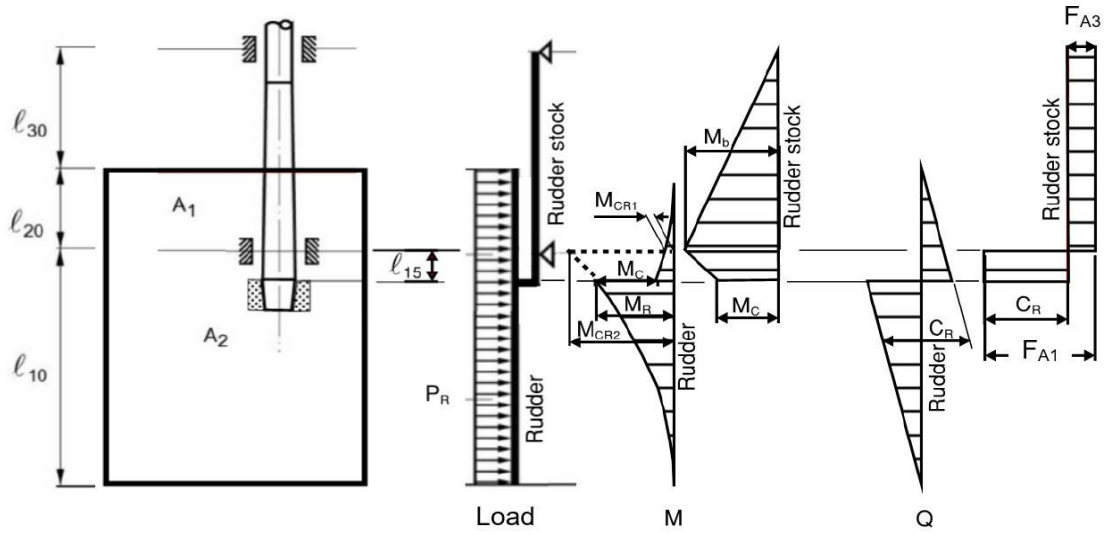
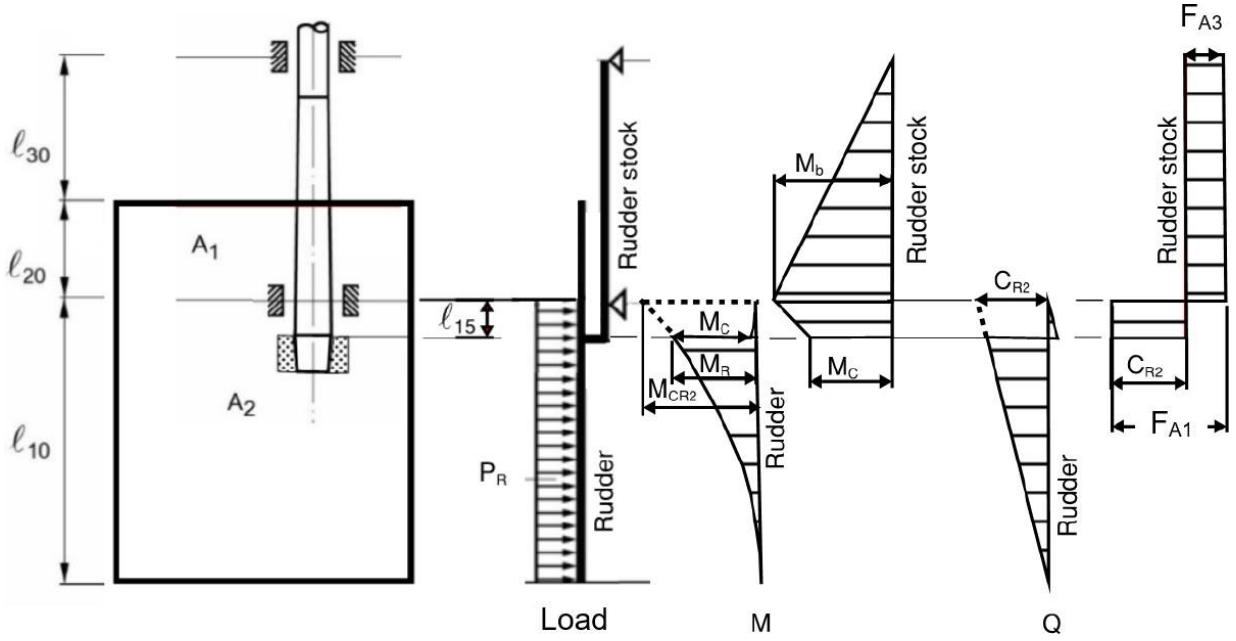


Figure 3 : Rudder force C_{R2} corresponding to rudder torque Q_{R2} acting at rudder blade area A_2 with rudders stock bending moment $M_b = M_{CR2}$ *(1/7/2024)*



$M_{CR2} = C_{R2} (\ell_{10} - \ell_{CG2})$

$M_{CR1} = C_{R1} (\ell_{CG1} - \ell_{10})$

where:

C_{R1} : Rudder force over the rudder blade area A_1

C_{R2} : Rudder force over the rudder blade area A_2

ℓ_{CG1} : Vertical position of the centre of gravity of the rudder blade area A_1 from base

ℓ_{CG2} : Vertical position of the centre of gravity of the rudder blade area A_2 from base

$C_R = C_{R1}+ C_{R2}$

Support forces F_{A2} and F_{A3}, in N:

$F_{A3} = (M_{CR2} - M_{CR1})/(\ell_{20} \pm \ell_{30})$

$F_{A21} = C_R + F_{A3}$

1.4 Two bearing rudders with solepiece

1.4.1 Force per unit length *(1/7/2016)*

The force per unit length p_R (see Fig 4) acting on the rudder body is to be obtained, in N/m, from the following formula:

$$p_R = \frac{C_R}{\ell_{10}}$$

1.4.2 Support spring *(1/7/2016)*

The spring constant Z_C for the support in the solepiece (see Fig 4) is to be obtained, in N/m, from the following formula:

$$Z_C = \frac{6180 \cdot CJ_{50}}{\ell_{50}^3}$$

1.5 Two bearing semi-spade rudders with rudder horn

1.5.1 Force per unit length *(1/7/2016)*

The forces per unit length p_{R10} and p_{R20} (see Fig 5) acting on the rudder body are to be obtained, in N/m, from the following formulae:

$$p_{R10} = \frac{C_{R2}}{\ell_{10}}$$

$$p_{R20} = \frac{C_{R1}}{\ell_{20}}$$

1.5.2 Support spring *(1/1/2021)*

The spring constant Z_P for the support in the rudder horn (see Fig 5) is to be obtained, in N/m, from the following formula:

$$Z_P = \frac{1}{f_B + f_T}$$

where:

f_B : unit displacement of rudder horn due to a unit force of 1 N acting in the centroid of the rudder horn, to be obtained, in m/N, from the following formula:

$$f_B = 1{,}3\frac{d^3}{6180 J_N}$$

d : height, in m, of the rudder horn, defined in Fig 5. This value is measured downwards from the upper rudder horn end, at the point of curvature transition, to the mid-line of the lower rudder horn pintle.

J_N : moment of inertia of rudder horn about the x axis, in cm^4 (see Fig 6)

f_T : unit displacement of rudder horn due to torsion to be obtained, in m/N, from the following formula:

$$f_T = 10^8 \frac{3140 d^2 F^2}{\sum_i \frac{u_i}{t_i}}$$

b, e : lengths, in m, defined in Fig 5

F_T : mean sectional area of rudder horn, in m^2

u_i : length, in mm, of the individual plates forming the mean horn sectional area

t_i : thickness of the individual plates mentioned above, in mm.

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Part C

Machinery, Systems and Fire Protection

Chapter 1

MACHINERY

SECTION 1 GENERAL REQUIREMENTS

1 General

1.1 Application

1.1.1 Chapter 1 applies to the design, construction, installation, tests and trials of main propulsion and essential auxiliary machinery systems and associated equipment, boilers and pressure vessels, piping systems, and steering and manoeuvring systems installed on board classed ships, as indicated in each Section of this Chapter.

1.2 Additional requirements

1.2.1 Additional requirements for machinery are given in:

- Part E, for the assignment of the service notations
- Part F, for the assignment of additional class notations.

1.3 Documentation to be submitted

1.3.1 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 the relevant Sections of this Chapter.

The list of documents requested in each Section is to be intended as 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 to those detailed in the Sections, in the case of non-conventional design or if it is deemed necessary for the evaluation of the system, equipment or component.

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

Unless otherwise stated in the other Sections of this Chapter or agreed with the Society, documents for approval are to be sent in triplicate if submitted by the Shipyard and in four copies if submitted by the equipment supplier. Documents requested for information are to be sent in duplicate.

In any case, the Society reserves the rights to require additional copies when deemed necessary.

1.3.2 *(1/1/2025)*

For ships subject to the SOLAS Convention, ship builders are to identify and document the ship accelerations and motions periods to which machinery and equipment might be subjected to. The expected accelerations and ship motions periods are to be within machinery and equipment manufacturers requirements. The estimations are to consider vessel type, machinery or equipment location and expected service conditions.

1.3.3 *(1/1/2025)*

Machinery and equipment manufacturers are to submit evidence to the Society that their machinery or equipment can operate under the required static and dynamic conditions stated in Tab 1 and at least at the levels of shipboard accelerations as stated in [1.3.2] and/or specified in Pt E, Ch 9, Sec 5, [3.2]. Documentation of satisfactory performance is to take the form of:

a) Report of testing under representative conditions; or

b) Report of theoretical verification using recognised computational techniques accompanied by detailed and relevant validation data: or

c) Historical data which provides relevant demonstration of satisfactory experience in service.

1.4 Definitions

1.4.1 Machinery spaces of Category A

Machinery spaces of Category A are those spaces and trunks to such spaces which contain:

- *internal combustion machinery used for main propulsion, or*

- *internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW, or*
- *any oil fired boiler or fuel oil unit,* or
- gas generators, incinerators, waste disposal units, etc., which use oil fired equipment.

1.4.2 Machinery spaces

Machinery spaces are all machinery spaces of Category A and all other spaces containing propulsion machinery, boilers, fuel oil units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilising, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

1.4.3 Fuel oil unit

Fuel oil unit is the equipment used for the preparation of fuel oil for delivery to an oil fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 0,18 N/mm^2.

For the purpose of this definition, inert gas generators are to be considered as oil fired boilers and gas turbines are to be considered as internal combustion engines.

1.4.4 Dead ship condition

Dead ship condition is the condition under which the whole propulsion system, including the main power supply, is not in operation and auxiliary means for bringing the main propulsion machinery into operation and for the restoration of the main power supply, such as compressed air and starting current from batteries, are not available, but assuming that means are available to start the emergency generator at all times.

2 Design and construction

2.1 General

2.1.1 *The machinery, boilers and other pressure vessels, associated piping systems and fittings are to be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards.*

The design is to have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

2.1.2 Single essential propulsion components and their reliability *(1/1/2026)*

The Society shall give special consideration to the reliability of single essential propulsion components and may require a separate source of propulsion power sufficient to give the ship a navigable speed, especially in the case of unconventional arrangements.

The relevant interpretations in IACS UI SC305 apply, but the arrangement may be specially considered by the Society, upon a risk assessment being submitted and taking into account the ship service, size and navigation notation.

2.2 Materials, welding and testing

2.2.1 General

Materials, welding and testing procedures are to be in accordance with the requirements of Part D and those given in the other Sections of this Chapter. In addition, for machinery components fabricated by welding the requirements given in [2.2.2] apply.

2.2.2 Welded machinery components

Welding processes and welders are to be approved by the Society in accordance with Part D, Chapter 5.

References to welding procedures adopted are to be clearly indicated on the plans submitted for approval.

Joints transmitting loads are to be either:

- full penetration butt-joints welded on both sides, except when an equivalent procedure is approved
- full penetration T- or cruciform joints.

For joints between plates having a difference in thickness greater than 3 mm, a taper having a length of not less than 4 times the difference in thickness is required. Depending on the type of stress to which the joint is subjected, a taper equal to three times the difference in thickness may be accepted.

T-joints on scalloped edges are not permitted.

Lap-joints and T-joints subjected to tensile stresses are to have a throat size of fillet welds equal to 0,7 times the thickness of the thinner plate on both sides.

In the case of welded structures including cast pieces, the latter are to be cast with appropriate extensions to permit connection, through butt-welded joints, to the surrounding structures, and to allow any radiographic and ultrasonic examinations to be easily carried out.

Where required, preheating and stress relieving treatments are to be performed according to the welding procedure specification.

2.3 Vibrations

2.3.1 *Special consideration is to be given to the design, construction and installation of propulsion machinery systems* and auxiliary machinery *so that any mode of their vibrations shall not cause undue stresses in this machinery in the normal operating ranges.*

2.4 Operation in inclined position

2.4.1 *Main propulsion machinery and all auxiliary machinery essential to the propulsion and the safety of the ship are, as fitted in the ship, be designed to operate when the ship is upright and when inclined at any angle of list either way and trim by bow or stern as stated in Tab 1.*

The Society may permit deviations from angles given in Tab 1, taking into consideration the type, size and service conditions of the ship.

Machinery with a horizontal rotation axis is generally to be fitted on board with such axis arranged alongships. If this is not possible, the Manufacturer is to be informed at the time the machinery is ordered.

2.5 Ambient conditions

2.5.1 Machinery and systems covered by the Rules are to be designed to operate properly under the ambient conditions specified in Tab 2, unless otherwise specified in each Section of this Chapter.

2.6 Shipboard accelerations

2.6.1 *(1/1/2025)*

Main propulsion and steering machinery and auxiliary machinery that is essential to the propulsion and steering, and the safety of the ship are to be capable of operation under the effects of acceleration and motions.

2.6.2 *(1/1/2025)*

The requirements in [1.3.2], [1.3.3] and [3.1.2] and [3.1.3] apply where documented evidence of equipment suitability is specifically required in Sec 2, Tab 2, item 28 and Pt E, Ch 9, Sec 5, [3.2] for such equipment or requested by the Society.

2.7 Power of machinery

2.7.1 Unless otherwise stated in each Section of this Chapter, where scantlings of components are based on power, the values to be used are determined as follows:

- for main propulsion machinery, the power/rotational speed for which classification is requested
- for auxiliary machinery, the power/rotational speed which is available in service.

2.8 Astern power

2.8.1 *(1/1/2026)*

Sufficient power for going astern is to be provided to secure proper control of the ship in all normal circumstances.

The ~~main propulsion machinery is to be capable of maintaining in free route astern at least 70% of the maximum ahead revolutions for a period of at least 30 min~~minimum astern power required by SOLAS II-1 / 28.1 to secure proper control of the ship in all normal circumstances is to be determined by the ship designer and is not to exceed the maximum permissible astern power (MPAP) for which the propulsion plant is designed. Astern trials are to be conducted in accordance with the provisions of ISO 19019:2005, section 5.4: Astern trials.

Table 1 : Inclination of ship - inclinations applied to respective components *(1/1/2026)*

Installations, components	Angle of inclination (degrees) **(1)**			
	Athwartship		Fore and aft	
	static	dynamic	static	dynamic
Main and auxiliary machinery	15	22,5	5 **(4)**	7,5
Safety equipment, e.g. emergency power installations, emergency fire pumps and their devices Switch gear, electrical and electronic appliances **(3)** and remote control systems	22,5 **(2)**	22,5 **(2)**	10	10

(1) Athwartship and fore-and-aft inclinations may occur simultaneously.

(2) In ships for the carriage of liquefied gases and of chemicals the emergency power supply ~~must also~~is to remain operable with the ship flooded to a final athwartship inclination up to a maximum of 30° (see 1983 IGC Code, clause 2.9.2.2, 2014 IGC Code, clause 2.7.2.2, IBC Code, clause 2.9.3.2).

(3) No undesired switching operations or operational changes are to occur.

(4) Where the length of the ship exceeds 100m, the fore-and-aft static angle of inclination may be taken as 500/L degrees, where L is the length of ship, in metres, as defined in Pt B, Ch 1, Sec 2, [3.1.1].

Table 2 : Ambient conditions

AIR TEMPERATURE	
Location, arrangement	Temperature range (°C)
In enclosed spaces	between 0 and +45 **(2)**
On machinery components, boilers In spaces subject to higher or lower temperatures	According to specific local conditions
On exposed decks	between -25 and +45 **(1)**

WATER TEMPERATURE	
Coolant	Temperature (°C)
Sea water or, if applicable, sea water at charge air coolant inlet	up to +32

(1) Electronic appliances are to be designed for an air temperature up to 55°C (for electronic appliances see also Chapter 2).

(2) Different temperatures may be accepted by the Society in the case of ships intended for restricted service.

~~For m~~Main propulsion systems with reversing gears, controllable pitch propellers or electrical propeller drive are to be designed for the maximum permissible astern power, ~~running astern~~which is not to lead to an overload of propulsion machinery.

Note 1: The designed maximum astern power, as referred to in SOLAS II-1 / 3.15, defining the maximum astern speed for the design of the main steering gear and rudder stock as per SOLAS II-1 / 29.3.4 and Pt B, Ch 10, Sec 1, [2.1.1], is not to be taken less than the MPAP.

During the sea trials, the ability of the main propulsion machinery to reverse the direction of thrust of the propeller is to be demonstrated and recorded (see also Sec 16).

2.9 Safety devices

2.9.1 *Where risk from overspeeding of machinery exists, means are to be provided to ensure that the safe speed is not exceeded.*

2.9.2 *Where main or auxiliary machinery including pressure vessels or any parts of such machinery are subject to internal pressure and may be subject to dangerous overpressure, means shall be provided, where practicable, to protect against such excessive pressure.*

2.9.3 *Main turbine propulsion machinery and, where applicable, main internal combustion propulsion machinery and auxiliary machinery shall be provided with automatic shut-off arrangements in the case of failures, such as lubricating oil supply failure, which could lead rapidly to complete breakdown, serious damage or explosion.*

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SECTION 2 DIESEL ENGINES

1 General

1.1 Application

1.1.1 *(1/7/2024)*

Diesel engines listed below are to be designed, constructed, installed, tested and certified in accordance with the requirements of this Section, under the supervision and to the satisfaction of the Society's Surveyors:

a) main propulsion engines

b) engines driving electrical generators and other auxiliaries essential for safety and navigation and cargo pumps in tankers, when they develop a power of 110 kW and over.

All other engines are to be designed and constructed according to sound marine practice, with the equipment required in [4.3.4], [4.5.2], [4.7.2] [4.7.3], [4.7.5] and [4.7.8] and delivered with the relevant works' certificate (see Pt D, Ch 1, Sec 1, [4.2.3]).

Additional requirements for control and safety systems for dual fuel engines supplied with high pressure methane gas are given in App 2.

Additional requirements for internal combustion engines supplied with low pressure natural gas are given in App 12 and App 17.

In addition to the requirements of this Section, those given in Sec 1 apply.

1.2 Type approval certificate

1.2.1 *(1/7/2016)*

For each type of engine that is required to be certified, a type approval certificate is to be obtained by the engine designer.

The type approval process consists of:

- drawing and specification approval,
- conformity of production,
- approval of type testing programme,
- type testing of engines,
- review of the obtained type testing results,
- evaluation of the manufacturing arrangements,
- issue of a type approval certificate upon satisfactorily meeting the Rule requirements.

1.3 Engine certificate

1.3.1 *(1/7/2016)*

Each diesel engine manufactured for a shipboard application per [1.1.1] is to have an engine certificate:

The certification process consists of:

- the engine builder/licensee obtaining design approval of the engine application specific documents, if any, by submitting a comparison list of the production drawings to the previously approved engine design drawings referenced in [1.2.1]
- forwarding the relevant production drawings and comparison list for the use of the Surveyors at the manufacturing plant and shipyard if necessary
- engine's components testing and engine works trials
- the issuance of an engine certificate upon satisfactorily meeting the Rule requirements.

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No.	Item
29	Connecting rod with cap
30	Crosshead
31	Piston rod
32	Piston, assembly **(7)**
33	Piston head
34	Camshaft drive, assembly **(7)**
35	Flywheel
36	Arrangement of foundation (for main engines only)
37	Fuel oil injection pump
38	Shielding and insulation of exhaust pipes and other parts of high temperature which may be impinged as a result of a fuel system failure, assembly
39	Construction and arrangement of dampers
	For electronically controlled engines, assembly drawings or arrangements of:
40	• Control valves
41	• High-pressure pumps
42	• Drive for high pressure pumps
43	• Valve bodies, if applicable
44	Operation and service manuals **(8)**
45	Test program resulting from FMEA (for engine control system) **(9)**
46	Production specifications for castings and welding (sequence)
47	Type approval certification for environmental tests, control components **(10)**
48	Quality requirements for engine production

(1) For comparison with Society requirements for material, NDT and pressure testing as applicable.
(2) For approval of materials and weld procedure specifications. The weld procedure specification is to include details of pre and post weld heat treatment, weld consumables and fit-up conditions.
(3) Details of the system so far as supplied by the engine manufacturer such as: main dimensions, operating media and maximum working pressures.
(4) All engines.
(5) The documentation to contain specifications for pressures, pipe dimensions and materials.
(6) Only for engines of a cylinder diameter of 200 mm or more or a crankcase volume of 0.6 m^3 or more.
(7) Including identification (e.g. drawing number) of components.
(8) Operation and service manuals are to contain maintenance requirements (servicing and repair) including details of any special tools and gauges that are to be used with their fitting/settings together with any test requirements on completion of maintenance.
(9) Required for engines that rely on hydraulic, pneumatic or electronic control of fuel injection and/or valves.
(10) Documents modified for a specific application are to be submitted to the Classification Society for information or approval, as applicable. See [3.2], App 9 and App 10.

4 Design and construction

4.1 Materials and welding

4.1.1 Crankshaft materials *(1/7/2016)*

In general, crankshafts are to be of forged steel having a tensile strength not less than 400 N/mm^2 and not greater than 1000 N/mm^2.

The use of forged steels of higher tensile strength is subject to special consideration by the Society in each case.

The Society, at its discretion and subject to special conditions (such as restrictions in ship navigation), may accept crankshafts made of cast carbon steel, cast alloyed steel or spheroidal or nodular graphite cast iron of appropriate quality and manufactured by a suitable procedure having a tensile strength as follows:

a) between 400 N/mm^2 and 560 N/mm^2 for cast carbon steel

b) between 400 N/mm^2 and 700 N/mm^2 for cast alloyed steel.

The acceptable values of tensile strength for spheroidal or nodular graphite cast iron will be considered by the Society on a case by case basis.

4.1.2 Welded frames and foundations *(1/7/2016)*

Steels used in the fabrication of welded frames and bedplates are to comply with the requirements of Part D.

Welding is to be in accordance with the requirements of Sec 1, [2.2].

4.2 Crankshaft

4.2.1 Check of the scantling *(1/7/2016)*

The check of crankshaft strength is to be carried out in accordance with App 1.

4.3 Crankcase

4.3.1 Strength *(1/7/2016)*

Crankcase construction and crankcase doors are to be of sufficient strength to withstand anticipated crankcase pressures that may arise during a crankcase explosion taking into account the installation of explosion relief valves required in [4.3.4]. Crankcase doors are to be fastened sufficiently securely for them not be readily displaced by a crankcase explosion.

4.3.2 Ventilation and drainage *(1/1/2026)*

Ventilation of the crankcase, or any arrangement which could produce a flow of external air ~~within~~into the crankcase, is in principle not permitted except for ~~dual fuel~~ engines fuelled with gas or low-flashpoint fuel, where ~~crankcase ventilation is to be provided in accordance with App 2, [2.1.1]~~this might be necessary to maintain the gas concentration in the crankcase below LEL provided that:

a) it is demonstrated that the risk connected with a crankcase explosion is not increased by the ventilation system

b) the operation of the ventilation system is monitored

c) the automatic safety actions to be activated and/or the risk mitigation measures to be implemented in case of detection of a ventilation failure are specified by the engine manufacturer and justified in the safety concept of the engine.

Note 1: LEL means the Lower Explosive Limit, as defined in IEC 60079-10-1 (February 2021) standard, paragraph 3.6.12. The lowest applicable LEL of all possible gas or low flashpoint fuels, fuel vapours or mixture is to be considered.

Where provided, crankcase ventilation pipes are to be as small as practicable to minimise the inrush of air after a crankcase explosion.

~~If forced extraction of the oil mist atmosphere gases from the crankcase is provided (for mist smoke detection purposes, for instance), the vacuum in the crankcase is not to exceed 2,5 x10^{-4} N/mm^2~~When forced extraction of crankcase atmosphere is provided, the crankcase pressure level is not to influence the reliable function of measurement and safety devices (such as oil mist detection) in the crankcase.

To avoid interconnection between crankcases and the possible spread of fire following an explosion, crankcase ventilation pipes and oil drain pipes for each engine are to be independent of any other engine.

For engines fuelled with gas or low flashpoint fuel a detailed evaluation regarding the safety of crankcase is to be carried out justifying that:

a) either the gas concentration in the crankcase remains below the LEL without specific measures, or

b) the risk of a crankcase explosion is reduced through specific measures (see, for example, [4.3.2] or [4.3.5]).

Lubricating oil drain pipes from the engine sump to the drain tank are to be continuously submerged at their outlet ends.

4.3.3 Warning notice *(1/7/2016)*

A warning notice is to be fitted either on the control stand or, preferably, on a crankcase door on each side of the engine.

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4.3.5 Oil mist detection/monitoring arrangements *(1/1/2026)*

Oil mist detection arrangements (or engine bearing temperature monitors or equivalent devices) are required:

- for alarm and slowdown purposes for low -speed ~~diesel~~I.C engines of 2250 kW and above or having cylinders of more than 300 mm bore (see Note 1)
- for alarm and automatic shut-off purposes for medium- and high -speed ~~diesel~~I.C engines of 2250 kW and above or having cylinders of more than 300 mm bore (see Note 1).

Note 1:

- Low-Speed Engines means ~~diesel~~I.C engines having a rated speed of less than 300 rpm.
- Medium-Speed Engines means ~~diesel~~I.C engines having a rated speed of 300 rpm and above, but less than 1400 rpm.
- High-Speed Engines means ~~diesel~~I.C engines having a rated speed of 1400 rpm and above.

Oil mist detection arrangements are to be of a type approved by the Society and tested in accordance with App 6 and are to comply with the requirements indicated hereinafter.

Engine bearing temperature monitors or equivalent devices (see Note 2) used as safety devices are to be of a type approved by classification societies for such purposes.

Note 2: Engine bearing temperature monitors or equivalent devices are defined as follows:

a) For crosshead engines:

The wording “engine bearing” of the term “engine bearing temperature monitors or equivalent devices” includes at least journal and connecting rod bearings and the crosshead bearings.

b) For trunk piston engines:

“Engine bearing temperatures monitors” may be accepted as an alternative to the oil mist detector only when the temperature of all bearings, including the piston pin bearings, are monitored.

c) The expression “equivalent devices” includes measures applied to engines where specific design features to preclude the risk of crankcase explosion are incorporated, subject to satisfactory justifications.

d) The examples of acceptable “temperature monitors or equivalent devices” are as follows:

1) a temperature monitoring system of the bearing concerned
2) a bearing oil outlet temperature monitoring system
3) a splash oil temperature monitoring system
4) measures applied to engines where specific design features to preclude the risk of crankcase explosions are incorporated, subject to satisfactory justifications.

~~Equivalent devices mean measures applied to high speed engines where specific design features are incorporated to preclude the risk of crankcase explosions.~~

The oil mist detection system and arrangements are to be installed in accordance with the engine Designer's and oil mist detection system Manufacturer's instructions/recommendations. The following particulars are to be included in the instructions:

- Schematic layout of engine oil mist detection and alarm system showing location of engine crankcase sample points and piping or cable arrangements together with pipe dimensions to detector
- ~~Evidence of study to justify the selected location of sample points and sample extraction rate (if applicable) in consideration of the crankcase arrangements and geometry and the predicted crankcase atmosphere where oil mist can accumulate~~
- The Manufacturer's maintenance and test manual
- Information relating to type or in-service testing of the engine carried out with engine protection system test arrangements having approved types of oil mist detection equipment.

A copy of the oil mist detection equipment maintenance and test manual required above is to be provided on board ship.

Oil mist detection and alarm information is to be capable of being read from a safe location away from the engine.

Each engine is to be provided with its own independent oil mist detection arrangement and a dedicated alarm.

Oil mist detection and alarm systems are to be capable of being tested on the test bed and on board under engine at standstill and engine running at normal operating conditions in accordance with test procedures that are acceptable to the Society.

Alarms and shutdowns for the oil mist detection/monitoring system are to be in accordance with Pt F, Ch 3, Sec 1, Tab 2, Pt F, Ch 3, Sec 1, Tab 3 and Pt F, Ch 3, Sec 1, Tab 27 and the system arrangements are to comply with Ch 3, Sec 2, [6] and Ch 3, Sec 2, [7].

The oil mist detection arrangements are to provide an alarm indication in the event of a foreseeable functional failure in the equipment and installation arrangements.

The oil mist detection system is to provide an indication that any lenses fitted in the equipment and used in determination of the oil mist level have been partially obscured to a degree that will affect the reliability of the information and alarm indication.

Where oil mist detection equipment includes the use of programmable electronic systems, the arrangements are to be in accordance with Chapter 3.

Plans showing details and arrangements of oil mist detection and alarm arrangements are to be submitted for approval in accordance with Tab ~~1~~2, item 26.

Documentation containing evidence of studies justifying the selected location of sample points and the sample extraction rate (if applicable), supported by a confirmation from the oil mist detection system manufacturer, from the crankcase and the spaces mentioned in [4.3.4], e), is to be provided to the Society for reference purposes only.

As an alternative to the evidence of studies, an oil mist inlet test may be performed on a running engine. Test conditions such as setup, records or engine loads are to be agreed upon between engine designer, oil mist detector (OMD) manufacturer and respective class society. The test engine is to be chosen to demonstrate OMD arrangement suitability to cover a specified range of engine types and configurations. To allow a repeatable and comparable test, an oil mist generator as described under App 6 is to be used.

The equipment together with detectors is to be tested when installed on the test bed and on board ship to demonstrate that the detection and alarm system functionally operates. The testing arrangements are to be to the satisfaction of the Society.

Where sequential oil mist detection arrangements are provided, the sampling frequency and time are to be as short as reasonably practicable.

Where alternative methods are provided for the prevention of the build-up of potentially explosive oil mist conditions within the crankcase, details are to be submitted for consideration. The following information is to be included in the details to be submitted for consideration:

- Engine particulars - type, power, speed, stroke, bore and crankcase volume
- Details of arrangements to prevent the build-up of potentially explosive conditions within the crankcase, e.g. bearing temperature monitoring, oil splash temperature, crankcase pressure monitoring, recirculation arrangements
- Evidence to demonstrate that the arrangements are effective in preventing the build-up of potentially explosive conditions together with details of in-service experience
- Operating instructions and the maintenance and test instructions.

Where it is proposed to use the introduction of inert gas into the crankcase to minimise a potential crankcase explosion, details of the arrangements are to be submitted to the Society for consideration.

4.4 Scavenge manifolds

4.4.1 Fire extinguishing *(1/7/2016)*

For two-stroke crosshead type engines, scavenge spaces in open connection (without valves) to the cylinders are to be connected to a fixed fire-extinguishing system, which is to be entirely independent of the fire-extinguishing system of the machinery space.

4.4.2 Blowers *(1/7/2016)*

Where a single two-stroke propulsion engine is equipped with an independently driven blower, alternative means to drive the blower or an auxiliary blower are to be provided ready for use.

4.4.3 Relief valves *(1/7/2016)*

Scavenge spaces in open connection to the cylinders are to be fitted with explosion relief valves in accordance with [4.3.4].

4.5 Systems

4.5.1 General *(1/7/2016)*

In addition to the requirements of the present sub-article, those given in Sec 10 are to be satisfied.

Flexible hoses in the fuel and lubricating oil system are to be limited to the minimum and are to be type approved.

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SECTION 3 BOILERS AND PRESSURE VESSELS

1 General

1.1 Principles

1.1.1 Scope of the Rules

The boilers and other pressure vessels, associated piping systems and fittings shall be of a design and construction adequate for the service for which they are intended and shall be so installed and protected as to reduce to a minimum any danger to persons on board, due regard being paid to moving parts, hot surfaces and other hazards. The design is to have regard to materials used in construction, the purpose for which the equipment is intended, the working conditions to which it will be subjected and the environmental conditions on board.

1.1.2 Continuity of service *(1/1/2026)*

~~*The Society shall give special consideration to the reliability of single essential propulsion components and may require a separate source of propulsion power sufficient to give the ship a navigable speed, especially in the case of unconventional arrangements.*~~

For single essential propulsion components and their reliability, refer to Sec 1, [2.1.2].

1.1.3 Propulsion capability

Means shall be provided whereby normal operation of main boilers can be sustained or restored even though one of the essential auxiliaries becomes inoperative. Special consideration is to be given to the malfunctioning of:

- *the sources of steam supply*
- *the boiler feed water systems*
- *the fuel oil supply systems for boilers;*
- *the mechanical air supply for boilers.*

However, the Society, having regard to overall safety considerations, may accept a partial reduction in propulsion capability from normal operation.

1.1.4 Tests

All boilers and other pressure vessels including their associated fittings which are under internal pressure shall be subjected to appropriate tests including a pressure test before being put into service for the first time (see also [7]).

1.1.5 Protection against overpressure

Where main or auxiliary boilers and other pressure vessels or any parts thereof may be subject to dangerous overpressure, means shall be provided where practicable to protect against such excessive pressure.

1.2 Application

1.2.1 Boilers and pressure vessels covered by the Rules

The requirements of this Section apply to:

- all boilers and other steam generators, including the associated fittings and mountings with the exception of those indicated in [1.2.2]
- pressure vessels of metallic construction and heat exchangers, including the associated fittings and mountings with the exception of those indicated in [1.2.2].

1.2.2 Boilers and pressure vessels not covered by the Rules

The following boilers and pressure vessels are not covered by the Rules and will be considered on a case by case basis:

a) boilers with design pressure p > 10 MPa

b) pressure vessels intended for radioactive material

c) small pressure vessels included in self-contained domestic equipment.

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SECTION 4 STEAM TURBINES

1 General

1.1 Application

1.1.1 Propulsion turbines and turbines for essential services

The requirements of this Section apply to:

a) all propulsion turbines

b) turbines intended for auxiliary services essential for safety and navigation, or for driving cargo pumps in tankers.

1.1.2 Auxiliary turbines driving generators

In addition to the requirements contained in this Section, auxiliary turbines driving electric generators are to comply with those of Chapter 2 .

1.2 Documentation to be submitted

1.2.1 For propulsion turbines and turbines intended for driving machinery for essential services, the plans and data listed in Tab 1 are to be submitted.

All listed plans are to be constructional plans complete with all dimensions and are to contain full indication of the types of materials employed.

2 Design and construction

2.1 Materials

2.1.1 Rotating components

a) Rotors, shafts and discs of turbines are to be of forged steel. In general, the forgings are to have minimum tensile strength R_m within the limits in Tab 2.

b) Rotors of small turbines may be built of special cast steels.

c) Turbine blades are to be built of corrosion-resistant materials.

2.1.2 Static components

The casings and diaphragms of turbines are to be built of forged or cast steels capable of withstanding the pressures and temperatures to which they are subjected. Cast iron may be used for temperatures up to 300°C.

2.2 Design and constructional details

2.2.1 Rotors and stators

a) All components of turbines are to be free from defects and are to be built and installed with tolerances and clearances such as to allow thermal expansion and to minimise the distortions of casings and rotors in all expected service conditions.

b) Particular care is to be devoted to preventing condensation water from accumulating in the blade spaces of the casings. Adequate drain tubes and cocks are to be arranged in a suitable position, in the lower parts of the casings. Cocks are to be easy to operate.

c) When labyrinth packings are used, the steam supply pipes to the sealing system are to be so arranged that condensed steam may not enter the turbine.

d) Particular attention is to be paid to the connection of pipes to the turbine stators in order to avoid abnormal loads in service.

e) Smooth fillets are to be provided at changes of section of rotors, discs and blade roots. The holes in discs are to be well rounded and polished.

2.2.2 Bearings

a) Turbine bearings are to be so located that their lubrication is not impaired by overheating from adjacent hot parts.

b) Lubricating oil is to be prevented from dripping on high temperature parts.

c) Suitable arrangements for cooling the bearings after the turbines have been stopped may also be required, at the discretion of the Society.

2.2.3 Turning gear

a) Main propulsion turbines are to be equipped with turning gear for both directions of rotation. The rotors of auxiliary turbines are to be capable of being turned by hand.

b) The engagement of turning gear is to be visually indicated at the control platform.

c) An interlock is to be provided to ensure that the turbine cannot be started up when the turning gear is engaged.

2.2.4 Astern power for main propulsion *(1/1/2026)*

a) The main propulsion turbine is to have sufficient power for running astern. The astern power is considered to be sufficient if it is ~~able~~capable of operating at the maximum permissible astern power (MPAP) ~~to attain astern revolutions equivalent to at least 70% of the rated ahead revolutions~~ for a period of at least 15 minutes.

b) For main propulsion machinery with reverse gearing, controllable pitch propellers or an electrical transmission system, astern running is not to cause any overloading of the propulsion machinery.

c) During astern running, the main condenser and the ahead turbines are not to be excessively overheated.

Table 1 : Documents to be submitted

No.	A/I **(1)**	ITEM
1	I	Sectional assembly
2	A	Rotors and discs, revolving and stationary blades for each turbine
3	A	Fastening details of revolving and stationary blades
4	A	Casings
5	A	Schematic diagram of control and safety devices
6	I	General specification of the turbine, including an operation and instruction manual
7	I	Maximum power and corresponding maximum rotational speed, and the values of pressure and temperature at each stage
8	A	Material specifications of the major parts, including their physical, chemical and mechanical properties, the data relevant to rupture and creep at elevated temperatures, when the service temperature exceeds 400°C, the fatigue strength, the corrosion resistance and the heat treatments
9	I	Distribution box
10	A	Strength calculations of rotors, discs and blades and blade vibration calculations
11	A	Where the rotors, stators or other components of turbines are of welded construction, all particulars on the design of welded joints, welding conditions, heat treatments and non-destructive examinations after welding
(1) A = to be submitted for approval in four copies I = to be submitted for information in duplicate		

Table 2 : Limits of R_m

STEEL	R_m limits (N/mm^2)
Carbon and carbon-manganese steel	$400 < R_m < 600$
Alloy steels for rotors	$500 < R_m < 800$
Alloy steels for discs and other forgings	$500 < R_m < 1000$

2.2.5 Interlock

The simultaneous admission of steam to the ahead and astern turbines is to be prevented by interlocks. Brief overlapping of the ahead and astern valves during manoeuvring may be permitted.

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SECTION 6 GEARING

1 General

1.1 Application

1.1.1 *(1/1/2015)*

Unless otherwise specified, the requirements of this section apply to:

- reduction and/or reverse gears intended for propulsion plants with a transmitted power of 220 kW and above
- other reduction and step-up gears with a transmitted power of 110 kW and above, intended for essential service auxiliary machinery.

All other gears are to be designed and constructed according to sound marine practice and delivered with the relevant works' certificate (see Pt D, Ch 1, Sec 1, [4.2.3]).

Gearing approved prior to the application date and having a documented satisfactory service experience may be exempted from application of these Rules.

The provisions of Article [2] apply only to cylindrical involute spur or helical gears with external or internal teeth.

Additional requirements for gears fitted to ships having an ice notation are given in Part F, Chapter 9.

Some departure from the requirements of this Section may be accepted by the Society in cases of gears fitted to ships having a restricted navigation notation.

Alternative calculations based on a recognized standard may be submitted by the manufacturer of the gears and will be given special consideration by the Society.

1.2 Documentation to be submitted

1.2.1 Documents

Before starting construction, all plans, specifications and calculations listed in Tab 1 are to be submitted to the Society.

Table 1 : Documents to be submitted for gearing *(1/7/2023)*

No.	I/A **(1)**	Document **(2)**
1	A	Constructional drawings of shafts and flanges
2	A	Constructional drawings of pinions and wheels, including: a) specification and details of hardening procedure: • core and surface mechanical characteristics • diagram of the depth of the hardened layer as a function of hardness values b) specification and details of the finishing procedure: • finishing method of tooth flanks (hobbing, shaving, lapping, grinding, shot-peening) • surface roughness for tooth flank and root fillet • tooth flank corrections (helix modification, crowning, tip-relief, end-relief), if any • grade of accuracy according to ISO 1328-1:2013
3	A	Shrinkage calculation for shrunk-on pinions, wheels rims and/or hubs with indication of the minimum and maximum shrinkage allowances
4	A	Calculation of load capacity of the gears
5	A / I **(3)**	Constructional drawings of casings
6	A	Functional diagram of the lubricating system, with indication of: • specified grade of lubricating oil • expected oil temperature in service • kinematic viscosity of the oil
7	A	Functional diagram of control, monitoring and safety systems

No.	I/A **(1)**	Document **(2)**
8	I	Longitudinal and transverse cross-sectional assembly of the gearing, with indication of the type of clutch
9	I	Data form for calculation of gears

(1) A = to be submitted for approval, in four copies
I = to be submitted for information, in duplicate.

(2) Constructional drawings are to be accompanied by the specification of the materials employed including the chemical composition, heat treatment and mechanical properties and, where applicable, the welding details, welding procedure and stress relieving procedure.

(3) "A" for welded casing, "I" otherwise

1.2.2 Data

The data listed in Tab 2 are to be submitted with the documents required in [1.2.1].

Table 2 : Data to be submitted for gearing

No.	Description of the data
1	Type of driving and driven machines and, if provided, type of flexible coupling
2	Maximum power transmitted by each pinion in continuous running and corresponding rotational speed, for all operating conditions, including clutching-in
3	Modules of teeth for pinion and wheels
4	Pressure angle and helix angle
5	Tooth profiles of pinions and wheels together with tip diameters and fillet radii
6	Operating centre distance
7	Addendum of the cutting tool
8	Common face width, operating pitch diameter
9	Data related to the bearings: • type, characteristics and designed service life of roller bearings • materials and clearances of plain bearings • position of each gear in relation to its bearings
10	Torsional vibration data (inertia and stiffness)

2 Design of gears - Determination of the load capacity

2.1 Symbols, units, definitions

2.1.1 Symbols and units *(1/7/2023)*

The meaning of the main symbols used in this Section is specified below.

Other symbols introduced in connection with the definition of influence factors are defined in the appropriate articles.

a : Centre distance, in mm

b : Common face width (for double helix gear, width of one helix), in mm

$b_{1,2}$: Face width of pinion, wheel

d : Reference diameter, in mm

d_a : Tip diameter, in mm

d_b : Base diameter, in mm

d_f : Root diameter, in mm

$d_{w1,2}$: Working diameter of pinion, wheel, in mm

x : Addendum modification coefficient

z : Number of teeth

z_n : Virtual number of teeth

n : Rotational speed, in rpm

U : Reduction ratio

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$$N = \frac{(b/h)^2}{1 + (b/h) + (b/h)^2}$$

where b/h is the smaller of b_1/h_1 and b_2/h_2 but is not to be taken lower than 3.

For double helical gears, the face width of only one helix is to be used.

d) In case of end relief or crowing: $K_{F\beta} = K_{H\beta}$

2.3.6 Transverse load distribution factors $K_{H\alpha}$ and $K_{F\alpha}$ *(1/7/2022)*

The transverse load distribution factors, $K_{H\alpha}$ for contact stress, and $K_{F\alpha}$ for tooth root bending stress, account for the effects of pitch and profile errors on the transversal load distribution between two or more pairs of teeth in mesh.

The values of $K_{H\alpha}$ and $K_{F\alpha}$ are to be determined according to Method B of ISO 6336-1:2019.

2.4 Calculation of surface durability

2.4.1 General

The criterion for surface durability is based on the contact stress (Hertzian pressure) on the pitch point or at the inner point of single pair contact.

The contact stress σ_H is not to exceed the permissible contact stress σ_{HP}.

2.4.2 Contact stress σ_H *(1/1/2015)*

The contact stress σ_H is to be determined as follows.

- for the pinion

$$\sigma_H = Z_B \cdot \sigma_{H0} \sqrt{K_A \cdot K_\gamma \cdot K_V \cdot K_{H\beta} \cdot K_{H\alpha}}$$

- for the wheel

$$\sigma_H = Z_D \cdot \sigma_{H0} \sqrt{K_A \cdot K_\gamma \cdot K_V \cdot K_{H\beta} \cdot K_{H\alpha}}$$

where:

σ_{H0} : calculated from the following formulae:

for external gears:

$$\sigma_{H0} = Z_H \cdot Z_E \cdot Z_\varepsilon \cdot Z_\beta \sqrt{\frac{F_t}{d_1 \cdot b} \cdot \frac{u + 1}{u}}$$

for internal gears:

$$\sigma_{H0} = Z_H \cdot Z_E \cdot Z_\varepsilon \cdot Z_\beta \sqrt{\frac{F_t}{d_1 \cdot b} \cdot \frac{u - 1}{u}}$$

K_A : Application factor (see [2.3.2]),

K_γ : Load sharing factor (see [2.3.3]),

K_V : Dynamic factor (see [2.3.4]),

$K_{H\beta}$: Face load distribution factors (see [2.3.5]),

$K_{H\alpha}$: Transverse load distribution factors (see [2.3.6]),

Z_B : Single pair tooth contact factor for pinion (see [2.4.4]),

Z_D : Single pair tooth contact factor for wheel (see [2.4.4]),

Z_H : Zone factor (see [2.4.5]),

Z_E : Elasticity factor (see [2.4.6]),

Z_ε : Contact ratio factor (see [2.4.7]),

Z_β : Helix angle factor (see [2.4.8]).

