Amendments to the "Rules for the Classification of Ships": new additional service features “barge - liquefied gas”, “barge - LNG bunker” and “barge – chemical” to the Barge service notation:

- **Part A, Chapter 1, Section 2: [4.9.1]; Chapter 4, Sec 10, [1.1.1] and [17.8] to [17.19] (new)**
- **Part E, Chapter 19: changes to all sections**

RFC/002/AMN/011

Effective from 1/6/2021

SECTION 2 CLASSIFICATION NOTATIONS

1 General

1.1 Purpose of the classification notations

1.1.1 The classification notations give the scope according to which the class of the ship has been based and refer to the specific rule requirements which are to be complied with for their assignment. In particular, the classification notations are assigned according to the type, service and navigation of the ship and other criteria which have been provided by the Interested Party, when applying for classification.

The Society may change the classification notations at any time, when the information available shows that the requested or already assigned notations are not suitable for the intended service, navigation and any other criteria taken into account for classification.

Note 1: Reference should be made to Sec 1, [1.3] on the limits of classification and its meaning.

1.1.2 The classification notations assigned to a ship are indicated on the Certificate of Classification, as well as in the Register of Ships published by the Society.

1.1.3

Ships and units, other than those covered in Parts B, C, D, E and F, are to comply with specific Rules published by the Society, which also stipulate the relevant classification notations.

1.1.4 The classification notations applicable to existing ships conform to the Rules of the Society in force at the date of assignment of class, as indicated in Ch 2, Sec 1. However, the classification notations of existing ships may be updated according to the currrent Rules, as far as applicable.

1.2 Types of notations assigned

1.2.1 The types of classification notations assigned to a ship are the following:

a) main class symbol
b) construction marks
c) service notations with additional service features, as applicable
d) navigation notations
e) operating area notations (optional)
f) additional class notations (optional)

The different classification notations and their conditions of assignment are listed in [2] to [6] below, according to their types.

1.2.2 As an example, the classification notations assigned to a ship may be as follows (the kind of notation shown in brackets does not form part of the classification notation indicated in the Register of Ships and on the Certificate of Classification):

C ✠ HULL ✠ MACH

(main class symbol, construction marks)

oil tanker-chemical tanker-ESP-Flash point > 60°C

(service notation and additional service features)

Unrestricted navigation

(navigation notation)

✠ SYS - NEQ

(additional class notation).

2 Main class symbol

2.1 Main class symbol

2.1.1 The main class symbol expresses the degree of compliance of the ship with the rule requirements as regards its construction and maintenance. There is one main class symbol, which is compulsory for every classed ship.

2.1.2

The main class symbol C is assigned to ships built in accordance with the requirements of the Rules or other rules recognised as equivalent, and maintained in a condition considered satisfactory by the Society. The period of class (or interval between class renewal surveys) assigned to a ship is maximum 5 years; see Ch 2, Sec 2, [4].

Except for special cases, class is assigned to a ship only when the hull, propulsion and auxiliary machinery installations, and equipment providing essential services have all been reviewed in relation to the requirements of the Rules.

Note 1: The symbol **C** with the 5 year class period is to be understood as being the highest class granted by the Society.

Note 2: The symbol **C** may be followed by the additional construction feature **light ship** in case of ships or other units having restricted navigation notations and generally having length not greater than 50 m as well as speed greater than 15 knots, whose hull scantlings and outfitting comply with the applicable requirements of Chapters 3 and 6 of the "Rules for the Classification of High Speed Craft", issued separately by the Society.

3 Construction marks

3.1 General

3.1.1 The construction mark identifies the procedure under which the ship and its main equipment or arrangements have been surveyed for initial assignment of the class. The procedures under which the ship is assigned one of the construction marks are detailed in Ch 2, Sec 1.

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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.

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

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.

The service notation may be completed by the additional service feature **flash point > 60°C**, where the ship collects only oil with flash point exceeding 60°C.

4.8.6 *(15/2/2016)*

The service notation **chemical recovery ship** is assigned to ships designed for operation in hazardous atmosphere in case of accident involving chemical products and specially equipped with fixed installations and/or mobile equipment for the removal of chemical products from the sea surface and its retention on board, carriage and subsequent unloading. The additional requirements of Part E, Chapter 28 are applicable to these ships.

4.8.7 The service notation **cable laying ship** is assigned to ships specially equipped for the carriage and/or laying, hauling and repair of submarine cables. The additional requirements of Part E, Chapter 18 are applicable to these ships.

4.8.8

The service notation **research ship** is assigned to ships specially intended for scientific or technological research. The additional requirements of Part E, Chapter 21 are applicable to these ships.

4.8.9

The service notation **pipe laying ship** is assigned to ships specially equipped for the carriage and/or laying, hauling and repair of submarine pipes. The additional requirements of Part E, Chapter 22 are applicable to these ships.

4.8.10 *(1/4/2016)*

The service notation **well stimulation** is assigned to ships specially equipped permanently with specific systems for the stimulation of the well to improve their productivity.

The additional requirements of Part E, Chapter 29 are applicable to these ships.

4.9 Non-propelled and assisted propulsion units, sailing ships

4.9.1 Barge *(1/6/2021)*

The service notation **barge** is assigned to non-propelled units intended to carry (dry or liquid) cargo inside holds or tanks. The type of cargo may be considered adding an additional service feature, e.g. **barge - oil**, **barge - liquefied gas, barge - LNG bunker, barge - chemical, barge - general cargo**. The additional requirements of Part E, Chapter 19 are applicable to these ships.

This service notation may be completed by the additional service feature **tug combined** when units are designed to be connected with tugs, and comply with the relevant requirements of Pt E, Ch 14, Sec 3. The tugs to which the barge can be connected are specified in an annex to the Certificate of Classification.

In the case of barges equipped with specific arrangements for accommodating on board, when moored, persons other than crew, the additional service feature **accommodation** is added to the notation **barge** (i.e. **barge-accommodation**). It covers units such as floating hotels used for different purposes like offshore industry support or other commercial uses. The notation **barge accommodation** is completed by the additional class notation **MOORING**.

4.9.2 Pontoon *(1/7/2015)*

The service notation **pontoon** is assigned to non-propelled units intended to carry cargo and/or equipment on deck only. This service notation may be completed by the service feature **crane** when a cargo lifting appliance, such as crane or derrick, is permanently fitted on board, the cargo lifting appliance is to be certified by the Society according to the "Rules for loading and unloading arrangements and for

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SECTION 10 OTHER SERVICE NOTATIONS

1 General

1.1

1.1.1 *(1/6/2021)*

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 ship**, in [10]
- **fishing vessel**, in [11]
- **pipe laying ship**, 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, ~~or~~ -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].

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.

2 Container ship or ship equipped for the carriage of containers

2.1 Annual survey

2.1.1 The survey is to include:

- confirmation of the availability of instructions and instruments for stowage of containers, as required or fitted
- examination of container supports welded to the ship's structure or on to the hatch covers
- examination of cell guides, if fitted.

2.2 Class renewal survey

2.2.1 The renewal is to include:

- examination of container supports welded to the ship's structure or on to the hatch covers, checking for possible cracks and deformations
- examination of cell guides and associated elements, checking for possible cracks, deformations or corrosion.

2.2.2 For ships assigned with the service notation **container ship**, examination of the torsion box girder or equivalent structure at the top sides is carried out. Thickness measurements additional to those related to the transverse sections may be required.

3 Livestock carrier

3.1 Annual survey

3.1.1

The survey is to include a general examination of:

- spaces for the livestock and related hatch covers (to be surveyed according to Ch 3, Sec 3, [2])
- ventilation means, including prime movers
- main, emergency and portable lighting systems in livestock spaces, passageways and access routes
- the drainage system
- fodder and fresh water system.

3.2 Class renewal survey

3.2.1 The equipment related to ventilation, lighting and the related power supply is to be submitted to a survey to the same extent as required for similar equipment at the class renewal survey as indicated in Ch 3, Sec 5.

3.2.2 The drainage, fodder and fresh water systems, including piping and pumps, are to be surveyed to the same

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tings, is opened during repair periods and can be examined internally.

The Surveyor may require dismantling and/or thickness measurements of piping. A hydraulic test is to be carried out in the event of repair or dismantling of cargo, crude oil washing, or ballast piping, or where doubts arise.

It is to be confirmed that pipelines are electrically bonded to the hull or, alternatively, electrical resistance to the hull is to be verified.

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

c) 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.

17.7.3 Machinery - Cargo area and cargo pump rooms

a) Ballast and stripping pumps are to be internally examined and prime movers checked. A working test is to be carried out, as far as practicable. Maintenance records of cargo pumps are to be made available to the Surveyor.

b) Where a crude oil washing system is fitted, piping, pumps, valves and deck-mounted washing machines are to be examined and tested for signs of leakage, and anchoring devices of deck-mounted washing machines are to be checked to the Surveyor's satisfaction.

c) The satisfactory condition of the cargo heating system is to be verified and, if deemed necessary by the Surveyor, the system is to be pressure tested.

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

e) 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 and fixtures, 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.

17.7.4 Machinery - Inert gas system

In addition to the inspections required at the intermediate survey, the following is to be carried out:

a) an internal examination of:
   1) the inert gas generator, where fitted
   2) the scrubber
   3) the deck water seal including the non-return valve
   4) the pressure/vacuum breaking device
   5) the cooling water systems including overboard discharge from the scrubber
   6) all valves

b) a test to verify the proper operation of the system upon completion of all survey checks.

17.8 Barge-Liquefied gas - Application

17.8.1 *(1/6/2021)*

The requirements of the hereinafter paragraphs from [17.8] to [17.14] apply to all barges which have been assigned the additional service feature liquefied gas.

These requirements are additional to the requirements applicable to the remainder of the unit, given in Chapter 3 according to the relevant surveys.

17.8.2 *(1/6/2021)*

The requirements apply to the surveys of the hull structure and piping systems in way of pump rooms, compressor rooms, cofferdams, pipe tunnels, void spaces and fuel oil tanks within the cargo area and all ballast tanks.

17.9 Barge-Liquefied gas - Documentation on board

17.9.1 *(1/6/2021)*

a) Cargo tank testing and inspection procedures

b) cargo operating manual,

c) loading and unloading operation description, including cargo tank filling limits,

d) list of products to be carried, including maximum vapour pressure, maximum liquid temperature and other important design conditions).

17.10 Barge-Liquefied gas - Annual Survey - Hull Items

17.10.1 Scope *(1/6/2021)*

The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

17.10.2 Hull and weather decks *(1/6/2021)*

The survey is to consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition.

a) examination of the hull plating and its closing appliances as far as can be seen,

b) examination of watertight penetrations as far as practicable,

c) examination of flame screens on vents to all bunker tanks,

d) examination of bunker and vent piping systems.

17.10.3 Hull - Cargo pump rooms and compressor rooms and, as far as practicable, pipe tunnels when fitted *(1/6/2021)*

a) Examination of all pump room and compressor room bulkheads for signs of leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump room and compressor room bulkheads.

b) examination of the condition of all piping systems, except those related to cargo installations, for which reference is to be made to [17.11].

17.10.4 Examination of ballast tanks *(1/6/2021)*

Examination of ballast tanks is to be carried out when required as a consequence of the results of the class renewal survey and intermediate survey. When considered necessary by the Surveyor, or where extensive corrosion exists, thickness measurement is to be carried out. If the results of these thickness measurements indicate that there is substantial corrosion, then the extent of measurements is to be increased to determine the extent of areas of substantial corrosion.

17.11 Barge-Liquefied gas - Annual Survey - Cargo installation items

17.11.1 Method of survey *(1/6/2021)*

The annual survey of cargo installations is preferably to be carried out during a loading or discharging operation. Access to cargo tanks or inerted hold spaces, necessitating gas-freeing/aerating will normally not be necessary.

17.11.2 Check of cargo log book *(1/6/2021)*

Gas plant operational record (log) entries since the last survey are to be examined in order to check the past performance of the system and to establish whether certain parts have shown any irregularities in operation. The evaporation rate and the inert gas consumption are also to be considered.

17.11.3 Weather decks and cargo handling rooms *(1/6/2021)*

The survey is to include:

a) examination of all accessible gas-tight bulkhead penetrations including gas-tight shaft sealings.

b) examination of the sealing arrangements for tanks or tank domes penetrating decks or tank covers.

c) examination of vapour and gas tightness devices of the wheelhouse windows and doors, sidescuttles and windows in way of ends of superstructures and deckhouses facing the cargo area or bow or stern loading/unloading arrangements, and closing devices of air intakes and openings into accommodation, service and machinery spaces and control stations.

d) examination of cargo and process piping, including the expansion arrangements, insulation from the hull structure, pressure relief and drainage arrangements and water curtain protection in way of the hull under the shore connections as appropriate.

e) examination of vent piping systems, including pressure relief valves, vacuum relief valves, vent masts and protective screens, for cargo tanks, interbarrier spaces, hold spaces, fuel tanks and ballast tanks.

f) examination of cargo tank and interbarrier space relief valves and associated safety systems and alarms.

g) confirmation that the certificate for the relief valve opening/closing pressures is on board.

h) examination of drip trays or insulation for deck protection against cargo leakage.

i) examination of the cargo machinery spaces (cargo pump room, cargo compressor room, etc.), the turret compartments and the cargo control room, including their escape routes.

j) confirmation of proper maintenance of arrangements for the airlocks.

k) confirmation that all accessible cargo piping systems are electrically bonded to the hull.

17.11.4 Other arrangements or devices *(1/6/2021)*

The survey is to include:

a) confirmation that any liquid and vapour hoses are suitable for their intended purpose and, where appropriate, type approved or marked with the date of testing and in satisfactory condition.

b) confirmation that any special arrangement made for bow or stern loading/unloading is satisfactory.

c) confirmation that relevant instruction and information material such as cargo handling plans, filling limit information, cooling down procedures, etc. is on board.

d) confirmation that, if applicable, the provisions made for products which have special arrangements as per Pt E, Ch 19, Sec 5, [10] are satisfactory.

17.11.5 Cargo area, cargo compressor rooms, cargo pump rooms *(1/6/2021)*

The survey is to include:

a) examination of artificial ventilation fans in gas-dangerous spaces and zones.

b) examination and confirmation of the satisfactory operation of artificial ventilation of spaces normally entered during operation.

c) examination, as far as possible during operation, of cargo heat exchangers, vaporisers, pumps, compressors and hoses.

d) confirmation that fixed and/or portable ventilation arrangements provided for spaces not normally entered are satisfactory.

e) examination of the gas detection safety arrangements for cargo control rooms and of the measures taken to

exclude ignition sources when such spaces area classified as hazardous areas.

f) examination of cargo (if accessible), bilge, ballast and stripping pumps for excessive gland seal leakage.

g) confirmation that electrical equipment in hazardous areas is in satisfactory condition and is being properly maintained.

h) examination, as far as possible, of arrangements for the use of cargo as fuel, and associated instrumentation and safety devices.

i) examination of the arrangements for the cargo pressure/temperature control including, when fitted, the thermal oxidation systems and any cargo reliquefaction or refrigeration system and confirmation that any associated safety measures and alarms are in satisfactory condition.

j) confirmation that the manually operated emergency shutdown system together with the automatic shutdown of the cargo pumps and compressors are satisfactory.

k) confirmation that the arrangements for the air locks are being properly maintained.

l) examination of the arrangements for the cargo pressure/temperature control including, when fitted, the thermal oxidation systems and any refrigeration system and confirmation that any associated safety measures and alarms are satisfactory.

17.11.6 Instrumentation and safety devices *(1/6/2021)*

The survey is to include:

a) confirmation that installed pressure gauges on cargo discharge lines are operational (see Note 1).

b) confirmation that cargo tank liquid level gauges are operational and that high level alarms as well as automatic shut-off systems are satisfactory (see Note 1).

c) confirmation that the temperature indicating equipment of the cargo containment system and associated alarms are satisfactory (see Note 1).

d) examination of the log-books for confirmation that the emergency shutdown system has been tested.

e) confirmation that cargo tank, hold and insulation space pressure gauging systems and associated alarms are satisfactory.

f) examination, and testing as appropriate, of fixed gas detection equipment.

g) confirmation of the availability and suitability of the portable gas detection equipment and instruments for measuring oxygen levels.

Note 1: Verification of these devices is to be carried out by one or more of the following methods:

- visual external examination
- comparing of read-outs from different indicators
- consideration of read-outs with regard to the actual cargo and/or actual conditions
- examination of maintenance records with reference to the cargo plant instrumentation maintenance manual
- verification of calibration status of the measuring instruments

17.11.7 Inert gas /air drying system *(1/6/2021)*

The survey is to include:

a) the examinations and tests as provided for the annual survey of inert gas systems of oil tankers, given in Sec 3, [3.3].

b) confirmation that arrangements are made for sufficient inert gas to be carried to compensate for normal losses and that means are provided for monitoring the spaces.

c) confirmation that the use of inert gas has not increased beyond that needed to compensate for normal losses by examining records of inert gas usage.

d) confirmation that the means for prevention of backflow of cargo vapour to gas-safe spaces are in satisfactory operating condition.

e) confirmation that any air drying system and any interbarrier and hold space purging inert gas system are satisfactory.

f) for membrane containment systems, confirmation by the Master to the Surveyor of the normal operation of the nitrogen control system for insulation and interbarrier spaces.

17.12 Barge-Liquefied gas - Intermediate survey - Hull items

17.12.1 Ballast tanks *(1/6/2021)*

a) For units between 5 and 10 years of age, an overall survey of representative ballast tanks is to be carried out. If there is no hard protective coating, or if there is soft or semi-hard coating or poor coating condition, the examination is to be extended to other ballast tanks of the same type.

b) for units over 10 years of age, an overall survey of all ballast tanks is to be carried out.

c) if such examinations reveal no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.

d) for ballast tanks, excluding double bottom tanks, if there is no hard protective coating, or if there is soft or semi-hard coating, or poor coating condition and it is not renewed, the tanks in question are to be internally examined at annual intervals.

e) when such conditions are found in double bottom ballast tanks, the tanks in question may be internally examined at annual intervals.

17.12.2 Close up survey *(1/6/2021)*

The minimum requirements for close-up surveys at intermediate survey are given in Tab 1.

Table 1 : Minimum requirement for close up survey at hull intermediate survey of barge-liquified gas *(1/6/2021)*

Age of unit (in years at time of intermediate survey)	
10 < age ≤15	age > 15
Close-up survey of: a) all web frames and both transverse bulkheads in a representative ballast tank **(1)** and **(2)**	Close-up survey of: a) all web frames and both transverse bulkheads in two representative ballast tanks **(1)** and **(2)**
(1) Complete transverse web frame including adjacent structural members **(2)** Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure Note 1:Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted. Note 2:For areas in tanks where protective coating is found to be in good condition, the extent of close-up survey may be specially considered by the Society. Note 3:For units having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by the Society. Note 4:The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases: a) in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar units according to available information; b) in tanks having structures approved with reduced scantlings.	

17.13 Barge-Liquefied gas - Intermediate survey - Cargo Installation

17.13.1 Aim of survey *(1/6/2021)*

The aim of the intermediate survey is to supplement the annual survey by testing cargo handling installations with related automatic control, alarm and safety systems for correct functioning.

17.13.2 Method of survey *(1/6/2021)*

The intermediate survey is preferably to be carried out with the unit in a gas-free condition. In fact, the extent of the testing required for the intermediate survey will normally be such that the survey cannot be carried out during a loading or discharging operation.

17.13.3 Weather decks and cargo handling rooms *(1/6/2021)*

The survey is to include:

a) examination, as far as applicable, of cargo and process, liquid nitrogen (if any), ballast, bunker, stripping and vent piping systems as well as vent masts and headers. If upon examination there is any doubt as to the condition of the piping, pressure testing, thickness measurement or both may be required.

b) examination of vent line drainage arrangements.

c) confirmation that cargo pipes and independent cargo tanks, where applicable, are electrically bonded to the hull.

17.13.4 Cargo area, cargo pump rooms, cargo compressor rooms *(1/6/2021)*

Electrical equipment and cables in dangerous zones such as cargo pump rooms, cargo compressor rooms and spaces adjacent to and areas above cargo tanks are to be examined as far as practicable and tested with particular regard to:

a) protective earthing (spot check).

b) integrity of enclosures.

c) damage of outer sheath of cables.

d) function test of pressurised equipment and associated alarms.

e) test of systems for de-energising non-certified safe electrical equipment located in spaces protected by air-locks, such as electric motor rooms, cargo control rooms, etc.

The electrical insulation resistance of the electrical equipment and circuits in dangerous zones is to be measured. These measurements are only to be effected when the unit is in a gas-free or inerted condition. Where a proper record of testing is maintained, consideration may be given to accepting recent readings by the unit's personnel.

Reference is also to be made to IACS Recommendation No. 35 - Inspection and maintenance of electrical equipment installed in hazardous areas.

In addition to the requirements of what above, the survey also consists of:

a) confirmation that the cargo heating/cooling system is in satisfactory condition.

b) confirmation that the heating system of the hull structure is in satisfactory working condition.

c) general examination and test of leakage detection systems in interbarrier and hold spaces.

17.13.5 Instrumentation and safety devices *(1/6/2021)*

The survey is to include:

a) examination of the installed pressure gauging systems on cargo discharge lines, cargo tanks, holds and insulation spaces and associated alarms.

b) examination of the cargo tank liquid level gauges and high level alarms as well as automatic shut-off systems.

c) examination of the temperature indicating equipment of the cargo containment system and associated alarms.

d) test of the above-mentioned instrumentation by changing pressure, level and temperature as applicable and comparing with test instruments. Simulated tests may be accepted for sensors which are not accessible or located

within cargo tanks or inerted hold spaces. The test is to include alarm and safety functions.

e) examination, as far as practicable, of the piping of the gas detection system for corrosion and damage. The integrity of the suction lines between suction points and analysing units is to be verified as far as possible.

f) calibration of gas detectors or verification thereof with sample gases.

g) confirmation of the availability and suitability of the portable gas detection equipment and instruments for measuring oxygen levels.

h) test of the manually operated emergency shutdown system (without flow in the pipelines) to verify that the system will cause the cargo pumps and compressors to stop.

17.13.6 Inert gas system *(1/6/2021)*

For units over 10 years old at the time of the intermediate survey due date, if an inert gas system such as that installed on board oil tankers is fitted, the requirements given in Sec 3, [5.2] for intermediate survey of oil tankers are to be complied with.

In the case of low temperature liquid nitrogen storage, the plant and its associated arrangements for protecting the hull structure against liquid nitrogen leakage are to be examined.

17.14 Barge-Liquefied gas - Renewal survey

17.14.1 Hull General *(1/6/2021)*

In addition to the requirements of annual surveys, the class renewal survey is to include the following examination, tests and checks.

17.14.2 Tanks, spaces and areas *(1/6/2021)*

Ballast tanks, including double bottom tanks, pump rooms, compressor rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented thickness measurement and testing, as required in [17.14.5] and [17.14.6], to ensure that the structural integrity remains effective.

17.14.3 Dry-docking survey *(1/6/2021)*

The class renewal survey is to include a bottom survey in dry condition as laid down in Ch 3, Sec 6, [2.2.1].

17.14.4 Close-up surveys *(1/6/2021)*

The minimum requirements for close-up surveys at class renewal survey are given in Tab 2.

17.14.5 Thickness measurement *(1/6/2021)*

The minimum requirements for close-up surveys at class renewal survey are given in Tab 3.

Table 2 : Minimum requirements for close-up survey at class renewal surveys of barge-liquefied gas *(1/6/2021)*

Age of unit (in years at time of intermediate survey)		
age ≤ 5	10 < age ≤15	age > 15
One web frame in a representative ballast tank of the topside, hopper side and double hull side type **(1)** One transverse bulkhead in a ballast tank **(3)**	All web frames in a ballast tank, which is to be a double hull side tank or a topside tank. If such tanks are not fitted, another ballast tank is to be selected **(1)** One web frame in each remaining ballast tank **(1)** One transverse bulkhead in each ballast tank **(2)**	All web frames in all ballast tanks (1) All transverse bulkheads in all ballast tanks **(2)**

(1) Complete transverse web frame including adjacent structural members

(2) Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure

(3) Transverse bulkhead lower part including girder system and adjacent structural members

Note 1:Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted.

Note 2:For areas in tanks where coatings are found to be in good condition, as defined in Ch 2, Sec 2, [2.2.13], the extent of close up surveys may be specially considered by the Society.

Note 3: For units having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of close-up surveys may be specially considered by the Society.

Note 4:The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

a) in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar units according to available information;

b) in tanks having structures approved with reduced scantlings.

Table 3 : MMinimum requirements for thickness measurements at class renewal surveys of barge-liquefied gas *(1/6/2021)*

Age of unit (in years at time of intermediate survey)		
age ≤5	10 < age ≤15	age > 15
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 2	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 2	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 2

17.14.6 Extent of tank testing *(1/6/2021)*

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

17.14.7 Cargo installation items *(1/6/2021)*

The requirements of intermediate survey apply with the following additions:

a) cleaning and examination of tanks: all cargo tanks are to be cleaned and examined internally.

b) insulation and cold spots: when accessible, the outer surface of uninsulated cargo tanks or the outer surface of cargo tank insulation together with any vapour or protective barrier is to be examined. Special attention is to be given to the cargo tank and insulation in way of chocks, supports and keys. Removal of insulation may be required in order to verify the condition of the tank or the insulation itself if found necessary by the Surveyor. Where the arrangement is such that the insulation cannot be examined, the surrounding structures of wing tanks, double bottom tanks and cofferdams are to be examined for cold spots when the cargo tanks are in the cold condition unless voyage records together with the instrumentation give sufficient evidence of the integrity of the insulation system.

c) non-destructive testing: non-destructive testing is to supplement cargo tank inspection with special attention to be given to the integrity of the main structural members, tank shell and highly stressed parts, including welded connections as deemed necessary by the Surveyor. However, for type C tanks, this does not mean that non-destructive testing can be dispensed with totally. The following items are, inter alia, considered highly stressed parts:

   1) cargo tank supports and anti-rolling/anti-pitching devices.
   2) web frames or stiffening rings.
   3) Y-connections between tank shell and a longitudinal bulkhead of bilobe tanks.
   4) swash bulkhead boundaries.
   5) dome and stump connections to tank shell.
   6) foundations for pumps, towers, ladders, etc..
   7) pipe connections.

   Where the tanks are to be hydraulically tested in accordance with g), non-destructive testing is to be carried out after the hydraulic testing.

d) type B tanks: for independent tanks of type B, the extent of non-destructive testing is to be as given in a program specially prepared for the cargo tank design.

e) tightness of tanks: the tightness of all cargo tanks is to be verified by an appropriate procedure. Provided that the effectiveness of the unit's gas detection equipment has been confirmed, it will be acceptable to utilise this equipment for the tightness test of independent tanks below deck.

f) hydraulic or hydro-pneumatic test: where the results of the examinations dealt with from a) to e) or the examination of the voyage records raise doubts as to the structural integrity of a cargo tank, a hydraulic or hydro-pneumatic test is to be carried out. For integral tanks and for independent tanks of type A and B, the test pressure is to be not less than the MARVS. For independent tanks of type C, the test pressure is to be not less than 1,25 times the MARVS.

g) type C tanks: when the unit is 10 years old and thereafter at every alternate class renewal survey, independent cargo tanks of type C are to be either:

   1) hydraulically tested to 1,25 times the MARVS, and thereafter non-destructively tested in accordance with g) or
   2) subjected to thorough non-destructive testing in accordance with a program specially prepared for the tank design. If a special program of non-destructive testing does not exist, special attention is to be given to the detection of surface cracks in welded connections in highly stressed areas as listed in c). At least 10% of the length of the welded connections in each of the above-mentioned areas is to be tested. This testing is to be carried out internally and externally, as applicable. Insulation is to be removed as necessary for the required non-destructive testing

h) Hold spaces and secondary barriers: as far as accessible, all hold spaces and hull insulation (if provided), secondary barriers and tank supporting structures are to be visually examined. The secondary barrier of tanks is to be checked for its effectiveness by means of a pressure/vacuum test, a visual examination or any other acceptable method

i) Membrane and semi-membrane systems:

   1) For membrane containment systems, a tightness test of the primary and secondary barrier is to be carried out in accordance with the system Designers' procedures and acceptance criteria as approved by the

Society. Low differential pressure tests may be used to monitor the cargo containment system performance, but are not considered an acceptable test for the tightness of the secondary barrier.

2) For membrane containment systems with glued secondary barriers, if the designer's threshold values are exceeded, an investigation is to be carried out and additional testing such as thermographic or acoustic emissions testing should be carried out.

j) Gas-tight bulkheads: all gas-tight bulkheads are to be examined and the effectiveness of gas-tight shaft sealing is to be verified.

k) Tanks electrically bonded: it is to be verified that independent cargo tanks are electrically bonded to the hull.

l) Pressure relief valves: pressure relief valves for cargo tanks are to be opened for examination, adjusted, function tested and sealed. If the cargo tanks are equipped with relief valves with non-metallic membranes in the main or pilot valves, these non-metallic membranes are to be replaced. Where a proper record of continuous overhaul and re-testing of individually identifiable relief valves is maintained, consideration may be given to acceptance on the basis of opening, internal examination and testing of a representative sample of valves, including each size and type of liquefied gas or vapour relief valves in use, provided there is evidence in the log-book that the remaining valves have been overhauled and tested since crediting of the previous class renewal survey

m) Pressure/vacuum relief valves : Pressure/vacuum relief valves, rupture disc and other pressure relief devices for interbarrier spaces and hold spaces are to be opened, examined, tested and readjusted as necessary, depending on their design

n) Piping systems: Cargo, liquid nitrogen (if any), process, stripping and venting piping systems, including valves, actuators, compensators, etc. are to be opened for examination as deemed necessary. Insulation is to be removed as deemed necessary to ascertain the condition of the pipes. If the visual examination raises doubt as to the integrity of the pipelines, a pressure test at 1.25 times the MARVS for the pipeline is to be carried out.

After reassembly the complete piping systems are to be tested for leaks. It is to be verified that all cargo piping systems are electrically bonded to the hull.

Pressure relief valves on cargo piping are to be function tested. A random selection of valves is to be opened for examination and adjusted.

17.14.8 Cargo area, cargo pump rooms, cargo compressor rooms *(1/6/2021)*

a) Examination of spaces: all cargo pump room, compressor room and control room boundaries are to be generally examined. Gas-tight shaft sealing devices are to be examined. The bottom of cargo pump rooms and cargo compressor rooms is to be presented clean for the examination of stripping devices and gutters.

b) examination of 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.

c) electrical equipment in dangerous zones: electrical equipment and cables in dangerous zones such as cargo pump rooms, cargo compressor rooms and spaces adjacent to and areas above cargo tanks are to be examined as far as practicable and tested with particular regard to:

1) protecting earthing (spot check)

2) integrity of enclosures

3) damage of outer sheath of cables

4) function testing of pressurised equipment and associated alarms

5) testing of systems for de-energising non-certified safe electrical equipment located in spaces protected by airlocks, such as electric motor rooms, cargo control rooms, etc..

d) measurement of electrical insulation: the electrical insulation resistance of the electrical equipment and circuits in dangerous zones is to be measured. These measurements are only to be effected when the unit is in a gas-free or inerted condition. Where a proper record of testing is maintained, consideration may be given to accepting recent readings by the unit's personnel. Reference is also to be made to IACS Recommendation No. 35 - Inspection and maintenance of electrical equipment installed in hazardous areas.

17.14.9 Reliquefaction or refrigeration plants, arrangements for the use of cargo as fuel *(1/6/2021)*

When there is a reliquefaction or refrigeration plant, and/or arrangements for the use of cargo as fuel, the corresponding machinery and equipment, such as cargo pumps, compressors, heat exchangers, condensers, liquid nitrogen tanks, process pressure vessels and other components, are to be surveyed to the same extent as required for similar equipment on board oil tankers at the class renewal survey (refer to Sec 3).

17.14.10 Additional examinations *(1/6/2021)*

In addition to the requirements of [17.14.8] to [17.14.9], the survey also consists of:

a) confirmation that the installation for heating the hull structure is in satisfactory working condition.

b) general examination and testing of leakage detection systems in interbarrier spaces and hold spaces.

c) examination of the gas detection piping system for corrosion or damage; checking, as far as possible, of the integrity of suction lines between suction points and analysing units.

d) examination and tests of systems for the removal of water from interbarrier spaces and hold spaces.

e) examination of portable equipment, such as hoses and spool pieces used for segregation of piping systems for cargo, inert gas and bilge pumping.

17.14.11 Inert gas system *(1/6/2021)*

If an inert gas system such as that installed on board oil tankers is fitted, the requirements given in Sec 3, [7.2] are to be complied with.

In the case of low temperature liquid nitrogen storage, the plant and its associated arrangements for protecting the hull structure against liquid nitrogen leakage are to be examined.

17.15 Barge-LNG Bunker

17.15.1 *(1/6/2021)*

The requirements of [17.15] apply to all barges assigned with additional feature **LNG Bunker** and intended to load LNG from land based or offshore terminals, gas carriers or truck and transfer the LNG to LNG fuelled units.

The additional service feature **LNG Bunker** may be complemented by one or more of the following:

- **IG-Bunker (Inert Gas Bunker)**
- **BT (Bunker Trust)**
- **VCS-Bunker (Vapour Control System Bunker)**

These units are to comply with the survey requirements in [17.8] to [17.14] and with the additional survey requirements in [17.15] for annual surveys

17.15.2 *(1/6/2021)*

These requirements apply to the surveys of the bunker transfer system and related installation, systems, apparatus and equipment within the cargo area. These provisions are additional to the classification requirements applicable to the remainder of the unit, given in Chapter 3 according to the relevant surveys.

17.15.3 Documentation on board *(1/6/2021)*

a) LNG system schematic/piping and instrumentation diagram (P&ID) to permanently mounted in the bunkering control station.

b) type approval and test certificate or test punch mark for cargo hoses, emergency release coupling (ERC), quick connecting disconnecting coupling (QCDC) and pressure swivel

17.15.4 Bunkering station *(1/6/2021)*

a) Examination of LNG bunkering station including bunkering connections for hoses and piping used for liquid and vapour return lines, isolating valves and the emergency shut-down valves, drips trays, water curtain system (when fitted) and, grating platforms, gas detection system, ESD indication, inerting and purging system connection, pressure relieving system for manifold.

b) examination of LNG bunkering station at the unit bow and stern if fitted.

c) examination of air lock to access closed or semi-enclosed bunkering station from other closed or semi-enclosed space.

17.15.5 Piping system *(1/6/2021)*

a) Examination of manifold including manually operated stop valves and remotely/automatically operated valve (ESD valve) fitted in series, pressure gauge, pressure transmitter, temperature gauge, temperature transmitter, sampling point for gas detection, safety relief valve between the presentation flange and ESD bunkering valve.

b) examination of draining and purging (Nitrogen) arrangement including pressure relief valve fitted in piping that which may be isolated due to the ESD activation.

17.15.6 Mooring and Fendeing equipment *(1/6/2021)*

Examination of mooring and fendering equipment.

17.15.7 Instrumentation and Safety systems *(1/6/2021)*

a) Examination of Emergency Shut Down System (ESD) including manual and automatic activation system, override command, if fitted, and relevant alarm indication location.

b) examination of ship-ship link (SSL).

c) confirmation that at least one local manual activation position for the ESD is provided at disposal of the LNG fueled ship being bunkered, e.g. a pendant with sufficient length of cable.

d) examination of LNG bunker monitoring systems (i.e. thermal imaging camera on open areas or gas detector for enclosed spaces).

e) examination of quick connect disconnect coupling (QCDC) of the LNG transfer system.

f) examination of Emergency Release Coupling (ERC) of the LNG transfer system with associated self-closing shut-off valves and manual or automatic control, including automatic stop of bunkering operation in case of loss of power supply to ERC.

17.15.8 Electrical installations *(1/6/2021)*

a) Examination of lighting system at the bunker station.

b) examination of equipment and apparatus within the hazardous area associated with the operating area of transfer arm, if fitted and bunker station.

c) examination of bunkering control station including indication of overfilling alarm and automatic and manual shutdown.

d) confirmation of unobstructed direct or camera view of the gas bunkering station from the bunkering control station.

e) examination of permanently installed thermal imaging camera, if fitted, in bunkering station and bunkering process systems located on open areas.

17.15.9 Transfer arm *(1/6/2021)*

Examination of loading arm, if fitted, with associated safety devices, marking and certificate.

17.15.10 Inert Gas *(1/6/2021)*

Confirmation that inerting capacity not to be less than 5 times the volume of the hose and pipes to be purged when it is based on inert gas storage on board.

17.15.11 *(1/6/2021)*

For additional feature **IG BUNKER**:

a) confirmation that the lines used for the inert gas are independent from the LNG liquid and vapour lines used for normal operation..

b) confirmation that procedure for supplying inert gas to the receiving ship are available on board.

17.15.12 *(1/6/2021)*

For additional feature **BT (Bunker Trust)**:

a) review of LNG analyser approval/certificate and calibration status.

b) review of the approval of the Custody transfer Measuring System.

c) availability and review of sampling procedure.

d) examination of sapling connection and relevant fittings.

17.15.13 *(1/6/2021)*

For additional feature **VCS-Bunker (Vapour Control System Bunker)**:

a) Examination of fittings and equipment to handle vapour return such as re-liquefaction, gas combustion unit, dual-fuel engines and or boilers and for unit not assigned with additional class notation VCS-Transfer.

b) examination of the instruction manual to verify the lay-out of the complete system and confirm the correspondence to the actual system fitted on board.

c) examination of components of the system such as vapour piping (including manifold and hoses), cargo tank gauging equipment, cargo tank level alarms, vapour pressure alarms and vapour balancing, if any, as applicable.

17.16 Barge-Chemical - Application

17.16.1 *(1/6/2021)*

The requirements contained from [17.16] to [17.19] are additional to the requirements applicable to the remainder of the unit, given in Chapter 3 according to the relevant surveys.

17.16.2 *(1/6/2021)*

The requirements for hull surveys apply to the surveys of the hull structure and piping systems in way of cargo tanks, pump rooms, cofferdams, pipe tunnels and void spaces within the cargo area and all ballast tanks.

17.16.3 *(1/6/2021)*

When, in any survey, thickness measurements are required:

- the procedure detailed in Ch 2, Sec 2, [2.3] is to be applied;
- the thickness measurement companyfirm is to be part of the survey planning meeting held prior to commencing the survey.

17.16.4 *(1/6/2021)*

When close-up surveys are required, consideration maybe given by the Surveyor to allow the use of Remote Inspection Techniques (RIT), according to the provisions of Ch 2, Sec 2, [2.3.3] and Ch 2, Sec 2, [2.6].

17.16.5 *(1/6/2021)*

The requirements for machinery surveys apply to surveys of the machinery and equipment in the cargo area or dedicated to cargo service systems.

17.17 Barge-Chemical - Annual survey

17.17.1 Documentation on board *(1/6/2021)*

a) main structural plans of cargo and ballast tanks.

b) previous repair history.

c) extent of use of inert gas system and tank cleaning procedures.

d) thickness measurement reports.

e) list of products to be carried, including maximum vapour pressure, maximum liquid cargo temperature and other important design conditions.

17.17.2 Hull and weather decks *(1/6/2021)*

The survey is to include:

a) examination of the hull plating and its closing appliances as far as can be seen.

b) examination of watertight penetrations as far as practicable.

c) examination of cargo tank openings, including gaskets, covers, coamings and flame screens.

d) examination, as far as practicable, of the cargo tank vent system, including the pressure/vacuum valves and secondary means to prevent overpressure or under pressure as well as devices to prevent the passage of flame.

e) examination of flame screens on vents to all bunker tanks.

f) examination of cargo, bunker, vent piping systems, including vent masts and headers.

g) confirmation that side scuttles and windows in superstructure and deckhouse ends facing the cargo area are in satisfactory condition.

h) confirmation that pumps, valves and pipelines are identified and distinctively marked.

17.17.3 Hull - Cargo pump rooms and pipe tunnels *(1/6/2021)*

a) examination of all pump room bulkheads and pipe tunnels (if any) for signs of chemical cargo leakage or fractures and, in particular, the sealing arrangements of penetrations in pump room bulkheads.

b) examination of the condition of all piping systems, in cargo pump rooms and pipe tunnels (if any).

c) examination of the bilge and ballast arrangements and confirmation that pumps and pipelines are identified.

17.17.4 Machinery - Cargo area and cargo pump rooms *(1/6/2021)*

a) confirmation that potential sources of ignition in or near the cargo pump rooms, such as loose gear, excessive product in bilge, excessive vapours, combustible mate-

rials, etc., are eliminated and that access ladders are in satisfactory condition.

b) examination, as far as practicable, of cargo, bilge, ballast and stripping pumps for excessive gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of the pump room bilge system, and checking that pump foundations are intact.

c) confirmation that the ventilation system, including portable equipment, if any, of all spaces in the cargo area (including cargo pump rooms) is operational, ducting is intact and screens are clean.

d) confirmation that electrical equipment in dangerous zones, cargo pump rooms and other spaces is in satisfactory condition and has been properly maintained.

e) confirmation that the remote operation of the cargo pump room bilge system is satisfactory.

f) confirmation that cargo pump room rescue arrangements are in order.

g) examination, as far as practicable, and confirmation of the satisfactory operation of the arrangements for the ventilation of spaces normally entered during cargo handling operations and other spaces in the cargo area.

h) confirmation that removable pipe lengths or other approved equipment necessary for cargo separation are available and in satisfactory condition.

i) examination, when applicable, of the cargo heating or cooling systems, including any sampling arrangements, and confirmation that the means for measuring the temperature and associated alarms are operating satisfactorily.

j) examination of the cargo transfer arrangements and confirmation that any hoses are suitable for their intended purpose and, where appropriate, type approved or marked with the date of testing.

k) confirmation that any special arrangement made for bow or stern loading/unloading is in satisfactory condition and test of the means of communications and the remote shutdown for the cargo pumps.

l) confirmation that, if applicable, the provisions made for chemical products which have special requirements as per Pt E, Ch 19, Sec 7, [9] are satisfactory.