2.4.3 Permissible contact stress σ_{HP} *(1/7/2022)*

The permissible contact stress σ_{HP} is to be determined separately for pinion and wheel using the following formula:

$$\sigma_{HP} = \frac{\sigma_{Hlim}}{S_H} \cdot Z_L \cdot Z_V \cdot Z_R \cdot Z_W \cdot Z_X \cdot Z_N$$

where:

Z_L : Lubricant factor (see [2.4.9]),

Z_V : Velocity factor (see [2.4.9]),

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$$Z_R = \left(\frac{3}{R_{Z10(f))}}\right)^{C_{ZR}}$$

where:

$R_{Z10(f)}$: Mean relative flank peak-to-valley roughness for the gear pair

$$R_{Z10(f)} = R_{Z(f)} \sqrt[3]{\frac{10}{\rho_{red}}}$$

$R_{Z(f)}$: Mean flank peak-to-valley roughness of the gear pair,

$$R_{Z(f)} = \frac{R_{Z(f)1} + R_{Z(f)2}}{2}$$

where $R_{Z(f)1}$ and $R_{Z(f)2}$ are mean values measured on several tooth flanks

ρ_{red} : Relative radius of curvature, equal to:

$$\rho_{red} = \frac{\rho_1 \cdot \rho_2}{\rho_1 + \rho_2} \quad \text{with:}$$

$$\rho_1 = 0{,}5 \cdot d_{b1} \cdot \tan\alpha_{tw}$$

$$\rho_2 = 0{,}5 \cdot d_{b2} \cdot \tan\alpha_{tw}$$

d_b being taken negative for internal gears,

If the roughness stated is an arithmetic mean roughness, i.e. R_a value (=CLA value) (=AA value) the following approximate relationship may be applied:

R_a = CLA = AA = R_z / 6

C_{ZR} : Coefficient having the following values:

- for $\sigma_{H,lim} < 850$ N/mm²
  $C_{ZR} = 0{,}15$
- for 850 N/mm² ≤ $\sigma_{H,lim}$ ≤ 1200 N/mm²
  $$C_{ZR} = 0{,}32 - \frac{\sigma_{Hlim}}{5000}$$
- for $\sigma_{H,lim} > 1200$ N/mm²
  $C_{ZR} = 0{,}08$

2.4.10 Hardness ratio factor Z_W *(1/1/2026)*

The hardness ratio factor Z_W accounts for the increase of surface durability in the case of a soft steel gear meshing with a significantly (≥ 200HV) harder gear with a smooth surface in the following cases:

a) Surface-hardened pinion with through-hardened wheel

- for HB < 130
  $$Z_W = 1{,}2 \cdot \left(\frac{3}{R_{ZH}}\right)^{0,15}$$
- for 130 ≤ HB ≤ 470
  $$Z_W = \left(1{,}2 - \frac{HB - 130}{1700}\right) \cdot \left(\frac{3}{R_{ZH}}\right)^{0,15}$$
- for HB > 470
  $$Z_W = \left(\frac{3}{R_{ZH}}\right)^{0,15}$$

where:

HB : Brinell hardness of the tooth flanks of the softer gear of the pair

R_{ZH} : equivalent roughness, μm

$$R_{ZH} = \frac{R_{Z1} \cdot (10 / \rho_{red})^{0,33} \cdot (R_{Z1} / R_{Z2})^{0,66}}{(V \cdot \nu_{40} / 1500)^{0,33}}$$

If $R_{ZH} > 16$ then $R_{ZH} = 16$ μm

If $R_{ZH} < 3$ then $R_{ZH} = 3$ μm

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SECTION 7 MAIN PROPULSION SHAFTING

1 General

1.1 Application

1.1.1 This Section applies to shafts, couplings, clutches and other shafting components transmitting power for main propulsion.

For shafting components in engines, turbines, gears and thrusters, see Sec 2, Sec 4, Sec 5, Sec 6 and Sec 12, respectively; for propellers, see Sec 8.

For vibrations, see Sec 9.

Additional requirements for navigation in ice are given in Pt F, Ch 9, Sec 3.

1.2 Documentation to be submitted

1.2.1 The Manufacturer is to submit to the Society the documents listed in Tab 1 for approval.

Plans of power transmitting parts and shaft liners listed in Tab 1 are to include the relevant material specifications.

2 Design and construction

2.1 Materials

2.1.1 General

The use of other materials or steels having values of tensile strength exceeding the limits given in [2.1.2], [2.1.3] and [2.1.4] will be considered by the Society in each case.

2.1.2 Shaft materials *(1/7/2006)*

In general, shafts are to be of forged steel having tensile strength, R_m, between 400 and 800 N/mm^2.

Where shafts may experience vibratory stresses close (i.e. higher than 80%) to the permissible stresses for transient operation, the materials are to have a specified minimum ultimate tensile strength (R_m) of 500 N/mm^2. Otherwise, materials having a specified minimum ultimate tensile strength (R_m) of 400 N/mm^2 may be used.

Table 1 : Documentation to be submitted

No.	Document (drawings, calculations, etc.)
1	Shafting arrangement **(1)**
2	Thrust shaft
3	Intermediate shafts
4	Propeller shaft
5	Shaft liners, relevant manufacture and welding procedures, if any
6	Couplings and coupling bolts
7	Flexible couplings **(2)**
8	Sterntube
9	Details of sterntube glands
10	Oil piping diagram for oil lubricated propeller shaft bearings

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- the shaft portion between liners, likely to come into contact with sea water, is protected with a coating of suitable material with characteristics, fitting method and thickness approved by the Society.

2.3.2 Scantling

The thickness of metal liners fitted on propeller shafts or on intermediate shafts inside sterntubes is to be not less than the value t, in mm, given by the following formula:

$$t = \frac{d + 230}{32}$$

where:

d : Actual diameter of the shaft, in mm.

Between the sternbushes, the above thickness t may be reduced by 25%.

2.4 ~~Stern tube~~Aftmost propeller shaft bearings

The requirements in [2.4.1] to [2.4.5] are valid only for the aftmost propeller shaft bearing, next to and carrying the propeller, whether the bearing is in a stern tube or in a strut.

2.4.1 Oil lubricated ~~aft~~ bearings of antifriction metal

a) The length of bearings lined with white metal or other antifriction metal and with oil glands of a type approved by the Society is to be not less than twice the rule diameter of the shaft in way of the bearing.

b) The length of the bearing may be less than that given in (a) above, provided the nominal bearing pressure is not more than 0,8 N/mm^2, as determined by static bearing reaction calculations taking into account shaft and propeller weight, as exerting solely on the aft bearing, divided by the projected area of the shaft.

However, the minimum bearing length is to be not less than 1,5 times its actual inner diameter.

2.4.2 Oil lubricated ~~aft~~ bearings of synthetic rubber, reinforced resin or plastic materials *(1/1/2026)*

a) For bearings of synthetic rubber, reinforced resin or plastics material which are approved by the Society for use as oil lubricated sternbush bearings, the length of the bearing is to be not less than twice the rule diameter of the shaft in way of the bearing.

b) The length of the bearing may be less than that given in (a) above provided the nominal bearing pressure is not more than 0,6 N/mm^2, as determined according to [2.4.1] b).

However, the minimum length of the bearing is to be not less than 1,5 times its actual inner diameter.

Where the material has proven satisfactory testing and operating experience, consideration may be given to an increased bearing pressure.

c) Synthetic materials used for ~~application as~~ oil lubricated ~~stern tube~~ aftmost propeller shaft bearings are to be Type Approved.

The type approval requirements in this clause apply to all aftmost propeller shaft bearings made of synthetic materials.

d) For type approval testing requirements of synthetic material for the aftmost propeller shaft bearing, refer to App 19.

2.4.3 Water lubricated ~~aft~~ bearings of lignum vitae or antifriction metal

Where the bearing comprises staves of wood (known as "lignum vitae") or is lined with antifriction metal, the length of the bearing is to be not less than 4 times the rule diameter of the shaft in way of the bearing.

2.4.4 Water lubricated ~~aft~~ bearings of synthetic materials *(1/1/2026)*

a) The length of the bearing is to be not less than 4 times the rule diameter of the shaft in way of the bearing.

b) For a bearing of synthetic material, consideration may be given to a bearing length less than 4 times, but in no case less than 2 times, the rule diameter of the shaft in way of the bearing, provided the bearing design and material is substantiated by experiments to the satisfaction of the Society.

c) Synthetic materials used for ~~application as~~ water lubricated ~~stern tube~~ aftmost propeller shaft bearings are to be Type Approved. The type approval requirements in this clause apply to all aftmost propeller shaft bearings made of synthetic materials.

d) For type approval testing requirements of synthetic material for the aftmost propeller shaft bearing, refer to App 19.

2.4.5 Grease lubricated ~~aft~~ bearings *(1/1/2021)*

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.

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SECTION 10 PIPING SYSTEMS

1 General

1.1 Application

1.1.1 *(1/1/2025)*

a) General requirements applying to all piping systems are contained in:
- [2] for their design and construction
- [3] for the welding of steel pipes
- [4] for the bending of pipes
- [5] for their arrangement and installation
- [21] for their certification, inspection and testing.

b) Specific requirements for ship piping systems and machinery piping systems are given in Articles [6] to [19].

The requirements of this Section do not apply to the following piping systems:

a) Chemical cargo piping systems of ships subject to the IBC Code and shipboard hydrocarbon/chemical process piping system, for which the requirements in Pt E, Ch 8 applies

b) Gas cargo/fuel and process piping systems of ships, subject to the IGC Code and gas fuel piping systems of ships subject to the IGF Code, for which the requirements in Pt E, Ch 9 and App 7 respectively applies

c) Piping systems for other low flashpoint fuels defined in SOLAS II-1/2.29. for which the applicable requirements in the appendices of this chapter applies.

1.2 Documentation to be submitted

1.2.1 Documents

The documents listed in Tab 1 are to be submitted.

1.2.2 Additional information

The information listed in Tab 2 is also to be submitted.

Table 1 : Documents to be submitted *(1/7/2006)*

No.	I/A **(1)**	Document **(2)**
1	A	Drawing showing the arrangement of the sea chests and ship side valves
2	A	Diagram of the bilge and ballast systems (in and outside machinery spaces)
3	A	Specification of the central priming system intended for bilge pumps, when provided
4	A	Diagram of the scuppers and sanitary discharge systems
5	A	Diagram of the air, sounding and overflow systems
6	A	Diagram of cooling systems (sea water and fresh water)
7	A	Diagram of fuel oil system
8	A	Drawings of the fuel oil tanks not forming part of the ship‘s structure
9	A	Diagram of the lubricating oil system
10	A	Diagram of the thermal oil system
11	A	Diagram of the hydraulic systems intended for essential services or located in machinery spaces
12	A	Diagram of steam system, including safety valve exhaust and drain pipes

(1) A = to be submitted for approval, in four copies;
I = to be submitted for information, in duplicate.

(2) Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.

No.	I/A (1)	Document (2)
13	A I	For high temperature steam pipes: • stress calculation note • drawing showing the actual arrangement of the piping in three dimensions
14	A	Diagram of the boiler feed water and condensate system
15	A	Diagram of the compressed air system
16	A	Diagram of the hydraulic and pneumatic remote control systems
17	A	Diagram of the remote level gauging system
18	I	Diagram of the exhaust gas system
19	A	Diagram of drip trays and gutterway draining system
20	A	Diagram of the oxyacetylene welding system
21	A	Drawings and specification of valves and accessories, where required in [2.7]
22	A	Diagram of the onboard carbon capture and storage system, drawings and documents referred to in Pt E, Ch 9, Sec 1, as applicable.
23	I	Risk Assessment of the onboard carbon capture and storage system

(1) A = to be submitted for approval, in four copies;
I = to be submitted for information, in duplicate.

(2) Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.

Table 2 : Information to be submitted *(1/7/2020)*

No.	I/A (1)	Document
1	I	Nature, service temperature and pressure of the fluids
2	A	Material, external diameter and wall thickness of the pipes
3	A	Type of the connections between pipe lengths, including details of the weldings, where provided
4	A	Material, type and size of the accessories
5	A	Capacity, prime mover and, when requested, location of the pumps
6	A	For plastic pipes: • the chemical composition • the physical and mechanical characteristics in function of temperature • the characteristics of inflammability and fire resistance • the resistance to the products intended to be conveyed
7	A	For fuel oil system : the diagram of the fuel oil system is to indicate the location of sampling points or a dedicated diagram of sampling points is to be presented together with the documentation relevant to the fuel system

(1) A = to be submitted for approval, in four copies;
I = to be submitted for information, in duplicate.

1.3 Definitions

1.3.1 Piping and piping systems

a) Piping includes pipes and their connections, flexible hoses and expansion joints, valves and their actuating systems, other accessories (filters, level gauges, etc.) and pump casings.

b) Piping systems include piping and all the interfacing equipment such as tanks, pressure vessels, heat exchangers, pumps and centrifugal purifiers, but do not include boilers, turbines, internal combustion engines and reduction gears.

Note 1: The equipment other than piping is to be designed in accordance with the relevant Sections of Chapter 1.

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Media conveyed by the piping system	CLASS I	CLASS II	CLASS III
Other flammable media: • heated above flashpoint, or • having flashpoint <60°C (7)	without special safeguards **(3)**	with special safeguards **(3)**	
Oxyacetylene	irrespective of p		
Toxic media	irrespective of p, T		
Corrosive media	without special safeguards **(3)**	with special safeguards **(3)**	
Steam	p > 1,6 or T > 300	other **(2)**	p ≤ 0,7 and T ≤ 170
Air, gases, water, non-flammable hydraulic oil **(4)**, Urea for SCR systems (6)	p > 4 or T > 300	other **(2)**	p ≤ 1,6 and T ≤ 200
Open-ended pipes (drains, overflows, vents, exhaust gas lines, boiler escape pipes)			irrespective of T

(1) Valves under static pressure on fuel oil tanks belong to class II.
(2) Pressure and temperature conditions other than those required for class I and class III.
(3) Safeguards for reducing the possibility of leakage and limiting its consequences, e.g. pipes led in positions where leakage of internal fluids will not cause a potential hazard or damage to surrounding areas which may include the use of pipe ducts, shielding, screening, etc.
(4) Valves and fittings fitted on the ship side and collision bulkhead belong to class II.
(5) Steering gear piping belongs to class I irrespective of p and T
(6) When piping materials selected according to ISO 18611-3:2014 for Urea in SCR systems.
(7) Methyl/ethyl alcohol piping are to comply with the requirements in App 15, [7.3.2].
Note 1: p : Design pressure, as defined in [1.3.2], in MPa.
Note 2: T : Design temperature, as defined in [1.3.3], in °C.

2 General requirements for design and construction

2.1 Materials

2.1.1 General

Materials to be used in piping systems are to be suitable for the medium and the service for which the piping is intended.

2.1.2 Use of metallic materials

a) Metallic materials are to be used in accordance with Tab 4.

b) Materials for class I and class II piping systems are to be manufactured and tested in accordance with the appropriate requirements of Part D.

c) Materials for class III piping systems are to be manufactured and tested in accordance with the requirements of acceptable national or international standards or specifications.

d) Mechanical characteristics required for metallic materials are specified in Part D.

2.1.3 Use of plastics

a) Plastics may be used for piping systems belonging to class III in accordance with App 3. The use of plastics for other systems or in other conditions will be given special consideration.

b) Plastics intended for piping systems dealt with in this Section are to be of a type approved by the Society.

2.2 Thickness of pressure piping

2.2.1 Calculation of the thickness of pressure pipes

a) The thickness t, in mm, of pressure pipes is to be determined by the following formula but, in any case, is not to be less than the minimum thickness given in Tab 5 to Tab 8.

$$t = \frac{t_0 + b + c}{1 - \frac{a}{100}}$$

where:

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Table 17 : Application of mechanical joints depending upon the class of piping *(1/1/2025)*

Types of joints	Classes of piping systems		
	Class I	Class II	Class III
Pipe Unions			
Welded and brazed type	yes (outside diameter ≤ 60.3mm)	yes (outside diameter ≤ 60.3mm)	yes
Compression Couplings			
Swage type	yes	yes	yes
Bite type Typical compression type Flared type	yes yes yes	yes yes yes	yes yes yes
Press type	not	not	yes
Slip-on joints			
Machine grooved type	yes	yes	yes
Grip type	not	yes	yes
Slip type	not	yes	yes
yes means application is allowed not means application is not allowed			

2.5 Protection against overpressure

2.5.1 General

a) These requirements deal with the protection of piping systems against overpressure, with the exception of heat exchangers and pressure vessels, which are dealt with in Sec 3, [2.4].

b) Safety valves are to be sealed after setting.

2.5.2 Protection of flammable oil systems *(1/7/2002)*

Provisions shall be made to prevent overpressure in any flammable oil tank or in any part of the flammable oil systems, including the filling pipes served by pumps on board.

2.5.3 Protection of pump and compressor discharges *(1/1/2026)*

a) Provisions are to be made so that the discharge pressure of pumps and compressors cannot exceed the pressure for which the pipes located on the discharge of these pumps and compressors are designed.

b) When provided on the pump discharge for this purpose, safety valves are to lead back to the pump suction or to any other suitable place.

c) The discharge capacity of the safety valves installed on pumps and compressors is to be such that the pressure at the discharge side cannot exceed by more than 10% the design pressure of the discharge pipe in the event of operation with closed discharge.

d) All positive displacement pumps which are capable of developing a pressure exceeding the design pressure of the system should be provided with relief valves. Each relief valve should be so arranged as to discharge back to the suction side of the pump/piping system or to a tank as appropriate, and to effectively limit the pump discharge pressure to the design pressure of the system. If the vessel design requires isolation valves at the relief valve discharge line, these valves should be locked open, otherwise other arrangements should be set to prevent overpressurization. In addition to the arrangement to prevent overpressurization, further arrangements initiating a visual and audible alarm following the relief valve opening can be also considered to enhance safety.

2.5.4 Protection of pipes

a) Pipes likely to be subjected to a pressure exceeding their normal working pressure are to be provided with safety valves or equivalent overpressure protecting devices.

b) In particular, pipes located on the low pressure side of pressure reducing valves are to be provided with safety valves unless they are designed for the maximum pressure on the high pressure side of the pressure reducing valve. See also [1.3.2] and [2.9.1].

c) The discharge capacity of the devices fitted on pipes for preventing overpressure is to be such that the pressure in these pipes cannot exceed the design pressure by more than 10%.

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j) Flexible hose assemblies and expansion joints constructed of non-metallic materials intended for installation in piping systems for flammable media and sea water systems where failure may result in flooding are to be of fire-resistant type, except in cases where such hoses are installed on open decks, as defined in Regulation 9.2.3.3.2.2(10) of SOLAS Chapter II-2 as amended by IMO resolutions up to MSC.421(98) and not used for fuel oil lines. Fire resistance is to be demonstrated by testing according to ISO 15540:2016 and 15541:2016.

k) Flexible hose assemblies are to be selected for the intended location and application taking into consideration ambient conditions, compatibility with fluids under working pressure and temperature conditions consistent with the Manufacturer's instructions.

2.6.3 Conditions of use of expansion joints in sea water systems and within duct keels and tanks *(1/1/2006)*

a) The use of non-metallic expansion joints on pipes connected to sea inlets and overboard discharges will be given special consideration by the Society. As a rule, the fitting of such joints between the ship side and the valves mentioned in [2.8.3] is not permitted. Furthermore, unless the above-mentioned valves are fitted with remote controls operable from places located above the freeboard deck, the expansion joints are to be arranged with guards which effectively enclose, but do not interfere with, the action of the expansion joints and reduce to the minimum practicable any flow of water into the machinery spaces in the event of failure of the flexible elements.

b) Use of expansion joints in water lines for other services, including ballast lines in machinery spaces, in duct keels and inside double bottom water ballast tanks, and bilge lines inside double bottom tanks and deep tanks, will be given special consideration by the Society.

2.7 Valves and accessories

2.7.1 General *(1/7/2002)*

a) Valves and accessories are normally to be built in accordance with a recognised standard.

Valves and fittings in piping systems are to be compatible with the pipes to which they are attached in respect of their strength (see [1.3.2] for design pressure) and are to be suitable for effective operation at the maximum working pressure they will experience in service.

Failing this, they are to be approved by the Society when they are fitted:

- in a class I piping system, or
- in a class II piping system with a diameter exceeding 100 mm, or
- on the ship side, on the collision bulkhead or on fuel tanks under static pressure.

b) Shut-off valves are to be provided where necessary to isolate pumps, heat exchangers, pressure vessels, etc., from the rest of the piping system when necessary, and in particular:

- to allow the isolation of duplicate components without interrupting the fluid circulation
- for survey or repair purposes.

2.7.2 Design of valves and accessories

a) Materials of valve and accessory bodies are to comply with the provisions of [2.1].

b) Connections of valves and accessories with pipes are to comply with the provisions of [2.4].

c) All valves and accessories are to be so designed as to prevent the loosening of covers and glands when they are operated.

d) Valves are to be so designed as to shut with a right-hand (clockwise) motion of the wheels.

e) Valves are to be provided with local indicators showing whether they are open or shut, unless this is readily apparent.

2.7.3 Valves with remote control *(1/1/2026)*

a) All valves which are provided with remote control are also to be designed for local manual operation.

b) The remote control system and means of local operation are to be independent. In this respect, arrangement of the local operation by means of a fixed hand pump will be specially considered by the Society.

c) In the case of valves which are to be provided with remote control in accordance with the Rules, opening and/or closing of the valves by local manual means is not to render the remote control system inoperable.

d) Power failure of the remote control system is not to cause an undesired change of the valve position.

e) Electrical components - such as solenoid valves and remote indication devices (limit switches) - installed on remotely controlled bilge valves that are located below the bulkhead deck or may be subject to submersion are to comply with an IPX8 protection rating. The water pressure testing of the enclosures protected to IPX8 is to be based

on the maximum hydrostatic pressure that may occur at the installed location during flooding, for a period of 36 hours or consistent with the endurance time required by the applicable statutory and classification requirements.

2.8 Sea inlets and overboard discharges

2.8.1 General

Except where expressly stated in Article [8], the requirements of this sub-article do not apply to scuppers and sanitary discharges.

2.8.2 Design of sea inlets and overboard discharges

a) All inlets and discharges in the shell plating are to be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the ship.

b) Sea inlets and overboard discharges are to be fitted with valves complying with [2.7] and [2.8.3].

c) Machinery space main and auxiliary sea inlets and discharges in connection with the operation of machinery are to be fitted with readily accessible valves between the pipes and the shell plating or between the pipes and fabricated boxes attached to the shell plating. The valves may be controlled locally and are to be provided with indicators showing whether they are open or closed.

d) Sea inlets are to be so designed and arranged as to limit turbulence and to avoid the admission of air due to motion of the ship.

e) Sea inlets are to be fitted with gratings complying with [2.8.4].

f) Provisions are to be made for clearing sea inlet gratings.

g) Sea chests are to be suitably protected against corrosion.

2.8.3 Valves

a) Sea inlet and overboard discharge valves are to be secured:
   - directly on the shell plating, or
   - on sea chests built on the shell plating, with scantlings in compliance with Part B, or
   - on extra-reinforced and short distance pieces attached to the shell (see Tab 5).

b) The bodies of the valves and distance pieces are to have a spigot passing through the plating without projecting beyond the external surface of such plating or of the doubling plates and stiffening rings, if any.

c) Valves are to be secured by means of:
   - bolts screwed through the plating with a countersunk head, or
   - studs screwed in heavy pads themselves secured to the hull or chest plating, without penetration of the plating by the stud holes.

d) The use of butterfly valves will be specially considered by the Society. In any event, butterfly valves not fitted with flanges are not to be used for water inlets or overboard discharges unless provisions are made to allow disassembling at sea of the pipes served by these valves without any risk of flooding.

e) The materials of the valve bodies and connecting pieces are to comply with [2.1.2] and Tab 4.

f) Ship side valves serving piping systems made of plastics are to comply with App 3, [3.7.1].

2.8.4 Gratings

a) Gratings are to have a free flow area not less than twice the total section of the pipes connected to the inlet.

b) When gratings are secured by means of screws with a countersunk head, the tapped holes provided for such screws are not to pass through the plating or doubling plates outside distance pieces or chests.

c) Screws used for fixing gratings are not to be located in the corners of openings in the hull or of doubling plates.

d) In the case of large sea inlets, the screws used for fixing the gratings are to be locked and protected from corrosion.

e) When gratings are cleared by use of compressed air or steam devices, the chests, distance pieces and valves of sea inlets and outlets thus arranged are to be so constructed as to withstand the maximum pressure to which they may be subjected when such devices are operating.

2.8.5 Ship side connections for blow-down of boilers

a) Blow-down pipes of boilers are to be provided with cocks or valves placed as near the end of the pipes as possible, while remaining readily accessible and located above the engine room floor.

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4.3 Heat treatment after bending

4.3.1 Copper and copper alloy

Copper and copper alloy pipes are to be suitably annealed after cold bending if their external diameter exceeds 50 mm.

4.3.2 Steel

a) After hot bending carried out within the temperature range specified in [4.2.4], the following applies:
   - for C, C-Mn and C-Mo steels, no subsequent heat treatment is required,
   - for Cr-Mo and Cr-Mo-V steels, a subsequent stress relieving heat treatment in accordance with Tab 20 is required.

b) After hot bending performed outside the temperature range specified in [4.2.4], a subsequent new heat treatment in accordance with Tab 21 is required for all grades.

c) After cold bending at a radius lower than 4 times the external diameter of the pipe, a heat treatment in accordance with Tab 21 is required.

5 Arrangement and installation of piping systems

5.1 General

5.1.1 Unless otherwise specified, piping and pumping systems covered by the Rules are to be permanently fixed on board ship.

5.2 Location of tanks and piping system components

5.2.1 Flammable oil systems

Location of tanks and piping system components conveying flammable fluids under pressure is to comply with [5.10].

5.2.2 Piping systems with open ends

Attention is to be paid to the requirements for the location of open-ended pipes on board ships having to comply with the provisions of [5.5].

5.2.3 Pipe lines located inside tanks *(1/7/2006)*

a) The passage of pipes through tanks, when permitted, requires special arrangements such as reinforced thickness as per Tab 5 for steel pipes or tunnels, in particular for:
   - bilge pipes
   - ballast pipes
   - scuppers and sanitary discharges
   - air, sounding and overflow pipes
   - fuel oil pipes.

b) Junctions of pipes inside tanks are to be made by welding or welded reinforced flange connections. See also [2.4.3].

5.2.4 Overboard discharges

Overboard discharges are to be so located as to prevent any discharge of water into the lifeboats while they are being lowered.

5.2.5 Piping and electrical apparatus *(1/7/2007)*

The installation of piping near switchboards and other electrical apparatus is to comply with Ch 2, Sec 12, [6.1.7].

5.3 Passage through watertight bulkheads or decks

5.3.1 General *(1/7/2009)*

Item [5.3.2] applies to cargo ships.

Item [5.3.3] applies to cargo and passenger ships.

5.3.2 Penetration of watertight bulkheads and decks *(1/1/2011)*

a) Where penetrations of watertight bulkheads and internal decks are necessary for piping and ventilation, arrangements are to be made to maintain the watertight integrity.

b) Lead or other heat sensitive materials are not to be used in piping systems which penetrate watertight subdivision bulkheads or decks, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkhead or decks.

This applies in particular to the following systems:

- bilge system
- ballast system
- scuppers and sanitary discharge systems.

c) Where bolted connections are used for piping passing through watertight bulkheads or decks, the bolts are to be screwed in heavy pads secured to the bulkhead or deck plating without penetration of the plating by the bolt holes. Where welded connections are used, they are to be welded on both sides of the bulkhead or deck plating.

d) Penetrations of watertight bulkheads or decks by plastic pipes are to comply with App 3, [3.6.2].

5.3.3 Passage through the collision bulkhead *(1/1/2026)*

a) For ships constructed before 1 January 2024 except as provided in c), *the collision bulkhead may be pierced below the bulkhead deck of passenger ships and the freeboard deck of cargo ships by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a screw-down valve capable of being operated from above the bulkhead deck of passenger ships and the freeboard deck of cargo ships, the valve being located inside the forepeak to the collision bulkhead. The Society may, however, authorise the fitting of this valve on the after side of the collision bulkhead provided that the valve is readily accessible under all service conditions and the space in which it is located is not a cargo space.*

Alternatively, for cargo ships, the pipe may be fitted with a butterfly valve suitably supported by a seat or flanges and capable of being operated from above the freeboard deck.

All valves are to be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable.

b) For ships constructed on or after 1 January 2024, except as provided in c), the collision bulkhead may be pierced below the bulkhead deck of passenger ships and the freeboard deck of cargo ships by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a remotely controlled valve capable of being operated from above the bulkhead deck of passenger ships and the freeboard deck of cargo ships. The valve shall be normally closed. If the remote control system should fail during operation of the valve, the valve shall close automatically or be capable of being closed manually from a position above the bulkhead deck of passenger ships and the freeboard deck of cargo ships. The valve shall be located at the collision bulkhead on either of forward or aft side, provided that the space on the aft side is not a cargo space. The valve shall be steel, bronze other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable.

The relevant interpretation in IACS UI SC306 applies.

c) If the forepeak is divided to hold two different kinds of liquids the Society may allow the collision bulkhead to be pierced below the bulkhead deck of passenger ships and the freeboard deck of cargo ships by two pipes, each of which is fitted as required in a) or b), provided the Society is satisfied that there is no practical alternative to the fitting of such a second pipe and that, having regard to the additional subdivision provided in the forepeak, the safety of the ship is maintained.

d) The remote operation device of the valve referred to in a) or b) is to include an indicator to show whether the valve is open or shut.

5.4 Independence of lines

5.4.1 As a general rule, bilge and ballast lines are to be entirely independent and distinct from lines conveying liquid cargo, lubricating oil and fuel oil, with the exception of:

- pipes located between collecting boxes and pump suctions
- pipes located between pumps and overboard discharges
- pipes supplying compartments likely to be used alternatively for ballast, fuel oil or liquid or dry cargoes, provided such pipes are fitted with blind flanges or other appropriate change-over devices, in order to avoid any mishandling.

5.5 Prevention of progressive flooding

5.5.1 Principle

a) In order to comply with the subdivision and damage stability requirements of Pt F, Ch 13, Sec 11, provision is to be made to prevent any progressive flooding of a dry compartment served by any open-ended pipe, in the event that such pipe is damaged or broken in any other compartment by collision or grounding.

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e) One of the sea inlets may be that of the ballast pump or of the general service pump.

Table 25 : Cooling systems

Symbol convention H = High, HH = High high, G = group alarm L = Low, LL = Low low, I = individual alarm X = function is required, R = remote	Monitoring		Automatic control				
			System			Auxiliary	
Identification of system parameter	Alarm	Indication	Slow-down	Shut-down	Control	Stand by Start	Stop
Sea water pump pressure or flow	L	local					
Fresh water pump pressure or flow	L	local					
Level in cooling water expansion tank	L	local					

10.7.2 Coolers

a) Coolers are to be fitted with isolating valves at the inlets and outlets.

b) Coolers external to the hull (chest coolers and keel coolers) are to be fitted with isolating valves at the shell.

10.7.3 Filters

a) Where propulsion engines and auxiliary engines for essential services are directly cooled by sea water, both in normal service and in emergency operating conditions, filters are to be fitted on the suction of cooling pumps.

b) These filters are to be so arranged that they can be cleaned without interrupting the cooling water supply.

10.7.4 Pumps

a) Cooling pumps for which the discharge pressure may exceed the design pressure of the piping system are to be fitted with relief valves in accordance with [2.5].

b) Where general service pumps, ballast pumps or other pumps may be connected to a cooling system, arrangements are to be made, in accordance with [2.5], to avoid overpressure in any part of the cooling system.

10.7.5 Air venting

Cocks are to be installed at the highest points of the pipes conveying cooling water to the water jackets for venting air or gases likely to accumulate therein. In the case of closed fresh water cooling systems, the cock is to be connected to the expansion tank.

11 Fuel oil systems

11.1 Application

11.1.1 Scope

This Article applies to all fuel oil systems supplying any kind of installation.

11.1.2 Requirements applying to fuel oil systems and not contained in this Section *(1/1/2007)*

Additional requirements are given:

- for independent fuel oil tanks, in App 4
- for fuel oil supply equipment forming part of engines, gas turbines, boilers, thermal heaters and incinerators, in the corresponding sections
- for the location and scantling of tanks forming part of the ship’s structure, in Part B, Chapter 2 and Part B, Chapter 7.

11.2 Principle

11.2.1 General

a) Fuel oil systems are to be so designed as to ensure the proper characteristics (purity, viscosity, pressure) of the fuel oil supply to engines and boilers.

b) Fuel oil systems are to be so designed as to prevent:
   - overflow or spillage of fuel oil from tanks, pipes, fittings, etc.
   - fuel oil from coming into contact with sources of ignition
   - overheating and seizure of fuel oil.

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f) Fuel treatment system performance in the removal of catfines and water is recommended to be regularly assessed, by drawing and analyzing samples from before and after the purifier plant and after the service tank to ensure that the catfines and water levels dot not exceed maximum engine entry levels recommended by engine manufacturers.

g) Centrifugal separators are to be certified for a flow rating in accordance with a recognised standard, e.g. EN 17763:2022, Centrifuges - Marine fuel centrifuges - Determination of particle separation performance and certified flow rate (CFR) under defined test conditions, CEN Workshop Agreement (CWA) 15375 (latest revision).

h) Centrifugal separators are to meet the safety requirements of a recognized standard, e.g. EN 12547, Centrifuges - Common safety requirements.

11.9 Fuel oil pumps

11.9.1 General *(1/7/2020)*

Fuel pump capacity is to ensure that fuel flow rate through the fuel system is sufficient to maintain the installed oil fuelled machinery's fuel consumption during normal operation at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant.

Satisfactory fuel pump operation is to be verified according to the Society requirements after installation on board.

11.9.2 Fuel oil pumps arrangement *(1/7/2020)*

The fuel oil pumps used in fuel oil treatment and transfer systems and operating on RMF and DMF are to comply with the requirements in [11.9.3] that are applicable to primary and secondary essential services fuel oil pumps (main and stand-by) which include: separator fuel oil supply pumps; booster pumps; feeder pumps; fuel valve cooling pumps (in systems which use fuel oil for this service); and fuel oil transfer pumps.

11.9.3 Requirements for fuel oil pumps arrangement *(1/7/2024)*

For ships intending to use RMF and/or DMF in non-restricted areas and marine fuels with a minimum viscosity of 2.0 cSt in emission control areas, the fuel oil pumps arrangement is to be in compliance with SOLAS regulation II-I/26.3.4 as interpreted by MSC.1/Circ.1467 (reflecting IACS UI SC255).

11.10 Design of fuel supply systems

11.10.1 General *(1/7/2024)*

a) In ships where heavy fuel oil and marine diesel oil are used, a change-over system from one fuel to the other is to be provided. This system is to be so designed as to avoid:
   - overheating of marine diesel oil
   - inadvertent ingress of heavy fuel oil into marine diesel oil tanks.

b) When necessary, arrangements are to be made for cooling the marine diesel oil from engine return lines.

c) The fuel oil treatment system is to be provided with redundancy so that failure of one system will not render the other system(s) inoperative. Arrangements are to ensure that any single failure in the system will not interrupt the supply of clean fuel to machinery used for propulsion and electrical generating purposes.

11.10.2 Fuel oil service tanks *(1/7/2022)*

a) Two fuel oil service tanks for each type of fuel used on board necessary for propulsion and vital systems, or equivalent arrangements, are to be provided on each new ship, with a capacity of at least 8 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant.

b) Where main engines, auxiliary engines and boilers are operated with heavy fuel oil, the following equivalent arrangements may be accepted for fuel oil service tanks:
   - one heavy fuel oil service tank with a capacity of at least 8 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant and of the auxiliary boiler
   - one marine diesel oil service tank with a capacity of at least 8 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant and of the auxiliary boiler.

c) Where main engine and auxiliary boilers are operated with heavy fuel oil and auxiliary engines are operated with marine diesel oil, the following equivalent arrangements may be accepted for fuel oil service tanks:
   - one heavy fuel oil service tank with a capacity of at least 8 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the auxiliary boiler
   - two marine diesel oil service tanks, each with a capacity of at least the higher of:
     - 8 h at normal operating load at sea of the auxiliary engines and auxiliary boilers

- 4 h at maximum continuous rating of the propulsion plant and normal operating load at sea of the generator plant and of the auxiliary boiler.

d) The above calculated capacities are to be increased by the volume below the suction pipe due to the requirement in [11.10.4] a).

Note 1: The requirement in [11.10.2] need not be applied to cargo ships of less than 500 tons gross tonnage:

- intended for restricted service or
- having engines declared suitable for prolonged operation on untreated fuel oil.

11.10.3 Fuel oil supply to boilers *(1/7/2011)*

a) In ships where boilers burning oil under pressure are installed to supply steam for propulsion purposes and essential services (such as propulsion machinery, machinery serving essential services or systems essential for propulsion and other essential services, e.g. heavy fuel oil heating system), the fuel oil supply system is to include at least two units, each one comprising:
   - a suction filter
   - an independent pump
   - a heater in the case of heavy fuel oil
   - a discharge filter.

b) Alternative arrangements using double filters are acceptable provided the element of one such filter can be cleaned while the other operates.

c) The fuel oil supply system is to be capable of supplying the fuel oil necessary to generate enough steam for propulsion purposes and essential services with one unit out of action.

d) A quick-closing valve is to be provided on the fuel supply to the burners of each boiler, arranged to be easily operated in case of emergency, either directly or by remote control.

e) The fuel supply to the burners is to be capable of being automatically cut off when required under Sec 3, [5.1.8].

f) Burners are to comply with Section Sec 3, [2.2.5].

g) Where burners are provided with fuel oil flow-back to the pump suctions or other parts under pressure, non-return devices are to be provided to prevent fuel oil from flowing back to the burners when the oil supply is cut off.

h) For the starting-up of boilers, an auxiliary fuel oil unit not requiring power from shore is to be provided.

i) Where fuel oil is supplied to the burners by gravity, a double filter satisfying the provisions of a) is to be provided in the supply line.

j) Fuel oil supply systems are to be entirely separate from feed, bilge, ballast and other piping systems.

11.10.4 Fuel oil supply to internal combustion engines *(1/1/2026)*

a) The suctions of engine fuel pumps are to be arranged at an appropriate distance above the fuel-oil treatment tank drain point in order to prevent accumulated water and sludge being drawn into the fuel oil treatment system (e.g. 5% of the tank volume is below the suction pipe).

b) Suitable filters are to be provided on the fuel oil line to the injection pumps.

   Fuel filters are to reduce the level of contaminants (i.e. metallic particles / sediments etc.) in the fuel to a level commensurate with the downstream equipment manufacturers' requirements.

   Internal combustion engines intended for main propulsion are to be fitted with at least two filters, or similar devices, so arranged that one of the filters can be overhauled while the other is in use.

Note 1: Where the propulsion plant consists of:

- two or more engines, each one with its own filter, or
- one engine with an output not exceeding 375 kW,

the second filter may be replaced by a readily accessible and easily replaceable spare filter.

c) Oil filters fitted in parallel are to be so arranged as to minimise the possibility of a filter under pressure being opened by mistake.

   Filter chambers are to be provided with suitable means for:

   - ventilating when put into operation
   - de-pressurising before being opened.

   Valves or cocks used for this purpose are to be fitted with drain pipes led to a safe location.

d) Oil filters are to be so located that in the event of a leakage the fuel oil cannot be pulverised onto the exhaust manifold.

e) When a fuel oil booster pump is fitted which is essential to the operation of the main engine, a standby pump, connected ready for immediate use, is to be provided.

The standby pump may be replaced by a complete spare pump of appropriate capacity ready to be connected, in the following cases:

- where two or more main engines are fitted, each with its own booster pump
- in ships having main engines each with an output not exceeding 375 kW.

For ships intending to use Heavy Fuel Oil (HFO) or Marine Diesel Oil (MDO) in some areas and marine fuels with a lower viscosity in other areas, either:

- each of the fuel oil pumps (main one and stand-by one) is suitable to supply both types of fuel at the required capacity for normal operation of propulsion machinery, or
- each of the fuel oil pumps (main one and stand-by one) is suitable to supply both types of fuel but one pump alone is not capable of delivering at the required capacity, then both pumps may operate in parallel to achieve the required capacity for normal operation of propulsion machinery but one additional (third) fuel oil pump shall be fitted. The additional pump shall, when operating in parallel with one of the other pumps, be suitable for and capable of delivering fuel at the required capacity for normal operation of the propulsion machinery
- two separate fuel oil pumps (one main and one stand-by) are to be fitted, each capable of and suitable for supplying low viscosity fuels at the required capacity for normal operation of propulsion machinery.

f) Where fuel oils require pre-heating in order to have the appropriate viscosity when being injected in the engine, the following equipment is to be provided in the fuel oil line:

- one viscosity control and monitoring system
- two pre-heaters, one serving as a standby for the other.

g) In case of unrestricted navigation, automatic viscosity controllers are to be maintained as the primary means to control required injection viscosity, with automatic temperature control being only a secondary back up option. In case of restricted navigation, manual temperature control can be accepted.

h) Excess fuel oil from pumps or injectors is to be led back to the service or settling tanks, or to other tanks intended for this purpose.

i) De-aeration tanks fitted in pressurised fuel oil return lines are to be equipped with at least:

- an automatic venting valve or equivalent device discharging to the daily service tank
- a non-return valve in the return line from the engines.

j) Components of a diesel engine fuel system are to be designed considering the maximum peak pressure which will be experienced in service, including any high pressure pulses which are generated and transmitted back into the fuel supply and spill lines by the action of fuel injection pumps.

k) Connections within the fuel supply and spill lines are to be constructed having regard to their ability to prevent pressurised fuel oil leaks while in service and after maintenance.

l) In multi-engine installations which are supplied from the same fuel source, means of isolating the fuel supply and spill piping to individual engines, are to be provided. The means of isolation are not to affect the operation of the other engines and are to be operable from a position not rendered inaccessible by a fire on any of the engines.

m) For high pressure fuel oil pipes, refer to Sec 2.

n) For protection from overpressure in the fuel oil return line, refer to [2.5.3],d).

11.10.5 Sampling points *(1/7/2022)*

The fuel oil supply system is to be provided with sampling points.

The sampling points are to be:

- easily and safely accessible
- downstream of the in-use fuel oil service tank
- as close to the fuel oil combustion machinery as safely feasible taking into account the type of fuel oil, flow-rate, temperature, and pressure behind the selected sampling point
- clearly marked for easy identification and described in either the piping diagram or other relevant documents
- located in a position shielded from any heated surface or electrical equipment and the shielding device or construction should be sturdy enough to endure leaks, splashes or spray under design pressure of the fuel oil supply line so as to preclude impingement of fuel oil onto such surface or equipment
- provided with suitable drainage to the drain tank or other safe location
- equipped with closable valve and permanent means of closure like plugs.

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14.5.2 Hydraulic oil storage tanks

a) Hydraulic power installations supplying essential services are to include a storage tank of sufficient capacity to refill the whole installation should the need arise case of necessity.

b) For hydraulic power installations of less than 5 kW, the storage means may consist of sealed drums or tins stored in satisfactory conditions.

14.5.3 Hydraulic accumulators

The hydraulic side of the accumulators which can be isolated is to be provided with a relief valve or another device offering equivalent protection in case of overpressure.

14.6 Control and monitoring

14.6.1 General *(1/7/2006)*

In addition to those of this item [14.6], the general requirements given in Chapter 3 apply.

In the case of ships with automation notations, the requirements in Part F, Chapter 3 also apply.

14.6.2 Indicators

Arrangements are to be made for connecting a pressure gauge where necessary in the piping system.

14.6.3 Monitoring

Alarms and safeguards for hydraulic power installations intended for essential services, except steering gear, for which the provisions of Sec 11 apply, are to be provided in accordance with Tab 29.

Note 1: Some departures from Tab 29 may be accepted by the Society in the case of ships with a restricted navigation notation.

Note 2: Tab 29 does not apply to steering gear.

14.7 Construction of hydraulic oil piping systems

14.7.1 Materials

a) Pipes are to be made of seamless steel. The use of welded steel pipes will be given special consideration by the Society.

b) Casings of pumps, valves and fittings are to be made of steel or other ductile material.

15 Steam systems

15.1 Application

15.1.1 Scope

This Article applies to all steam systems intended for essential and non-essential services.

Steam systems with a design pressure of 10 MPa or more will be given special consideration.

Table 29 : Hydraulic oil systems

Symbol convention H = High, HH = High high, G = group alarm L = Low, LL = Low low, I = individual alarm X = function is required, R = remote	Monitoring		Automatic control				
			System			Auxiliary	
Identification of system parameter	Alarm	Indication	Slow-down	Shut-down	Control	Stand by Start	Stop
Pump pressure	L						
Service tank level	L **(1)**						
(1) The low level alarm is to be activated before the quantity of lost oil reaches 100 litres or 50 % of the circuit volume , whichever is the less.							

15.2 Principle

15.2.1 General

Steam systems are to be so designed as to:

- avoid overpressure in any part of the steam piping system
- ensure the draining of condensate from the steam line.

15.2.2 Availability *(1/1/2026)*

a) ~~Where a single boiler is installed, the steam system may supply only non-essential services.~~

b) ~~Where more than one boiler is installed, the steam piping system is to be so designed that, in the event that any one boiler is out of action, the steam supply to essential services can be maintained.~~

Steam systems supplying essential services other than cargo services are to be fitted with more than one boiler, so that the steam supplied to essential services can be maintained in case of failure of any single boiler.

15.3 Design of steam lines

15.3.1 General

a) Every steam pipe and every connected fitting through which steam may pass is to be designed, constructed and installed such as to withstand the maximum working stresses to which it may be subjected.

b) When the design temperature of the steam piping system exceeds 400°C, calculations of thermal stresses are to be submitted to the Society as specified in [2.3].

c) Steam connections on boilers and safety valves are to comply with the applicable requirements of Sec 3.

15.3.2 Provision against overpressure

a) If a steam pipe or fitting may receive steam from any source at a higher pressure than that for which it is designed, a suitable reducing valve, relief valve and pressure gauge are to be fitted.

b) When, for auxiliary turbines, the inlet steam pressure exceeds the pressure for which the exhaust casing and associated piping up to the exhaust valves are designed, means to relieve the excess pressure are to be provided.

15.3.3 Provision for dumping

In order to avoid overpressure in steam lines due to excessive steam production, in particular in systems where the steam production cannot be adjusted, provisions are to be made to allow the excess steam to be discharged to the condenser by means of an appropriate dump valve.

15.3.4 Provision for draining

Means are to be provided for draining every steam pipe in which dangerous water hammer action might otherwise occur.

15.3.5 Steam heating pipes

a) When heating coils are fitted in compartments likely to contain either fuel oil or liquid or dry cargoes, arrangements such as blind flanges are to be provided in order to disconnect such coils in the event of carriage of dry or liquid cargoes which are not to be heated.

b) The number of joints on heating coils is to be reduced to the minimum consistent with dismantling requirements.

15.3.6 Steam lines in cargo holds

a) Live and exhaust steam pipes are generally not to pass through cargo holds, unless special provisions are made with the Society's agreement.

b) Where steam pipes pass through cargo holds in pipe tunnels, provision is to be made to ensure the suitable thermal insulation of such tunnels.

c) When a steam smothering system is provided for cargo holds, provision is to be made to prevent any damage of the cargo by steam or condensate leakage.

15.3.7 Steam lines in accommodation spaces

Steam lines are not to pass through accommodation spaces, unless they are intended for heating purposes.

15.3.8 Turbine connections

a) A sentinel valve or equivalent is to be provided at the exhaust end of all turbines. The valve discharge outlets are to be visible and suitably guarded if necessary.

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20 Exhaust gas treatment systems

20.1 Application

20.1.1 *(1/1/2026)*

This Article applies to:

- exhaust gas cleaning systems (scrubbers)
- ~~s~~Selective ~~c~~Catalytic ~~r~~Reduction (SCR) systems.~~-~~
- Onboard Carbon Capture and Storage (OCCS) systems.

20.1.2 Applicability of other Rules *(1/4/2021)*

Exhaust gas treatment systems are regarded as non-essential services, therefore:

- redundancy is not necessary, and
- testing of materials and components is to be in compliance with the requirements for equipment intended non essential services.

  However, equipment intended to ensure the ship safety or essential to ensure personnel safety (such as but not limited to valves connected to the outer shell, sea water piping, pipes conveying hazardous substances, exhaust gas by-pass valves), is anyway to be inspected and tested as requested for equipment intended for essential services.

20.2 Efficiency

20.2.1 *(1/1/2018)*

When the additional class notations "**EGCS-Sox**" or "**EGCS NOx**" are issued, the efficiency of the equipment is to be certified against the requirements of the latest IMO Guidelines published at the Building Contract date.

20.3 Exhaust ducting

20.3.1 *(1/1/2018)*

The parts of the Exhaust gas treatment systems containing exhaust gas are to be in compliance with [18].

When the exhaust gas treatment system may influence the operation of essential machinery, arrangements are to be made to ensure the continuity of the service concerned also in case of possible failures of the exhaust gas treatment system (e.g. exhaust gas bypasses are to be arranged, to enable continued operation of engine intended to drive single essential users in case of filters clogging by particulate matter).

20.3.2 *(1/1/2026)*

Where closing devices are fitted in the exhaust gas main and bypass flow paths, it is to be ensured that there is an open flow path for exhaust gas at all times, even in case of failure of the control or actuation system to the closing devices. The essential services are not to be impaired during the bypass activation.

20.3.3 *(1/1/2026)*

Where an exhaust gas treatment system is fed from multiple exhaust gas inlet streams, the arrangement is to be such that the following safety functions are provided:

- preventing reverse flow of exhaust gas (e.g. isolating valves or equivalent means of isolating the exhaust systems of individual engines from common manifolds are to be provided to prevent reverse flow of exhaust gas into the exhaust manifolds of engines which have been shut down)
- maintaining the backpressure within the allowable limits (such limits are to be provided by machinery manufacturers for all engine or combustion machinery operating configurations).

20.4 Materials

20.4.1 *(1/1/2018)*

Materials used for equipment and piping systems are to be suitable with fluids conveyed, taking into account their chemical reactivity.

Aluminium and galvanized pipes are to be avoided for equipment and piping systems in contact with fluids containing sodium hydroxide or acids.

Copper is to be avoided for equipment and piping systems in contact with fluids containing ammonia.

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20.8 Monitoring and Safety Functions for Exhaust Gas Cleaning (SO_x) Systems

20.8.1 General *(1/1/2026)*

Marine air pollution regulations typically require the use of low-sulfur fuel in order to reduce SO_x gaseous emissions. The use of Exhaust Gas Cleaning Systems (EGCS) technology is generally permitted as an alternative means of compliance. EGCS – SO_x Scrubbers can be effective in complying with regulations that require the use of 0,5 percent sulfur fuel globally and 0,1 percent in Emission Control Areas (ECA). The following requirements apply to the arrangements intended for the safeguard of the ship in case of malfunction of the EGCS.

20.8.2 Exhaust Bypass *(1/1/2026)*

The EGCS bypass arrangement is to be provided in order to continue the operation of the engines. The arrangement is to be operated automatically in accordance with Tab 33. The bypass arrangement may be omitted, provided the EGCS is designed for dry operation and the lack of the bypass arrangement does not interfere with the continuous operation of the engine.

In installations with individually controlled bypass and uptake dampers, an interlock is required to prevent both dampers from being closed at the same time. The interlock can comprise a pressure sensor upstream of the dampers, interfaced to the EGCS safety system, opening the bypass damper in case of high back pressure.

20.8.3 Control and Monitoring System *(1/1/2026)*

Automatic control, monitoring (including washwater discharge criteria), alarm, and safety functions are to be provided for the EGCS so that operations remain within preset parameters for all fuel oil combustion unit(s) and SO_x emission abatement system operating conditions.

The control system for the exhaust gas cleaning system may be connected to an integrated control system or may be a standalone system. The system is to be designed such that a single fault of a component will not lead to a potentially dangerous situation for human safety and/or the vessel. An FMEA, or equivalent, demonstrating the safety system design basis is to be submitted to the Society, when the control system is connected to an integrated control system of a vessel.

For vessels with unmanned propulsion machinery space, the alarm and monitoring systems of the EGCS can be integrated in the vessel's centralized monitoring systems.

20.8.4 Safety Shutdown System *(1/1/2026)*

A safety shutdown system is to be provided. The safety system is to be designed as far as is practicable to operate independently of the control and alarm systems mentioned in [20.8.3], such that failures or malfunctions in the control and alarm systems will not prevent the safety system from operating:

a) Upon activation of the safety shutdown system, visual and audible alarms are to be indicated at both the local and remote control positions. Visual alarms are to include a means of indicating the parameters causing shutdown.

b) In addition to the automatic shutdown system, manual emergency shutdown arrangements are to be provided at both the local and remote the control positions.

c) In the event where shutdown by the safety shutdown system is activated, the restart should not occur automatically, unless after the system is manually reset.

d) Safety shutdown is to be automatically activated for the conditions in Tab 33.

20.8.5 Monitored Parameters *(1/1/2026)*

Table 33 : Parameters for indication, alarm and safety functions *(1/1/2026)*

	Gr 1		Gr 2
Monitored Parameters	Indication at control position(s)	Alarm Activation	Automatic EGC Shutdown with alarm and EGC Bypass **(1)**
Exhaust gas temperature after EGC unit	X	High	X (High-High)
Pressure before the EGC unit and/or Differential pressure across EGC unit **(2)**	X	High	X (High-High)
Water level in wet EGC unit		High	X (High-High)
EGC exhaust fan/blower motors **(3)**	Running	Stop	
EGC exhaust bypass, isolation, mixing valves, where provided	Position **(4)**		

	Gr 1		Gr 2
Operation of EGC washwater pumps or washwater system supply pressure	Running X	Stop Low	
Chemical treatment fluid storage tank temperature		Low/High **(5)**	
Chemical treatment fluid storage tank level		Low/High **(5)**	
Chemical treatment fluid leakage detection in system drip tray or drain / residue tank		X **(6)**	

Gr 1 Common sensor for indication and alarm
Gr 2 Sensor for shut down and bypass

(1) Automatic stopping of all EGCS pumps. Automatic bypass of the EGC unit is required when the EGC unit is not suitable for operation in the dry condition

(2) As applicable in accordance with the specific EGC system design and installation

(3) If applied

(4) See [20.8.2]

(5) See [20.7.2] e)

(6) if necessary, see [20.7.2] m)

20.9 Onboard Carbon Capture and Storage systems (OCCS)

20.9.1 Definitions *(1/1/2026)*

a) OCCS - Onboard Carbon Capture and Storage System

b) CO_2 Storage tanks - Tanks where captured CO_2 is stored either in a packaged form (e.g. portable tank) or in bulk (e.g. IMO Type C storage tanks, as defined in IGC Code, integral ship tanks)

c) CO_2 Machinery handling spaces - Spaces where captured CO_2 is handled, such as but not limited to the spaces where the CO_2 compressors, heat exchangers, and equipment and pumps for stripping, drying, liquefaction and transfer are located

d) CO_2 tank room/hold space - Enclosed space where a CO_2 storage tank is fitted

e) Chemical Carbon solvent - Amine-based chemical solvent such as Ethanolamine solutions (MEA-Monoethanolamine, DEA-Diethanolamine, TEA-Triethanolamine) are currently the common and most widely used solvent for Carbon emissions abatement systems. Additionally, sodium hydroxide (NaOH) or calcium hydroxide ($Ca(OH)_2$) may also be used as chemical carbon solvent where reaction with CO_2 produces a solution containing sodium carbonate and sodium bicarbonate depending on the reaction conditions. All the chemical carbon solvents are hereinafter referred to as solvents

f) post-combustion carbon emission abatement plant - a system which is intended to deal with the carbon composites generated during combustion of a carbon containing fuel in a fuel consumer. It is opposite of pre-combustion carbon emission abatement plant, which is a system intended to deal with the carbon in the fuel, prior to its combustion in a fuel consumer

g) full flow carbon capture plants - carbon capture plants where the full amount of exhaust gases from an engine or group of engines is passing through the carbon capture plant

h) side streams carbon capture plants - plants where the flow of exhaust gases is divided in two streams, one of which is passing through the carbon capture plant.

20.9.2 Risk Assessment *(1/1/2026)*

When an Onboard Carbon Capture and Storage system is intended to be installed onboard, a risk assessment is to be conducted and the relevant recommendations are to be considered in the design construction, testing and operation of the OCCS as applicable.

The risk assessment is to address at least the following systems:

a) supply, storage, handling, venting and unloading system (if installed) of solvents

b) compression, liquefaction, storage and unloading system of OCCS (if installed)

c) location and layout of OCCS equipment and CO_2 storage tanks on board

d) supply, storage, and handling of the refrigerant for the carbon dioxide liquefaction system

e) gas detection system for the vapours of the solvents and of other solutions as result of the CO_2 capture process chemical reaction

f) bilge and draining system dedicated to rooms where OCCS equipment are installed

g) ventilation system dedicated to rooms where OCCS equipment are installed.

The risk assessment is to address at least the following failure scenarios:

a) leakage of chemical carbon solvent into the ship and on open deck

b) leakage of CO2 into the ship and on open deck

c) leakage of refrigerant for carbon dioxide liquefaction system into the ship and on open deck

d) failure and malfunction of components of carbon capture and storage system which may impair the performance of the ship essential services (e.g. propulsion, life saving appliances, fire fighting systems, main power generation and distribution…).

The hazards to be considered are to include the following:

a) toxicity and flammability of the solvent and other chemical solutions used in the CO2 capture process

b) the asphyxiation capability of CO2

c) toxicity and flammability properties of the refrigerant.

The flashpoint of the chemical carbon solvent should be above 60°C. In case that the chemical treatment fluid has a flashpoint below 60°C or is toxic, the requirements are to be decided on a case-by-case basis and as part of the risk assessment.

20.9.3 General Arrangement *(1/1/2026)*

The equipment handling CO2, such as compressors, heat exchangers, equipment receivers and pumps for stripping, drying, liquefaction and transfer are not to be located within machinery spaces of Category A, unless the arrangement is supported by the risk assessment, in which case such space is also to be regarded as a CO2 machinery handling space.

CO2 machinery handling spaces are not regarded as cargo pump-rooms.

Where the solvent is stored in integral tanks, they are to be segregated, except on those surfaces bound by shell plating, by cofferdams, void spaces, pump-rooms, empty tanks or other similar spaces so as to not be located adjacent to accommodation spaces, control stations, electrical equipment rooms, cargo spaces containing cargoes which react with chemical treatment fluids in a hazardous manner, and any food stores, oil tanks or fresh water tanks. Where a cofferdam is impracticable, alternative arrangements can be considered and are subject to risk assessment.

The solvent storage tanks are not to be located forward of the collision bulkhead.

Arrangements for solvent storage and transfer are to be made to allow the replacement and refilling of the solvent, in accordance with the transfer facility and in line with the operating manual of the plant.

Arrangements for captured CO2 and relevant solutions transfer are to be made to allow safe offloading/discharge in accordance with the transfer facility and in line with the operating manual of the plant.

For the arrangement of the tanks containing the captured CO2 and relevant solutions from CO2 capture process, see [20.9.5].

20.9.4 Piping arrangement *(1/1/2026)*

Means of measuring the exhaust gas differential pressure across the carbon capture plant are to be provided.

In carbon capture plants intended to capture carbon from a limited flow side stream of exhaust gases, the piping for the exhaust gas mainstream is to be suitable for the maximum exhaust gas flow from the combustion machinery to which it is connected.

Acceptance of a common carbon emissions abatement plant (post-combustion) fed by multiple consumers using gas as fuel or other low-flashpoint fuels, is subject to the risk assessment required in [20.9.2] due to the hazard connected to unburned gas or low-flashpoint fuel entering any other machinery.

20.9.5 CO2 storage tank arrangement *(1/1/2026)*

The storage tanks containing captured CO2 and relevant solutions from CO2 capture process are to be located outside of accommodation spaces, control stations and machinery spaces of Category A, and are not to be located forward of the collision bulkhead.

The hold spaces of CO2 storage tanks containing pure CO2 below open deck are to be separated from machinery and boiler spaces, accommodation spaces, service spaces, control stations, chain lockers, domestic water tanks and from stores by a gastight bulkhead of all-welded construction forming an A-0 class division. Alternative arrangements can be accepted for storage tanks containing CO2 dissolved in solutions considered not to have toxicity and polluting risks as evaluated during the risk assessment.

CO2 storage tanks containing pure CO2 are to be located at a distance inboard of not less than B/15 or 2 m, whichever is less, measured from the moulded line of the bottom shell plating at centreline and nowhere less than "d", where "d" =

0,8 m, from the moulded line of outer shell to ensure an appropriate protective distance from external damage, except when fitted on open deck. Alternative arrangement can be accepted for storage tanks containing CO2 dissolved in solutions considered not having toxicity risks and polluting risk as evaluated during the risk assessment

Where the CO2 storage tanks are arranged on the open deck, the impacts on the navigation bridge visibility and the safety access for crew members are to be considered. In addition, the tank location is to consider the potential hazards related to external mechanical damage. This includes areas for storing or handling machinery, the risk of accidental mechanical damage (such as dropped objects), and environmental conditions.

For CO2 storage tanks containing pure CO2 fitted in enclosed or semi-enclosed tank hold spaces, suitable drainage arrangements for the hold spaces that are not connected with the machinery space of Category A are to be provided. Means of detecting any leakage are to be provided.

Spaces surrounding CO2 storage tanks containing liquefied pure CO2 carried at low temperature are to be filled with suitable dry air and be maintained in this condition with dry air provided by suitable air-drying equipment. If CO2 is carried at ambient temperature or the design of the tank ensures no risk of moisture condensation, the requirement for dry air is not applicable.

The materials used in construction of the CO2 storage tank hold spaces are to be protected from potential leakages or are to have a design temperature corresponding to the temperature they can be subject to in a leakage scenario.

20.9.6 Chemical carbon solvent arrangements *(1/1/2026)*

OCCS systems using the aqueous solution of sodium hydroxide (NaOH) or calcium hydroxide (Ca(OH)2) as chemical carbon solvents are to comply with the requirements contained in [20.7].

20.9.7 Piping design, construction and testing *(1/1/2026)*

Piping intended for conveying pure CO2 or CO2 dissolved in solution is to be joined by welding and regarded as a Class II piping system, but vapour lines at pressure greater than 4 MPa or liquid lines are to be regarded as a Class I piping system. Open ended (not pressurized) vent piping may be regarded as a Class III piping system.

Piping systems containing chemical carbon solvents (such as amine-based solutions) only are to comply with the requirements applicable to Class I, Class II or Class III piping systems, depending on design pressure, temperature, flashpoint, toxicity and corrosiveness of the chemical carbon solvent. Toxic and corrosive solvents are those which are listed in the IMO "International Maritime Dangerous Goods Code (IMDG Code)", as amended and as described in the Material Safety Data Sheet (MSDS) provided by the product supplier. Open ended and vent piping may be regarded as a Class III piping system.

Pipes/piping systems containing chemical carbon solvent are to be of steel or other equivalent material with melting point above 925 degrees 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. The solvent pipes/piping systems are to be made with a material compatible with the solvent or coated with appropriate anti-corrosion coating.

The design, construction and testing of liquefied and gaseous CO2 piping systems (including exhaust lines of safety valves or similar piping) are to comply with the requirements in Pt E, Ch 9, Sec 5, as far as reasonable and practicable.

20.9.8 CO2 Tank design, construction and testing *(1/1/2026)*

Fully pressurized and refrigerated storage tanks for pure CO2 are to be independent tanks, as defined in the IGC Code and the additional and special CO2 requirements in IGC Code, para. 17.21 "Carbon dioxide" are to be complied with, as far as reasonable and practicable. The storage tanks for CO2 dissolved solutions where the toxicity and corrosive hazards are considered negligible in the risk assessment, can be built as ship integral or independent tanks.

Independent CO2 storage tanks are to comply with the requirements in Pt E, Ch 9, Sec 4, Sec 6, Sec 8, Sec 13 and Sec 15, as far as reasonable and practicable.

CO2 process pressure vessels are to comply with the requirements in Pt E, Ch 9, Sec 5 and Sec 6, as far as reasonable and practicable.

20.9.9 CO2 storage tank pressure/temperature control *(1/1/2026)*

With the exception of tanks designed to withstand full gauge vapour pressure of the CO2 under conditions of the upper ambient design temperatures, tank pressure and temperature are to be maintained at all times within their design range by one, or a combination of, the following methods:

- pressure accumulation
- reliquefaction of vapours
- liquid cooling.

Venting of the captured CO2 from the storage tank is only allowed when necessary for the purpose of securing the safety of the ship or saving life at sea, or when resulting from damage to the ship or its equipment.

20.9.10 Ventilation *(1/1/2026)*

The ventilation system for the CO2 machinery handling spaces (enclosed spaces) is to be separated from other ventilation systems and is to be of the extraction type. The ventilation capacity is to be minimum as follows:

- 6 air changes per hour in spaces with only desorption & stripping equipment
- 6 air changes per hour in CO2 handling spaces but with ability to automatically increase upon detection of leakage to 30 air changes per hour.

The suction points for exhaust are to be fitted at the floor level of the room/space.

The ventilation of the CO2 tank hold/space is to have a capacity of 30 air changes per hour; in normal conditions the ventilation may be reduced to 6 changes per hour, subject to availability of a leakage detection system capable of increasing the ventilation in case of leakages.

Spaces where chemical storage tanks are located are to have a mechanical ventilation of extraction type with at least 6 air changes/hour independent from the ventilation system of other spaces. The ventilation system is to be capable of being controlled from outside the compartment.

21 Certification, inspection and testing of piping systems

21.1 Application

21.1.1 This Article defines the certification and workshop inspection and testing programme to be performed on:

- the various components of piping systems,
- the materials used for their manufacture.

On board testing is dealt with in Sec 16.

21.2 Type tests

21.2.1 Type tests of flexible hoses and expansion joints *(1/1/2006)*

a) Type approval tests are to be carried out on flexible hoses or expansion joints of each type and of sizes to be agreed with the Society, in accordance with Tab 3~~3~~4 (see also the "Rules for the type approval of flexible hoses and expansion joints").

b) The flexible hoses or expansion joints subjected to the tests are to be fitted with their connections.

Table 34 : Type tests to be performed for flexible hoses and expansion joints *(1/7/2001)*

Test	Flexible hoses and expansion joints in non-metallic material	Flexible hoses and expansion joints in metallic material
bursting test	X	X
fire-resistance test	X **(1)**	NR
vibration test **(2)**	X	X
pressure impulse test	X **(6)**	NR
flexibility test	X **(3)**	NR
elastic deformation test	NR	X
cyclic expansion test **(4)**	NR	X
resistance of the material **(5)**	X	X

(1) only for flexible hoses and expansion joints used in flammable oil systems and, when required, in sea water systems.
(2) the Society reserves the right to require the vibration test in case of installation of the components on sources of high vibrations.
(3) only for flexible hoses conveying low temperature fluids.
(4) the Society reserves the right to require the cyclic expansion test for piping systems subjected to expansion cycles
(5) internal to the conveyed fluid to be demonstrated by suitable documentation and / or tests.
(6) only for flexible hoses.
Note 1: X = required, NR = not required.

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SECTION 16 TESTS ON BOARD

1 General

1.1 Application

1.1.1 This Section covers shipboard tests, both at the moorings and during sea trials. Such tests are additional to the workshop tests required in the other Sections of this Chapter.

1.2 Purpose of shipboard tests

1.2.1 Shipboard tests are intended to demonstrate that the main and auxiliary machinery and associated systems are functioning properly, in particular in respect of the criteria imposed by the Rules. The tests are to be witnessed by a Surveyor.

1.3 Documentation to be submitted

1.3.1 A comprehensive list of the shipboard tests intended to be carried out by the shipyard is to be submitted to the Society.

For each test, the following information is to be provided:

- scope of the test
- parameters to be recorded.

2 General requirements for shipboard tests

2.1 Trials at the moorings

2.1.1 Trials at the moorings are to demonstrate the following:

a) satisfactory operation of the machinery in relation to the service for which it is intended

b) quick and easy response to operational commands

c) safety of the various installations, as regards:
   - the protection of mechanical parts
   - the safeguards for personnel

d) accessibility for cleaning, inspection and maintenance.

Where the above features are not deemed satisfactory and require repairs or alterations, the Society reserves the right to require the repetition of the trials at the moorings, either wholly or in part, after such repairs or alterations have been carried out.

2.2 Sea trials

2.2.1 Scope of the tests

Sea trials are to be conducted after the trials at the moorings and are to include the following:

a) demonstration of the proper operation of the main and auxiliary machinery, including monitoring, alarm and safety systems, under realistic service conditions

b) check of the propulsion capability when one of the essential auxiliaries becomes inoperative

c) detection of dangerous vibrations by taking the necessary readings when required

d) checks either deemed necessary for ship classification or requested by the interested parties and which are possible only in the course of navigation in open sea.

2.2.2 Exemptions

Exemption from some of the sea trials may be considered by the Society in the case of ships having a sister ship for which the satisfactory behaviour in service is demonstrated.

Such exemption is, in any event, to be agreed upon by the interested parties and is subject to the satisfactory results of trials at the moorings to verify the safe and efficient operation of the propulsion system.

3 Shipboard tests for machinery

3.1 Conditions of sea trials

3.1.1 Displacement of the ship *(1/7/2012)*

Except in cases of practical impossibility, or in other cases to be considered individually, the sea trials are to be carried out at a displacement as close as possible to the deadweight (full load).

3.1.2 Power of the machinery

a) The power developed by the propulsion machinery in the course of the sea trials is to be as close as possible to the power for which classification has been requested. In general, this power is not to exceed the maximum continuous power at which the weakest component of the propulsion system can be operated. In cases of diesel engines and gas turbines, it is not to exceed the maximum continuous power for which the engine type concerned has been approved.

b) Where the rotational speed of the shafting is different from the design value, thereby increasing the stresses in excess of the maximum allowable limits, the power developed in the trials is to be suitably modified so as to confine the stresses within the design limits.

3.1.3 Determination of the power and rotational speed

a) The rotational speed of the shafting is to be recorded in the course of the sea trials, preferably by means of a continuous counter.

b) In general, the power is to be determined by means of torsiometric readings, to be effected with procedures and instruments deemed suitable by the Society.

As an alternative, for reciprocating internal combustion engines and gas turbines, the power may be determined by measuring the fuel consumption and on the basis of the other operating characteristics, in comparison with the results of bench tests of the prototype engine.

Other methods of determining the power may be considered by the Society on a case by case basis.

3.2 Navigation and manoeuvring tests

3.2.1 Speed trials

a) Where required by the Rules (see Pt A, Ch 1, Sec 2, [4.9.4]), the speed of the ship is to be determined using procedures deemed suitable by the Society.

b) The ship speed is to be determined as the average of the speeds taken in not less than two pairs of runs in opposite directions.

3.2.2 Astern trials *(1/1/2026)*

a) The ability of the machinery to reverse the direction of thrust of the propeller in sufficient time, and so to bring the ship to rest within reasonable distance from maximum ahead service speed, shall be demonstrated and recorded.

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 to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the Master or designated personnel.

c) Where the ship is provided with supplementary means for manoeuvring or stopping, the effectiveness of such means shall be demonstrated and recorded as referred to in paragraphs a) and b).

d) ~~Main propulsion systems are to undergo tests to demonstrate the astern response characteristics.~~ The astern tests are to be carried out ~~at least over the manoeuvring range of the propulsion system and~~ from ~~all~~ control positions. A test plan is to be provided by the yard and accepted by the surveyor. If specific operational characteristics have been defined by the manufacturer these shall be included in the test plan.

e) ~~The reversing characteristics of the propulsion plant, including the blade pitch control system of controllable pitch propellers, are to be demonstrated and recorded during trials.~~

For electric propulsion systems, see [3.7].

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c) at approved intermittent overload (if applicable): testing for duration as agreed with the manufacturer

d) minimum engine speed to be determined

e) the ability of reversible engines to be operated in reverse direction is to be demonstrated.

Note 2: To be carried out during stopping tests according to Resolution MSC.137 (76), see [3.4.10] for additional requirements in the case of a barred speed range.

Note 3: The test in e) may be performed during the dock or sea trials.

3.4.6 Main propulsion engines driving controllable pitch propellers *(1/7/2018)*

a) At rated engine speed n_0 with a propeller pitch leading to rated engine power (or to the maximum achievable power if 100% cannot be reached): at least 4 hours

b) At approved intermittent overload (if applicable): testing for duration as agreed with the manufacturer

c) With reverse pitch suitable for manoeuvring, see [3.4.10] for additional requirements in the case of a barred speed range.

3.4.7 Engines driving generators for electrical propulsion and/or main power supply *(1/7/2018)*

a) At 100% power (rated electrical power of generator): at least 60 min

b) At 110% power (rated electrical power of generator): at least 10 min

c) Demonstration of the generator prime movers' and governors' ability to handle load steps as described in Sec 2.

Note 1: Each engine is to be tested 100% electrical power for at least 60 min and 110% of rated electrical power of the generator for at least 10 min. This may, if possible, be done during the electrical propulsion plant test, which is required to be tested with 100% propulsion power (i.e. total electric motor capacity for propulsion) by distributing the power on as few generators as possible. The duration of this test is to be sufficient to reach stable operating temperatures of all rotating machines or for at least 4 hours. When some of the gen. set(s) cannot be tested due to insufficient time during the propulsion system test mentioned above, those required tests are to be carried out separately.

3.4.8 Propulsion engines also driving power take off (PTO) generator *(1/7/2018)*

a) 100% engine power (MCR) at corresponding speed n_0: at least 4 hours

b) 100% propeller branch power at engine speed n_0 (unless already covered in a): 2 hours

c) 100% PTO branch power at engine speed n_0: at least 1 hour.

3.4.9 Engines driving auxiliaries *(1/7/2018)*

a) 100% power (MCR) at corresponding speed n0: at least 30 min

b) Approved intermittent overload: testing for duration as approved. shipboard generating sets, account is to be taken of the times needed to actuate the generator's overload protection system.

3.4.10 Torsional vibrations *(1/7/2018)*

Barred speed range

Where a barred speed range is required, passages through this barred speed range, both accelerating and decelerating, are to be demonstrated. The times taken are to be recorded and are to be equal to or below those times stipulated in the approved documentation, if any. This also includes when passing through the barred speed range in reverse rotational direction, especially during the stopping test.

Note 1: Applies both for manual and automatic passing-through systems.

The ship's draft and speed during all these demonstrations is to be recorded. In the case of a controllable pitch propeller, the pitch is also to be recorded.

The engine is to be checked for stable running (steady fuel index) at both upper and lower borders of the barred speed range. Steady fuel index means an oscillation range less than 5% of the effective stroke (idle to full index).

3.5 Tests of steam turbines

3.5.1 Main propulsion turbines *(1/1/2026)*

Main turbines are to be subjected during dock trials and subsequent sea trials to the following tests:

- operation at rated rpm for at least 3 hours
- reversing manoeuvres
- ~~in free route~~the astern trial is to demonstrate that they are capable of operating at their maximum permissible astern

power (MPAP) ~~at least 70% of the ahead revolutions~~ for a period of at least 15 minutes. The astern trial is to be limited to 30 minutes or in accordance with the Manufacturer's recommendation to avoid overheating of the turbine due to the effects of "windage" and friction.

During astern and subsequent forward operation, the steam pressures and temperatures and the relative expansion are not to assume magnitudes liable to endanger the safe operation of the plant.

During the trials all safety, alarm, shut-off and control systems associated to the turbine are to be tested or properly simulated.

3.5.2 Auxiliary turbines

Turbines driving electric generators or auxiliary machines are to be run for at least 4 hours at their rated power and for 30 minutes at 110% of rated power.

During the trials all safety, alarm, shut-off and control systems associated to the turbine are to be tested or properly simulated.

3.6 Tests of gas turbines

3.6.1 Main propulsion turbines

Main turbines are to be subjected during dock trials and subsequent sea trials to the following tests:

- operation at rated rpm for at least 3 hours
- ship reversing manoeuvres.

During the various operations, the pressures, temperatures and relative expansion are not to assume magnitudes liable to endanger the safe operation of the plant.

During the trials all safety, alarm, shut-off and control systems associated to the turbine are to be tested or properly simulated.

3.6.2 Auxiliary turbines

Turbines driving electric generators or auxiliary machines are to be run for at least 4 hours at their rated power and for 30 minutes at 110% of rated power.

During the trials all safety, alarm, shut-off and control systems associated to the turbine are to be tested or properly simulated.

3.7 Tests of electric propulsion system

3.7.1 Dock trials

a) The dock trials are to include the test of the electrical production system, the power management and the load limitation.

b) A test of the propulsion plant at a reduced power, in accordance with dock trial facilities, is to be carried out. During this test, the following are to be checked:
   - Electric motor rotation speed variation
   - Functional test, as far as practicable (power limitation is to be tested with a reduced value)
   - Protection devices
   - Monitoring and alarm transmission including interlocking system.

c) Prior to the sea trials, an insulation test of the electric propulsion plant is to be carried out.

3.7.2 Sea trials *(1/7/2002)*

Testing of the performance of the electric propulsion system is to be effected in accordance with an approved test program.

This test program is to include at least:

a) Speed rate of rise

b) Endurance test:
   - 4 hours at 100% rated output power
   - 2 hours at the maximum continuous output power normally used at sea
   - 10 minutes at maximum astern running power

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APPENDIX 3 PLASTIC PIPES

1 General

1.1 Application

1.1.1 *(1/7/2022)*
These requirements are applicable to all piping systems with parts made predominantly of other material than metal and addresses the provisions of IMO Resolution A.753(18), as amended by IMO Resolutions MSC.313(88) and MSC.399(95).

1.1.2 *(1/7/2023)*
The use of mechanical joints approved for the use in metallic piping systems only are not permitted.

1.1.3 *(1/1/2020)*
Piping systems intended for non-essential services are to meet only the requirements of recognised standards as well as [2.1.2], [2.3.4], [2.4.2], [3] and [4].

1.2 Use of plastic pipes

1.2.1 Plastic may be used in piping systems in accordance with the provisions of Sec 10, [2.1.3], provided the following requirements are complied with.

1.2.2 Plastic pipes are to be type approved by the Society.

1.3 Definitions

1.3.1 Plastic *(1/1/2020)*
Plastic includes both thermoplastic and thermosetting plastic materials with or without reinforcement, such as PVC and FRP (reinforced plastics pipes). Plastic includes synthetic rubber and materials of similar thermo/mechanical properties.

1.3.2 Piping systems *(1/1/2007)*
Piping systems means those made of plastic and include the pipes, fittings, joints, and any internal or external liners, coverings and coatings required to comply with the performance criteria.

1.3.3 Joints *(1/7/2023)*
Joints means the location at which two pieces of pipe or a pipe and a fitting are connected together. The joint may be made by adhesive bonding, laminating, welding, flanges and mechanical joints according to Sec 10, Fig 2.

1.3.4 Fittings
Fittings include bends, elbows, fabricated branch pieces, etc. made of plastic materials.

1.3.5 Nominal pressure
Nominal pressure is the maximum permissible working pressure which is to be determined in accordance with [2.2.2]

1.3.6 Design pressure
Design pressure is the maximum working pressure which is expected under operation conditions or the highest set pressure of any safety valve or pressure relief device on the system, if fitted.

1.3.7 Fire endurance
Fire endurance is the capability of the piping system to perform its intended function, i.e. maintain its strength and integrity, for some predicted period of time while exposed to fire.

1.3.8 Essential to the safety of ship *(1/7/2023)*
Essential to the safety of ship means all piping systems that in event of failure will pose a threat to personnel and the ship.

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3 Arrangement and installation of plastic pipes

3.1 General

3.1.1 Plastic pipes and fittings are to be installed in accordance with the manufacturer's guidelines.

3.2 Supporting of the pipes

3.2.1 *(1/1/2020)*

a) Selection and spacing of pipe supports in shipboard systems are to be determined as a function of allowable stresses and maximum deflection criteria.

b) The selection and spacing of pipe supports are to take into account the following data:
- pipe dimensions
- length of the piping
- mechanical and physical properties of the pipe material
- mass of pipe and contained fluid
- external pressure
- operating temperature
- thermal expansion effects
- load due to external forces
- thrust forces
- water hammer
- vibrations
- maximum accelerations to which the system may be subjected.

Combinations of loads are also to be considered.

c) Support spacing is not to be greater than the pipe manufacturer's recommended spacing.

3.2.2 Each support is to evenly distribute the load of the pipe and its content over the full width of the support. Measures are to be taken to minimise wear of the pipes where they are in contact with the supports.

3.2.3 Heavy components in the piping system such as valves and expansion joints are to be independently supported.

3.3 Provision for expansion

3.3.1 Suitable provision is to be made in each pipeline to allow for relative movement between pipes made of plastic and the steel structure, having due regard to:

- the high difference in the coefficients of thermal expansion
- deformations of the ship's structure.

3.3.2 Calculations of the thermal expansions are to take into account the system working temperature and the temperature at which the assembly is performed.

3.4 External loads

3.4.1 When installing the piping, allowance is to be made for temporary point loads, where applicable. Such allowance is to include at least the force exerted by a load (person) of 100 kg at mid-span on any pipe of more than 100 mm nominal outside diameter.

3.4.2 Pipes are to be protected from mechanical damage where necessary.

3.4.3 *(1/1/2020)*

As well as providing adequate robustness for all piping, including open-ended piping, the minimum wall thickness complying with [2.2.2] a) may be increased taking into account the conditions encountered during service on board ships.

3.5 Earthing

3.5.1 Where, in pursuance of [2.3.4], pipes are required to be electrically conductive, the resistance to earth from any point in the piping system is not to exceed 1 x 10^6 ohm.

3.5.2 Where provided, earthing wires are to be accessible for inspection.

3.6 Penetration of fire divisions and watertight bulkheads or decks

3.6.1 *(1/7/2023)*
Where plastic pipes pass through “A” or “B” class divisions, arrangements are to be made to ensure that fire endurance is not impaired. These arrangements are to be tested in accordance with “Recommendations for Fire Test Procedures for “A”, “B” and “F” Bulkheads” specified in Part 3 of Annex 1 to the 2010 FTP Code.

3.6.2 *(1/1/2020)*
When plastic pipes pass through watertight bulkheads or decks, the watertight integrity of the bulkhead or deck is to be maintained.

For pipes not able to satisfy the requirements in [2.2.2] b), a metallic shut-off valve operable from above the freeboard deck should be fitted at the bulkhead or deck.

If the bulkhead or deck is also a fire division and destruction by fire of plastic pipes may cause the inflow of liquid from tanks, a metallic shut-off valve operable from above the freeboard deck is to be fitted at the bulkhead or deck.

3.6.3 *(1/1/2026)*
For passenger ships, the penetrations used for the passage of plastic piping systems through a watertight bulkhead or deck under SOLAS II-1/13.2.3 are to be successfully prototype tested for watertight integrity, as per paragraphs 3, 4 and 5 of the explanatory notes to SOLAS regulation II-1/13.2.3 contained in the annex of resolution MSC.429(98)/Rev.2, as applicable, after the fire test. SOLAS II-1/13.2.3 is to be applicable to heat-sensitive piping systems like plastic piping and is not to be applied to cable penetrations in watertight bulkheads and decks.

3.7 Systems connected to the hull

3.7.1 Bilge and sea water systems

a) Where, in pursuance of [2.3.1], plastic pipes are permitted in bilge and sea water systems, the ship side valves required in Sec 10, [2.8] and, where provided, the connecting pipes to the shell are to be made of metal in accordance with Sec 10, [2.1].

b) Ship side valves are to be provided with remote control from outside the space concerned. See Tab 1, footnote **(1)**.

3.7.2 Scuppers and sanitary discharges

a) Where, in pursuance of [2.3.1], plastic pipes are permitted in scuppers and sanitary discharge systems connected to the shell, their upper end is to be fitted with closing means operated from a position above the freeboard deck in order to prevent downflooding. See Tab 1, footnotes **(1)** and **(8)**.

b) Discharge valves are to be provided with remote control from outside the space concerned.

3.8 Application of fire protection coatings

3.8.1 Where necessary for the required fire endurance as stated in [2.3.3], fire protection coatings are to be applied on the joints, after performing hydrostatic pressure tests of the piping system.

3.8.2 The fire protection coatings are to be applied in accordance with the manufacturer’s recommendations, using a procedure approved in each case.

4 Certification, inspection and testing of plastic piping

4.1 Certification

4.1.1 Type approval *(1/1/2007)*

Plastic pipes, fittings, joints and any internal or external liners, coverings and coatings are to be of a type approved by the Society for the intended use according to the Rules for Type Approval of Plastic Pipes.

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APPENDIX 15 METHYL/ETHYL ALCOHOL FUELLED SHIPS

1 General

1.1 Scope

1.1.1 Application *(1/1/2022)*

The provisions of this Appendix apply to the arrangement, installation, control and monitoring of machinery, equipment and systems of ships using methyl/ethyl alcohol as fuel (hereinafter named "methyl/ethyl alcohol fuelled ships").

1.1.2 Acceptance by the flag Administration *(1/1/2022)*

The use of methyl/ethyl alcohol as fuel in ships requires acceptance by the Administration of the State whose flag the ship is entitled to fly on the basis of the alternative design approach as required in MSC.1/Circ.1621 para 2.3.

1.1.3 MSC.1/Circ.1621 requirements and the Society's rules *(1/1/2022)*

For methyl/ethyl alcohol fuelled ships, the requirements of the IMO Interim Guidelines for the Safety of Ships using Methyl/Ethyl Alcohol as Fuel set out in the annex of IMO circular MSC.1/Circ.1621 (hereinafter named "MSC.1/Circ.1621") are to be applied as class requirements as specified and with the deviations given in this Appendix.

For the scope of classification, when reference is made to paragraphs of MSC.1/Circ.1621 where the wording "Administration" is used, it is to be regarded as referring to the "Society".

In general, this Appendix applies to machinery, equipment and systems of ships using methyl/ethyl alcohol as fuel and to their interfaces with the other ship systems. Unless otherwise specified, the machinery, equipment and systems of ships using methyl/ethyl alcohol as fuel are also to comply with the requirements given in Part C.

1.1.4 MSC.1/Circ.1621 requirements not within the scope of classification *(1/1/2022)*

The following requirements of MSC.1/Circ.1621 are not within the scope of classification:

- Section 11 - Fire Safety
- Section 16 - Training, drills and emergency exercises
- Section 17 - Operation

These requirements are applied by the Society when acting on behalf of the flag Administration, within the scope of delegation (see [1.1.6]).

1.1.5 Correspondence of the MSC.1/Circ.1621 with the Rules *(1/1/2022)*

All the requirements of this Appendix are cross referenced to the applicable paragraphs of MSC.1/Circ.1621, as appropriate.

1.1.6 Statutory certificates *(1/1/2022)*

The responsibility for interpretation of the MSC.1/Circ.1621 requirements for the purpose of issuing statutory certificates for methyl/ethyl alcohol fuelled ships lies with the Administration of the State whose flag the ship is entitled to fly.

Whenever the Society is authorized by an Administration to issue on its behalf the statutory certificates for methyl/ethyl alcohol fuelled ships, or where the Society is authorized to carry out investigations and surveys on behalf of an Administration on the basis of which the statutory certificates for methyl/ethyl alcohol fuelled ships will be issued by the Administration, or where the Society is requested to certify compliance with MSC.1/Circ.1621, the full compliance with the requirements of MSC.1/Circ.1621, including the operative requirements mentioned in [1.1.4], will be granted by the Society, subject to [1.1.2].

1.2 Documentation to be submitted

1.2.1 *(1/1/2022)*

Tab 1 lists the plans, information, analysis, etc. which are to be submitted in addition to the information required in the other Parts of the Rules, for the portion of the ship not involved in the methyl/ethyl alcohol handling.

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.

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- Deflagration and detonation
- Fires (radiative heat fluxes, fire resistance of methyl/ethyl alcohol system)
- Impact on people, asset and environment (severity of methyl/ethyl alcohol incidents)
- Mitigation techniques (detection method, barriers, ventilation level)
- Emergency operation (strategy control of incident)

The risk assessment is to include the following hazards:

- Creation of explosive atmosphere (methyl/ethyl alcohol concentration in air)
- High flammability
- Chemical reaction with oxidant agents
- Invisible and very hot flame during methyl/ethyl alcohol burning
- Toxicity of vapours
- Corrosion.

4.3 Limitation of explosion consequences

4.3.1 *(1/1/2022)*

The preferred safety policy is to be the elimination of either any source of release or any source of ignition, or both. Only in case this is demonstrated not to be feasible, the MSC.1/Circ.1621 para. 4.3 applies. In this case an explosion analysis is to be carried out to demonstrate that, for the worst case scenario, the maximum pressure built-up in case of explosion does not exceed the design pressure of the space, enclosure, air lock, tank, taking into account the venting arrangement and the explosion pressure relief devices, where provided. The scenario for the explosion analysis shall be evaluated during the risk assessment

5 Ship design and arrangement

MSC.1/Circ.1621 REFERENCE: para. 5

5.1 Goal

5.1.1 *(1/1/2022)*

The goal of this paragraph [5] is to provide for safe location, space arrangements and mechanical protection of power generation equipment, fuel storage system, fuel supply equipment and refuelling systems.

5.2 Functional requirements

5.2.1 *(1/1/2022)*

This paragraph [5] is related to functional requirements in 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 3.2.7, 3.2.12, 3.2.14 and 3.2.16 of MSC.1/Circ.1621. In particular, the following applies:

a) the fuel tank(s) is(are) be located in such a way that the probability of the tank(s) being damaged following a collision or grounding is reduced to a minimum taking into account the safe operation of the ship and other hazards that may be relevant to the ship;

b) fuel containment systems, fuel piping and other fuel release sources are to be located and arranged such that released fuel, either as vapour or liquid, is led to safe locations;

c) the access or other openings to spaces containing potential sources of fuel release are to be arranged such that flammable, asphyxiating or toxic vapours or liquids cannot escape to spaces that are not designed for the presence of such substances;

d) fuel piping is to be protected against mechanical damage;

e) the propulsion and fuel supply system is to be designed such that safety actions after any fuel leakage do not lead to an unacceptable loss of power; and

f) the probability of a fire or explosion in a machinery space as a result of a fuel release is to be minimized in the design, with special attention to the risk of leakage from pumps, valves and connections.

5.3 General provisions

5.3.1 *(1/7/2025)*

The requirements in MSC.1/Circ.1621 para. 5.3 and the relevant interpretations in IACS UI GF20 apply.

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5.6.3 *(1/1/2022)*
Enclosure used for the containment of methyl/ethyl alcohol piping (e.g. valves, pumps, filters etc..) excluding annular space of double wall pipes are to be provided with means for draining and for inspection. The layout of inspection openings and connections for draining is to be evaluated in the risk assessment as required in [4.2].

5.7 Provisions for location and protection of fuel piping

5.7.1 *(1/1/2022)*
The requirements in MSC.1/Circ.1621 para. 5.7 apply.

5.7.2 *(1/1/2026)*
In case of double wall pipes the annular space between inner and outer pipe is to be provided either with:

- a) an independent mechanical underpressure ventilation having a capacity of minimum 30 air changes per hour and be routed to open air, or
- b) filled with inert gas at a pressure greater than the methyl/ethyl alcohol fuel pressure, or.
  c) filled with inert gas at a pressure greater than piping installation space pressure.

For cases b) and c) above, ~~S~~suitable alarms ~~shall~~are to be provided to indicate a loss of inert gas pressure between the pipes.

Appropriate means for detecting leakage into the annular space are to be provided. The double wall enclosure is to be fitted with means for safe draining to a suitable fixed or portable tank allowing the collection and the detection of any possible leakage.

5.7.3 *(1/1/2022)*
The outer pipe in the double walled fuel pipes is to be designed for a design pressure not less than the maximum working pressure of the methyl/ethyl alcohol fuel pipes.

5.8 Provisions for fuel preparation spaces design

5.8.1 *(1/1/2022)*
The requirements in MSC.1/Circ.1621 para. 5.8 apply.

5.8.2 *(1/1/2022)*
The enclosures required in [5.6.3] are to be considered as fuel preparation space with reference to MSC.1/Circ.1621 para. 2.2.4. Those enclosures which, due their dimensions, cannot be entered during operation of methyl/ethyl alcohol fuel supply system are to be fitted with inspection means to be used only after the space can be assumed as safe.

5.9 Provisions for bilge systems

5.9.1 *(1/1/2022)*
The requirements in MSC.1/Circ.1621 para. 5.9 apply.

5.9.2 *(1/1/2022)*
The bilge systems installed in areas where leaked methyl/ethyl alcohol fuel can be present are to be fitted with sampling points for possible detection of explosive atmosphere.

5.10 Provisions for drip trays

5.10.1 *(1/1/2022)*
The requirements in MSC.1/Circ.1621 para. 5.10 apply.

5.10.2 *(1/1/2022)*
The capacity of drip trays is to be evaluated through the risk assessment taking into account the following steps:

a) The team of experts is to conduct a Hazard Identification (HAZID) to agree on the scenarios to be subjected to the risk assessment, and on the assumptions regarding the most critical events (e.g. instrument connection failure causing methyl/ethyl alcohol fuel leakage) considering also available internationally recognized standard (e.g. ISO/TR 15916) for the identification of hazards and risks.

b) Reasonable assumptions on the extent of connection failures or other selected events and the process parameters of the methyl/ethyl alcohol fuel are to be made by the team of experts, preferably on the basis of statistics available in the public domain or provided and documented by stakeholders.

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10.5 Provision for single fuel engines

10.5.1 *(1/1/2022)*
The requirements in MSC.1/Circ.1621 para. 10.5 apply.