17.17.5 Machinery - Instrumentation and safety devices *(1/6/2021)*

The survey is to include the following items, as far as required or fitted:

a) confirmation that installed pressure gauges on cargo discharge lines are properly operational.

b) examination of gauging devices, high level alarms and valves associated with overflow control.

c) confirmation that devices provided for measuring the temperature of the cargo and associated alarms operate satisfactorily.

d) confirmation that the required gas detection instruments are on board and satisfactory arrangements have been made for the supply of any required vapour detection tubes.

e) confirmation that the cargo sample stowage arrangements are in satisfactory condition.

f) confirmation that the system for continuous monitoring of the concentration of flammable vapours is in satisfactory condition.

g) confirmation, as far as practicable, that the intrinsically safe systems and circuits used for measurement, monitoring, control and communication purposes in all hazardous locations are being properly maintained.

h) confirmation that sampling points or detector heads are located in suitable positions in order that potentially dangerous leakages are readily detected.

17.17.6 Machinery - Inert gas system and inert/padding/drying gas *(1/6/2021)*

a) the examinations and tests as provided for the annual survey of inert gas systems of oil tankers, given in Sec 3, [3.3].

b) if an inert gas system consisting of a gas container package is fitted, arrangements are to be made for sufficient inert or padding gas to be carried to compensate for normal losses and means are to be provided for monitoring of ullage spaces.

c) if drying gas is necessary to supply the cargo spaces, arrangements are to be made for sufficient drying gas to be carried to compensate for normal losses and means are to be provided for monitoring of ullage spaces.

d) when drying agents are used on air inlets to cargo tanks, it is to be verified that arrangements are made for sufficient medium to be carried.

17.18 Barge-chemical - Intermediate survey

17.18.1 Weather decks *(1/6/2021)*

The survey is to include:

a) examination, as far as applicable, of cargo, stripping, cargo washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers. If upon examination there is any doubt as to the condition of the piping, pressure testing, thickness measurement or both may be required.

b) confirmation that the pipelines and independent cargo tanks, where applicable, are electrically bonded to the hull.

c) examination of vent line drainage arrangements.

17.18.2 Units between 5 and 10 years of age *(1/6/2021)*

An overall survey of representative ballast tanks selected by overall survey of representative tanks selected by the Surveyor is to be carried out. If such inspections reveal no visible structural defects, the examination may be limited to verification that the hard protective coating remains in good condition.

A ballast tank is to be examined at subsequent annual surveys where:

a) a hard protective coating has not been applied since the time of construction, or

b) a soft or semi-hard coating has been applied, or

c) substantial corrosion is found within the tank, or d) the hard protective coating is found to be in less than good condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

In addition to the requirements above, suspect areas identified at previous surveys are to be examined.

17.18.3 Units between 10 and 15 years of age *(1/6/2021)*

Overall inspection of all the ballast tanks and overall inspection of at least two representative cargo tanks is to be carried out.

17.18.4 Units over 15 years of age *(1/6/2021)*

Overall inspection of all ballast and cargo tanks is to be carried out.

17.18.5 Close up survey *(1/6/2021)*

The minimum requirements for close-up surveys at intermediate survey are given in Tab 4.

17.18.6 Thickness measurement *(1/6/2021)*

The minimum requirements for close-up surveys at intermediate survey are given in Tab 5.

Table 4 : Requirements for close-up survey at class intermediate survey of Barge-Chemical *(1/6/2021)*

Age of unit (in years at time of intermediate survey)	
10 < age ≤15	age > 15
Close-up survey of: a) all web frames and both transverse bulkheads in a representative ballast tank **(1)** and **(2)** b) one transverse bulkhead in another representative ballast tank **(2)**	Close-up survey of: a) all web frames and both transverse bulkheads in two representative ballast tanks **(1)** and **(2)**
(1) Complete transverse web frame including adjacent structural members **(2)** Transverse bulkhead complete, including girder system and adjacent members, and adjacent longitudinal bulkhead structure Note 1: Ballast tanks include topside, double hull side, double bottom, hopper side, or any combined arrangement of the aforementioned, and peak tanks where fitted. Note 2: For areas in tanks where protective coating is found to be in good condition, the extent of close-up survey may be specially considered by the Society. Note 3: The extent of close-up surveys may be extended by the Surveyor as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases: a) in particular, in tanks having structural arrangements or details which have suffered defects in similar tanks, or on similar units according to available information; b) in tanks having structures approved with reduced scantlings.	

Table 5 : Requirements for thickness measurement at class intermediate survey of Barge-Chemical *(1/6/2021)*

Age of unit (in years at time of intermediate survey)	
10 < age ≤15	age > 15
Suspect areas	Suspect areas
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up

17.18.7 Machinery - Cargo area and cargo pump rooms *(1/6/2021)*

a) 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.

b) 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 unit's personnel.

c) the satisfactory condition of the cargo heating/cooling system is to be verified.

17.18.8 Machinery - Inert gas system *(1/6/2021)*

The survey is to include:

For units over 10 years old at the time of the intermediate survey due date, the following is to be carried out:

a) main parts such as the scrubber, washing machines, blowers, deck water seal and non-return valve are to be opened out as considered necessary and examined.

b) gas distribution lines and shut-off valves, including soot blower interlocking devices, are to be examined as deemed necessary.

c) all automatic shutdown devices and alarms are to be examined and tested.

17.19 Barge-chemical - Renewal survey

17.19.1 General - Scope of survey *(1/6/2021)*

In addition to the requirements of annual surveys, the class renewal survey is to include examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in [17.19.5], is in satisfactory condition and is fit for its intended purpose for the new period of class to be assigned, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

All cargo tanks, ballast tanks, including double bottom tanks, pump rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull are to be examined, and this examination is to be supplemented by thickness measurement and testing as required in [17.19.3] and [17.19.4], respectively, to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

The survey extent of ballast tanks converted to void spaces will be specially considered by the Society in relation to the requirements for ballast tanks.

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

A ballast tank is to be examined at subsequent annual surveys where:

a) a hard protective coating has not been applied since the time of construction, or

b) a soft or semi-hard coating has been applied, or

c) substantial corrosion is found within the tank, or

d) the hard protective coating is found to be in poor condition and the hard protective coating is not repaired to the satisfaction of the Surveyor.

Thickness measurements are to be carried out as deemed necessary by the Surveyor.

In the case of independent cargo tanks, the survey consists of:

a) an external examination of cargo tanks.

b) an examination of cargo tank supports, chocks, keys and the adjacent hull structure with non-destructive testing if deemed necessary.

17.19.2 Overall and close-up surveys *(1/6/2021)*

Each class renewal survey is to include an overall survey of all tanks and all spaces. For fuel oil, lube oil and fresh water tanks, however, the requirements given in Ch 3, Sec 5, Tab 5 are to be complied with.

The survey of stainless steel tanks may be carried out as an overall survey supplemented by close-up survey as deemed necessary by the Surveyor.

Each class renewal survey is to include a close-up examination of sufficient extent to establish the condition of cargo tanks and salt water ballast tanks.

The minimum requirements for close-up surveys are given in Tab 6.

The Surveyor may extend the close-up survey as deemed necessary, taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- where tanks have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.
- where tanks have structures approved with reduced scantlings due to an approved corrosion control system.

For areas in tanks where hard protective coatings are found to be in good condition, as defined in Ch 2, Sec 2, [2.2.13], the extent of close-up surveys required according to Tab 6 may be specially considered.

Table 6 : Requirements for close-up survey at class renewal survey of Barge-Chemical *(1/6/2021)*

Age of unit (in years at time of class renewal survey)			
age ≤ 5	5 < age ≤ 10 (see Note 1 and Note 2)	10 < age ≤15 (see Note 1 and Note 2)	age > 15
B / (2) ONE DECK TRANSVERSE - in a cargo tank or on deck	A / (1) ONE WEB FRAME RING - in a ballast wing tank (for single hull) or ballast double hull tank (for double hull) (see Note 3)	A / (1) ALL WEB FRAME RINGS - in a ballast wing tank or ballast double hull tank (see Note 3	A / (1) ALL WEB FRAME RINGS - in all ballast tanks
B ONE DECK TRANSVERSE - in a cargo wing tank or on deck (for single hull)	B / (2) ONE DECK TRANSVERSE - in a cargo tank or on deck	B ONE DECK TRANSVERSE - in each remaining ballast tank or on deck (for S.H.)	A / (7) ALL WEB FRAME RINGS - in a cargo wing tank
	B ONE DECK TRANSVERSE - in a cargo wing tank or on deck (for single hull)	B / (2) ONE DECK TRANSVERSE - in two cargo centre tanks or on deck (for single hull) and one deck transverse in two cargo tanks (for double hull)	A / (7) ONE WEB FRAME RING - in each remaining cargo tank
	D / C / (4) ONE TRANSVERSE BULKHEAD (lower part for single hull - complete for double hull) - in a ballast tank	C BOTH TRANSVERSE BULKHEADS - in a ballast wing tank (for single hull) (4) ONE TRANSVERSE BULKHEAD in each ballast tank (for double hull) (see Note 3)	C / (3) ALL TRANSVERSE BULKHEADS - in all cargo tanks

Note 1: (1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements for double hull chemical tankers (see Fig 1, Fig 2 and Fig 3).

(1) Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.

(2) Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).

(3) Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.

(4) Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tankr, inner bottom plating, hopper side, connecting brackets.

(5) Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.

(6) The knuckle area and the upper part (5 metres approximately), including adjacent structural members. Knuckle area is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.

(7) Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

Note 2: A-B-C-D: are areas to be subjected to close-up surveys and thickness measurements for single hull chemical tankers (see Fig 1 and Fig 2).

A : Complete transverse web frame ring including adjacent structural members.

Deck transverse including adjacent deck structural members.

C: Transverse bulkhead complete - including girder system and adjacent structural members.

D: Transverse bulkhead lower part - including girder system and adjacent structural members.

Note 3: Ballast double hull tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate.

Note 4: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed.

Age of unit (in years at time of class renewal survey)			
age ≤ 5	5 < age ≤ 10 (see Note 1 and Note 2)	10 < age ≤15 (see Note 1 and Note 2)	age > 15
	D / (5) ONE TRANSVERSE BULKHEAD - in a cargo wing tank	D ONE TRANSVERSE BULKHEAD - in each remaining ballast tank (for single hull)	C / (4) ALL TRANSVERSE BULKHEADS - in all ballast tanks
	D / (5) ONE TRANSVERSE BULKHEAD - in a cargo centre tank (see Note 4)	D / (5) ONE TRANSVERSE BULKHEAD - in two cargo centre tanks (see Note 4) ONE TRANSVERSE BULKHEAD - in a cargo wing tank	

Note 1: (1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements for double hull chemical tankers (see Fig 1, Fig 2 and Fig 3).

(1) Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double bottom tank and deck transverse in double deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.

(2) Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).

(3) Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.

(4) Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double bottom tankr, inner bottom plating, hopper side, connecting brackets.

(5) Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.

(6) The knuckle area and the upper part (5 metres approximately), including adjacent structural members. Knuckle area is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 metres from the corners both on the bulkhead and the double bottom.

(7) Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

Note 2: A-B-C-D: are areas to be subjected to close-up surveys and thickness measurements for single hull chemical tankers (see Fig 1 and Fig 2).

A : Complete transverse web frame ring including adjacent structural members.

Deck transverse including adjacent deck structural members.

C: Transverse bulkhead complete - including girder system and adjacent structural members.

D: Transverse bulkhead lower part - including girder system and adjacent structural members.

Note 3: Ballast double hull tank: means double bottom tank plus double side tank plus double deck tank, as applicable, even if these tanks are separate.

Note 4: Where no centre cargo tanks are fitted (as in case of centre longitudinal bulkhead), transverse bulkheads in wing tanks are to be surveyed.

Figure 1 : Representative transverse section of Barge-Chemical. Areas A & B and 1 and 2 *(1/6/2021)*

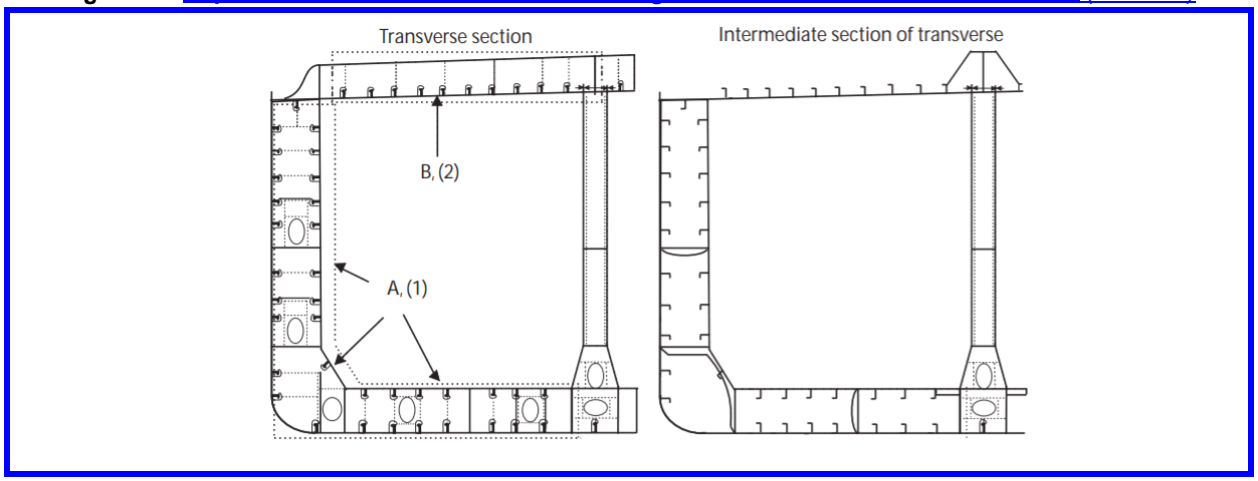


Figure 2 : Representative transverse section of Barge-Chemical. Areas C & D and 3, 4 and 5 *(1/6/2021)*

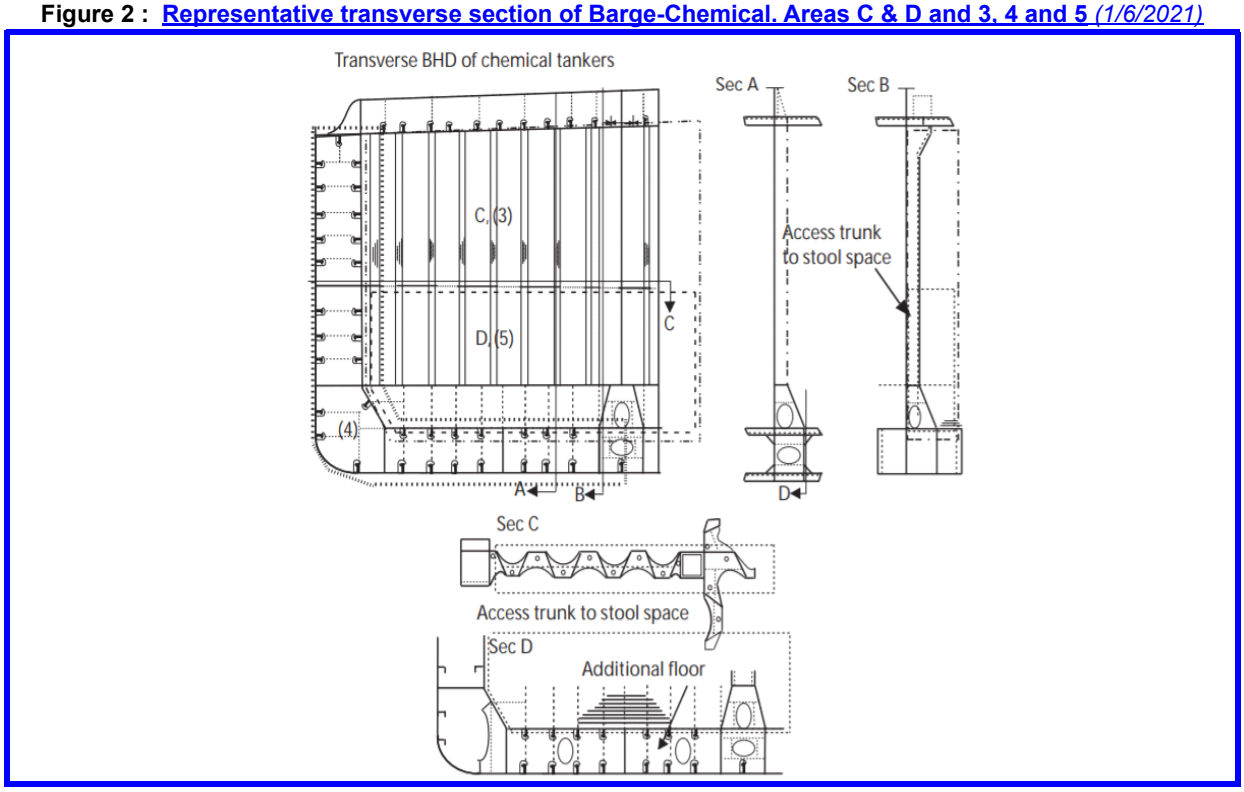
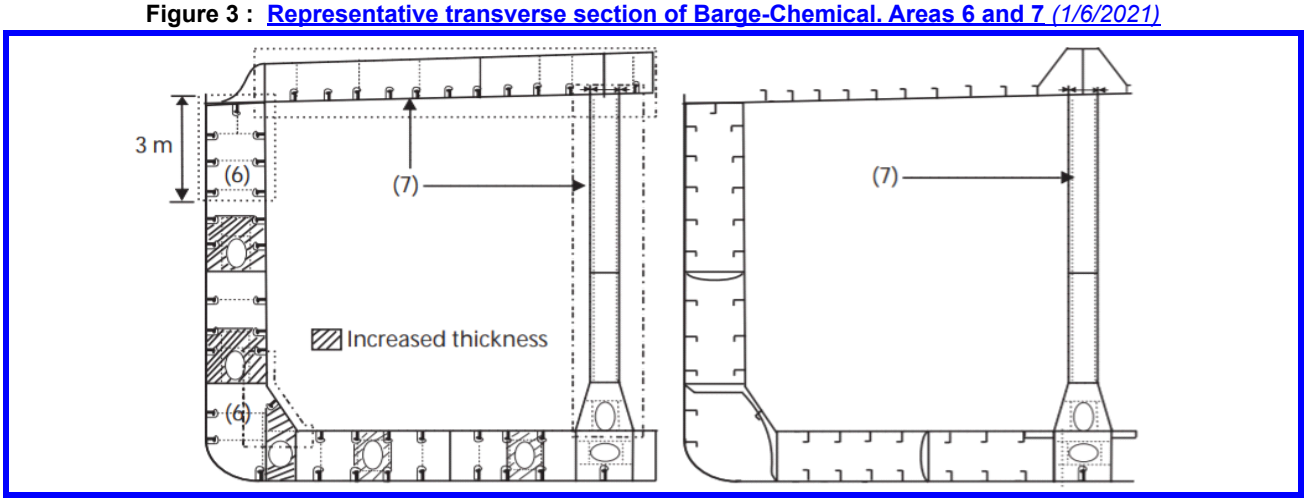


Figure 3 : Representative transverse section of Barge-Chemical. Areas 6 and 7 *(1/6/2021)*



17.19.3 Thickness measurement *(1/6/2021)*

The minimum requirements for thickness measurements at class renewal survey are given in Tab 7.

Thickness measurement of stainless steel hull structure and piping may be waived by the Society, except for clad steel plating.

When pitting is found on bottom plating and its intensity is 20% or more, thickness measurements are to be extended in order to determine the actual plate thickness out of the pits and the depth of the pits. Where the wastage is in the substantial corrosion range or the average depth of pitting is 1/3 or more of the actual plate thickness, the pitted plate is to be considered as a substantially corroded area.

For areas in tanks where hard protective coatings are found to be in good condition as defined in Ch 2, Sec 2, [2.2.13], the extent of thickness measurements according to Tab 5 may be specially considered.

Table 7 : Requirements for thickness measurements at class renewal survey of Barge-Chemical *(1/6/2021)*

Age of unit (in years at time of class renewal survey)			
age ≤ 5	5 < age ≤ 10	10 < age ≤15	age > 15
Suspect areas	Suspect areas	Suspect areas	Suspect areas
	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 3	Within the cargo area: o each deck plate two transverse sections **(1) (2)** o all wind and water strake	Within the cargo area: • each deck plate • each bottom plate three transverse sections **(1) (2)**
		Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 3	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Tab 3

(1) Transverse sections are to be chosen where the largest reductions are likely to occur or as revealed by deck plating measurements.

(2) At least one section is to be within 0,5 L amidships and, where applicable, in way of a ballast tank.

17.19.4 Tank Testing *(1/6/2021)*

Boundaries of double bottom, deep, ballast, peak and other tanks, including holds adapted for the carriage of salt water ballast, are to be tested with a head of liquid to the top of air pipes or to near the top of hatches for ballast/cargo holds.

The minimum requirements for cargo tank testing at Special Survey are given in Tab 8.

Cargo tank testing carried out by the vessel's crew under the direction of the Master may be accepted by the surveyor provided the following conditions are complied with:

a) a tank testing procedure, specifying fill heights, tanks being filled and bulkheads being tested, has been submitted by the owner and reviewed by the Society prior to the testing being carried out;

b) there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;

c) the tank testing has been satisfactorily carried out within special survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed;

d) the satisfactory results of the testing are recorded in the vessel's logbook;

e) the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey.

The Surveyor may extend the tank testing as deemed necessary.

Table 8 : Requirements for cargo tank testing at class renewal survey of Barge-Chemical *(1/6/2021)*

Age of unit (in years at time of intermediate survey)	
5 < age ≤10	age > 10
Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, pump rooms or cofferdams	All cargo tank bulkheadsa)

17.19.5 Hull - Cargo area and cargo pump rooms *(1/6/2021)*

Cargo piping on deck and cargo and ballast piping within the cargo area are to be examined and operationally tested to working pressure to the attending Surveyor's satisfaction to ensure that their tightness and condition remain satisfactory.

Special attention is to be given to any ballast piping in cargo tanks and cargo piping in ballast tanks and void spaces. Surveyors are to be advised on all occasions when this piping, including valves and fittings, is opened during repair periods and can be examined internally.

The surveyor may require dismanthing and/or thickness measurements of piping. A hydraulic test is to be carried out in the event of repair or dismanthing of cargo or ballast piping, or where doubts arise.

Vent line drainage arrangements are to be examined.

It is to be verified that cargo piping and independent cargo tanks, where applicable, are electrically bonded to the hull.

For units over 10 years of age, selected steel cargo pipes outside cargo tanks, cargo/slop discharge pipes passing through ballast tanks and void spaces and ballast pipes passing through cargo tanks are to be:

a) subjected to thickness measurement at random, or selected pipe lengths are to be opened for internal inspection,

b) pressure tested to the maximum working pressure. Special attention is to be given to cargo/slop discharge piping through ballast tanks and void spaces.

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

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.

17.19.6 **Machinery - Cargo area and cargo pump rooms** *(1/6/2021)*

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.

Where a washing system is fitted, piping, pumps, valves and deck-mounted washing machines are to be examined and tested for signs of leakage, and anchoring devices of deck-mounted washing machines are to be checked to the Surveyor's satisfaction.

The satisfactory condition of the cargo heating/cooling system is to be verified and, if deemed necessary by the Surveyor, the system is to be pressure tested.

Heat exchangers and anti-sparking fans are to be examined.

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

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 unit 's personnel.

17.19.7 **Machinery - Inert gas system** *(1/6/2021)*

The requirements given in [17.18.8] for intermediate survey are to be complied with.

Running test, including check of alarms and safety devices, is to be carried out.

18 Oil Carrier-Assisted Propulsion, Palm Oil Carrier-Assisted Propulsion

18.1 Annual survey - Hull items

18.1.1 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.

18.1.2 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 chemical cargo 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.

18.2 Annual survey - Cargo machinery items

18.2.1 Cargo area and cargo pump rooms

The Owner or his representative is to declare to the attending Surveyor that no modifications or alterations which might impair safety have been made to the various installations in dangerous zones without prior approval from the Society.

The survey is to include:

- confirmation that potential sources of ignition in or near the cargo pump rooms, such as loose gear, excessive product in bilge, excessive vapours, combustible materials, are eliminated and that access ladders are in satisfactory condition
- examination, as far as practicable, of cargo, bilge, ballast and stripping pumps for excessive gland seal leakage, verification of proper operation of electrical and mechanical remote operating and shutdown devices and operation of pump room bilge system, and checking that pump foundations are intact
- confirmation that the ventilation system, including portable equipment, if any, of all spaces in the cargo area (including cargo pump room) is operational, ducting is intact and screens are clean
- confirmation that electrical equipment in dangerous zones, cargo pump rooms and other spaces is in satisfactory condition and has been properly maintained
- confirmation that the remote operation of the cargo pump room bilge system is satisfactory
- examination of the cargo heating system
- examination of the cargo-transfer arrangement and confirmation that the ship's cargo hoses are suitable for their intended purpose and in satisfactory condition
- confirmation that any special arrangement made for bow or stern loading/unloading is in satisfactory condition.

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SECTION 1 GENERAL

1 General

1.1 Application

1.1.1 *(1/6/2021)*

Ships complying with the requirements of this Chapter are eligible for the assignment of one of the following service notations applicable to non-propelled units, as defined in Pt A, Ch 1, Sec 2, [4.9]:

- ~~service notations:~~
  - **barge** with the additional service features:
    - **general cargo**
    - **oil**
    - **liquefied gas**
    - **LNG bunker**
    - **chemical**
    - **tug combined**
    - **accommodation**
  - **pontoon**
  - **pontoon-crane**

The service notation **barge-oil** may be completed by the additional service feature **flash point > 60°C**, where the unit carries only oil with flash point exceeding 60°C.

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 taking into account the exemptions given in the different Sections of this Chapter, and with the requirements of this Chapter, which are specific to non-propelled units.

1.1.3 *(1/6/2021)*

Barge-general cargo are to comply with the requirements in this Chapter for barge that are not specific to barge with other additional service features.

1.1.4 *(1/6/2021)*

Barge-liquefied gas and **barge-LNG bunker** are to comply with the requirements of the latest version of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as amended, as specified in Ch 9, [1.1.1] and [1.1.2].

1.1.5 *(1/6/2021)*

Barge-chemical are to comply with the requirements of the latest version of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), as amended, as specified in Ch 8 [1.1.1] to [1.1.3].

The requirements in this chapter applicable to barge-chemical apply to units intended to carry products listed in the table in Chapter 17 of the IBC Code. For the carriage of products listed in the table in Chapter 18 of the IBC Code and products not at present listed in either of the tables in Chapter 17 or Chapter 18 of the IBC Code, the Society reserves the right to establish specific requirements.

1.2 Summary table

1.2.1 Tab 1 indicates, for ready reference, the Sections of this Chapter containing specific requirements applicable to non-propelled units.

Table 1 *(1/6/2021)*

Main subject	Reference
Ship arrangement	**(1)**
Hull and ~~s~~Stability	Sec 2
Machinery ~~s~~Systems	Sec 3
Additional Requirements for Machinery and Cargo ~~-~~Systems for~~of~~ ~~Barge- Oil, Flashp~~oint > 60°C	Sec 4
Additional Requirements for Machinery and Cargo Systems of Barge-Liquefied Gas	Sec 5
Additional Requirements for Machinery and Cargo Systems of Barge-LNG Bunker	Sec 6
Additional Requirements for Machinery and Cargo Systems of Barge-Chemical	Sec 7
Electrical ~~i~~Installations	Sec ~~5~~8
Automation	**(1)**
Fire protection, detection and extinction	**(1)**
(1) No specific requirements for non-propelled units are given in this Chapter.	

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**, ~~and~~ **barge-accommodation**, **barge-liquified gas**, **barge-LNG bulker** and **barge-chemical**, are indicated in [2.3] ~~and~~to ~~[2.4]~~[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

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.

2.1.3 Stability calculations

Stability calculations may be carried out according to the following criteria:

- no account is to be taken of the buoyancy of deck cargo (except buoyancy credit for adequately secured timber)
- consideration is to be given to such factors as water absorption (e.g. timber), trapped water in cargo (e.g. pipes) and ice accretion
- in carrying out wind heel calculations:
  - the wind pressure is to be constant and for general operations considered to act on a solid mass extending over the length of the deck and to an assumed height above the deck
  - the centre of gravity of the cargo is to be assumed at a point mid-height of the cargo
  - the wind lever arm is to be taken from the centre of the deck cargo to a point at one half the draught
- calculations are to be carried out covering the full range of operating draughts
- the downflooding angle is to be taken as the angle at which an opening through which progressive flooding may take place is immersed. This would not be an opening closed by a watertight manhole cover or a vent fitted with an automatic closure.

2.1.4 Intact stability criteria

The following intact stability criteria are to be complied with, for the loading conditions specified in *Pt B, Ch 3, App 2, [1.2.1]* and *Pt B, Ch 3, App 2, [1.2.2]*:

- the area under the righting lever curve up to the angle of maximum righting lever is to be not less than 0,08 m·rad
- the static angle of heel due to a uniformly distributed wind load of 0,54 kPa (wind speed 30 m/s) may not exceed a heeling angle corresponding to half the freeboard for the relevant loading condition, where the lever of wind heeling moment is measured from the centroid of the windage area to half the draught
- The minimum range of stability is to be:
  - 20° for L < 100 m
  - 20° - 0,1° (L - 100) for 100 ≤ L ≤ 150 m
  - 15° for L > 150 m.

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

2.2.1 Application

The requirements of this item apply to ships with the service notation **pontoon - crane** and specify the criteria these ships are to satisfy during cargo lifting in addition to those in [2.1].

2.2.2 Intact stability criteria during cargo lifting

The following intact stability criteria are to be complied with:

- $\theta_C \leq 15°$
- $GZ_C \leq 0,6\ GZ_{MAX}$
- $A_1 \geq 0,4\ A_{TOT}$

where:

θ_C : Heeling angle of equilibrium, corresponding to the first intersection between heeling and righting arms (see Fig 1)

GZ_C, GZ_{MAX}: Defined in Fig 1

A_1 : Area, in m·rad, contained between the righting lever and the heeling arm curves, measured from the heeling angle θ_C to the heeling angle equal to the lesser of:

- heeling angle θ_R of loss of stability, corresponding to the second intersection between heeling and righting arms (see Fig 1)
- heeling angle θ_F, corresponding to flooding of unprotected openings as defined in Pt F, Ch 13, Sec 11, [2.1.4] (see Fig 1)

A_{TOT} : Total area, in m·rad, below the righting lever curve.

In the above formula, the heeling arm, corresponding to the cargo lifting, is to be obtained, in m, from the following formula:

$$b = \frac{Pd - Zz}{\Delta}$$

where:

P : Cargo lifting mass, in t

d : Transversal distance, in m, of lifting cargo to the longitudinal plane (see Fig 1)

Z : Mass, in t, of ballast used for righting the pontoon, if applicable (see Fig 1)

z : Transversal distance, in m, of the centre of gravity of Z to the longitudinal plane (see Fig 1)

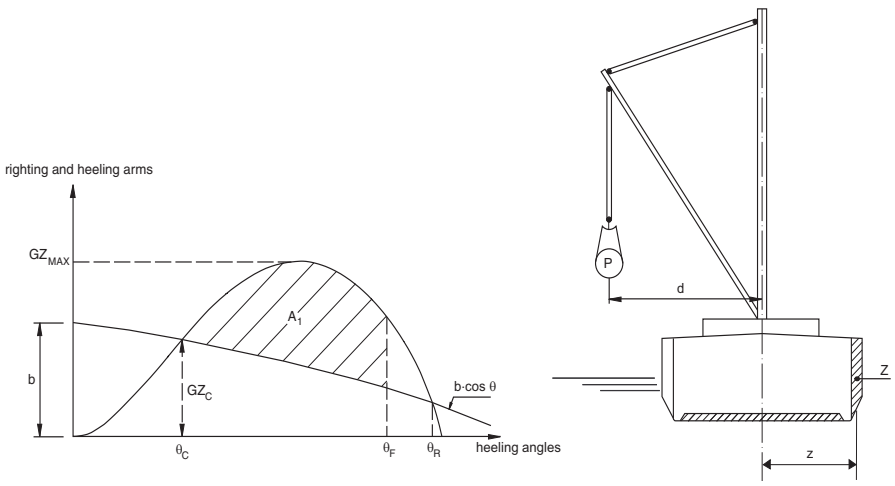
Δ : Displacement, in t, at the loading condition considered.

The above check is to be carried out considering the most unfavourable situations of cargo lifting combined with the lesser initial metacentric height GM, corrected according to the requirements in Pt B, Ch 3, Sec 2, [4].

The residual freeboard of the unit during lifting operations in the most unfavourable stability condition is to be not less than 0,30 m. However, the heeling of the unit is not to produce in the lifting devices higher loads than those envisaged by the Manufacturer, generally expected to be 5° in the boom plane and 2° transversally in the case of a crane.

The vertical position of the centre of gravity of cargo lifting is to be assumed in correspondence of the suspension point.

Figure 1 : Cargo lifting



2.2.3 Intact stability criteria in the event of sudden loss of cargo during lifting

This additional requirement is compulsory when counterweights or ballasting of the ship are necessary or when deemed necessary by the Society taking into account the ship dimensions and the weights lifted.

The case of a hypothetical loss of cargo during lifting due to a break of the lifting cable is to be considered.

In this case, the following intact stability criteria are to be complied with:

- $\frac{A_2}{A_1} \geq 1$
- $\theta_2 - \theta_3 \geq 20°$

where:

A_1 : Area, in m·rad, contained between the righting lever and the heeling arm curves, measured from the heeling angle θ_1 to the heeling angle θ_C (see Fig 3),

A_2 : Area, in m·rad, contained between the righting lever and the heeling arm curves, measured from the heeling angle θ_C to the heeling angle θ_2 (see Fig 3)

A_3 : Area, in m.rad, contained between the righting lever and the heeling arm curves, measured from the heeling angle θ_C to the heeling angle θ_3 (see Fig 3)

θ_1 : Heeling angle of equilibrium during lifting (see Fig 3)

θ_2 : Heeling angle corresponding to the lesser of θ_R and θ_F

θ_C : Heeling angle of equilibrium, corresponding to the first intersection between heeling and righting arms (see Fig 3)

θ_3 : Maximum heeling angle due to roll, at which $A_3 = A_1$, to be taken not greater than 30° (angle in correspondence of which the loaded cargo on deck is assumed to shift (see Fig 3)

θ_R : Heeling angle of loss of stability, corresponding to the second intersection between heeling and righting arms (see Fig 3).

θ_F : Heeling angle at which progressive flooding may occur (see Fig 3)

In the above formulae, the heeling arm, induced on the ship by the cargo loss, is to be obtained, in m, from the following formula:

$$b = \frac{Zz}{\Delta}\cos\theta$$

where Z, z and Δ are defined in [2.2.2].

2.3 Additional intact stability criteria for ships with service notation "barge-oil"

2.3.1 General

The stability of the ship for the loading conditions in Pt B, Ch 3, App 2, [1.2.6] is to be in compliance with the requirements in Pt B, Ch 3, Sec 2. In addition, the requirements in [2.3.2] are to be complied with.

2.3.2 Liquid transfer operations

Ships with certain internal subdivision may be subjected to lolling during liquid transfer operations such as loading, unloading or ballasting. In order to prevent the effect of lolling, the design of barges of 5000 t deadweight and above is to be such that the following criteria are complied with:

a) The intact stability criteria reported in b) is to be complied with for the worst possible condition of loading and ballasting as defined in c), consistent with good operational practice, including the intermediate stages of liquid transfer operations. Under all conditions the ballast tanks are to be assumed slack.

b) The initial metacentric height GMo, in m, corrected for free surface measured at 0° heel, is to be not less than 0,15. For the purpose of calculating GMo, liquid surface corrections are to be based on the appropriate upright free surface inertia moment.

c) The vessel is to be loaded with:
   - all cargo tanks filled to a level corresponding to the maximum combined total of vertical moment of volume plus free surface inertia moment at 0° heel, for each individual tank
   - cargo density corresponding to the available cargo deadweight at the displacement at which transverse KM reaches a minimum value
   - full departure consumable
   - 1% of the total water ballast capacity.The maximum free surface moment is to be assumed in all ballast tanks.

2.4 Additional intact stability criteria for units with service notation "barge - accommodation"

2.4.1 Application

In addition to the requirements of [2.1], the requirements of this item [2.4] apply to ship units with the service notation **barge - accommodation**.

2.4.2 Righting moment and heeling moment curves

a) Curves of righting moments and of wind heeling moments similar to Fig 3 with supporting calculations are to be prepared covering the full range of operating draughts.

   The righting moment curves and wind heeling moment curves are to be related to the most critical axes.

   Account is to be taken of the free surface of liquid in tanks.

   Where equipment is of such a nature that it can be lowered and stowed, additional wind heeling moment curves may be required and such data are to clearly indicate the position of such equipment.

b) The curves of wind heeling moments are to be drawn for wind forces calculated by the following formula:

   $F = 0,5\ C_s \cdot C_H \cdot r \cdot V^2 \cdot A$

   where:

   F : the wind force, in N

C_s : the shape coefficient depending on the shape of the structural member exposed to the wind (see Tab 1);

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

r : the air mass density (1,222 kg/m^3)

V : the wind velocity, in m/s;

A : the projected area of all exposed surfaces in either the upright or the heeled condition, in m^2.

Shapes or combinations of shapes which do not readily fall into the specified categories will be subject to special consideration by the Society.

Realistic operating conditions are to be evaluated as follows:

1) The unit is to be capable of remaining in the operating mode with a sustained wind velocity of not less than 36 m/s (70 knots).

2) The capability of remaining in safe condition during a severe storm condition, with a sustained wind velocity of not less than 51,5 m/s (100 knots), in a reasonable period of time for the particular unit.

3) In all cases, the limiting wind velocities are to be specified and instructions are to be included in the Stability booklet for changing the mode of operation by redistribution of the variable load and equipment, by changing draughts, or both.

4) Consideration may be given to a reduced sustained wind velocity of not less than 25,8 m/s (50 knots). Particulars of the applicable service restrictions are to be recorded in the stability booklet. For the purpose of calculation, it is to be assumed that the unit is floating free of mooring restraints.

In calculating the projected areas to the vertical plane, the area of surfaces exposed to wind due to heel or trim, such as under-deck surfaces, etc., is to be included using the appropriate shape factor.

An appropriate shape coefficient is to be taken from Tab 1.

In calculating the wind forces, the following procedures are recommended:

- in the case of units with columns, the projected areas of all columns are to be included; i.e. no shielding allowance is to be taken;
- the block projected area of a clustering of deckhouses may be used in lieu of the calculation of each individual area. The shape coefficient may be assumed to be 1,1;
- isolated houses, structural shapes, cranes, etc. are to be calculated individually, using the appropriate shape coefficient.

c) In calculating the wind heeling moments, the lever of the wind overturning force is to be taken vertically from the centre of pressure of all surfaces exposed to the wind to the centre of lateral resistance or, if available, the centre of hydrodynamic pressure, of the underwater body of the unit.

The unit is to be assumed floating free of mooring restraints.

However, the possible detrimental effects of mooring restraints are to be considered.

d) The wind heeling moment curve is to be calculated for a sufficient number of heel angles to define the curve. For unit shaped hulls, the curve may be assumed to vary as the cosine function of unit heel.

Table 1 : Values of the shape coefficient C_s

Shape	C_s
Spherical	0,4
Cylindrical	0,5
Large flat surfaces (hull, deckhouse, smooth under-deck areas)	1,0
Drilling derrick	1,25
Wires	1,2
Exposed beams and girders under deck	1,3
Small parts	1,4
Isolated shapes (crane, beam, etc.)	1,5
Clustered deckhouses or similar structures	1,1

Table 2 : Values of the height coefficient C_H

Height above sea level (m)	C_H
0 - 15,3	1,00
15,3 - 30,5	1,10
30,5 - 46,0	1,20
46,0 - 61,0	1,30
61,0 - 76,0	1,37
76,0 - 91,5	1,43
91,5 - 106,5	1,48
106,5 - 122,0	1,52
122,0 - 137,0	1,56
137,0 - 152,5	1,60
152,5 - 167,5	1,63
167,5 - 183,0	1,67
183,0 - 198,0	1,70
198,0 - 213,5	1,72
213,5 - 228,5	1,75
228,5 - 244,0	1,77
244,0 - 256,0	1,79
above 256	1,80

2.4.3 Intact stability

a) The stability of a unit is to meet the following criteria (see also Fig 2).

1) For all units, the area under the righting moment curve to the second intercept or downflooding angle, whichever is less, is to be not less than 40% in excess of the area under the wind heeling moment curve to the same limiting angle.

2) The righting moment curve is to be positive over the entire range of angles from upright to the second intercept.

3) A check is to be carried out to ensure that the lesser of the downflooding angle and the second intercept angle is not greater than the following angles:

- the angle for which the stresses of whichever primary structural element become excessive;
- the limit angle for which lashes of loads on the decks are calculated.

b) Each unit is to be capable of attaining a severe storm condition in a period of time consistent with the meteorological conditions. The procedures recommended and the approximate length of time required, are to be contained in the stability booklet.

It is to be possible to achieve the severe storm condition without the removal or relocation of solid consumables or other variable load. However, the Society may permit relaxations in a geographic location where weather conditions annually or seasonally do not become sufficiently severe to require a unit to go to severe storm condition.

The geographic locations, weather conditions and loading conditions in which this is permitted are to be identified in the stability booklet.

c) Alternative stability criteria may be considered by the Society provided an equivalent level of safety is maintained and if they are demonstrated to afford adequate positive initial stability. In determining the acceptability of such criteria, the Society may consider at least the following and take into account as appropriate:

1) environmental conditions representing realistic winds (including gusts) and waves appropriate for worldwide service in various modes of operation;

2) dynamic response of a unit. Analysis is to include the results of wind tunnel tests, wave tank model tests and non-linear simulation, where appropriate. Any wind and wave spectra used is to cover sufficient frequency ranges to ensure that critical motion responses are obtained;

3) potential for flooding taking into account dynamic responses and wave profile in a seaway;

4) susceptibility to capsizing considering the unit's restoration energy and the static inclination due to the mean wind speed and the maximum dynamic response;

5) an adequate safety margin to account for uncertainties.

2.4.4 Intact stability for units to be moored in sheltered waters

The initial metacentric height GM_0, duly corrected for free surfaces effects of liquids, see Pt B, Ch 3, Sec 2, [4], is to result not less than 0,35 m in any expected operating condition.

2.5 Additional intact stability criteria for units with service notation "barge - liquified gas" and "barge - LNG bunker"

2.5.1 General *(1/6/2021)*

The stability of the ship for the loading conditions in Pt B, Ch 3, App 2, [1.2.8] is to be in compliance with the requirements in Pt B, Ch 3, Sec 2.

2.6 Additional intact stability criteria for units with service notation "barge - chemical"

2.6.1 General *(1/6/2021)*

The stability of the ship for the loading conditions in Pt B, Ch 3, App 2, [1.2.7] is to be in compliance with the requirements in Pt B, Ch 3, Sec 2.

3 Structure design principles

3.1 Hull structure

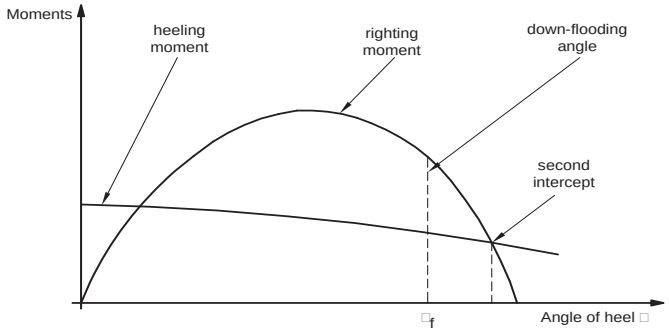
3.1.1 Framing of ships with one of the service notations “pontoon” and “pontoon - crane”

In general, ships with one of the service notations **pontoon** and **pontoon - crane** are to be longitudinally framed.

3.1.2 Supports for docked non-propelled units

Adequate supports are to be fitted on the longitudinal centreline in order to carry loads acting on the structure when the non-propelled units are in dry dock.

Figure 2 : Righting moment and heeling moment curves



3.1.3 Truss arrangement supporting deck loads

Where truss arrangements are used as supports of the deck loads, including top and bottom girders in association with pillars and diagonal bracing, the diagonal members are generally to have angles of inclination with the horizontal of about 45° and cross-sectional area of about 50% that of the adjacent pillars.

3.2 Lifting appliances

3.2.1 Crane or derrick position during navigation For ships with the service notation **pontoon - crane**, the crane boom or the derrick structure is to be lowered and efficiently secured to the pontoon during the voyage.

4 Hull girder strength

4.1 Yielding check

4.1.1 Small non-propelled units lifted by crane

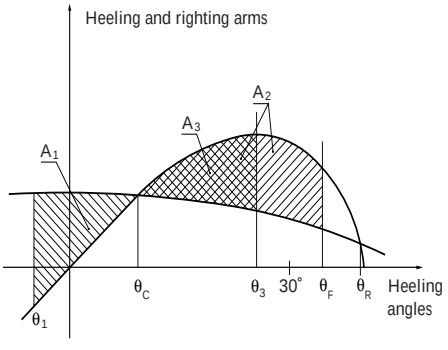
For small non-propelled units intended to be lifted on board ship by crane, the hull girder strength is to be checked, in the condition of fully-loaded barge lifted by crane, through criteria to be agreed with the Society on a case-by-case basis.

In any case, in general, the normal stress σ and the shear stress τ induced in the hull girder when lifted by crane are to comply with the following formulae:

$\leq \sigma$ 150/k N/mm^2

$\leq \tau$ 100/k N/mm^2.

Figure 3 : Cargo loss



A_1: Area between θ_1 and θ_C
A_2: Area between θ_C and θ_2 (in the figure $\theta_2 = \theta_F$)
A_3: Area between θ_C and θ_3
$A_3 = A_1$

4.1.2 Ships with service notation “pontoon” carrying special cargoes

For ships with the service notation **pontoon** intended for the carriage of special cargoes, such as parts of offshore units, the hull girder strength is to be checked through criteria to be agreed with the Society on a case-by-case basis.

Moreover, where these ships are fitted with arrangements for launching the above structures, additional calculations are to be carried out in order to evaluate the stresses during the various stages of launching. The Society may accept stresses higher than those in [4.1.1], to be considered on a case-by-case basis, taking into account favourable sea and weather conditions during launching.

4.1.3 Ships with service notation “pontoon - crane”

For ships with the service notation **pontoon - crane** having length greater than 65 m, the hull girder strength is to be checked when the lifting appliance, such as a crane or derrick, is operated, taking into account the various loading conditions considered, through criteria to be agreed with the Society on a case-by-case basis.

5 Hull scantlings

5.1 General

5.1.1 Minimum net thicknesses of ships with service notation “barge” carrying liquids

For ships with the service notation **barge** carrying liquid cargo inside tanks, the net thicknesses of cargo tank platings are to be not less than the values given in Tab 3.

For other structures or transverse bulkheads not forming boundaries of cargo tanks, the above minimum thicknesses may be reduced by 1 mm.

In pump rooms, the net thicknesses of plating of exposed decks, longitudinal bulkheads and associated ordinary stiffeners and primary supporting members are to be not less than the values given in Tab 3.

5.1.2 Minimum net thicknesses of decks forming tank top

Where the decks of non-propelled units form a tank top, the minimum net thicknesses of plating are to be not less than those obtained from Tab 3.

5.1.3 Scantlings of plating, ordinary stiffeners and primary supporting members

Where no rudder is fitted, in applying the formulae in Part B, Chapter 7 or Part B, Chapter 8, as applicable, L need not exceed 0,97 L_G.

5.1.4 Net thickness of strength deck plating

Within the cargo area, the net thickness of strength deck plating is to be increased by 1,5 mm with respect to that calculated according to Pt B, Ch 7, Sec 1 or Pt B, Ch 8, Sec 3, as applicable.

Table 3 : Minimum net thickness of plating

Plating	Minimum net thickness, in mm
Decks, sides, bottom, inner bottom, bulkheads, primary supporting members in the cargo area	• For L ≤ 45m, the greater of: - $(4,1 + 0,060\ L)k^{0,5}$ - $2,8 + 0,060\ L$ • For 45m < L ≤ 200m, the greater of: - $(5,9 + 0,023\ L)k^{0,5}$ - $4,5 + 0,023\ L$ • For L > 200m, the greater of: - $(8,6 + 0,009\ L)k^{0,5}$ - $7,2 + 0,009\ L$
Weather deck, within cargo area outside 0,4 amidships	• For L ≤ 200m, the greater of: - $11,3\ s\ k^{0,5}$ - $11,3\ s - 1,4$ • For 200m < L < 250m, the greater of: - $(11,3\ s + 0,026\ (L - 200))k^{0,5}$ - $11,3\ s + 0,026\ s\ (L - 200) - 1,4$ • For L ≥ 250m, the greater of: - $12,6\ s\ k^{0,5}$ - $12,6\ s - 1,4$
Plating of ordinary stiffeners and other structures of cargo tanks	• For L ≤ 45m, the greater of: - $(4,1 + 0,060\ L)k^{0,5}$ - $2,8 + 0,060\ L$ • For 45m < L ≤ 200m, the greater of: - $(5,9 + 0,023\ L)k^{0,5}$ - $4,5 + 0,023\ L$ • For L > 200m, the greater of: - $10,0\ k^{0,5}$ - $8,6$
Note 1: k : Material factor for steel, defined in Pt B, Ch 4, Sec 1, [2.3].	

5.2 Hull scantlings of non-propelled units with the service notation “pontoon” fitted with arrangements and systems for launching operations

5.2.1 Additional information *(1/1/2015)*

In addition to the documentation specified in Pt B, Ch 1, Sec 3, the following information is to be submitted to the Society for approval:

- maximum draught of the ship during the different stages of the launching operations
- maximum still water and inertial operating loads and their distribution in load out, towing and launching conditions
- launching cradle or grillage location.

The scantlings of the launching cradle or grillage and, if fitted, of the skid beams are to be submitted to the Society for information, in order to check that their loads are correctly transmitted to the deck structure.

5.2.2 Scantlings of plating, ordinary stiffeners and primary supporting members

In applying the formulae in Part B, Chapter 7 or Part B, Chapter 8, as applicable, T is to be taken equal to the maximum draught during the different stages of launching and taking into account, where appropriate, the differential static pressure.

5.2.3 Deck scantlings *(1/1/2015)*

The net scantlings of decks are to be in accordance with Part B, Chapter 7 or Part B, Chapter 8, considering the maximum loads acting on the launching cradle or grillage.

The net thickness of deck plating in way of launch ground ways is to be suitably increased if the cradle or grillage may be placed in different positions.

The scantlings of decks in way of pivoting and end areas of the cradle or grillage are to be obtained through direct calculations, to be carried out according to the criteria in Pt B, Ch 7, App 1.

5.2.4 Launching cradles or grillage *(1/1/2015)*

The launching cradles or grillage are to be adequately connected to deck structures and arranged, as far as possible, in way of longitudinal bulkheads or at least of girders.

5.3 Hull scantlings of non-propelled units with service notation “pontoon - crane”

5.3.1 Loads transmitted by the lifting appliances

The forces and moments transmitted by the lifting appliances to the ship’s structures, during both lifting service and navigation, are to be obtained by means of criteria to be considered by the Society on a case-by-case basis.

5.3.2 Ship’s structures

The ship’s structures, subjected to the forces transmitted by the lifting appliances, are to be reinforced to the Society’s satisfaction.

5.3.3 Lifting appliances

The check of the behaviour of the lifting appliances at sea is outside the scope of the classification and is under the responsibility of the Designer. However, where the requirements in [3.2.1] may not be complied with (i.e. sailing with boom or derrick up) or where, exceptionally, trips with suspended load are envisaged, the Designer is to submit the check of the lifting appliances during navigation to the Society for information.

The Society may check these calculations following a specific request, while also reserving the right to do so, when deemed necessary, without any such request.

6 Other structures

6.1 Reinforcement of the flat bottom forward area of ships with one of the service notations “pontoon” and “pontoon - crane”

6.1.1 Area to be reinforced

The structures of the flat bottom forward area are to be able to sustain the dynamic pressure due to the bottom impact.

The flat bottom forward area is:

- longitudinally, over the bottom located from the fore end to 0,15 L aft of the fore end
- transversely, over the whole flat bottom, and the adjacent zones up to a height, from the base line, not less than 2L, in mm. In any case, this height need not be greater than 300 mm.

6.1.2 Bottom impact

The bottom dynamic impact pressure is to be considered if:

$T_F < 0,04\ L$,

where T_F is the minimum forward draught, in m, among those foreseen in operation in ballast conditions or conditions of partial loading.

If T_F is less than 0,025 L, strengthening of the flat bottom forward is to be considered by the Society on a case-by-case basis.

6.1.3 Partial safety factors

The partial safety factors to be considered for checking the reinforcements of the flat bottom forward area are specified in Tab 4.

Table 4 : Reinforcements of the flat bottom forward area - Partial safety factors

Partial safety factors covering uncertainties regarding:	Partial safety factors		
	Symbol	Plating	Ordinary stiffeners
Still water pressure	γ_{S2}	1,00	1,00
Wave pressure	γ_{W2}	1,10	1,10
Material	γ_m	1,02	1,02
Resistance	γ_R	1,30	1,15

6.1.4 Scantlings of plating and ordinary stiffeners

Where T_F is less than 0,03 L, the net scantlings of plating and ordinary stiffeners of the flat bottom forward area, as defined in [6.1.1], are to be not less than those obtained according to Pt B, Ch 9, Sec 1, [2] and those obtained from Tab 5.

Where T_F is between 0,03 L and 0,04 L, the net scantlings of plating and ordinary stiffeners are to be obtained by linear interpolation between those obtained according to Pt B, Ch 9, Sec 1, [2] and those obtained from Tab 5.

6.1.5 Tapering

Outside the flat bottom forward area, scantlings are to be gradually tapered so as to reach the values required for the areas considered.

6.1.6 Floor spacing

In the area to be reinforced, defined in [6.1.1], the floor spacing is to be not greater than $0,68\ L^{1/4}$.

7 Hull outfitting

7.1 Equipment

7.1.1 Manned non-propelled units

The equipment of anchors, chain cables and ropes to be fitted on board manned non-propelled units is to comply with Pt B, Ch 10, Sec 4, unless otherwise required by the Society.

Chain cables for anchors may be replaced by steel ropes having the same breaking load. The ropes are to be connected to the anchors by approximately 10 m of chain cable complying with Pt B, Ch 10, Sec 4.

Non-propelled units continuously assisted by a tug may have only one anchor, complying with Pt B, Ch 10, Sec 4, and a chain rope having length neither less than 75% of the length obtained according to Pt B, Ch 10, Sec 4, nor less than 220 m.

7.1.2 Manned non-propelled units with navigation notation “sheltered area”

For non-propelled units with the navigation notation **sheltered area**, the equipment is not required for classification purposes.

However, in this case, the equipment to be fitted may be obtained from Pt B, Ch 10, Sec 4, based on the value of equipment number EN equal to 50% of that obtained from the applicable formulae in Pt B, Ch 10, Sec 4, [2].

7.1.3 Unmanned non-propelled units

For unmanned non-propelled units, the equipment is not required for classification purposes. The scantlings of anchors, chain cables and ropes to be fitted on board are the responsibility of the Designer.

7.1.4 Towing arrangements

Non-propelled units are to be fitted with suitable arrangements for towing, with scantlings under the responsibility of the Designer.

The Society may, at the specific request of the interested parties, check the above arrangements and the associated hull strengthening; to this end, the maximum pull for which the arrangements are to be checked is to be specified on the plans.

Table 5 : Reinforcements of plating and ordinary stiffeners of the flat bottom forward area

Element	Formula	Minimum value
Plating	Net thickness, in mm: $t = 13{,}9 c_a c_r s \sqrt{\gamma_R \gamma_m \frac{\gamma_{W2} p_{BI}}{R_y}}$	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: $w = \gamma_R \gamma_m \beta_b \frac{\gamma_{W2} p_{BI}}{16 c_P R_y} \left(1 - \frac{s}{2\ell}\right) s \ell^2 10^3$ $w = \gamma_R \gamma_m \beta_b \frac{\gamma_{S2} T}{6 R_y} s \ell^2 10^4$	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: $A_{Sh} = 10 \gamma_R \gamma_m \beta_s \frac{\gamma_{W2} p_{BI}}{R_y} \left(1 - \frac{s}{2\ell}\right) s \ell$	

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

The requirements of this item apply to ships with the service notation “barge-oil”.

8.2 Cargo segregation

8.2.1

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

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].

Figure 4

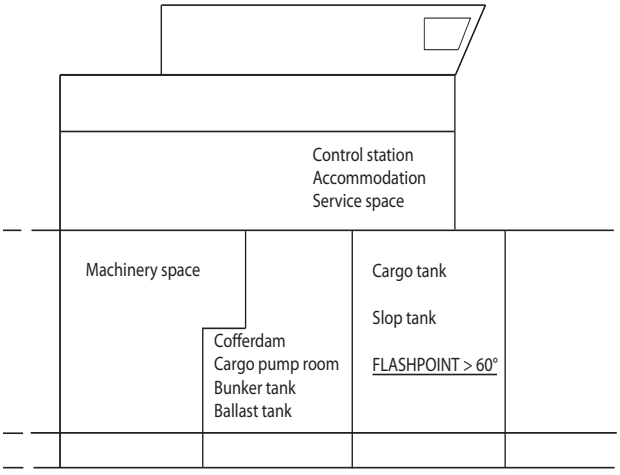
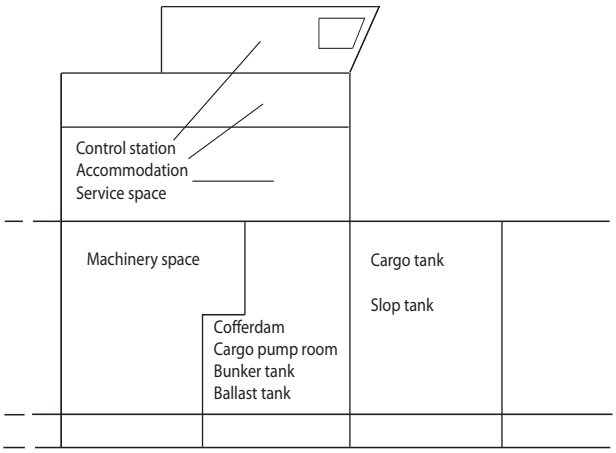


Figure 5



8.3.2 Size and arrangement of cargo tanks

The length of each cargo tank is not to exceed 10 metres or one of the values of Tab 6, as applicable, whichever is the greater.

Table 6 : Length of cargo tanks

Longitudinal bulkhead arrangement	Cargo tank	Condition	Centreline bulkhead arrangement	Length of cargo tanks, in m
No bulkhead	-	-	-	$(0,5\ b_i / B + 0,1)\ L$
Centreline bulkhead	-	-	-	$(0,25\ b_i / B + 0,15)\ L$
Two or more bulkheads	Wing cargo tank	-	-	0,2 L
	Centre cargo tank	bi / B $\geq$ 1/5	-	0,2 L
		bi / 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

8.3.3 Slop tanks

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

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

Means of access to side and centre tanks may not be provided in the same transverse section.

8.4.3

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

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

The access to the fore peak tank 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) 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.

8.4.6 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.

8.4.7 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.

8.4.8 Barge-oil less than 5000 t deadweight

For barge-oil 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.

9 Mooring systems for units with the service notation "barge - accommodation"

9.1 Application

9.1.1

For units with the service notation barge - accommodation, the mooring system is to be in accordance with with the requirements in Pt F, Ch 13, Sec 21 for the assignment of the additional class notation **MOORING**.

10 Additional requirements for ships with service notation "Barge-liquefied gas"

10.1 Accommodation, service and machinery spaces and control stations

10.1.1 Precautions against hazardous vapours *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.2.2

Compliance with the relevant requirements of the IGC Code, in particular with 3.2.4, 3.8, 8.2.10 and 12.1.6, as applicable, also ensures compliance with the requirements in IGC Code 3.2.2, relevant to precautions against hazardous vapours.

10.1.2 Air outlets *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.2.4

The requirements in IGC Code 3.2.4, relevant to air intakes, are also intended to be applicable to air outlets. This interpretation also applies to the requirements in IGC Code 3.8.4.

10.1.3 Doors facing cargo area *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.2.4

Doors facing the cargo area or located in prohibited zones in the sides are to be restricted to stores for cargo-related and safety equipment, cargo control stations as well as decontamination showers and eye wash.

Where such doors are permitted, the space may not give access to other spaces covered in IGC Code 3.2.4 and the common boundaries with these spaces are to be insulated with A60 class bulkheads.

10.1.4 Exemptions, ventilation openings and type of closures *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.2.6

The requirement for fitting air intakes and openings with closing devices operable from inside the space in ships intended to carry toxic products is to apply to spaces which are used for the ship's radio and main navigating equipment, cabins, mess rooms, toilets, hospitals, galleys, etc., but does not apply to spaces not normally manned such as engine room casings, steering gear compartments.

The closing devices are to give a reasonable degree of gas-tightness. Ordinary steel fire-flaps without gaskets/seals are normally not considered satisfactory.

10.1.5 Openings for removal of machinery *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.2.6

Bolted plates of A60 class for removal of machinery may be accepted on bulkheads facing cargo areas, provided sign-boards are fitted to warn that these plates may only be opened when the ship is in gas-free condition.

10.2 Access arrangement

10.2.1 Access to compartments in the cargo area *(1/6/2021)*

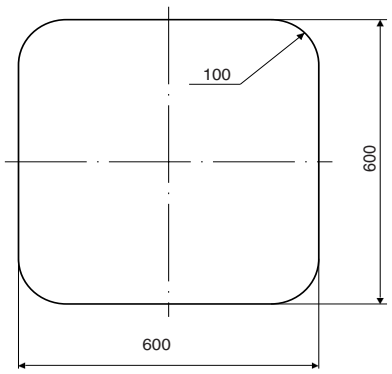
a) Passage through hatches and manholes

IGC CODE REFERENCE : Ch 3, 3.5

For the purpose of the requirements in IGC Code 3.5.3, the following applies:

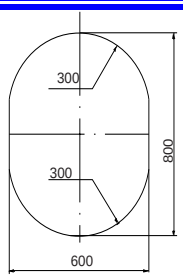
1) The term “minimum clear opening of not less than 600 x 600 mm” means that such openings may have corner radii up to a maximum of 100 mm (see Fig 6).

Figure 6 : Minimum horizontal hatch size *(1/6/2021)*



2) The term “minimum clear opening of not less than 600 x 800 mm” also includes an opening of the size specified in Fig 7:

Figure 7 : Minimum size of manholes *(1/6/2021)*



b) Cofferdams

IGC CODE REFERENCE : Ch 3, 3.5

Where fitted, cofferdams are to have sufficient size for easy access to all their parts. The width of the cofferdams may not be less than 600 mm.

c) Pipe tunnels

IGC CODE REFERENCE : Ch 3, 3.5

Pipe tunnels are to have enough space to permit inspection of pipes. The pipes in pipe tunnels are to be installed as high as possible from the ship’s bottom.

d) Access to pipe tunnels

IGC CODE REFERENCE : Ch 3, 3.5

Access to pipe tunnels through manholes in the engine space is not permitted.

10.2.2 Access to the bow *(1/6/2021)*

a) This item [10.2.2] applies to ships subject to the International Load Line Convention 1966, as amended.

b) Liquefied gas carriers 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.

c) *Liquefied gas 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.

10.3 Cargo containment

10.3.1 *(1/6/2021)*

The requirements of Ch 9, Sec 4 apply.

10.4 Materials for construction

10.4.1 *(1/6/2021)*

The requirements of Ch 9, Sec 6 apply.

11 Additional requirements for ships with service notation "Barge-LNG bunker"

11.1 Mooring and fendering

11.1.1 *(1/6/2021)*

Steel to steel contact between LNG bunker ship and receiving ship e.g. via mooring lines, ladders, gangways, chains for fender support etc. shall be avoided through the use of insulation. Bunker hoses/pipes shall be supported and isolated to prevent electrical contact with the receiving ship.

11.1.2 *(1/6/2021)*

The rubber fenders used for keeping the distance between the LNG bunkering ship and receiving ship shall be built according to an international recognized standard such as ISO 17357-2 or equivalent. The dimensions and arrangement of fenders shall be verified during risk assessment as required in [11.1.1] taking into consideration the interferences of the hazardous areas of both ships and the minimum bend radius of the bunkering hose.

11.2 Access arrangement

11.2.1 *(1/6/2021)*

The requirements of [10.2] apply.

11.3 Cargo containment

11.3.1 *(1/6/2021)*

The requirements of Ch 9, Sec 4 apply.

11.4 Materials for construction

11.4.1 *(1/6/2021)*

The requirements of Ch 9, Sec 6 apply.

12 Additional requirements for ships with service notation "Barge-chemical"

12.1 Accommodation, service and machinery spaces and control stations

12.1.1 Air intakes and other openings to accommodation spaces *(1/6/2021)*

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.

12.1.2 Windows, sidescuttles and doors *(1/6/2021)*

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.

12.1.3 Ships fitted with deckhouses originating from main deck *(1/6/2021)*

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).

12.2 Cargo tank arrangement

12.2.1 Location of cargo tanks *(1/6/2021)*

IBC CODE REFERENCE: Ch 2, 2.6

The requirements in IBC Code 2.6 apply to cargo tanks.

12.3 Access arrangement

12.3.1 Access to compartments in the cargo area *(1/6/2021)*

a) Access to fuel oil tanks

IBC CODE REFERENCE : Ch 3, 3.4.1

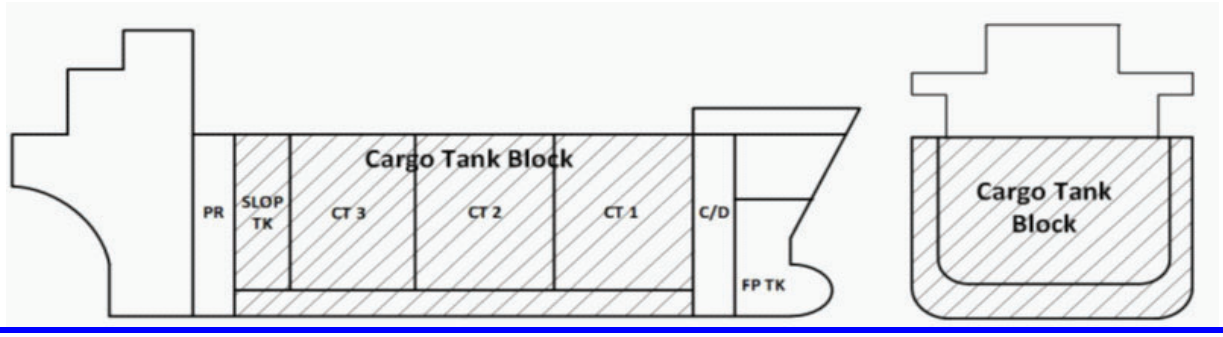
The requirements in IBC Code 3.4.1 apply to fuel oil tanks adjacent to cargo tanks even if such fuel oil tanks are not included in the “cargo area” as defined in IBC Code 1.3.5.

b) Accesses and escapes from double bottom tanks and similar spaces

IBC CODE REFERENCE : Ch 3, 3.4.1

To cater for restrictions in the movement of personnel and to limit the time needed for a possible emergency escape, two separate means of access are generally to be fitted in double bottom tanks and similar spaces where obstructions impede movement. The two accesses are to be as widely separated as practicable. Only one access may be approved in special circumstances if, it being understood that the escapes have the required dimensions, the ability to readily traverse the space and to remove an injured person can be proved to the satisfaction of the Society.

Figure 8 *(1/6/2021)*

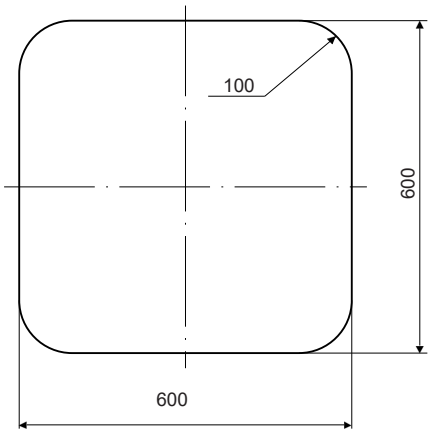


c) Access through horizontal openings

IBC CODE REFERENCE : Ch 3, 3.4.2

The shape of the minimum acceptable clear opening of 600 mm by 600 mm is indicated in Fig 9.

Figure 9 : Shape of minimum acceptable clear opening of 600 mm by 600 mm *(1/6/2021)*



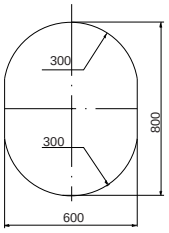
d) Access through vertical openings

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 10.

Figure 10 : Minimum size of vertical oval openings *(1/6/2021)*



12.3.2 Access to the bow *(1/6/2021)*

a) This item [12.3.2] applies to ships subject to the International Load Line Convention 1966, as amended.

b) 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.

c) *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.

12.3.3 Access to pump rooms *(1/6/2021)*

IBC CODE REFERENCE : Ch 3, 3.3.1

In general, a cargo pump room is to be provided with one set of access/escape ladders. Where it is envisaged that personnel are normally employed in a pump room or the pump room is unusually large, an additional means of escape may be required.

12.3.4 Segregation of pump rooms *(1/6/2021)*

IBC CODE REFERENCE : Ch 3, 3.3.1

Cargo pump rooms and pump rooms may not give direct access to other ship spaces and are to be separated from adjacent spaces by means of gas-tight bulkheads and/or decks.

12.4 Coamings

12.4.1 *(1/6/2021)*

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.

12.5 Cargo containment

12.5.1 *(1/6/2021)*

The requirements of Ch 8, Sec 4 apply.

12.6 Materials for construction

12.6.1 *(1/6/2021)*

The requirements of Ch 8, Sec 6 apply.

12.7 Minimum distance of cargo tanks from shell

12.7.1 Exception *(1/6/2021)*

Any cargo tank, irrespective of its location, may be used for collecting contaminated cargo pump room bilge water or tank washings, as an exception to the requirements in IBC Code 2.6.1.1.

12.7.2 Suction wells *(1/6/2021)*

In general, the area of suction wells is not to be greater than that required to accommodate cargo pumps, suction pipes, valves, heating coils etc., and to ensure efficient flow and the necessary access for cleaning and maintenance.

SECTION 3 MACHINERY SYSTEMS

1 General

1.1 Application

1.1.1 *(1/6/2021)*

This Section applies to non-propelled units.

~~Item [3] provides additional requirements that only apply to barges having the service notation barge-oil intended to carry products having any flashpoint.~~

Item ~~[5]~~ [3] provides additional requirements that only apply to barges having the service notation barge-accommodation.

Sections 4 to 7 provide additional requirements that only apply to barges having the service notations **barge-oil**, **barge-liquified gas**, **barge-LNG bunker** and **barge-chemical**, respectively.

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 all barges.

~~The documents listed in Tab 2 are to be submitted for approvalfor barges having the service notation **barge-oil**.~~

1.3 Exemptions

1.3.1

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 Bilge system

2.1 Bilge system in ships having no source of electrical power

2.1.1 General

Where there is no source of electrical power on board, hand pumps are to be provided, in sufficient number and so positioned as to permit an adequate drainage of all the compartments of the ship.

The requirement to provide a bilge system and associated hand pumps may be waived in the case of vessels without persons on board.

2.1.2 Arrangement of the bilge system

The bilge system is to comply with one of the following arrangements:

a) at least one pump is to be provided for each compartment

b) at least two pumps connected to a bilge main are to be provided. The main is to have branch pipes allowing the draining of each compartment through at least one suction.

The spaces served only by hand pumps may be not provided with air pipes according to Pt C, Ch 1, Sec 10, [9.1]. In any event they are anyway to be provided with sounding means according to Pt C, Ch 1, Sec 10, [9.2].

2.1.3 Hand pumps

a) Hand pumps are to be capable of being operated from positions above the load waterline and are to be readily accessible at any time.

b) Hand pumps are to have a maximum suction height not exceeding 7,30 m.

2.1.4 Size of bilge pipes

a) The internal diameter, in mm, of suction pipes is not to be less than the diameter given by the following formula:

$$d_1 = \frac{T}{100} + 50$$

where:

T : Underdeck tonnage, in tons.

b) When the ship is subdivided into small watertight compartments, the diameter of these suctions need not exceed 50 mm.

2.2 Bilge system in ships having a source of electrical power

2.2.1 General

On board ships having no propelling machinery but having a source of electrical power, mechanical pumps are to be provided for draining the various compartments of the ship.

Cargo pumps may be used for this purpose.

2.2.2 Arrangement of the bilge system

The bilge system is to comply with the provisions of Pt C, Ch 1, Sec 10, [6.3] to Pt C, Ch 1, Sec 10, [6.6] applicable to the spaces concerned, except that direct suctions need not be provided.

2.2.3 Bilge pumps

The number and capacity of the bilge pumps are to comply with the relevant requirements of Pt C, Ch 1, Sec 10, [6.7].

2.2.4 Size of bilge pipes

The size of bilge pipes is to comply with the relevant requirements of Pt C, Ch 1, Sec 10, [6.8].

2.2.5 Unmanned barges and occasionally manned barges (1/1/2017)

The requirement to provide pumps and a bilge system suitable to drain water from each compartment may be waived in the case of vessels without persons on board, and in case of vessels intended to have persons on board only during specific operations at fixed location, with the presence of an assisting propelled ship in close proximity.

Even in these latest units, when the source of power is made of engines located within compartments having the bottom plating in any place extending below the deepest waterline, these compartments are to be fitted with suctions from suitably located pumps operated by power.

The waiver to occasionally manned units may be granted only to such units showing satisfactory stability in the worse combination of loading and flooding of two adjacent compartments.

Table 1 : Documents to be submitted for all barges

No.	A/I **(1)**	Document **(2)**
1	A	Diagram of the bilge system
2	A	Diagram of the central priming system intended for the bilge pumps, where provided
3	A	Capacity, prime mover and location of the bilge pumps

(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 : ~~Additional documents to be submitted for barge oil~~

~~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.~~

3 ~~Additional requirements for ships with service notation "barge oil"~~

3.1 ~~Piping systems other than cargo piping system~~

3.1.1 ~~Materials~~

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.~~

3.1.2 ~~Independence of piping systems~~

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.

3.1.3 Passage through cargo tanks and slop tanks

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 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.

3.1.4 Draining of pump rooms

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.

3.1.5 Ballast system

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 [3.2.3] and [3.2.4].

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.

a) Provisions may be made for filling cargo tanks with sea water, where permitted. Such ballast water is to be dealt with as per [3.4].

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 [3.4.10].

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.

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 [3.1.3], item b).

Sliding type couplings are not to be used for expansion purposes where ballast lines pass through cargo tanks. Expansion bends only are permitted.

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

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.

3.1.6 Air and sounding pipes of spaces other than cargo tanks

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 [3.1.3], item b) are complied with.

3.1.7 Scupper pipes

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
- they have only welded or heavy flanged joints the number of which is kept to a minimum
- they are of substantial wall thickness as per Pt C, Ch 1, Sec 10, Tab 23, column 1.

3.1.8 Heating systems intended for cargo

a) Heating systems intended for cargo are to comply with the relevant requirements of Pt C, Ch 1, Sec 10.

b) The steam and heating media temperature within the cargo area is not to exceed 220° C.

c) Blind flanges or similar devices are to be provided on the heating circuits fitted to tanks carrying cargoes which are not to be heated.

d) Heating systems are to be so designed that the pressure maintained in the heating circuits is higher than that exerted by the cargo oil. This need not be applied to heating circuits which are not in service provided they are drained and blanked off.

e) Isolating valves are to be provided at the inlet and outlet connections of the tank heating circuits. Arrangements are to be made to allow manual adjustement of the flow.

f) Heating pipes and coils inside tanks are to be built of a material suitable for the heated fluid. They are to have welded connections only.

To reduce the risk of liquid or gaseous cargo returns inside the engine or boiler rooms, steam heating systems of cargo tanks are to satisfy either of the following provisions:

- they are to be independent of other ship services, except cargo heating or cooling systems, and are not to enter machinery spaces, or
- they are to be provided with an observation tank on the water return system located within the cargo area. However, this tank may be placed inside the engine room in a well-ventilated position remote from boilers and other sources of ignition. Its air pipe is to be led to the open and fitted with a flame arrester.

Hot water systems serving cargo tanks are to be independent of other systems. They are not to enter machinery spaces unless the expansion tank is fitted with:

- means for detection of flammable vapours
- a vent pipe led to the open and provided with a flame arrester.

Thermal oil heating systems serving cargo tanks are to be arranged by means of a separate secondary system, located completely within the cargo area. However, a single circuit system may be accepted provided that:

- the system is so arranged as to ensure a positive pressure in the coil of at least 3 m water column above the static head of the cargo when the circulating pump is not in operation
- means are provided in the expansion tank for detection of flammable cargo vapours. Portable equipment may be accepted
- valves for the individual heating coils are provided with a locking arrangement to ensure that the coils are under static pressure at all times.

3.2 Cargo pumping system

3.2.1 Number and location of cargo pumps

Arrangements are to be adopted to make discharge by pumps in the oil terminal possible, taking into account the NPSHD at the pumps, or a fixed mean of discharging and stripping is to be fitted.

Cargo pumps are to be located:

- in a dedicated pump room, or
- on deck, or
- when designed for this purpose, within the cargo tanks.

3.2.2 Use of cargo pumps

Except where expressly permitted in [2.2] and [3.1.5], cargo pumps are to be used exclusively for handling the liquid cargo and are not to have any connections to compartments other than cargo tanks.

Subject to their performance, cargo pumps may be used for tank stripping.

Cargo pumps may be used, where necessary, for the washing of cargo tanks

3.2.3 Cargo pumps drive

a) Prime movers of cargo pumps are not to be located in the cargo area, except in the following cases:

- steam driven machine supplied with steam having a temperature not exceeding 220 °C
- hydraulic motors
- electric motors of certified explosion proof type.

b) Pumps with a submerged electric motor are not permitted in cargo tanks.

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

1) drive shafts are to be fitted with flexible couplings or other means suitable to compensate for any misalignment
2) the shaft bulkhead or deck penetration is to be fitted with a gas-tight gland of a type approved by the Society. The gland is to be efficiently lubricated from outside the pump room and so designed as to prevent overheating. The seal parts of the gland are to be of material that cannot initiate sparks.
3) temperature sensing devices are to be fitted for bulkhead shaft gland bearings.

Note 1: The provisions of this requirement also apply to stripping pumps and ballast pumps.

3.2.4 Design of cargo pumps

a) Materials of cargo pumps are to be suitable for the products carried.

b) The delivery side of cargo pumps is to be fitted with relief valves discharging back to the suction side of the pumps (bypass) in closed circuit. Such relief valves may be omitted in the case of centrifugal pumps with a maximum delivery pressure not exceeding the design pressure of the piping, with the delivery valve closed.

c) Pump casings are to be fitted with temperature sensing devices; see [3.2.5].

3.2.5 Monitoring of cargo pumps

Cargo pumps are to be monitored as required in Tab 3.

3.2.6 Control of cargo pumps

Cargo pumps are to be capable of being stopped from:

- a position outside the pump room, and
- a position next to the pumps.

3.2.7 Cargo piping design

Unless otherwise specified, cargo piping is to be designed and constructed according to the requirements of Pt C, Ch 1, Sec 10 applicable to piping systems of class III.

- For tests, refer to [4].
- Cargo piping is, in general, to be made of steel or cast iron.
- Valves, couplings and other end fittings of cargo pipe lines for connection to hoses are to be of steel or other suitable ductile material.
- Spheroidal graphite cast iron may be used for cargo oil piping.
- Grey cast iron may be accepted for cargo oil lines:
  - within cargo tanks, and
  - on the weather deck for pressure up to 1,6 Mpa.

  It is not to be used for manifolds and their valves of fittings connected to cargo handling hoses.
- Plastic pipes may be used in the conditions specified in Pt C, Ch 1, App 3. Arrangements are to be made to avoid the generation of static electricity.

Cargo pipe lengths may be connected either by means of welded joints or, unless otherwise specified, by means of flange connections.

Where necessary, cargo piping is to be fitted with expansion joints or bends.

Expansion joints including bellows are to be of a type approved by the Society.

Expansion joints made of non-metallic material may be accepted only inside tanks and provided they are:

- of an approved type
- designed to withstand the maximum internal and external pressure
- electrically conductive

Sliding type couplings are not to be used for expansion purposes where lines for cargo oil pass through tanks for segregated ballast.

Valves with remote control are to comply with Pt C, Ch 1, Sec 10, [2.7.3].

Submerged valves are to be remote controlled. In the case of a hydraulic remote control system, control boxes are to be provided outside the tank, in order to permit the emergency control of valves.

Valve actuators located inside cargo tanks are not to be operated by means of compressed air.

Cargo hoses are to be of a type approved by?the Society for the intended conditions of use.

Hoses subject to tank pressure or pump discharge pressure are to be designed for a bursting pressure not less than 4 times the maximum pressure under cargo transfer conditions.

The ohmic electrical resistance of cargo hoses is not to exceed 10^6 Ω.

Table 3 : Monitoring of cargo pumps

Equipment, parameter	Alarm (1)	Indication (2)	Comments
pump, discharge pressure	-	L	• on the pump (3), or • next to the unloading control station
pump casing, temperature	H		visual and audible, in cargo control room or pump control station
bulkhead shaft gland bearing, temperature	H		visual and audible, in cargo control room or pump control station

(1) H = high
(2) L = low
(3) and next to the driving machine if located in a separate compartment

3.2.8 Cargo piping arrangement and installation

Cargo piping is not to pass through tanks or compartments located outside the cargo area.

Cargo piping and similar piping to cargo tanks is not to pass through ballast tanks except in the case of short lengths of piping complying with [3.1.3], item b).

Cargo piping may pass through vertical fuel oil tanks adjacent to cargo tanks on condition that the provisions of [3.1.3], item b) are complied with.

Piping through cargo tanks, see also Ch 7, Sec 2, [3.1.4].

Cargo piping passing through bulkheads is to be so arranged as to preclude excessive stresses at the bulkhead. Bolted flanges are not to be used in the bulkhead.

Stop valves are to be provided to isolate each tank.

A stop valve is to be fitted at each end of the cargo manifold.

When a cargo pump in the cargo pump room serves more than one cargo tank, a stop valve is to be fitted in the cargo pump room on the line leading to each tank.

Main cargo oil valves located in the cargo pump room below the floor gratings are to be remote controlled from a position above the floor.

To avoid the hazard of an incendive discharge due to the build-up of static electricity resulting from the flow of the liquid/gases/vapours, the following requirements are to be complied with:

- the loading pipes are to be led as low as practicable in the tank
- the resistance between any point on the surface of the cargo and slop tanks, piping systems and equipment, and the hull of the ship is not to be greater than 10^6 Ω.

Bonding straps are required for cargo and slop tanks, piping systems and equipment which are not permanently connected to the hull of the ship, for example:

a) independent cargo tanks

b) cargo tank piping systems which are electrically separated from the hull of the ship

c) pipe connections arranged for the removal of the spool pieces.

Where bonding straps are required, they are to be:

- clearly visible so that any shortcoming can be clearly detected
- designed and sited so that they are protected against mechanical damage and are not affected by high resistivity contamination, e.g. corrosive products or paint
- easy to install and replace.

Where the ship is arranged for loading and unloading outside the cargo area, the following provisions are to be complied with:

- the piping outside the cargo area is to be fitted with a shut-off valve at its connection with the piping system within the cargo area and separating means such as blank flanges or removable spool pieces or equivalent (see Note 1) are to be provided when the piping within the cargo area is not in use
- the shore connection is to be fitted with a shut-off valve and a blank flange

Note 1: Those indicated in the IMO MSC/Circ. 474 are acceptable as equivalent

d) pipe connections outside the cargo area are to be of welded type only

e) arrangements are made to allow the piping outside the cargo area to be efficiently drained and purged.

3.3 Cargo tanks and fittings

3.3.1 -

The provisions of this paragraph apply to cargo tanks and slop tanks.

3.3.2 Cargo tank venting

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.

3.3.3 Design of venting arrangements

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). 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 underpressure conditions within a tank.

3.3.4 Combination of venting arrangements

a) the venting arrangements in each cargo tank may be independent or combined with other cargo tanks and may 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 [3.3.3] a).

c) if cargo loading or 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 [3.3.3] c).

3.3.5 Arrangement of vent lines

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.

3.3.6 Openings for pressure release

Openings for pressure release required by [3.3.3] 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.

3.3.7 Pressure/vacuum valves

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 [3.3] 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 [3.3.3] 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 Ch 7, 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.