10.6 Requirements for dual fuel boilers

10.6.1 *(1/1/2022)*
Boiler arrangements are to comply with the requirements of Sec 3 and Sec 10.

10.6.2 *(1/1/2022)*
Combustion chambers and uptakes are to be designed to prevent any accumulation of unburned methyl/ethyl alcohol fuel.

10.6.3 *(1/1/2022)*
In case of dual fuel boilers essential for the ship main propulsion, an automatic system is to be provided for a fast changeover from methyl/ethyl alcohol fuel operation to oil fuel operation giving relevant alarm.

10.6.4 *(1/1/2022)*
A risk assessment of the dual fuel boiler is to be carried out using the HAZID or FMECA methods and reflected in the safety concept of the boiler. The risk assessment is to cover at least the following hazards:

- condensation of methyl/ethyl alcohol vapours
- unburnt methyl/ethyl alcohol vapours in the exhaust duct
- single failure of a methyl/ethyl alcohol fuel supply valve
- single failure of the burner and flame scanner
- single failure of the purging system
- effects of methyl/ethyl alcohol characteristics associated with its composition (density, flashpoint, heat value, flammability range).

11 Fire safety

MSC.1/Circ.1621 REFERENCE: para. 11

11.1 Application

11.1.1 *(1/1/2026)*
This paragraph is void, as the provisions of MSC.1/Circ.1621 para. 11 are not within the scope of classification.

These provisions are applied by the Society when acting on behalf of the flag Administration, within the scope of delegation (see [1.1.6]), together with the relevant interpretations in IACS UI GF21, unless instructed otherwise by the flag Administration.

12 Explosion prevention and area classification

MSC.1/Circ.1621 REFERENCE: para. 12

12.1 Goal

12.1.1 *(1/1/2022)*
The goal of this paragraph [12] is to provide for the prevention of explosions and for the limitation of effects of a fire and explosion.

12.2 Functional requirements

12.2.1 *(1/1/2022)*
This paragraph [12] is related to functional requirements in 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 3.2.8 and 3.2.11 to 3.2.17 of MSC.1/Circ.1621. The probability of explosions is to be reduced to a minimum by:

a) reducing number of sources of ignition; and

b) reducing the probability of formation of ignitable mixtures, and

c) using certified safe type electrical equipment suitable for the hazardous zone where the use of electrical equipment in hazardous areas is unavoidable.

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APPENDIX 19 TYPE APPROVAL TESTING OF SYNTHETIC MATERIALS FOR AFTMOST PROPELLER SHAFT BEARINGS

1 Scope

1.1 *(1/1/2026)*

This Appendix gives the requirements for the Type Approval testing of synthetic materials for aftmost propeller shaft bearings.

1.2 *(1/1/2026)*

The procedures and requirements of this Appendix are applicable to Type Approval obtained for the synthetic material required by Sec 7, [2.4].

1.3 *(1/1/2026)*

The qualification for design and application of aftmost propeller shaft bearings is to be provided and guaranteed by the manufacturer.

1.4 *(1/1/2026)*

Testing and inspection is to be carried out in accordance with the specific requirements given in this Appendix.

2 Documentation

2.1 *(1/1/2026)*

The manufacturer is to submit request of approval, test programme (see [3.1]) and information including the following contents to the Society:

a) product name

b) name and address of the manufacturer, including details for all relevant production places

c) reference of applicable rules and standards which the product is to comply with

d) product description:
   - material type
   - lubrication type
   - isotropic or anisotropic behaviour
   - elastomeric or non-elastomeric type

e) limitations of the product

f) product specification, technical data sheet, and installation manual including:
   1) maximum nominal surface pressure
   2) product dimensions:
      - minimum and maximum dimensions
      - other, if relevant
   3) commonly acceptable mating material (type of shaft material, roughness, hardness, etc.)
   4) running clearance
   5) maximum operating temperature

g) safety data sheet.

h) description of production processes

i) description of quality assurance system or copy of ISO 9001 certificate

j) in-service experience, if available

k) list of tests and measuring equipment including calibration certificate.

3 Type Approval testing

3.1 Test program

3.1.1 *(1/1/2026)*

Test program is to include following items:

a) description of products to be approved

b) description of the selected test samples

c) content of tests (test items, test standard, test conditions, acceptance criteria, etc.)

d) description of the wear testing stands and the test conditions.

3.1.2 *(1/1/2026)*

The extent of the test program is to test the material properties of [3.3].

In particular a reduction or complete suppression of the approval tests may be accepted by the Society taking into account:

a) documentation of approval tests performed

b) a proven track record.

3.2 Wear testing procedure

3.2.1 *(1/1/2026)*

Unless otherwise specified in this Appendix, the requirements for the wear test should refer to ASTM G77-17 or other national or international equivalent standards, with the following data:

- material of the shaft used in the test and its properties are to be specified and are to be equivalent to typical mating material e.g. alloyed steel or stainless steel or copper alloy
- diameter of shaft: the shaft diameter depends on the bearing size. The running clearance should be considered in the wear test
- motion of shaft: continuous rotation
- circumferential velocity should be 6 m/s for oil or water lubrication and should be 3 m/s for grease lubrication
- lubrication: sea water or substitute ocean water (23°C ± 2°C), or mineral oil (80°C ± 2°C), or grease (80°C ± 2°C) according to the applicable lubrication type
- surface roughness of test shaft: Ra is not to exceed 0,5 μ m for stainless steel and Ra is not to exceed 0,8 μ m for copper alloy
- interface pressure : maximum nominal surface pressure ± 10%
- duration of test: until the coefficient of friction and wear rate remains constant at least 192h. Wear of bushings is to be measured continuously or regularly. If regularly, wear to be measured by disassembling every 48 hours until a constant wear rate has been achieved (minimum of four points of measurements).

3.2.2 *(1/1/2026)*

Parameters to be recorded:

- dimensions of test specimen
- wear vs. time
- coefficient of friction vs. time
- temperature of test specimen during test cycle
- deviation of load from the maximum nominal surface pressure.

3.3 Material properties

3.3.1 *(1/1/2026)*

The properties of non-elastomeric materials for aftmost propeller shaft bearings are to comply with the requirements of Tab 1. The properties of elastomeric materials for aftmost propeller shaft bearings are to comply with the requirements of Tab 2.

Table 1 : Type testing for non-elastomeric materials for aftmost propeller shaft bearings *(1/1/2026)*

Test items	Test standard **(1)**	Number of specimens for each sample **(2)**, at least	Test conditions	Acceptance criteria
Compressive strength [N/mm^2]	ISO 604: 2002; ASTM D695-2015	5 **(3)**		Min.85 N/mm^2 in the case of isotropic materials. Min.85 N/mm^2 for specimens parallel to sheet plane in the case of anisotropic materials. Min.100 N/mm^2 for specimens normal to sheet plane in the case of anisotropic materials.
Compressive modulus [N/mm^2]	ISO 604: 2002; ASTM D695-2015	5 **(3)**		Min.850 N/mm^2 in the case of isotropic materials. Min.850 N/mm^2 for specimens parallel to sheet plane in the case of anisotropic materials. Min.1000 N/mm^2 for specimens normal to sheet plane in the case of anisotropic materials.
Water swelling [volume, %], only required for water lubrication	ISO 175: 2010	3	Four weeks in substitute ocean water (ASTM D1141-98(2021)) at (20°C ± 2°C) and maximum temperature ((60°C ± 2°C or advised maximum working temperature by manufacturer, whichever is higher). At least three specimens with dimension:50x50xt mm, t is min. 4 mm or the min. thickness of the bushing product. Testing immediately after extraction (wet condition).	Volumetric swelling ≤ 3%
Oil swelling (for oil lubricated system) [volume, %], only required for oil lubrication	ISO 175: 2010	3	Four weeks -in oil No.3(ISO 1817:2022) at 20°C ± 2°C. At least three specimens with dimension: 50x50xt mm, t is min. 4 mm or the min. thickness of the bushing product. Testing immediately after extraction (wet condition).	Volumetric swelling ≤ 3%
Compressive strength and modulus change when immersed in water, only required for water lubrication	ISO 604: 2002; ASTM D695- 2015	5 **(3)**	Four weeks in substitute ocean water (ASTM D1141) at 20°C ± 2°C.	Min. 80% retention of minimum specified compressive strength and modulus before water immersion
Temperature resistance	ISO 604: 2002; ASTM D695- 2015	5 **(3)**	Compressive strength and compressive modulus at maximum temperature (60°C ± 2°C or advised maximum working temperature by manufacturer, whichever is higher).	Min. 80% retention of minimum specified compressive strength and modulus at 20°C ± 2°C

Test items	Test standard **(1)**	Number of specimens for each sample **(2)**, at least	Test conditions	Acceptance criteria
Wear test	See [3.2]	1		

(1) Other testing standards may also be accepted, provided that they are suitable for testing of the synthetic material selected for application in aftmost propeller shaft bearings.

(2) The number of specimens is to be prepared for each sample.

(3) Test at least five specimens for each sample in the case of isotropic materials. Test at least ten specimens, five normal to and five parallel to sheet plane, for each sample in the case of anisotropic materials.

Table 2 : Type testing for elastomeric materials for aftmost propeller shaft bearings *(1/1/2026)*

Test items	Test standard **(1)**	Number of specimens **(2)**, at least	Test conditions	Acceptance criteria
Tensile strength [N/mm^2]	ISO 37:2017; Method A of ASTM D412-16(2021); ASTM D638-22	3		Min.10 N/mm^2 for rubber bearing, and min.30 N/mm^2 for other elastomeric bearing
Elongation (%)	ISO 37:2017; Method A of ASTM D412-16(2021); ASTM D638-22	3		Min.150% for rubber bearing, and min.60% for other elastomeric bearing
Hardness	ISO 48-4:2018; ASTM D2240-15(2021)	3		
Water swelling [volume, %], only required for water lubrication	ISO 1817: 2022	3	Four weeks in substitute ocean water (ASTM D1141) at 20°C ± 2°C and maximum temperature (60°C ± 2°C or advised maximum working temperature by manufacturer, whichever is higher). At least three specimens with dimension:50x50xt mm, t is min. 4 mm or the min. thickness of the bushing product. Testing immediately after extraction (wet condition).	Volumetric swelling ≤ 3%
Oil swelling (for oil lubricated system) [volume, %], only required for oil lubrication	ISO 1817: 2022	3	Four weeks in oil No.3(ISO 1817) at 20°C ± 2°C. At least three specimens with dimension: 50x50xt mm, t is min. 4 mm or the min. thickness of the bushing product. Testing immediately after extraction (wet condition).	Volumetric swelling ≤ 3%
Tensile strength and elongation change when immersed in water, only required for water lubrication	ISO 37:2017; Method A of ASTM D412-16(2021); ASTM D638-22	3	Four weeks in substitute ocean water (ASTM D1141) at 20°C ± 2°C.	Min. 80% retention of minimum specified tensile strength and elongation before water immersion

Test items	Test standard (1)	Number of specimens (2), at least	Test conditions	Acceptance criteria
Temperature resistance	ISO 37:2017; ISO 7743:2017; Method A of ASTM D412-16(2021); ASTM D638-22	3	Tensile strength and elongation at maximum temperature (60°C ± 2°C or advised maximum working temperature by manufacturer, whichever is higher).	Min. 80% retention of minimum specified tensile strength and elongation at 20°C ± 2°C
Adhesion to metals (except those not to be adhered to metals) [N/mm^2]	ISO 813:2019; ISO 1827:2022	3		
Change of properties due to aging [%]	ISO 37:2017; ISO 7743:2017; Method A of ASTM D412-16(2021); ASTM D638-22	3	After oven aging for tension and elongation tests. Test specimens are to be subjected to circulating air at maximum temperature (60°C ± 2°C or advised maximum working temperature by manufacturer, whichever is higher) for 96 hours. Tension and elongation tests are to be performed not less than 20 hours and not more than 48 hours after removal from the aging environment.	Min. 75% retention of Tensile strength and elongation before aging
Wear test	See [3.2]	1		

(1) Other testing standards may also be accepted, provided that they are suitable for testing of the synthetic material selected for application in aftmost propeller shaft bearings.

(2) The number of specimens is to be prepared for each sample.

3.4 Test products

3.4.1 *(1/1/2026)*

At least three representative diameter products of each kind of product are to be selected for type approval testing, except for the wear test where one representative product may be selected.

Each kind of product means:

- same chemical composition range
- same reinforcement, only applicable to composite materials
- same production process

The test products used for type approval testing are to be selected from the manufacturer's production line or stock by a Surveyor of the Society as a:

- finished certified component itself; or
- on samples taken from earlier stages in the production of the component, when applicable.

3.5 Test laboratories

3.5.1 *(1/1/2026)*

The selected test facility are to have accreditation according to ISO/IEC 17025 for carrying out and recording of the material property tests required by this Appendix. The test facility and the testing arrangements are to be to the satisfaction of the Society. If the test laboratory does not have the relevant accreditation, then specified testing will need to be witnessed by a Surveyor of the Society.

4 Type Approval certificate

4.1 *(1/1/2026)*

The Society issues a Type Approval Certificate based on the test reports and manufacturer's technical documentation e.g., installation/ engineering manuals.

The Type Approval Certificate is to contain the general information as defined by Society Rules. As minimum, the following information is specifically applicable to products relevant to this document and are to be included on the relevant Type Approval Certificate:

a) Product description and properties in accordance with paragraph [3.3] above

b) Maximum nominal surface pressure

c) Maximum operating temperature.

Part C

Machinery, Systems and Fire Protection

Chapter 2

ELECTRICAL INSTALLATIONS

SECTION 3 SYSTEM DESIGN

1 Supply systems and characteristics of the supply

1.1 Supply systems

1.1.1 The following distribution systems may be used:

a) on d.c. installations:
- two-wire insulated
- two-wire with one pole earthed

b) on a.c. installations:
- three-phase three-wire with neutral insulated
- three-phase three-wire with neutral directly earthed or earthed through an impedance
- three-phase four-wire with neutral directly earthed or earthed through an impedance
- single-phase two-wire insulated
- single-phase two-wire with one phase earthed.

1.1.2 Distribution systems other than those listed in [1.1.1] (e.g. with hull return, three-phase four-wire insulated) will be considered by the Society on a case by case basis.

1.1.3 The hull return system of distribution is not to be used for power, heating or lighting in any ship of 1600 tons gross tonnage and upwards.

1.1.4 The requirement of [1.1.3] does not preclude under conditions approved by the Society the use of:

a) impressed current cathodic protective systems,

b) limited and locally earthed systems, or

c) insulation level monitoring devices provided the circulation current does not exceed 30 mA under the most unfavourable conditions.

Note 1: Limited and locally earthed systems such as starting and ignition systems of internal combustion engines are accepted provided that any possible resulting current does not flow directly through any dangerous spaces.

1.1.5 For the supply systems of ships carrying liquid developing combustible gases or vapours, see Pt E, Ch 7, Sec 5, Pt E, Ch 8, Sec 10 or Pt E, Ch 9, Sec 10.

1.1.6 For the supply systems in HV Installations, see Sec 13.

1.2 Maximum voltages

1.2.1 The maximum voltages for both alternating current and direct current low-voltage systems of supply for the ship's services are given in Tab 1.

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3 Distribution

3.1 Earthed distribution systems

3.1.1 System earthing is to be effected by means independent of any earthing arrangements of the non-current-carrying parts.

3.1.2 Means of disconnection are to be fitted in the neutral earthing connection of each generator so that the generator may be disconnected for maintenance or insulation resistance measurements.

3.1.3 Generator neutrals may be connected in common, provided that the third harmonic content of the voltage wave form of each generator does not exceed 5%.

3.1.4 Where a switchboard is split into sections operated independently or where there are separate switchboards, neutral earthing is to be provided for each section or for each switchboard. Means are to be provided to ensure that the earth connection is not removed when generators are isolated.

3.1.5 Where for final sub-circuits it is necessary to locally connect a pole (or phase) of the sub-circuits to earth after the protective devices (e.g. in automation systems or to avoid electromagnetic disturbances), provision (e.g. d.c./d.c. convertors or transformers) is to be made such that current unbalances do not occur in the individual poles or phases.

3.1.6 For high voltage systems see Sec 13.

3.2 Insulated distribution systems

3.2.1 *Every insulated distribution system, whether primary or secondary* (see Note 1)*, for power, heating or lighting, shall be provided with a device capable of continuously monitoring the insulation level to earth* (i.e. the values of electrical insulation to earth) *and of giving an audible* and *visual indication of abnormally low insulation values.*

Note 1: A primary system is one supplied directly by generators. Secondary systems are those supplied by transformers or convertors.

3.2.2 For high voltage systems see Sec 13.

3.3 Distribution systems with hull return

3.3.1 *Where the hull return system is used,* if permitted*, all final sub-circuits, i.e. all circuits fitted after the last protective device, shall be two-wire.*

The hull return is to be achieved by connecting to the hull one of the busbars of the distribution board from which the final sub-circuits originate.

3.4 General requirements for distribution systems

3.4.1 The distribution system is to be such that the failure of any single circuit will not endanger or impair primary essential services and will not render secondary essential services inoperative for longer periods.

3.4.2 No common switchgear (e.g. contactors for emergency stop) is to be used between the switchboard's busbars and two primary non duplicated essential services.

3.4.3 *Where the main source of electrical power is necessary for propulsion and steering of the ship, the system shall be so arranged that the electrical supply to equipment necessary for propulsion and steering and to ensure safety of the ship will be maintained or immediately restored in the case of loss of any one of the generators in service.*

3.4.4 *(1/1/2001)*

Where the electrical power is normally supplied by more than one generator set simultaneously in parallel operation, provision of protection, including automatic disconnection of sufficient non-essential services and if necessary secondary essential services and those provided for habitability, are to be made to ensure that, in case of loss of any of these generating sets, the remaining ones are kept in operation to permit propulsion and steering and to ensure safety.

3.4.5 *(1/1/2001)*

Where the electrical power is normally supplied by one generator, provision are to be made, upon loss of power, for automatic starting and connecting to the main switchboard of stand-by generator(s)of sufficient capacity with automatic restarting of the essential auxiliaries, in sequential operation if required. Starting and connection to the main switchboard of one generator is to be as rapid as possible, preferably within 30 seconds after loss of power.

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3.6.3 *A main electric lighting system which shall provide illumination throughout those parts of the ship normally accessible to and used by (passengers or) crew shall be supplied from the main source of electrical power.*

3.7 Emergency distribution of electrical power

3.7.1 *The emergency switchboard shall be supplied during normal operation from the main switchboard by an interconnector feeder which shall be adequately protected at the main switchboard against overload and short-circuit and which is to be disconnected automatically at the emergency switchboard upon failure of the main source of electrical power.*

Where the system is arranged for feedback operation, the interconnector feeder is also to be protected at the emergency switchboard at least against short-circuit.

3.7.2 *In order to ensure ready availability of the emergency source of electrical power, arrangements shall be made where necessary to disconnect automatically non-emergency circuits from the emergency switchboard to ensure that power shall be available to the emergency circuits.*

3.7.3 *(1/1/2023)*

The emergency source of electrical power shall be capable of supplying simultaneously at least the following services for the periods specified hereafter, if they depend upon an electrical source for their operation:

a) for a period of 3 hours, emergency lighting at every muster and embarkation station and over the sides;

b) for a period of 18 hours, emergency lighting:

1) in all service and accommodation alleyways, stairways and exits, personnel lift cars and personnel lift trunks;

2) in the machinery spaces and main generating stations including their control positions;

3) in all control stations, machinery control rooms, and at each main and emergency switchboard;

4) at all stowage positions for firemen's outfits;

5) at the steering gear;

6) at the fire pump referred to in (e) below, at the sprinkler pump, if any, at the emergency bilge pump, if any, and at the starting positions of their motors; and

7) in all cargo pump-rooms of tanker

c) for a period of 18 hours:

1) the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea in force;

2) on ships constructed on or after 1 February 1995 the VHF radio installation required by Regulation IV/7.1.1 and IV/7.1.2 of SOLAS Consolidated Edition 1992, and, if applicable:

- *the MF radio installation required by Regulations IV/9.1.1, IV/9.1.2, IV/10.1.2 and IV/10.1.3;*
- *the ship earth station required by Regulation IV/10.1.1; and*
- *the MF/HF radio installation required by Regulations IV/10.2.1, IV/10.2.2 and IV/11.1;*

d) for a period of 18 hours:

1) all internal communication equipment as required in an emergency [3.7.4]*;*

2) the shipborne navigational equipment as required by Regulation V/19; where such provision is unreasonable or impracticable the Society may waive this requirement for ships of less than 5 000 tons gross tonnage;

3) the fire detection and fire alarm systems (see Sec 1, [1.1.2]); and

4) intermittent operation of the daylight signalling lamp, the ship's whistle, the manually operated call points and all internal signals (see [3.7.5]) *that are required in an emergency;*

unless such services have an independent supply for the period of 18 hours from an accumulator battery suitably located for use in an emergency;

e) for a period of 18 hours: one of the fire pumps, when required, if dependent upon the emergency generator for its source of power (see Sec 1, [1.1.2]);

f) for the period of time required in Ch 1, Sec 11, [2]*, the steering gear where it is required to be so supplied.*

Note 1: for ships having navigation notation "sheltered area" or "special navigation" in an area at not more than 6 miles from the shore (see Sec 1, [1.1.3]) and not subject to the SOLAS convention, the Society may accept that the emergency source of electrical power is capable of supplying, for a period of not less than 2 times the expected duration of the longest voyage, but not less than:

- *3 hours, or*
- *30 minutes for ships having navigation notation "sheltered area",*

only the following services:

- *emergency lighting;*
- *navigation lights;*
- *radio installation;*
- *internal communication equipment and general alarm system;*
- *fire detection and alarm system;*
- *the steering gear pump (where it is required to be so supplied);*
- *fire pump (when required, if dependent upon the emergency source of electrical power for its source of power);*
- *power to the control, indication and alarm circuits of watertight and fire doors (where provided).*

3.7.4 *(1/1/2026)*

Internal communication equipment required in an emergency generally includes:

a) the means of communication between the navigating bridge and the steering gear compartment

b) the means of communication between the navigating bridge and the position in the machinery space or control room from which the engines are normally controlled

c) the means of communication between the bridge and the radio telegraph or radio telephone stations, where separately arranged outside the bridge.

d) the general emergency alarm system (as required in [3.15])

e) the public address system (~~see Sec 1, [1.1.2]~~as required in [3.16]).

3.7.5 *(1/7/2007)*

Internal signals required in an emergency generally include:

a) general alarm (see Sec 1, [1.1.2])

b) watertight door indication.

3.7.6 In a ship engaged regularly in voyages of short duration, i.e. voyages where the route is no greater than 20 nautical miles offshore or where the vessel has a class notation "Coastal Navigation", the Society may, if satisfied that an adequate standard of safety would be attained, accept a lesser period than the 18-hour period specified in [3.7.3] (item b to item e) but not less than 12 hours.

Note 1: In ships for which SOLAS is not applicable, a reduced period of time may be accepted.

Note 2: For passenger ships see Pt E, Ch 11, Sec 5.

3.7.7 *The transitional source of emergency electrical power, where required, shall supply for half an hour at least the following services if they depend upon an electrical source for their operation:*

a) the lighting required by [3.7.3](item a, b, c1)*; for this transitional phase, the required emergency electric lighting, in respect of the machinery space and the accommodation and service spaces may be provided by permanently fixed, individual, automatically charged, relay operated accumulator lamps; and*

b) all services required by [3.7.3] (item d1, d3, d4) *unless such services have an independent supply for the period specified from an accumulator battery suitably located for use in an emergency.*

3.8 Shore supply

3.8.1 Where arrangements are made for supplying the electrical installation from a source on shore or elsewhere, a suitable connection box is to be installed on the ship in a convenient location to receive the flexible cable from the external source.

3.8.2 *(1/7/2006)*

Permanently fixed cables of adequate rating are to be provided for connecting the box to the main switchboard or emergency switchboard.

3.8.3 Where necessary for systems with earthed neutrals, the box is to be provided with an earthed terminal for connection between the shore's and ship's neutrals or for connection of a protective conductor.

3.8.4 *(1/7/2009)*

The connection box is to contain a circuit-breaker or a switch-disconnector and fuses.

The shore connection is to be protected against short-circuit and overload; however, the overload protection may be omitted in the connection box if provided on the main or emergency switchboard.

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3.19.3 In the case of propulsion engines which do not depend for their operation on electrical power, i.e. pumps driven from the main engine, the speed control systems are to be fed both from the main source of electrical power and from an accumulator battery for at least 15 minutes or from a similar supply source.

Such battery may also be used for other services such as automation systems, where foreseen.

3.20 Power supply to the speed control systems of generator sets

3.20.1 Each electrically operated control and/or speed control system of generator sets is to be provided with a separate supply from the main source of electric power and from an accumulator battery for at least 15 minutes or from a similar supply source.

3.20.2 The wiring supplying the main source of electrical power is to be from the main switchboard or from independent section boards.

Where the main busbars are divided into two sections, the governors are, as far as practicable, to be supplied from the sections to which the relevant generators are connected.

4 Degrees of protection of the enclosures

4.1 General

4.1.1 The minimum required degree of protection for electrical equipment, in relation to the place of installation, is generally that specified in Tab 2.

4.1.2 Equipment supplied at nominal voltages in excess of 500 V and accessible to non-authorised personnel (e.g. equipment not located in machinery spaces or in locked compartments under the responsibility of the ship's officers) is to have a degree of protection against touching live parts of at least IP4X.

4.1.3 In addition to the requirements of this sub-article, equipment installed in spaces with an explosion hazard is also subject to the provisions of Sec 2, [6].

4.1.4 The enclosures of electrical equipment for the monitoring and control of watertight doors which are situated below the bulkhead deck are to provide suitable protection against the ingress of water.

In particular, the minimum required degree of protection is to be:

- IPX7 for electric motors, associated circuits and control components
- IPX8 for door position indicators and associated circuit components
- IPX6 for door movement warning signals.

Note 1: The water pressure testing of the enclosures protected to IPX8 is to be based on the pressure that may occur at the location of the component during flooding for a period of 36 hours.

Table 2 : Minimum required degrees of protection *(1/1/2026)*

Condition in location	Example of location	Switchboard Control gear Motor starters	Generators	Motors	Transformers	Luminaires	Heating appliances	Cooking appliances	Socket outiets	Accessories (e.g. switches, connection boxes)
Danger of touching live parts only	Dry accommodation spaces Dry control rooms	I P 20	X **(1)**	I P 20	I P 20	I P 20	I P20	I P 20	I P 20	I P 20

Condition in location	Example of location	Switchboard Control gear Motor starters	Generators	Motors	Transformers	Luminaires	Heating appliances	Cooking appliances	Socket outiets	Accessories (e.g. switches, connection boxes)
Danger of dripping liquid and/for moderate mechanical damage	Control rooms, wheel-house, radio room	I P 22	X	I P 22	I P 22	I P 22	I P22	I P 22	I P 22	I P 22
	Engine and boiler rooms above floor	I P 22	I P 22	I P 22	I P 22	I P 22	I P22	I P 22	I P 44	I P 44
	Steering gear rooms	I P 22	I P 22	I P 22	I P 22	I P 22	I P22	X	I P 44	I P 44
	Emergency machinery rooms	I P 22	I P 22	I P 22	I P 22	I P 22	I P22	X	I P 44	I P 44
	General storerooms	I P 22	X	I P 22	I P 22	I P 22	I P22	X	I P 22	I P 44
	Pantries	I P 22	X	I P 22	I P 22	I P 22	I P22	I P 22	I P 44	I P 44
	Provision rooms	I P 22	X	I P 22	I P 22	I P 22	I P22	X	I P 44	I P 44
	Ventilation ducts	X	X	I P 22	X	X	X	X	X	X
Increased danger of liquid and/for mechanical damage	Bathrooms and/or showers	X	X	X	X	I P 34	I P44	X	I P 55	I P 55
	Engine and boiler rooms below floor	X	X	I P 44	X	I P 34	I P44	X	X	I P 55
	Closed fuel oil separator rooms	I P 44	X	I P 44	I P 44	I P 34	I P44	X	X	I P 55
	Closed lubricating oil separator rooms	I P 44	X	I P 44	I P 44	I P 34	I P44	X	X	I P 55
Increased danger of liquid and mechanical damage	Ballast pump rooms	I P 44	X	I P 44 **(2)**	I P 44 **(2)**	I P 34	I P44	X	I P 55	I P 55
	Refrigerated rooms	X	X	I P 44	X	I P 34	I P44	X	I P 55	I P 55
	Galleys and laundries	I P 44	X	I P 44	I P 44	I P 34	I P44	I P 44	I P 44	I P 44
	Public bathrooms and shower	X	X	I P 44	I P 44	I P 34	I P44	X	I P 44	I P 44
Danger of liquid spraying. Presence of cargo dust. Serious mechanical damage. Aggressive fumes	Shaft or pipe tunnels in double bottom	I P 55	X	I P 55	I P 55	I P 55	I P55	X	I P 56	I P 56
	Holds for general cargo	X	X	I P 55	X	I P 55	I P55	X	I P 56	I P 56
	Ventilation trunks	X	X	I P 55	X	X	X	X	X	X
Danger of liquid in massive quantities	Open decks	I P 56	X	I P 56	X	I P 55	I P56	X	I P 56	I P 56

Condition in location	Example of location	Switchboard Control gear Motor starters	Generators	Motors	Transformers	Luminaires	Heating appliances	Cooking appliances	Socket outiets	Accessories (e.g. switches, connection boxes)
Danger of submersion	Spaces in which equipment, required to remain operational, may be subject to submersion (e.g. spaces below the bulkhead deck) **(3)**	X	X	IP X8 **(4)**	X	X	X	X	X	IP X8 **(4)**

(1) The symbol "X" denotes equipment which it is not advised to install.

(2) Electric motors and starting transformers for lateral thrust propellers located in spaces similar to ballast pump rooms may have degree of protection IP22.

(3) For watertight doors see also [4.1.4]; and for solenoid valves and remote indication devices (limit switches) installed on remotely controlled bilge valves see also Ch 1, Sec 10, [2.7.3].

(4) Conditions of pressure and time to be specified.

Table 3 : Required Environmental Categories *(1/7/2017)*

Location within main area				
Main Areas on Board	General	Inside cubicles, desks, etc.	On machinery such as internal combustion engines, compressors	Masts
Machinery Spaces/Steering Gear	EC21	EC3a1	EC3b3	X **(1)**
Control Room, Accommodation	EC21 EC11C	EC3a1	X	X
Bridge	EC21 EC11C	EC3a1	X	X
Pump Room, Holds, Rooms with no Heating	EC41	X	X	X
Exposed Decks	EC41S	X	X	EC42S

(1) The symbol "X" denotes locations which are generally not applicable.

4.1.5 *(1/7/2005)*

For electrical and electronic equipment installed in engine rooms protected by fixed water-based local application fire-fighting systems, see Ch 4, Sec 1, [7].

5 Diversity (demand) factors

5.1 General

5.1.1 The cables and protective devices of final sub-circuits are to be rated in accordance with their connected load.

5.1.2 Circuits supplying two or more final sub-circuits are to be rated in accordance with the total connected load subject, where justifiable, to the application of a diversity (demand) factor.

5.1.3 A diversity (demand) factor may be applied provided that the known or anticipated operating conditions in a particular part of an installation are suitable for the application of diversity.

6 Environmental categories of the equipment

6.1 Environmental categories

6.1.1 The environmental categories of the electrical equipment, in relation to the place of installation, are generally to be those specified in Tab 3.

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SECTION 11 LOCATION

1 General

1.1 Location

1.1.1 The degree of protection of the enclosures and the environmental categories of the equipment are to be appropriate to the spaces or areas in which they are located; see Sec 3, Tab 2, Sec 3, Tab 3 and Sec 2, [5.2.2].

1.2 Areas with a risk of explosion

1.2.1 Except where the installation of equipment for explosive gas atmosphere is provided for by the Rules, electrical equipment is not to be installed where flammable gases or vapours are liable to accumulate; see Sec 3, [10].

2 Main electrical system

2.1 Location in relation to the emergency system

2.1.1 The arrangement of the emergency electrical system is to be such that a fire or other casualty in spaces containing the emergency source of electrical power, associated converting equipment, if any, the emergency switchboard and the emergency lighting switchboard will not render inoperative the main electric lighting system and the other primary essential services.

2.2 Main switchboard

2.2.1 *The main switchboard shall be so placed relative to one main generating station that, as far as is practicable, the integrity of the normal electrical supply may be affected only by a fire or other casualty in one space.*

2.2.2 *An environmental enclosure for the main switchboard, such as may be provided by a machinery control room situated within the main boundaries of the space, is not to be considered as separating switchboards from generators.*

2.2.3 The main generating station is to be situated within the machinery space, i.e. within the extreme main transverse watertight bulkheads.

2.2.4 Any bulkhead between the extreme main transverse watertight bulkheads is not regarded as separating the equipment in the main generating station provided that there is access between the spaces.

2.2.5 The main switchboard is to be located as close as practicable to the main generating station, within the same machinery space and the same vertical and horizontal A60 fire boundaries.

2.2.6 *(1/1/2021)*
Where essential services for steering and propulsion are supplied from distribution boards, these and any transformers, convertors and similar appliances constituting an essential part of the electrical supply system are also to satisfy the above provisions.

2.2.7 A non-required subdivision bulkhead, with sufficient access, located between the switchboard and generators, or between two or more generators, is not to be considered as separating the equipment.

3 Emergency electrical system

3.1 Spaces for the emergency source

3.1.1 *The emergency source of electrical power, associated transforming equipment, if any, transitional source of emergency power, emergency switchboard and emergency lighting switchboard shall be located above the uppermost continuous deck and shall be readily accessible from the open deck.*
They shall not be located forward of the collision bulkhead.

3.1.2 *The spaces containing the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency electrical power and the emergency switchboard are not to be contiguous to the boundaries of machinery spaces of Category A or those spaces containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard.*

Where this is not practicable, the contiguous boundaries are to be Class A60.

3.2 Location in relation to the main electrical system

3.2.1 *The location of the emergency source of electrical power, associated transforming equipment, if any, the transitional source of emergency power, the emergency switchboard and the emergency lighting switchboard in relation to the main source of electrical power, associated transforming equipment, if any, and the main switchboard shall be such as to ensure to the satisfaction of the Society that a fire or other casualty in the space containing the main source of electrical power, associated transforming equipment, if any, and the main switchboard or in any machinery space of Category A will not interfere with the supply, control and distribution of emergency electrical power.*

3.2.2 The arrangement of the main electrical system is to be such that a fire or other casualty in spaces containing the main source of electrical power, associated converting equipment, if any, the main switchboard and the main lighting switchboard will not render inoperative the emergency electric lighting system and the other emergency services other than those located within the spaces where the fire or casualty has occurred.

3.3 Emergency switchboard

3.3.1 *The emergency switchboard shall be installed as near as is practicable to the emergency source of electrical power.*

3.3.2 *Where the emergency source of electrical power is a generator, the emergency switchboard shall be located in the same space unless the operation of the emergency switchboard would thereby be impaired.*

3.4 Emergency battery

3.4.1 *No accumulator battery fitted in accordance with the provisions of* Sec 3, [2.3] *shall be installed in the same space as the emergency switchboard.*

3.4.2 *(1/1/2021)*

For ships not subject to SOLAS, accumulator batteries fitted in accordance with the provisions of Sec 3, [2.3] may be accepted in the same space as the emergency switchboard, provided that they are not vented type batteries connected to a charging device of power greater than 2 kW.

4 Distribution boards

4.1 Distribution boards for cargo spaces and similar spaces

4.1.1 Distribution boards containing multipole switches for the control of power and lighting circuits in bunkers and cargo spaces are to be situated outside such spaces.

4.2 Distribution board for navigation lights

4.2.1 The distribution board for navigation lights is to be placed in an accessible position on the bridge.

5 Cable runs

5.1 General

5.1.1 Cable runs are to be selected so as to be as far as practicable accessible, with the exception of single cables, situated behind walls or ceilings constructed of incombustible materials, supplying lighting fittings and socket-outlets in accommodation spaces, or cables enclosed in pipes or conduits for installation purposes.

5.1.2 Cable runs are to be selected so as to avoid action from condensed moisture and from dripping of liquids.

5.1.3 Connection and draw boxes are to be accessible.

5.1.4 Cables are generally not to be installed across expansion joints.

Where this is unavoidable, however, a loop of cable of length proportional to the expansion of the joint is to be provided (see Sec 12, [7.2.2]).

5.2 Location of cables in relation to the risk of fire and overheating

5.2.1 *(1/1/2026)*

Cables and wiring serving essential or emergency power, lighting, internal communications or signals are, so far as is practicable, to be routed clear of galleys, laundries, machinery spaces of Category A and their casings and other high fire risk areas, except for supplying equipment in those spaces.

The relevant interpretation in IACS UI SC11 applies.

5.2.2 When it is essential that a circuit functions for some time during a fire and it is unavoidable to carry the cable for such a circuit through a high fire risk area (e.g. cables connecting fire pumps to the emergency switchboard), the cable is to be of a fire-resistant type or adequately protected against direct exposure to fire.

5.2.3 *(1/1/2021)*

Main cable runs (see Note 1) and cables for the supply and control of essential services are, as far as is practicable, to be kept away from machinery parts having an increased fire risk (see Note 2) unless:

- the cables have to be connected to the subject equipment,
- the cables are protected by a steel bulkhead or deck, or
- the cables in that area are of the fire-resisting type.

Note 1: Main cable runs are for example:

- cable runs from generators and propulsion motors to main and emergency switchboards
- cable runs directly above or below main and emergency switchboards, centralised motor starter panels, distribution boards and centralised control panels for propulsion and essential auxiliaries.

Note 2: Machinery, machinery parts or equipment handling combustibles are considered to present an increased fire risk.

5.2.4 Cables and wiring serving essential or emergency power, lighting, internal communications or signals are to be arranged, as far as practicable, in such a manner as to preclude their being rendered unserviceable by heating of the bulkheads that may be caused by a fire in an adjacent space.

5.2.5 Cables are to be arranged as remote as possible from sources of heat such as hot pipes, resistors, etc. Where installation of cables near heat sources cannot be avoided, and where there is consequently a risk of damage to the cables by heat, suitable shields are to be installed, or other precautions to avoid overheating are to be taken, for example use of ventilation, heat insulation materials or special heat-resisting cables.

5.3 Location of cables in relation to electromagnetic interference

5.3.1 For the installation of cables in the vicinity of radio equipment or of cables belonging to electronic control and monitoring systems, steps are to be taken in order to limit the effects of unwanted electromagnetic interference (see Ch 3, Sec 7).

5.4 Services with a duplicate feeder

5.4.1 In the case of essential services requiring a duplicate supply (e.g. steering gear circuits), the supply and associated control cables are to follow different routes which are to be as far apart as practicable, separated both vertically and horizontally.

5.5 Emergency circuits

5.5.1 Cables supplying emergency circuits are not to run through spaces containing the main source of electrical power, associated transforming equipment, if any, the main switchboard and the main lighting switchboard, except for cables supplying emergency equipment located within such spaces (see [3.2.2]).

5.6 Electrical distribution in passenger ships

5.6.1 For the electrical distribution in passenger ships, see Pt E, Ch 11, Sec 5, [1.3].

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SECTION 14 ELECTRIC PROPULSION PLANT

1 General

1.1 Applicable requirements

1.1.1 The following requirements apply to ships for which the main propulsion plants are provided by at least one electric propulsion motor and its electrical supply. All electrical components of the propulsion plants are to comply with these requirements.

1.1.2 Prime movers are to comply with the requirements of Ch 1, Sec 2.

1.1.3 For the torsional vibration characteristics of the electric propulsion plant, the provisions of Ch 1, Sec 9 apply.

1.1.4 Cooling and lubricating oil systems are to comply with the requirements of Ch 1, Sec 10.

1.1.5 Monitoring and control systems are to comply with the requirements of Chapter 3.

1.1.6 Installations assigned an additional notation for automation are to comply with the requirements of Part F.

1.2 Operating conditions

1.2.1 The normal torque available on the electric propulsion motors for manoeuvring is to be such as to enable the vessel to be stopped or reversed when sailing at its maximum service speed.

1.2.2 Adequate torque margin is to be provided for three-phase synchronous motors to avoid the motor pulling out of synchronism during rough weather and when turning.

1.2.3 When an electric generating plant has a continuous rating greater than the electric propulsion motor rating, means are to be provided to limit the continuous input to the motor. This value is not to exceed the continuous full load torque for which motor and shafts are designed.

1.2.4 The plant as a whole is to have sufficient overload capacity to provide the torque, power and reactive power needed during starting and manoeuvring conditions.

Locked rotor torque which may be required in relation to the operation of the vessel (e.g. for navigation in ice) is to be considered.

1.2.5 The electric motors and shaftline are to be constructed and installed so that, at any speed reached in service, all the moving components are suitably balanced.

2 Design of the propulsion plant

2.1 General

2.1.1 The electrical power for the propulsion system may be supplied from generating sets, dedicated to the propulsion system, or from a central power generation plant, which supplies the ship's services and electric propulsion.

The minimum configuration of an electric propulsion plant consists of one prime mover, one generator and one electric motor. When the electrical production used for propulsion is independent of the shipboard production, the diesel engines driving the electric generators are to be considered as main engines.

2.1.2 For plants having only one propulsion motor controlled via a static convertor, a standby convertor which it is easy to switch over to is to be provided. Double stator windings with one convertor for each winding are considered as an alternative solution.

2.1.3 In electric propulsion plants having two or more constant voltage propulsion generating sets, the electrical power for the ship's auxiliary services may be derived from this source. Additional ship's generators for auxiliary services need not be fitted provided that effective propulsion and the services mentioned in Sec 3, [2.2.3] are maintained with any one generating set out of service.

Where transformers are used to supply the ship's auxiliary services, see Sec 5.

2.1.4 Plants having two or more propulsion generators, two or more static convertors or two or more motors on one propeller shaft are to be so arranged that any unit may be taken out of service and disconnected electrically, without affecting the operation of the others.

2.1.5 *(1/1/2026)*

For single essential propulsion components and their reliability, refer to Ch 1, Sec 1, [2.1.2].

2.2 Power supply

2.2.1 Where the plant is intended exclusively for electric propulsion, voltage variations and maximum voltage are to be maintained within the limits required in Sec 2.

2.2.2 In special conditions (e.g. during crash-stop manoeuvres), frequency variations may exceed the limits stipulated in Sec 2 provided that other equipment operating on the same network is not unduly affected.

2.2.3 The electric plant is to be so designed as to prevent the harmful effects of electromagnetic interference generated by semiconductor convertors, in accordance with Sec 2.

2.3 Auxiliary machinery

2.3.1 Propeller/thruster auxiliary plants are to be supplied directly from the main switchboard or from the main distribution board or from a distribution board reserved for such circuits, at the auxiliary rated voltage.

2.3.2 When the installation has one or more lubrication systems, devices are to be provided to ensure the monitoring of the lubricating oil return temperature.

2.3.3 Propelling machinery installations with a forced lubrication system are to be provided with alarm devices which will operate in the event of oil pressure loss.

2.4 Electrical Protection

2.4.1 Automatic disconnections of electric propulsion plants which adversely affect the manoeuvrability of the ship are to be restricted to faults liable to cause severe damage to the equipment.

2.4.2 The following protection of convertors is to be provided:

- protection against overvoltage in the supply systems to which convertors are connected
- protection against overcurrents in semiconductor elements during normal operation
- short-circuit protection.

2.4.3 Overcurrent protective devices in the main circuits are to be set sufficiently high so that there is no possibility of activation due to the overcurrents caused in the course of normal operation, e.g. during manoeuvring or in heavy seas.

2.4.4 Overcurrent protection may be replaced by automatic control systems ensuring that overcurrents do not reach values which may endanger the plant, e.g. by selective tripping or rapid reduction of the magnetic fluxes of the generators and motors.

2.4.5 In the case of propulsion plants supplied by generators in parallel, suitable controls are to ensure that, if one or more generators are disconnected, those remaining are not overloaded by the propulsion motors.

2.4.6 In three-phase systems, phase-balance protective devices are to be provided for the motor circuit which de-excite the generators and motors or disconnect the circuit concerned.

2.5 Excitation of electric propulsion motor

2.5.1 Each propulsion motor is to have its own exciter.

2.5.2 For plants where only one generator or only one motor is foreseen, each machine is to be provided with a standby static electronic exciter, which it is easy to switch over to.

2.5.3 In the case of multi-propeller propulsion ships, one standby static electronic exciter which it is easy to switch over to is to be provided.

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Part C

Machinery, Systems and Fire Protection

Chapter 3

AUTOMATION

SECTION 3 COMPUTER BASED SYSTEMS

1 Scope

1.1 General

1.1.1 *(1/7/2024)*

These requirements apply to design, construction, commissioning and maintenance of computer based systems where they depend on software for the proper achievement of their functions.

1.1.2 *(1/7/2024)*

These requirements apply to systems which provide control, alarm, monitoring, safety or internal vessel communication functions that are subject to classification requirements.

1.1.3 *(1/7/2024)*

Computer-based systems that are covered by statutory regulations are excluded from the requirements of this Section.

Guidance:

Examples of such systems are navigation systems and radio communication system required by SOLAS chapter V and IV, and vessel loading instrument/stability computer.

For loading instrument/stability computer, IACS recommendation no. 48 may be considered.

1.2 Reference to other regulations and standards

1.2.1 *(1/7/2024)*

For the purposes of this Section, the applicable requirements in Sec 4, Sec 5 and Sec 8 are to be complied with.

1.2.2 Informative standards *(1/7/2024)*

For the purposes of this Section, the following standards are listed for information and may be used for the development of hardware/software of computer based systems:

- IEC 61508:2010 "Functional safety of electrical/electronic/programmable electronic safety related Systems"
- ISO/IEC 12207:2017 "Systems and software engineering - Software life cycle processes"
- ISO 9001:2015 "Quality Management Systems - Requirements"
- ISO/IEC 90003:2018 "Software engineering - Guidelines for the application of ISO 9001:2015 to computer software"
- IEC 60092-504:2016 "Electrical installations in ships - Part 504: Special features - Control and instrumentation"
- ISO/IEC 25000:2014 "Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - Guide to SQuaRE"
- ISO/IEC 25041:2012 "Systems and software engineering - Systems and software Quality Requirements and Evaluation (SQuaRE) - Evaluation guide for developers, acquirers and independent evaluators"
- IEC 61511:2016 "Functional safety - Safety instrumented systems for the process industry sector"
- ISO/IEC 15288:2015 "Systems and software engineering - system life cycle process"
- ISO ~~9~~10007:2017 Quality management – Guidelines for configuration management
- ISO 24060:2021 Ships and marine technology - Ship software logging system for operational technology.

Other industry standards may also be considered.

1.3 Structure

1.3.1 *(1/7/2024)*

The general certification requirements for computer-based systems and the relation to type approval is described in [2]. The requirements and extent of verification of a computer-based system depends on its categorization into one of three categories. The categories are described in [3].

The requirements of this Section cover the lifecycle of computer-based system from design through operations. The requirements are split into groups representing the different phases of the life cycle and the roles responsible for fulfilling the requirements.

The activities related to the development and delivery of a computer-based system is described in [4], while the activities related to the maintenance in the operational phase are described in [5].

Management of changes to software and systems is given special attention in this Section, and the main aspects of a management of change process are described in [6].

Most requirements in this Section are related to the way of working, and thus focus on activities to be performed, but it also contains some technical requirements. The technical requirements on computer-based systems have been gathered in [8].

Each activity contains a requirement part which describes the minimum requirements on the role in question, and a part which describes the Society's verification of the activity in question.

1.4 Abbreviations

1.4.1 *(1/7/2024)*

For the purpose of this Section the abbreviations in Tab 1 apply.

Table 1 : Abbreviations *(1/7/2024)*

Abbreviation	Expansion
Cat I	Category one systems as defined in
Cat II	Category two systems as defined in [3.1]
Cat III	Category three systems as defined in [3.1]
COTS	Commercial off-the-shelf
FAT	Factory acceptance test
FMEA	Failure mode and effect analysis
IT	Information technology
OT	Operational technology
PMS	Planned maintenance system
SAT	System acceptance test
SOST	System of systems test
SSLS	Ship software logging system

1.5 Definitions

1.5.1 Black-box description *(1/7/2024)*

A description of a system's functionality and behaviour and performance as observed from outside the system in question.

1.5.2 Black-box test methods *(1/7/2024)*

Verification of the functionality, performance, and robustness of a system, sub-system or component by only manipulating the inputs and observing the outputs. This does not require any knowledge of the system's inner workings and focuses only on the observable behaviour of the system/component under test in order to achieve the desired level of verification.

1.5.3 Computer-based system (CBS) *(1/7/2024)*

A programmable electronic device, or interoperable set of programmable electronic devices, organized to achieve one or more specified purposes such as collection, processing, maintenance, use, sharing, dissemination, or disposition of information. CBSs onboard include IT and OT systems. A CBS may be a combination of subsystems connected via network. Onboard CBSs may be connected directly or via public means of communications (e.g. Internet) to ashore CBSs, other vessels' CBSs and/or other facilities.

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1.5.18 Software master files *(1/7/2024)*

The computer-files that constitutes the original source of the software. For custom made software this may be readable source-code files, and for COTS software it may be different forms of binary files.

1.5.19 Software-structure *(1/7/2024)*

Overview of how the different software components interact and is commonly referred to as the Software Architecture, or Software Hierarchy.

1.5.20 Simulation tests *(1/7/2024)*

Monitoring, control, or safety system testing where the equipment under control is partly or fully replaced with simulation tools, or where parts of the communication network and lines are replaced with simulation tools.

1.5.21 Society Certificate *(1/7/2024)*

Compliance document issued by a Class Society stating:

- conformity with applicable rules and requirements
- that the tests and inspections have been carried out on
- the finished certified component itself; or
- on samples taken from earlier stages in the production of the component, when applicable.
- that the inspection and tests were performed in the presence of the Surveyor or in accordance with special agreements, i.e. Alternative Certification Scheme (ACS).

1.5.22 Type approval Certificate *(1/7/2024)*

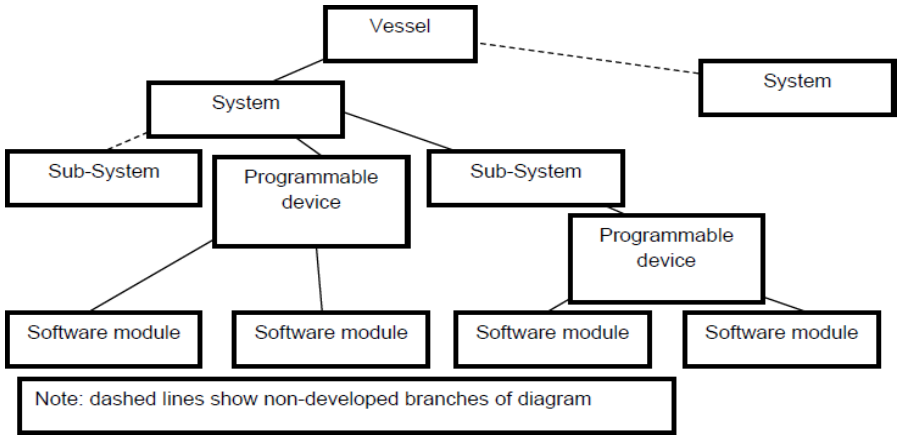
Compliance document issued by the Society by which the Society declares that a product design meets a minimum set of technical requirements.

1.5.23 Vessel *(1/7/2024)*

Ship or offshore unit where the computer-based system is to be installed.

The following diagram (Fig 1) shows the hierarchy and relationships of a typical computer-based system.

Figure 1 : Illustrative System Hierarchy *(1/7/2017)*



2 Approval of system and components

2.1 Type approval and system certification

2.1.1 System certification *(1/7/2024)*

Computer-based systems that are necessary to accomplish vessel-functions of category II or category III (as defined in [3.1.1]) are to be delivered with a vessel-specific Society certificate. The objective of the vessel-specific system certification is to confirm that design and manufacturing of the system has been completed and that the system complies with applicable rules of the Society.

Vessel-specific system certification consist of two main verification activities:

a) Assessment of vessel-specific documentation (see [4.2] and [6])

b) Survey and testing of the system to be delivered to the vessel (see [4.2.7])

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The system supplier is to follow procedures for maintenance of the system including procedures for management of change as described in [6].

Society's verification:

Category I: No documentation requirements

Category II and III: See [6.12].

5.3.2 Testing of changes before installation onboard *(1/7/2024)*

Requirement:

The system supplier is to make sure that the planned changes to a system have passed relevant in-house tests before the change is made to systems on board.

Society's verification:

Category I: No documentation requirements

Category II and III: See [6.12].

6 Management of change

6.1 General

6.1.1 *(1/7/2024)*

This Article provides requirements for the management of change throughout the lifecycle of a computer-based system. Different procedures for the management of change may be defined for specific phases in a system's lifecycle as the different phases typically involve different stakeholders. The Society's verification is described in [6.12].

6.2 Documented change management procedures

6.2.1 *(1/7/2024)*

Requirement:

The organization in question is to have defined and documented change management procedures applicable for the computer-based system in question covering both hardware and software. After FAT, the system supplier is to manage all changes to the system in accordance with the procedure. Examples could be qualification of new versions of acquired software, new hardware, modified control logic, changes to configurable parameters.

The procedure(s) is at least to describe the activities listed in [6.3] through [6.11]. The outcome of the impact analysis in [6.8] will determine to what extent the activities in [6.3] to [6.12] are to be performed. Change records (described in [6.11]) are always to be produced.

6.3 Agreement between relevant stakeholders

6.3.1 *(1/7/2024)*

Requirement:

The management of change process is to be coordinated and agreed between the relevant stakeholders along the different stages of the lifecycle of the computer-based system.

Guidance:

Typically, the management of change address at least three different stages:

- Development and internal verification before FAT; involving the system supplier and sub-suppliers.
- From FAT to handover of the vessel to the owner; involving the system supplier, the systems integrator, the Society, and the owner.
- In operation; involving the system supplier, service suppliers, the owner, and the Society

6.4 Approved software shall be under change management

6.4.1 *(1/7/2024)*

Requirement:

If changes are required to a system after it has been approved by applicable stakeholders (typically the systems integrator and the Society at FAT) the modifications are to follow defined change management procedures.

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6.11 Change records

6.11.1 *(1/7/2024)*

Changes to systems and software are to be documented in change records to allow for visibility and traceability of the changes. The change records is to contain at least the following items:

- The purpose for a change
- A description of the changes and modifications
- The main conclusions from the impact analysis (see [6.8])
- The identity and version of any new system or software version(s) (see [6.5])
- Test reports or tests summaries (see [6.10])

Documentation of the changes to software may be recorded in the planned maintenance system (PMS), in a software registry or equivalent.

6.12 Verification of change management by the Society

6.12.1 In operation (vessel in service) phase *(1/7/2024)*

The verification by the Society regarding the management of change in operation is generally performed during the annual survey of the vessel. Procedures for management of change and relevant change records (see [6.11]) are to be made available at the time of survey.

In the cases where the change requires approval from the Society up front, the relevant procedures and documentation for the change in question may be verified at that time.

6.12.2 During newbuilding *(1/7/2024)*

The verification of management of change in the newbuilding phase is divided into two; Procedures are verified as a part of the verification of the quality management system ([4.1.2]), while project specific implementation of the procedures are verified during FAT ([4.2.7]), SAT ([4.3.6]), and ~~after FAT~~SOST ([~~6~~4.~~12~~3.~~1~~7]) activities.

7 Technical requirements on computer-based systems

7.1 General

7.1.1 *(1/7/2024)*

The Articles below contain technical requirements on computer-based systems. The compliance to these requirements are to be documented in the design documentation (see [4.2.3]) and verified through the verification activities described in this Section.

7.2 Reporting of system and software identification and version

7.2.1 System identification *(1/7/2024)*

The system is to provide means to identify its name, version, identifier, and manufacturer. It is recommended that the system can automatically report the status of its software to a ship software logging system (SSLS) as specified in the international standard ISO 24060.

7.3 Data links

7.3.1 General requirements for category II and III systems *(1/7/2024)*

Loss of a data link is to be specifically addressed in risk assessment analysis/FMEA. See [4.2.3].

a) A single failure in data link is not to cause loss of vessel- functions of category III. Any effect of such failures is to meet the principle of fail-to-safe for the vessel-function(s) being served.

b) For vessel-functions of category II and III, any loss of functionality in the remote control system is to be compensated for by local/manual means.

c) The data link is to have means to prevent or cope with excessive communication rates.

d) Data links are to be self-checking, detecting failures or performance issues on the link itself and data communication failures on nodes connected to the link.

e) Detected failures are to initiate an alarm.

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SECTION 4 CYBER RESILIENCE OF SHIPS

1 Introduction

1.1 General

1.1.1 *(1/7/2024)*

Interconnection of computer systems on ships, together with the widespread use onboard of commercial-off-the-shelf (COTS) products, open the possibility for attacks to affect personnel data, human safety, the safety of the ship, and threaten the marine environment.

Attackers may target any combination of people and technology to achieve their aim, wherever there is a network connection or any other interface between onboard systems and the external world. Safeguarding ships, and shipping in general, from current and emerging threats involves a range of measures that are continually evolving.

This Section establish a set of minimum functional and performance criteria to deliver a ship that can indeed be described as cyber resilient.

The minimum requirements in this Section applied consistently to the full threat surface using a goal-based approach are considered necessary to make cyber resilient ships.

1.2 Structure of this Section

1.2.1 *(1/7/2024)*

Tab 1 illustrate the structure of this Section

Table 1 : Structure of this Section *(1/7/2024)*

Introductory Part	1 Introduction 2 Definitions 3 Goals and Organization of Requirements
Main Part	4 Requirements 4.1 General 4.2 Identify 4.3 Protect 4.4 Detect 4.5 Respond 4.6 Recover
	5 Demonstration of compliance 5.1 General 5.2 During design and construction phases 5.3 Upon ship commissioning 5.4 During the operational life of the ship
Supplementary Part	6 Risk assessment for exclusion of CBS from the application of requirements (required only when systems are excluded from application of this Section)
	7: Summary of actions and documents 8: Summary of requirements and documents

1.3 Aim and purpose

1.3.1 *(1/7/2024)*

The aim of this Section is to provide a minimum set of requirements for cyber resilience of ships, with the purpose of providing technical means to stakeholders which would lead to cyber resilient ships.

This Section targets the ship as a collective entity for cyber resilience and is intended as a base for the complementary application of other industry standards addressing cyber resilience of onboard systems, equipment and components.

Minimum requirements for cyber resilience of on-board systems and equipment are given in Sec 5.

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b) Protect: Develop and implement appropriate safeguards to protect the ship against cyber incidents and maximize continuity of shipping operations.

c) Detect: Develop and implement appropriate measures to detect and identify the occurrence of a cyber incident onboard.

d) Respond: Develop and implement appropriate measures and activities to take action regarding a detected cyber incident onboard.

e) Recover: Develop and implement appropriate measures and activities to restore any capabilities or services necessary for shipping operations that were impaired due to a cyber incident.

These sub-goals and relevant functional elements should be concurrent and considered as parts of a single comprehensive risk management framework.

3.3 Organization of requirements

3.3.1 *(1/7/2024)*

The requirements are organized according to a goal-based approach. Functional/technical requirements are given for the achievement of specific sub-goals of each functional element.

The requirements are intended to allow a uniform implementation by stakeholders and to make them applicable to all types of vessels, in such a way as to enable an acceptable level of resilience and apply to all classed vessels/units regardless of operational risks and complexity of OT systems.

For each requirement, a rationale is given.

A summary of actions to be carried out and documentation to be made available is also given for each phase of the ship's life and relevant stakeholders participating to such phase.

4 Requirements

4.1 General

4.1.1 *(1/7/2024)*

This Article contains the requirements to be satisfied in order to achieve the primary goal defined in [3.1], organized according to the five functional elements identified in [3.2].

The requirements are to be fulfilled by the stakeholders involved in the design, building and operation of the ship. Among them, the following stakeholders can be identified (see also [2] for definitions):

- Shipowner/Company
- Systems integrator
- Supplier
- Classification Society

Whilst the above requirements may be fulfilled by these stakeholders, for the purposes of this Section, responsibility to fulfil them will lie with the stakeholder who has contracted with the Society.

4.2 Identify

4.2.1 *(1/7/2024)*

The requirements for the 'Identify' functional element are aimed at identifying: on one side, the CBSs onboard, their interdependencies and the relevant information flows; on the other side, the key resources involved in their management, operation and governance, their roles and responsibilities.

4.2.2 Vessel asset inventory *(1/1/2026)*

a) **Requirement**

An inventory of hardware and software (including application programs, operating systems, if any, firmware and other software components) of the CBSs in the scope of applicability of this Section and of the networks connecting such systems to each other and to other CBSs onboard or ashore is to be provided and kept up to date during the entire life of the ship.

b) **Rationale**

The inventory of CBSs onboard and relevant software used in OT systems, is essential for an effective management of cyber resilience of the ship, the main reason being that every CBS becomes a potential point of vulnerability.

Cybercriminals can exploit unaccounted and out-of-date hardware and software to hack systems. Moreover, managing CBS assets enables Companies understand the criticality of each system to ship safety objectives.

c) **Requirement details**

The vessel asset inventory is to include at least the CBSs indicated in [1.4.2], if present onboard.

The inventory is to be kept updated during the entire life of the ship. Software and hardware modifications potentially introducing new vulnerabilities or modifying functional dependencies or connections among systems is to be recorded in the inventory.

If confidential information is included in the inventory (e.g. IP addresses, protocols, port numbers), special measures are to be adopted to limit the access to such information only to authorized people.

1) **Hardware**

For all hardware devices in the scope of applicability of this Section, the vessel asset inventory is to include at least the information in Sec 5, [3.1.2].

In addition, the vessel asset inventory may specify system category and security zone associated with the CBS.

2) **Software**

For all software in the scope of applicability of this Section (e.g., application program, operating system, firmware), the vessel asset inventory is to include at least the information in Sec 5, [3.1.2].

The software of the CBSs in the scope of applicability of this Section is to be maintained and updated in accordance with the shipowner's process for management of software maintenance and update policy in the Ship cyber security and resilience program, see [5.4.2].

d) **Demonstration of compliance**

1) **Design phase**

The systems integrator is to submit vessel asset inventory to the Society (ref. [5.2.4]).

The vessel asset inventory is to incorporate the asset inventories of all individual CBSs falling under the scope of this Section. Any equipment in the scope of this Section delivered by the systems integrator is also to be included in the vessel asset inventory.

2) **Construction phase**

The systems integrator is to keep the vessel asset inventory updated.

3) **Commissioning phase**

The systems integrator is to submit Ship cyber resilience test procedure (ref. [5.3.2]) and demonstrate to the Society that:

- Vessel asset inventory is updated and completed at delivery
- CBSs in the scope of applicability of this Section are correctly represented by the vessel asset inventory
- Software of the CBSs in the scope of applicability of this Section has been kept updated, e.g. by vulnerability scanning or by checking the software versions of CBSs while switched on.

4) **Operation phase**

For general requirements to surveys in the operation phase, see [5.4].

The shipowner is in the Ship cyber security and resilience program to describe the process of management of change (MoC) for the CBSs in the scope of applicability of this Section, addressing at least the following requirements in this Section:

- Management of change (see [5.4])
- Hardware and software modifications (see [4.2.2] c))

The shipowner is in the Ship cyber security and resilience program also to describe the management of software updates, addressing at least the following requirements in this Section:

- Vulnerabilities and cyber risks (see [4.2.2] b) and c))
- Security patching (see [4.3.7] c) 2))

First annual survey

The shipowner is to present to the Society records or other documented evidence demonstrating implementation of the Ship cyber security and resilience program, i.e., that:

- The approved management of change process has been adhered to.
- Known vulnerabilities and functional dependencies have been considered for the software in the CBSs.
- The Vessel asset inventory has been kept updated.

Subsequent annual surveys

The shipowner is upon request by the Society to demonstrate implementation of the Ship cyber security and resilience program by presenting records or other documented evidence as specified for the first annual survey.

Special Survey

The shipowner is to demonstrate to the Society the activities in section [4.2.2] d), 3) as per the Ship cyber resilience test procedure.

An example of the "Vessel Asset Inventory Template" form to be filled in and submitted by the shipyard/integrator during vessel construction and maintained through the vessel's operational life by the Shipowner, is available in IACS Rec.190 and published on the Society website.

4.3 Protect

4.3.1 General *(1/7/2024)*

The requirements for the Protect functional element are aimed at the development and implementation of appropriate safeguards supporting the ability to limit or contain the impact of a potential incident.

4.3.2 Security Zones and Network Segmentation *(1/7/2024)*

a) **Requirement**

All CBSs in the scope of applicability of this Section are to be grouped into security zones with well-defined security policies and security capabilities. Security zones are either to be isolated (i.e. air gapped) or connected to other security zones or networks by means providing control of data communicated between the zones (e.g. firewalls/routers, simplex serial links, TCP/IP diodes, dry contacts, etc.)

Only explicitly allowed traffic is to traverse a security zone boundary.

b) **Rationale**

While networks may be protected by firewall perimeter and include Intrusion Detection Systems (IDS) or Intrusion Prevention Systems (IPS) to monitor traffic coming in, breaching that perimeter is always possible. Network segmentation makes it more difficult for an attacker to perpetrate an attack throughout the entire network.

The main benefits of security zones and network segmentation are to reduce the extent of the attack surface, prevent attackers from achieving lateral movement through systems, and improve network performance. The concept of allocating the CBSs into security zones allows grouping the CBSs in accordance with their risk profile.

c) **Requirement details**

A security zone may contain multiple CBSs and networks, all of which are to comply with applicable security requirements given in this Section and Sec 5.

The network(s) of a security zone is to be logically or physically segmented from other zones or networks. See also [4.3.7] c)).

CBSs providing required safety functions are to be grouped into separate security zones and are to be physically segmented from other security zones.

Navigational and communication systems are not to be in same security zone as machinery or cargo systems. If navigation and/or radiocommunication systems are approved in accordance with other equivalent standard(s) (see [1.4.2]), these systems should be in a dedicated security zone.

Wireless devices are to be in dedicated security zones. See also [4.3.6].

Systems, networks or CBSs outside the scope of applicability of this Section are considered untrusted networks and are to be physically segmented from security zones required by this Section. Alternatively, it is accepted that such systems are part of a security zone if these OT-systems meet the same requirements as demanded by the zone.

It is to be possible to isolate a security zone without affecting the primary functionality of the CBSs in the zone, see also [4.5.4].

d) **Demonstration of compliance**

1) **Design phase**

The systems integrator is to submit Zones and conduit diagram and the Cyber security design description (see [5.2.2] and [5.2.3]).

The Zones and conduit diagram are to illustrate the CBSs in the scope of applicability of this Section, how they are grouped into security zones, and include the following information:

- Clear indication of the security zones
- Simplified illustration of each CBS in scope of applicability of this Section, and indication of the security zone in which the CBS is allocated, and indication of physical location of the CBS/equipment

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SECTION 5 CYBER RESILIENCE OF ON-BOARD SYSTEMS AND EQUIPMENT

1 General

1.1 Introduction

1.1.1 *(1/7/2024)*
This Section specifies requirements for cyber resilience of on-board systems and equipment.

1.2 Limitations

1.2.1 *(1/7/2024)*
This Section does not cover environmental performance for the system hardware and the functionality of the software.

1.3 Scope of applicability

1.3.1 *(1/7/2024)*
The requirements specified in this Section are applicable to computer based systems specified in Sec 4 for the following types of vessels:

- **Mandatory requirements for**:
  - Passenger ships (including passenger high-speed craft) engaged in international voyages
  - Cargo ships of 500 GT and upwards engaged in international voyages
  - High speed craft of 500 GT and upwards engaged in international voyage
  - Mobile offshore drilling units of 500 GT and upwards
  - Self-propelled mobile offshore units engaged in construction (i.e. wind turbine installation maintenance and repair, crane units, drilling tenders, accommodation, etc).
- **Non-mandatory guidance to**:
  - Ships of war and troopships
  - Cargo ships less than 500 gross tonnage
  - Vessels not propelled by mechanical means
  - Wooden ships of primitive build
  - Passenger yachts (passengers not more than 12)
  - Pleasure yachts not engaged in trade
  - Fishing vessels
  - Site specific offshore installations (i.e. FPSOs, FSUs, etc).

For navigation and radiocommunication systems, the application of IEC 61162-460 or other equivalent standards in lieu of the required security capabilities in [4] may be accepted by the Society, on the condition that requirements in Sec 4 are complied with.

1.3.2 Information and Communication Technology (ICT) *(1/7/2024)*
Attention is made to the following requirements on Computer Based Systems and Cyber Resilience:

- Sec 3 “Computer based systems” which includes requirements for design, construction, commissioning and maintenance of computer-based systems where they depend on software for the proper achievement of their functions. The requirements in Sec 3 focus on the functionality of the software and on the hardware supporting the software which provide control, alarm, monitoring, safety or internal communication functions
- Sec 4 “Cyber resilience of Ships” which includes requirements for cyber resilience of ships, with the purpose of providing technical means to stakeholders which would lead to cyber resilient ships
- IACS Recommendation 166 on Cyber Resilience: non-mandatory recommended technical requirements that stakeholders may reference and apply to assist with the delivery of cyber resilient ships, whose resilience can be maintained throughout their service life.

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2.2 Cyber Resilience

2.2.1 *(1/7/2024)*
The cyber resilience requirements in [4] will be applicable for all systems in scope of Sec 4 as applicable. Additional requirements related to interface with untrusted networks will only apply for systems where such connectivity is designed.

2.3 Essential Systems Availability

2.3.1 *(1/7/2024)*
Security measures for Essential system are not to adversely affect the systems availability.

2.3.2 *(1/7/2024)*
Implementation of security measures is not to cause loss of safety functions, loss of control functions, loss of monitoring functions or loss of other functions which could result in health, safety and environmental consequences.

2.3.3 *(1/7/2024)*
The system is to be adequately designed to allow the ship to continue its mission critical operations in a manner that ensures the confidentiality, integrity, and availability of the data necessary for safety of the vessel, its systems, personnel and cargo.

2.4 Compensating Countermeasures

2.4.1 *(1/7/2024)*
Compensating countermeasure may be employed in lieu of or in addition to inherent security capabilities to satisfy one or more security requirements.

Compensating countermeasure(s) is(are) to meet the intent and rigor of the original stated requirement considering the referenced standards as well as the differences between each requirement and the related items in the standards, and follow the principles specified in [3.1.4].

3 Documentation

3.1 CBS Documentation

3.1.1 *(1/7/2024)*
The following documents are to be submitted to the Society for review and approval in accordance with the requirements in this Section; see also [6.2].

3.1.2 CBS asset inventory *(1/1/2026)*
The CBS asset inventory is to include the information below:

- List of hardware components (e.g., host devices, embedded devices, network devices) Name
- Brand/manufacturer
- Model/type
- Short description of functionality/purpose
- Physical interfaces (e.g., network, serial)
- Name/type of system software (e.g., operating system, firmware)
- Version and patch level of system software
- Supported communication protocols

List of software components (e.g., application software, utility software)

- The hardware component where it is installed
- Brand/manufacturer
- Model/type
- Short description of functionality/purpose
- Version of software

An example of the "Vessel Asset Inventory Template" form to be filled in and submitted by the shipyard/integrator during vessel construction and maintained through the vessel's operational life by the Shipowner, is available in IACS Rec.190 and published on the Society website.

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SECTION 8 TESTING

1 General

1.1 Commissioning

1.1.1 Automation systems are to be tested for type approval, acceptance or commissioning, when required. Tests are to be carried out under the supervision of a Surveyor of the Society.

1.1.2 The type testing conditions for electrical, control and instrumentation equipment, computers and peripherals are described in [2].

1.1.3 Automation systems are to be inspected at works, according to the requirements of [3], in order to check that the construction complies with the Rules.

1.1.4 Automation systems are to be commissioned when installed on board and prior to sea trials, to verify their performance and adaptation on site, according to [4].

2 Type approval

2.1 General

2.1.1 *(1/1/2016)*

This test specification for type approval is applicable, but not confined, to electrical, electronic and programmable equipment intended for (see Note 1a)):

- control, monitoring, alarm and protection systems for use in ships
- internal communication.

Note 1:

a) These test requirements are harmonised with IEC 60092-504 “Electrical Installations in Ships -Part 504: Special features - Control and Instrumentation” and IEC 60533 “Electrical and electronic installations in ships - Electromagnetic compatibility”. Electrical and electronic equipment on board ships, required neither by the Rules nor by International Conventions, liable to cause electromagnetic disturbance are to be of type which fulfill the test requirements of test specification items 19 and 20 of Tab 1.

b) Functional test, as used in Tab 1, is a simplified test sufficient to verify that the equipment under test (EUT) has not suffered any deterioration caused by the individual environmental tests and not a complete performance test as required in item 2 of Tab 1.

2.1.2 The necessary documents to be submitted, prior to type testing, are listed in Sec 1, [2.4.1]. The type approval of automation systems refers to hardware type approval or software type approval, as applicable.

2.2 Hardware type approval

2.2.1 *(1/1/2002)*

These tests are to demonstrate the ability of the equipment to function as intended under the specified testing conditions.

The extent of the testing, i.e. the selection and sequence of tests and the number of pieces to be tested is to be determined upon examination and evaluation of the equipment or component subject to testing giving due regard to its intended use.

Equipment is to be tested in its normal position unless otherwise specified in the test specification.

The relevant tests are listed in Tab 1.

2.2.2 The following additional tests may be required, depending on particular manufacturing or operational conditions:

- mechanical endurance test
- temperature shock test (e.g. 12 shocks on exhaust gas temperature sensors from 20°C ± 5°C to maximum temperature of the range)

- immersion test
- oil resistance test
- shock test.

The test procedure is to be defined with the Society in each case.

Table 1 : Type tests *(1/1/2026)*

No.	Test	Procedure **(1)**	Test parameters	Other information
1	Visual inspection			• conformance to drawings, design data.
2	Performance test	Manufacturer performance test programme based upon specification and relevant Rule requirements. When the EUT is required to comply with an international performance standard, e.g. protection relays, verification of requirements in the standard are to be part of the performance testing required in this initial test and subsequent performance tests after environmental testing where required in this Tab 1.	• standard atmosphere condition • temperature: 25°C ± 10°C • relative humidity: 60% ± 30% • air pressure: 96 KPa ±10 KPa	• confirmation that operation is in accordance with the requirements specified for particular system or equipment • checking of self-monitoring features • checking of specified protection against an access to the memory • checking against effect an erroneous use of control elements in the case of computer systems
3	External power supply failure		• 3 interruptions during 5 minutes • switching- off time 30 s each case	• The time of 5 minutes may be exceeded if the equipment under test needs a longer time for start up, e.g. booting sequence • For equipment which requires booting, one additional power supply interruption during booting to be performed Verification of: • equipment behaviour upon loss and restoration of supply; • possible corruption of programme or data held in programmable electronic systems, where applicable.

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No.	Test	Procedure **(1)**	Test parameters	Other information
8	Inclination	IEC 60092-504	Static 22,5° Dynamic 22,5°	a) inclined to the vertical at an angle of at least 22,5° b) inclined to at least 22,5° on the other side of the vertical and in the same plane as in (a) c) inclined to the vertical at an angle of at least 22,5° in plane at right angles to that used in (a) d) inclined to at least 22,5° on the other side of the vertical and in the same plane as in (c). Note: The period of testing in each position should be sufficient to fully evaluate the behaviour of the equipment. Using the directions defined in a) to d) above, the equipment is to be rolled to an angle of 22,5° each side of the vertical with a period of 10 seconds. The test in each direction is to be carried out for not less than 15 minutes. On ships for the carriage of liquified gases and chemicals, the emergency power supply is to remain operational with the ship flooded up to a maximum final athwart ship inclination of 30°. (see 1983 IGC Code, clause 2.9.2.2, 2014 IGC Code, clause 2.7.2.2, IBC Code, clause 2.9.3.2). Note: These inclination tests are normally not required for equipment with no moving parts
9	Insulation resistance	Rated supply voltage voltage U_n(V) (V) $U_n \leq 65$ $U_n > 65$ Test voltage D.C. 2 x U_n min. 24 500	Minimum insulation resistance before test: 10 MΩ after test: 1,0 MΩ 100 MΩ 10 MΩ	For high voltage equipment, reference is made to Ch 2, Sec 13. • insulation resistance test is to be carried out before and after: damp heat test, cold test and salt mist test, high voltage test; • between all circuits and earth; and where appropriate • between the phases. Note: Certain components e.g. for EMC protection may be required to be disconnected for this test.

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No.	Test	Procedure **(1)**	Test parameters	Other information
17	Electrical Fast Transients / Burst	IEC 61000-4-4	Single pulse time: 5ns (between 10% and 90% value) Single pulse width: 50 ns (50% value) Amplitude (peak): 2 kV line on power supply port/earth; 1 kV on I/O data control and communication ports (coupling clamp) Pulse period: 300 ms Burst duration: 15 ms Duration/polarity: 5 min According to test level 3	• arcs generated when actuating electrical contacts • interface effect occurring on the power supply, as well as at the external wiring of the test specimen • performance criterion B (see **(5)**)
18	Surge	IEC 61000-4-5+AMD1	Test applicable to AC and DC power ports Open-circuit voltage: Pulse rise time: 1,2 µs ((front time) Pulse width: 50 µs (time to half value) Amplitude (peak) : 1 kV line/earth; 0,5 kV line/line Short-circuit current: Pulse rise time: 8 µs (front time) Pulse width: 20 µs (time to half value) Repetition rate: ≥ 1 pulse/min No of pulses: 5 per polarity Application: continuous According to test level 2	• interference generated for instance, by switching “ON” or “OFF” high power inductive consumers • test procedure in accordance with figure 10 of the standard for equipment where power and signal lines are identical • performance criterion B (see **(5)**)
19	Radiated Emission	CISPR 16-2-3+AMD1+AMD2 IEC 60945 for 156-165 MHz	Limits below 1000 MHz For equipment installed in the bridge and deck zone: Frequency range: — Quasi peak limits: 0,15 - 0,30 MHz — 80 - 52 dBµV/m 0,30 - 30 MHz — 52 - 34 dBµV/m 30 - 1000 MHz — 54 dBµV/m except for: 156 - 165 MHz — 24 dBµV/m For equipment installed in the general power distribution zone: Frequency range: — Quasi peak limits: 0,15 - 30 MHz — 80 - 50 dBµV/m 30 - 100 MHz — 60 - 54 dBµV/m 100 - 1000 MHz — 54 dBµV/m except for: 156 - 165 MHz — 24 dBµV/m Limits above 1000 MHz Frequency range: Average limit: 1000 - 6000 MHz 54 dBµV/m	• procedure in accordance with the standard but distance 3 m between equipment and antenna • for the frequency band 156 MHz to 165 MHz the measurement is to be repeated with a receiver bandwidth of 9 kHz (as per IEC 60945) • alternatively the radiation limit at a distance of 3 m from the enclosure port over the frequency 156 MHz to 165 MHz is to be 30 dB micro-V/m peak (as per IEC 60945). • procedure in accordance with the standard (distance 3 m between equipment and antenna) • equipment intended to transmit radio signals for the purpose of radio communication (e.g. wi-fi router, remote radio controller) may be exempted from limit, within its communication frequency range, subject to the provisions “Specific requirements for wireless data links” in Sec 3, [7.3.2].

No.	Test	Procedure **(1)**	Test parameters	Other information
20	Conducted Emission	CISPR 16-2-1+AMD1	Test applicable to AC and DC power ports For equipment installed in the bridge and deck zone: Frequency range: Limits: 10 - 150 kHz 96 - 50 dBµV 150 - 350 kHz 60 - 50 dBµV 0,35 - 30 MHz 50 dBµV For equipment installed in the general power distribution zone: Frequency range: Limits: 10 - 150 kHz 120 - 69 dBµV 150 - 500 kHz 79 dBµV 0,5 - 30 MHz 73 dBµV	

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Part E

Service Notations

Chapter 6

COMBINATION CARRIERS

SECTION 2 SHIP ARRANGEMENT

1 General

1.1 Application

1.1.1 The requirements in Sec 2 and Sec 3 apply to:

- single deck ships of double side skin construction, with a double bottom, hopper tanks and topside tanks and intended to carry dry cargoes in bulk, including ore cargo, or oil cargoes in bulk (ships with the service notation **combination carrier/OBO ESP**); a typical midship section is shown in Fig 1
- single deck ships with two longitudinal bulkheads and a double bottom throughout the cargo region and intended to carry dry cargoes in bulk, including ore cargo, or oil cargoes in the centre holds (ships with the service notation **combination carrier/OOC ESP**); typical midship sections are shown in Fig 2.

The application of these requirements to other ship types is to be considered by the Society on a case-by-case basis.

2 General arrangement design

2.1 General

2.1.1 Cofferdams

A cofferdam or similar compartment of width not less than 760 mm is to be provided at the aft end of the oil cargo tank area. Its bulkheads are to extend from keel to deck across the full breadth of the ship.

For the purpose of this requirement, the term “cofferdam” is intended to mean an isolating compartment between two adjacent steel bulkheads or decks. The minimum distance between the two bulkheads or decks is to be sufficient for safe access and inspection.

In order to meet the single failure principle, in the particular case when a corner-to-corner situation occurs, this principle may be met by welding a diagonal plate across the corner.

Cofferdams are also to be constructed so as to enable adequate ventilation.

2.1.2 Cargo segregation

Unless expressly provided otherwise, tanks containing oil cargoes or oil cargo residues are to be segregated from accommodation, service and machinery spaces, drinking water and stores for human consumption by means of a cofferdam, or any other similar compartment.

Where accommodation and service compartments are arranged immediately above the compartments containing flammable liquids, the cofferdam may be omitted only where the deck is not provided with access openings and is coated with a layer of material recognised as suitable by the Society. The cofferdam may also be omitted where such compartments are adjacent to a passageway, subject to the following conditions:

- the thicknesses of common boundary plates of adjacent tanks are increased with respect to those obtained from the applicable requirements in Pt B, Ch 6, Sec 2, by 2 mm in the case of tanks carrying fresh water or boiler feed water, and by 1 mm in all other cases
- the sum of the throats of the weld fillets at the edges of such plates is not less than the thickness of the plates themselves
- the hydrostatic test is carried out with a head increased by 1 m with respect to that required in Pt B, Ch 12, Sec 3.

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- *in any case the draught at the after perpendicular is to be not less than that which is necessary to obtain full immersion of the propeller(s)*
- *in no case is ballast water to be carried in oil cargo tanks, except:*
  - *on those rare voyages when weather conditions are so severe that, in the opinion of the Master, it is necessary to carry additional ballast water in oil cargo tanks for the safety of the ship*
  - *in exceptional cases where the particular character of the operation of a combination carrier renders it necessary to carry ballast water in excess of the quantity required to comply with the requirements above, provided that such operation of the combination carrier falls under the category of exceptional cases.*

5.2.2 Combination carriers less than 150 m in length

The capacity of the segregated ballast tanks is to be considered by the Society on a case-by-case basis.

6 Access arrangement

6.1 Access to double bottom and pipe tunnel

6.1.1 Means of access

Adequate means of access to the double bottom and the pipe tunnel are to be provided.

6.1.2 Manholes in the inner bottom, floors and girders

Manholes may not be cut in the inner bottom in way of oil cargo holds; access to the double bottom is, in general, to be provided by trunks leading to the upper deck.

The location and size of manholes in longitudinal girders and floors are to be determined to facilitate the access to double bottom structures and their ventilation. However, they are to be avoided in the areas where high shear stresses may occur.

6.1.3 Access to pipe tunnels under oil cargo tanks

The pipe tunnel in the double bottom under oil cargo tanks is to comply with the following requirements:

- it may not communicate with the engine room
- provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

6.1.4 Doors between pipe tunnel and main pump room

Where there is a permanent access from a pipe tunnel to the main pump room, a watertight door is to be fitted complying with the requirements in Pt B, Ch 2, Sec 1, [6.2.1] for watertight doors open at sea and located below the freeboard deck. In addition the following is to be complied with:

- *in addition to bridge operation, the watertight door is to be capable of being manually closed from outside the main pump room entrance*
- *the watertight door is to be kept closed during normal operations of the ship except when access to the pipe tunnel is required.* A notice is to be affixed to the door to the effect that it may not be left open.

6.2 Access to dry cargo holds

6.2.1 Means of access

As far as practicable, permanent or movable means of access stored on board are to be provided to ensure proper survey and maintenance of dry cargo holds.

6.2.2 Hatches of large cargo holds

When the access to the dry cargo hold is arranged through the cargo hatch, the top of the ladder, as required in [6.2.3], is to be placed as close as possible to the hatch coaming.

Accesses and ladders are to be so arranged that personnel equipped with self-contained breathing apparatus may readily enter and leave the dry cargo hold.

Access hatch coamings having a height greater than 900 mm are also to have steps on the outside in conjunction with dry cargo hold ladders.

6.2.3 Ladders within large cargo holds

Each dry cargo hold is to be provided with at least two ladders as far apart as practicable longitudinally. If possible these ladders are to be arranged diagonally, e.g. one ladder near the forward bulkhead on the port side, the other one near the aft bulkhead on the starboard side, from the ship's centreline.

Ladders are to be so designed and arranged that the risk of damage from the cargo handling gear is minimised.

Vertical ladders may be permitted provided they are arranged above each other in line with other ladders to which they form access and resting positions are provided at not more than 9 metres apart.

Tunnels passing through dry cargo holds are to be equipped with ladders or steps at each end of the hold so that personnel may get across such tunnels.

Where it may be necessary for work to be carried out within a dry cargo hold preparatory to loading, consideration is to be given to suitable arrangements for the safe handling of portable staging or movable platforms.

6.3 Access to compartments in the oil cargo area

6.3.1 General

Access to cofferdams, ballast tanks, dry cargo holds, oil cargo tanks and other compartments in the oil cargo area is to be direct from the open deck and such as to ensure their complete inspection.

6.3.2 Access to the fore peak tank *(1/1/2026)*

The requirements for access to the fore peak tank in Ch 7, Sec 2, [7.2] and [7.3] applyis to be direct from the open deck.

Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that:

a) if 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 electrically certified safe in the enclosed space is isolated

b) if the enclosed space has a common boundary with the cargo tanks and is therefore a hazardous area (see Note 1), the enclosed space can be well ventilated.

Note 1: The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features.

6.3.3 Access through horizontal openings

For access through horizontal openings the dimensions are to be sufficient to allow a person wearing a self-contained, air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the compartment. The minimum clear opening is to be not less than 600 mm by 600 mm.

6.3.4 Access through vertical openings

For access through vertical openings the minimum clear opening is to be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

6.4 Access to the bow

6.4.1 *(1/7/2008)*

This item [6.4] applies to ships subject to the International Load Line Convention 1966, as amended.

6.4.2 *Combination carriers are to be provided with the means to enable the crew to gain safe access to the bow even in severe weather conditions. Such means are to be accepted by the Society.*

Note 1: The Society considers means in compliance with the Guidelines adopted by the Maritime Safety Committee of IMO with Resolution MSC.62(67) on 5/12/1996 as being acceptable.

Part E

Service Notations

Chapter 7

OIL TANKERS AND FLS TANKERS

SECTION 2 SHIP ARRANGEMENT

1 General

1.1 Application

1.1.1 *(1/7/2011)*

The requirements in Sec 2 apply to single deck ships, with machinery aft, double bottom throughout the cargo tank area, double side skin and possible longitudinal bulkheads, or single side skin and one or more longitudinal bulkheads throughout the cargo tank area. The deck may be single or double skin, with or without a trunk.

The application of these requirements to other ship types is to be considered by the Society on a case-by-case basis.

1.1.2 Deviations *(1/7/2011)*

The requirements in [2.1.2] to [2.1.4], apply only to ships with the service notations:

- **oil tanker ESP**
- **oil tanker ESP CSR**
- **FLS tanker**.

The requirements in [2.2], [3], [4] and [5] apply only to ships with the service notations:

- **oil tanker ESP**
- **oil tanker ESP CSR**
- **oil tanker ESP, flashpoint > 60°C**
- **oil tanker ESP CSR, flashpoint > 60°C**
- **asphalt tanker**
- **asphalt tanker ESP.**

The requirements in [6] apply only to ships with the service notations:

- **oil tanker ESP**
- **oil tanker ESP CSR**
- **oil tanker ESP, flashpoint > 60°C**
- **oil tanker ESP CSR, flashpoint > 60°C**
- **asphalt tanker**
- **asphalt tanker ESP**

apart from [6.2.2], which applies also to ships having the service notation **FLS tanker**.

2 General arrangement design

2.1 General

2.1.1 Specification

The requirements in [2.1.2] to [2.1.4] apply also to ships with the service notation **FLS tanker**.

2.1.2 Cofferdams

A cofferdam or similar compartment of width not less than 760 mm is to be provided at the aft end of the cargo tank area. Its bulkheads are to extend from keel to deck across the full breadth of the ship.

For the purpose of this requirement, the term “cofferdam” is intended to mean an isolating compartment between two adjacent steel bulkheads or decks. The minimum distance between the two bulkheads or decks is to be sufficient for safe access and inspection.

In order to meet the single failure principle, in the particular case when a corner-to-corner situation occurs, this principle may be met by welding a diagonal plate across the corner.

The cofferdams are also to be constructed so as to enable adequate ventilation.

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or the minimum mean draught, in m, and the maximum trim, in m, are obtained from the following formulae, respectively:

$d_m = 1,55 + 0,023\ L$

$t_m = 1,6 + 0,013\ L$

5.3.4 Formulation C

The following formulae provide for certain increased draughts to aid in the prevention of propeller emergence and slamming in higher length ships.

The minimum draughts, in m, at stern and at bow are obtained from the following formulae, respectively:

$d_{m,S} = 2,0 + 0,0275\ L$

$d_{m,B} = 0,5 + 0,0225\ L$

6 Access arrangement

6.1 General

6.1.1 As far as practicable, permanent or movable means of access stored on board are to be provided to ensure proper survey and maintenance of cargo tanks and ballast compartments.

6.1.2 Means of access to side and centre tanks may not be provided in the same transverse section.

6.2 Access to pipe tunnel and opening arrangement

6.2.1 Access to the pipe tunnel in the double bottom

The pipe tunnel in the double bottom is to comply with the following requirements:

- it may not communicate with the engine room
- provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

6.2.2 Doors between pipe tunnel and main pump room

This requirement also applies to ships with the service notation **FLS tanker**.

Where there is a permanent access from a pipe tunnel to the main pump room, a watertight door is to be fitted complying with the requirements in Pt B, Ch 2, Sec 1, [6.2.1] for watertight doors open at sea and located below the freeboard deck. In addition the following is to be complied with:

- *in addition to bridge operation, the watertight door is to be capable of being manually closed from outside the main pump room entrance*
- *the watertight door is to be kept closed during normal operations of the ship except when access to the pipe tunnel is required.* A notice is to be affixed to the door to the effect that it may not be left open.

6.3 Access to compartments in the cargo area

6.3.1 General

Access to cofferdams, ballast tanks, cargo tanks and other compartments in the cargo area is to be direct from the open deck and such as to ensure their complete inspection. Access to double bottom compartments may be through a cargo pump room, pump room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

6.3.2 Access to the fore peak tank *(1/1/2026)*

The requirements for access to the fore peak tank in [7.2] and [7.3] apply ~~is to be direct from the open deck.~~

~~Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that:~~

a) ~~if 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 electrically certified safe in the enclosed space is isolated~~

b) ~~if the enclosed space has a common boundary with the cargo tanks and is therefore a hazardous area (see Note 1), the enclosed space can be well ventilated.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features.~~

6.3.3 Access through horizontal openings

For access through horizontal openings the dimensions are to be sufficient to allow a person wearing a self-contained, air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the compartment. The minimum clear opening is to be not less than 600 mm by 600 mm.

6.3.4 Access through vertical openings

For access through vertical openings the minimum clear opening is to be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

6.3.5 Oil tankers less than 5000 t deadweight

For oil tankers of less than 5000 t deadweight smaller dimensions may be approved by the Society in special circumstances, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Society.

6.4 Access to the bow

6.4.1 *(1/7/2008)*

This item [6.4] applies to ships subject to the International Load Line Convention 1966, as amended.

6.4.2 Oil tankers are to be provided either with a gangway between the superstructure or deckhouse aft and the forecastle, or with equivalent arrangements in accordance with the International Load Line Convention 1966, as amended.

6.4.3 *Oil tankers are to be provided with the means to enable the crew to gain safe access to the bow even in severe weather conditions. Such means are to be accepted by the Society.*

Note 1: The Society considers means in compliance with the Guidelines adopted by the Maritime Safety Committee of IMO with Resolution MSC.62(67) on 5/12/1996 as being acceptable.