3.3.8 Vent oulets

Vent outlets for cargo loading, discharging and ballasting required by [3.3.3] b) are to:

a) permit:

1) the free flow of vapour mixtures, or

2) 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 deck machinery which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard,

d) where the method is by high velocity discharge, be located at a height not less than 2 m above the cargo tank deck and not less than 10 m measured horizontally

from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard. These outlets are to be provided with high velocity devices of a type approved by the Society,

e) be designed on the basis of the maximum designed loading rate multiplied by a factor of at least 1,25 to take account of gas evolution, in order to prevent the pressure in any cargo tank from exceeding the design pressure. The Master is to be provided with information regarding the maximum permissible loading rate for each cargo tank and in the case of combined venting systems, for each group of cargo tanks.

The arrangements for the venting of vapours displaced from the cargo tanks during loading and ballasting are to comply with this item [3.3] and are to consist of either one or more mast risers, or a number of high-velocity vents. The inert gas supply main may be used for such venting.

3.3.9 High velocity valves

a) High velocity valves are to be readily accessible

b) High velocity valves not required to be fitted with flame arresters (see [3.3.10]) are not to be capable of being locked on open position.

3.3.10 Prevention of the passage of flame into the tanks

a) The venting system is to be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of these devices are to comply with Ch 7, App 1.

Ullage openings are not to be used for pressure equalisation. They are to be provided with self-closing and tightly sealing covers. Flame arresters and screens are not permitted in these openings.

b) A flame arresting device integral to the venting system may be accepted.

c) Flame screens and flame arresters are to be designed for easy overhauling and cleaning.

3.3.11 Prevention of liquid rising in the venting system

a) Provisions are to be made to prevent liquid rising in the venting system; refer to [3.3.16].

b) Cargo tanks gas venting systems are not to be used for overflow purposes.

c) Spill valves are not considered equivalent to an overflow system.

3.3.12 Cargo tank purging and/or gas freeing

a) Arrangements are to be made for purging and/or gas-freeing of cargo tanks. The arrangements are to be such as to minimise the hazards due to the dispersal of flammable vapours in the atmosphere and to flammable mixtures in a cargo tank. Accordingly, the provisions of [3.3.13] and [3.3.14], as applicable, are to be complied with.

b) In the case of fans installed in safe spaces, two non-return devices are to be fitted to avoid return of cargo vapours to safe spaces when the ventilation system is shut down. These non-return devices are to operate in all normal conditions of ship trim and list.

c) Discharge outlets are to be located at least 10 m measured horizontally from the nearest air intake and openings to enclosed spaces with a source of ignition and from deck machinery equipment which may constitute an ignition hazard.

3.3.13 Ships provided with an inert gas system

When the ship is provided with an inert gas system, the cargo tanks are first to be purged in accordance with the provisions of Part C, Chapter 4 until the concentration of hydrocarbon vapours in the cargo tanks has been reduced to less than 2% by volume. Thereafter, gas-freeing may take place at the cargo tank deck level.

3.3.14 Ships not provided with an inert gas system

When the ship is not provided with an inert gas system, the operation is to be such that the flammable vapour is discharged initially:

a) through the vent outlets as specified in [3.3.8], or

b) through outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas freeing operation, or

c) through outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 20 m/s and which are protected by suitable devices to prevent the passage of flame.

The above outlets are to be 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 deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard.

When the flammable vapour concentration at the outlet has been reduced to 30% of the lower flammable limit, gas-freeing may thereafter be continued at cargo tank deck level.

3.3.15 Cargo tank level gauging systems

a) Each cargo or slop tank is to be fitted with a level gauging system indicating the liquid level along the entire height of the tank. Unless otherwise specified, the gauge may be portable or fixed with local reading.

b) Gauging devices and their remote reading systems are to be type approved.

c) Ullage openings and other gauging devices likely to release cargo vapour to the atmosphere are not to be arranged in enclosed spaces.

1) a "restricted gauging device" means a device which penetrates the tank and which, when in use, permits a small quantity of vapour or liquid to be exposed to

the atmosphere. When not in use, the device is completely closed. Examples are sounding pipes.

2) a "closed gauging device" means a device which is separated from the tank atmosphere and keeps tank contents from being released. It may:

- penetrate the tank, such as float-type systems, electric probe, magnetic probe or protected sight glass,
- not penetrate the tank, such as ultrasonic or radar devices.

3) an "indirect gauging device" means a device which determines the level of liquid, for instance by means of weighing or pipe flow meter .

In barges fitted with an inert gas system, the gauging devices are to be of the closed type; use of indirect gauging devices will be given special consideration.

In barges not fitted with an inert gas system:

- the gauging devices are to be of the closed or restricted types. Ullage openings may be used only as a reserve sounding means and are to be fitted with a watertight closing appliance.
- Where restricted gauging devices are used, provisions are to be made to avoid dangerous escape of liquid or vapour under pressure when using the device relieve the pressure in the tank before the device is operated.
- Where used, sounding pipes are to be fitted with a a self-closing blanking device.

3.3.16 Protection against tank overload

Provisions are to be made to guard against liquid rising in the venting system of cargo or slop tanks to a height which would exceed the design head of the tanks. This is to be accomplished by high level alarms or overflow control systems or other equivalent means, together with gauging devices and cargo tank filling procedures.

Sufficient ullage is to be left at the end of tank filling to permit free expansion of liquid during carriage.

High level alarms, overflow control systems and other means referred to in a) are to be independent of the gauging systems referred to in [3.3.15]].

High level alarms are to be type approved.

High level alarms are to give an audible and visual signal at the control station, where provided.

Where the tank level gauging systems, cargo and ballast pump control systems and valve control systems are centralised in a single location, the provisions above may be complied with by the fitting of a level gauge for the indication of the end of loading, in addition to that required for each tank under [3.3.15]. The readings of both gauges for each tank are to be as near as possible to each other and so arranged that any discrepancy between them can be easily detected.

Where a tank can be filled only from other tanks, the provisions of [3.3.16] are considered as complied with.

3.3.17 Tank washing systems

Adequate means are to be provided for cleaning the cargo tanks, except on units which:

- are dedicated to the same type of cargo for many consecutive voyages, and
- are arranged with segregated ballast tanks according to Sec 2, [5], and
- do not carry out tank washing on a regular basis, and
- use shore services for tank washing and disposal of washing media and residues, when needed.

Crude oil washing systems, when fitted, are to comply with the provisions of Ch 7, App 2 related to safety.

Tank washing machines are to be of a type approved by the Society.

Washing machines are to be made of steel or other electricity conducting materials with a limited propensity to produce sparks on contact.

Washing pipes are to be built, fitted, inspected and tested in accordance with the applicable requirements of Pt C, Ch 1, Sec 10, depending on the kind of washing fluid, water or crude oil.

Crude oil washing pipes are also to satisfy the requirements of [3.2.7].

Crude oil washing machines may be connected to water washing pipes, provided that isolating arrangements, such as a valve and a detachable pipe section, are fitted to isolate water pipes.

Tank cleaning openings are not to be arranged in enclosed spaces.

The complete installation is to be permanently earthed to the hull.

3.4 Prevention of pollution by cargo oil

3.4.1 Application

Unless otherwise specified, the provisions of [3.4.4], [3.4.5] and [3.4.6] apply only to barges of 150 gross tonnage and above.

3.4.2 Provisions for barges of less than 150 gross tonnage

The control of discharge for **barges** of less than 150 gross tonnage is to be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities unless adequate arrangements are made to ensure that the discharge of any effluent into the sea, where allowed, is effectively monitored to ensure that the total quantity of oil discharged into the sea does not exceed 1/30 000 of the total quantity of the particular cargo of which the residue formed a part.

3.4.3 Exemptions

The provisions of [3.4.4] and [3.4.5] may be waived in the following cases:

- barges engaged exclusively on voyages within 50 miles from the nearest land and of 72 hours or less in duration and limited to trades between ports or terminals agreed

by the Society, provided that oily mixtures are retained on board for subsequent discharge to reception facilities

- carrying products which through their physical properties inhibit effective product/water separation and monitoring, for which the control of discharge is to be effected by the retention of residues on board with discharge of all contaminated washings to reception facilities.

3.4.4 Retention of oil on board

Adequate means are to be provided for transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the Society.

3.4.5 Capacity of slop tanks

The arrangement of the slop tank or combination of slop tanks is 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 not to be less than 3% of the oil carrying capacity of the ship, except that the Society may accept:

a) 2% for barges 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 eductors, without the introduction of additional water into the system

b) 2% where segregated ballast tanks are provided, or where a cargo tank cleaning system using crude oil washing is fitted in accordance with [3.3.17]. This capacity may be further reduced to 1,5% for barges 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 eductors, without introduction of additional water into the system

c) 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.

Barges of 70 000 tonnes deadweight and above are to be fitted with at least two slop tanks.

3.4.6 Design of slop tanks

Slop tanks are to be so designed particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, as to avoid excessive turbulence and entrainment of oil or emulsion with the water.

3.4.7 Pumping, piping and discharge arrangements

In every barge, a discharge manifold for connection to reception facilities for the discharge of dirty ballast water or oil contaminated water is to be located on the open deck on both sides of the ship.

3.4.8 Discharge pipelines

In every barge, pipelines for the discharge of ballast water or oil contaminated water from cargo tank areas to the sea, where permitted, are to be led to the open deck or to the ship side above the waterline in the deepest ballast condition, except that:

a) segregated ballast and clean ballast may be discharged below the waterline:

- in ports or at offshore terminals, or
- at sea by gravity,

provided that the surface of the ballast water has been examined immediately before the discharge to ensure that no contamination with oil has taken place.

b) on every barge at sea, dirty ballast water or oil contaminated water from tanks in the cargo area, other than slop tanks, may be discharged by gravity below the waterline, provided that sufficient time has elapsed in order to allow oil/water separation to have taken place and the water ballast has been examined immediately before the discharge with an oil/water interface detector, in order to ensure that the height of the interface is such that the discharge does not involve any increased risk of harm to the marine environment.

3.4.9 Discharge stopping

Means are to be provided for stopping the discharge into the sea of ballast water or oil contaminated water from cargo tank areas, other than those discharges below the waterline permitted under [3.4.8], from a position on the upper deck or above located so that the manifold in use referred to in [3.4.7] and the discharge to the sea from the pipelines referred to in [3.4.8]] may be visually observed. Means for stopping the discharge need not be provided at the observation position if a positive communication system such as a telephone or radio system is provided between the observation position and the discharge control position.

3.4.10 Cargo piping connections to sea chests

On every barge where a sea chest is permanently connected to the cargo pipeline system, it is to be equipped with both a sea chest valve and an inboard isolation valve. In addition to these valves, the sea chest is to be capable of isolation from the cargo piping system whilst the barge is loading, transporting or discharging cargo by use of a positive means that is to the satisfaction of the Society. Such a positive means is a facility that is installed in the pipeline system in order to prevent the section of pipeline between the sea chest valve and the inboard valve being filled with cargo under all circumstances.

Examples of positive means may take the form of blanks, spectacle blanks, pipeline blinds, evacuation or vacuum systems, or air or water pressure systems. In the event that evacuation or vacuum systems, or air or water pressure systems are used, then they are to be equipped with both a pressure gauge and alarm system to enable the continuous monitoring of the status of the pipeline section, and thereby the valve integrity, between the sea chest and inboard valves.

4 Certification, inspection and testing

4.1 Application

4.1.1

The provisions of this Article are related to cargo piping and other equipment fitted in the cargo area. They supplement those given in Pt C, Ch 1, Sec 10, [21] for piping systems.

4.2 Workshop tests

4.2.1 Tests for materials

Where required in Tab 4, materials used for pipes, valves and fittings are to be subjected to the tests specified in Pt C, Ch 1, Sec 10, [21.3.2].

4.2.2 Hydrostatic testing

a) Where required in Tab 4, cargo pipes, valves, fittings and pump casings are to be submitted to hydrostatic tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

b) Expansion joints and cargo hoses are to be submitted to hydrostatic tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

c) Where fitted, bellow pieces of gas-tight penetration glands are to be pressure tested.

4.2.3 Tightness tests

Tightness of the following devices is to be checked:

- gas-tight penetration glands
- cargo tank P/V and high velocity valves.

Note 1: These tests may be carried out in the workshops or on board.

4.2.4 Check of the safety valves setting

The setting pressure of the pressure/vacuum valves is to be checked in particular with regard to [3.4.7].

4.2.5 Summary table

Inspections and tests required for cargo piping and other equipment fitted in the cargo area are summarised in Tab 4.

4.3 Shipboard tests

4.3.1 Pressure test

a) After installation on board, the cargo piping system is to be checked for leakage under operational conditions.

b) The piping system used in crude oil washing systems is to be submitted to hydrostatic tests in accordance with, Ch 7, App 2, [3.2.1].

4.3.2 Survey of pollution prevention equipment

Every oil barge of 150 gross tonnage and above is to be subjected to an initial survey before the ship is put in service, to ensure that the equipment, systems, fittings, arrangements and materials fully comply with the relevant provisions of [3.3.17] and [3.4].

Table 4 : Inspection and testing at works

No.	Item	Tests for materials		Inspections and tests for the products			References
		Y/N (1)	Type of material certificate (2)	during manufacturing (1)	after completion (1) (3)	Type of product certificate (2)	
1	pipes, valves and fittings of class II (see [3.3.1])	Y	• C where ND>100 mm • W where ND≤100 mm	Y	Y	C	[4.2.1] [4.2.1] [4.2.2] [4.2.3]
2	expansion joints and cargo hoses	Y (4)	W	N	Y	C	[4.2.1] [4.2.3]
3	cargo pumps	Y	W	Y (5)	Y	C	see note [4.2.3] (5)

(1) Y = required, N = not required.
(2) C = class certificate, W = works' certificate.
(3) includes the checking of the rule characteristics according to the approved drawings.
(4) if metallic.
(5) inspection during manufacturing is to be carried out according to a program approved by the Society.
(6) may also be carried out on board.

No.	Item	Tests for materials		Inspections and tests for the products			References
		Y/N (1)	Type of material certificate (2)	during manufacturing (1)	after completion (1) (3)	Type of product certificate (2)	
4	gas-tight penetration glands	N		N	Y	C	[4.2.3], [4.2.4]
5	cargo tank P/V and high velocity valves	Y	C	Y	Y	C	[4.2.1] [4.2.2] [4.2.5][4.2.3] [4.2.4] [4.2.5]
6	flame arresters	N		N	Y	C	see note (3)
7	Oil discharge monitoring and control system	N			Y (6)	C	see note (3)
8	Oil/water interface detector	N			Y (6)	C	see note (3)

(1) Y = required, N = not required.
(2) C = class certificate, W = works' certificate.
(3) includes the checking of the rule characteristics according to the approved drawings.
(4) if metallic.
(5) inspection during manufacturing is to be carried out according to a program approved by the Society.
(6) may also be carried out on board.

5 3 Additional requirements for units with service notation "barge-accommodation"

5.1 3.1 Bilge system

5.1.1 3.1.1 General *(1/6/2021)*

a) The bilge pumping system required in Pt C, Ch 1, Sec 10, [6] is to be capable of operation under all practicable conditions after a casualty, whether the unit is upright or listed. For this purpose, wing suctions is generally to be fitted except in narrow compartments at the end of the unit where one suction may be sufficient. In compartments of unusual form, additional suctions may be required.

b) Arrangements are to be made whereby water in the compartment may find its way to the suction pipes.

c) Where, for particular compartments, the Society is satisfied that the provisions of drainage may be undesirable, it may allow such provision to be dispensed with if damage stability calculations carried out in accordance with Sec 2, [1] show that the survival capability of the unit will not be impaired.

5.1.2 3.1.2 Bilge pumps

a) Number and capacity of bilge pumps

Any unit is to be provided with at least two power bilge pumps connected to the bilge main. For units with the service notation **barge-accommodation**, where the bilge pump numeral is 30 or more, one additional independent power pump is to be provided.

The bilge pump numeral is to be calculated as follows:

- where P_1 is greater than P:

$$\text{bilge pump numeral} = 72 \cdot \left[\frac{M + 2P_1}{V + P_1 - P}\right]$$

- in other cases:

$$\text{bilge pump numeral} = 72 \cdot \left[\frac{M + 2}{V}\right]$$

where:

L : the length of the unit (m), as defined in the International Convention on Load Lines in force

M : the volume of the machinery space (m^3), that is below the bulkhead deck; with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward of, or abaft, the machinery space. For the purpose of this item, machinery spaces are spaces between the watertight boundaries of a space containing the auxiliary machinery, including boilers and generators. In the case of unusual arrangements, the Administration

may define the limits of the machinery spaces;

P : the whole volume of the passenger and crew spaces below the bulkhead deck (m^3), which are provided for the accommodation and use of passengers and crew, excluding baggage, store, provision and mail rooms;

V : the whole volume of the unit below the bulkhead deck (m^3);

P_1 : NK where:

N : the number of passengers for which the ship is to be certified; and

K : 0,056 L

Each of the above pumps is to have a capacity not less than that required in Pt C, Ch 1, Sec 10, [6.7.4].

For use of ejectors in lieu of bilge pumps, see Pt C, Ch 1, Sec 10, [6.7.2].

b) Location of bilge pumps

Where practicable, the power bilge pumps are to be placed in separate watertight compartments and so arranged or situated that these compartments will not be flooded by the same damage. If the auxiliary machinery and boilers are in two or more watertight compartments, the pumps available for bilge service are to be distributed as far as is possible throughout these compartments.

c) Availability of pumps

On a unit of 91,5 m in length and upwards or having a bilge pump numeral of 30 or more, as stated in [~~5~~3.1.2] a), the arrangements are to be such that at least one power bilge pump will be available for use in all flooding conditions which the unit is required to withstand, as follows:

1) one of the required bilge pumps is to be an emergency pump of a reliable submersible type having a source of power situated above the bulkhead deck, or

2) the bilge pumps and their sources of power are to be so distributed throughout the length of the unit that at least one pump in an undamaged compartment will be available.

d) Draining capability

With the exception of additional pumps which may be provided for peak compartments only, each required bilge pump is to be so arranged as to draw water from any space required to be drained.

5.1.3 3.1.3 Direct bilge suction

a) In units subject to subdivision regulations, independent power bilge pumps situated in machinery and/or boiler spaces are to have direct suctions from these spaces, except that not more than two such suctions are to be required in any one space.

b) Where two or more such suctions are provided in one compartment, there is to be at least one on each side of the unit.

c) The Society may require independent power bilge pumps situated in other spaces to have separate direct suctions.

5.1.4 3.1.4 Control location

a) The spindles of the sea inlet and direct suction valves are to extend well above the engine room platform.

b) Where the pumps are driven by electric motors, their starting equipment are to be located at, or above, the level of the motors.

5.1.5 3.1.5 Provision against bilge system damage

a) Damage to the bilge system

Provision is to be made to prevent the compartment served by any bilge suction pipe being flooded in the event of the pipe being severed or otherwise damaged by collision or grounding in any other compartment. For this purpose, where the pipe is at any part situated nearer the side of the unit than one fifth of the breadth of the unit (measured at right angles to the centreline at the level of the deepest subdivision load line), or is in a duct keel, a non-return valve is to be fitted to the pipe in the compartment containing the open end.

b) Operation in the case of flooding

1) Distribution boxes, cocks and valves in connection with the bilge pumping system is to be so arranged that, in the event of flooding, one of the bilge pumps may be operative on any compartment; in addition, damage to a pump or its pipe connecting to the bilge main outboard of a line drawn at one fifth of the breadth of the unit is to not put the bilge system out of action.

2) If there is only one system of pipes common to all the pumps, the necessary valves for controlling the bilge suctions must be capable of being operated from above the bulkhead deck.

3) Where in addition to the main bilge pumping system an emergency bilge pumping system is provided, it is to be independent of the main system and so arranged that a pump is capable of operating on any compartment under flooding condition; in that case, only the valves necessary for the operation of the emergency system need be capable of being operated from above the bulkhead deck.

c) Valve controls

All cocks and valves referred in [~~5~~3.1.5] b) which can be operated from above the bulkhead deck are to have their controls at their place of operation clearly marked and are to be provided with means to indicate whether they are open or closed.

5.1.6 3.1.6 Bilge system for small units

For units not subject to subdivision regulations, less than 25 tons gross tonnage, the bilge system will be specially considered by the Society in each single case.

5.2 3.2 Ballast system

5.2.1 3.2.1

Water ballast should not in general be carried in tanks intended for fuel oil. In units in which it is not practicable to avoid putting water in fuel oil tanks, oily-water separating equipment to the satisfaction of the Society is to be fitted, or other alternative means, such as discharge to shore facilities are to be provided for disposing of the oily-water ballast.

5.3 3.3 Special requirements for starting arrangement of emergency generating sets

5.3.1 3.3.1

The arrangements are to be such that the energy for the first charge of the sources of stored energy for starting the emergency generator can be produced on board under emergency condition, without external aid.

5.3.2 3.3.2

The arrangements are to be such that the emergency generating set is automatically started periodically and kept running for a predetermined warm-up time. The interval between the starting and warm-up periods is not to exceed one month, and an alarm is to be given in case of failure of the starting attempts.

SECTION 4 ADDITIONAL REQUIREMENTS FOR MACHINERY AND CARGO SYSTEMS ~~FOR~~OF BARGE-OIL~~, FLASHPOINT > 60°C~~

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 *(1/6/2021)*

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 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.

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 *(1/6/2021)*

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.

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

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.

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
- they have only welded or heavy flanged joints the number of which is kept to a minimum
- they are of substantial wall thickness as per Pt C, Ch 1, Sec 10, Tab 23, column 1.

2.1.9 Heating systems intended for cargo *(1/6/2021)*

a) Heating systems intended for cargo are to comply with the relevant requirements of Pt C, Ch 1, Sec 10.

b) The steam and heating media temperature within the cargo area is not to exceed 220° C.

c) Blind flanges or similar devices are to be provided on the heating circuits fitted to tanks carrying cargoes which are not to be heated.

d) Heating systems are to be so designed that the pressure maintained in the heating circuits is higher than that exerted by the cargo oil. This need not be applied to heating circuits which are not in service provided they are drained and blanked-off.

e) Isolating valves are to be provided at the inlet and outlet connections of the tank heating circuits. Arrangements are to be made to allow manual adjustment of the flow.

f) Heating pipes and coils inside tanks are to be built of a material suitable for the heated fluid. They are to have welded connections only.

g) To reduce the risk of liquid or gaseous cargo returns inside the engine or boiler rooms, steam heating systems of cargo tanks are to satisfy either of the following provisions:

- they are to be independent of other ship services, except cargo heating or cooling systems, and are not to enter machinery spaces, or
- they are to be provided with an observation tank on the water return system located within the cargo area. However, this tank may be placed inside the engine room in a well-ventilated position remote from boilers and other sources of ignition. Its air pipe is to be led to the open and fitted with a flame arrester.

h) Hot water systems serving cargo tanks are to be independent of other systems. They are not to enter machinery spaces unless the expansion tank is fitted with:

- means for detection of flammable vapours
- a vent pipe led to the open and provided with a flame arrester.

i) Thermal oil heating systems serving cargo tanks are to be arranged by means of a separate secondary system, located completely within the cargo area. However, a single circuit system may be accepted provided that:

- the system is so arranged as to ensure a positive pressure in the coil of at least 3 m water column above the static head of the cargo when the circulating pump is not in operation
- means are provided in the expansion tank for detection of flammable cargo vapours. Portable equipment may be accepted
- valves for the individual heating coils are provided with a locking arrangement to ensure that the coils are under static pressure at all times.

2.2 Cargo pumping system

2.2.1 Number and location of cargo pumps *(1/6/2021)*

Arrangements are to be adopted to make discharge by pumps in the oil terminal possible, taking into account the NPSHD at the pumps, or a fixed mean of discharging and stripping is to be fitted.

Cargo pumps are to be located:

- in a dedicated pump room, or
- on deck, or
- when designed for this purpose, within the cargo tanks.

2.2.2 Use of cargo pumps *(1/6/2021)*

Except where expressly permitted in [2.1.5] and Sec 3, [2.2.1], cargo pumps are to be used exclusively for handling the liquid cargo and are not to have any connections to compartments other than cargo tanks.

Subject to their performance, cargo pumps may be used for tank stripping.

Cargo pumps may be used, where necessary, for the washing of cargo tanks

2.2.3 Cargo pumps drive *(1/6/2021)*

a) Prime movers of cargo pumps are not to be located in the cargo area, except in the following cases:
   - steam driven machine supplied with steam having a temperature not exceeding 220 °C
   - hydraulic motors
   - electric motors of certified explosion proof type.

b) Pumps with a submerged electric motor are not permitted in cargo tanks.

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

   1) drive shafts are to be fitted with flexible couplings or other means suitable to compensate for any misalignment
   2) the shaft bulkhead or deck penetration is to be fitted with a gas-tight gland of a type approved by the Society. The gland is to be efficiently lubricated from outside the pump room and so designed as to prevent overheating. The seal parts of the gland are to be of material that cannot initiate sparks.
   3) temperature sensing devices are to be fitted for bulkhead shaft gland bearings.

Note 1: The provisions of this requirement also apply to stripping pumps and ballast pumps.

2.2.4 Design of cargo pumps *(1/6/2021)*

a) Materials of cargo pumps are to be suitable for the products carried.

b) The delivery side of cargo pumps is to be fitted with relief valves discharging back to the suction side of the pumps (bypass) in closed circuit. Such relief valves may be omitted in the case of centrifugal pumps with a maximum delivery pressure not exceeding the design pressure of the piping, with the delivery valve closed.

c) Pump casings are to be fitted with temperature sensing devices; see [2.2.5].

2.2.5 Monitoring of cargo pumps *(1/6/2021)*

Cargo pumps are to be monitored as required in Tab 2.

2.2.6 Control of cargo pumps *(1/6/2021)*

Cargo pumps are to be capable of being stopped from:

- a position outside the pump room, and
- a position next to the pumps.

2.2.7 Cargo piping design *(1/6/2021)*

Unless otherwise specified, cargo piping is to be designed and constructed according to the requirements of Pt C, Ch 1, Sec 10 applicable to piping systems of class III.

- For tests, refer to Sec 4, [4].
- Cargo piping is, in general, to be made of steel or cast iron.
- Valves, couplings and other end fittings of cargo pipe lines for connection to hoses are to be of steel or other suitable ductile material.
- Spheroidal graphite cast iron may be used for cargo oil piping.
- Grey cast iron may be accepted for cargo oil lines:
  - within cargo tanks, and
  - on the weather deck for pressure up to 1,6 Mpa.

  It is not to be used for manifolds and their valves of fittings connected to cargo handling hoses.
- Plastic pipes may be used in the conditions specified in Pt C, Ch 1, App 3. Arrangements are to be made to avoid the generation of static electricity.

Cargo pipe lengths may be connected either by means of welded joints or, unless otherwise specified, by means of flange connections.

Where necessary, cargo piping is to be fitted with expansion joints or bends.

Expansion joints including bellows are to be of a type approved by the Society.

Expansion joints made of non-metallic material may be accepted only inside tanks and provided they are:

- of an approved type
- designed to withstand the maximum internal and external pressure
- electrically conductive

Sliding type couplings are not to be used for expansion purposes where lines for cargo oil pass through tanks for segregated ballast.

Valves with remote control are to comply with Pt C, Ch 1, Sec 10, [2.7.3].

Submerged valves are to be remote controlled. In the case of a hydraulic remote control system, control boxes are to be provided outside the tank, in order to permit the emergency control of valves.

Valve actuators located inside cargo tanks are not to be operated by means of compressed air.

Cargo hoses are to be of a type approved by the Society for the intended conditions of use.

Hoses subject to tank pressure or pump discharge pressure are to be designed for a bursting pressure not less than 4 times the maximum pressure under cargo transfer conditions.

The ohmic electrical resistance of cargo hoses is not to exceed 10^6 Ω .

Table 2 : Monitoring of cargo pumps *(1/6/2021)*

Equipment, parameter	Alarm **(1)**	Indication **(2)**	Comments
pump, discharge pressure	-	L	• on the pump **(3)**, or • next to the unloading control station
pump casing, temperature	H		visual and audible, in cargo control room or pump control station
bulkhead shaft gland bearing, temperature	H		visual and audible, in cargo control room or pump control station

(1) H = high
(2) L = low
(3) and next to the driving machine if located in a separate compartment

2.2.8 Cargo piping arrangement and installation *(1/6/2021)*

Cargo piping is not to pass through tanks or compartments located outside the cargo area.

Cargo piping and similar piping to cargo tanks is not to pass through ballast tanks except in the case of short lengths of piping complying with [2.1.3] b).

Cargo piping may pass through vertical fuel oil tanks adjacent to cargo tanks on condition that the provisions of [2.1.3] b) are complied with.

Piping through cargo tanks, see also Ch 7, Sec 2, [3.1.4].

Cargo piping passing through bulkheads is to be so arranged as to preclude excessive stresses at the bulkhead. Bolted flanges are not to be used in the bulkhead.

Stop valves are to be provided to isolate each tank.

A stop valve is to be fitted at each end of the cargo manifold.

When a cargo pump in the cargo pump room serves more than one cargo tank, a stop valve is to be fitted in the cargo pump room on the line leading to each tank.

Main cargo oil valves located in the cargo pump room below the floor gratings are to be remote controlled from a position above the floor.

To avoid the hazard of an incendive discharge due to the build-up of static electricity resulting from the flow of the liquid/gases/vapours, the following requirements are to be complied with:

- the loading pipes are to be led as low as practicable in the tank
- the resistance between any point on the surface of the cargo and slop tanks, piping systems and equipment, and the hull of the ship is not to be greater than 10^6 Ω.

Bonding straps are required for cargo and slop tanks, piping systems and equipment which are not permanently connected to the hull of the ship, for example:

a) independent cargo tanks

b) cargo tank piping systems which are electrically separated from the hull of the ship

c) pipe connections arranged for the removal of the spool pieces.

Where bonding straps are required, they are to be:

- clearly visible so that any shortcoming can be clearly detected
- designed and sited so that they are protected against mechanical damage and are not affected by high resistivity contamination, e.g. corrosive products or paint
- easy to install and replace.

Where the ship is arranged for loading and unloading outside the cargo area, the following provisions are to be complied with:

- the piping outside the cargo area is to be fitted with a shut-off valve at its connection with the piping system within the cargo area and separating means such as blank flanges or removable spool pieces or equivalent (see Note 1) are to be provided when the piping within the cargo area is not in use
- the shore connection is to be fitted with a shut-off valve and a blank flange

Note 1: Those indicated in the IMO MSC/Circ. 474 are acceptable as equivalent

d) pipe connections outside the cargo area are to be of welded type only

e) arrangements are made to allow the piping outside the cargo area to be efficiently drained and purged.

2.3 Cargo tanks and fittings

2.3.1 *(1/6/2021)*

The provisions of this paragraph apply to cargo tanks and slop tanks.

2.3.2 Cargo tank venting *(1/6/2021)*

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.

2.3.3 Design of venting arrangements *(1/6/2021)*

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). 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 underpressure conditions within a tank.

2.3.4 Combination of venting arrangements *(1/6/2021)*

a) the venting arrangements in each cargo tank may be independent or combined with other cargo tanks and may 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 [2.3.3] a).

c) if cargo loading or 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 [2.3.3] c).

2.3.5 Arrangement of vent lines *(1/6/2021)*

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.

2.3.6 Openings for pressure release *(1/6/2021)*

Openings for pressure release required by [2.3.3] 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.

2.3.7 Pressure/vacuum valves *(1/6/2021)*

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 [2.3] 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 [2.3.3] 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 Ch 7, 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.

2.3.8 Vent oulets *(1/6/2021)*

Vent outlets for cargo loading, discharging and ballasting required by [2.3.3] b) are to:

a) permit:

1) the free flow of vapour mixtures, or

2) 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 deck machinery which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard,

d) where the method is by high velocity discharge, be located at a height not less than 2 m above the cargo tank deck and not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard. These outlets are to be provided with high velocity devices of a type approved by the Society,

e) be designed on the basis of the maximum designed loading rate multiplied by a factor of at least 1,25 to take account of gas evolution, in order to prevent the pressure in any cargo tank from exceeding the design pressure. The Master is to be provided with information regarding the maximum permissible loading rate for each cargo tank and in the case of combined venting systems, for each group of cargo tanks.

The arrangements for the venting of vapours displaced from the cargo tanks during loading and ballasting are to comply with this item [2.3] and are to consist of either one or more mast risers, or a number of high-velocity vents. The inert gas supply main may be used for such venting.

2.3.9 High velocity valves *(1/6/2021)*

a) High velocity valves are to be readily accessible

b) High velocity valves not required to be fitted with flame arresters (see [2.3.10]) are not to be capable of being locked on open position.

2.3.10 Prevention of the passage of flame into the tanks *(1/6/2021)*

a) The venting system is to be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of these devices are to comply with Ch 7, App 1.

Ullage openings are not to be used for pressure equalisation. They are to be provided with self-closing and tightly sealing covers. Flame arresters and screens are not permitted in these openings.

b) A flame arresting device integral to the venting system may be accepted.

c) Flame screens and flame arresters are to be designed for easy overhauling and cleaning.

2.3.11 Prevention of liquid rising in the venting system *(1/6/2021)*

a) Provisions are to be made to prevent liquid rising in the venting system; refer to [2.3.16].

b) Cargo tanks gas venting systems are not to be used for overflow purposes.

c) Spill valves are not considered equivalent to an overflow system.

2.3.12 Cargo tank purging and/or gas-freeing *(1/6/2021)*

a) Arrangements are to be made for purging and/or gas-freeing of cargo tanks. The arrangements are to be such as to minimise the hazards due to the dispersal of flammable vapours in the atmosphere and to flammable mixtures in a cargo tank. Accordingly, the provisions of [2.3.13] and [2.3.14], as applicable, are to be complied with.

b) In the case of fans installed in safe spaces, two non-return devices are to be fitted to avoid return of cargo vapours to safe spaces when the ventilation system is shut down. These non-return devices are to operate in all normal conditions of ship trim and list.

c) Discharge outlets are to be located at least 10 m measured horizontally from the nearest air intake and openings to enclosed spaces with a source of ignition and from deck machinery equipment which may constitute an ignition hazard.

2.3.13 Ships provided with an inert gas system *(1/6/2021)*

When the ship is provided with an inert gas system, the cargo tanks are first to be purged in accordance with the provisions of Part C, Chapter 4 until the concentration of hydrocarbon vapours in the cargo tanks has been reduced to less than 2% by volume. Thereafter, gas-freeing may take place at the cargo tank deck level.

2.3.14 Ships not provided with an inert gas system *(1/6/2021)*

When the ship is not provided with an inert gas system, the operation is to be such that the flammable vapour is discharged initially:

a) through the vent outlets as specified in [2.3.8], or

b) through outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas-freeing operation, or

c) through outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 20 m/s and which are protected by suitable devices to prevent the passage of flame.

The above outlets are to be 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 deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard.

When the flammable vapour concentration at the outlet has been reduced to 30% of the lower flammable limit, gas-freeing may thereafter be continued at cargo tank deck level.

2.3.15 Cargo tank level gauging systems *(1/6/2021)*

a) Each cargo or slop tank is to be fitted with a level gauging system indicating the liquid level along the entire height of the tank. Unless otherwise specified, the gauge may be portable or fixed with local reading.

b) Gauging devices and their remote reading systems are to be type approved.

c) Ullage openings and other gauging devices likely to release cargo vapour to the atmosphere are not to be arranged in enclosed spaces.

1) a “restricted gauging device” means a device which penetrates the tank and which, when in use, permits a small quantity of vapour or liquid to be exposed to the atmosphere. When not in use, the device is completely closed. Examples are sounding pipes.

2) a “closed gauging device” means a device which is separated from the tank atmosphere and keeps tank contents from being released. It may:

- penetrate the tank, such as float-type systems, electric probe, magnetic probe or protected sight glass.
- not penetrate the tank, such as ultrasonic or radar devices.

3) an “indirect gauging device” means a device which determines the level of liquid, for instance by means of weighing or pipe flow meter .

In barges fitted with an inert gas system, the gauging devices are to be of the closed type; use of indirect gauging devices will be given special consideration.

In barges not fitted with an inert gas system:

- the gauging devices are to be of the closed or restricted types. Ullage openings may be used only as a reserve sounding means and are to be fitted with a watertight closing appliance.
- Where restricted gauging devices are used, provisions are to be made to avoid dangerous escape of liquid or vapour under pressure when using the device relieve the pressure in the tank before the device is operated.
- Where used, sounding pipes are to be fitted with a a self-closing blanking device.

2.3.16 Protection against tank overload *(1/6/2021)*

Provisions are to be made to guard against liquid rising in the venting system of cargo or slop tanks to a height which would exceed the design head of the tanks. This is to be accomplished by high level alarms or overflow control systems or other equivalent means, together with gauging devices and cargo tank filling procedures.

Sufficient ullage is to be left at the end of tank filling to permit free expansion of liquid during carriage.

High level alarms, overflow control systems and other means referred to above are to be independent of the gauging systems referred to in [2.3.15].

High level alarms are to be type approved.

High level alarms are to give an audible and visual signal at the control station, where provided.

Where the tank level gauging systems, cargo and ballast pump control systems and valve control systems are centralised in a single location, the provisions above may be complied with by the fitting of a level gauge for the indication of the end of loading, in addition to that required for each tank under [2.3.15]. The readings of both gauges for each tank are to be as near as possible to each other and so arranged that any discrepancy between them can be easily detected.

2.3.17 Tank washing systems *(1/6/2021)*

Adequate means are to be provided for cleaning the cargo tanks, except on units which:

- are dedicated to the same type of cargo for many consecutive voyages, and
- are arranged with segregated ballast tanks according to Sec 2, [5], and
- do not carry out tank washing on a regular basis, and
- use shore services for tank washing and disposal of washing media and residues, when needed.

Crude oil washing systems, when fitted, are to comply with the provisions of Ch 7, App 2 related to safety.

Tank washing machines are to be of a type approved by the Society.

Washing machines are to be made of steel or other electricity conducting materials with a limited propensity to produce sparks on contact.

Washing pipes are to be built, fitted, inspected and tested in accordance with the applicable requirements of Pt C, Ch 1, Sec 10, depending on the kind of washing fluid, water or crude oil.

Crude oil washing pipes are also to satisfy the requirements of [2.2.7].

Crude oil washing machines may be connected to water washing pipes, provided that isolating arrangements, such as a valve and a detachable pipe section, are fitted to isolate water pipes.

Tank cleaning openings are not to be arranged in enclosed spaces.

The complete installation is to be permanently earthed to the hull.

2.4 Prevention of pollution by cargo oil

2.4.1 Application *(1/6/2021)*

Unless otherwise specified, the provisions of [2.4.4], [2.4.5] and [2.4.6] apply only to barges of 150 gross tonnage and above.

2.4.2 Provisions for barges of less than 150 gross tonnage *(1/6/2021)*

The control of discharge for **barges** of less than 150 gross tonnage is to be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities unless adequate arrangements are made to ensure that the discharge of any effluent into the sea, where allowed, is effectively monitored to ensure that the total quantity of oil discharged into the sea does not exceed 1/30 000 of the total quantity of the particular cargo of which the residue formed a part.

2.4.3 Exemptions *(1/6/2021)*

The provisions of [2.4.4] and [2.4.5] may be waived in the following cases:

- barges engaged exclusively on voyages within 50 miles from the nearest land and of 72 hours or less in duration and limited to trades between ports or terminals agreed

by the Society, provided that oily mixtures are retained on board for subsequent discharge to reception facilities

- carrying products which through their physical properties inhibit effective product/water separation and monitoring, for which the control of discharge is to be effected by the retention of residues on board with discharge of all contaminated washings to reception facilities.

2.4.4 Retention of oil on board *(1/6/2021)*

Adequate means are to be provided for transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the Society.

2.4.5 Capacity of slop tanks *(1/6/2021)*

The arrangement of the slop tank or combination of slop tanks is 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 not to be less than 3% of the oil carrying capacity of the ship, except that the Society may accept:

a) 2% for barges 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 eductors, without the introduction of additional water into the system

b) 2% where segregated ballast tanks are provided, or where a cargo tank cleaning system using crude oil washing is fitted in accordance with [2.3.17]. This capacity may be further reduced to 1,5% for barges 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 eductors, without introduction of additional water into the system

c) 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.

Barges of 70 000 tonnes deadweight and above are to be fitted with at least two slop tanks.

2.4.6 Design of slop tanks *(1/6/2021)*

Slop tanks are to be so designed particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, as to avoid excessive turbulence and entrainment of oil or emulsion with the water.

2.4.7 Pumping, piping and discharge arrangements *(1/6/2021)*

In every barge, a discharge manifold for connection to reception facilities for the discharge of dirty ballast water or oil contaminated water is to be located on the open deck on both sides of the ship.

2.4.8 Discharge pipelines *(1/6/2021)*

In every barge, pipelines for the discharge of ballast water or oil contaminated water from cargo tank areas to the sea, where permitted, are to be led to the open deck or to the ship side above the waterline in the deepest ballast condition, except that:

a) segregated ballast and clean ballast may be discharged below the waterline:

- in ports or at offshore terminals, or
- at sea by gravity,

provided that the surface of the ballast water has been examined immediately before the discharge to ensure that no contamination with oil has taken place.

b) on every barge at sea, dirty ballast water or oil contaminated water from tanks in the cargo area, other than slop tanks, may be discharged by gravity below the waterline, provided that sufficient time has elapsed in order to allow oil/water separation to have taken place and the water ballast has been examined immediately before the discharge with an oil/water interface detector, in order to ensure that the height of the interface is such that the discharge does not involve any increased risk of harm to the marine environment.

2.4.9 Discharge stopping *(1/6/2021)*

Means are to be provided for stopping the discharge into the sea of ballast water or oil contaminated water from cargo tank areas, other than those discharges below the waterline permitted under [2.4.8], from a position on the upper deck or above located so that the manifold in use referred to in [2.4.7] and the discharge to the sea from the pipelines referred to in [2.4.8] may be visually observed. Means for stopping the discharge need not be provided at the observation position if a positive communication system such as a telephone or radio system is provided between the observation position and the discharge control position.

2.4.10 Cargo piping connections to sea chests *(1/6/2021)*

On every barge where a sea chest is permanently connected to the cargo pipeline system, it is to be equipped with both a sea chest valve and an inboard isolation valve. In addition to these valves, the sea chest is to be capable of isolation from the cargo piping system whilst the barge is loading, transporting or discharging cargo by use of a positive means that is to the satisfaction of the Society. Such a positive means is a facility that is installed in the pipeline system in order to prevent the section of pipeline between the sea chest valve and the inboard valve being filled with cargo under all circumstances.

Examples of positive means may take the form of blanks, spectacle blanks, pipeline blinds, evacuation or vacuum systems, or air or water pressure systems. In the event that evacuation or vacuum systems, or air or water pressure systems are used, then they are to be equipped with both a pressure gauge and alarm system to enable the continuous monitoring of the status of the pipeline section, and thereby the valve integrity, between the sea chest and inboard valves.

3 ~~General~~Additional requirements for barge-oil intended to carry products having flashpoint > 60°C

3.1 ~~Application~~

3.1.1

~~The requirements of this Section apply to ships having the service notation:~~

- ~~**Barge-oil, flashpoint > 60°C**~~

~~intended to carry products having flashpoint > 60°C.~~

3.1.2 ~~Exemptions~~

~~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.~~

3.2 ~~Documents to be submitted~~

3.2.1

~~The documents listed in Ch 7, Sec 5, Tab 1 are to be submitted for approval in four copies.~~

4 3.1 Piping systems other than cargo piping system

4.1 General

4.1.1 3.1.1 *(1/6/2021)*

Requirements in [2.1] are applicable with the following exceptions.

4.1.2 ~~Materials~~

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.~~

4.1.3 3.1.2 Independence of piping systems *(1/6/2021)*

Requirements in [2.1.2] are applicable except for item a) and third bullet of item b).

a) ~~Fuel oil systems are to:~~

- ~~be independent from the cargo piping system~~
- ~~have no connections with pipelines serving cargo or slop tanks.~~

4.1.4 ~~Passage through cargo tanks and slop tanks~~

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 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.~~

Table 3 : ~~Documents to be submitted for all barges~~

~~No.~~	~~A/I (1)~~	~~Document (2)~~
~~1~~	~~A~~	~~Diagram of the bilge system~~
~~2~~	~~A~~	~~Diagram of the central priming system intended for the bilge pumps, where provided~~
~~3~~	~~A~~	~~Capacity, prime mover and location of the bilge pumps~~

(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 4 : ~~Additional documents to be submitted for barge-oil~~

~~No.~~	~~Document (1)~~
~~1~~	~~Diagram of cargo piping system~~
~~2~~	~~Diagram of the cargo tank venting system with indication of the outlet position~~
~~3~~	~~Diagram of the cargo tank level gauging system with overfill safety arrangements~~
~~4~~	~~Diagram of the cargo tank cleaning system, if any~~

(1) ~~Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.~~

No.	Document (1)
5	Diagram of the bilge and ballast systems serving the spaces located in the cargo area
6	Diagram of the cargo heating systems

(1) Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.

4.2 Bilge system in ships having no source of electrical power

4.2.1 General

Where there is no source of electrical power on board, hand pumps are to be provided, in sufficient number and so positioned as to permit an adequate drainage of all the compartments of the ship.

The requirement to provide a bilge system and associated hand pumps may be waived in the case of vessels without persons on board.

4.2.2 Arrangement of the bilge system

The bilge system is to comply with one of the following arrangements:

a) at least one pump is to be provided for each compartment

b) at least two pumps connected to a bilge main are to be provided. The main is to have branch pipes allowing the draining of each compartment through at least one suction.

The spaces served only by hand pumps may be not provided with air pipes according to Pt C, Ch 1, Sec 10, [9.1]. In any event they are anyway to be provided with sounding means according to Pt C, Ch 1, Sec 10, [9.2].

4.2.3 Hand pumps

a) Hand pumps are to be capable of being operated from positions above the load waterline and are to be readily accessible at any time.

b) Hand pumps are to have a maximum suction height not exceeding 7,30 m.

4.2.4 Size of bilge pipes

a) The internal diameter, in mm, of suction pipes is not to be less than the diameter given by the following formula:

$$d_1 = \frac{T}{100} + 50$$

where:

T : Underdeck tonnage, in tons.

b) When the ship is subdivided into small watertight compartments, the diameter of these suctions need not exceed 50 mm.

4.3 Bilge system in ships having a source of electrical power

4.3.1 General

On board ships having no propelling machinery but having a source of electrical power, mechanical pumps are to be provided for draining the various compartments of the ship.

4.3.2 Arrangement of the bilge system

The bilge system is to comply with the provisions of Pt C, Ch 1, Sec 10, [6.3] to Pt C, Ch 1, Sec 10, [6.6] applicable to the spaces concerned, except that direct suctions need not be provided.

4.3.3 Bilge pumps

The number and capacity of the bilge pumps are to comply with the relevant requirements of Pt C, Ch 1, Sec 10, [6.7].

4.3.4 Size of bilge pipes

The size of bilge pipes is to comply with the relevant requirements of Pt C, Ch 1, Sec 10, [6.8].

4.3.5 3.1.3 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. Requirements in [2.1.4] are applicable except for second bullet.

4.4 3.1.4 Ballast system

4.4.1 General *(1/6/2021)*

In lieu of the requirements in [2.1.5] the following applies.

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].

4.4.2 Pumping arrangements for ballast tanks within the cargo area

The mean intended to pump from segregated ballast tanks is to be a pump or an eductor used exclusively for dealing with ballast. The ballast system serving the spaces located outside the cargo area may be used for this purpose.

4.4.3 Emergency discharge of segregated ballast

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.

4.4.4 ~~Carriage of ballast water in cargo tanks~~

Provisions may made for filling cargo tanks with sea water, where permitted. Such ballast water is to be dealt with as per Ch 7, Sec 5, [5].

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 ~~[5.3.4]~~[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.

4.4.5 ~~Ballast pipes passing through tanks~~

In oil 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 ~~Ch 7, Sec 5, [2.1.3]~~[2.1.3], ~~item~~ b).

Sliding type couplings are not to be used for expansion purposes where ballast lines pass through cargo tanks. Expansion bends only are permitted.

4.5 ~~Scupper pipes~~

4.5.1 .

~~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~~
- ~~they have only welded or heavy flanged joints the number of which is kept to a minimum~~
- ~~they are of substantial wall thickness as per Pt C, Ch 1, Sec 10, Tab 23, column 1.~~

4.6 3.1.5 Heating systems intended for cargo

4.6.1 ~~General~~

~~Heating systems intended for cargo are to comply with the relevant requirements of Pt C, Ch 1, Sec 10.~~The requirements in 2.1.9 are not applicable.

5 ~~Cargo pumping and piping systems~~

5.1 ~~General~~

5.1.1 .

~~A complete system of piping is to be fitted for handling the cargo.~~

5.2 3.2 Cargo pumping system

5.2.1 3.2.1 Number and location of cargo pumps

Each cargo tank is to be served by at least one fixed mean of discharging and stripping. As an alternative, arrangements are to be adopted to make discharge by pumps in the oil terminal possible, taking into account the NPSHD at the pumps.

5.2.2 3.2.2 Use of cargo pumps *(1/6/2021)*

a) Except where expressly permitted in [3.1.4] and Sec 3, [2.2.1] ~~[2.2] and [2.3]~~ cargo pumps are to be used exclusively for handling the liquid cargo and are not to have any connections to compartments other than cargo tanks.

b) Subject to their performance, cargo pumps may be used for tank stripping.

c) Cargo pumps may be used, where necessary, for the washing of cargo tanks.

5.2.3 3.2.3 Cargo pump drive

Pumps with a submerged electric motor are not permitted in cargo tanks.

Note 1: The provisions of this requirement also apply to stripping pumps and ballast pumps.

5.2.4 3.2.4 Design of cargo pumps

a) Materials of cargo pumps are to be suitable for the products carried.

b) The delivery side of cargo pumps is to be fitted with relief valves discharging back to the suction side of the pumps (bypass) in closed circuit. Such relief valves may be omitted in the case of centrifugal pumps with a maximum delivery pressure not exceeding the design pressure of the piping, with the delivery valve closed.

5.2.5 3.2.5 Monitoring of cargo pumps

Cargo pumps are to be monitored as required in Tab 3.

5.2.6 3.2.6 Control of cargo pumps

Cargo pumps are to be capable of being stopped from:

- a position outside the pump room, and
- a position next to the pumps.

Table 5 : Tab 3 Monitoring of cargo pumps

Equipment, parameter	Alarm	Indication **(1)**	Comments
pump, discharge pressure		L	• on the pump **(2)**, or • next to the unloading control station
(1) L = low **(2)** and next to the driving machine if located in a separate compartment			

5.3 3.3 Cargo piping ~~design~~

5.3.1 3.3.1 ~~General~~Cargo piping design *(1/6/2021)*

The requirements in 2.2.7 are applicable. ~~Unless otherwise specified, cargo piping is to be designed and constructed according to the requirements of Pt C, Ch 1, Sec 10 applicable to piping systems of class III, for tests, refer to [6].~~

5.3.2 ~~Materials~~

a) ~~Cargo piping is, in general, to be made of steel or cast iron.~~

b) ~~Valves, couplings and other end fittings of cargo pipe lines for connection to hoses are to be of steel or other suitable ductile material.~~

c) ~~Spheroidal graphite cast iron may be used for cargo oil piping.~~

d) ~~Grey cast iron may be accepted for cargo oil lines:~~

- ~~within cargo tanks, and~~
- ~~on the weather deck for pressure up to 1,6 MPa.~~

~~It is not to be used for manifolds and their valves of fittings connected to cargo handling hoses.~~

e) ~~Plastic pipes may be used in the conditions specified in Pt C, Ch 1, App 3. Arrangements are to be made to avoid the generation of static electricity.~~

5.3.3 ~~Connection of cargo pipe lengths~~

~~Cargo pipe lengths may be connected either by means of welded joints or, unless otherwise specified, by means of flange connections.~~

5.3.4 ~~Expansion joints~~

a) ~~Where necessary, cargo piping is to be fitted with expansion joints or bends.~~

b) ~~Expansion joints including bellows are to be of a type approved by the Society.~~

c) ~~Expansion joints made of non-metallic material may be accepted only inside tanks and provided they are:~~

- ~~of an approved type~~
- ~~designed to withstand the maximum internal and external pressure~~
- ~~electrically conductive~~
- ~~sliding type couplings are not to be used for expansion purposes where lines for cargo oil pass through tanks for segregated ballast.~~

5.3.5 ~~Valves with remote control~~

a) ~~Valves with remote control are to comply with Pt C, Ch 1, Sec 10, [2.7.3].~~

b) ~~Submerged valves are to be remote controlled. In the case of a hydraulic remote control system, control boxes are to be provided outside the tank, in order to permit the emergency control of valves.~~

c) ~~Valve actuators located inside cargo tanks are not to be operated by means of compressed air.~~

5.3.6 ~~Cargo hoses~~

a) ~~Cargo hoses are to be of a type approved by the Society for the intended conditions of use.~~

b) ~~Hoses subject to tank pressure or pump discharge pressure are to be designed for a bursting pressure not less than 4 times the maximum pressure under cargo transfer conditions.~~

c) ~~The ohmic electrical resistance of cargo hoses is not to exceed 10^6 Ω.~~

5.4 ~~Cargo piping arrangement and installation~~

5.4.1 3.3.2 Cargo pipes passing through tanks or compartments

a) Cargo piping and similar piping to cargo tanks is not to pass through ballast tanks except in the case of short lengths of piping complying with [2.1.3], item b).

b) Cargo piping may pass through vertical fuel oil tanks adjacent to cargo tanks on condition that the provisions of [2.1.3], item b) are complied with.

5.4.2 3.3.3 Cargo piping passing through bulkheads

Cargo piping passing through bulkheads is to be so arranged as to preclude excessive stresses at the bulkhead. Bolted flanges are not to be used in the bulkhead.

5.4.3 3.3.4 Valves

a) Stop valves are to be provided to isolate each tank.

b) A stop valve is to be fitted at each end of the cargo manifold.

c) When a cargo pump in the cargo pump room serves more than one cargo tank, a stop valve is to be fitted in the cargo pump room on the line leading to each tank.

d) Main cargo oil valves located in the cargo pump room below the floor gratings are to be remote controlled from a position above the floor.

6 3.4 Cargo tanks and fittings

6.1 3.4.1 Application

6.1.1 *(1/6/2021)*

The provisions of ~~Article [4]~~3.4 apply to cargo tanks and slop tanks.

6.2 3.4.2 Cargo tank venting

6.2.1

The relevant provisions of Pt C, Ch 1, Sec 10, [9] and Pt C, Ch 1, Sec 10, [11] are to be complied with.

Tank venting systems are to open to the atmosphere at a height of at least 760 mm above the weather deck. If the cargo is carried at a temperature exceeding the flashpoint by more than 15°C, this height is to be increased to 2,4 m.

Tanks may be fitted with venting systems of the open type provided with a flame screen. For ships carrying bulk cargoes with flashpoint > 100°C, the flame screen may be omitted.

6.3 3.4.3 Protection against tank overload

6.3.1 ~~General~~ *(1/6/2021)*

The requirements in 2.3.16 are applicable.

a) ~~Provisions are to be made to guard against liquid rising in the venting system of cargo or slop tanks to a height which would exceed the design head of the tanks. This is to be accomplished by high level alarms or overflow control systems or other equivalent means, together with gauging devices and cargo tank filling procedures.~~

b) ~~Sufficient ullage is to be left at the end of tank filling to permit free expansion of liquid during carriage.~~

c) ~~High level alarms, overflow control systems and other means referred to in a) are to be independent of the gauging systems.~~

6.3.2 ~~High level alarms~~

a) ~~High level alarms are to be type approved.~~

b) ~~High level alarms are to give an audible and visual signal at the cargo control station, where provided.~~

6.3.3 ~~Other protection systems~~

a) ~~Where the tank level gauging systems, cargo and ballast pump control systems and valve control systems are centralised in a single location, the provisions of [4.3.1] may be complied with by the fitting of a level gauge for the indication of the end of loading, in addition to that required for each tank under [4.3.1]. The readings of both gauges for each tank are to be as near as possible to each other and so arranged that any discrepancy between them can be easily detected.~~

b) ~~Where a tank can be filled only from other tanks, the provisions of [4.3.1] are considered as complied with.~~

6.4 3.4.4 Tank washing systems

6.4.1 ~~General~~ *(1/6/2021)*

The requirements in 2.3.17 are applicable.

~~Adequate means are to be provided for cleaning the cargo tanks except on 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~~
- ~~use shore services for tank washing and disposal of washing media and residues, when needed.~~

6.4.2 ~~Washing machines~~

a) ~~Tank washing machines are to be of a type approved by the Society.~~

b) ~~Washing machines are to be made of steel or other electricity conducting materials with a limited propensity to produce sparks on contact.~~

6.4.3 ~~Washing pipes~~

~~Washing pipes are to be built, fitted, inspected and tested in accordance with the applicable requirements of Pt C, Ch 1, Sec 10, depending on the kind of washing fluid or water.~~

6.4.4 ~~Installation of washing systems~~

~~Tank cleaning openings are not to be arranged in enclosed spaces.~~

7 3.5 Prevention of pollution by cargo oil

7.1 ~~General~~

7.1.1 3.5.1 ~~Application~~ *(1/6/2021)*

The requirements in 2.4 are applicable with the following additional exemption:

~~Unless otherwise specified, the provisions of [5.2] and [5.3] apply only to oil barges of 150 gross tonnage and above.~~

7.1.2 ~~Provisions for oil barges of less than 150 gross tonnage~~

~~The control of discharge for **barges** of less than 150 gross tonnage is to be effected by the retention of oil on board with subsequent discharge of all contaminated washings to reception facilities unless adequate arrangements are made to ensure that the discharge of any effluent into the sea, where allowed, is effectively monitored to ensure that the total quantity of oil discharged into the sea does not exceed 1/30 000 of the total quantity of the particular cargo of which the residue formed a part.~~

7.1.3 ~~Exemptions~~

a) ~~The provisions of [5.2] and [5.3] may be waived in the following cases:~~

- ~~oil barges engaged exclusively on voyages within 50 miles from the nearest land and of 72 hours or less in duration and limited to trades between ports or terminals agreed by the Society, provided that oily mixtures are retained on board for subsequent discharge to reception facilities~~
- ~~oil barges carrying products which through their physical properties inhibit effective product/water separation and monitoring, for which the control of discharge is to be effected by the retention of residues on board with discharge of all contaminated washings to reception facilities.~~

Where, in the view of the Society, the equipment referred to in ~~[5.3.1]~~[2.4.7] and ~~[5.3.2]~~[2.4.8] is not obtainable for the monitoring of discharge of oil refined products (white oils), compliance with such requirements may be waived provided that discharge is performed only in accordance with the applicable procedures.

7.2 ~~Retention of oil on board~~

7.2.1 ~~General~~

~~Adequate means are to be provided for transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the Society.~~

7.2.2 ~~Capacity of slop tanks~~

~~The arrangement of the slop tank or combination of slop tanks is 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 not to be~~

~~less than 3% of the oil carrying capacity of the ship, except that the Society may accept:~~

a) ~~2% for oil tankers 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 eductors, without the introduction of additional water into the system~~

b) ~~2% where segregated ballast tanks are provided. This capacity may be further reduced to 1,5% for oil tankers 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 eductors, without introduction of additional water into the system.~~

c) ~~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.~~

~~Oil barges of 70 000 tonnes deadweight and above are to be fitted with at least two slop tanks.~~

7.2.3 ~~Design of slop tanks~~

~~Slop tanks are to be so designed particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, as to avoid excessive turbulence and entrainment of oil or emulsion with the water.~~

7.3 ~~Pumping, piping and discharge arrangements~~

7.3.1 ~~Discharge manifold~~

~~In every oil barge, a discharge manifold for connection to reception facilities for the discharge of dirty ballast water or oil contaminated water is to be located on the open deck on both sides of the ship.~~

7.3.2 ~~Discharge pipelines~~

~~In every oil barge, pipelines for the discharge of ballast water or oil contaminated water from cargo tank areas to the sea, where permitted, are to be led to the open deck or to the ship side above the waterline in the deepest ballast condition, except that:~~

a) ~~segregated ballast and clean ballast may be discharged below the waterline:~~

- ~~in ports or at offshore terminals, or~~
- ~~at sea by gravity,~~

~~provided that the surface of the ballast water has been examined immediately before the discharge to ensure that no contamination with oil has taken place.~~

b) ~~on every oil barge at sea, dirty ballast water or oil contaminated water from tanks in the cargo area, other than slop tanks, may be discharged by gravity below the waterline, provided that sufficient time has elapsed in order to allow oil/water separation to have taken place and the water ballast has been examined immediately before the discharge with an oil/water interface detector referred to in [5.3.3], in order to ensure that the height of the interface is such that the discharge does not involve any increased risk of harm to the marine environment.~~

7.3.3 ~~Discharge stopping~~

~~Means are to be provided for stopping the discharge into the sea of ballast water or oil contaminated water from cargo tank areas, other than those discharges below the waterline permitted under [5.3.2], from a position on the upper deck or above located so that the manifold in use referred to in [5.3.1] and the discharge to the sea from the pipelines referred to in [5.3.2] may be visually observed. Means for stopping the discharge need not be provided at the observation position if a positive communication system such as a telephone or radio system is provided between the observation position and the discharge control position.~~

7.3.4 ~~Cargo piping connections to sea chests~~

~~Where a sea chest is permanently connected to the cargo pipeline system, it is to be equipped with both a sea chest valve and an inboard isolation valve. In addition to these valves, the sea chest is to be capable of isolation from the cargo piping system whilst the barge is loading, transporting or discharging cargo by use of a positive means that is to the satisfaction of the Society. Such a positive means is a facility that is installed in the pipeline system in order to prevent the section of pipeline between the sea chest valve and the inboard valve being filled with cargo under all circumstances.~~

~~Examples of positive means may take the form of blanks, spectacle blanks, pipeline blinds, evacuation or vacuum systems, or air or water pressure systems. In the event that evacuation or vacuum systems, or air or water pressure systems are used, then they are to be equipped with both a pressure gauge and alarm system to enable the continuous monitoring of the status of the pipeline section, and thereby the valve integrity, between the sea chest and inboard valves.~~

8 4 Certification, inspection and testing

8.1 4.1 ~~Application~~

8.1.1 4.1.1 *(1/6/2021)*

The provisions of ~~this Article~~ Ch 7, Sec 4, [6] are applicable to barge-oil intended to carry oil having any flashpoint (i.e. including oils having flash point < 60°C). ~~related to cargo piping and other equipment fitted in the cargo area~~. ~~They supplement those given in Pt C, Ch 1, Sec 10, [21] for piping systems.~~

The provisions of Ch 7, Sec 5, [6] are applicable to barge-oil intended to carry only oil having flashpoint > 60°C.

8.2 Workshop tests

8.2.1 Tests for materials

Where required in Tab 4, materials used for pipes, valves and fittings are to be subjected to the tests specified in Pt C, Ch 1, Sec 10, [21.3.2].

8.2.2 Hydrostatic testing

a) Where required in Tab 4, cargo pipes, valves, fittings and pump casings are to be submitted to hydrostatic tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

b) Expansion joints and cargo hoses are to be submitted to hydrostatic tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

c) Where fitted, bellow pieces of gas-tight penetration glands are to be pressure tested.

8.2.3 Tightness tests

Tightness of the following devices is to be checked:

- gas-tight penetration glands
- cargo tank P/V and high velocity valves.

Note 1: These tests may be carried out in the workshops or on board.

8.2.4 Check of the safety valves setting

The setting pressure of the pressure/vacuum valves is to be checked in particular with regard to Sec 3, [4.2.4].

8.2.5 Summary table

Inspections and tests required for cargo piping and other equipment fitted in the cargo area are summarised in Tab 4.

8.3 Shipboard tests

8.3.1 Pressure test

After installation on board, the cargo piping system is to be checked for leakage under operational conditions.

8.3.2 Survey of pollution prevention equipment

Every oil barge of 150 gross tonnage and above is to be subjected to an initial survey before the ship is put in service, to ensure that the equipment, systems, fittings, arrangements and materials fully comply with the relevant provisions of [4.4] and [5].

Table 6 : Inspection and testing at works

No.	Item	Tests for materials		Inspections and tests for the products			References
		Y/N (1)	Type of material certificate (2)	during manufacturing (1)	after completion (1) (3)	Type of product certificate (2)	
1	pipes, valves and fittings of class II (see [3.3.1])	Y	• C where ND>100 mm • W where ND≤100 mm	Y	Y	C	[6.2.1] [6.2.1] [6.2.2] [6.2.3]
2	expansion joints and cargo hoses	Y (4)	W	N	Y	C	[6.2.1] [6.2.3]
3	cargo pumps	Y	W	Y (5)	Y	C	see note [6.2.3] (5)
4	gas-tight penetration glands	N		N	Y	C	[6.2.3], [6.2.4]

(1) Y = required, N = not required.
(2) C = class certificate, W = works' certificate.
(3) includes the checking of the rule characteristics according to the approved drawings.
(4) if metallic.
(5) inspection during manufacturing is to be carried out according to a program approved by the Society.
(6) may also be carried out on board.

No.	Item	Tests for materials		Inspections and tests for the products			References
		Y/N (1)	Type of material certificate (2)	during manufacturing (1)	after completion (1) (3)	Type of product certificate (2)	
5	cargo tank P/V and high velocity valves	Y	C	Y	Y	C	[6.2.1] [6.2.2] [6.2.3], [6.2.4], [6.2.5]
6	flame arresters	N		N	Y	C	see note (3)
7	Oil discharge monitoring and control system	N			Y (6)	C	see note (3)
8	Oil/water interface detector	N			Y (6)	C	see note (3)

(1) Y = required, N = not required.
(2) C = class certificate, W = works' certificate.
(3) includes the checking of the rule characteristics according to the approved drawings.
(4) if metallic.
(5) inspection during manufacturing is to be carried out according to a program approved by the Society.
(6) may also be carried out on board.

SECTION 5 ADDITIONAL REQUIREMENTS FOR MACHINERY AND CARGO SYSTEMS OF BARGE-LIQUEFIED GAS

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.

These units are to comply with the requirements of the latest version of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as amended, as specified in Ch 9, [1.1.1] and [1.1.2].

The requirements of this Section supplement those of the IGC Code.

All the requirements of this Section are cross referenced to the applicable Chapters, Sections or paragraphs of the IGC Code, as appropriate.

1.2 Documents to be submitted

1.2.1 *(1/6/2021)*

The documents listed in Tab 1 are to be submitted for approval.

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.

Table 1 : Documents to be submitted *(1/6/2021)*

No	A/I	Documents
1	I	List of products to be carried, including maximum vapour pressure, maximum liquid temperature and other important design conditions
2	I	P&A manual, when applicable
3	A	Ventilation duct arrangement in gas-dangerous spaces and adjacent zones
4	A	Plans, arrangement and calculations of safety relief valves
5	A	Details of cargo handling and vapour system, including arrangements and details of piping and fitting
6	A	Details of cargo pumps and cargo compressors
7	A	Details of process pressure vessels and relative valving arrangement
8	A	Piping stress analysis when T<-110°C
9	A	Cargo operating manual
10	A	Bilge and ballast system in cargo area
11	A	Gas freeing system in cargo tanks including inert gas system
12	A	Interbarrier space drainage, inerting and pressurisation systems
13	A	Ventilation system in cargo area
14	A	Refrigeration and reliquefaction plant system diagram, if any
15	A	Gas detection system

Note 1: A = to be submitted for approval in four copies
I = to be submitted for information in duplicate

No	A/I	Documents
16	A	Loading and unloading operation description, including cargo tank filling limits
17	A	Cargo tank testing and inspection procedures

Note 1: A = to be submitted for approval in four copies
I = to be submitted for information in duplicate

2 Cargo pump rooms and cargo compressor rooms

2.1 Equipment in cargo pump rooms and cargo compressor rooms

2.1.1 *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.3

Cargo pump rooms and/or cargo compressor rooms of ships carrying flammable gases may not contain electrical equipment, except as provided for in Chapter 10 of the IGC Code, or other ignition sources such as internal combustion engines or steam engines with operating temperature which could cause ignition or explosion of mixtures of such gases, if any, with air.

3 Bilge, ballast and fuel oil arrangements

3.1 Drainage arrangement

3.1.1 Drainage of dry spaces in the cargo area *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.7

Dry spaces within the cargo area are to be fitted with a bilge or drain arrangement not connected to the machinery space.

Spaces not accessible at all times are to be fitted with sounding arrangements.

Spaces without a permanent ventilation system are to be fitted with a pressure/vacuum relief system or with air pipes.

3.2 Additional requirements relative to the bilge system

3.2.1 Operation of the bilge system in cargo and interbarrier spaces *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.7

Bilge arrangements for holds containing cargo tanks and for interbarrier spaces are to be operable from the weather deck.

3.2.2 Means for leakage detection *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 3.7

With reference to the means to ascertain leakages in holds and/or in interbarrier spaces, the following requirements apply:

- the above-mentioned means is to be suitable to ascertain the presence of water:
  - in holds containing type C independent tanks
  - in holds and interbarrier spaces outside the secondary barrier
- the above-mentioned means is to be suitable to ascertain the presence of liquid cargo in the spaces adjacent to cargo tanks which are not type C independent tanks.

Where the aforesaid spaces may be affected by water leakages from the adjacent ship structures, the means is also to be suitable to ascertain the presence of water.

Where the above-mentioned means is constituted by electrical level switches, the relevant circuits are to be of the intrinsically safe type and signals are to be transduced the wheelhouse and to the cargo control station, if fitted.

4 Bow or stern loading and unloading arrangements

4.1 Locations of stopping devices for cargo pumps and compressors

4.1.1 *(1/6/2021)*

IGC CODE REFERENCE : Ch 3, 8.7

Devices to stop cargo pumps and cargo compressors and to close cargo valves are to be fitted in a position from which it is possible to keep under control the loading/unloading manifolds.

5 Process pressure vessels and liquid, vapour and pressure piping systems

5.1 General

5.1.1 Process pressure vessels *(1/6/2021)*

IGC CODE REFERENCE : Ch 5, 5.1.2

Process pressure vessels handling cargo are to be considered at least as class 2 pressure vessels, in accordance with Pt C, Ch 1, Sec 3, [1.4.1].

5.1.2 Temperature of steam and heating media within the cargo area *(1/6/2021)*

IGC CODE REFERENCE : Ch 5, 5.1

The maximum temperature of steam and heating media within the cargo area is to be adjusted to take into account the temperature class of the cargoes.

5.2 Cargo and process piping

5.2.1 General *(1/6/2021)*

a) Provisions for protection of piping against thermal stress

IGC CODE REFERENCE : Ch 5, 5.7.1, 5.11.6.4

Expansion joints are to be protected from extensions and compressions greater than the limits fixed for them and the connected piping is to be suitably supported and anchored. Bellow expansion joints are to be protected from mechanical damage.

The design and installation of expansion bellows is to be in accordance with recognized standards acceptable to the Society.

b) Segregation of high temperature piping

IGC CODE REFERENCE : Ch 5, 5.7.2

High temperature pipes are to be thermally isolated from the adjacent structures. In particular, the temperature of pipelines is not to exceed 220 °C in gas-dangerous zones.

c) Pressure relief valve setting

IGC CODE REFERENCE : Ch 5, 5.5.6 and 5.5.7

Pressure relief valves are to be set to discharge at a pressure not greater than the design pressure such that the overpressure during discharge does not exceed 110% of the design pressure.

d) Protection against leakage

IGC CODE REFERENCE : Ch 5, 5.2

Where the piping system is intended for liquids having a boiling point lower than - 30 °C, permanent means to avoid possibility of contact between leaks and hull structures are to be provided in all those locations where leakage might be expected, such as shore connections, pump seals, flanges subject to frequent dismantling, etc.

e) Means for detecting the presence of liquid cargo

IGC CODE REFERENCE : Ch 5, 5.2

The means to detect the presence of liquid cargo may be constituted by electrical level switches whose circuit is intrinsically safe. The alarm signals given by the level switches are to be transmitted to the wheelhouse and to the cargo control station, if provided.

f) Connections of relief valve discharges to cargo tanks

IGC CODE REFERENCE : Ch 5, 5.2

The connections, if any, to the cargo tanks of relief valve discharges fitted on the liquid phase cargo piping are not to be fitted with shut-off valves, but are to be provided with non-return valves in the proximity of the tanks.

g) Centrifugal pumps

IGC CODE REFERENCE : Ch 5, 5.2

Overpressure relief valves on cargo pumps may be omitted in the case of centrifugal pumps having a maximum delivery head, the delivery valve being completely closed, not greater than that permitted for the piping.

5.2.2 Scantlings based on internal pressure *(1/6/2021)*

a) Piping scantlings

IGC CODE REFERENCE : Ch 5, 5.11.2.2, 5.11.2.4 and 5.11.4

Piping systems are to be designed in accordance with recognized standards acceptable to the Society.

The minimum thickness is to be in accordance with recognized standards acceptable to the Society.

b) Piping subject to green seas

IGC CODE REFERENCE : Ch 5, 5.11.2.2

In particular for piping subject to green seas, the design pressure P, in bar, in the formula in 5.11.2.2 of the IGC CODE is to be replaced by an equivalent pressure P' given by the following formula:

$$P' = \frac{1}{2}\left(P + \sqrt{P^2 + 0,006R'K\frac{D_C}{D}}\right)$$

where:

D_C : External diameter of the pipe taking into account the insulation (in mm), whose thickness is to be taken at least equal to:

40 mm if D ≤ 50 mm

80 mm if D ≥ 150 mm

Intermediate values are to be determined by interpolation.

R' : Drag corresponding to the effect of green seas, in da N/m², such as given in Tab 2 as a function of the location of the pipes and of their height H (in m) above the deepest loadline; intermediate values are to be determined by interpolation.

K : permissible stress, in N/mm²

Table 2 *(1/6/2021)*

External diameter of pipe **(1)**	Aft of the quarter of the ship's length			Forward of the quarter of the ship's length		
	H ≤ 8	H = 13	H ≥ 18	H ≤ 8	H = 13	H ≥18
≤ 25	1500	250	150	2200	350	150
50	1400	250	150	2000	350	150
75	1100	250	150	1600	350	150
100	700	250	150	700	350	150
≥150	500	250	150	700	350	150

(1) D_C if the pipe is insulated, D otherwise.

5.2.3 Desigmn pressure *(1/6/2021)*

a) Design pressure definition

IGC CODE REFERENCE : Ch 5, 5.4.1

For each piping section, the maximum pressure value among those applicable in paragraph 5.11.2.2 of the IGC Code is to be considered.

Higher and lower values of the saturated and superheated vapour pressure at 45°C may be used if agreed upon by the Society.

5.2.4 Permissible stress *(1/6/2021)*

a) Flanges not complying with standards

IGC CODE REFERENCE : Ch 5, 5.11.6.1, 5.11.6.2

For flanges not complying with a standard, the dimensions and type of gaskets are to be to the satisfaction of the Society.

Flanges are to be selected as to type, made and tested in accordance with the Pt C, Ch 1, Sec 10.

5.2.5 Stress analysis *(1/6/2021)*

a) Calculations in accordance with recognised standards

IGC CODE REFERENCE : Ch 5, 5.11.5

When such an analysis is required, it is to be carried out in accordance with the requirements listed below. Subject to this condition, calculations in accordance with recognised standards are admitted by the Society.

b) Calculation cases

IGC CODE REFERENCE : Ch 5, 5.11.5

The calculations are to be made for every possible case of operation, but only those leading to the most unfavourable results are required to be submitted.

c) Loads to be taken for calculation

IGC CODE REFERENCE : Ch 5, 5.11.5

The calculations are to be carried out taking into account the following loads:

1) piping not subject to green seas:
   - pressure
   - weight of the piping with insulation and internal medium
   - contraction

2) piping subject to green seas that is liable to be in operation at sea and in port:
   - pressure
   - weight of the piping and internal medium
   - green seas
   - contraction
   - ship motion accelerations

3) piping subject to green seas that is in operation only in port; the more severe of the following two combinations of loads:
   - pressure
   - weight of the piping of the internal fluid
   - contraction

   and
   - weight of the piping
   - green seas
   - expansion, assuming that the thermal stresses are fully relaxed.

d) Green sea directions

IGC CODE REFERENCE : Ch 5, 5.11.5

When green seas are considered, their effects are to be studied, unless otherwise justified, in the following three directions:

- axis of the ship
- vertical
- horizontal, perpendicular to the axis of the ship. The load on the pipes is the load R' defined in [5.2.2] b).

e) Stress intensity

IGC CODE REFERENCE : Ch 5, 5.11.5

The stress intensity is to be determined as specified in the formulae in Pt C, Ch 1, Sec 10, [2.3.2] for pipes intended for high temperatures:

1) for primary stresses resulting from:
   - pressure
   - weight
   - green seas

2) for primary stresses and secondary stresses resulting from contraction.

f) Stress intensity limits

IGC CODE REFERENCE : Ch 5, 5.11.5

1) For the first case, the stress intensity is to be limited to the lower of:

   $0,8\ R_e$ and $0,4\ R_m$

2) For the second case, the stress intensity is to be limited to the lower of:

   $1,6\ R_e$ and $0,8\ R_m$.

g) Piping with expansion devices

IGC CODE REFERENCE : Ch 5, 5.11.5

For piping fitted with expansion devices, their characteristics are to be submitted to the Society. Where these characteristics are such that the forces and moments at the ends of the devices are negligible for the contraction they must absorb, the calculation of the loads due to contraction in the corresponding piping is not required. It is, however, to be checked that the stress intensity corresponding to the primary stresses does not exceed the limits given in [5.2.5] f).

h) Flexibility coefficient

IGC CODE REFERENCE : Ch 5, 5.11.5

The flexibility coefficient of elbows is to be determined from the formulae given in Pt C, Ch 1, Sec 10, [2.3.2] for pipes intended for high temperatures.

i) Local stresses

IGC CODE REFERENCE : Ch 5, 5.11.5

Particular attention is to be paid to the calculation of local stresses in the assemblies subjected to axial forces and bending moments. The Society reserves the right to

request additional justifications or local strengthening where considered necessary.

j) Materials

IGC CODE REFERENCE : Ch 5, 5.12

Aluminised pipes may be fitted in ballast tanks, in inerted cargo tanks and, provided the pipes are protected from accidental impact, in hazardous areas on open deck.

For an outer pipe or duct equipped with mechanical exhaust ventilation having a capacity of at least 30 air changes per hour, the effects of both pressure and possible low temperature in the event of a high pressure line failure shall be taking into account.

k) Piping fabrication and joining details

IGC CODE REFERENCE : Ch 5, 5.8

The Society may accept relaxations, based on recognized standards, from the requirements in IGC Code, 5.8 for piping inside cargo tanks and open ended piping.

Acceptance of types of piping connections other than those mentioned in IGC Code, 5.8 may be considered by the Society case by case.

l) Welding, post-weld heat treatment and non-destructive testing

IGC CODE REFERENCE : Ch 5, 5.9

For post-weld heat treatments, the Society may waive the requirement for thermal stress relieving for pipes having a wall thickness less than 10 mm in relation to the design temperature and pressure of the concerned piping system.

For butt-welded joints of pipes not covered by IGC Code 5.9.3.2 spot radiographic controls or other non-destructive controls are to be carried out at the discretion of the Society depending upon service, position and materials.

5.3 Tests of piping components and pumps prior to installation on board

5.3.1 Valves *(1/6/2021)*

a) Prototype Testing

IGC CODE REFERENCE : Ch 5, 5.13

For safey valves that are subject to IGC Code para. 8.2.5, the flow or capacity are to certified by the Society; for other types of valves, the manufacturer is to certify the flow properties of the valves based on tests carried out according to recognized standards.

For emergency shutdown valves, with materials having melting temperatures lower than 925°C, the type testing shall include a fire test to a standard acceptable to the Society.

b) Unit Production Testing

IGC CODE REFERENCE: Ch 5, 5.13

All valves are to be tested at the Manufacturer's plant in the presence of the Society's Surveyor.

Testing is to include a hydrostatic test of the valve body at a pressure equal to 1,5 times the design pressure for all valves, seat and stem leakage test at a pressure equal to 1,1 times the design pressure for valves other than safety valves. In addition, cryogenic testing consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve for valves other than safety valves intended to be used at a working temperature below -55°C. The set pressure of safety valves is to be tested at ambient temperature.

For valves used for isolation of instrumentation in piping not greater than 25 mm, unit production testing need not be witnessed by the surveyor. Records of testing are to be available for review.

As an alternative to the above, if so requested by the relevant Manufacturer, certification of a valve may be issued subject to the following:

- the valve has been approved as required in a) for valves intended to be used at a working temperature below -55°C, and
- the Manufacturer has a recognised quality system that has been assessed and certified by the Society subject to periodical audits, and
- the quality control plan contains a provision to subject each valve to a hydrostatic test of the valve body at a pressure equal to 1,5 times the design pressure for all valves and seat and stem leakage test at a pressure equal to 1,1 times the design pressure for valves other than safety valves. The set pressure of safety valves is to be tested at ambient temperature. The Manufacturer is to maintain records of such tests, and
- cryogenic testing is performed, in the presence of the Society's representative, consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve for valves other than safety valves intended to be used at a working temperature below -55°C.

5.3.2 Cargo Pumps *(1/6/2021)*

a) Prototype Testing

Each size and type of pump is to be approved through design assessment and prototype testing. Prototype testing is to be witnessed in the presence of the Society's Surveyor. In lieu of prototype testing, satisfactory in-service experience of an existing pump design approved by a QSCS Classification Society submitted by the Manufacturer may be considered.

Prototype testing is to include a hydrostatic test of the pump body equal to 1,5 times the design pressure and a capacity test. For submerged electric motor driven pumps, the capacity test is to be carried out with the design medium or with a medium below the minimum working temperature. For shaft driven deep well pumps, the capacity test may be carried out with water. In addition, for shaft driven deep well pumps, a spin test to demonstrate satisfactory operation of bearing clearances, wear rings and sealing arrangements is to be carried out at the minimum design temperature. The full length of shafting is not required for the spin test, but must be of sufficient length to include at least one bearing and sealing arrangements. After completion of tests, the pump is to be opened out for examination.

b) Unit Production Testing

All pumps are to be tested at the Manufacturer's plant in the presence of the Society's Surveyor. Testing is to include a hydrostatic test of the pump body equal to 1.5 times the design pressure and a capacity test. For submerged electric motor driven pumps, the capacity test is to be carried out with the design medium or with a medium below the minimum working temperature. For shaft driven deep well pumps, the capacity test may be carried out with water.

As an alternative to the above, if so requested by the relevant Manufacturer, the certification of a pump may be issued subject to the following:

- the pump has been approved as required in a) and
- the Manufacturer has a recognised quality system that has been assessed and certified by the Society subject to periodical audits, and
- the quality control plan contains a provision to subject each pump to a hydrostatic test of the pump body equal to 1.5 times the design pressure and a capacity test. The Manufacturer is to maintain records of such tests.

5.4 Cargo system valving requirements

5.4.1 Cargo tank connections for gauging *(1/6/2021)*

a) Exemption

IGC CODE REFERENCE : Ch 5, 5.5.5

The requirements in paragraph 5.5.5 of the IGC Code relevant to cargo tank connections for pressure gauges and measuring devices do not apply to tanks with an MARVS not exceeding 0.07 MPa.

5.4.2 Emergency shutdown *(1/6/2021)*

a) Clarification on location of fusible elements

IGC CODE REFERENCE : Ch 18, 18.10

The cargo stations in way of which the fusible elements mentioned in paragraph 18.10.3.2 of the IGC Code are to be fitted are to be intended as the loading and unloading manifolds.

5.5 Cargo transfer methods

5.5.1 Discharge into common header *(1/6/2021)*

IGC CODE REFERENCE : Ch 5, 5.6

When two or more pumps located in different cargo tanks are operating at the same time discharging into a common header, the stopping of the pumps is to activate an alarm at the centralised cargo control location.

5.6 Bonding

5.6.1 Static electricity *(1/6/2021)*

a) Acceptable resistance

IGC CODE REFERENCE : Ch 5, 5.7.4

To avoid the hazard of an incentive discharge due to the build-up of static electricity resulting from the flow of the liquid/gases/vapours, the resistance between any point on the surface of the cargo and slop tanks, piping systems and equipment, and the hull of the ship is not to be greater than 10^6 Ω.

b) Bonding straps

IGC CODE REFERENCE : Ch 5, 5.7.4

Bonding straps are required for cargo and slop tanks, piping systems and equipment which are not permanently connected to the hull of the ship, for example:

1) independent cargo tanks
2) cargo tank piping systems which are electrically separated from the hull of the ship
3) pipe connections arranged for the removal of the spool pieces.