7 Fore peak ballast tanks and space arrangements

7.1 Definitions

7.1.1 *(1/1/2026)*

The following definitions apply in this Article:

- **Hazardous area**: means an area in which an explosive gas atmosphere is present, or may be expected to be present in quantities such as to require special precautions for the construction, installation and use of equipment.
- **Non-hazardous area**: means an area that is not a hazardous area.
- **Cargo area of tankers**: defined in regulation 3.6 of SOLAS Chapter II-2 for tankers to which regulation 1.6.1 of SOLAS Chapter II-2 as amended by IMO resolutions up to MSC.421(98) (hereinafter the same) applies, considering also the relevant interpretations in IACS UI SC211.

7.2 Fore peak ballast tanks and space arrangements

7.2.1 *(1/1/2026)*

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

a) The vent pipe openings are located on open deck at a distance from sources of ignition as required by IEC 60092-502:1999 Electrical installations in ships - Tankers - Special features; This requirement does not apply to sounding arrangements.

b) Access to the fore peak tank is direct from open deck. Alternatively, indirect access from the open deck to the forepeak tank may be from a pump-room, deep cofferdam, pipe tunnel, cargo hold, double hull space, bosun's store or similar compartment not intended for the carriage of oil or hazardous cargoes, conforming to the requirements of SOLAS II-1/3-6.3.1. Electrical equipment in such indirect access is to be of the certified safe type suitable for use in the hazardous area it opens into or is to be isolated before entry.

c) Continuous ventilation is maintained while accessing the forepeak tank.

d) The sounding arrangement to the fore peak tank is direct from open deck.

e) The forepeak tank is gas freed direct from open deck, or through a dedicated trunk to open deck. Before the manhole and the entrance of the dedicated trunk are opened, the trunk and the forepeak tank are to be confirmed as made gas free. Means are to be provided to free the space of gas without opening manholes or the entrance to a dedicated trunk. Manholes on the open deck and away from sources of ignition at the top of the dedicated trunk which are used to gas-free the space are allowed to be opened.

f) The fore peak ballast tank is considered as a hazardous zone 2 if segregated from cargo area with a cofferdam, or as a hazardous zone 1 if located adjacent to a cargo tank. For tankers where a bow thruster space is provided, the piping passing through the non-hazardous bow thruster room are to be fully welded and it is required to have the collision bulkhead valve located within the forepeak tank.

g) Means are to be provided on the open deck by a suitable portable instrument, to allow detection of toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of FPT was carried out), in order to ensure the FPT is fully gas freed. In the case that sounding arrangements can be used as the means for the portable instrument additional means for the purpose is not required.

7.3 Additional requirements for forward spaces not being defined as a ballast tank

7.3.1 *(1/1/2026)*

Any spaces, voids and/or indirect accesses from the open deck or intermediate space being located adjacent to cargo tanks, and/or are defined as hazardous area zone 1 or 2, is to follow the same requirements to openings and access as reflected for fore peak ballast tanks in [7.2].

7.3.2 *(1/1/2026)*

In case any spaces or voids are defined as non-hazardous spaces and have access to other non-hazardous spaces (such as bosun store), the following applies:

a) For any non-hazardous space with access to a hazardous space (example: fore peak ballast tank), the non-hazardous space is to have access directly to open deck and is to be gas freed directly from open deck, and not through the non-hazardous space (example: bosun store).

b) Access from bosun store to a non-hazardous space (example: void) having access to hazardous space (example: fore peak ballast tank) may be accepted through a gas tight bolted manhole, with signboard stating that the non-hazardous space cannot be entered until the space is confirmed gas free. Separation of such spaces are described in IEC 60092-502:1999 section 4.1.4 and 4.1.5 as applicable.

The following figures illustrate the above points:

Figure 5 : Sample 1 *(1/1/2026)*

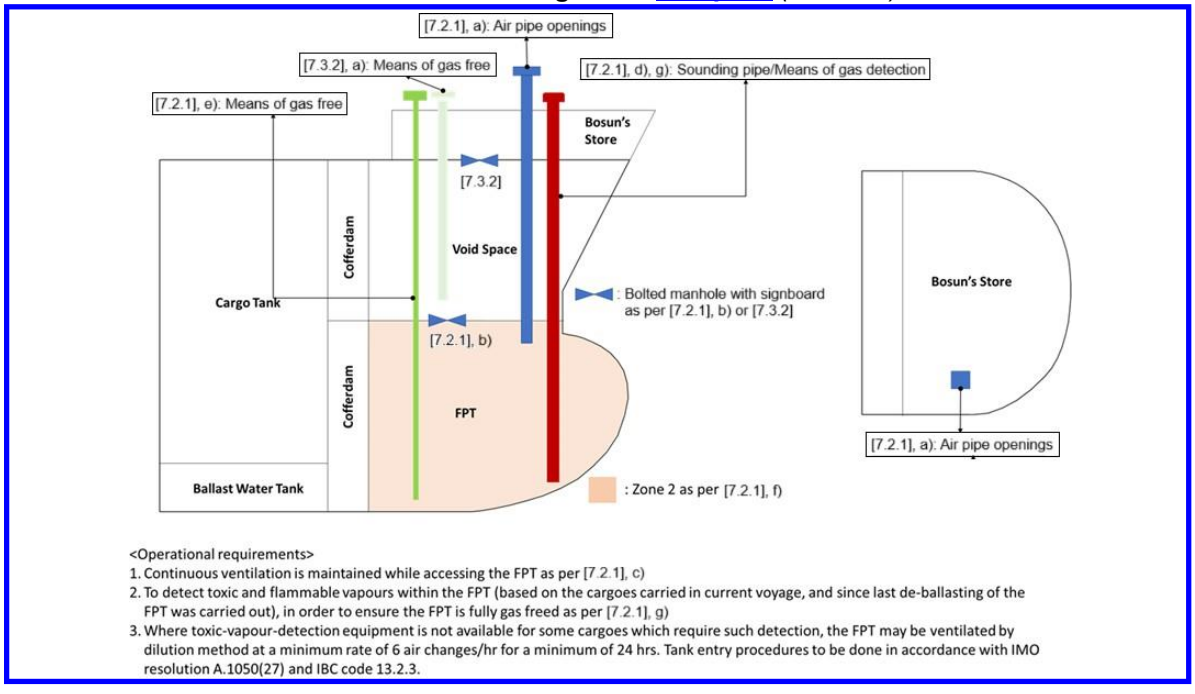
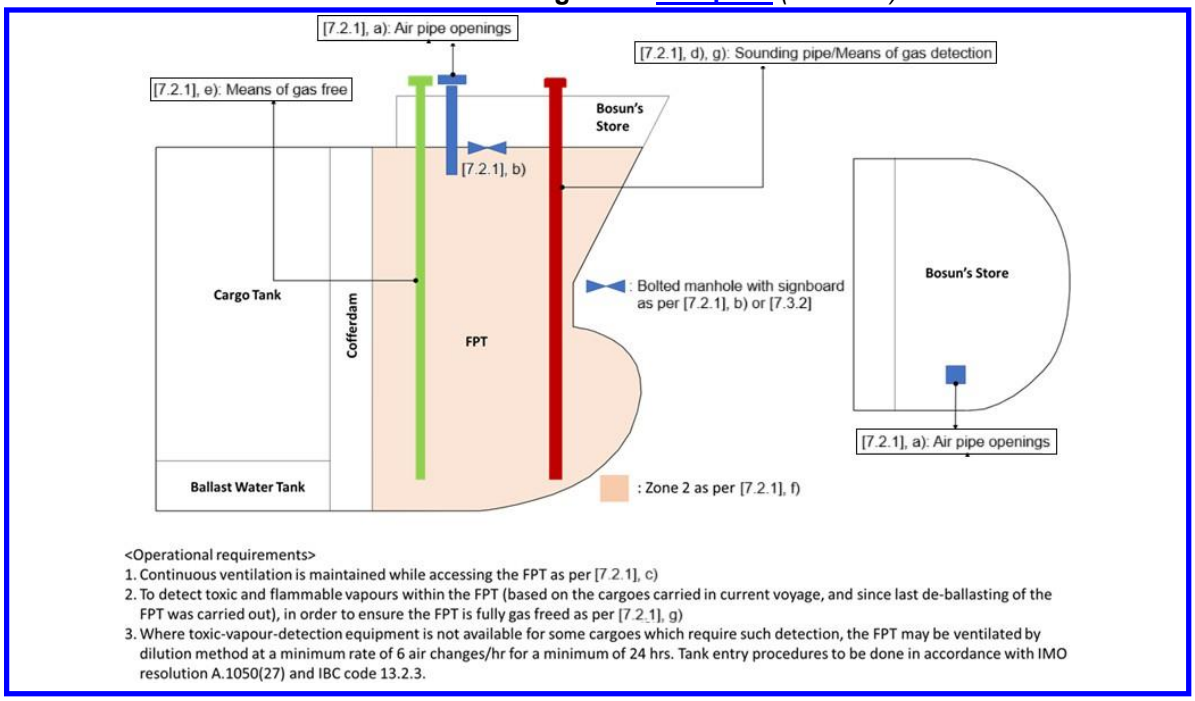
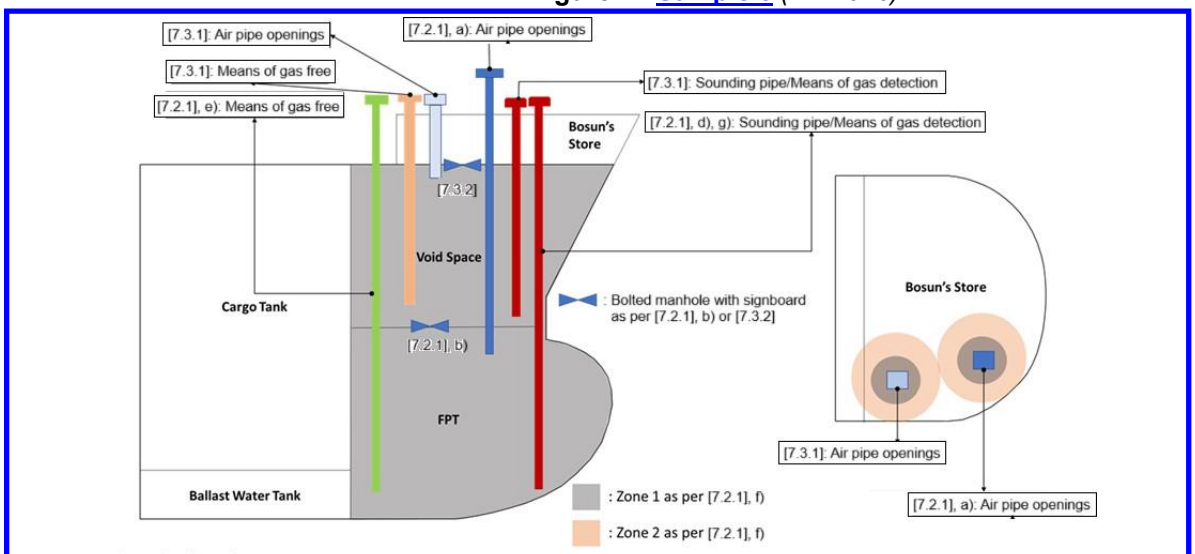


Figure 6 : Sample 2 *(1/1/2026)*



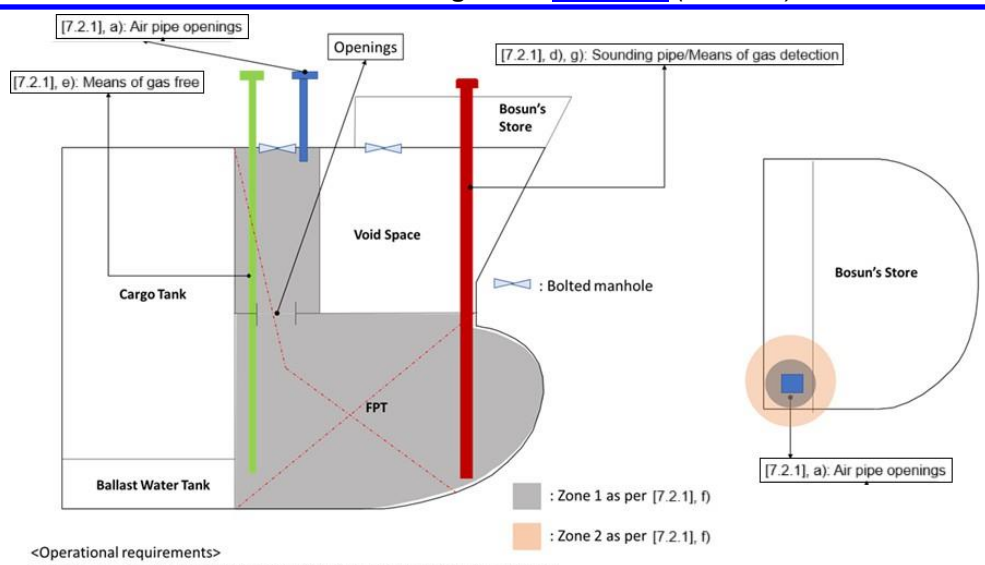
<Operational requirements>
1. Continuous ventilation is maintained while accessing the FPT as per [7.2.1], c)
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per [7.2.1], g)
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

Figure 7 : Sample 3 *(1/1/2026)*



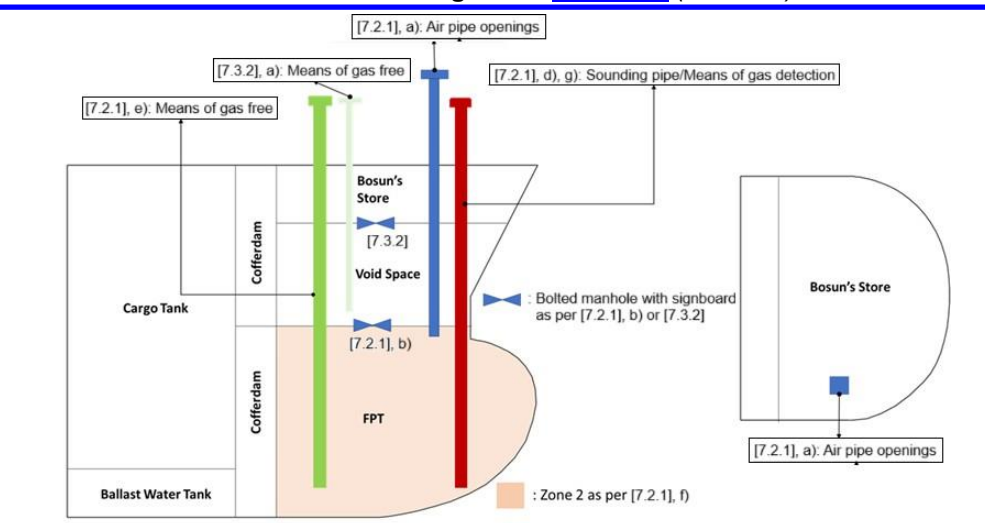
<Operational requirements>
1. Continuous ventilation is maintained while accessing the FPT as per [7.2.1], c)
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per [7.2.1], g)
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

Figure 8 : Sample 4 *(1/1/2026)*



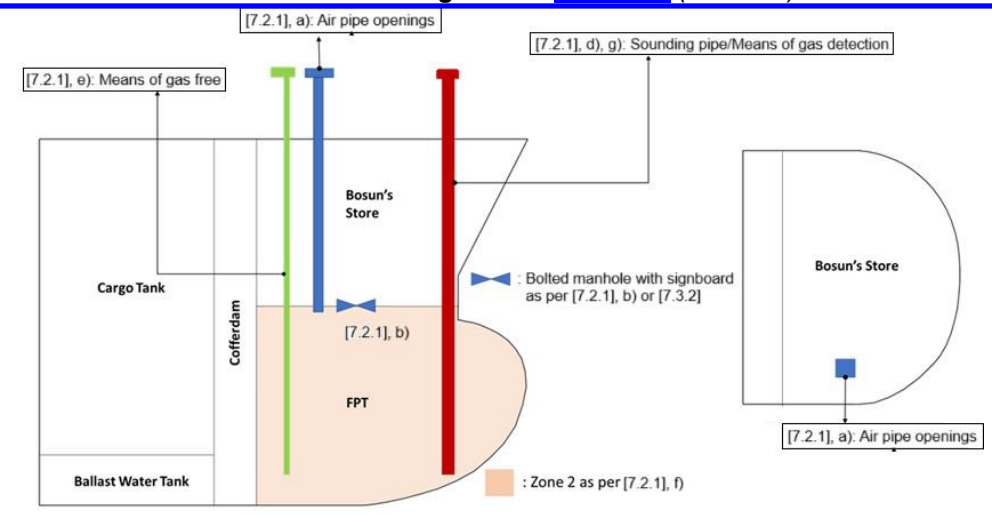
<Operational requirements>
1. Continuous ventilation is maintained while accessing the FPT as per [7.2.1], c)
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per [7.2.1], g)
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

Figure 9 : Sample 5 *(1/1/2026)*



<Operational requirements>
1. Continuous ventilation is maintained while accessing the FPT as per [7.2.1], c)
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per [7.2.1], g)
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

Figure 10 : Sample 6 *(1/1/2026)*



<Operational requirements>

1. Continuous ventilation is maintained while accessing the FPT as per [7.2.1], c)
2. To detect toxic and flammable vapours within the FPT (based on the cargoes carried in current voyage, and since last de-ballasting of the FPT was carried out), in order to ensure the FPT is fully gas freed as per [7.2.1], g)
3. Where toxic-vapour-detection equipment is not available for some cargoes which require such detection, the FPT may be ventilated by dilution method at a minimum rate of 6 air changes/hr for a minimum of 24 hrs. Tank entry procedures to be done in accordance with IMO resolution A.1050(27) and IBC code 13.2.3.

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SECTION 4 MACHINERY AND CARGO SYSTEMS FOR OIL TANKER ESP, OIL TANKER ESP CSR, FLS TANKER

1 General

1.1 Application

1.1.1 *(1/1/2012)*

The requirements of this Section apply to ships having the service notations:

- **oil tanker ESP**
- **oil tanker ESP CSR**
- **FLS tanker**

intended to carry products having any flashpoint.

The requirements in [2.1.3], [2.3.1], [2.3.5], [2.3.6], [2.3.7], [2.4.3], [3.4.6], [4.6.1] c) and d), [4.6.3] b), [4.6.4], [5] and [6.3.2], derived from MARPOL Annex I regulations, apply only to ships having the service notation **oil tanker ESP** or **oil tanker ESP CSR** (named oil tankers in this Section).

The requirements in [8.2] apply to ships having the service notation FLS tanker intended to carry substances of pollution category Z.

Some departures from these requirements may be accepted for ships of less than 500 gross tonnage as indicated in Tab 1.

1.2 Documents to be submitted

1.2.1 *(1/1/2012)*

The documents listed in Tab 2 are to be submitted for approval in four copies.

2 Piping systems other than cargo piping system

2.1 General

2.1.1 Materials *(1/1/2012)*

a) Materials are to comply with the provisions of Pt C, Ch 1, Sec 10.

b) Spheroidal graphite cast iron may be accepted for bilge and ballast piping.

2.1.2 Independence of piping systems *(1/1/2012)*

a) Bilge, ballast and scupper systems serving spaces located within the cargo area:
   - are to be independent from any piping system serving spaces located outside the cargo area
   - are not to lead outside the cargo area.

b) Fuel oil systems are to:
   - be independent from the cargo piping system
   - have no connections with pipelines serving cargo or slop tanks.

2.1.3 Passage through cargo tanks and slop tanks *(1/1/2025)*

a) Unless otherwise specified, bilge, ballast and fuel oil systems serving spaces located outside the cargo area are not to pass through cargo tanks or slop tanks. They may pass through ballast tanks or void spaces located within the cargo area.

b) Where expressly permitted, ballast pipes passing through cargo tanks are to fulfil the following provisions:
   - they are to have welded or heavy flanged joints (see Note 1) the number of which is kept to a minimum
   - they are to be of extra-reinforced wall thickness as per Pt C, Ch 1, Sec 10, Tab 5
   - they are to be adequately supported and protected against mechanical damage.

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b) Cargo pumps or stripping pumps may be used for draining cargo pump rooms provided that:
   - a screw-down non-return valve is fitted on the bilge suctions, and
   - a remote control valve is fitted between the pump suction and the bilge distribution box.

c) Bilge pipe internal diameter is not to be less than 50 mm.

d) The bilge system of cargo pump rooms is to be capable of being controlled from outside.

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

2.2.4 Draining of tunnels and pump rooms other than cargo pump rooms *(1/1/2012)*

Arrangements are to be provided to drain tunnels and pump rooms other than cargo pump rooms. Cargo pumps may be used for this service under the provisions of [2.2.3], item b).

2.2.5 Draining of cofferdams located at the fore and aft ends of the cargo spaces *(1/1/2012)*

a) When they are not intended to be filled with water ballast, cofferdams located at the fore and aft ends of the cargo spaces are to be fitted with drainage arrangements.

b) Aft cofferdams adjacent to the cargo pump room may be drained by a cargo pump in accordance with the provisions of [2.2.3], items b) and c), or by bilge ejectors.

c) Cofferdams located at the fore end of the cargo spaces may be drained by the bilge or ballast pumps required in [2.1.4], or by bilge ejectors.

d) Drainage of the after cofferdam from the engine room bilge system is not permitted.

Note 1: On tankers of less than 500 gross tonnage, cofferdams may be drained by means of hand pumps with a suction diameter of not less than 50 mm.

2.2.6 Drainage of other cofferdams and void spaces located within the cargo area *(1/1/2012)*

Other cofferdams and void spaces located within the cargo area and not intended to be filled with water ballast are to be fitted with suitable means of drainage.

2.3 Ballast system

2.3.1 General *(1/1/2012)*

a) Every crude oil tanker of 20 000 tonnes deadweight and above and every product carrier of 30 000 tonnes deadweight and above is to be provided with segregated ballast tanks.

b) Except where expressly permitted, ballast systems serving segregated ballast tanks are to be completely separated from the cargo oil and fuel oil systems.

c) In oil tankers of 150 gross tonnage and above, no ballast water is normally to be carried in any fuel oil tank; see Pt C, Ch 1, Sec 10, [7.1.3].

d) In:
   - crude oil tankers of 20 000 tonnes deadweight and above
   - product carriers of 30 000 tonnes deadweight and above,

   no ballast water is to be carried in cargo tanks, except in exceptional cases.

2.3.2 Ballast pumps *(1/1/2012)*

a) Ballast pumps are to be located in the cargo pump room, or a similar space within the cargo area not containing any source of ignition.

b) Where installed in the cargo pump room, ballast pumps are to comply with the applicable provisions of [3.2.3] and [3.2.4].

2.3.3 Pumping arrangements for ballast tanks within the cargo area *(1/1/2012)*

a) Ballast systems serving segregated ballast in the cargo area are to be entirely located within the cargo area and are not to be connected to other piping systems.

b) Segragated ballast tanks located within the cargo area are to be served by two different means. At least one of these means is to be a pump or an eductor used exclusively for dealing with ballast.

2.3.4 Pumping arrangement for cofferdams located at the fore and aft ends of the cargo spaces *(1/1/2012)*

Where they are intended to be filled with water ballast, the cofferdams located at the fore and aft ends of the cargo spaces may be emptied by a ballast pump located inside the machinery compartment or the forward space mentioned in [2.1.4], whichever is the case, provided that:

- the suction is directly connected to the pump and not to a piping system serving machinery spaces
- the delivery is directly connected to the ship side.

2.3.5 Emergency discharge of segregated ballast *(1/1/2012)*

Provisions may be made for emergency discharge of the segregated ballast by means of a connection to a cargo pump through a detachable spool piece provided that:

- non-return valves are fitted on the segregated ballast connections to prevent the passage of oil to the ballast tank, and
- shut-off valves are fitted to shut off the cargo and ballast lines before the spool piece is removed.

The detachable spool piece is to be placed in a conspicuous position in the pump room and a permanent warning notice restricting its use is to be displayed in a conspicuous position adjacent to it.

2.3.6 Carriage of ballast water in cargo tanks *(1/1/2012)*

a) Provisions are to be made for filling cargo tanks with sea water, where permitted. Such ballast water is to be processed and discharged using the equipment referred to in [5].

b) The sea water inlets and overboard discharges serving cargo tanks for the purpose of a) are not to have any connection with the ballast system of segregated ballast tanks.

c) Cargo pumps may be used for pumping ballast water to or from the cargo tanks, provided two shut-off valves are fitted to isolate the cargo piping system from the sea inlets and overboard discharges. See also [5.3.4].

d) Ballast pumps serving segregated ballast tanks may be used for filling the cargo tanks with sea water provided that the connection is made on the top of the tanks and consists of a detachable spool piece and a screw-down non-return valve to avoid siphon effects.

2.3.7 Ballast pipes passing through tanks *(1/1/2025)*

a) In oil tankers of 600 tonnes deadweight and above, ballast piping is not to pass through cargo tanks except in the case of short lengths of piping complying with [2.1.3], item b).

b) Sliding type couplings are not to be used for expansion purposes where ballast lines pass through cargo tanks. Expansion bends only are permitted (see Note 1).

Note 1: Expansion bends means expansion loops such as an omega bend (' Ω ') in piping system to counteract excessive stresses or displacement caused by thermal expansion or hull deformation which could be fabricated from straight lengths of pipe.

2.3.8 Fore peak ballast system on oil tankers *(1/1/2026)*

The fore peak tank can be ballasted with the system serving ballast tanks within the cargo area, provided the requirements in Sec 2, [7.2.1] are complied with~~:~~.

a) ~~the fore peak tank is considered a hazardous area (see Note 1)~~

b) ~~the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this respect, the distance is to be of at least 3 m, as requested for openings into cofferdams or other Zone 1 spaces (1.5 m hazardous area Zone 1 + 1.5 m hazardous area Zone 2) according to IEC 60092-502: Electrical installations in ships - Tankers - Special features;~~

c) ~~c)means are provided, on the open deck, to allow measurement of flammable gas concentrations within the fore peak tank by a suitable portable instrument;~~

d) ~~the sounding arrangements to the fore peak tank are direct from the open deck.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features.~~

2.3.9 Integrated cargo and ballast system *(1/1/2012)*

The requirements for integrated cargo and ballast systems are given in [3.5].

2.4 Air and sounding pipes of spaces other than cargo tanks

2.4.1 General *(1/1/2012)*

The air and sounding pipes fitted to the following spaces:

- cofferdams located at the fore and aft ends of the cargo spaces

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3.5.2 Design features *(1/1/2012)*

The following design features are, inter alia, to be fitted:

a) the emergency stop circuits of the cargo and ballast systems are to be independent from the circuits for the control systems. A single failure in the control system circuits or the emergency stop circuits is not to render the integrated cargo and ballast system inoperative;

b) manual emergency stops of the cargo pumps are to be arranged such that they do not cause the shutdown of the power pack making ballast pumps inoperable;

c) the control systems are to be provided with backup power supply, which may be satisfied by a duplicate power supply from the main switchboard. The failure of any power supply is to provide audible and visible alarm activation at each location where the control panel is fitted.

d) in the event of failure of the automatic or remote control systems, a secondary means of control is to be made available for the operation of the integrated cargo and ballast system. This is to be achieved by manual overriding and/or redundant arrangements within the control systems.

4 Cargo tanks and fittings

4.1 Application

4.1.1 *(1/1/2012)*

The provisions of Article [4] apply to cargo tanks and slop tanks.

4.2 Cargo tank venting

4.2.1 Principle *(1/1/2012)*

Cargo tanks are to be provided with venting systems *entirely distinct from the air pipes of the other compartments of the ship. The arrangements and position of openings in the cargo tank deck from which emission of flammable vapours can occur are to be such as to minimise the possibility of flammable vapours being admitted to enclosed spaces containing a source of ignition, or collecting in the vicinity of deck machinery and equipment which may constitute an ignition hazard.*

4.2.2 Design of venting arrangements *(1/1/2026)*

The venting arrangements are to be so designed and operated as to ensure that neither pressure nor vacuum in cargo tanks exceeds design parameters and be such as to provide for:

a) the flow of the small volumes of vapour, air or inert gas mixtures caused by thermal variations in a cargo tank in all cases through pressure/vacuum valves, and

b) the passage of large volumes of vapour, air or inert gas mixtures during cargo loading and ballasting, or during discharging,

c) a secondary means of allowing full flow relief of vapour, air or inert gas mixtures to prevent overpressure or underpressure in the event of failure of the arrangements in b). In addition, for tankers constructed on or after 1 January 2017, the secondary means are to be capable of preventing over-pressure or under-pressure in the event of damage to, or inadvertent closing of, the means of isolation required in [4.2.3] b). Alternatively, pressure sensors may be fitted in each tank protected by the arrangement required in b), with a monitoring system in the ship's cargo control room or the position from which cargo operations are normally carried out. Such monitoring equipment is also to provide an alarm facility which is activated by detection of overpressure or under-pressure conditions within a tank.

For ships that apply pressure sensors in each tank as an alternative to having the secondary means of venting as per c), ~~T~~the setting of the overpressure alarm is to be above the pressure setting of the P/V-valve and the setting of the under-pressure alarm ~~shall~~is to be below the vacuum setting of the P/V-valve. The alarm settings are to be within the design pressures of the cargo tanks. The settings are to be fixed and are not to be arranged for blocking or adjustment in operation~~.~~. An exception is permitted for ships that carry different types of cargo and use P/V valves with different settings, one setting for each type of cargo. The settings may be adjusted to account for the different types of cargo.

4.2.3 Combination of venting arrangements *(1/1/2026)*

a) The venting arrangements in each cargo tank may be independent or, where the cargo is homogenous or, for multiple cargoes, where the vapours are compatible and do not require isolation, they may be combined with other cargo tanks or be incorporated into the inert gas piping.

b) Where the arrangements are combined with other cargo tanks, either stop valves or other acceptable means are to be provided to isolate each cargo tank. Where stop valves are fitted, they are to be provided with locking arrangements which are to be under the control of the responsible ship's officer. There is to be a clear visual indication of the operational status of the valves or other acceptable means. Where tanks have been isolated, it is to be ensured that relevant isolating valves are opened before cargo loading or ballasting or discharging of those tanks is commenced. Any isolation must continue to permit the flow caused by thermal variations in a cargo tank in accordance with [4.2.2] a). For tankers constructed on or after 1 January 2017, any isolation is also to continue to permit the passage of large volumes of vapour, air or inert gas mixtures during cargo loading and ballasting, or during discharging in accordance with [4.2.2] b).

c) If cargo loading and ballasting or discharging of a cargo tank or cargo tank group is intended, which is isolated from a common venting system, that cargo tank or cargo tank group is to be fitted with a means for overpressure or underpressure protection as required in [4.2.2] c).

4.2.4 Arrangement of vent lines *(1/1/2012)*

The venting arrangements are to be connected to the top of each cargo tank and are to be self-draining to the cargo tanks under all normal conditions of trim and list of the ship. Where it may not be possible to provide self-draining lines, permanent arrangements are to be provided to drain the vent lines to a cargo tank.

Plugs or equivalent means are to be provided on the lines after the safety relief valves.

4.2.5 Openings for pressure release *(1/1/2012)*

Openings for pressure release required by [4.2.2] a) are to:

a) have as great a height as is practicable above the cargo tank deck to obtain maximum dispersal of flammable vapours but in no case less than 2 m above the cargo tank deck,

b) be arranged at the furthest distance practicable but not less than 5 m from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery and equipment which may constitute an ignition hazard. Anchor windlass and chain locker openings constitute an ignition hazard.

4.2.6 Pressure/vacuum valves *(1/1/2012)*

a) One or more pressure/vacuum-breaking devices are to be provided to prevent the cargo tanks from being subject to:

1) a positive pressure, in excess of the test pressure of the cargo tank, if the cargo were to be loaded at the maximum rated capacity and all other outlets were left shut; and

2) a negative pressure in excess of 700 mm water gauge if cargo were to be discharged at the maximum rated capacity of the cargo pumps and the inert gas blowers were to fail.

Such devices are to be installed on the inert gas main unless they are installed in the venting system required by this item [4.2] or on individual cargo tanks.

b) Pressure/vacuum valves are to be set at a positive pressure not exceeding 0,021 MPa and at a negative pressure not exceeding 0,007 MPa. Higher setting values not exceeding 0,07 MPa may be accepted in positive pressure if the scantlings of the tanks are appropriate.

c) Pressure/vacuum valves required by item a) of [4.2.2] may be provided with a bypass when they are located in a vent main or masthead riser. Where such an arrangement is provided, there are to be suitable indicators to show whether the bypass is open or closed.

d) Pressure/vacuum valves are to be of a type approved by the Society in accordance with App 1.

e) Pressure/vacuum valves are to be readily accessible.

f) Pressure/vacuum valves are to be provided with a manual opening device so that valves can be locked on open position. Locking means on closed position are not permitted.

4.2.7 Vent oulets *(1/1/2012)*

Vent outlets for cargo loading, discharging and ballasting required by [4.2.2] b) are to:

a) permit:

- *the free flow of vapour mixtures, or*
- *the throttling of the discharge of the vapour mixtures to achieve a velocity of not less than 30 m/s,*

b) be so arranged that the vapour mixture is discharged vertically upwards,

c) where the method is by free flow of vapour mixtures, be such that the outlet is not less than 6 m above the cargo tank deck or fore and aft gangway if situated within 4 m of the gangway and located not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from

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SECTION 5 MACHINERY AND CARGO SYSTEMS FOR OIL TANKER ESP FLASHPOINT > 60°, OIL TANKER ESP CSR FLASHPOINT > 60°, ASPHALT TANKER, ASPHALT TANKER ESP, FLS TANKER FLASHPOINT > 60°

1 General

1.1 Application

1.1.1 *(1/1/2012)*

The requirements of this Section apply to ships having the service notation:

- **oil tanker ESP, flashpoint > 60°C**
- **oil tanker ESP CSR, flashpoint > 60°C**
- **asphalt tanker**
- **asphalt tanker ESP**
- **FLS tanker, flashpoint > 60°C**

intended to carry products having flashpoint > 60°C.

The requirements in [2.1.3], [2.3.1], [2.3.3], [2.3.4], [2.3.5], [3.4.4], [5] and [6.3.2] derived from MARPOL Annex I regulations apply only to ships having the service notation **oil tanker ESP, flashpoint > 60°C** or **oil tanker ESP CSR, flashpoint > 60°C** (named oil tankers in this Section) or **asphalt tanker** or **asphalt tanker ESP** (named asphalt tanker in this Section).

The ships having the service notation **FLS tanker**, **flashpoint > 60°C** are named **FLS tankers** in this Section.

1.1.2 Additional requirements *(1/1/2012)*

Additional requirements are provided in:

- [8] for ships having the service notation **asphalt tanker** or **asphalt tanker ESP**
- [9] for ships intended to carry substances of pollution category Z.

1.2 Documents to be submitted

1.2.1 *(1/1/2012)*

The documents listed in Tab 1 are to be submitted for approval in four copies.

2 Piping systems other than cargo piping system

2.1 General

2.1.1 Materials *(1/1/2012)*

a) Materials are to comply with the provisions of Pt C, Ch 1, Sec 10.

b) Spheroidal graphite cast iron may be accepted for bilge and ballast piping.

2.1.2 Independence of piping systems *(1/1/2012)*

a) Fuel oil systems are to:
   - be independent from the cargo piping system
   - have no connections with pipelines serving cargo or slop tanks.

2.1.3 Passage through cargo tanks and slop tanks *(1/1/2025)*

a) Unless otherwise specified, bilge, ballast and fuel oil systems serving spaces located outside the cargo area are not to pass through cargo tanks or slop tanks. They may pass through ballast tanks or void spaces located within the cargo area.

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requirements of recognised standards. If found necessary, fracture mechanics analysis may be used for determining maximum allowable flaw size.

b) Other testing

1) Tests, including hydrostatic tests, of all pressure parts at 1,5 times the design pressure are to be carried out.

2) When installed on board the ship, the rudder actuator is to be subjected to a hydrostatic test and a running test.

8 Additional requirements for asphalt tankers

8.1 Application

8.1.1 *(1/1/2012)*

The provisions of this Article apply, in addition to those contained in Articles [1] to [7] above, to oil tankers having the additional service notation **asphalt carrier**.

8.2 Additional requirements

8.2.1 Heating systems *(1/1/2026)*

a) Cargo tanks intended for the carriage of asphalt solutions are to be equipped with a heating system capable of preserving the asphalt solutions in their liquid state. Valves are to be fitted on the heating system inlet and outlet.

b) Cargo piping and associated fittings outside tanks are to be provided with suitable heating devices. For heating of piping and fittings, refer to Sec 4, [2.6].

c) Steam heating systems of cargo tanks are to be fitted with more than one boiler, so that the steam supply to the cargo heating system can be maintained in case of failure of any single boiler.

8.2.2 Thermometers *(1/1/2012)*

Each tank is to be equipped with at least two thermometers in order to ascertain the temperature of the asphalt solution.

8.2.3 Insulation *(1/1/2012)*

Cargo piping and associated fittings outside tanks are to be suitably insulated, where necessary.

9 Specific requirements for FLS tanker

9.1 Application

9.1.1 *(1/1/2012)*

The provisions of this Article, derived from Annex II of the MARPOL 73/78 Convention, are related to the prevention of pollution by noxious liquid substances. They apply as follows:

a) Where the ship is granted only the service notation **FLS tanker**, these provisions replace those of [5] related to the prevention of pollution by cargo oil.

b) Where the ship is granted both service notations **oil tanker, flashpoint > 60°C** and **FLS tanker, flashpoint > 60°C**, these provisions are additional to those of [5].

9.2 Design requirements

9.2.1 General *(1/1/2012)*

The requirements of [9.2] apply to ships carrying category Z substances (see App 4, Tab 1).

9.2.2 Cargo piping and pumping system *(1/1/2012)*

The pumping and piping arrangement is to ensure that each tank does not retain a quantity of residue in excess of 75 litres in the tank and its associated piping. A performance test shall be carried out in accordance with Appendix 5 of Annex II of MARPOL 73/78 Convention as amended

9.2.3 Underwater discharge *(1/1/2012)*

An underwater discharge outlet (or outlets) shall be fitted.

The underwater discharge outlet (or outlets) shall be located within the cargo area in the vicinity of the turn of the bilge and shall be so arranged as to avoid the re-intake of residue/water mixtures by the ship's seawater intakes.

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Part E

Service Notations

Chapter 8

CHEMICAL TANKERS

SECTION 3 SHIP ARRANGEMENT

1 Cargo segregation

1.1 Segregation of cargoes mutually reacting

1.1.1 Common edges

IBC CODE REFERENCE : Ch 3, 3.1.2

The common edge in a cruciform joint, either vertically or horizontally, may be considered a “double barrier” for the purpose of segregation:

- between mutually reactive products (see Fig 1)
- between water reactive products and water (see Fig 1).

1.1.2 Chain lockers

IBC CODE REFERENCE : Ch 3, 3.1.2

The chain locker is to be arranged outside the cargo area.

1.2 Cargo piping arrangement

1.2.1 Bow or stern loading arrangement

IBC CODE REFERENCE : Ch 3, 3.1.3

The requirement in IBC Code 3.1.3 is considered to be satified if the requirements in IBC Code 3.7, relevant to bow or stern loading and unloading arrangements, are complied with.

2 Accommodation, service and machinery spaces and control stations

2.1 Air intakes and other openings to accommodation spaces

2.1.1

IBC CODE REFERENCE : Ch 3, 3.2.2

The requirements relevant to air intakes in IBC Code 3.2.2 are also intended to be applicable to air outlets. This interpretation also applies to the requirements in IBC Code 3.2.3, 3.7.4, 8.3, 15.12.1.3 and 19.3.8.

2.2 Windows, sidescuttles and doors

2.2.1 General requirements

IBC CODE REFERENCE : Ch 3, 3.2.3

a) Access facing the cargo area or other prohibited zones is to be restricted to stores for cargo-related and safety equipment, cargo control stations and emergency shower spaces.

b) Entrances and openings to service spaces located forward of the cargo area may not face such area. However, for small ships alternative arrangements may be specially considered by the Society.

c) The bolt spacing for bolted plates mentioned in the paragraph in the reference is to be such as to guarantee a suitable gas-tightness.

2.2.2 Ships fitted with deckhouses originating from main deck

IBC CODE REFERENCE : Ch 3, 3.2.3

On all chemical tankers, regardless of the type of products to be carried, where a deckhouse is substituted for a superstructure and liquid products could flow along the sides of the house, the house front is to be continued to the sides of the ship in the form of a sill, or a permanent spillage barrier is to be arranged as described in Regulation II-2/56.6 of SOLAS 74(83).

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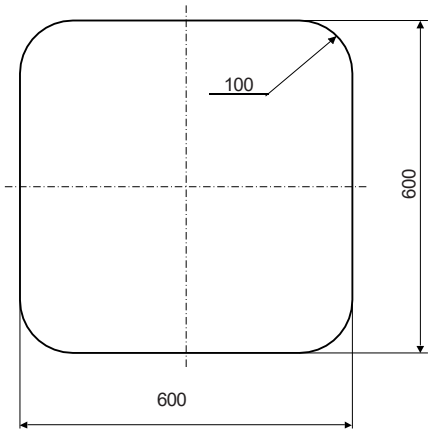
Figure 3 : Shape of minimum acceptable clear opening of 600 mm by 600 mm



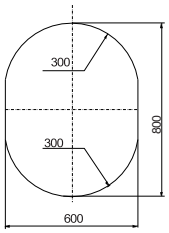
5.1.4 Access through vertical openings

IBC CODE REFERENCE : Ch 3, 3.4.3

For pressure cargo tanks only, access openings may be circular openings having a diameter not less than 600 mm.

The minimum size of vertical oval openings is defined in Fig 4.

Figure 4 : Minimum size of vertical oval openings



5.2 Access to the bow

5.2.1 *(1/7/2008)*

This item [5.2] applies to ships subject to the International Load Line Convention 1966, as amended.

5.2.2 *(1/7/2006)*

Chemical tankers are to be provided either with a gangway between the superstructure or deckhouse aft and the forecastle, or with equivalent arrangements in accordance with the International Load Line Convention 1966, as amended.

5.2.3 *(1/7/2006)*

Chemical tankers are to be provided with the means to enable the crew to gain safe access to the bow even in severe weather conditions. Such means are to be accepted by the Society.

Note 1: The Society considers means in compliance with the Guidelines adopted by the Maritime Safety Committee of IMO with Resolution MSC.62(67) on 5/12/1996 as being acceptable.

6 Bilge and ballast arrangements

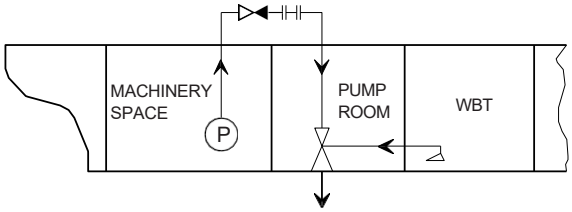
6.1 Ballast segregation

6.1.1 Eductors

IBC CODE REFERENCE : Ch 3, 3.5.1

An eductor situated in the cargo area using water power from pumps in the machinery spaces may be accepted as a means to discharge permanent ballast from tanks and/or double bottoms adjacent to cargo tanks, provided the supply line is above deck level and a non-return valve and removable spool piece are fitted in the supply line outside the machinery space (see Fig 5).

Figure 5 : Discharge arrangement



6.2 Ballast filling arrangement

6.2.1 Clarification

IBC CODE REFERENCE : Ch 3, 3.5.2

The filling of cargo tanks with ballast may be performed at deck level by means of pumps serving permanent ballast tanks, as specified in IBC Code 3.5.2, provided that a removable spool piece or flexible hose plus a shut-off valve are fitted on the inlet to the cargo tank. The shut-off valve is in addition to the required non-return valve. Consideration is to be given to the arrangement of the in-tank piping and the possible creation of static electricity (see Fig 5).

6.3 Bilge

6.3.1 Arrangement

IBC CODE REFERENCE : Ch 3, 3.5.3

The relaxation relevant to the bilge system for spaces which are separated from cargo tanks by a double bulkhead is to be understood as limited to spaces not enclosing piping which may contain cargo.

6.3.2 Use of cargo pumps as bilge pumps

IBC CODE REFERENCE : Ch 3, 3.5.3

a) Cargo pumps may also be used as bilge pumps provided they are connected to the bilge piping through a shut-off valve and a non-return valve arranged in series.

b) In the case of carriage of corrosive liquids, one of the cargo pumps, as specified in IBC Code 3.5.3, may be used for bilge service provided it is connected to the bilge piping through two shut-off valves plus a non-return valve arranged in series.

c) In cargo pump rooms of ships carrying toxic or corrosive products, suitable means for conveying spills from cargo pumps and valves to collecting trays are to be fitted. Trays may also consist of part of the pump room bottom, suitably bounded and protected against the corrosive action of products. Spills may be disposed of by means of suitable pumps or eductors. In the case of carriage of mutually incompatible products, the above-mentioned means for collecting and disposing of spills are to be different and separated from each other.

6.4 Fore peak ballast tanks and space arrangements

6.4.1 *(1/1/2026)*

The requirements in Ch 7, Sec 2, [7] apply, with the following deviations:

a) The definition of “Cargo area of tankers” in Ch 7, Sec 2, [7.1.1] is to be changed into:

Cargo area of tankers: defined in paragraph 1.3.6 of the IBC Code as amended by IMO resolutions up to MSC.460(101), considering also the relevant interpretations in IACS UI SC211.

b) the arrangements shown in Ch 7, Sec 2, Fig 7 and Fig 8 are not applicable as they apply to oil tankers only.

7 Bow or stern loading and unloading arrangements

7.1 Coamings

7.1.1

IBC CODE REFERENCE : Ch 3, 3.7.7

In general, the height of the coaming is to be not less than 150 mm. In any case, it is to be not less than 50 mm above the upper edge of the sheerstrake.

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Part E

Service Notations

Chapter 11

PASSENGER SHIPS

SECTION 5 ELECTRICAL INSTALLATIONS

1 General

1.1 Application

1.1.1 *(1/7/2007)*

As stated in Note 1 of Pt A, Ch 1, Sec 1, [1.1.2], the statutory requirements of the SOLAS Convention and/or national safety regulations, as applicable, regarding fire protection, detection and extinction (hereinafter referred to as "fire protection statutory requirements") are no longer mandatory for the purpose of classification, except where the Society carries out surveys relevant to fire protection statutory requirements on behalf of the flag Administration. In such cases, fire protection statutory requirements are considered a matter of class and therefore compliance with these requirements is also verified by the Society for classification purposes.

1.2 Documentation to be submitted

1.2.1 The documentation dealing with the electrical system for watertight door and fire door systems (see [1.1.1]) is to be submitted for approval.