Where bonding straps are required, they are to be:

1) clearly visible so that any shortcoming can be clearly detected
2) designed and sited so that they are protected against mechanical damage and are not affected by high resistivity contamination, e.g. corrosive products or paint
3) easy to install and replace.

5.7 Integrated cargo and ballast system

5.7.1 General *(1/6/2021)*

The requirements for integrated cargo and ballast systems are given in Ch 7, Sec 4, [3.5].

6 Cargo tank venting system

6.1 Pressure relief systems

6.1.1 Cargo tank *(1/6/2021)*

a) Size of pressure relief devices

IGC CODE REFERENCE : Ch 8, 8.4.1.2 and Figure 8.1

For application of the formula in paragraph 8.4.1.2 of the IGC Code, the following is to be applied for prismatic tanks:

- L_{min}, for non-tapered tanks, is the smaller of the horizontal dimensions of the flat bottom of the tank. For tapered tanks, as would be used for the forward tank, L_{min} is the smaller of the length and the average width.
- For prismatic tanks whose distance between the flat bottom of the tank and bottom of the hold space is equal to or less than $L_{min}/10$:

  A = external surface area minus flat bottom surface area.
- For prismatic tanks whose distance between the flat bottom of the tank and bottom of the hold space is greater than $L_{min}/10$:

  A = external surface area.

6.1.2 Interbarrier spaces *(1/6/2021)*

a) Protection of interbarrier spaces

IGC CODE REFERENCE : Ch 8, 8.2.2

1) The formula for determining the relieving capacity given in b) is developed for interbarrier spaces sur-

rounding independent type A cargo tanks, where the thermal insulation is fitted to the cargo tanks.

2) The relieving capacity of pressure relief devices of interbarrier spaces surrounding independent type B cargo tanks may be determined on the basis of the method given in b); however, the leakage rate is to be determined in accordance with 4.7.2 of the IGC Code.

3) The relieving capacity of pressure relief devices for interbarrier spaces of membrane and semi-membrane tanks is to be evaluated on the basis of specific membrane/semi-membrane tank design.

4) The relieving capacity of pressure relief devices for interbarrier spaces adjacent to integral type cargo tanks may, if applicable, be determined as for type A independent cargo tanks.

b) Size of pressure relief devices

IGC CODE REFERENCE : Ch 8, 8.4

The combined relieving capacity (in m^3/s) of the pressure relief devices for interbarrier spaces surrounding type A independent cargo tanks where the insulation is fitted to the cargo tanks may be determined by the following formula:

$$Q_{sa} = 3{,}4 \cdot A_c \cdot \frac{\rho}{\rho_V} \cdot \sqrt{h}$$

where:

Q_{sa} : Minimum required discharge rate of air in standard conditions of 273 K and 1.013 bar

A_c : Design crack opening area in (m^2)

$$A_c = \frac{\pi}{4} \cdot \delta \cdot l$$

with:

δ : Max. crack opening width in (m)

$$\delta = 0{,}2 \cdot t$$

t : Thickness of tank bottom plating in (m)

l : Design crack length in (m) equal to the diagonal of the largest plate panel of the tank bottom (see Fig 1)

h : Max. liquid height above tank bottom plus 10 × MARVS in (m)

ρ : Density of product liquid phase in kg/m^3 at the set pressure of the interbarrier space relief device

ρ_V : Density of product vapour phase in kg/m^3 at the set pressure of the interbarrier space relief device and a temperature of 273 K.

MARVS : max allowable relief valve setting of the cargo tank (bar)

6.1.3 Vents *(1/6/2021)*

IGC CODE REFERENCE : Ch 8, 8.2.10

The height of vent exits as indicated in paragraph 8.2.10 of the IGC Code is also to be measured above storage tanks and cargo liquid lines, where applicable.

6.1.4 Segregation of vents *(1/6/2021)*

a) Additional requirements on vent location

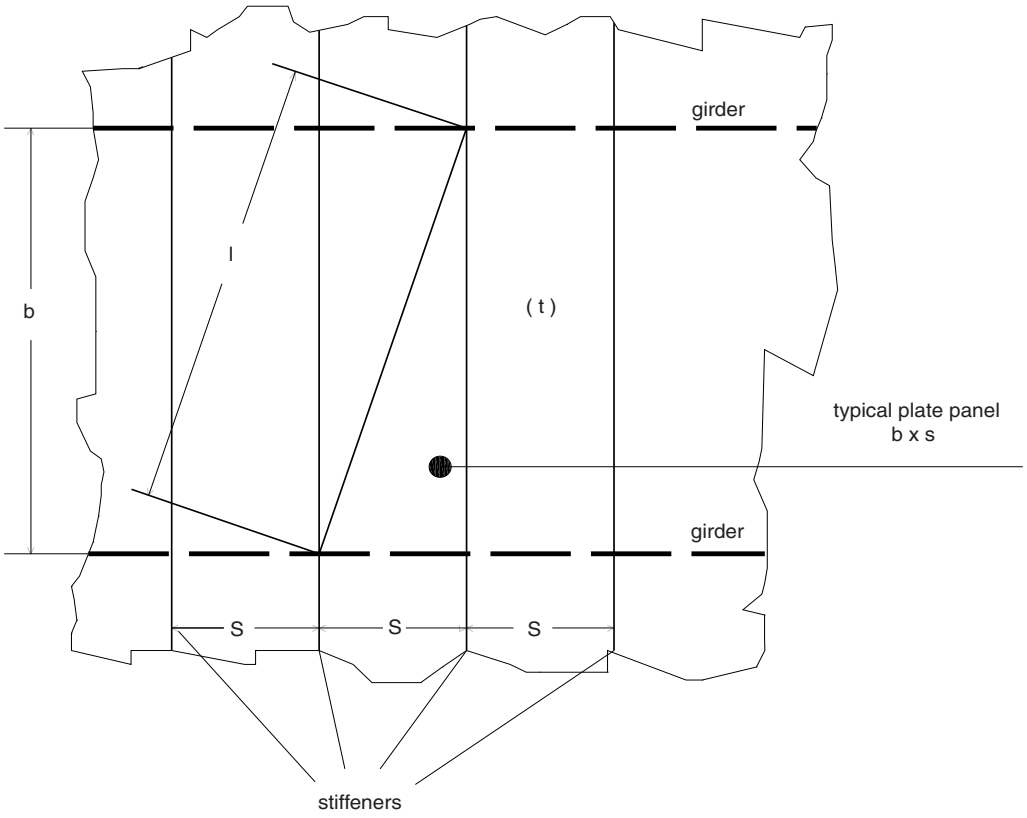
IGC CODE REFERENCE : Ch 8, 8.2.11.1 and 8.2.11.2

1) The distances of the vent exits are to be measured horizontally.

2) In the case of carriage of flammable and/or toxic products, the vent exits are to be arranged at a distance of at least 5 m from exhaust ducts and at least 10 m from intake ducts serving cargo pump rooms and/or cargo compressor rooms.

3) The distances are also intended to refer to outlets of ventilation ducts of safe spaces.

Figure 1 : Determination of l *(1/6/2021)*



6.2 Additional pressure relieving system for liquid level control

6.2.1 Tank filling limits *(1/6/2021)*

IGC CODE REFERENCE : Ch 13, 13.3.2

The words 'to prevent the tank from becoming liquid full' in paragraph 13.3.2 of the IGC Code have the following meaning:

At no time during the loading, transport or unloading of the cargo including fire conditions will the tank be more than 98% liquid full, except as permitted by 15.4.1 of the IGC Code. These requirements, together with those of 8.2.17 of the IGC Code, are intended to ensure that the pressure relief valves remain in the vapour phase.

7 Environmental control

7.1 Inerting

7.1.1 General *(1/6/2021)*

a) Dew point

IGC CODE REFERENCE : Ch 9, 9.4.1

As far as the IGC Code requirements relevant to the dew point are concerned, the following additional provisions apply:

1) where cargo tank insulation is not protected from water vapour penetration by means of an effective vapour barrier, accepted by the Society, the maximum value of the dew point is to be less than the design temperature

2) where cargo tank insulation is protected by an effective vapour barrier, accepted by the Society, the maximum value of the dew point is to be less than the minimum temperature which may be found on any surface within the spaces filled with dry inert gas or dry air

3) the temperature of the hull structures adjacent to cargo tanks is not to become lower than the minimum permissible working temperature, specified in Ch 9, Sec 6, for the steel grade employed for such hull structures.

b) Precautions against fire

IGC CODE REFERENCE : Ch 9, 9.4.1

Precautions are to be taken to minimise the risk that static electricity generated by the inert gas system may become a source of ignition.

7.2 Inert gas production on board

7.2.1 Exemptions *(1/6/2021)*

IGC CODE REFERENCE : Ch 9, 9.5

a) Inert gas generating systems are to be considered as essential services and are to comply with the applicable Sections of the Rules, as far as applicable.

b) Where, in addition to inert gas produced on board, it is possible to introduce dry air into the above-mentioned spaces, where this is acceptable depending on the type

of cargo tank adopted, or to introduce inert gas from a supply existing on board, it is not necessary that standby or spare components for the inert gas system are kept on board.

8 Mechanical ventilation in the cargo area

8.1 Spaces required to be entered during normal cargo handling operations

8.1.1 Ventilation duct arrangement *(1/6/2021)*

IGC CODE REFERENCE : Ch 12, 12.1.5

a) Ventilation ducts to gas-dangerous spaces are to be fitted with metallic shut-off dampers provided with "open" and "closed" signs. These dampers are to be arranged in the open, in a readily accessible position.

b) Gas-dangerous spaces for the purpose of a) are those mentioned in paragraph 12.1.1 of the IGC Code. For other spaces which are gas-dangerous only due to their position, some relaxation may be granted.

8.1.2 Recirculation prevention *(1/6/2021)*

IGC CODE REFERENCE : Ch 12, 12.1.5

a) Exhaust ducts from gas-dangerous spaces are to be arranged at a distance in the horizontal direction of at least 10 m from ventilation outlets of gas-safe spaces. Shorter distances may be accepted for ventilation outlets from safe spaces protected by air-locks.

b) Intakes of gas-dangerous spaces are to be arranged at a distance in the horizontal direction of at least 3 m from ventilation intakes and outlets and openings of accommodation spaces, control stations and other gas-safe spaces.

c) Exhaust and intake ducts for the same gas-dangerous space, or for the same space rendered safe by an air-lock, are to be arranged at a distance from each other in the horizontal direction of not less than 3 m.

8.1.3 Additional requirements for non-sparking fans *(1/6/2021)*

a) Non-sparking fans

IGC CODE REFERENCE : Ch 12, 12.1.7

1) A fan is considered as non-sparking if in both normal or abnormal conditions it is unlikely to produce sparks.

2) The air gap between the impeller and the casing is to be not less than 0.1 of the shaft diameter in way of the impeller bearing and not less than 2 mm. It need not be more than 13 mm.

b) Materials for non-sparking fans

IGC CODE REFERENCE : Ch 12, 12.1.7

1) The impeller and the housing in way of the impeller are to be made of materials as per list in the Code, with a production certificate.

2) Electrostatic charges both in the rotating body and the casing are to be prevented by the use of anti-static materials. Furthermore, the installation on board of the ventilation units is to be such as to ensure their safe bonding to the hull.

3) The following impellers and housings are considered as sparking and are not permitted:

- impellers of an aluminium alloy or magnesium alloy and a ferrous housing, regardless of tip clearance
- housing made of an aluminium alloy or a magnesium alloy and a ferrous impeller, regardless of tip clearance
- any combination of ferrous impeller and housing with less than 13 mm design tip clearance.

c) Type test for non-sparking fans

IGC CODE REFERENCE : Ch 12, 12.1.7

Type tests on the finished product are to be carried out in accordance with the requirements of the Society or an equivalent national or international standard.

d) Motor shafting

IGC CODE REFERENCE : 12, 12.1.7

The shafting penetration of motors driving fans through bulkheads and decks of dangerous spaces or through ventilation ducts is to be fitted with a gas-tight sealing device, of the oil-seal type or equivalent, deemed suitable by the Society.

8.2 Spaces not normally entered

8.2.1 General requirements *(1/6/2021)*

a) Minimum number of air changes

IGC CODE REFERENCE : 12, 12.2

Both fixed and portable systems are to guarantee the efficient ventilation of such spaces in relation to the relative density, in respect of the air, and to the toxicity of the gases transported. The type of portable fans and their connection to the spaces served are to be approved by the Society. In no case are portable electrical fans acceptable.

9 Instrumentation (Gauging, Gas detection)

9.1 General

9.1.1 Cargo tank instrumentation *(1/6/2021)*

The instrumentation is to be of a type approved by the Society.

9.1.2 Detection of leak through secondary barrier *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.7.1

Upon special approval, appropriate temperature indicating devices may be accepted by the Society instead of gas detecting devices when the cargo temperature is not lower than - 55 °C.

9.1.3 Indicator location *(1/6/2021)*

Monitoring list

IGC CODE REFERENCE : Ch. 13, 13.1.2

The following information and alarms are to be concentrated in the positions specified in this requirement.

a) The following is to be transduced to the "cargo control room" and the "control position" as defined in 3.4.1 of the IGC Code:

1) the indication signalling the presence of water and/or liquid cargo in holds or interbarrier spaces

2) the cargo heater low temperature alarm

3) the alarm signalling the presence of liquid cargo in the vent main as per 5.2.2.4 of the IGC Code

4) the indication of the hull temperature and the hull structure low temperature alarm required in 13.7.2.2 of the IGC Code

5) the alarm signalling the automatic shutdown of electrically driven submerged pumps required in 10.2.9 of the IGC Code

6) the indication of the cargo level and the cargo tank high level alarm required in 13.3.1 of the IGC Code

7) the indication of the vapour space pressure and the vapour space pressure gauges of each cargo tank and associated high and low pressure alarms required in 13.4.1 of the IGC Code

8) the gas detection equipment alarm required in 13.6.13 of the IGC Code

9) the cargo compressor high temperature alarm required in 17.4.2.2 of the IGC Code

10) the alarm for automatic shutdown of the cargo compressor for high pressure or high temperature, as required in 17.16.4.4 of the IGC Code.

When the cargo system is not remote controlled and therefore the aforesaid "control positions" are not required, the above-mentioned controls, information and alarms are to be located in a suitable, easily accessible location.

If this position is an enclosed space, it is to comply with the requirements of 3.4 of the IGC Code. This position should preferably be located in the wheelhouse.

b) Independently of the above, the following is to be transduced to the wheelhouse:

1) the alarm signalling the presence of water and/or liquid cargo in holds or interbarrier spaces

2) the cargo heater low temperature alarm

3) the alarm signalling the presence of liquid cargo in the vent main as per 5.2.2.4 of the IGC Code

4) the indication of the pressure value in the vapour space of each cargo tank mentioned in 13.4.1 of the IGC Code; such indication is to give the setting pressure value of the relief valve and the minimum allowable pressure value in the cargo tank concerned

5) the high pressure and low pressure alarms, when required, for cargo tanks as per 13.4.2 of the IGC Code

6) the hull structure low temperature alarm required in 13.7.2.2 of the IGC Code

7) the gas detection equipment alarm required in 13.6.13 of the IGC Code

8) the cargo compressor high temperature alarm required in 17.4.2.2 of the IGC Code

9) the alarm for automatic shutdown of the cargo compressor for high pressure or high temperature, as required in 17.16.4.4 of the IGC Code.

c) Where the cargo control room is located within the accommodation spaces and is readily accessible, the alarms in b) may be grouped in a single audible and visual alarm except for the indication and alarms in 4), 5) and 7), which are to be independent from each other.

d) The high level and high or low pressure audible and visual alarms for cargo tanks as per 13.3.1 to 13.3.3 and 13.4.1 to 13.4.3 of the IGC Code and the alarm signalling the presence of liquid in the vent main are to be located in such a position as to be clearly heard and identifiable by the personnel in charge of loading operation control.

9.2 Level indicators for cargo tanks

9.2.1 General *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.2.1 and 13.2.2

a) In order to assess whether or not one level gauge is acceptable, the wording "can be maintained" is to be interpreted to mean that any part of the level gauge other than passive parts can be overhauled while the cargo tank is in service.

Passive parts are those parts assumed not subject to failures under normal service conditions.

b) Where level gauges containing cargo are arranged outside the tank they serve, means are to be provided to shut them off automatically in the event of failure.

9.3 Overflow control

9.3.1 Overflow alarm and shutdown *(1/6/2021)*

a) Shut-off valve for overflow control

IGC CODE REFERENCE : Ch. 13, 13.3.2

The sensor for automatic closing of the loading valve for overflow control may be combined with the liquid level indicators required by paragraph 13.2.1 of the IGC Code.

b) Shut-off valve closing time

IGC CODE REFERENCE : Ch. 13, 13.3.1 to 13.3.3

The closing time of the valve referred to in 13.3.2 in seconds (i.e. time from shutdown signal initiation to complete valve closure) is to be not greater than:

$$\frac{3600 \cdot U}{LR}$$

where:

U : Ullage volume at operating signal level (m^3)

LR : Maximum loading rate agreed between ship and shore facility (m^3/h)

The loading rate is to be adjusted to limit surge pressure on valve closure to an acceptable level taking into account the loading hose or arm, and the ship and shore piping systems, where relevant.

9.4 Pressure gauges

9.4.1 Pressure gauges in cargo tanks *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.4.1

The low pressure alarm indicated in paragraph 13.4.1 of the IGC Code is also to be located in the cargo control room.

9.5 Temperature indicating devices

9.5.1 Temperature recording *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.5.1

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

9.6 Gas detection requirements

9.6.1 Gas measurements *(1/6/2021)*

In addition to the provisions of [9.6.2] to [9.6.3], the fitting of gas measuring equipment is subject to the those of Pt C, Ch 4, Sec 1, [5.2.4] b).

9.6.2 Position of sampling heads *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.6.12

Sampling heads in cargo holds are not to be located in positions where bilge water may collect.

9.6.3 Gas sampling lines *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.6.8

Gas sampling lines are to be located outside accommodation spaces, unless they are fitted within gas-tight pipes.

9.6.4 Protected spaces *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.6.2

In addition to the list in paragraph 13.6.2 of the IGC Code, the gas detection system is also to serve spaces adjacent to pump rooms and compressor rooms.

9.6.5 Portable gas detectors *(1/6/2021)*

IGC CODE REFERENCE : Ch. 13, 13.6.19

For ships intended to carry toxic and flammable gases, two sets for toxic gases and two sets for flammable gases are to be provided.

10 Special requirements

10.1 Materials for construction

10.1.1 *(1/6/2021)*

IGC CODE REFERENCE : Ch. 17, 17.2

Materials "exposed to cargo" are those constituting systems, cargo appliances or arrangements which are in contact with (liquid or vapour) cargo in normal operating conditions.

10.2 Inhibition

10.2.1 Polymerisation prevention - Alternative requirement *(1/6/2021)*

IGC CODE REFERENCE : Ch. 17, 17.8.1

a) As an alternative to the addition of inhibited liquid, it may be accepted that, at the end of each refrigeration period, the liquid is completely removed from the refrigeration system by means of vapour from compressors or by means of inert gas. In such case, the following wording is to be entered on the Certificate of Fitness:

"At the end of each refrigeration period, the liquid is to be completely removed from the refrigeration system by means of vapour from compressors or by means of inert gas."

b) On the cargo compressor delivery side, a temperature switch is to be fitted, set at a suitable temperature, depending on the characteristics of the product carried (e.g. 60°C for butadiene), giving a visual and audible alarm on the navigation bridge and in the cargo control station, if any, which causes the compressor to stop when such temperature is exceeded.

10.3 Chlorine

10.3.1 Cargo containment system *(1/6/2021)*

a) Relief valves

IGC CODE REFERENCE : Ch. 17, 17.13.1.4

Chlorine discharge from pressure relief valves is to be led to an absorption device deemed suitable by the Society.

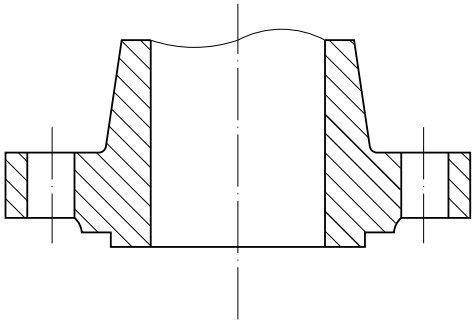
10.3.2 Cargo piping system *(1/6/2021)*

a) Piping design and fabrication

IGC CODE REFERENCE : Ch. 17, 17.13.2.2

A welding neck type flange deemed suitable is shown in Fig 2 as an example.

Figure 2 : Suitable neck type flange *(1/6/2021)*



10.3.3 Instrumentation - Safety devices *(1/6/2021)*

a) Gas detection system

IGC CODE REFERENCE : Ch. 17, 17.13.4.3

The gas detection system is to be permanently installed.

10.3.4 Protection of personnel *(1/6/2021)*

a) Additional equipment

IGC CODE REFERENCE : Ch. 17, 17.13.5

In addition to the source of uncontaminated air, two complete and independent air breathing apparatuses, not employing oxygen supplies, each having a capacity of at least 1200 litres of non-compressed air and two sets of protective equipment, complete with gas-tight boots, gloves and eye protection, are to be provided. The above-mentioned equipment and clothing are to be kept in the space indicated in paragraph 17.13.5 of the IGC Code and are additional to those required in other parts of this Chapter.

10.3.5 Filling limits for cargo tanks *(1/6/2021)*

IGC CODE REFERENCE : Ch. 17, 17.13.6.1

When determining the filling limits of the cargo tanks for the transport of chlorine, the effect of the refrigeration plant is not to be considered.

11 Personnel protection requirements for individual products

11.1 Showers and eyes wash

11.1.1 *(1/6/2021)*

IGC CODE REFERENCE : Ch 14, 14.4.3

The showers and eyes wash are to be fitted with a heating system, or other suitable installation, in order to avoid any ice formation in their piping.

12 Summary of minimum requirements

12.1 Additional information on products

12.1.1 *(1/6/2021)*

IGC CODE REFERENCE - CHAPTER 19

Table 3 lists some additional information for those products which are listed in the table in Chapter 19 of the IGC Code.

The list shown in Table 3 gives properties for pure products. The specific gravity to be taken into account for the design of a ship might be altered considering the actual properties of the commercial product.

Information on temperature classes and explosion groups for electrical equipment in connection with the products to be carried is indicated in Sec 8, Tab 4.

Table 3 *(1/6/2021)*

Product name	Boiling temperature (°C)	Specific gravity at boiling point (kg/m^3)	Ratio vapour/air density
Acethaldehyde	20.8	780	1.52
Ammonia, anhhydrous	- 33.4	680	0.60
Butadiene	- 4.5	650	1.87
Butane	-0.5/11.7	600	2.02
Butylenes	- 6.3/- 7	625	1.94
Chlorine	- 34	1560	2.49
Diethyl ether	34.6	640	2.55
Dimethylamine	6.9	670	1.55
Ethane	- 88.6	549	1.04
Ethyl chloride	12.4	920	2.22
Ethylene	- 104	570	0.97
Ethylene oxide	-10.7	870	1.52
Isoprene	34.5	680	2.35
Isopropylamine	32.5	700	2.03
Methane (LNG)	-161.5	420	0.55
Methyl bromide	4.5	1730	3.27
Methyl chloride	-23.7	1000	1.78
Monoethylamine	16.6	690	1.56
Nitrogen	-196	808	0.97

Product name	Boiling temperature (°C)	Specific gravity at boiling point (kg/m³)	Ratio vapour/air density
Pentanes (all isomers)	36.1	610	2.6
Pentene (all isomers)	30.1/37	610	2.6
Propane	-42.3	580	1.56
Propylene	-47.7	610	1.50
Propylene oxides	34.5	860	2.00
Refrigerant gases			
Dichlorodifluoromethane (R12)	-30	1486	4.26
Dichloromonofluoroethane (R21)	8.9	1480	3.9
Dichlorotetrafluoroethane (R114)	3.8	1510	1.31
Monochlorodifluoromethane (R22)	-42	1420	2.98
Monochlorotetrafluoroethane (R124)	-	-	4.70
Monochlorotrifluoromethane (R13)	-81.4	1520	3.60
Sulphur dioxide	-10	1460	2.3
Vinyl chloride	-13.9	970	2.15
Vinyl ethyl ether	35.5	754	2.50
Vinylidene chloride	31.7	1250	3.45

SECTION 6 ADDITIONAL REQUIREMENTS FOR MACHINERY AND CARGO SYSTEMS OF BARGE-LNG BUNKER

1 General

1.1 Application

1.1.1 *(1/6/2021)*

These units are to comply with the requirements of Sec 5.

The requirements in this Section are additional to the ones in Sec 5.

Units complying with the requirements of this Section will be granted the additional service feature **LNG bunker** which may be complemented by one or more of the following:

- **IG-Bunker (Inert Gas Bunker)**, where the barge-LNG bunker is designed to also supply inert gas, to ensure gas freeing and aeration, to a LNG fuelled ship.
- **BT (Bunker Trust)** where the barge-LNG bunker is designed with arrangement for the verification of the LNG quality and quantity delivered to the receiving ship.
- **VCS-Bunker (Vapour Control System Bunker)** where the barge-LNG bunker is designed with systems for control of vapour emission from cargo tanks from receiving ship during bunkering.

1.2 Scope

1.2.1 *(1/6/2021)*

This Section addresses:

- the design and installation of the of the piping system of the barge-LNG bunker intended to transfer LNG to the LNG fueled ship and the vapour transfer system to/from these units.
- the safety arrangements.

1.2.2 *(1/6/2021)*

Units intended to load, carry and transfer gases other than LNG will be considered on a case by case basis, and the Society reserves the right to establish additional requirements.

2 Definitions

2.1 Bunker emergency shut-down system (ESD)

2.1.1 *(1/6/2021)*

A bunker ESD is a system that safely and effectively stops the transfer of LNG (and vapour as applicable) between the receiving ship and the bunker ship in the event of an emergency during the bunkering operation, and puts the system in a safe condition.

2.2 Bunkering connections

2.2.1 *(1/6/2021)*

Bunkering connections correspond to the end of the fixed piping of the barge-LNG bunker (i.e. manifold for a system with flexible hose and before the swivel for a system with transfer arm).

2.3 Custody Transfer Measuring system

2.3.1 *(1/6/2021)*

Custody transfer Measuring system in fluid measurement is a metering point (location) where the fluid is being measured for sale from one party to another.

2.4 Emergency release coupling (ERC) or breakaway coupling (BRC)

2.4.1 *(1/6/2021)*

A breakaway coupling or emergency release coupling (ERC) is a coupling located in the LNG transfer system (at one end of the transfer system, either the receiving ship end or the barge-LNG bunker end, or in the middle of the transfer system), which separates at a predetermined section when required, each separated section containing a self-closing shut-off valve, which seals automatically.

An emergency release coupling can be activated:

- by external forces applied to the predetermined section exceeding a predetermined value, and/or
- by manual, remote or automatic control, in case of emergency.

2.5 ESD link system or Ship-ship link (SSL)

2.5.1 *(16/2021)*

ESD link system or Ship-ship or ship-shore link (SSL) is a communication system to transmit ESD signals and other signals between two different ESD systems (ship to shore/ship or vice versa) via compatible system technologies such as pneumatic, electric, fiber-optic or radio telemetry.

2.6 LNG bunkering station

2.6.1 *(1/6/2021)*

LNG bunkering station means the following equipment and the area where they are fitted:

- bunkering connections (see [2.2]) for hoses and piping used for liquid and vapour return lines,
- isolating valves and emergency shut-down valves,
- drip trays, draining arrangement and other arrangements such as water curtain intended for the protection of the ship structure from cold leakages,
- gas detection system through thermal camera or gas detectors for enclosed space,
- bunkering system ESD indication,
- inerting and purging system connections,
- pressure relieving system for the Bunkering manifold.

2.7 LNG transfer system

2.7.1 *(1/6/2021)*

A LNG transfer system is a system used to connect the barge-LNG bunker and the receiving ship in order to transfer LNG or both LNG and vapours.

The LNG transfer system includes:

- loading arms and transfer hoses, as applicable
- manifold including valves and instrumentation,
- QCDC,
- breakaway coupling (BRC) or Emergency release coupling (ERC),
- isolation flanges.

2.8 MID

2.8.1 *(1/6/2021)*

Measuring Instruments Directive (MID). The Measuring Instruments Directive (MID) for Custody Transfer metering for liquids, is the European directive law that sets down the essential requirements for a wide range of measuring instruments. It provides options for the manufacturer as to how the requirements are met and which organizations to apply to for conformity assessment.

2.9 OIML R117-1

2.9.1 *(1/6/2021)*

OIML R117-1 is a recommendation issued by the ORGANISATION INTERNATIONALE DE METROLOGIE LEGALE (OIML). The International Organization of Legal Metrology (OIML) is a worldwide, intergovernmental organization whose primary aim is to harmonize the regulations and metrological controls applied by the national metrological services, or related organizations, of its Member States. R117-1 addresses the Dynamic measuring systems for liquids other than water.

2.10 Pendant

2.10.1 *(1/6/2021)*

Pendant (for ESD system) is a portable device provided by one ship to another ship or shore terminal or provided by the shore to the ship for the manual tripping of its ESD system by the other party in the absence of a compatible ship-ship link (SSL).

2.11 Quick connect and disconnect coupling (QCDC)

2.11.1 *(1/62021)*

A QCDC is a manual or powered mechanical device used to connect the LNG transfer system to the receiving ship manifold. The coupling consists of a Nozzle (male) and a receptacle (female). The nozzle allows quick connection and disconnection of the fuel supply hose to the receptacle, mounted on the LNG manifold.

2.12 Safety zone

2.12.1 *(1/6/2021)*

The safety zone is a zone around the barge-LNG bunker, the bunkering station of the receiving ship and the LNG transfer system, where the only activities to be performed are the bunkering operations and related activities and where safety measures are taken to cope with a possible leakage of LNG or vapour.

2.13 Transfer arm

2.13.1 *(1/6/2021)*

Transfer arm refers to any system allowing supporting transfer hoses or rigid pipes during bunkering operations.

3 Document to be submitted

3.1 General

3.1.1 *(1/6/2021)*

The drawings and related information to be submitted are listed in Tab 1.

3.1.2 *(1/6/2021)*

The operating manuals and procedures to be submitted are listed in Tab 2.

Table 1 : Documents to be submitted *(1/6/2021)*

No	A/I	Documents
1	A	Arrangement of the ship showing the location of the bunkering station and bunkering control station
2	I	Risk assessment report including operational constraints for the bunkering operation such as minimum visibility, day/night, maximum wind and wave, weather condition.
3	I	List of all bunkering equipment with their technical specification (including hoses)
4	A	Details of LNG transfer system and vapor return line system
5	A	Purging and Inerting system supplying inert gas to the bunker station and bunkering equipment
6	I	Custody Transfer Measuring Instruments system (Including evidence of approval according to MID or OIML R117-1 requirements)
7	A	ESD Bunkering Concept including cause and effect matrix
8	A	Block diagram of Control, Monitoring and Safety System
9	A	ESD link system (SSL) description and list of communication devices used for the bunkering operation with their specification
10	A	Drip trays and water curtain arrangement
11	I	Instrumentation list and relevant Safety certificates for electrical equipment located in hazardous areas and concerning the bunkering, where applicable
12	A	Drawings of transfer arm
13	I	Fender and mooring arrangement for bunkering operation with mooring analysis
14	A	Bunkering station manifold specification and drawings, with strength calculation including values of maximum allowable working pressure and allowable loads at manifold flange
15	A	Access and walkway arrangement to bunkering station
Note 1: A = to be submitted for approval I = to be submitted for information		

Table 2 : Operating manuals and procedures to be submitted *(1/6/2021)*

No	A/I	Documents
1	I	Operational manual including bunkering procedure (with details of maximum allowable bunkering flow and maximum allowable working pressure), all information required in IGF Code 18.4.2 and IGC Code 18.2 and procedure for the boil off gas and vapour return management
2	I	Bunkering Safety Checklist according to IGF Code 18.4.3
3	I	Safety Zones Layout for the bunkering operation
4	I	Maintenance and storage instruction manual for the bunkering equipment
Note 1: A = to be submitted for approval I = to be submitted for information		

4 General design requirements

4.1 Risk Assessment

4.1.1 LNG transfer system *(1/6/2021)*

A risk assessment shall be conducted according to IGC Code 1.1.11 and IGF Code 4.2 as far as applicable.

The goal of the risk assessment is to identify all safety, environmental and asset hazards associated to the LNG Transfer system during bunkering operation and their possible mitigation where required. The risk analysis can be of qualitative or semi-quantitative type and shall be based on international recognized standards and Tasneef Guide for Risk Analysis.

4.1.2 *(1/6/2021)*

The risk assessment is to be performed using the most appropriate techniques such HAZID (Hazards Identification), FMEA (Failure Mode and Effect Analysis) or HAZOP

(Hazard and Operability study) as far as applicable and at least the following items shall be assessed:

- Bunkering station including manifold arrangement
- ESD Bunkering System
- Bunkering Equipment
- ESD Link system (SSL)
- Voice communication System between barge-LNG bunker and receiving ship
- Monitoring, Control and Safety System of bunkering operation
- Fender and mooring arrangement

taking into account the following operations:

- Arrival, approach and mooring of barge-LNG bunker close to the receiving ship
- Connection and testing of LNG transfer system including ESD system and communication link
- LNG bunkering procedure (including hose handling, hose connection, gassing up, cooling down)
- LNG bunkering in parallel with other activities (SIMOPs)
- Disconnection of the LNG bunker hose in normal and emergency condition (including draining, purging and inerting).

4.1.3 *(1/6/2021)*

The SIMOPs shall be defined with reference to international recognized standards or guidelines such as IACS Rec. 142, SGMF FP08-01 "Simultaneous Operations (SIMOPS) during LNG Bunkering" and other activities identified by the risk assessment experts considering the expected port operations of the receiving ship.

4.2 Hazardous area

4.2.1 General *(1/6/2021)*

In general, safety and security zones are to comply with IACS Rec. 142, Section 2 and they are to be addressed during the risk assessment for the LNG bunkering operation.

4.2.2 *(1/6/2021)*

In addition to the hazardous areas in accordance with IGC Code, the following are to be included:

- LNG bunkering station and 3 m beyond these, up to a height of 2,4 m above the deck
- areas on the open deck within spillage coamings surrounding LNG bunkering connections and manifold valves and 3 m beyond these, up to a height of 2,4 m above the deck
- when applicable, transfer arm operating area extended by 3 m on either direction.

4.3 Materials

4.3.1 *(1/6/2021)*

Materials used in LNG transfer systems, piping system for liquefied gas and other systems or components in contact with LNG or gas are to be in accordance with IGC Code, Chapter 6.

4.4 Arrangement of bunkering system

4.4.1 LNG bunkering station *(1/6/2021)*

The LNG bunkering station is to be located on open deck so that sufficient natural ventilation is provided. Closed or semi-enclosed bunkering stations will be subject to special consideration and are subject to risk assessment as specified in [4.1]. Access to closed or semi-enclosed bunkering station from other closed or semi-enclosed space shall be granted via airlock.

The LNG bunkering station when not located in the cargo area shall be separated from accommodation and control stations through gas tight divisions and the layout is subject to risk assessment.

LNG bunkering station may be accepted at the ship bow and stern provided that the relevant requirements of IGC Code 3.8 are complied with.

The maximum allowable loads are to be indicated on a warning plate fitted on the manifold or nearby.

The manifold shall be arranged at least with the following instruments and fittings:

- Pressure gauge
- Pressure transmitter
- Temperature gauge
- Temperature transmitter
- Sampling point for gas detection
- Safety relief valve fitted in between the presentation flange and ESD bunkering valve.

4.4.2 Drip trays and protection of ship hull *(1/6/2021)*

Drip trays are to be fitted below the liquid bunkering connections and where leakage may occur which can cause damage to the ship structure.

Thermal sensors are to be positioned in the drip trays.

The drip trays are to be made of stainless steel and can be drained overboard.

When LNG boiling point at atmospheric pressure is lower than design temperature of the hull steel, a water piping system is to be fitted, providing a low-pressure water curtain in way of the hull under the bunkering manifold for additional protection of the hull steel and the ship's structure; other solutions will be considered on a case by case basis.

The operating platforms in way of the manifold operating position are to be fitted with raised gratings made of a material suitable for the LNG boiling point at atmospheric pressure.

4.4.3 Bunkering control station *(1/6/2021)*

Control of the bunkering operation should be possible from a bunkering control station that is placed in a safe location with regards to bunkering operations. The bunkering control station may be within the cargo control room. At this location, overfilling alarm and automatic and manual shutdown are be indicated.

Unobstructed direct or camera view of the LNG bunkering station is to be available from the Bunkering control station.

An LNG system schematic/piping and instrumentation diagram (P&ID) shall be reproduced and permanently mounted in the bunkering control station.

4.4.4 LNG Transfer Systems *(1/6/2021)*

The manifold for transfer of liquid shall be fitted with manually operated stop valve and a remotely/automatically operated valve (ESD valve) fitted in series.

The LNG transfer system is to include at least an emergency release coupling (ERC) and an insulation flange. A Quick Connect Disconnect Coupling (QCDC) may be installed together with above mentioned components.

The ERC is to be fitted on the receiving ship side, but may be accepted also fitted on LNG transfer system side provided that the relevant scenario is considered during the risk analysis required in [4.1].

In case the ERC is fitted on the LNG transfer system side, the nearest pressure relief valve on the receiving ship shall have sufficient capacity to accommodate the trapped liquid in the bunkering hose or pipe.

The hoses are to be adequately supported and protected to prevent potential damage or sparks in the event of activation of the ERC.

The manifolds are to be capable to withstand the allowable loads as defined in an international recognized standard or guideline such as SGMF TGN-06-04 "Technical Guidance Manifold" or equivalent.

The LNG transfer system is to be designed to avoid the release of gas to the atmosphere during bunkering operations.

The bunkering transfer rate is to be capable of being controlled to match with the capabilities and requirements of the receiving ship.

The maximum LNG transfer rate is to be declared and justified, taking into consideration:

- The management of the BOG generated during bunkering operation
- The temperature of the LNG supplied to the ship
- The maximum flow permitted by the ERC and or break away coupling
- The maximum flow permitted by the hose
- The maximum flow permitted by the QCDC
- The maximum allowable working pressure of the receiving ship bunkering station.

The GAS/LNG velocity in the piping system is not to exceed 10 m/s in order to avoid the generation of static electricity and to limit the heat transfer due to friction inside the pipes; higher velocity may be considered provided they are duly justified.

In order to prevent cryogenic liquid spills, the design of the transfer system is to be such that the lines can be drained and purged by nitrogen after a normal or emergency disconnection.

Any pipeline or component containing liquid, which may be isolated due to the ESD activation, is to be provided with pressure relief valve.

4.4.5 LNG Bunkering ESD system *(1/6/2021)*

A bunkering ESD system is to be installed in addition to the ESD required by IGC Code, if a separate transfer system is provided.

All electrical components of the ESD systems are to be of suitable safe type taking into account the hazard categorization of the area where they are located.

4.4.6 Lighting *(1/6/2021)*

Lighting shall illuminate the bunker station area, and if installed in a hazardous area should be compliant with applicable hazardous area equipment requirements. Lighting shall adequately illuminate the bunkering operation work area as follows:

- LNG bunker hose(s),
- Connection and couplings on both receiving ship and bunkering facility,
- ESD system call points,
- Communication systems,
- Fire-fighting equipment,
- Passage ways / gangways intended to be used by the personnel in charge of the bunkering operation, and
- Vent mast(s).

4.5 Mooring and fendering

4.5.1 *(1/6/2021)*

Steel to steel contact between barge-LNG bunker and receiving ship e.g. via mooring lines, ladders, gangways, chains for fender support etc. shall be avoided through the use of insulation. Bunker hoses/pipes shall be supported and isolated to prevent electrical contact with the receiving ship.

4.5.2 *(1/6/2021)*

The rubber fenders used for keeping the distance between the barge-LNG bunker and receiving ship shall be built according to an international recognized standard such as ISO 17357-2 or equivalent. The dimensions and arrangement of fenders shall be verified during risk assessment as required in [4.1] taking into consideration the interferences of the hazardous areas of both ships and the minimum bend radius of the bunkering hose.

5 Hoses and pumps

5.1 Hose design requirements

5.1.1 General *(1/6/2021)*

The hoses used for bunkering are to comply with the requirements in IGC Code 5.11.7.

For bunkering hoses the following characteristics are to be defined by the designer and submitted to the Society:

- Minimum/Maximum Allowable Working Temperature
- Maximum Allowable Working Pressure
- Minimum Bend Radius
- Maximum Allowable Crush Load
- Maximum Allowable Axial Load,

5.1.2 Hose Maximum Working Pressure and Strength *(1/6/2021)*

The maximum working pressure specified by manufacturer is not to be less than 1 MPa in accordance with IGC Code 5.11.7.3.

The strength of the hoses is to be compatible with the maximum release forces of the ERC.

5.1.3 Materials *(1/6/2021)*

All materials of hose ~assembly are to be suitable for marine environment, compatible with each other and with the fluid conveyed (LNG and LNG vapours).

5.1.4 End connection and coupling *(1/6/2021)*

The end fittings are to be made of corrosion resistant material and in accordance with IGC Code Table 6.4.

5.2 Type approval, testing and certification of LNG bunkering hoses

5.2.1 *(1/6/2021)*

Bunkering hoses are to be type approved by the Society.

Flexible hoses intended for the handling of LNG are to be in compliance with design and testing requirements standards EN1474-2, or EN21012 or equivalent standards and IGC Code 5.11.7.

5.2.2 *(1/6/2021)*

All hoses are to be individually certified by the Society at satisfactory outcome of testing according to [5.3], carried out by the manufacturer in the presence of a Society Surveyor, unless an alternative certification scheme is agreed with the Society.

5.3 Testing of Hoses at workshop

5.3.1 Pressure test *(1/6/2021)*

Each hose assembly is to be subjected to a hydraulic pressure test at ambient temperature to a pressure not less than 1,5 times the maximum operating (nominal) pressure, to demonstrate that the hose assembly is capable of withstanding pressure without leaking.