1.3 Electrical distribution and protection

1.3.1 *In a passenger ship, distribution systems shall be so arranged that fire in any main vertical zone as defined in* Part C, Chapter 4 *will not interfere with services essential for safety in any other such zone.*

This requirement will be met if main and emergency feeders passing through any such zone are separated both vertically and horizontally as widely as is practicable.

1.3.2 For generators arranged to operate in parallel and for individually operating generators, arrangements are to be made to disconnect automatically the excess load when the generators are overloaded in such a way as to prevent a sustained loss of speed. The operation of such device is to activate a visual and audible alarm.

1.3.3 *(1/7/2010)*

In passenger ships, supplementary lighting shall be provided in all cabins to clearly indicate the exit so that occupants will be able to find their way to the door. Such lighting, which may be connected to an emergency source of power or have a self-contained source of electrical power in each cabin, shall automatically illuminate when power to the normal cabin lighting is lost and remain on for a minimum of 30 min.

1.3.4 *(1/7/2025)*

For passenger ships carrying 36 or more persons, a flooding detection system for watertight spaces below the bulkhead deck in compliance with the provisions in IMO MSC.1/Circ.1291 *is to be provided.*

2 Emergency source of electrical power and emergency installations

2.1 General

2.1.1 *A self-contained emergency source of electrical power shall be provided.*

2.1.2 *Provided that suitable measures are taken for safeguarding independent emergency operation under all circumstances, the emergency generator may be used, exceptionally, and for short periods, to supply non-emergency circuits.*

Exceptionally, whilst the vessel is at sea, is understood to mean conditions such as:

a) blackout situation

b) dead ship situation

c) routine use for testing

d) short-term parallel operation with the main source of electrical power for the purpose of load transfer.

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2.1.14 *The transitional source of emergency electrical power required by* [2.1.12] (c) *shall consist of an accumulator battery which shall operate without recharging while maintaining the voltage of the battery throughout the discharge period within 12% above or below its nominal voltage and be so arranged as to supply automatically in the event of failure of either the main or emergency source of electrical power at least the services in* [2.2.7] *if they depend upon an electrical source for their operation.*

2.2 Distribution of electrical power

2.2.1 *The emergency switch board shall be supplied during normal operation from the main switchboard by an interconnector feeder which shall be adequately protected at the main switchboard against overload and short-circuit and which is to be disconnected automatically at the emergency switchboard upon failure of the main source of electrical power.*

Where the system is arranged for feedback operation, the interconnector feeder is also to be protected at the emergency switchboard at least against short-circuit.

2.2.2 *In order to ensure ready availability of the emergency source of electrical power, arrangements shall be made where necessary to disconnect automatically non-emergency circuits from the emergency switchboard to ensure that power shall be available to the emergency circuits.*

2.2.3 *(1/1/2023)*

The emergency source of electrical power shall be capable of supplying simultaneously at least the following services for the periods specified hereafter, if they depend upon an electrical source for their operation:

a) for a period of 36 hours, emergency lighting:

1) at every muster and embarkation station and over the sides;

2) in alleyways, stairways and exits giving access to the muster and embarkation stations;

3) in all service and accommodation alleyways, stairways and exits, personnel lift cars;

4) in the machinery spaces and main generating stations including their control positions;

5) in all control stations, machinery control rooms, and at each main and emergency switchboard;

6) at all stowage positions for firemen's outfits;

7) at the steering gear; and

8) at the fire pump, the sprinkler pump and the emergency bilge pump referred to in (d) below and at the starting position of their motors;

9) in all cabins, unless this supplementary lighting has a self-contained source of electrical power in each cabin (see [1.3.3])

b) for a period of 36 hours:

1) the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea in force; and

2) on ships constructed on or after 1 February 1995 the VHF radio installation required by Regulation IV/7.1.1 and IV/7.1.2 of SOLAS Consolidated Edition 1992, and, if applicable:

- *the MF radio installation required by Regulations IV/9.1.1, IV/9.1.2, IV/10.1.2 and IV/10.1.3;*
- *the ship earth station required by Regulation IV/10.1.1; and*
- *the MF/HF radio installation required by Regulations IV/10.2.1, IV/10.2.2 and IV/11.1;*

c) for a period of 36 hours:

1) all internal communication equipment required in an emergency (see [2.2.4]*);*

2) the shipborne navigational equipment as required by Regulation V/12; where such provision is unreasonable or impracticable the Head Office may waive this requirement for ships of less than 5,000 tons gross tonnage;

3) the fire detection and fire alarm system, the fire door holding and release system (see [1.1.1]); and

4) intermittent operation of the daylight signalling lamp, the ship's whistle, the manually operated call points and all internal signals (see [2.2.5]) *that are required in an emergency;*

unless such services have an independent supply for the period of 36 hours from an accumulator battery suitably located for use in an emergency;

d) for a period of 36 hours:

1) one of the fire pumps required by the relevant provisions of Part C, Chapter 4 (see [1.1.1]*);*

2) the automatic sprinkler pump, if any [1.1.1]); and

3) the emergency bilge pump and all the equipment essential for the operation of electrically powered remote controlled bilge valves;

e) for the period of time required in Pt C, Ch 1, Sec 11, [2]*, the steering gear if required to be so supplied;*

f) for a period of half an hour:

1) any watertight doors required by Regulation II-1/15 to be power operated together with their indicators and warning signals;

2) the emergency arrangements to bring the lift cars to deck level for the escape of persons. The passenger lift cars may be brought to deck level sequentially in an emergency.

Note 1: For ships having navigation notation "sheltered area" or "special navigation" having an area of operation at not more than 6 miles from the shore (see Pt C, Ch 2, Sec 1, [1.1.3]) and not subject to the SOLAS convention, the Society may accept that the emergency source of electrical power is capable of supplying, for a period of not less than 2 times the expected duration of the longest voyage, but not less than:

- *3 hours, or*
- *30 minutes for ships having navigation notation "sheltered area",*

only the following services:

- *emergency lighting*
- *navigation lights;*
- *radio installation;*
- *internal communication equipment and general alarm system;*
- *fire detection and alarm system;*
- *the steering gear pump (where it is required to be so supplied);*
- *one of the fire pumps;*
- *power to the control, indication and alarm circuits of watertight and fire doors (where provided);*
- *the sprinkler pump;*
- *the emergency bilge pump.*

2.2.4 *(1/1/2026)*

Internal communication equipment required in an emergency generally includes:

a) the means of communication between the navigating bridge and the steering gear compartment

b) the means of communication between the navigating bridge and the position in the machinery space or control room from which the engines are normally controlled

c) the means of communication which is provided between the bridge and the radio telegraph or radio telephone stations, where separately arranged outside the bridge.

d) the general emergency alarm system (as required in [3.2])

e) the means of communication which is provided between the officer of the watch and the person responsible for closing any watertight door which is not capable of being closed from a central control station as defined in SOLAS II-2/3.9

f) the public address system ~~or other effective means of communication throughout the accommodation, public and service spaces~~ (~~see [1.1.1]~~as required in [3.3])

g) the means of communication between the navigating bridge and the main fire control station.

2.2.5 *(1/7/2007)*

Internal signals required in an emergency generally include:

a) general alarm (see [1.1.1])

b) watertight door indication

c) fire door indication (see [1.1.1]).

2.2.6 *(1/7/2003)*

In a ship engaged regularly in voyages of short duration, i.e. voyages where the route is not greater than 20 nautical miles offshore or where the vessel has a class notation "Coastal Service"*, the Society if satisfied that an adequate standard of safety would be attained may accept a lesser period than the 36-hour period specified in [2.2.3] (b) to (e) but not less than 12 hours.*

Note 1: In ships for which SOLAS is not applicable, a reduced period of time may be accepted, but not less than three hours.

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Part E

Service Notations

Chapter 14

TUGS

SECTION 1 GENERAL

1 General

1.1 Application

1.1.1 Ships complying with the requirements of this Chapter are eligible for the assignment of one of the following service notations:

- **tug**
- **salvage tug**
- **escort tug**

as defined in Pt A, Ch 1, Sec 2, [4.8.2].

1.1.2 Ships dealt with in this Chapter are to comply with the requirements stipulated in Parts A, B, C and D, as applicable, and with the requirements of this Chapter, which are specific to tugs.

1.2 Summary table

1.2.1 Tab 1 indicates, for ready reference, the Sections of this Chapter containing specific requirements applicable to tugs.

Table 1 *(1/1/2026)*

Main subject	Reference
Ship arrangement	(1)
Hull and stability	Sec 2
Machinery	~~(1)~~(2)
Electrical installations	~~(1)~~(2)
Automation	~~(1)~~(2)
Fire protection, detection and extinction	~~(1)~~(2)
Integrated tug/barge combination	Sec 3

(1) The only specific difference in the requirements is that Pt B, Ch 2, Sec 2, [2.1.4] is not applicable to tugs less than 500 GT (i.e. no cofferdam is required between spaces intended for the carriage of flammable liquids and accommodations and/or service spaces).

(2) No specific requirements for tugs are given in this Chapter.

SECTION 2 HULL AND STABILITY

1 General

1.1 Application

1.1.1 *(1/1/2026)*

The requirements of this Section apply to ships with one of the following service notations:

- **tug**, mainly intended for towing services, which are to comply with the requirements in [3]
- **salvage tug**, having specific equipment for salvage services, which are to comply with the requirements in [3] and [4]
- **escort tug**, mainly intended for escort services such as for steering, braking and otherwise controlling escorted ships, which are to comply with the requirements in [3] and [5].

Ships with the additional service feature **barge combined** (units designed to be connected with barges) are to comply with the applicable requirements in Sec 3.

Ships with the additional service feature **rescue** (units specially equipped for the rescue of shipwrecked persons and for their accommodation) are to comply with the requirements given in [3.11].

Ships with the additional service feature **standby vessel** (units specially intended to perform rescue and standby services) are to comply with the requirements given in [3.12].

Ships with the additional service feature **anchor handling** (units specially designed for anchor handling operations) are to comply with the requirements given in Ch 15, Sec 2, [2.10]~~,~~ and [8.3] ~~and [8.5]~~.

Ships with the additional service feature **anchor handling stab** (units specially designed and equipped for anchor handling operation and also fulfilling specific stability requirements related to this service) are to comply with the requirements given in Ch 15, Sec 2, [2.10], [3.4]~~,~~ and [8.3] ~~and [8.6]~~.

2 Definitions

2.1 Design bollard pull

2.1.1 *(1/1/2025)*

The design bollard pull T_{BP}, in kN, is the maximum sustained towline force the tug is capable of generating at zero forward speed, to be initially specified by the designer and to be verified by a full scale test, generally referred to as bollard pull test (see [3.10.1]).

2.1.2 *(1/1/2025)*

Where the value of the design bollard pull is not provided, the following default values may be used for preliminary design review:

- for tugs with propellers fitted with nozzles:

  $T_{BP} = 0{,}204 \cdot N \cdot P$
- for tugs with propellers not fitted with nozzles or with Voith-Schneider type cycloidal propulsion units:

  $T_{BP} = 0{,}176 \cdot N \cdot P$

where:

N : Number of propellers

P : Maximum continuous power per propeller shaft, in kW.

2.2 Calculation load

2.2.1 *(1/1/2025)*

The calculation load CL, in kN, is the force taken into consideration for the strength assessment and testing of the towing equipment and the associated supporting structures, and is to be taken as not less than:

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Figure 1 : Towline 'fleet angle' *(1/7/2021)*

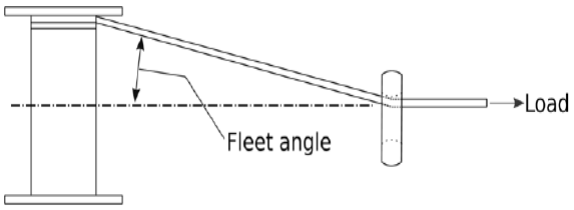
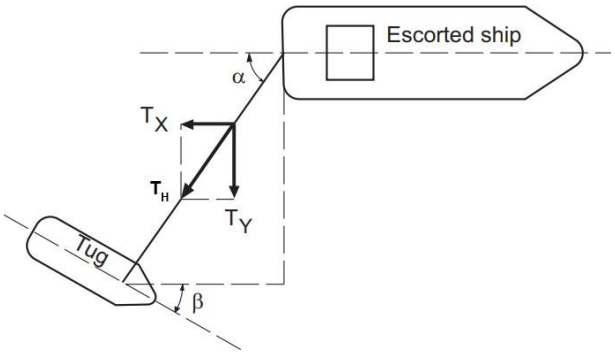


Figure 2 : Typical escort configuration *(1/1/2025)*



3 Tugs, salvage tugs and escort tugs

3.1 General

3.1.1 In general, tugs are completely decked ships provided with an ample drift surface and, where intended for service outside sheltered areas, with a forecastle or half forecastle, or at least with a large sheer forward.

Tugs of unusual design are to be considered by the Society on a case-by-case basis.

3.2 Stability

3.2.1 Openings *(1/1/2021)*

a) Openings which cannot be closed weathertight:

Openings in the hull, superstructures or deckhouses which cannot be closed weathertight are to be considered as unprotected openings and, consequently, as down-flooding points for the purpose of stability calculations (the lower edge of such openings is to be taken into account).

b) Ventilation openings of machinery space and emergency generator room:

It is recognised that for tugs, due to their size and arrangement, compliance with the requirements of ICLL Reg. 17(3) for ventilators necessary to continuously supply the machinery space and the emergency generator room may not be practicable. Lesser heights of the coamings of these particular openings may be accepted if the openings:

- are positioned as close to the centreline and as high above the deck as practicable in order to maximise the down-flooding angle and to minimise exposure to green water
- are provided with weathertight closing appliances in combination with suitable arrangements, such as separators fitted with drains
- are equipped with efficient protective louvers and mist eliminators
- have a coaming height of not less than 900 mm above the deck
- are considered as unprotected openings and, consequently, as down-flooding points for the purpose of stability calculations.

3.2.2 Stability booklet *(1/1/2021)*

The stability booklet for ships engaged in harbour, coastal or ocean going towing operations and/or escort operations is to contain additional information on:

- maximum bollard pull
- details on the towing arrangement, including location and type of the towing point(s) such as towing hook, staple, fairlead or any other point serving that purpose

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3.8 Towing equipment

3.8.1 General *(1/1/2026)*

In general, towing hooks and winches are to be arranged in way of the ship's centreline, in such a position as to minimise heeling moments in normal working conditions.

In general, towing winches are to be chosen in such a way that their brake holding capacity is to be equal to or greater than 1.25·CL, where CL is to be calculated in compliance with Tab 6 or Tab 7, as the case may be.

The provisions in [3.8] are applicable to towing hooks and towing winches made up of metal materials having a well defined yielding/proof(0.2%) stress and a well defined ultimate stress.

The towing hook and the towing winch materials are to comply with the applicable requirements of Part D.

The towing hook and the towing winch are to be tested after construction in compliance with the requirements given in [3.9].

Towing winches intended for anchor handling service are to comply also with the requirements of Ch 15, Sec 2, [8.3].

3.8.2 Documents to be submitted *(1/1/2025)*

The documents to be submitted for the review and the approval of the towing hook design are listed in Tab 4.

Table 4 : Documents to be submitted (Towing hook) *(1/1/2025)*

No.	A/I **(1)**	Document
1	I	General Assembly: main views of the hook with the captioning of the various components, with the extreme angles of working rotations and with the safe working load specification.
2	A	Structural Drawings: representation of each hook component showing the scantlings, the weld features, the bolt features and the construction material specification.
(1) A: to be submitted for approval I: to be submitted for information		

The documents to be submitted for the review and the approval of the towing winch design are listed in Tab 5.

Table 5 : Documents to be submitted (Towing winch) *(1/1/2025)*

No.	A/I **(1)**	Document
1	I	General Assembly: main views of the winch with the captioning of the various components.
2	I	Data Sheet: sheet with the specification of the following values: • active pull at each layer • winding speed at each layer • power and torque of the prime mover • reduction ratio • max brake torque • rope construction material • rope diameter • rope length.
3	A	Structural drawings: representations showing the scantlings, the weld features, the bolt features, and the construction material specification of the following components: • Frame • Drum • Shaft • Brake • Accessories (if any).
(1) A: to be submitted for approval I: to be submitted for information		

3.8.3 Towline breaking strength *(1/1/2026)*

The towline breaking strength, in kN, is to be not less than 2,2 times the value of the design bollard pull T_{BP}, as defined in [2.1.1].

3.8.~~3~~4 Towing Winch - configuration *(1/1/2025)*

The winch brake is normally to act directly on the drum and is to be operable in case of failure of the primary power supply system (either manually or otherwise arranged).

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3.12 Additional arrangements and equipment for tugs with additional service feature "standby vessel"

3.12.1 *(1/7/2016)*
Tugs with additional service feature "**standby vessel**" are to be provided with at least the arrangements and equipment indicated in [3.12.2].

3.12.2 *(1/7/2016)*
a) Rescue area
Ships with additional service feature **standby vessel** are to be provided, on each side, with a clearly marked rescue area having length not less than 8 m.
The rescue area is to comply with the following requirements:
- The ship's side in way of the rescue zone is to be free of any obstacle
- The ship's deck in way of the rescue area is to be so arranged as to protect personnel against injury
- The area is to be adequately fitted far from propellers and any ship side discharges up to 2 m below the waterline
- Each rescue area is to be provided with a scrambling net made of corrosion resistant and non-slip material

b) Rescue area lighting
Satisfactory lighting is to be provided along the rescue area.
A searchlight, able to provide an illumination level of 50 lux at a distance of 250 m, is to be available on each side and operated from the navigation bridge.

4 Additional requirements for salvage tugs

4.1 General

4.1.1 Application
The requirements of this Article apply to ships with the service notation **salvage tug** and specify the criteria these ships are to satisfy in addition to those in [3].

4.2 Equipment

4.2.1 Additional equipment
Ships with the service notation **salvage tug** are to be fitted with the additional equipment specified in Tab 12 in addition to that specified in Tab 3.

5 Additional requirements for escort tugs

5.1 General

5.1.1 Application
The requirements of this Article apply to ships with the service notation **escort tug** and specify the criteria these tugs are to satisfy in addition to those in [3].

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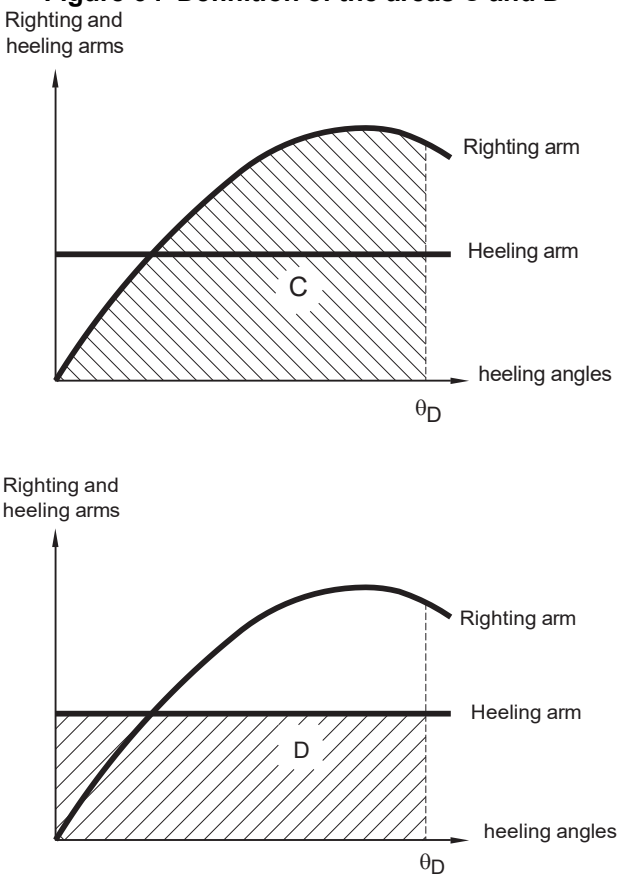
Figure 6 : Definition of the areas C and D



5.3 Structural design principles

5.3.1 Hull shape

The hull shape is to be such as to provide adequate hydrodynamic lift and drag forces and to avoid excessive trim angles for large heeling angles.

5.3.2 Bulwark

A bulwark is to be fitted all around the weather deck.

5.4 Towing Equipment

5.4.1 Towline breaking stength *(1/1/2026)*

The towline breaking strength, in KN, is to be not less than 2,2 times the value of ~~CL, to be calculated in compliance with Tab 7~~the design maximum steady towline force $T_{H,MAX}$, as defined in [2.3.4].

5.4.2 Towing winches *(1/1/2025)*

The escort winch is to be fitted with a system suitable to reduce the load in order to avoid overload due to dynamic oscillations of the towline. It is to be able to release the towline when the pull is greater than 50% of the towline breaking load.

Escort operations in conditions where dynamic oscillations of the towline are likely to occur may not be based on use of the brakes of the winch drum.

Escort operations performed by escort tugs in calm water conditions, such as in ports and sheltered (confined) waters, may be based on the use of the brakes of the winch drum.

The escort winch is to be fitted with equipment to continuously measure the tension in the towline. The measured data are to be displayed in the wheelhouse next to the control desk or another appropriate location.

As a minimum, the winch brake holding load is to be equal to or greater than 1,25·CL, where CL is to be calculated in compliance with Tab 7.

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Part E

Service Notations

Chapter 15

SUPPLY VESSELS

SECTION 2 HULL AND STABILITY

Symbols

k : Material factor for steel, defined in Pt B, Ch 4, Sec 1, [2.3],

s : Length, in m, of the shorter side of the plate panel.

α : Working fleet angle, in degrees, between the anchor handling wire rope in way of the last connection with the ship and a vertical axis, measured on the vertical plane π on which the anchor handling line lies (see Fig 1),

β : Working fleet angle, in degrees, measured horizontally between the vertical plane π on which the anchor handling line lies and the longitudinal vertical plane in way of the last connection with the ship (see Fig 1),

F_{AH} : Maximum allowed tension, in kN, in the steel wire rope used for anchor handling operation.

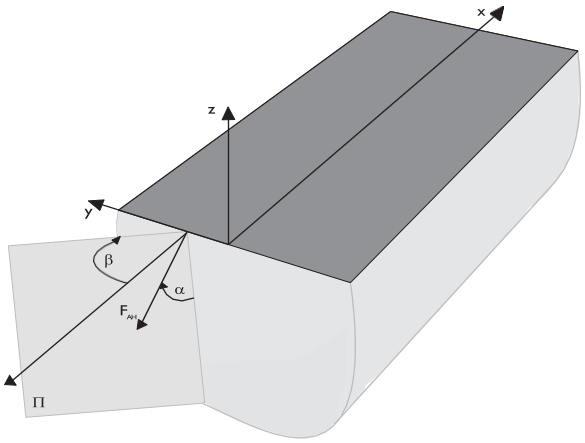
1 General

1.1 Definitions

1.1.1 Supply vessels

Supply vessels are, in general, single deck ships arranged with superstructures forward and a broad open deck aft intended for cargo.

Figure 1 *(1/7/2011)*



1.1.2 Additional service feature “oil product”

The additional service notation of supply vessels designed to carry oil products having any flashpoint in dedicated tanks is to be completed by the additional service feature **oil product**.

1.1.3 Additional service feature “chemical product”

The additional service notation of supply vessels designed to carry noxious products is to be completed by the additional service feature **chemical product**.

The products which may be carried are:

- hazardous and noxious liquids listed in Tab 1 and those other products which may be assigned to this list
- flammable liquid.

1.1.4 Additional service feature standby vessel *(1/7/2003)*

The additional service notation of supply vessels designed to provide rescue and standby services to offshore installations is to be completed by the additional service feature **standby vessel**.

1.1.5 Additional service feature "rescue" *(1/7/2004)*

The additional service notation of supply vessels is completed by the additional service feature **rescue** when they are specially equipped for the rescue of shipwrecked persons and for their accommodation.

1.1.6 Additional service feature "anchor handling" *(1/1/2026)*

The additional service notation of supply vessels is completed by the additional service feature **anchor handling** when they have visibility from the bridge and equipment specially designed for anchor handling operation which comply with the requirements in [8.3].

For the purposes of the anchor handling equipment verifications, the following definitions apply:

a) Anchor handling winch: any winch for the purpose of deploying, recovering and repositioning anchors and mooring lines in subsea operations.

b) Guide pin: deck supports, generally retractable, used to keep the anchoring line within a limited region of the working deck.

c) Stopper: device used for securing and holding a section of line, thereby relieving the load on the winch drum.

d) Roller: rollers, fairleads or other equipment used at the line exit from the vessel to support the line during lifting or lowering in order to avoid chafing and excessive bending and arranged to ease also the launch and recovery of rig anchors.

e) Haul in Load (HIL): force equal to the max active pulling capacity of the drum on the rope at the first layer.

f) Brake Load (BL): force equal to the max retaining capacity of the brake before slippage with the rope at the first layer.

g) Rendering Load (RL): force equal to the rope tension when drum starts to rotate in the opposite direction of the applied driving torque.

h) Safe working load (SWL): max static force which a shipboard fitting has been designed for. The SWL shall be declared the fitting manufacturer, and it is to be clearly marked on the fitting itself.

1.1.7 Additional service feature "anchor handling stab" *(1/1/2026)*

The additional service notation of supply vessels is completed by the additional service feature **anchor handling stab** when they ~~are specially equipped and designed for anchor handling operation~~ comply with the requirements for the assignment of the additional service feature anchor handling and, in addition, ~~also~~ fulfil specific stability requirements related to this service.

1.1.8 Additional service feature "heavycargo (X kN/m^2)" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **heavycargo (X kN/m^2)** when the weather deck intended to support heavy cargoes fulfills the appropriate structural rule requirements. The value X indicates the maximum allowable local pressure in kN/m^2, which is to be greater than 10 kN/m^2. The requirements for the assignment of this additional service feature are given in Pt B, Ch 5, Sec 6, [4.1.1] and Part B, Chapter 7 or Part B, Chapter 8, as applicable.

1.1.9 Additional service feature "heavyliquid (X t/m^3)" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **heavyliquid (X t/m^3)** when the ship is designed with specified cargo tanks strengthened to carry heavy liquids (i.e liquids having density greater than the one of the sea water) that fulfill the appropriate structural rule requirements. The value X indicates the maximum density in t/m^3 of the liquids that can be carried in the specified tanks 98% full. The requirements for the assignment of this additional service feature are given in Part B, Chapter 5 and Part B, Chapter 7 or Part B, Chapter 8, as applicable.

1.1.10 Additional service feature "Crew Transfer Vessel - CTV" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **Crew Transfer Vessel - CTV** when they are specially intended to transport technician and other personnel out to sites.

1.1.11 Additional service feature "Dive Support Vessel - DSV" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **Dive Support Vessel - DSV** when they are specially intended to support the offshore diving operation.

1.1.12 Additional service feature "Patrol and Guard Vessel" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **Patrol and Guard Vessel** when they are specially intended to patrol a coastal area or site for security, observation and defense.

1.1.13 Additional service feature "Seismic and Geotechnical Survey Vessel - SGSV" *(1/7/2022)*

The additional service notation of supply vessels is completed by the additional service feature **Seismic and Geotechnical Survey Vessel - SGSV** when they are specially intended for the purpose of research, seismic survey and mapping at seas.

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7.3.5 Freeing ports through box-bulwarks

Where box-bulwarks the upper level of which extends to the forecastle deck are fitted in way of the loading area, the freeing ports are to pass through these box-bulwarks, and their area is to be increased to take account of the height of the bulwarks.

7.3.6 Miscellaneous

Air pipes, ventilators, small hatchways, fans and control valves are to be located outside the loading area and protected from possible shifting of the deck cargo.

8 Hull outfitting

8.1 Rudders

8.1.1 Rudder stock scantlings

The rudder stock diameter is to be increased by 5% with respect to that determined according to Pt B, Ch 10, Sec 1, [4].

8.2 Bulwarks

8.2.1 Plating

In the case of a high bulwark, fitted with a face plate of large cross-sectional area, which contributes to the longitudinal strength, the net thickness of the plating contributing to the longitudinal strength is to be not less than the value obtained according to Pt B, Ch 7, Sec 1 or Pt B, Ch 8, Sec 3, as applicable.

8.2.2 Stays

The bulwark stays are to be strongly built with an attachment to the deck reinforced to take account of accidental shifting of deck cargo (e.g. pipes).

8.2.3 Bulwark arrangement for ships with additional service feature standby vessel *(1/7/2003)*

For ships with additional service feature **standby vessel**, bulwarks or railings in way of the rescue zone are to be easy to open or remove, so as to enable direct access to deck.

8.3 ~~Strength of rollers and their supporting structures~~ Requirements for anchor handling equipment for ships with additional service feature "anchor handling" and "anchor handling stab"

8.3.1 General~~Strength of rollers used for anchor handling operations and of their hull supporting structures~~ *(1/1/2026)*

~~Stern rollers and all the rollers used for anchor handling operations, as well as their hull supporting structures, are to be designed to have a factor of safety of 3 with respect to the minimum yield strength of the material under a working load that is to be assumed not less than the greater of the maximum pull of the winch and the maximum brake holding capacity of the winch.~~

The provisions in [8.3] are applicable to anchor handling equipment made up of steel. The steel of the anchor handling equipment is to comply with the applicable requirements of Part D.

8.3.2 Documents to be submitted *(1/1/2026)*

The documents to be submitted for the review and the approval of the guide pins and of the stoppers design are listed in Tab 8:

Table 8 : Documents to be submitted (guide pins and stoppers) *(1/1/2026)*

No.	A/I (1)	Document
1	I	General Assembly: main views of the device with the captions of the various components, with the extreme angles of working rotations and with the safe working load specification.
2	A	Structural Drawings: representation of each device component showing the scantlings, the weld features, the bolt features and the construction material specification.

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

The documents to be submitted for the review and the approval of the anchor handling winches design are listed in Tab 9.

Table 9 : Documents to be submitted (Anchor handling winch) *(1/1/2026)*

No.	A/I (1)	Document
1	I	General Assembly: main views of the winch with the captioning of the various components.
2	I	Data Sheet: sheet with the specification of the following values: • active pull at each layer; • winding speed at each layer; • power and torque of the prime mover; • reduction ratio; • max brake torque; • rope construction material; • rope diameter; • rope length.
3	A	Structural drawings: representations showing the scantlings, the weld features, the bolt features, and the construction material specification of the following components: • Frame; • Drum; • Shaft; • Brake; • Accessories (if any).

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

8.3.3 Anchor handling winch - Configuration *(1/1/2026)*

The anchor handling winch brake is normally to act directly on the drum and is to be operable in case of failure of the primary power supply system (either manually or otherwise arranged).

Anchor handling winches are to be provided with an emergency release system as described in [8.3.5].

The dimensioning of the winch drum is to take into account the rope bending specifications provided by the rope manufacturer.

The in-board end of the rope is to be attached to the winch drum with a weak link or similar arrangement that is designed to release the towline at low load. In no case less than three turns are to remain on the drum in under normal operation.

Any dual service winch to be used both for towing operation and for anchor handling operation is to be compliant with the requirements of [8.3] and with those of Ch 14, Sec 2, [3.8].

8.3.4 Anchor handling winch - Strength *(1/1/2026)*

The strength of the anchor handling winch is to be checked with respect to the following loads:

a) Haul in Load (HIL): force equal to the max active pulling capacity of the drum on the rope at the first layer.

b) Brake Load (BL): force equal to the max retaining capacity of the brake before slippage with the rope at the first layer.

c) Rendering Load (RL): force equal to the rope tension when drum starts to rotate in the opposite direction of the applied driving torque.

The stresses acting on each component of the winch calculated with the above loads are not to exceed the allowable stresses reported on Tab 10; it is to be noted that the stresses can be obtained by an engineering analysis or by a FEM calculation but they have always to be combined in Von Mises stresses before comparison with the allowable stresses.

Table 10 : Allowable stresses *(1/1/2026)*

Load	Allowable Stress
HIL	ReH / 2,5
BL	ReH / 1,25
RL	ReH / 1,20

Note 1: ReH (yield stress) is not to be taken more than 80% of Rm (ultimate tensile stress).

When the stresses acting in the winch components are calculated by means of FEM calculations taking accurately into account the stress concentrations, the allowable stresses envisaged in Tab 8 may be multiplied by 1,1.

Specific buckling and/or fatigue analysis aimed to show the compliance of the winch components with the requirements of any recognized national or international standard may be requested by the Society on a case-by-case basis.

In all cases, the thickness of the drum is to be checked in compliance with the provisions of Ch 14, Sec 2, [3.8.5].

8.3.5 Anchor handling winch - Brake *(1/1/2026)*

The retaining capacity of the brake is not to be less than 1,25 times the max dynamic force on the winch line during the anchoring handling operation. In no case, however, the retaining capacity of the brake is not to be less than 2,0 times the haul in load of the winch.

8.3.6 Anchor handling winch - Emergency release system *(1/1/2026)*

The anchor handling winch is to be provided with a system for releasing the rope in a quick, safe and controlled manner under all critical circumstances like overloading, loss of power or loss of the ordinary controls.

The controls of the emergency release system shall be fitted mainly in the winch control station. However, a second control shall be fitted also in another location having ease of access and good visibility on the operational field.

The controls of the emergency release system shall be easily detectable by any operator and be protected against unintentional activation. Instructions for the proper usage of the emergency release system controls shall be clearly displayed close to the controls themself.

8.3.7 Guide pins - Strength *(1/1/2026)*

The strength of the pins is to be checked with respect to the greatest of the following loads:

a) 2·Safe Working Load (SWL): 2 times the max design rope tension applied to the pin structures in static conditions.

b) Brake Load (BL): force equal to the max retaining capacity of the ah winch brake before slippage with the wire rope at the first layer.

c) 2·Haul In Load (HIL): 2 times the max active pulling capacity of the ah winch drum on the rope at the first layer.

The stresses acting on each component of the pins calculated with the above loads are not to exceed the allowable stress reported on Tab 11; it is to be noted that the stresses can be obtained by an engineering analysis or by a FEM calculation, but they have always to be combined in Von Mises stresses before comparison with the allowable stresses.

Table 11 : Allowable stresses *(1/1/2026)*

Load	Allowable Stress
max (2·SWL;BL;2·HIL)	Reh / 1,2

When the stresses acting in the pin components are calculated by means of FEM calculations taking accurately into account the stress concentrations, the allowable stresses envisaged in Tab 8 may be multiplied by 1,1.

Specific buckling and/or fatigue analysis by the Society on a case-by-case basis.

8.3.8 Stoppers - Strength *(1/1/2026)*

The strength of the wire stoppers is to be checked with respect to 2 times the max design rope tension applied to the stopper structures in static conditions (2·Safe Working Load (SWL)).

The stresses acting on each component of the stoppers calculated with the above load are not to exceed the allowable stress reported on Tab 12; it is to be noted that the stresses can be obtained by an engineering analysis or by a FEM calculation, but they have always to be combined in Von Mises stresses before comparison with the allowable stresses.

Table 12 : Allowable stresses *(1/1/2026)*

Load	Allowable Stress
2·SWL	Reh / 1,2

When the stresses acting in the stopper components are calculated by means of FEM calculations taking accurately into account the stress concentrations, the allowable stresses envisaged in Tab 8 may be multiplied by 1,1.

Specific buckling and/or fatigue analysis may be requested by the Society on a case-by-case basis.

8.3.9 Stoppers - Emergency release system *(1/1/2026)*

The stoppers is to be provided with a system for releasing the rope in a quick, safe and controlled manner under all critical circumstances like overloading, loss of power or loss of ordinary controls.

The controls of the emergency release system are to be fitted mainly in the winch control station. However, a second control is to be fitted also in another location having ease of access and good visibility on the operational field.

The controls of the emergency release system are to be easily detectable by any operator and be protected against unintentional activation. Instructions for the proper usage of the emergency release system controls are to be clearly displayed close to the controls themself.

8.3.10 Roller - Strength *(1/1/2026)*

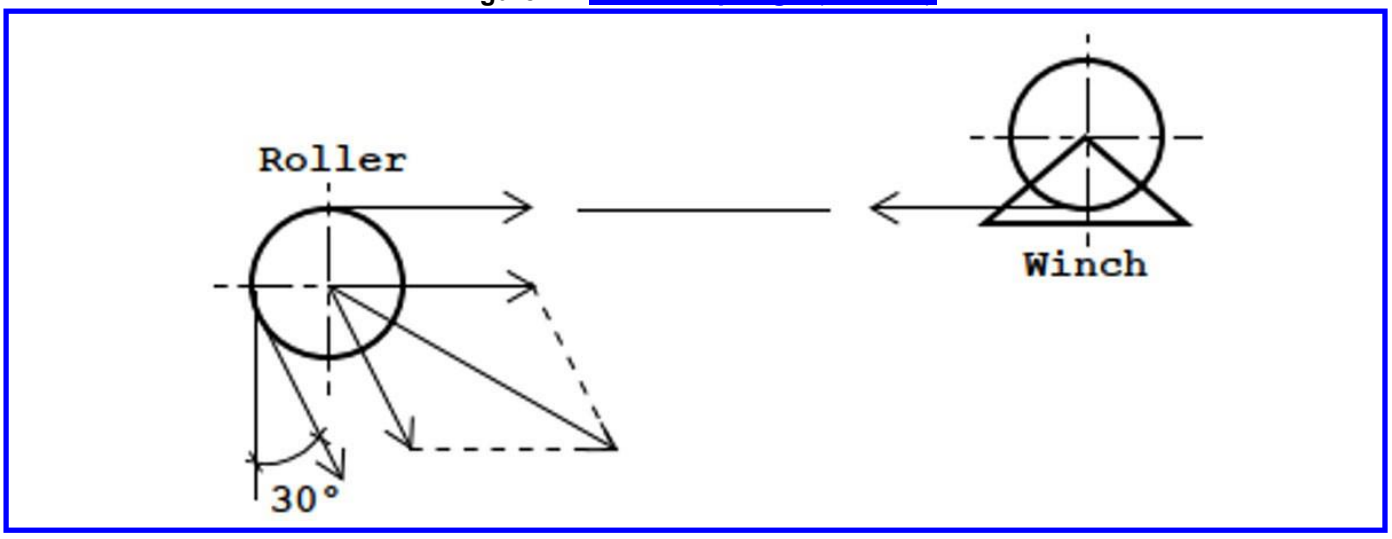
The strength of the roller is to be checked with respect to the greatest of the following loads:

a) Brake Load (BL): force equal to the max retaining capacity of the ah winch brake before slippage with the wire rope at the first layer.

b) 2·Haul In Load (HIL): 2 times the max active pulling capacity of the ah winch drum on the rope at the first layer.

The combined force on the roller is to be obtained considering that the max angle between a vertical line and the inclined line of the anchor cable below the hull is equal to 30° towards the winch (see Fig 7).

Figure 7 : Roller wrap angle *(1/1/2026)*



The stresses acting on each component of the pins calculated with the above loads are not to exceed the allowable stress reported on Tab 13; it is to be noted that the stresses can be obtained by an engineering analysis or by a FEM calculation, but they have always to be combined in Von Mises stresses before comparison with the allowable stresses.

Table 13 : Allowable stresses *(1/1/2026)*

Load	Allowable Stress
max (BL;2·HIL)	ReH / 1,2

When the stresses acting in the pin components are calculated by means of FEM calculations taking accurately into account the stress concentrations, the allowable stresses envisaged in Tab 8 may be multiplied by 1,1.

Specific buckling and/or fatigue analysis by the Society on a case-by-case basis.

8.3.11 Supporting hull structures *(1/1/2026)*

The scantlings of supporting hull structures are to be in compliance with Pt B, Ch 7 or Pt B, Ch 8 of the Rules, with respect to the following loads:

a) max (2·HIL;BL;RL) for the structures supporting the anchor handling winch;

b) max (2·SWL;BL;2·HIL) for the structures supporting the guide pins;

c) max (2·SWL) for the structures supporting the wire stoppers;

d) max (BL;2·HIL) for the structures supporting the roller.

8.3.12 Winch monitoring systems *(1/1/2026)*

The ship with additional service feature **anchor handling stab** is to be fitted with a monitoring system on the bridge deck showing the following information:

a) winch operation data (tension of steel wire rope, wirerope length, wire speed);

b) winch control system status.

8.3.13 Anchor handling winch - Line *(1/1/2026)*

The breaking load of the anchor handling line is not to be less than the max between BL and 2-HIL for both steel and synthetic ropes.

8.3.14 Anchor handling loose gear *(1/1/2026)*

The anchor handling loose gear is to be designed and tested according to the provisions for the offshore loose gear in Chapter 12 of TASNEEF Rules for loading and unloading arrangements and for other lifting appliances on board ships. The PSI factor to be considered in the design verifications and in the testing is to be equal to 1,8.

8.3.15 Anchor handling winch - Testing *(1/1/2026)*

The anchor handling winch is to be load tested with respect to the 95% of the BL and with respect to the HIL after installation on board. The rope of the winch is to be fixed to an onshore strong point or to an anchor on the seabed. Functional tests are to be carried out after installation on board aimed at verifying the following aspects:

a) proper working within the specified limitations;

b) proper working under the normal operation modes;

c) proper working under the emergency operation modes, including the emergency release and the dead ship operations.

8.4 Equipment

8.4.1 Chain cables for anchors *(15/3/2009)*

With the exception of ships with the additional class notation **DYNAPOS**, the required total length and the diameter of chain cables for bow anchors are to be those obtained from Pt B, Ch 10, Sec 4, Tab 1, for the EN range in the table, two rows below the one calculated according to Pt B, Ch 10, Sec 4, [2.1.2] or Pt B, Ch 10, Sec 4, [2.1.3], as applicable, for the ship under consideration.

8.4.2 Mooring lines

The length of mooring lines is to be calculated according to Pt B, Ch 10, Sec 4, [3.5].

However, in the case of ships provided with devices enabling ample manoeuvring characteristics (e.g. ships provided with two or more propellers, athwartship thrust propellers, etc.), the length of mooring lines, in m, may be reduced to (L+20).

8.4.3 Chain locker

Chain lockers are to be arranged as gas-safe spaces. Hull penetrations for chain cables and mooring lines are to be arranged outside the gas-dangerous spaces specified in [1.1.16].

8.4.4 Towline breaking load for ships with additional service feature standby vessel *(1/7/2003)*

For ships with additional service feature **standby vessel**, the towline breaking load is to be not less than 0,04 P, in t, where P is the total power of the propulsion engines, in kW.

8.5 ~~Arrangement of winches used for anchor handling operations for ships with additional service feature "anchor handling"~~

8.5.1 ~~Winch design and testing~~ *~~(1/7/2011)~~*

~~The winch materials are to be in compliance with the applicable requirements of Part D.~~

~~The maximum handling capacity of the anchor handling winch is to be specified in the structural arrangement of the winch.~~

~~The winches are to be subjected to a static test corresponding to their maximum handling capacity and to a static test considering the maximum brake winch holding capacity (with the brake in force).~~

8.5.2 ~~Winch slip device~~ *~~(1/7/2011)~~*

~~Anchor handling winches are to be equipped with a suitable slip device, operable by local and remote control (if possible located on the bridge), allowing the rope to unwind when necessary.~~

8.5.3 ~~Winch quick-release device~~ *~~(1/7/2011)~~*

~~The unhooking of the rope from the winch drum is to be possible by means of a suitable device or by using a rope whose terminal is not fixed to the drum.~~

8.5.4 ~~Connection with hull structures~~ ~~*(1/7/2011)*~~

~~The scantlings of the hull structures intended to connect the anchor handling winch to the hull are to be in accordance with Part B, Chapter 7 or Part B, Chapter 8, as applicable, where the load to be considered is the greater of the maximum pull of the winch and the maximum brake holding capacity of the winch.~~

8.6 ~~Arrangement of winches used for anchor handling operations for ships with additional service feature "anchor handling stab"~~

8.6.1 ~~Winch design~~ ~~*(1/7/2011)*~~

~~The anchor handling winches are to be in accordance with the requirements from [8.5.1] to [8.5.4] and, in addition, they are to be fitted with a system suitable to adjust and keep constant the pull (the maximum pull for a precise loading condition is to be fixed by the Master according to the information provided in the operational loading manual).~~

~~This system is to be able to release the steel wire rope when the pull is greater than the adjusted one.~~

8.6.2 ~~Winch monitoring systems~~ ~~*(1/7/2011)*~~

~~The ship is to be fitted with a monitoring system on the bridge deck showing the following information:~~

- ~~winch operation data (tension of steel wire rope, wire rope length, wire speed)~~
- ~~winch control system status.~~

Part E

Service Notations

Chapter 19

NON-PROPELLED UNITS

SECTION 2 HULL AND STABILITY

Symbols

L_G : Ship's length, in m, measured at the maximum load waterline

s : Spacing, in m, of ordinary stiffeners.

1 General

1.1 Application

1.1.1 General *(1/6/2021)*

Unless otherwise specified, the requirements of this Section apply to ships with one of the service notations **barge**, **pontoon** and **pontoon - crane**.

Specific requirements which apply only to ships with the service notation **barge** or ships with the service notation **pontoon** or **pontoon - crane** are indicated.

Barges with the additional service feature **tug combined** are also to comply with the applicable additional requirements in Ch 14, Sec 3.

Intact stability additional requirements for units with service notations **barge-oil**, **barge-accommodation, barge-liquified gas**, **barge-LNG bulker** and **barge-chemical**, are indicated in [2.3] to [2.6] respectively.

1.1.2 Main characteristics of non-propelled units

The requirements of this Section are based on the following assumptions, relevant to the main characteristics of non-propelled units:

- the structural configuration and proportions of non-propelled units are similar to those of propelled ships
- the cargo is homogeneously distributed.

The scantlings of non-propelled units with unusual shapes and dimensional proportions or carrying cargoes which are not homogeneously distributed, such as containers or heavy loads concentrated in limited areas, are to be considered by the Society on a case-by-case basis, taking into account the results of direct calculations, to be carried out according to Pt B, Ch 7, App 1.

2 Stability

2.1 Intact stability for ships with service notation "barge", "pontoon" or "pontoon-crane"

2.1.1 Application *(1/7/2012)*

The requirements of this item [2.1] apply to seagoing ships with one of the service notations **barge**, **pontoon** and **pontoon-crane** with the following characteristics:

a) unmanned

b) having a block coefficient not less than 0,9

c) having a breadth/depth ratio greater than 3,0

d) having no hatchways in the deck except small manholes closed with gasketed covers.

The requirements of item [2.1] also apply to barges that do not comply with d).

The intact stability of ships not having any one of the above characteristics is to comply with Pt B, Ch 3, Sec 2, unless otherwise decided by the Society, on a case by case basis, taking into account the ship's characteristics. In this case, an appropriate entry is made in the classification files of the ship.

Items [2.1.2] and [2.1.3] do not apply to barges.

2.1.2 Trim and stability booklet

In addition to the information to be included in the trim and stability booklet specified in *Pt B, Ch 3, App 2, [1.1],* simplified stability guidance, such as a loading diagram, is to be submitted to the Society for approval, so that pontoons may be loaded in compliance with the stability criteria.

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Table 5 : Reinforcements of plating and ordinary stiffeners of the flat bottom forward area

Element	Formula	Minimum value
Plating	Net thickness, in mm: $t = 13{,}9 c_a c_r s \gamma_{W2} \sqrt{\frac{p_{BI}}{\gamma_R \gamma_m R_y}}$	Net minimum thickness, to be taken, in mm, not less than: $t = 0{,}03L + 5{,}5 - c_E$ nor than the lesser of: $t = 16$ $t = 6{,}3\,(s - 0{,}228\,L^{1/4}) + 0{,}063\,L + 3{,}5$ where s is to be taken not less than $0{,}182\,L^{1/4}$
Ordinary stiffeners	Net section modulus, in cm^3, to be taken as the lesser of: $w = \gamma \gamma_R \beta_m \frac{\gamma_{W2} p_{BI}}{16 c_P R_y} \left(1 - \frac{s}{2\ell}\right) s \ell^2 10^3$ $w = \gamma \gamma_R \beta_m \frac{\gamma_{S2}}{6} \frac{T}{R_y} s \ell^2 10^4$	Web net minimum thickness, in mm, to be not less than the lesser of: • $t = 1{,}5 L_2^{1/3}$ • the thickness of the attached plating.
	Net shear sectional area, in cm^2: $A_{Sh} = 10 \gamma \gamma_R \beta_m \gamma_s \frac{\gamma_{W2} p_{BI}}{R_y} \left(1 - \frac{s}{2\ell}\right) s \ell$	

Note 1:

c_E : coefficient, to be taken equal to:

$c_E = 1$ for $L \leq 65$ m

$c_E = 3 - L / 32{,}5$ for $65 \text{ m} < L < 90$ m

$c_E = 0$ for $L \geq 90$ m

c_P : Ratio of the plastic section modulus to the elastic section modulus of the ordinary stiffeners with an attached shell plating, to be taken equal to 1,16 in the absence of more precise evaluation

γ_R, γ_m, γ_{S2}, γ_{W2}:Partial safety factors, defined in Tab 4

p_{BI} : Bottom dynamic impact pressure, defined in Pt B, Ch 9, Sec 1, [3.2].

8 Additional arrangement requirements for ships with service notation "Barge-oil"

8.1 Application

8.1.1 *(1/5/2013)*

The requirements of this item apply to ships with the service notation “**barge-oil**”.

8.2 Cargo segregation

8.2.1 *(1/5/2013)*

Unless expressly provided otherwise, in ships enabled to carry cargoes having a flashpoint below 60°C, tanks containing cargo or cargo residues are to be placed forward of and segregated from accommodation, service and machinery spaces, drinking water and stores for human consumption by means of a cofferdam, a cargo pump room, a fuel oil tank, a ballast tank or any other similar compartment and arranged in such a way that a single failure of a deck or bulkhead will not permit the entry of gas or vapour from the cargo tank into control stations, accommodation and service spaces (see Fig 3 and Fig 4).

8.3 Size and arrangement of cargo tanks and slop tanks

8.3.1 Cargo tanks *(1/5/2013)*

Barge-oil of 600 t deadweight and above are not allowed to carry oil in any compartment extending forward of a collision bulkhead located in accordance with Pt B, Ch 2, Sec 1, [2].

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8.3.3 Slop tanks *(1/5/2013)*

The arrangements of the slop tank or combination of slop tanks are to have a capacity necessary to retain the slop generated by tank washings, oil residues and dirty ballast residues. The total capacity of the slop tank or tanks is to be not less than 3 per cent of the oil carrying capacity of the ships, except that the Society may accept:

- 2% for such barge -oil where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for ejectors, without the introduction of additional water into the system
- 2% where segregated ballast tanks are provided in accordance with [5]. This capacity may be further reduced to 1,5% for such barge -oil where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for ejectors, without the introduction of additional water into the system.
- The society may accept slop tanks of any size, including absence of dedicated slop tanks, for units which:
  - are dedicated to the same type of cargo for many consecutive voyages, and
  - are arranged with segregated ballast tanks, and
  - do not carry out tank washing on a regular basis, and
  - retain on board (in cargo tanks) the total quantity of washing media, and discharge it ashore.

8.4 Access arrangement

8.4.1 *(1/5/2013)*

As far as practicable, permanent or movable means of access stored on board are to be provided to ensure proper survey and maintenance of cargo tanks and ballast compartments.

8.4.2 *(1/5/2013)*

Means of access to side and centre tanks may not be provided in the same transverse section.

8.4.3 *(1/5/2013)*

The pipe tunnel in the double bottom is to comply with the following requirements:

- it may not communicate with the engine room
- provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

8.4.4 Access to compartments in the cargo area *(1/5/2013)*

Access to cofferdams, ballast tanks, cargo tanks and other compartments in the cargo area is to be direct from the open deck and such as to ensure their complete inspection. Access to double bottom compartments may be through a cargo pump room, pump room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

8.4.5 Access to the fore peak tank *(1/1/2026)*

The requirements for access to the fore peak tank in Ch 7, Sec 2, [7.2] and [7.3] apply ~~is to be direct from the open deck.~~

~~Alternatively, i~~Indirect access from the open deck to the fore peak tank through an enclosed space may be accepted ~~provided that~~ if the unit is only enabled to carry products having a flashpoint exceeding 60°C~~:~~.

a) ~~The unit is only enabled to carry products having a flashpoint exceeding 60°C, or~~

b) ~~The unit is enabled to carry products having any flashpoint and:~~

   1) ~~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 electrically certified safe in the enclosed space is isolated or~~

   2) ~~the enclosed space has a common boundary with the cargo tanks, is classified as hazardous area (see Note 1), the equipment inside is suitable for the hazardous area Zone 1 and the enclosed space can be well ventilated.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features.~~

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SECTION 4 ADDITIONAL REQUIREMENTS FOR MACHINERY AND CARGO SYSTEMS OF BARGE-OIL

1 General

1.1 Application

1.1.1 *(1/6/2021)*

These units are to comply with the requirements of Sec 3.

The requirements in this Section are additional to the ones in Sec 3.

Item [2] provides additional requirements that only apply to barges having the service notation barge-oil intended to carry oil having any flashpoint (i.e. including oils having flash point < 60°C).

Item [3] provides additional requirements that only apply to barges having the service notation barge-oil intended to carry only oil having flashpoint > 60°C.

Oil means petroleum in any form including crude oil, fuel oil, sludge, oil refuse and refined products (other than those petrochemicals listed in IBC Code Chapter 17).

1.2 Documents to be submitted

1.2.1 *(1/6/2021)*

The documents listed in Tab 1 are to be submitted for approval for barge oil intended to carry oil having any flashpoint.

The documents listed in Tab 1 are to be submitted for approval, for barge-oil intended to carry only oil having flashpoint > 60°Cexcept for items 8 and 9.

1.3 Exemptions

1.3.1 *(1/6/2021)*

The requirements in Pt C, Ch 1, Sec 10, [11.4.1] b) do not apply to service tanks.

The requirements in Pt C, Ch 1, Sec 10, [11.4.6] a) do not apply.

2 Additional requirements for ships with service notation "barge-oil"

2.1 Piping systems other than cargo piping system

2.1.1 Materials *(1/6/2021)*

a) Materials are to comply with the provisions of Pt C, Ch 1, Sec 10.

b) Spheroidal graphite cast iron may be accepted for bilge and ballast piping.

2.1.2 Independence of piping systems *(1/6/2021)*

a) Bilge, ballast and scupper systems serving spaces located within the cargo area:
   - are to be independent from any piping system serving spaces located outside the cargo area
   - are not to lead outside the cargo area.

b) Fuel oil systems are to:
   - be independent from the cargo piping system
   - have no connections with pipelines serving cargo or slop tanks
   - bilge pumps serving spaces located within the cargo area are to be located in the cargo pump room or in another suitable space within the cargo area.

2.1.3 Passage through cargo tanks and slop tanks *(1/1/2025)*

a) Unless otherwise specified, bilge, ballast and fuel oil systems serving spaces located outside the cargo area are not to pass through cargo tanks or slop tanks. They may pass through ballast tanks or void spaces located within the cargo area.

b) Where expressly permitted, ballast pipes passing through cargo tanks are to fulfil the following provisions:

- they are to have welded or heavy flanged joints (see Note 1) the number of which is kept to a minimum
- they are to be of extra-reinforced wall thickness as per Pt C, Ch 1, Sec 10, Tab 5
- they are to be adequately supported and protected against mechanical damage.

Note 1: Heavy flanged joints means welded flange joints rated at least PN10 or one pressure rating higher than required design pressure, whichever is greater.

2.1.4 Draining of pump rooms *(1/6/2021)*

Cargo pumps or stripping pumps may be used for draining cargo pump rooms provided that:

- a screw-down non-return valve is fitted on the bilge suctions, and
- a valve is fitted between the pump suction and the bilge distribution box.

Table 1 : Additional documents to be submitted for barge-oil *(1/6/2021)*

No.	Document **(1)**
1	General layout of cargo pump room with details of: • bulkhead penetrations • gas detection system • other alarms and safety arrangements
2	Diagram of cargo piping system
3	Diagram of the cargo tank venting system with: • indication of the outlet position • details of the pressure/vacuum valves and flame arrestors • details of the draining arrangements, if any
4	Diagram of the cargo tank level gauging system with overfill safety arrangements
5	Diagram of the cargo tank cleaning system
6	Diagram of the bilge and ballast systems serving the spaces located in the cargo area
7	Diagram of the cargo heating systems
8	Diagram of inert gas system with details of the inert gas plant
9	Diagram of gas measurement system for double hull and double bottom spaces
(1) Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.	

2.1.5 Ballast system *(1/1/2026)*

Except where expressly permitted, ballast systems serving segregated ballast tanks are to be completely separated from the cargo oil and fuel oil systems.

In barges of 150 gross tonnage and above, no ballast water is normally to be carried in any fuel oil tank; see Pt C, Ch 1, Sec 10, [7.1.3].

Ballast pumps are to be located in the cargo pump room, or a similar space within the cargo area not containing any source of ignition.

Where installed in the cargo pump room, ballast pumps are to comply with the applicable provisions of [2.2.3] and [2.2.4].

Ballast systems serving segregated ballast in the cargo area are to be entirely located within the cargo area and are not to be connected to other piping systems.

Where they are intended to be filled with water ballast, the cofferdams located at the fore and aft ends of the cargo spaces may be emptied by a ballast pump located inside the machinery compartment or the forward space provided that:

- the suction is directly connected to the pump and not to a piping system serving machinery spaces
- the delivery is directly connected to the ship side.

Provisions may be made for emergency discharge of the segregated ballast by means of a connection to a cargo pump through a detachable spool piece provided that:

- non-return valves are fitted on the segregated ballast connections to prevent the passage of oil to the ballast tank, and
- shut-off valves are fitted to shut off the cargo and ballast lines before the spool piece is removed.

The detachable spool piece is to be placed in a conspicuous position in the pump room and a permanent warning notice restricting its use is to be displayed in a conspicuous position adjacent to it.

Provisions may be made for filling cargo tanks with sea water, where permitted. Such ballast water is to be dealt with as per [2.4].

The sea water inlets and overboard discharges serving cargo tanks for the purpose of a) are not to have any connection with the ballast system of segregated ballast tanks.

Cargo pumps may be used for pumping ballast water to or from the cargo tanks, provided two shut-off valves are fitted to isolate the cargo piping system from the sea inlets and overboard discharges. See also [2.4.10].

Ballast pumps serving segregated ballast tanks may be used for filling the cargo tanks with sea water provided that the connection is made on the top of the tanks and consists of a detachable spool piece and a screw-down non-return valve to avoid siphon effects.

In barges of 600 tonnes deadweight and above, ballast piping is not to pass through cargo tanks except in the case of short lengths of piping complying with [2.1.3] b).

Sliding type couplings are not to be used for expansion purposes where ballast lines pass through cargo tanks. Expansion bends only are permitted (see Note ~~2~~1).

The fore peak tank can be ballasted with the system serving ballast tanks within the cargo area, provided the requirements in Ch 7, Sec 2, [7.2.1] are complied with~~:~~.

a) ~~the fore peak tank is considered a hazardous area (see Note 1)~~

b) ~~the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this respect, the separation distances for hazardous zones are to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features~~

c) ~~means are provided, on the open deck, to allow measurement of flammable gas concentrations within the fore peak tank by a suitable portable instrument~~

d) ~~the sounding arrangements to the fore peak tank are direct from the open deck.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - Tankers - Special features.~~

Note 2: Expansion bends means expansion loops such as an omega bend (' Ω ') in piping system to counteract excessive stresses or displacement caused by thermal expansion or hull deformation which could be fabricated from straight lengths of pipe.

2.1.6 Integrated cargo and ballast system *(1/6/2021)*

The requirements for integrated cargo and ballast systems are given in Ch 7, Sec 4, [3.5].

2.1.7 Air and sounding pipes of spaces other than cargo tanks *(1/6/2021)*

The air and sounding pipes fitted to the following spaces:

- cofferdams located at the fore and aft ends of the cargo spaces
- tanks and cofferdams located within the cargo area and not intended for cargo

are to be led to the open.

The air pipes referred to above are to be arranged as per Pt C, Ch 1, Sec 10, [9] and are to be fitted with easily removable flame screens at their outlets.

In barges of 600 tonnes deadweight and above, the air and sounding pipes referred above are not to pass through cargo tanks except in the following cases:

- short lengths of piping serving ballast tanks
- lines serving double bottom tanks located within the cargo area, except in the case of barges of 5000 tonnes deadweight and above where the provisions of [2.1.3], item b) are complied with.

2.1.8 Scupper pipes *(1/6/2021)*

Scupper pipes are not to pass through cargo tanks except, where this is impracticable, in the case of short lengths of piping complying with the following provisions:

- they are of steel

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Part E

Service Notations

Chapter 25

OIL CARRIERS - ASSISTED PROPULSION

SECTION 2 SHIP ARRANGEMENT

1 General

1.1 Application

1.1.1 *(1/5/2013)*

The requirements in Sec 2 apply to single deck ships, integral cargo tanks with machinery aft, double bottom throughout the cargo tank area, double side skin and possible longitudinal bulkheads, or single side skin and one or more longitudinal bulkheads throughout the cargo tank area. The deck may be single or double skin, with or without a trunk.

The application of these requirements to other ship types is to be considered by the Society on a case-by-case basis.

1.1.2 Deviations *(1/5/2013)*

The requirements in [2.1.2] and [2.1.3], apply only to ships with the service notations:

- **oil carrier**.

The requirements in [2.2], [3] and [4], apply only to ships with the service notations:

- **oil carrier**
- **oil carrier, flashpoint > 60°C**.

1.1.3 Exemptions *(1/5/2013)*

The requirements in Pt B, Ch 2, Sec 2, [3] b) and [5] do not apply.

2 General arrangement design

2.1 General

2.1.1 Cofferdams *(1/5/2013)*

A cofferdam or similar compartment of width not less than 760 mm is to be provided at the aft end of the cargo tank area. Its bulkheads are to extend from keel to deck across the full breadth of the ship.

For the purpose of this requirement, the term “cofferdam” is intended to mean an isolating compartment between two adjacent steel bulkheads or decks. The minimum distance between the two bulkheads or decks is to be sufficient for safe access and inspection.

In order to meet the single failure principle, in the particular case when a corner-to-corner situation occurs, this principle may be met by welding a diagonal plate across the corner.

The cofferdams are also to be constructed so as to enable adequate ventilation.

2.1.2 Cargo segregation *(1/5/2013)*

Unless expressly provided otherwise, in ships enabled to carry cargoes having a flashpoint below 60°C, tanks containing cargo or cargo residues are to be placed forward of and segregated from accommodation, service and machinery spaces, drinking water and stores for human consumption by means of a cofferdam, or any other similar compartment and arranged in such a way that a single failure of a deck or bulkhead will not permit the entry of gas or vapour from the cargo tank into control stations, accommodation and service spaces (see Fig 1 and Fig 2).

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4 Access arrangement

4.1 General

4.1.1 *(1/5/2013)*

As far as practicable, permanent or movable means of access stored on board are to be provided to ensure proper survey and maintenance of cargo tanks and ballast compartments.

4.1.2 *(1/5/2013)*

Means of access to side and centre tanks may not be provided in the same transverse section.

Table 1 : Length of cargo tanks *(1/5/2013)*

Longitudinal bulkhead arrangement	Cargo tank	Condition **(1)**	Centreline bulkhead arrangement	Length of cargo tanks, in m
No bulkhead	-	-	-	$(0,5\ b_i / B + 0,1)\ L$ **(2)**
Centreline bulkhead	-	-	-	$(0,25\ b_i / B + 0,15)\ L$
Two or more bulkheads	Wing cargo tank	-	-	0,2 L
	Centre cargo tank	$b_i / B \geq 1/5$	-	0,2 L
		$b_i / B < 1/5$	No	$(0,5\ b_i / B + 0,1)\ L$
			Yes	$(0,25\ b_i / B + 0,15)\ L$

(1) b_i is the minimum distance from the ship side to the outer longitudinal bulkhead of the i-th tank, measured inboard at right angles to the centreline at the level corresponding to the assigned summer freeboard.

(2) Not to exceed 0,2 L

4.2 Access to pipe tunnel and opening arrangement

4.2.1 Access to the pipe tunnel in the double bottom *(1/5/2013)*

The pipe tunnel in the double bottom is to comply with the following requirements:

- it may not communicate with the engine room
- provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

4.2.2 Doors between pipe tunnel and main pump room *(1/5/2013)*

Where there is a permanent access from a pipe tunnel to the main pump room, a watertight door is to be fitted complying with the requirements in Pt B, Ch 2, Sec 1, [6.2.1] for watertight doors open at sea and located below the freeboard deck. In addition the following is to be complied with:

- in addition to bridge operation, the watertight door is to be capable of being manually closed from outside the main pump room entrance
- the watertight door is to be kept closed during normal operations of the ship except when access to the pipe tunnel is required. A notice is to be affixed to the door to the effect that it may not be left open.

4.3 Access to compartments in the cargo area

4.3.1 General *(1/5/2013)*

Access to cofferdams, ballast tanks, cargo tanks and other compartments in the cargo area is to be direct from the open deck and such as to ensure their complete inspection. Access to double bottom compartments may be through a cargo pump room, pump room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

4.3.2 Access to the fore peak tank *(1/1/2026)*

The requirements for access to the fore peak tank in Ch 7, Sec 2, [7.2] and [7.3] apply~~is to be direct from the open deck.~~

~~Alternatively, i~~Indirect access from the open deck to the fore peak tank through an enclosed space may be accepted ~~provided that~~if the unit is only enabled to carry products having a flashpoint exceeding 60°C~~:~~.

a) ~~The unit is only enabled to carry products having a flashpoint exceeding 60°C, or~~

b) ~~The unit is enabled to carry products having any flashpoint and:~~

1) ~~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 electrically certified safe in the enclosed space is isolated~~

~~or~~

2) ~~the enclosed space has a common boundary with the cargo tanks, is classified as a hazardous area (see Note 1), the equipment inside is suitable for the corresponding hazardous area and the enclosed space can be well ventilated.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships – Tankers – Special features.~~

4.3.3 Access through horizontal openings *(1/5/2013)*

For access through horizontal openings the dimensions are to be sufficient to allow a person wearing a self-contained, air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the compartment. The minimum clear opening is to be not less than 600 mm by 600 mm.

4.3.4 Access through vertical openings *(1/5/2013)*

For access through vertical openings the minimum clear opening is to be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

4.3.5 Oil carriers less than 5000 t deadweight *(1/5/2013)*

For oil carriers of less than 5000 t deadweight smaller dimensions may be approved by the Society in special circumstances, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Society.

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SECTION 4 MACHINERY AND CARGO SYSTEMS

1 General

1.1 Application

1.1.1 *(1/5/2013)*

The requirements of this Section apply to ships having the service notation:

- **oil carrier**

intended to carry products having any flashpoint.

Some departures from these requirements may be accepted for ships of less than 500 gross tonnage as indicated in Tab 1.

1.1.2 Exemptions *(1/5/2013)*

The requirements in Part C, Ch 1, Sec 10, [11.4.1] b) do not apply to service tanks.

1.2 Documents to be submitted

1.2.1 *(1/5/2013)*

The documents listed in Tab 2 are to be submitted for approval in four copies.

2 Piping systems other than cargo piping system

2.1 General

2.1.1 Materials *(1/5/2013)*

a) Materials are to comply with the provisions of Pt C, Ch 1, Sec 10.

b) Spheroidal graphite cast iron may be accepted for bilge and ballast piping.

2.1.2 Independence of piping systems *(1/5/2013)*

a) Bilge, ballast and scupper systems serving spaces located within the cargo area:
   - are to be independent from any piping system serving spaces located outside the cargo area
   - are not to lead outside the cargo area.

b) Fuel oil systems are to:
   - be independent from the cargo piping system
   - have no connections with pipelines serving cargo or slop tanks.

2.1.3 Passage through cargo tanks and slop tanks *(1/1/2025)*

a) Unless otherwise specified, bilge, ballast and fuel oil systems serving spaces located outside the cargo area are not to pass through cargo tanks or slop tanks. They may pass through ballast tanks or void spaces located within the cargo area.

b) Where expressly permitted, ballast pipes passing through cargo tanks are to fulfil the following provisions:
   - they are to have welded or heavy flanged joints (see Note 1) the number of which is kept to a minimum
   - they are to be of extra-reinforced wall thickness as per Pt C, Ch 1, Sec 10, Tab 5
   - they are to be adequately supported and protected against mechanical damage.

Note 1: Heavy flanged joints means welded flange joints rated at least PN10 or one pressure rating higher than required design pressure, whichever is greater.

2.1.4 Pumps *(1/5/2013)*

One or more driven pumps are to be fitted, in a suitable space forward of cargo tanks, for bilge, ballast and, where relevant, fuel oil services.

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

2.2.4 Draining of tunnels and pump rooms other than cargo pump rooms *(1/5/2013)*

Arrangements are to be provided to drain tunnels and pump rooms other than cargo pump rooms. Cargo pumps may be used for this service under the provisions of [2.2.3], item b).

2.2.5 Draining of cofferdams located at the fore and aft ends of the cargo spaces *(1/5/2013)*

a) When they are not intended to be filled with water ballast, cofferdams located at the fore and aft ends of the cargo spaces are to be fitted with drainage arrangements.

b) Aft cofferdams adjacent to the cargo pump room may be drained by a cargo pump in accordance with the provisions of [2.2.3], items b) and c), or by bilge ejectors.

c) Cofferdams located at the fore end of the cargo spaces may be drained by the bilge or ballast pumps required in [2.1.4], or by bilge ejectors.

d) Drainage of the after cofferdam from the engine room bilge system is not permitted.

Note 1: On carriers of less than 500 gross tonnage, cofferdams may be drained by means of hand pumps with a suction diameter of not less than 50 mm.

2.2.6 Drainage of other cofferdams and void spaces located within the cargo area *(1/5/2013)*

Other cofferdams and void spaces located within the cargo area and not intended to be filled with water ballast are to be fitted with suitable means of drainage.

2.3 Ballast system

2.3.1 General *(1/5/2013)*

a) Except where expressly permitted, ballast systems serving segregated ballast tanks are to be completely separated from the cargo oil and fuel oil systems.

b) In oil carriers of 150 gross tonnage and above, no ballast water is normally to be carried in any fuel oil tank; see Pt C, Ch 1, Sec 10, [7.1.3].

2.3.2 Ballast pumps *(1/5/2013)*

a) Ballast pumps are to be located in the cargo pump room, or a similar space within the cargo area not containing any source of ignition.

b) Where installed in the cargo pump room, ballast pumps are to comply with the applicable provisions of [3.2.3] and [3.2.4].

2.3.3 Pumping arrangements for ballast tanks within the cargo area *(1/5/2013)*

a) Ballast systems serving segregated ballast in the cargo area are to be entirely located within the cargo area and are not to be connected to other piping systems.

b) Segregated ballast tanks located within the cargo area are to be served by two different means. At least one of these means is to be a pump or an eductor used exclusively for dealing with ballast.

2.3.4 Pumping arrangement for cofferdams located at the fore and aft ends of the cargo spaces *(1/5/2013)*

Where they are intended to be filled with water ballast, the cofferdams located at the fore and aft ends of the cargo spaces may be emptied by a ballast pump located inside the machinery compartment or the forward space mentioned in [2.1.4], whichever is the case, provided that:

- the suction is directly connected to the pump and not to a piping system serving machinery spaces
- the delivery is directly connected to the ship side.

2.3.5 Emergency discharge of segregated ballast *(1/5/2013)*

Provisions may be made for emergency discharge of the segregated ballast by means of a connection to a cargo pump through a detachable spool piece provided that:

- non-return valves are fitted on the segregated ballast connections to prevent the passage of oil to the ballast tank, and
- shut-off valves are fitted to shut off the cargo and ballast lines before the spool piece is removed.

The detachable spool piece is to be placed in a conspicuous position in the pump room and a permanent warning notice restricting its use is to be displayed in a conspicuous position adjacent to it.

2.3.6 Carriage of ballast water in cargo tanks *(1/5/2013)*

a) Provisions may be made for filling cargo tanks with sea water, where permitted. Such ballast water is to be processed and discharged using the equipment referred to in [5].

b) The sea water inlets and overboard discharges serving cargo tanks for the purpose of a) are not to have any connection with the ballast system of segregated ballast tanks.

c) Cargo pumps may be used for pumping ballast water to or from the cargo tanks, provided two shut-off valves are fitted to isolate the cargo piping system from the sea inlets and overboard discharges. See also [5.3.4].

d) Ballast pumps serving segregated ballast tanks may be used for filling the cargo tanks with sea water provided that the connection is made on the top of the tanks and consists of a detachable spool piece and a screw-down non-return valve to avoid siphon effects.

2.3.7 Ballast pipes passing through tanks *(1/1/2025)*

a) In oil carriers of 600 tonnes deadweight and above, ballast piping is not to pass through cargo tanks except in the case of short lengths of piping complying with [2.1.3], item b).

b) Sliding type couplings are not to be used for expansion purposes where ballast lines pass through cargo tanks. Expansion bends only are permitted (see Note 1).

Note 1: Expansion bends means expansion loops such as an omega bend (' Ω ') in piping system to counteract excessive stresses or displacement caused by thermal expansion or hull deformation which could be fabricated from straight lengths of pipe.

2.3.8 Fore peak ballast system on oil carriers *(1/1/2026)*

The fore peak tank can be ballasted with the system serving ballast tanks within the cargo area, provided the requirements in Ch 7, Sec 2, [7.2.1] are complied with~~:~~.

a) ~~the fore peak tank is considered a hazardous area (see Note 1)~~

b) ~~the vent pipe openings are located on open deck at an appropriate distance from sources of ignition. In this respect, the separation distances for hazardous zones are to be defined in accordance with IEC 60092-502: Electrical installations in ships - carriers - Special features;~~

c) ~~c)means are provided, on the open deck, to allow measurement of flammable gas concentrations within the fore peak tank by a suitable portable instrument;~~

d) ~~the sounding arrangements to the fore peak tank are direct from the open deck.~~

Note 1: ~~The hazardous area classification is to be defined in accordance with IEC 60092-502: Electrical installations in ships - carriers - Special features.~~

2.3.9 Integrated cargo and ballast system *(1/5/2013)*

The requirements for integrated cargo and ballast systems are given in [3.5].

2.4 Air and sounding pipes of spaces other than cargo tanks

2.4.1 General *(1/5/2013)*

The air and sounding pipes fitted to the following spaces:

- cofferdams located at the fore and aft ends of the cargo spaces
- tanks and cofferdams located within the cargo area and not intended for cargo

are to be led to the open.

2.4.2 Air pipes *(1/5/2013)*

The air pipes referred to in [2.4.1] are to be arranged as per Pt C, Ch 1, Sec 10, [9] and are to be fitted with easily removable flame screens at their outlets.

2.4.3 Passage through cargo tanks *(1/5/2013)*

In oil carriers of 600 tonnes deadweight and above, the air and sounding pipes referred to in [2.4.1] are not to pass through cargo tanks except in the following cases:

- short lengths of piping serving ballast tanks
- lines serving double bottom tanks located within the cargo area, except in the case of oil carriers of 5000 tonnes deadweight and above

where the provisions of [2.1.3], item b) are complied with.

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Part E

Service Notations

Chapter 26

PALM OIL CARRIERS - ASSISTED PROPULSION

SECTION 2 SHIP ARRANGEMENT

1 General

1.1 Application

1.1.1 *(1/5/2013)*

The requirements in Sec 2 apply to single deck ships, integral cargo tanks with machinery aft, double bottom throughout the cargo tank area, double side skin and possible longitudinal bulkheads, or single side skin and one or more longitudinal bulkheads throughout the cargo tank area. The deck may be single or double skin, with or without a trunk.

The application of these requirements to other ship types is to be considered by the Society on a case-by-case basis.

1.1.2 Exemptions *(1/5/2013)*

The requirements in Pt B, Ch 2, Sec 2, [3], b) and [5] do not apply.

2 General arrangement design

2.1 General

2.1.1 Cofferdams *(1/5/2013)*

A cofferdam or similar compartment of width not less than 760 mm is to be provided at the aft end of the cargo tank area. Its bulkheads are to extend from keel to deck across the full breadth of the ship.

For the purpose of this requirement, the term “cofferdam” is intended to mean an isolating compartment between two adjacent steel bulkheads or decks. The minimum distance between the two bulkheads or decks is to be sufficient for safe access and inspection.

In order to meet the single failure principle, in the particular case when a corner-to-corner situation occurs, this principle may be met by welding a diagonal plate across the corner.

The cofferdams are also to be constructed so as to enable adequate ventilation.

2.1.2 Cargo segregation *(1/5/2013)*

Unless expressly provided otherwise, tanks containing cargo or cargo residues are to be segregated from accommodation, service and machinery spaces, drinking water and stores for human consumption by means of a cofferdam, or any other similar compartment (see Fig 1).

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DW is the deadweight, in t.

3.1.3 Piping through cargo tanks *(1/5/2013)*

Lines of piping which run through cargo tanks in a position less than 0,30 B_s from the ship's side or less than 0,30 D_s from the ship's bottom are to be fitted with valves or similar closing devices at the point at which they open into any cargo tank. These valves are to be kept closed at sea at any time when the tanks contain cargo oil, except that they may be opened only for cargo transfer needed for essential operations.

3.1.4 Suction wells in cargo tanks *(1/5/2013)*

Suction wells in cargo tanks may protrude into the double bottom below the boundary line defined by the distance h in [2.2.2], provided that such wells are as small as practicable and the distance between the well bottom and bottom shell plating is not less than 0,5 h.

Figure 2 : Cargo tank boundary lines *(1/5/2013)*

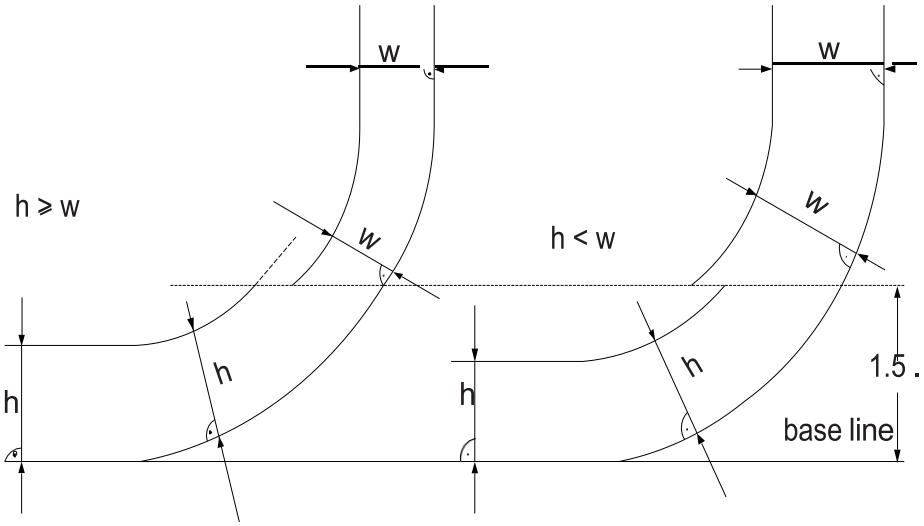
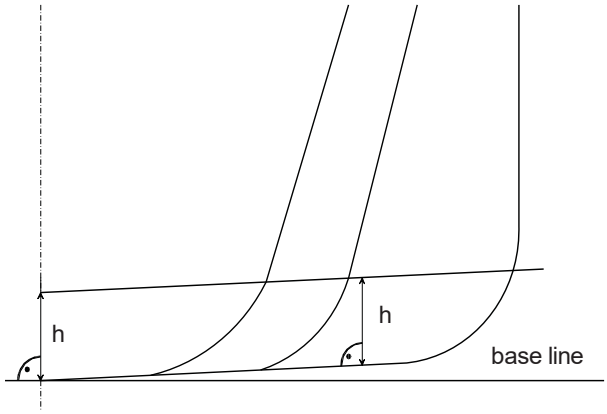


Figure 3 : Cargo tank boundary lines *(1/5/2013)*



4 Access arrangement

4.1 General

4.1.1 *(1/5/2013)*

As far as practicable, permanent or movable means of access stored on board are to be provided to ensure proper survey and maintenance of cargo tanks and ballast compartments.

4.1.2 *(1/5/2013)*

Means of access to side and centre tanks may not be provided in the same transverse section.

Table 1 : Length of cargo tanks *(1/5/2013)*

Longitudinal bulkhead arrangement	Cargo tank	Condition **(1)**	Centreline bulkhead arrangement	Length of cargo tanks, in m
No bulkhead	-	-	-	$(0,5\ b_i / B + 0,1)\ L$ **(2)**
Centreline bulkhead	-	-	-	$(0,25\ b_i / B + 0,15)\ L$
Two or more bulkheads	Wing cargo tank	-	-	0,2 L
	Centre cargo tank	$b_i / B \geq 1/5$	-	0,2 L
		$b_i / B < 1/5$	No	$(0,5\ b_i / B + 0,1)\ L$
			Yes	$(0,25\ b_i / B + 0,15)\ L$

(1) b_i is the minimum distance from the ship side to the outer longitudinal bulkhead of the i-th tank, measured inboard at right angles to the centreline at the level corresponding to the assigned summer freeboard.

(2) Not to exceed 0,2 L

4.2 Access to pipe tunnel and opening arrangement

4.2.1 Access to the pipe tunnel in the double bottom *(1/5/2013)*

The pipe tunnel in the double bottom is to comply with the following requirements:

- it may not communicate with the engine room
- provision is to be made for at least two exits to the open deck arranged at a maximum distance from each other. One of these exits fitted with a watertight closure may lead to the cargo pump room.

4.2.2 Doors between pipe tunnel and main pump room *(1/5/2013)*

Where there is a permanent access from a pipe tunnel to the main pump room, a watertight door is to be fitted complying with the requirements in Pt B, Ch 2, Sec 1, [6.2.1] for watertight doors open at sea and located below the freeboard deck. In addition the following is to be complied with:

- in addition to bridge operation, the watertight door is to be capable of being manually closed from outside the main pump room entrance
- the watertight door is to be kept closed during normal operations of the ship except when access to the pipe tunnel is required. A notice is to be affixed to the door to the effect that it may not be left open.

4.3 Access to compartments in the cargo area

4.3.1 General *(1/5/2013)*

Access to cofferdams, ballast tanks, cargo tanks and other compartments in the cargo area is to be direct from the open deck and such as to ensure their complete inspection. Access to double bottom compartments may be through a cargo pump room, pump room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

4.3.2 Access to the fore peak tank *(1/1/2026)*

The requirements for access to the fore peak tank in Ch 7, Sec 2, [7.2] and [7.3] are to be complied with where only the arrangements in Ch 7, Sec 2, Fig 5, 6, 9 and 10 are applicable to palm oil carriers~~is to be direct from the open deck~~.

~~Alternatively, indirect access from the open deck to the fore peak tank through an enclosed space may be accepted provided that the enclosed space is separated from the cargo tanks by cofferdams or the enclosed space can be well ventilated.~~

4.3.3 Access through horizontal openings *(1/5/2013)*

For access through horizontal openings the dimensions are to be sufficient to allow a person wearing a self-contained, air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the compartment. The minimum clear opening is to be not less than 600 mm by 600 mm.

4.3.4 Access through vertical openings *(1/5/2013)*

For access through vertical openings the minimum clear opening is to be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

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Part F

Additional Class Notations

Chapter 13

OTHER ADDITIONAL CLASS NOTATIONS

SECTION 26 EXHAUST GAS CLEANING SYSTEMS (EGCS-SOX AND EGCS-NOX)

1 General

1.1 Application

1.1.1 *(1/7/2017)*

The additional class notation **EGCS-SOx** assigned, in accordance with Pt A, Ch 1, Sec 2, [6.14.41], to ships onto which an Exhaust gas cleaning system suitable to reduce the SOx emissions is installed and certified by the Society according to the requirements of this section.

The additional class notation **EGCS-NOx** assigned, in accordance with Pt A, Ch 1, Sec 2, [6.14.41], to ships onto which an Exhaust gas cleaning system suitable to reduce the NOx emissions is installed and certified by the Society according to the requirements of this section.

1.2 Basic principles

1.2.1 *(1/4/2021)*

The installed equipment is to be certified as complying with the performance standard established by international Regulations and Guidelines, and tested by the Society according to the Rules applicable to equipment intended for essential services, both when installed on new ship or retrofitted to existing ships.

Special consideration will be given to the assignment of the additional class notations to existing ships entering into TASNEEF Class as existing ships not built under Society surveillance, previously fitted with properly certified equipment.

2 Definitions and acronym

2.1 Acronyms for EGCG-SOX and EGCS-NOX notations

2.1.1 *(1/7/2017)*

EGCS: Exhaust gas cleaning system

Nox: Nitrogen oxides

SOx: sulphur oxides

EIAPP: Engine International Air Pollution Prevention Certificate (NOx)

ETM: Exhaust Gas cleaning system (SOx) Technical Manual

OMM: On-board monitoring manual (SOx)

SECP: Ship Emission compliance plan (SOx)

SCR: Selective catalytic reduction

3 Documentation to be submitted

3.1 Standard list of documents

3.1.1 *(1/7/2017)*

Before the survey for the assignment of the notation is carried out, the following documentation is to be submitted for information:

a) EIAPP Certificates relevant to the engines fitted Selective Catalytic Reduction systems;

b) NOx Technical files of engines fitted Selective Catalytic Reduction system;

c) Testing certificates of each engine fitted with an EGCS for NOx, or of the Selective Catalytic Reduction system, if separately certified;

d) ETM of installed Exhaust Gas cleaning systems for SOx, in approved form;

e) OMM of installed Exhaust Gas cleaning systems for SOx, in approved form;

f) SECP in approved form

g) Testing certificates of each EGCS system (SOx) fitted on board.

The Society reserves the right to request the submission of additional documents, if deemed necessary, for the evaluation of compliance of the installed system.

4 Requirements

4.1 General

4.1.1 Performance and certification *(1/7/2023)*

The installed equipment is to be certified as complying with the performance standard established by international Regulations and Guidelines, in particular:

a) EGCS for reducing NOx emission are to be certified according to Resolutions MEPC.176(58)(MARPOL Annex VI), MEPC.177(58) (NOx Technical Code 2008) and MEPC.291(71) as capable of achieving NOx emission levels conforming to Tier 3 standard.

b) EGCS for reducing SOx emission are to be certified according to Resolution MEPC.340(77). The achieved SO/CO ratio, when the connected fuel oil burning equipment is operated at any rating and supplied with fuel with 3.5 % sulphur content (equivalent to using a fuel with sulphur content as specified in Resolution MEPC.340(77)), is to be verified. The equivalent value of fuel sulphur content, in percentage, is to be indicated in brackets (e.g. EGCS-SOX(0,5%) or ECGS-SOX(0,1%)).

All the above mentioned Resolutions are to be applied in the "as amended, repealed or replaced status" in force or applicable at the date of the request of issuance of the additional notation, or at the date of the contract for the supply and installation on board of the equipment, if earlier.

The equipment is to be tested by the Society according to the Rules applicable to equipment intended for essential services, both when installed on new ships or retrofitted to existing ships.

4.1.2 Inspection and maintenance *(1/7/2017)*

Maintenance of the system is to be carried out regularly in accordance with the maker's instructions and internal procedures.

The plan is to describe the list of points to be inspected and the people in charge.

The reports of maintenance activities and inspections are to be maintained for at least three years, and are to be made available, upon Surveyor request, during the survey for the assignment of the notation and subsequent surveys.

4.1.3 Monitoring and recording *(1/7/2017)*

The monitoring and recording of the proper operation of the EGCS is to be carried out according to the requirements of the Resolutions quoted in [1.2.1].

The plan is to describe the list of points to be inspected and the people in charge.

Additionally, in case of SCR systems not permanently fitted with a NOx analyser for closed loop control, a periodical NOx measurement is be carried out by qualified personnel, at intervals not exceeding five years, to check the efficiency of the system and confirm compliance with the requirements in [1.2.1].

4.1.4 Monitoring and Safety Functions for Exhaust Gas Cleaning (SOx) Systems *(1/1/2026)*

Monitoring and safety functions for exhaust gas cleaning (SOx) systems are to comply with the requirements in Pt C, Ch 1, Sec 10, [20.8]

5 Assignment criteria

5.1 General

5.1.1 Performance and certification *(1/7/2017)*

The additional class notation **EGCS-NOX** is assigned to ships or new buildings upon verification of compliance of the documentation required in [3.1.1] a), b) and c) with the requirements in [4.1.1].

The additional class notation **EGCS-SOX** is assigned to ships or new buildings upon verification of compliance of the documentation required in [3.1.1] d, e), f) and g) with the requirements in [4.1.1].

SECTION 49 HIGH AND LOW VOLTAGE SHORE CONNECTION READY

1 General

1.1 Application

1.1.1 *(1/1/2026)*

The additional class notation **HVSC** or **LVSC (rated voltage, rated frequency) READY (X1, X2, X3)** is assigned, in accordance with Pt A, Ch 1, Sec 2, [6.14.77], to ships designed for the future installation of a Shore Connection system and complying with the requirements of this Section.

1.1.2 *(1/1/2026)*

HVSC (rated voltage, rated frequency) READY (X1, X2, X3) additional class notation is applicable for High Voltage installations, i.e. electrical system having rated voltage above 1.000 V.

1.1.3 *(1/1/2026)*

LVSC (rated voltage, rated frequency) READY (X1, X2, X3) additional class notation is applicable for Low Voltage installations, i.e. electrical system having rated voltage less than or equal to 1.000 V..

1.1.4 *(1/1/2026)*

A Statement of Compliance may be issued to ships not classed with the Society, complying with the requirements of this Section.

2 Assignment criteria

2.1 Characteristics of the notation

2.1.1 *(1/1/2026)*

The characteristics X_i of the notation are defined in Tab 1

Table 1 : Description of the notation characteristics *(1/1/2026)*

X_i	Characteristic	Description
1	**DESIGN**	The complete design of the ship HV or LV shore connection system is found to be in compliance with the rules(1) and the relevant space on board for the future installation is available.
2	**MAIN SWBD**	The ship's main switchboard is equipped with the necessary apparatus to receive the cables of the shore connection system
3	**CABLEWAYS**	The cableways are installed from the Main SWBD to the shore connection box
4	**CABLES**	The cableways and electrical cables are installed from the Main SWBD to the shore connection box
5	**BOX**	The shore connection box is installed
6	**EL CONV**	The electrical components for conversion (e.g. transformer, frequency converter, rectifiers etc.) are installed on board

(1) Reference rules: TASNEEF Rules Pt F, Ch 13, Sec 15; IEC 80005-1; IEC 80005-3

2.2 Assignment of the notation

2.2.1 *(1/1/2026)*

For the assignment of the notation, the complete design of the ship High or Low Voltage Shore Connection system is to comply with the requirements in Sec 15, IEC 80005-1, IEC 80005-3; and the relevant space on board for the future

installation of the Shore Connection system is to be available (i.e. as minimum, the characteristic DESIGN is to be assigned).

2.2.2 *(1/1/2026)*

Depending on the equipment installed, the following characteristics defined in Tab.1 may be added to the notation:

- **MAIN SWBD**
- **CABLEWAYS**
- **CABLE**
- **BOX**
- **EL CONV**

2.2.3 *(1/1/2026)*

Examples of assignment of the notation are given below for clarity (i.e. X_i is to be changed into the relevant characteristics, as applicable):

- **HVSC** (11kV, 60Hz) **READY (DESIGN)**
- **HVSC** (6.6kV, 60Hz) **READY (DESIGN, CABLES, BOX)**
- **LVSC** (690V, 60Hz) **READY (DESIGN, MAIN SWBD)**
- **LVSC** (750V, DC) **READY (DESIGN)**

2.2.4 *(1/1/2026)*

Regardless of the previous assignment of the notation, when all the necessary equipment to operate the shore connection system is installed onboard, approval for compliance with TASNEEF requirements in force at the time of installation will be required, followed by testing and commissioning under survey of a Society surveyor.

3 Documents to be submitted

3.1 Documentation requirements for characteristic "Design"

3.1.1 *(1/1/2026)*

The list of plans and documents to be submitted is given in Sec 15, Tab 1 and, in addition, in Tab 2.

The documentation is to be marked **"HVSC READY"** or **"LVSC READY"** in each drawing title.

The Society reserves the right to require additional documents in the case of non-conventional design or if it is deemed necessary for the evaluation of the systems and components.

Table 2 : Documents to be submitted *(1/1/2026)*

N.	Approval or Information	Document
1	I	Feasibility study, highlighting the modifications (if any) necessary for installing the complete shore connection system
2	I	Technical specification of all necessary components (already installed or to be installed later) including evidence of the space availability for their actual and future installation
3	I	Complete system general arrangement plan (see also N. 5, if applicable)
4	A	Structural modifications including new side openings (if any) and relevant means of closure (if needed)
5	A	Hazardous area plan (if applicable e.g. in the case of ships carrying dangerous goods or fuelled with gas or low flash point fuels)
6	A	Structural fire protection plan (if needed)
7	A	Plans relevant to fire detection and fixed fire extinguishing systems (if needed)
8	A	Means of escape plan (if needed)
9	A	Ventilation system plans