5.3.2 Non destructive testing of welding *(1/6/2021)*

Welds of the hose assembly are to be subjected to non destructive testing (NDT) according to international recognized standards.

5.4 Hoses documentation

5.4.1 *(1/6/2021)*

A hose technical file containing the following information is to be kept on board:

- Hose identification number
- Type approval certificate issued by Society
- Product test certificate issued by Society
- Overall weight of the hose and end fittings assembly
- Date of entry into service
- Inspection intervals and lifetime
- Instructions for the handling, storage and installation of hose

5.5 Marking of products

5.5.1 *(1/6/2021)*

Each hose is to be permanently marked according to a recognized international standard or the following information:

- Manufacturer's name or logo
- Hose designation and size
- Maximum Allowable Working Pressure
- Maximum and minimum allowable working temperature
- Date of manufacture
- Marking from Society

5.6 Transfer pumps

5.6.1 *(1/6/2021)*

The transfer pumps if different from cargo pumps shall comply with requirements specified in Ch 9, Sec 5, [3.2] and they shall be type approved.

All pumps are to be pressure tested in the presence of the Surveyor.

6 Quick connect disconnect coupler (QCDC)

6.1 Type approval, testing and certification of QCDC

6.1.1 *(1/6/2021)*

QCDC are t be type approved by the Society.

6.1.2 *(1/6/2021)*

All QCDC are to be individually certified by the Society at satisfactory outcome of testing according to [6.3] carried out by the manufacturer in the presence of the Surveyor, unless an alternative certification scheme is agreed with the Society.

6.2 Type testing

6.2.1 *(1/6/2021)*

The QCDC is to be subjected to a type test to confirm the release performance under ice built up condition according to an international recognized standard such as ISO 21593, ISO 16904 or equivalent.

6.3 Workshop testing

6.3.1 Pressure test *(1/6/2021)*

The QCDC is to be subjected to a hydrostatic pressure test, at ambient temperature, to a pressure not less than 1,5 times the Maximum Allowable Working Pressure to demonstrate that the QCDC is capable of withstanding pressure without leakage.

7 Emergency release coupling (ERC)

7.1 Type approval, testing and certification of QCDC

7.1.1 General *(1/6/2021)*

Transfer arms and hoses shall be fitted with an emergency release coupling (ERC) designed to minimize the release of LNG on emergency disconnection. The emergency release coupling is to be designed as breakaway coupling i.e. with automatic disconnection in case the allowable loads of manifold as defined in [4.4.4] are exceeded. Additionally the emergency release coupling may be designed with manual or remote and automatic activation by the ESD bunkering system.

7.1.2 *(1/6/2021)*

Each separate section is to contain a self-closing shut-off valve, which seals automatically on disconnection.

7.1.3 *(1/6/2021)*

All electrical components of the emergency release coupling are to be certified of a suitable safe type.

When applicable, the availability of power to the ERC is to be monitored and arranged so that bunkering operation is automatically stopped in case of loss of power supply to the ERC.

7.1.4 *(1/6/2021)*

The bunkering line is to be designed and arranged to withstand the surge pressure that may result from the activation of the ERC.

7.2 Type approval, testing and certification of ERC

7.2.1 *(1/6/2021)*

ERC are to be type approved by the Society.

7.2.2 *(1/6/2021)*

All ERCs are to be individually certified by the Society at satisfactory outcome of testing according to [7.4] carried out by the manufacturer in the presence of a Society Surveyor, unless an alternative certification scheme is agreed with the Society.

7.3 Type testing

7.3.1 *(1/6/2021)*

The ERC are to be subjected to a type test according to an international recognized standard such as ISO 18683 or equivalent to confirm the values of axial and shear forces at which it automatically separates. Additionally the tightness of the self-closing shut-off valves after separation is to be tested.

7.3.2 *(1/6/2021)*

The ERC are to be subjected to a type test to confirm the release performance under ice built up condition.

7.3.3 *(1/6/2021)*

When applicable, the ERC is to be subjected to a type test to confirm the release in case of remote or automatic activation.

7.4 Workshop testing

7.4.1 Pressure test *(1/6/2021)*

The ERC are to be subjected to a hydrostatic pressure test, at ambient temperature, to a pressure not less than 1,5 times the Maximum operating (nominal) pressure, to demonstrate that the ERC are capable of withstanding pressure without leaking.

8 Electrical insulation flanges

8.1 General

8.1.1 *(1/6/2021)*

Each insulation flange is to be subjected to a test of electrical resistance in air and the resistance is to be of at least 1000 Ω but less than 1 MΩ.

8.1.2 *(1/6/2021)*

The resistance of each insulation flange is to be measured after installation in the complete LNG transfer system and the resistance is to be not less than 1000 Ω.

9 Hose Supports and transfer arms

9.1 General

9.1.1 *(1/6/2021)*

Hoses are to be suitably supported in such a way that the minimum allowable bending radius is complied with.

9.1.2 *(1/6/2021)*

Arrangements such as cranes or winches are to be available for the handling of hoses whose size or weight does not allow a safe manual handling.

9.1.3 *(1/6/2021)*

Non electrical equipment located in hazardous area and belonging to items such as cranes, winches, etc. is to be suitable for explosive atmosphere according to international recognized standard (e.g. ISO 80079-36 or equivalent).

9.1.4 *((1/6/2021)*

Electrical equipment located in hazardous area is to comply with IGC Code 10.2.

9.2 Transfer arms

9.2.1 *(1/6/2021)*

Transfer arms are to be approved by the Society.

9.2.2 *(1/6/2021)*

Transfer arms are to be designed and constructed in accordance with a recognized national or international standards acceptable to the Society as EN1474-1.

9.2.3 *(1/6/2021)*

The maximum allowable operating amplitude and forces acting on the loading arm during the bunkering operations are to be defined and compatible with the hoses and ERC. The exceeding of transfer arm envelope is to activate two stages alarms in bunker control station and on the navigation bridge.

The initiation of the first stage is to activate a visual and audible alarm.

The initiation of the second stage is to activate the ESD and ERC system.

9.2.4 *(1/6/2021)*

All transfer arms are to be individually certified by the Society at satisfactory outcome of tests, as required for lifting appliances and operational tests, or per recognized international standards, carried out by the manufacturer in the presence of a Society Surveyor, unless an alternative certification scheme is agreed with the Society.

9.2.5 *(1/6/2021)*

The operational test per [9.2.4] is to give evidence of compliance with the design criteria per [9.2.3].

10 Inert Gas System

10.1

10.1.1 *(1/6/2021)*

An inert gas system is to be fitted on board, to enable purging and inerting of the bunkering lines; the system is to be in compliance with IGC Code 9.4 and 9.5.

10.1.2 *(1/6/2021)*

The inerting capacity is to be designed according the bunkering operations and when based on inert gas storage on board, the capacity is not to be less than 5 times the volume of the hose and pipes to be purged.

11 Gas detection

11.1 Gas detection in enclosed spaces

11.1.1 *(1/6/2021)*

Permanently installed gas detectors are to be fitted in all hazardous areas including bunkering station if of enclosed or semi-enclosed type, LNG process room and other enclosed spaces containing LNG piping or other equipment not equipped with double walled piping.

11.1.2 *(1/6/2021)*

The number of detectors in each space is to be considered taking into account the size, layout and ventilation of the space. At least two independent gas detectors are required in each hazardous area.

11.1.3 *(1/6/2021)*

The detection equipment is to be located where gas may accumulate and in the ventilation outlets. Gas dispersion analysis or a physical smoke test is to be used to find the best arrangement.

11.1.4 *(1/6/2021)*

An audible and visual alarm is to be activated before the vapour concentration reaches 30% of the lower explosive limit (LEL).

11.1.5 *(1/6/2021)*

Audible and visual alarms from the gas detection equipment are to be located on the bridge and in the bunkering control station.

11.2 Gas detection in open spaces

11.2.1 *(1/6/2021)*

The installation of thermal imaging camera is to be evaluated on the basis of the risk assessment as defined in [4.1], for open spaces classed as hazardous areas (e.g. bunkering station, hose handling areas).

Monitoring of thermal imaging camera is to be available in the bunkering control station.

12 Control and safety systems

12.1 General

12.1.1 *(1/6/2021)*

Appropriate segregation shall be maintained between control, monitoring/alarm and safety functions to limit the effects of single failures during bunkering.

Failure of one part of the integrated system shall not affect the functionality of other parts, except for those functions directly dependent on the defective part.

Being the bunkering control system combined with the cargo control system all relevant requirements specified in the IGC Code 13.9 are to be complied with.

12.2 Emergency shut-down systems (ESD)

12.2.1 *(1/6/2021)*

An ESD system is to be fitted to safely and effectively stop the transfer of LNG (and vapour as applicable) between the receiving ship and the bunkering ship in the event of an emergency during the bunkering operation and in general it is to be in compliance with IGC Code 18.10.

The ESD safety system is to be designed so as to limit the consequence of failures. It is to be constructed on the fail-to safety principle.

The ESD system is to be of the self-check type; as a rule, failure within the ESD including the outside connection, is to activate an alarm.

The control systems involved in the ESD, which is a linked system to allow both parties (on board receiving ship and the barge-LNG bunker) to shut down the transfer in an emergency situation, is to be capable of being activated automatically or manually.

The ESD system normally includes two stages:

- ESD-stage 1, a stage in which the LNG transfer process is shut down in a controlled manner
- ESD-stage 2, a stage in which decoupling of the transfer system between the transfer vessels or between a vessel and an LNG port facility is activated.

The ESD-1 and ESD-2 logic shall be verified and agreed among stakeholders during the risk assessment as required in [4.1] also considering applicable international recognized standard or guidelines (e.g. SIGTTO ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers).

Where provided, override command of ESD system has to be clearly indicated in the Bunkering control station.

The ESD-1 and ESD-2 trips are to trigger visual and audible alarms in the navigation bridge, engine control room, cargo and bunkering control room and manifold area.

12.2.2 *(1/6/2021)*

At least one local manual activation position for the ESD system is to be made available for the LNG fueled ship being bunkered, this may be in the form of an ESD System pendant with sufficient length of cable or an ESD link system (SSL ship/shore link or ship/ship link). The SSL may be various type (e.g.: electric, fibre-optic, radio telemetry, pneumatic). The SSL is to have an adequate reliability and redundancy level according to a recognized international standard or guideline (e.g.: SIGTTO ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers).

12.2.3 *(1/6/2021)*

At least one local manual activation position for the ESD system is to be fitted in a place that have a clear view of the manifold area (the 'clear view' may be provided via CCTV) but is at a safe distance from the manifold.

12.2.4 *(1/6/2021)*

Any activation of the ESD systems is to be implemented simultaneously on both bunkering facility and receiving ship.

12.2.5 *(1/6/2021)*

The timing sequence is to ensure that the involved pumps and compressors (if any) stop before the complete closure of any manifold valve.

12.2.6 *(1/6/2021)*

The bunkering lines are to be designed and arranged to withstand the surge pressure that may result from the activation of the emergency release coupling and quick closing of ESD valves. If not demonstrated to be required at a higher value due to pressure surge considerations, a default time of 5 seconds from the trigger of the alarm to full closure of the ESD valves is to be arranged.

12.2.7 *(1/6/2021)*

The components of the ESD system located in hazardous and safety zones are to be of a suitable safe type.

12.2.8 *(1/6/2021)*

LNG bunker transfer should not be resumed until the transfer system and associated safety systems (fire detection, etc.) are returned to normal operation condition.

12.2.9 *(1/6/2021)*

All electrical components of the emergency release coupling actuator and of the ESD systems that are provided by the barge-LNG bunker are to be approved and certified by the Society.

12.3 Alarms and safety actions

12.3.1 *(1/6/2021)*

The alarms and safety function/actions required for the transfer system are given in Tab 3 and they are additional to those required in the IGC Code Table 18.1 . The extent of alarms and safety functions may be reconsidered on the basis of outcome from risk assessment.

The receiving ship is expected to be capable of transmitting at least an ESD signal via an hardwired system.

Table 3 : Alarms and safety actions required for the transfer system *(1/6/2021)*

Parameters	Alarm	Activation of the Bunker ESD systems (ESD-1)	Automatic activation of the emergency release coupling (ESD-2) **(1)**
Fire Detection in way of tank domes or manifold area for receiving ship and barge-LNG bunker **(1)**	X	X	
Shutdown signal from shore or receiving ship	X	X	
Loss of ESD linked system **(1)**	X	X	
Loss of power supply to LNG bunkering control system	X	X	
ESD logic failure	X	X	
Low Pressure in cargo valve remote control system	X		
Low Low Pressure in cargo valve remote control system	X	X	
Stop of the ventilation of enclosed or semi-enclosed bunkering station	X	X	
Loss of actuating power to the common loading arm maneuvering system or to the ERC of individual loading arms	X	X	
High level in surge drum (where provided)	X		
High High level in surge drum (where provided)	X	X	
Low pressure in the supply cargo tank	X		
Low Low pressure in the supply cargo tank	X	X	
(1) when the receiving ship is equipped with an SSL compatible with the barge-LNG bunker SSL			

Parameters	Alarm	Activation of the Bunker ESD systems (ESD-1)	Automatic activation of the emergency release coupling (ESD-2) **(1)**
Sudden pressure drop at the transfer pump discharge	X	X	
High level in the LNG storage tank of receiving ship **(1)**	X		
High High level in the LNG storage tank of receiving ship **(1)**	X	X	
High pressure in the LNG storage tank of receiving ship **(1)**	X		
High High pressure in the LNG storage tank of receiving ship **(1)**	X	X	
High pressure in the manifold vapor return system	X		
High high pressure in the manifold vapor return system	X	X	
High pressure in the manifold liquid supply system	X		
High High pressure in the manifold liquid supply system	X	X	
LNG cold leakage in the manifold drip tray	X	X	
Gas detection in bunkering station of receiving ship **(1)**	X	X	
Gas detection in bunkering station of bunkering ship	X	X	
Excessive movement of ship from berth/ship	X	X	X
Disconnection of the ERC	X	X	
(1) when the receiving ship is equipped with an SSL compatible with the barge-LNG bunker SSL			

12.4 Communication systems

12.4.1 *(1/6/2021)*

A two-way voice communication system is to be provided between the barge-LNG bunker and the receiving ship.

12.4.2 *(1/6/2021)*

The components of the communication system located in hazardous and safety zones are to be of a suitable safe type.

13 Testing of the LNG transfer system at workshop

13.1 Pressure test

13.1.1 *(1/6/2021)*

All piping and tanks the LNG transfer system are to be subjected to a hydraulic pressure test in the presence of a Society Surveyor, at ambient temperature, to a pressure not less than 1,5 times the nominal pressure, to demonstrate the capability to withstand pressure without leaking.

13.2 Inspection of welds

13.2.1 *(1/6/2021)*

When applicable, the welds of the LNG transfer system are to be subjected to a non-destructive testing and all butt welds are to be subjected to a 100% radiographic or ultrasonic examination.

14 Testing and trials of the LNG transfer system at yard

14.1

14.1.1 *(1/6/2021)*

After assembly on board, the following tests and trials are to be carried out in the presence of a Surveyor.

14.2 Piping leak test

14.2.1 *(1/6/2021)*

A leak test, using air or other suitable medium, of the completely assembled and equipped LNG transfer and vapour return systems , in steps of 10-20% up to 90% of the operational pressure of the LNG/gas system is to be carried out in the presence of a Society Surveyor, to detect leakage with soap/leak detection spray. Holding time is depending of the volume/part of the installation being Leak tested.

14.3 Inerting

14.3.1 *(1/6/2021)*

Inerting of the total LNG/gas system including LNG storage tank(s), following the approved inerting procedure.

15 Implementation survey

15.1

15.1.1 *(1/6/2021)*

Upon issuance of the additional service feature LNG bunker, a dedicated survey if to be carried out on occasion of the first LNG bunkering, as follows:

a) The first LNG bunkering is to be carried out according to the relevant LNG bunkering procedure.

b) During the survey the following is to be carried out:

- Examination of transfer piping systems including supporting arrangements.
- Verification of satisfactory operation of:
  - Control and monitoring systems
  - Connections systems (QCDC).
  - ESD system
  - piping purging and inerting systems.

16 Additional features

16.1 IG-Bunker (Inert Gas Bunker)

16.1.1 General *(1/6/2021)*

The additional feature **IG-Bunker (Inert Gas Bunker)** is assigned to barge-LNG bunker designed to also supply inert gas to a LNG fuelled ship to ensure inerting of the receiving ship systems, and complying with the following requirements.

16.1.2 Inert Gas system *(1/6/2021)*

The inert gas system is to comply with IGC Code 9.4 and 9.5 and Chapter 9.

16.1.3 Piping system *(1/6/2021)*

The lines used for the inert gas are to be independent from the LNG liquid and vapour lines used for normal operation.

16.1.4 Document to be submitted *(1/6/2021)*

The following documents are to be submitted to the Society for approval in addition to the information required in [3]:

- Diagram of the Inert gas system
- Procedure for supplying inert gas to the receiving ship.

16.2 BT (Bunker Trust)

16.2.1 General *(1/6/2021)*

The additional feature **BT (Bunker Trust)** is assigned to barge-LNG bunker designed with arrangement for the verification of the LNG quality and quantity delivered to the receiving ship according to international recognized standard (e.g. ISO 23306) or equivalent or according to a gas fuel specification agreed among the stakeholders.

16.2.2 Documents to be submitted *(1/6/2021)*

The following documents are to be submitted to the Society for approval in addition to the information required in [3]:

- Diagram of the LNG sampling arrangement
- Technical specification of LNG analyzer
- LNG Sampling procedure
- Evidence of approval of the measuring system according to MID or OIML R117-1.

16.2.3 Sampling System *(1/6/2021)*

The unit has to be fitted with a sampling system in accordance with international recognized standard (e.g. ISO 8943) or equivalent. Other type of system or piping arrangement are subject to special consideration and they are evaluated case by case.

The sampling connections shall be in compliance with requirements specified in IGC Code 5.6.5.

The sampling procedure shall be in compliance with requirements specified in IGC Code 18.9 and included in the risk assessment as required in [4.1.2].

The LNG analyzer is to be type approved.

16.2.4 Custody Transfer Measuring System *(1/6/2021)*

A Custody Transfer Measuring System is to be installed on the barge-LNG bunker.

A recognized thirty party should approve the design and instruments against MID or OIML R117-1; evidence of this is required to be supplied to the Society.

16.3 VCS-Bunker (Vapour Control System Bunker)

16.3.1 General *(1/6/2021)*

The additional feature **VCS-Bunker (Vapour Control System Bunker)** is assigned to barge-LNG bunker in compliance with Pt F, Ch 13, Sec 7 for the assignment of notation **VCS-Transfer**.

16.3.2 Vapour return handling *(1/6/2021)*

The barge-LNG bunker is to be capable of handling all or part of the vapours from receiving ship generated during the LNG bunkering operation, in addition to its own boil-off gas (BOG), without release to the atmosphere. The vapour handling capacity of the barge-LNG bunker is to be indicated and justified.

Different ways to dispose of the vapours may be considered, such as:

- re-liquefaction
- utilization by the gas consuming equipment of the barge-LNG bunker (e.g. gas or dual-fuel engines or boilers)
- gas combustion unit.

A combination of these means is possible and other solutions may be accepted if they are duly justified to the Society.

SECTION 7 ADDITIONAL REQUIREMENTS FOR MACHINERY AND CARGO SYSTEMS OF BARGE-CHEMICAL

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.

These units are to comply with the requirements of the latest version of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), as amended, as specified in Ch 8, [1.1.1] to [1.1.3].

The requirements in this chapter applicable to barge-chemical apply to units intended to carry products listed in the table in Chapter 17 of the IBC Code. For the carriage of products listed in the table in Chapter 18 of the IBC Code and products not at present listed in either of the tables in Chapter 17 or Chapter 18 of the IBC Code, the Society reserves the right to establish specific requirements.

The requirements of this Section supplement those of the IBC Code.

All the requirements of this Section are cross referenced to the applicable Chapters, Sections or paragraphs of the IBC Code, as appropriate.

1.2 Documents to be submitted

1.2.1 *(1/6/2021)*

The documents listed in Tab 1 are to be submitted for approval.

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.

Table 1 : Documents to be submitted *(1/6/2021)*

No.	A/I	Document
1	I	List of products to be carried, including maximum vapour pressure, maximum liquid cargo temperature and other important design conditions
2	A	Ventilation duct arrangement in gas-dangerous spaces and adjacent zones
3	A	General layout of cargo pump room with details of: - bulkhead penetrations - gas detection system - other alarms and safety arrangement
4	A	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
5	A	Diagram of the cargo tank cleaning system
6	A	Diagram of the cargo heating systems
7	A	Diagram of inert gas system with details of the inert gas plant
8	A	Plans and calculations of safety relief valves
9	A	Details of cargo handling, including arrangements and details of piping and fittings
10	A	Details of cargo pumps
11	A	Details of process pressure vessels and relative valving arrangement
12	A	Bilge and ballast system in cargo area
13	A	Gas freeing system in cargo tanks including inert gas system
14	A	Ventilation system in cargo area

No.	A/I	Document
15	A	Gas detection system
16	A	Cargo tank instrumentation
17	I	Loading and unloading operation description, including cargo tank filling limits, where applicable

Note 1: A = to be submitted for approval in four copies
I = to be submitted for information in duplicate
Diagrams are also to include, where applicable, the (local and remote) control and monitoring systems and automation systems.

2 Cargo pump rooms

2.1 Machinery driven by shafting passing through pump room bulkheads

2.1.1 *(1/6/2021)*

IBC CODE REFERENCE : Ch 3, 3.3.7

a) Bulkhead or deck penetrations of cargo pump rooms, or of pump rooms intended for runs of shafts driving pumps and/or fans, are to be provided with gas-tight sealing devices to the satisfaction of the Society.

b) Lubrication or other means of ensuring permanence of gas-tightness of the above-mentioned sealing devices is to be arranged in such a way that it can be checked from outside the cargo pump room.

3 Fuel tanks in cargo area

3.1 Definition

3.1.1 *(1/6/2021)*

Cargo tank block is the part of the ship as indicated in Fig 1 extending from the aft bulkhead of the aftmost cargo or slop tank to the forward bulkhead of the forward most cargo or slop tank, extending to the full depth and beam of the ship, but not including the area above the deck of the cargo or slop tank.

3.2 Location of fuel tanks in cargo area

3.2.1 *(1/6/2021)*

a) These requirements apply to chemical tankers carrying toxic (see Note 1) liquid cargoes.

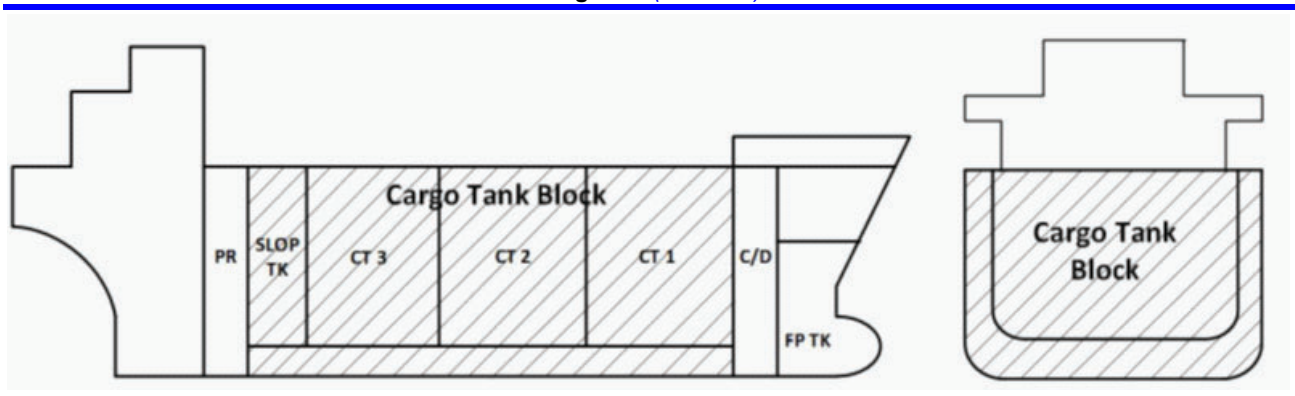
b) Fuel tanks located with a common boundary to cargo or slop tanks shall not be situated within nor extend partly into the cargo tank block. Such tanks may, however, be situated aft and/or forward of the cargo tank block.

c) They may be accepted when located as independent tanks on open deck in the cargo area subject to spill and fire safety considerations.

d) The arrangement of independent fuel tanks and associated fuel piping systems, including the pumps, can be as for fuel tanks and associated fuel piping systems located in the machinery spaces. For electrical equipment, requirements to hazardous area classification must however be met.

Note 1: toxic liquid cargoes include those for which toxic vapour detection is specified in column "k" of the table of chapter 17 of the IBC Code.

Figure 1 *(1/6/2021)*



4 Bilge and ballast arrangements

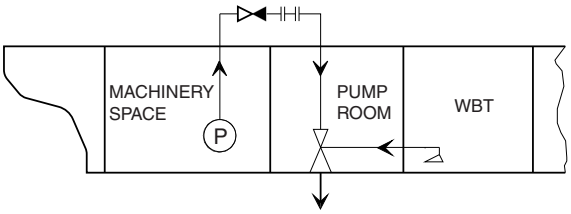
4.1 Ballast segregation

4.1.1 Eductors *(1/6/2021)*

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 2).

Figure 2 : Discharge arrangement *(1/6/2021)*



4.2 Ballast filling arrangement

4.2.1 Clarification *(1/6/2021)*

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 2).

4.3 Bilge

4.3.1 Arrangement *(1/6/2021)*

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.

4.3.2 Use of cargo pumps as bilge pumps *(1/6/2021)*

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.

5 Piping systems other than cargo piping system

5.1 General

5.1.1 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.

5.1.2 Independence of piping systems *(1/6/2021)*

Fuel oil systems are to:

- be independent from the cargo piping system
- have no connections with pipelines serving cargo or slop tanks.

5.1.3 Passage through cargo tanks and slop tanks *(1/6/2021)*

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 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.

5.2 Bilge system

5.2.1 Draining of spaces located outside the cargo area *(1/6/2021)*

For bilge draining of spaces located outside the cargo area, refer to Pt C, Ch 1, Sec 10, [6].

5.2.2 Draining of pump rooms *(1/6/2021)*

a) Arrangements are to be provided to drain the pump rooms by means of power pumps or bilge ejectors.

Note 1: On units of less than 500 gross tonnage, the pump rooms may be drained by means of hand pumps with a suction diameter of not less than 50 mm.

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

c) Bilge pipe internal diameter is not to be less than 50 mm.

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

5.2.3 Drainage of hold spaces, cofferdams and void spaces located within the cargo area *(1/6/2021)*

Hold spaces, 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.

5.3 Ballast system

5.3.1 General *(1/6/2021)*

a) Every unit is to be provided with segregated ballast tanks

b) The capacity of the segregated ballast tanks is to be considered by the Society on a case-by-case basis. In general, the capacity of segregated ballast tanks is to be at least such that, in any ballast condition at any part of the voyage, including the conditions consisting of lightweight plus segregated ballast only, the ship's draught and trim satisfy minimum and maximum values deemed reasonable by the Society

c) Except where expressly permitted, ballast systems serving segregated ballast tanks are to be completely separated from the cargo and fuel oil systems

d) In the unit 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].

5.3.2 Pumping arrangements for ballast tanks within the cargo area *(1/6/2021)*

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.

The ballast system serving the spaces located outside the cargo area may be used for this purpose.

5.3.3 Emergency discharge of segregated ballast *(1/6/2021)*

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 chemical products 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.

5.3.4 Carriage of ballast water in cargo tanks *(1/6/2021)*

a) Provisions are to be made for filling cargo tanks with sea water, where permitted. Such ballast water is to be processed and discharged as per [4.2.1] and [6.3.8].

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.

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.

5.3.5 Ballast pipes passing through tanks *(1/6/2021)*

a) In the ship 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 [5.1.3] 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.

5.3.6 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].

5.4 Scupper pipes

5.4.1 *(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
- they have only welded or heavy flanged joints the number of which is kept to a minimum
- they are of substantial wall thickness as per Pt C, Ch 1, Sec 10, Tab 23, column 1.

5.5 Cargo temperature control

5.5.1 Cargo heating and cooling systems *(1/6/2021)*

a) Cargo temperature control systems

IBC CODE REFERENCE : Ch 7, 7.1.1

Wherever a particular temperature (higher or lower than the ambient temperature) is required to be maintained for the preservation of the cargo, one of the following systems is to be adopted:

1) thermally insulated tanks capable of maintaining the temperature of the cargo within acceptable limits for the time of the voyage.

2) a heating or cooling plant or refrigerating plant.

3) a combination of 1) and 2) above.

b) Additional requirements for heating and cooling plants

IBC CODE REFERENCE : Ch 7, 7.1.1

1) Manifolds for the delivery and backflow of heating media are to be fitted on the weather deck; connec-

tions to cargo tanks for inlet and outlet are to be in way of the cargo tank top.

2) Where the heat exchanger room is located in the accommodation area and considered as gas-safe, it is to be treated as a machinery space (not a category A machinery space) and provided with independent mechanical extraction ventilation as well as with scuppers discharging directly into the machinery space.

3) The maximum temperature of steam and heating media within the cargo area is to be adjusted to take into account the temperature class of the cargoes.

c) Reference temperature

IBC CODE REFERENCE : Ch 7, 7.1.1

Wherever the cargo temperature is maintained by a heating or refrigerating plant, unless otherwise indicated in the contract specification, the system is to be designed taking into account the reference temperatures indicated in Tab 2.

Table 2 *(1/6/2021)*

Reference temperature (°C)		
	Heating system	Cooling system
Sea	0	32
Air	5	45

d) Redundancy

IBC CODE REFERENCE : Ch 7, 7.1.1

Wherever the heating or cooling system is essential for the preservation of the cargo, the following components are to be duplicated:

1) heating or cooling sources; in cargo heating systems, the Society may permit only one fired boiler capable of supplying the requested heating capacity to be installed, provided that sufficient spares for the burner and relevant auxiliaries are carried on board to enable any failure of the burner to be rectified by the ship's crew

2) circulating pumps for cargo and heating or cooling media; if suitable for the use, cargo pumps may be employed for the circulation of the heating or cooling media

3) refrigeration plant.

5.5.2 Valves and other fittings *(1/6/2021)*

a) Means for purging

IBC CODE REFERENCE : Ch 7, 7.1.3

Cargo heating or cooling systems are to be fitted with the necessary connections to purge, by inert gas or compressed air, the heating or cooling circuit of each cargo tank and to perform the pressure testing of the system.

5.5.3 Cargo temperature measuring system *(1/6/2021)*

a) Alarm

IBC CODE REFERENCE : Ch 7, 7.1.5

1) An alarm system is required for those products which are carried in a heated condition (see paragraph 15.13.6 of the IBC Code) and for which, in column "o" of the tables in Chapter 17 of the IBC Code, reference is made to the requirements of paragraph 15.13 of the IBC Code.

2) An alarm system is required for those products for which a carrying temperature not greater than certain limits is required by Chapter 15 of the IBC Code, such as elementary phosphorus and molten sulphur.

3) An alarm connection to the navigating bridge and to the cargo control station, if fitted, is to be provided.

5.5.4 Requirements for special products *(1/6/2021)*

a) Products which may damage the cargo heating or cooling system

IBC CODE REFERENCE : Ch 7, 7.1.6

1) The provisions of paragraph 7.1.6 of the IBC Code also apply to products which may damage the cargo heating or cooling system.

2) If the sampling equipment mentioned in paragraph 7.1.6.3 of the IBC Code consists of an observation tank for drains, this tank is generally to comply with the following requirements:

- it is to be located in the cargo area and provided with an air pipe with the end fitted with a flame screen, as per the Rules, and arranged at not less than 3 m from openings of accommodation spaces and from sources of ignition
- it is to be fitted with a connection for discharge into the slop tanks with associated shut-off valves and sight glass and equipped with a sampling cock for backflowing medium analysis.

6 Cargo pumping and piping systems

6.1 General

6.1.1 *(1/6/2021)*

A complete system of pumps and piping is to be fitted for handling the cargo.

6.1.2 *(1/6/2021)*

Except where expressly permitted, and namely for the bow and stern cargo loading and unloading stations, this system is not to extend outside the cargo area and is to be independent of any other piping system on board.

6.2 Cargo pumping system

6.2.1 Number and location of cargo pumps *(1/6/2021)*

a) Each cargo tank is to be served by at least two separate fixed means of discharging and stripping. However, for tanks fitted with an individual submerged pump, the second means may be portable.

b) Cargo pumps are to be located:

- in a dedicated pump room, or
- on deck, or
- when designed for this purpose, within the cargo tanks.

6.2.2 Use of cargo pumps *(1/6/2021)*

a) Except where expressly permitted in [5.2] and [5.3], cargo pumps are to be used exclusively for handling the liquid cargo and are not to have any connections to compartments other than cargo tanks.

b) Subject to their performance, cargo pumps may be used for tank stripping.

c) Cargo pumps may be used, where necessary, for the washing of cargo tanks.

6.2.3 Cargo pumps drive *(1/6/2021)*

a) Prime movers of cargo pumps are not to be located in the cargo area, except in the following cases:

- steam driven machine supplied with steam having a temperature not exceeding 220 °C
- hydraulic motors
- electric motors of certified type.

b) Pumps with a submerged electric motor are not permitted in cargo tanks.

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

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

2) the shaft bulkhead or deck penetration is to be fitted with a gas-tight gland of a type approved by the Society. The gland is to be efficiently lubricated from outside the pump room and so designed as to prevent overheating. The seal parts of the gland are to be of material that cannot initiate sparks;

3) temperature sensing devices are to be fitted for bulkhead shaft gland bearings: see [6.2.5].

Note 1: The provisions of this requirement also apply to stripping pumps and ballast pumps.

6.2.4 Design of cargo pumps *(1/6/2021)*

a) Materials of cargo pumps are to be suitable for the products carried.

b) The delivery side of cargo pumps is to be fitted with relief valves discharging back to the suction side of the pumps (bypass) in closed circuit. Such relief valves may be omitted in the case of centrifugal pumps with a maximum delivery pressure not exceeding the design pressure of the piping, with the delivery valve closed.

c) Pump casings are to be fitted with temperature sensing devices: see [6.2.5].

6.2.5 Monitoring of cargo pumps *(1/6/2021)*

Cargo pumps are to be monitored as required in Tab 3.

6.2.6 Control of cargo pumps *(1/6/2021)*

Cargo pumps are to be capable of being stopped from:

- a position outside the pump room, and
- a position next to the pumps.

Table 3 : Monitoring of cargo pumps *(1/6/2021)*

Equipment, parameter	Alarm **(1)**	Indication **(2)**	Comments
pump, discharge pressure		L	• on the pump **(3)**, or • next to the unloading control station
pump casing, temperature	H		visual and audible, in cargo control room or pump control station
bulkhead shaft gland bearing, temperature	H		visual and audible, in cargo control room or pump control station

(1) H = high
(2) L = low
(3) and next to the driving machine if located in a separate compartment

6.3 Cargo transfer

6.3.1 Piping scantlings *(1/6/2021)*

a) Pipe wall thickness calculation

1) Piping subjected to green seas

IBC CODE REFERENCE : Ch 5, 5.1.1

For piping subjected to green seas, the design pressure P, in bar, in the formula in paragraph 5.1.1 of the IBC Code is to be replaced by an equivalent pressure P' given by the following formula:

$$P' = \frac{1}{2}\left(P + \sqrt{P^2 + 0{,}006R'K\frac{D_C}{D}}\right)$$

where:

D_C : External diameter of the pipe taking into account the insulation (in mm), whose thickness is to be taken at least equal to:

40 mm if $D \leq 50$ mm

80 mm if $D \geq 150$ mm

Intermediate values are to be determined by interpolation.

R' : Drag corresponding to the effect of green seas, in da N/m², such as given in Tab 4 as a function of the location of the pipes and of their height H (in m) above the deepest loadline; intermediate values are to be determined by interpolation.

K : permissible stress, in N/mm²

b) Corrosion allowance

IBC CODE REFERENCE : Ch 5, 5.1.1

The coefficient c (added corrosion thickness) for the formula in paragraph 5.1.1 of the IBC Code is normally to be equal to at least 3 mm. The Society may accept a lesser value for pipes made of austenitic or austenitic-ferritic stainless steel, pipes with internal lining or, if applicable, pipes with acceptable external protective lining or painting.

6.3.2 Piping fabrication and joining details *(1/6/2021)*

a) Pipes not required to be joined by welding

1)

IBC CODE REFERENCE : Ch 5, 5.2.2

Cargo piping is to be welded except for necessary flanged connections to valves, expansion joints (as permitted in paragraph 5.2.2.1 of the IBC Code), spool pieces and similar fittings or where required for coating, lining, fabrication, inspection or maintenance.

2) Flanged connections

IBC CODE REFERENCE: Ch 5, 5.3.1

Flange types A and B in Pt C, Ch 1, Sec 10, Fig 1 are acceptable in piping systems with design pressure p > 1,6 MPa.

Flange types A, B, C1, C2 and C3 are acceptable in piping systems with design pressure p ≤ 1,6 MPa.

The type of flanges on open-ended cargo piping or cargo piping placed inside cargo tanks may be considered by the Society on a case-by-case basis.

b) Expansion joints

IBC CODE REFERENCE : Ch 5, 5.2.4

The use of bellows is not permitted for corrosive and polymerising products, except if provision is made to prevent stagnation of liquids.

c) Non-destructive testing of welding

1) IBC CODE REFERENCE : Ch 5, 5.2.5

- Butt welded pipes and accessories are to be radiographic at random and entirely checked by means of a dye-penetrant test or an equivalent method.
- radiographic examinations are to cover at least 10% of the connections and may be extended, at the request of the Surveyor depending on the results of the inspection.
- Relaxation of the above requirements may be considered by the Society on a case-by-case basis for pipes welded at workshops. However, this only applies to ships exclusively intended to carry cargoes with minor fire risk.

d) Certification, inspection and testing of piping system

Pipes, valves, fittings and other components are to be tested according to Tab 5.

Table 4 *(1/6/2021)*

External diameter of pipe **(1)**	Aft of the quarter of the ship's length			Forward of the quarter of the ship's length		
	H≤8	H=13	H≥18	H≤8	H=13	H≥18
≤25	1500	250	150	2200	350	150
50	1400	250	150	2000	350	150
75	1100	250	150	1600	350	150
100	700	250	150	700	350	150
≥150	500	250	150	700	350	150

(1) D_C if the pipe is insulated, D otherwise.

Table 5 *(1/6/2021)*

No.	Item	Tests for materials **(1)**		Inspections and tests for the products **(1)**		
		Tests required	Type of material certificate **(2) (3)**	During manufacturing (NDT)	After completion	Type of product certificate **(2)**
1	pipes, flanges and fittings	X	C **(4)**		X	C
2	valves	X	C **(4)**	X **(5)**	X	C

(1) X = test required.
(2) C = class certificate, W = works' certificate.
(3) W is requested for pipes of open-ended piping and piping within cargo tanks.
(4) W is accepted for d < 100 mm
(5) if of welded construction

No.	Item	Tests for materials **(1)**		Inspections and tests for the products **(1)**		
		Tests required	Type of material certificate **(2) (3)**	During manu-facturing (NDT)	After comple-tion	Type of product certificate **(2)**
3	pumps	X	W		X	C
4	cargo tank P/V and high velocity valves	X	C	X	X	C

(1) X = test required.
(2) C = class certificate, W = works' certificate.
(3) W is requested for pipes of open-ended piping and piping within cargo tanks.
(4) W is accepted for d < 100 mm
(5) if of welded construction

6.3.3 Materials *(1/6/2021)*

a) Cargo piping is, in general, to be made of steel or cast iron.

b) Valves, couplings and other end fittings of cargo pipe lines for connection to hoses are to be of steel or other suitable ductile material.

c) Spheroidal graphite cast iron may be used for cargo oil piping.

d) Grey cast iron may be accepted for cargo oil lines:

- within cargo tanks, and
- on the weather deck for pressure up to 1,6 Mpa.

It is not to be used for manifolds and their valves of fittings connected to cargo handling hoses.

e) Plastic pipes may be used in the conditions specified in Pt C, Ch 1, App 3. Arrangements are to be made to avoid the generation of static electricity.

6.3.4 Piping arrangements *(1/6/2021)*

a) Arrangement of cargo piping

1) Arrangement of cargo piping under deck

IBC CODE REFERENCE : Ch 5, 5.5.2

The intent of the provisions in paragraph 5.5.2 of the IBC Code is to preclude the hazard of cargo leaking past a shut-off valve gland into the space where the valve is located.

2) Arrangement of cargo piping on deck

IBC CODE REFERENCE : Ch 5, 5.5.2

Cargo piping on cargo tanks is to be extended down to the bottom of each tank.

3) Aluminised pipes

IBC CODE REFERENCE : Ch 5, 5.5

Aluminised pipes may be permitted in ballast tanks, in inerted cargo tanks and, provided the pipes are protected from accidental impact, in hazardous areas on open deck.

4) Cargo pipes passing through tanks or compartments

- Cargo piping and similar piping to cargo tanks is not to pass through ballast tanks except in the case of short lengths of piping complying with [5.1.3], item b).
- Cargo piping may pass through vertical fuel oil tanks adjacent to cargo tanks on condition that the provisions of [5.1.3], item b) are complied with.

5) Cargo piping passing through bulkheads

Cargo piping passing through bulkheads is to be so arranged as to preclude excessive stresses at the bulkhead.Bolted flanges are not to be used in the bulkhead.

6) Valves

- Stop valves are to be provided to isolate each tank.
- A stop valve is to be fitted at each end of the cargo manifold.
- When a cargo pump in the cargo pump room serves more than one cargo tank, a stop valve is to be fitted in the cargo pump room on the line leading to each tank.
- Main cargo valves located in the cargo pump room below the floor gratings are to be remote controlled from a position above the floor.

b) Removable piping systems

IBC CODE REFERENCE : Ch 5, 5.5

Pumps, piping and associated fittings are to constitute a permanently fitted system; in general, removable parts are not allowed, except for specific cases for which it can be proved, to the satisfaction of the Society, that no effective alternative solutions are available. In such circumstances, the safety measures deemed necessary will be considered by the Society on a case-by-case basis.

6.3.5 Cargo transfer control systems *(1/6/2021)*

a) General

IBC CODE REFERENCE : Ch 5, 5.6.1

- One blank flange is to be provided in addition to the stop valve required in paragraph 5.6.1.2 of the IBC Code at each cargo hose connection.
- The requirements of paragraph 5.6.1 of the IBC Code are not intended to be additional to those for piping below deck in 5.5.2 and 5.5.3 of the IBC Code.

b) Control, monitoring and alarm devices and cargo control room

IBC CODE REFERENCE : Ch 5, 5.6

a) The cargo pump control is to be fitted in a position which is readily accessible, even in the event that

the cargo piping or hoses break. This position is to be clearly indicated.

b) Where a cargo control room is fitted, the following controls, monitoring and alarms are to be connected to this room:

- cargo pump control
- control of loading/unloading valves
- level gauges
- temperature indicators
- high level alarms
- very high level alarms
- high/low temperature alarms
- high/low pressure alarms
- fixed gas detecting system alarms.

c) In general, high/low temperature alarms are also to be transduced to the navigating bridge.

d) The cargo control room is to be located above the weather deck and may be considered as a dangerous space or a safe space, depending on its location and on the possible presence of a product or of its vapours. If it is considered a dangerous space, it is to be provided with a ventilation system capable of supplying at least 20 air changes per hour, it is not to be located in the accommodation area and only safe type electrical equipment is allowed.

e) A cargo control room without cargo pump and valve control is defined as a "cargo control station".

6.3.6 Ship's cargo hoses *(1/6/2021)*

a) Compatibility

1) Cargo hoses are to be of a type approved by the Society for the intended conditions of use.

2) Hoses subject to tank pressure or pump discharge pressure are to be designed for a bursting pressure not less than 4 times the maximum pressure under cargo transfer conditions.

3) The ohmic electrical resistance of cargo hoses is not to exceed $10^6\ \Omega$.

IBC CODE REFERENCE : Ch 5, 5.7.1

The requirement of paragraph 5.7.1 of the IBC Code applies to cargo hoses carried on board the vessel and "compatibility with the cargo" means that:

a) the cargo hose does not lose its mechanical strength or deteriorate unduly when in contact with the cargo, and

b) the cargo hose material does not affect the cargo in a hazardous way.

Consideration is to be given to internal and external surfaces with respect to the above where hoses may be used as an integral part of, or connected to, emergency cargo pumps and submerged in the cargo tank.

6.3.7 Bonding *(1/6/2021)*

a) Static electricity

1) Acceptable resistance

IBC CODE REFERENCE : Ch 10, 10.3

To avoid the hazard of an incentive discharge due to the build-up of static electricity resulting from the flow of the liquid/gases/vapours, the resistance between any point on the surface of the cargo and slop tanks, piping systems and equipment, and the hull of the ship is not to be greater than $10^6\ \Omega$.

2) Bonding straps

IBC CODE REFERENCE : Ch 10, 10.3

Bonding straps are required for cargo and slop tanks, piping systems and equipment which are not permanently connected to the hull of the ship, for example:

a) independent cargo tanks

b) cargo tank piping systems which are electrically separated from the hull of the ship

c) pipe connections arranged for the removal of the spool pieces.

d) wafer-style valves with non-conductive (e.g. PTFE) gaskets or seals.

Where bonding straps are required, they are to be:

- clearly visible so that any shortcoming can be clearly detected
- designed and sited so that they are protected against mechanical damage and are not affected by high resistivity contamination, e.g. corrosive products or paint
- easy to install and replace.

6.3.8 Discharge of contaminated water *(1/6/2021)*

a) Location of discharge outlet

- For discharge of cargo contaminated water, an outlet located below the waterline in vicinity of the turn of the bilge, shall be arranged within the cargo area.
- The outlet(s) shall be located such that the cargo contaminated discharges will not enter the ship's seawater intakes.

b) Sizing of the discharge outlet

The internal diameter of the outlet shall not be less than:

$D = QD / 5L$

where: QD = discharge rate [m^3/h]

L = distance of outlet from forward perpendicular [m].

In the case of angled outlets, only the velocity component of the discharge perpendicular to the ship's shell plating shall be considered when determining QD.

The discharge rate assumed as the basis for outlet(s) sizing shall not be less than the aggregate throughput of the washing machines in anyone tank.

7 Cargo tanks and fittings

7.1 Application

7.1.1 *(1/6/2021)*

The provisions of this paragraph apply to cargo tanks and slop tanks.

7.2 Cargo tank venting

7.2.1 Large amounts of drainage *(1/6/2021)*

IBC CODE REFERENCE: Ch 8, 8.2.2

When large amounts of drainage from vent lines of the cargo tanks are envisaged, a hose connection to the drain line of the slop tank is to be provided.

7.2.2 Position of vent outlets from tanks intended for flammable and toxic products *(1/6/2021)*

IBC CODE REFERENCE: Ch 8, 8.3.3

Vent outlets of cargo tanks intended for the carriage of flammable or toxic products are to be arranged at a distance of not less than 3 m from exhaust ducts and as far as possible from inlet ducts to pump rooms and cargo pump rooms.

7.3 Cargo tank gas freeing

7.3.1 Fans *(1/6/2021)*

IBC CODE REFERENCE : Ch 8, 8.5

a) The impellers and housing of either fixed or portable fans fitted in dangerous spaces are to be of non-sparking materials according to paragraph 12.1.8 of the IBC Code.

b) In the case of fans installed in safe spaces, two non-return devices are to be fitted to avoid return of flammable and/or toxic cargo vapours to safe spaces when the ventilation system is shut down. These non-return devices are to operate in all normal conditions of ship trim and list.

7.4 Environmental control

7.4.1 Control by inerting or padding *(1/6/2021)*

IBC CODE REFERENCE : Ch 9, 9.1.3

The padding medium is to be compatible from the point of view of safety with the products to be carried, it is not to react with them and with air and it is to have chemical and physical properties deemed suitable by the Society. The system is to comply with the requirements for inert gas systems, as applicable.

7.4.2 Control by drying *(1/6/2021)*

IBC CODE REFERENCE : Ch 9, 9.1.4

In the case of simultaneous carriage of mutually incompatible products, dry gas supply piping systems to each cargo space are to be separate from each other.

7.4.3 Special requirements for inert gas systems on barge-chemical *(1/6/2021)*

a) Applicability

IBC CODE REFERENCE : Ch 9, 9.1

Pt C, Ch 4, Sec 1, [8.2] applies.

b) Simultaneous carriage of incompatible products

IBC CODE REFERENCE : Ch 9, 9.1

The inert gas system is to comply with the requirements of paragraph 9.1.5.1 of the IBC Code, adapted, to the satisfaction of the Society, to the individual characteristics of the products to be carried. In the case of simultaneous carriage of mutually incompatible products, inert gas supply piping systems to each cargo space are to be separate from each other.

c) Ships with no fixed inert gas system

IBC CODE REFERENCE : Ch 9, 9.1

Where no fixed installation for inert gas and/or dry gas production is provided for on board, the minimum quantity to be kept on board is established by the Master, based on the duration of the voyage, the anticipated daily temperature variations, gas leakage through cargo tank seals and experience of previous similar cases.

d) Additional requirements

IBC CODE REFERENCE : Ch 9, 9.1

1) These requirements apply where an inert gas system based on oil fired inert gas generators is fitted on board chemical tankers. Any proposal to use other sources of inert gas will be specially considered.

2) In addition to the provisions in paragraph 9.1.5.1 of the IBC Code, the inert gas system is to comply with the requirements of IMO Resolution A.567(14). Any use of the word "Administration" in the Resolution is to be considered as meaning the Society.

3) As an alternative to the water seal in the inert gas line on deck, an arrangement consisting of two shut-off valves in series with a venting valve in between may be accepted. The following conditions apply:

- The operation of the valve is to be automatically executed. Signals for opening/closing are to be taken from the process directly, e.g. inert gas flow or differential pressure.
- An alarm for faulty operation of the valves is to be provided, e.g. the operation status of "blower stop" and "supply valve(s) open" is an alarm condition.

4) In addition to the requirements detailed in Resolution A.567(14), the followings are to be complied with:

- Plans in diagrammatic form are to be submitted for appraisal and are to include the following:
  - details and arrangement of inert gas generating plant including all control monitoring devices
  - arrangement of piping system for distribution of the inert gas.
- In all cases, automatic combustion control, capable of producing suitable inert gas under all service conditions, is to be fitted.
- When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two and in no case is one blower to have a capacity less than 1/3 of the total required.
- Materials used in inert gas systems are to be suitable for their intended purpose in accordance with the Rules. In particular those parts of scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subjected to corrosive action of the gases and/or liquids are to be either constructed of corrosion-

resistant material or lined with rubber, glass fibre, epoxy resin or other equivalent coating material.

- A compartment in which any oil fired inert gas generator is situated is to be treated as a machinery space of category A in respect of fire protection.
- All of the equipment is to be installed on board and tried under working conditions to the satisfaction of the Surveyor.

7.4.4 Ventilation *(1/6/2021)*

IBC CODE REFERENCE : Ch 9, 9.1

When a cargo space ventilation system other than the venting system mentioned under paragraph 8.2 of the IBC Code is required by these provisions, such system is to comply with the requirements established by the Society in each case.

7.4.5 Mechanical ventilation in the cargo *(1/6/2021)*

a) Spaces normally entered during cargo handling operations

1) Miscellaneous requirements

- Ventilation system stopping

  IBC CODE REFERENCE : Ch 12, 12.1

  All required ventilation systems are to be capable of being stopped from a position located outside the served spaces and above the weather deck.
- Warning notices

  IBC CODE REFERENCE : Ch 12, 12.1

  In the proximity of entrances to all spaces served by the required mechanical ventilation systems, a clearly visible warning is to be posted requiring such spaces to be adequately ventilated prior to entering and relevant ventilation systems to be kept in operation all the time persons are present in the spaces themselves.
- Prevention of dangerous operation of electric Motors

  IBC CODE REFERENCE : Ch 12, 12.1

  A suitable automatic device is to be fitted to prevent operation of electric motors driving cargo pumps and operation of other electrical equipment not of a certified safe type prior to ventilating the spaces where such motors or equipment are located, in order to render them gas-safe (to this end it is pointed out that IEC provisions require at least 10 changes of air based on the volume of the served space).
- Prevention of dangerous operation of cargo pumps

  IBC CODE REFERENCE : Ch 12, 12.1

  An automatic device is to be fitted capable of stopping motors driving cargo pumps and de-energising any other electrical equipment not of a certified safe type in the case of stoppage of ventilation in spaces where such motors and equipment are fitted. This provisions does not apply to motors and other electrical equipment fitted in the engine room.
- Alternative to extraction type ventilation systems

  IBC CODE REFERENCE : Ch 12, 12.1

  As an alternative to ventilation systems of the extraction type, required in a)1) bullet 4), a ventilation system of the positive pressure type may be accepted:

  - in the case of cargo pump rooms adjacent to cargo tanks or to other gas-dangerous spaces, or
  - where, in adjacent gas-safe spaces, inclusive of spaces containing motors of cargo pumps, an adequate over-pressure is kept in relation to the cargo pump rooms themselves.
- Location of upper end of inlet ducts

  IBC CODE REFERENCE : Ch 12, 12.1

  With reference to the requirements of a)1) bullet 5), the upper ends of inlet ducts are generally to be located at a distance not less than 3 m from ventilation ducts and air intakes serving the safe spaces mentioned therein.
- Minimum distance between inlet and extraction ducts

  IBC CODE REFERENCE : Ch 12, 12.1

  With reference to 12.1.6 of IBC Code, the upper ends of (inlet and extraction) ventilation ducts serving the same space are to be located at a distance from each other, measured horizontally, of not less than 3 m and, in general, at an adequate height above the weather deck, but in any case not less than 2,4 m. Greater heights are required in paragraph 15.17 of the IBC Code.
- Upper ends of ventilation ducts in ships carrying materials producing flammable

  IBC CODE REFERENCE : Ch 12, 12.1

  For flammable products, or for products which may react with the ship's materials producing flammable vapours (such as strong acids), the upper ends of ventilation ducts are to be located at a distance of not less than 3 m from any source of ignition, as per the provisions of Ch 8, Sec 8, [2.1].
- Dampers

  IBC CODE REFERENCE : Ch 12, 12.1

  Ventilation ducts are to be provided with metallic dampers, fitted with the indication "open" and "closed". The dampers are to be located above the weather deck, in a readily accessible position.
- Location of electric motors of fans

  IBC CODE REFERENCE : Ch 12,12.1

  Electric motors driving fans are to be placed outside the served spaces and outside the ventilation ducts, in a suitable position with respect to the presence of flammable vapours.
- Penetration of motor shafts through bulkheads

IBC CODE REFERENCE : Ch 12, 12.1

Runs of shafts of electric motors driving fans through bulkheads or decks of gas-dangerous spaces or through ventilation ducts are to be provided with gas-tight seals, with oil glands or equivalent means, deemed suitable by the Society.

2) Additional requirements for non-sparking fans

- Non-sparking fans

  IBC CODE REFERENCE : Ch 12, 12.1

  - A fan is considered as non-sparking if in both normal and abnormal conditions it is unlikely to produce sparks.
  - The air gap between the impeller and the casing is to be not less than 0.1 of the shaft diameter in way of the impeller bearing and not less than 2 mm. It need not be more than 13 mm.

- Materials for non-sparking fans

  IBC CODE REFERENCE : Ch 12, 12.1

  - The impeller and the housing in way of the impeller are to be made of alloys which are recognised as being spark proof by appropriate tests.
  - Electrostatic charges in both the rotating body and the casing are to be prevented by the use of antistatic materials. Furthermore, the installation on board of the ventilation units is to be such as to ensure their safe bonding to the hull.
  - Tests may not be required for fans having the following combinations:
    - impellers and/or housings of non-metallic material, due regard being paid to the elimination of static electricity
    - impellers and housings of non-ferrous materials
    - impellers of aluminium alloys or magnesium alloys and a ferrous (including austenitic stainless steel) housing on which a ring of suitable thickness of non-ferrous materials is fitted in way of the impeller
    - any combination of ferrous (including austenitic stainless steel) impellers and housings with not less than 13 mm design tip clearance.
  - The following impellers and housings are considered as sparking and are not permitted:
    - impellers of an aluminium alloy or magnesium alloy and a ferrous housing, regardless of tip clearance
    - housing made of an aluminium alloy or a magnesium alloy and a ferrous impeller, regardless of tip clearance
    - any combination of ferrous impeller and housing with less than 13 mm design tip clearance.
  - Type test for non-sparking fans

    IBC CODE REFERENCE : Ch 12, 12.1

    Type tests on the finished product are to be carried out in accordance with the requirements of the Society or an equivalent national or international standard.

b) Pump rooms and other enclosed spaces normally entered

1) Clarification of general requirement

IBC CODE REFERENCE : Ch 12, 12.2

- The arrangements for the ventilation system of spaces to which paragraph 12.2 of the IBC Code applies are to comply, in general, with the provisions set out in the previous item a), as applicable.
- The provisions of paragraph 12.2 of the IBC Code apply to all pump rooms, whether or not the control for pumps and valves which are installed in such rooms is fitted externally.
- The distance of the upper ends of extraction and inlet ducts from air intakes and other openings of spaces mentioned in paragraph 12.1.5 of the IBC Code is not to be less than 3 m measured horizontally. These systems are to be capable of being controlled from outside the spaces they serve and, in the proximity of the entrances to such spaces, the warning notice mentioned in a)1)bullet 2) is to be posted.

c) Spaces not normally entered

1) Portable fans

IBC CODE REFERENCE : Ch 12, 12.3

- The type of portable fans and their connections to spaces to be ventilated are to be deemed suitable by the Society. Portable fans driven by electric or internal combustion motors are not acceptable.
- The arrangements for the ventilation of these spaces are to comply, in general, with the provisions set out in the previous item a), as applicable.

7.5 Instrumentation

7.5.1 Gauging *(1/6/2021)*

a) Types of gauging devices

1) Arrangement

IBC CODE REFERENCE : Ch 13, 13.1.1

- In almost all cases a cargo code which requires a high level alarm and overflow control also requires a closed gauging device. A cargo tank containing such a product therefore requires three sensors:

  I) one level gauging

II) one high level alarm

III) one overflow control

- The sensing elements for I), II) and III) are to be separated, although sensors for II) and III) (reed switches, float chambers, electronic devices, etc.) may be contained in the same tube.
- Electronic, pneumatic and hydraulic circuits required for sensors I), II) and III) are to be independent of each other such that a fault on any one will not render either of the others inoperative.
- Where processing units are used to give digital or visual indication, such as in a bridge space, the independence ofcircuitry is to be maintained at least beyond this point.
- The power is to be supplied from distribution boards.
- Where a control room or a bridge space containing a modular unit is envisaged, separate level indication and visual alarms are to be provided for each of the functions I), II) and III). An audible alarm is also to be provided but since this is not directional it need not be separate.
- An audible alarm is also to be arranged in the cargo area
- Where there is no control room, an audible and visual alarm is to be arranged at the cargo control station.
- Testing of sensors is to be arranged from outside the tanks, although entry into product clean tanks is not precluded.
- Simulation testing of electronic circuits or circuits which are self-monitored is acceptable.

2) Example of restricted gauging device

IBC CODE REFERENCE : Ch 13, 13.1.1

A restricted gauging device may consist of a sounding pipe with an inside diameter not greater than 200 mm, fitted with a gas-tight plug. The pipe is to have holes in order to make its internal pressure equal to that of the tank. There-fore the holes are to be located inside the cargo tank in the proximity of the top.

7.5.2 Vapour detection *(1/6/2021)*

a) Vapour detection instruments

1) Spaces to be monitored

IBC CODE REFERENCE : Ch 13, 13.2.1

Vapour detection instruments, either fixed or portable, are to be of a type recognised suitable by the Society for the products to be carried. The spaces to be monitored are:

- cargo pump rooms
- spaces containing motors driving cargo pumps, except for the machinery space
- enclosed spaces containing cargo piping, equipment connected with cargo handling, cofferdams, enclosed spaces and double bottoms adjacent to cargo tanks
- pipe tunnels
- other spaces, in the opinion of the Society, depending
- on the ship type.

Where a fixed system is installed, it is to serve the spaces among those listed above which are normally entered by the crew.

b) Gas Measurements

The fitting of gas measuring equipment is subject to the pro visions of Pt C, Ch 4, Sec 1, [5.2.4] b)1).

7.6 Tank washing systems

7.6.1 General *(1/6/2021)*

Adequate means are to be provided for cleaning the cargo tanks.

7.6.2 Washing machines *(1/6/2021)*

a) Tank washing machines are to be of a type approved by the Society.

b) Washing machines are to be made of steel or other electricity conducting materials with a limited propensity to produce sparks on contact.

7.6.3 Washing pipes *(1/6/2021)*

Washing pipes are to be built, fitted, inspected and tested in accordance with the applicable requirements of Pt C, Ch 1, Sec 10, depending on the kind of washing fluid.

7.6.4 Installation of washing systems *(1/6/2021)*

a) Tank cleaning openings are not to be arranged in enclosed spaces.

b) The complete installation is to be permanently earthed to the hull.

8 Certification, inspection and testing of piping systems

8.1 Application

8.1.1 *(1/6/2021)*

The provisions of this Article are related to cargo piping and other equipment fitted in the cargo area. They supplement those given in Pt C, Ch 1, Sec 10, [21] for piping systems other than cargo piping and [6.3.2] d) for cargo piping.

8.2 Workshop tests

8.2.1 Tests for materials *(1/6/2021)*

Where required in Tab 5, materials used for pipes, valves and fittings are to be subjected to the tests specified in Pt C, Ch 1, Sec 10, [21.3.2].

8.2.2 Hydrostatic testing *(1/6/2021)*

a) Where required in Tab 5, cargo pipes, valves, fittings and pump casings are to be submitted to hydrostatic

tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

b) Expansion joints and cargo hoses are to be submitted to hydrostatic tests in accordance with the relevant provisions of Pt C, Ch 1, Sec 10, [21.4].

c) Where fitted, bellow pieces of gas-tight penetration glands are to be pressure tested.

8.2.3 Tightness tests *(1/6/2021)*

Tightness of the following devices is to be checked:

- gas-tight penetration glands
- cargo tank P/V and high velocity valves.

Note 1: These tests may be carried out in the workshops or on board.

8.2.4 Check of the safety valves setting *(1/6/2021)*

The setting pressure of the pressure/vacuum valves is to be checked in particular with regard to Sec 4, [2.3.7].

8.3 Shipboard tests

8.3.1 Pressure test *(1/6/2021)*

After installation on board, the cargo piping system is to be checked for leakage under operational conditions.

9 Special Requirements

9.1 Ammonium nitrate solution (93%or less)

9.1.1 Ammonia injection procedure *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.2.6

Gaseous ammonia may be injected into the cargo while the latter is circulated by the cargo pump.

9.1.2 Cargo pumps seal *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.2.7

The seal for the centrifugal pump is to be a stuffing box provided with a lantern ring. Fresh water under pressure is to be injected into the stuffing box at the location of the lantern ring (see Fig 3).

9.2 Hydrogen peroxide solutions

9.2.1 Hydrogen peroxide solutions over 60% but not over 70% - Water spray system *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.5.10

It is specified that, for the purpose of evaluating the estimated size of the cargo spill in the case of failure, cargo piping/hose failure is to be assumed to be total.

9.3 Propylene oxide and mixtures of ethylene oxide/propylene oxide with an ethylene oxide content of not more than 30% by mass

9.3.1 Tank cleaning *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.8.3

Until an amendment in this respect is prepared at IMO, it is specified that the initial wording of the text of paragraph 15.8.3 of the IBC Code "Before loading, ..." is to be intended as follows: "Before initial loading of these products and before each loading of these products subsequent to loading of other products....."

9.3.2 Joints in cargo lines *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.8.12

Screwed connections are only allowed for accessory and instrumental lines with an external diameter of 25 mm or less.

9.3.3 Oxygen content in tank vapour spaces *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.8.28

Analysing equipment to determine oxygen and propylene oxide contents is to be of a type recognised as suitable by the Society. When portable analysers are used, there are to be at least two. When a fixed system is installed, a portable analyser is also to be provided.

9.3.4 Valves at cargo hose connections *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.8.30

The closing time of shut-off valves provided at each cargo hose connection is to take account of the loading/unloading rate and is to be such as to avoid dangerous overpressure in cargo piping and hoses.

9.4 Sulphur (molten)

9.4.1 Fire-fighting system *(1/6/2021)*

a) Cargo tank protection

IBC CODE REFERENCE: Ch 15, 15.10

Cargo tanks are to be protected by a fixed CO_2 extinguishing system in accordance with Part C, Chapter 4, or a steam extinguishing system. In the latter case, tank drying arrangements are to be provided to prevent corrosion after use of steam.

b) CO_2 nozzles

IBC CODE REFERENCE: Ch 15, 15.10

Under normal service conditions, CO_2 tank feed nozzles are to be blanked off by means of a breaking disk to prevent pipes from being chocked by sulphur. Nozzles are to be located at the upper part of the tank, above liquid level.

9.5 Acids

9.5.1 Lining *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.11.2

"Lining" is an acid-resistant material that is applied to the tank or piping system in a solid state with a defined elasticity property.

9.5.2 Electrical arrangements *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.11.15

In enclosed spaces adjacent to cargo tanks, electrical materials and equipment complying with the provisions of paragraph 10.1.2 of the IBC Code are allowed.

9.5.3 Leak detection system *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.11.7

There are to be at least two leak detection apparatuses designed and calibrated to detect leakage of cargo into spaces adjacent to cargo tanks. The apparatuses may consist of a pH-meter, a gas detector suitable for the detection of hydrogen/air mixtures, of a type deemed suitable by the Society, or of other suitable systems. These apparatuses may be fixed or portable; if a fixed system is installed, a portable apparatus is also to be provided.

9.6 Toxic products

9.6.1 Vapour return line to shore installation *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.12.2

The tank venting systems are to be fitted with a shut-off valve and a blank flange in way of the vapour return line to the shore installation.

9.7 Cargoes protected by additives

9.7.1 Prevention of blockage by polymerisation *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.13.6

In addition to being designed so as to avoid internal obstructions due to polymer formation, the venting systems are to be fitted with pressure/vacuum valves and devices to prevent the passage of flame which are accessible for inspection and maintenance.

9.8 Cargoes with a vapour pressure greater than 0,1013 MPa (1,013 bar) absolute at 37,8°C

9.8.1 System for maintaining cargo temperature below boiling point *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.14.1

Any system installed for the purpose of keeping the cargo temperature below its boiling point is to be constructed to the satisfaction of the Society.

9.8.2 Return of expelled gases *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.14.4

The tank venting systems are to be fitted with a shut-off valve and a blank flange in way of the vapour return line to the shore installation.

9.9 Special cargo pump room requirements

9.9.1 Clarification *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.18

As far as concerns the possibility of allowing the arrangement of cargo pump rooms below deck in specific cases, it is specified that, in practice, no circumstance can be foreseen where such an arrangement may be permitted.

9.10 Overflow control - Independence of systems

9.10.1 Gauging devices *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

In almost all cases where, for the carriage of a product, a cargo high level alarm or cargo overflow control is required, a closed gauging device is also required.

9.10.2 Separation of device sensing elements *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

A cargo tank intended to carry such a product therefore requires:

a) level gauging

b) high level alarm

c) overflow control.

The sensing elements for the devices under a), b) and c) are to be separated, although sensors for b) and c) (micro-switches, float chambers, electronic devices, etc.) may be contained in the same metal tube sections.

9.10.3 Electronic and hydraulic circuits for sensors *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

Electronic, pneumatic and hydraulic circuits required for sensors for a), b) and c) are to be independent of each other such that a fault on any one of them will not render either of the others inoperative. Where processing units are used to give digital or visual indication such as in a bridge space, the independence of circuitry is to be maintained at least up to such units. The power is to be supplied from distribution boards.

9.10.4 Alarms in cargo control room *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

Where a cargo control room or a bridge space containing a modular unit is envisaged, separate level indications and visual alarms are to be provided for each of the functions a), b) and c). An audible alarm is also to be provided; there need not be a separate alarm for each function since separate alarms could not be distinguished. An audible alarm is also to be arranged in the cargo area.

9.10.5 Alarms where cargo control room is not provided *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

a) Where no cargo control room is provided, an audible and visual alarm is to be arranged at the cargo control station, which generally coincides with the navigating bridge.

b) The audible and visual high level and cargo overflow alarms are to be located so as to be easily heard and noticed by the personnel in charge of loading/unloading operations. Attention is drawn to the fact that such alarms are generally grouped together into two independent signals; therefore it is not possible to single out directly the cargo tank from which the alarm signal is coming. In such cases, the Master is to arrange for a person to be present at the cargo control station, in order to

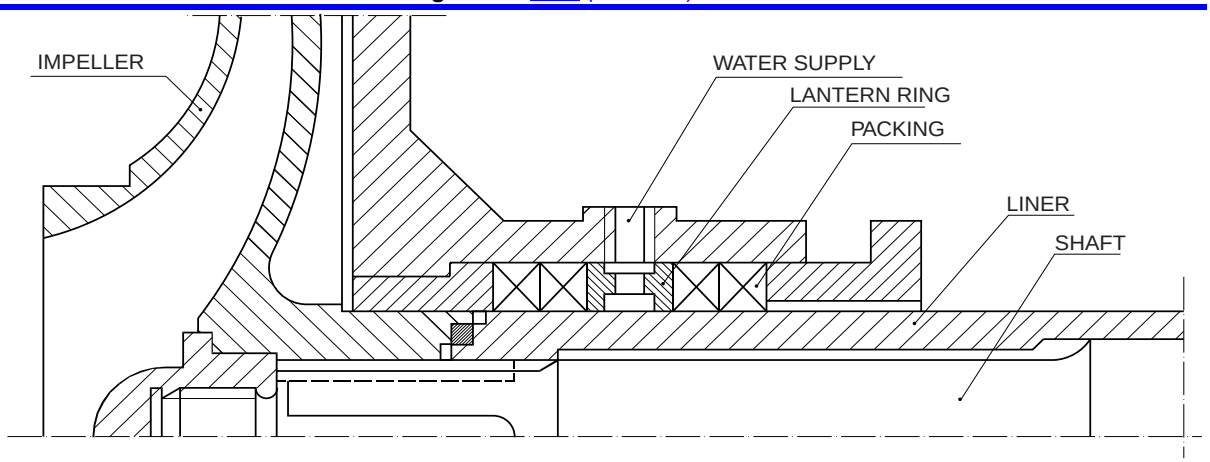
be able to warn the personnel in charge of loading operations on deck.

9.10.6 Testing of sensors *(1/6/2021)*

IBC CODE REFERENCE: Ch 15, 15.19

Testing of sensors is to be arranged from outside the tanks, although entry into product clean tanks is not prohibited. Simulation testing of electronic circuits or circuits which are self-monitoring is acceptable.

Figure 3 : Seal *(1/6/2021)*



SECTION 8 ELECTRICAL INSTALLATIONS

1 ~~General~~Electrical installations for units with service notation "barge-oil"

1.1 Application

1.1.1 *(1/6/2021)*

The requirements in this ~~Section~~ item [1] apply, in addition to those contained in Part C, Chapter 2, to ships with the service notation **barge-oil**.

1.2 Exemptions

1.2.1

The requirements in Pt C, Ch 2, Sec 3, [2.2.1] and [2.3.1] are not applicable in the case of vessels without persons on board.

1.3 Documentation to be submitted

1.3.1

In addition to the documentation requested in Pt C, Ch 2, Sec 1, Tab 1, the following are to be submitted for approval:

a) plan of hazardous areas

b) document giving details of types of cables and safety characteristics of the equipment installed in hazardous areas

c) diagrams of tank level indicator systems, high level alarm systems and overflow control systems where requested.

1.4 System of supply

1.4.1

Earthed systems with hull return are not permitted, with the following exceptions to the satisfaction of the Society:

a) impressed current cathodic protective systems

b) limited and locally earthed systems, such as starting and ignition systems of internal combustion engines, provided that any possible resulting current does not flow directly through any hazardous area

c) insulation level monitoring devices, provided that the circulation current of the device does not exceed 30 mA under the most unfavourable conditions

d) intrinsically safe systems.

1.4.2

In insulated distribution systems, no current carrying part is to be earthed, other than:

a) through an insulation level monitoring device

b) through components used for the suppression of interference in radio circuits.

1.4.3

The additional limitations in the choice of the system of supply (type of distribution system) as per SOLAS Ch.II-1 Reg. 45.4.3 apply to ships subject to the SOLAS Convention.

1.5 Electrical equipment

1.5.1

Electrical equipment, cables and wiring are not to be installed in hazardous locations unless they conform with standards not inferior to those given in IEC 60092-502 Standard.

However, for locations not covered by such standards, electrical equipment, cables and wiring which do not conform to the standards may be installed in hazardous locations based on a risk assessment to the satisfaction of the Society, to ensure that an equivalent level of safety is assured.

1.6 Earth detection

1.6.1

For both insulated and earthed distribution systems a device, or devices, are to be installed to continuously monitor the insulation to earth and to give an audible and visual alarm at a manned position in the event of an abnormally low level of insulation resistance and/or high level of leakage current.

The above is not applicable to systems mentioned in [1.3.1].

1.7 Precautions against inlet of gases or vapours

1.7.1

Suitable arrangements are to be provided, to the satisfaction of the Society, so as to prevent the possibility of gases or vapours passing from a gas-dangerous space to another space through runs of cables or their conduits.

1.8 Electrical equipment permitted in hazardous areas

1.8.1

Electrical equipment permitted in hazardous areas is that indicated in Pt C, Ch 2, Sec 3, [10.1.4], Pt C, Ch 2, Sec 3, [10.1.5], and Pt C, Ch 2, Sec 3, [10.1.6].

1.8.2

In addition to the requirements of [1.8.1], in Zone 1 and Zone 2 the installation of the following is permitted:

hull fittings containing the terminals or shell plating penetrations for anodes or electrodes of animpressed current cathodic protection system, or transducers such as those for depth sounding or log systems, provided that such fittings are of gas-tight construction or housed within a gas-tight

enclosure, and are not located adjacent to a cargo tank bulkhead. The design of such fittings or their enclosures and the means by which cables enter, as well as any testing to establish their gas-tightness, are to be to the satisfaction of the Society. The associated cables are to be protected by means of heavy gauge steel pipes with gas-tight joints.

1.8.3

The explosion group and temperature class of electrical equipment of a certified safe type are to be at least IIA and T3 in the case of ships arranged for the carriage of crude oil or other petroleum products.

Other characteristics may be required for dangerous products other than those above.

1.8.4

Enclosed or semi-enclosed spaces (not containing a source of hazard) having a direct opening, including those for ventilation, into any hazardous area, are to be designated as the same hazardous zone as the area in which the opening is located.

Electrical installations are to comply with the requirements for the space or area into which the opening leads.

Note 1: For openings, access and ventilation conditions affecting the extent of hazardous areas, see IEC Standard 60092-502.

1.9 ~~Special requirements for barge-oil carrying flammable liquids having a flash point not exceeding 60°C~~ Hazardous area classification

1.9.1 ~~Hazardous area classification~~ *(1/6/2021)*

~~For hazardous area classification see Tab 1.~~For hazardous area classification see:

a) Tab 1 for barge-oil carrying flammable liquids having:
   - a flash point not exceeding 60°C, or
   - a flash point exceeding 60°C, heated to a temperature above their flash point, or
   - a flash point exceeding 60°C, heated to a temperature within 15°C of their flash point;

b) Tab 2 for barge-oil carrying flammable liquids having a flash point exceeding 60°C, unheated or heated to a temperature below and not within 15°C of their flash point.

1.10 ~~Special requirements for barge-oil carrying flammable liquids having a flash point exceeding 60°C~~

1.10.1 ~~Hazardous area classification~~

~~For hazardous area classification see Tab 2.~~

1.10.2 ~~Cargoes heated to a temperature above their flash point and cargoes heated to a temperature within 15°C of their flash point~~

~~The requirements under [1.9] apply.~~

Table 1 : Classification of hazardous areas for barge-oil carrying flammable liquids having a flash point not exceeding 60°C

Spaces		Hazardous area
N.	Description	
1	Interior of cargo tanks, slop tanks, any pipework of pressure relief or other venting systems for cargo and slop tanks, pipes and equipment containing cargo or developing flammable gases or vapours.	Zone 0
2	Void spaces adjacent to, above or below integral cargo tanks.	Zone 1
3	Hold spaces containing independent cargo tanks.	Zone 1
4	Cofferdams and permanent (for example, segregated) ballast tanks adjacent to cargo tanks.	Zone 1
5	Cargo pump rooms.	Zone 1
6	Enclosed or semi-enclosed spaces immediately above cargo tanks (e.g. 'tweendecks) or having bulkheads above and in line with cargo tank bulkheads, unless protected by a diagonal plate acceptable to the Society.	Zone 1
7	Spaces other than cofferdams, adjacent to and below the top of a cargo tank (e.g. trunks, passageways and holds) as well as double bottoms and pipe tunnels below cargo tanks.	Zone 1
8	Areas on open deck, or semi-enclosed spaces on open deck, within 3 m of any cargo tank outlet, gas or vapour outlet, cargo manifold valve, cargo valve, cargo pipe flange, cargo pump room ventilation outlets and cargo tank openings for pressure release provided to permit the flow of small volumes of gas or vapour mixtures caused by thermal variation.	Zone 1
9	Areas on open deck, or semi-enclosed spaces on open deck above and in the vicinity of any cargo gas outlet intended for the passage of large volumes of gas or vapour mixture during cargo loading and ballasting or during discharging, within a vertical cylinder of unlimited height and 6m radius centred upon the centre of the outlet, and within a hemisphere of 6m radius below the outlet.	Zone 1
10	Areas on open deck, or semi-enclosed spaces on open deck, within 1,5m of cargo pump room entrances, cargo pump room ventilation inlets, openings into cofferdams or other Zone 1 spaces.	Zone 1

Spaces		Hazardous area
N.	Description	
11	Areas on open deck within spillage coamings surrounding cargo manifold valves and 3 m beyond these, up to a height of 2,4 m above the deck.	Zone 1
12	Areas on open deck over all cargo tanks (including all ballast tanks within the cargo tank area) where structures are restricting the natural ventilation and to the full breadth of the ship plus 3m fore and aft of the forward-most and aft-most cargo tank bulkhead, up to a height of 2,4m above the deck.	Zone 1
13	Compartments for cargo hoses.	Zone 1
14	Enclosed or semi-enclosed spaces in which pipes containing cargoes are located.	Zone 1
15	Areas 2m beyond the area defined in item 8.	Zone 2
16	Areas of 1,5 m surrounding open or semi-enclosed spaces of Zone 1.	Zone 2
17	Areas 4m beyond the cylinder and 4m beyond the sphere defined in item 9.	Zone 2
18	Areas on open deck extending to the coamings fitted to keep any spills on deck and away from the accommodation and service areas and 3m beyond these up to a height of 2,4m above the deck.	Zone 2
19	Areas on open deck over all cargo tanks (including all ballast tanks within the cargo tank area) where unrestricted natural ventilation is guaranteed and to the full breadth of the ship plus 3m fore and aft of the forward-most and aft-most cargo tank bulkhead, up to a height of 2,4m above the deck surrounding open or semi-enclosed spaces of Zone 1.	Zone 2
20	Spaces forward of the open deck areas to which reference is made in item 12 and item 18, below the level of the main deck, and having an opening on the main deck or at a level less than 0,5m above the main deck, unless: a) the entrances to such spaces do not face the cargo tank area and, together with all other openings to the spaces, including ventilation system inlets and exhausts, are situated at least 5m from the fore-most cargo tank and at least 10m measured horizontally from any cargo tank outlet or gas or vapour outlet; and b) the spaces are mechanically ventilated.	Zone 2

Table 2 : Hazardous areas classification for barge-oil carrying flammable liquids having a flash point exceeding 60°C unheated or heated to a temperature below and not within 15°C of their flash point

Spaces		Hazardous area
No.	Description	
1	Interior of cargo tanks, slop tanks, any pipework of pressure relief or other venting systems for cargo and slop tanks, pipes and equipment containing cargo.	Zone 2

2 Electrical installations for units with service notation "barge-accommodation"

2.1 Application

2.1.1

The requirements in this item [2] apply, in addition to those contained in Part C, Chapter 2, to ships with the service notation **barge-accommodation**.

2.2 Documentation to be submitted

2.2.1

The documentation dealing with the electrical system for watertight door and fire door systems is to be submitted for approval.

2.3 Electrical distribution and protection

2.3.1

Distribution systems are to be so arranged that a 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.

2.3.2

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 a device is to activate a visual and audible alarm.

2.3.3

Supplementary lighting is to 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, is to automatically illuminate when power to the normal cabin lighting is lost and remain on for a minimum of 30 min.

2.4 Control station

2.4.1

Where the navigation bridge is not provided, all the control, alarm, indication and communication equipment is to be centralized at a central control station which is to be continuously manned by a responsible member of the staff.

2.5 Main source of electrical power

2.5.1

The main source of electrical power is to consist of at least two generating sets.

The capacity of these main sets is to be such that in the event of any one generating set being stopped it will still be possible to supply those services necessary to provide:

a) normal operational conditions and safety;

b) minimum comfortable conditions of habitability.

Minimum comfortable conditions of habitability include at least adequate services for lighting, cooking, heating, domestic refrigeration, mechanical ventilation, sanitary and fresh water; they also include refrigerators for air-conditioning, unless the unit is only operated in cold-temperate and cold areas.

Such capacity is, in addition, to be sufficient to start the largest motor without causing any other motor to stop or having any adverse effect on other equipment in operation.

2.5.2

Pt C, Ch 2, Sec 3, [2.2.5] does not apply.

2.6 Emergency source of electrical power and emergency installations

2.6.1 General

a) 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, is understood to mean conditions such as:

   1) blackout situation
   2) dead ship situation
   3) routine use for testing
   4) short-term parallel operation with the main source of electrical power for the purpose of load transfer.

b) Pt C, Ch 2, Sec 3, [2.3.2] does not apply

c) The emergency source of electrical power is to be capable, having regard to starting currents and the transitory nature of certain loads, of supplying simultaneously at least the services stated in [2.6.2] a) for the period specified, if they depend upon an electrical source for their operation.

d) The transitional source of emergency electrical power, where required, is to be of sufficient capacity to supply at least the services stated in [2.6.2] d) for the periods specified therein, if they depend upon an electrical source for their operation.

e) An indicator is to be mounted in a suitable place on the main switchboard or in the machinery control room to indicate when the batteries constituting either the emergency source of electrical power or the transitional source of emergency electrical power referred to in c) and d) are being discharged.

f) If the services which are to be supplied by the transitional source receive power from an accumulator battery by means of semiconductor converters, means are to be provided for supplying such services also in the event of failure of the converter (e.g. providing a bypass feeder or a duplicate converter).

g) Provision is to be made for the periodical testing of the complete emergency system and is to include the testing of automatic starting arrangements. Testing at regular intervals is to also cover load operation.

h) The emergency source of electrical power may be either a generator or an accumulator battery, which are to comply with the provisions of i) or j), respectively.

i) Where the emergency source of electrical power is a generator, it is to be:

   1) driven by a suitable prime mover with an independent supply of fuel having a flashpoint (closed cup test) of not less than 43°C;
   2) started automatically upon failure of the electrical supply to the emergency switchboard from the main source of electrical power and are to be automatically connected to the emergency switchboard; those services referred to in [2.6.2] a) shall then be transferred automatically to the emergency generating set. The automatic starting system and the characteristics of the prime mover are to be such as to permit the emergency generator to carry its full rated load as quickly as is safe and practicable, subject to a maximum of 45 s; and
   3) provided with a transitional source of emergency electrical power according to k).

j) Where the emergency source of electrical power is an accumulator battery, it is to be capable of:

   1) carrying the emergency electrical load without recharging while maintaining the voltage of the battery throughout the discharge period within 12% above or below its nominal voltage;
   2) automatically connecting to the emergency switchboard in the event of failure of the main source of electrical power; and
   3) immediately supplying at least those services specified in [2.6.2] d).

k) The transitional source of emergency electrical power required by i) (3) is to consist of an accumulator battery which is to operate without recharging while maintain-

ing 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 [2.6.2] d) if they depend upon an electrical source for their operation.

2.6.2 Distribution of electrical power

a) The emergency source of electrical power is to 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:

1) for a period of 36 hours, emergency lighting:

- at every muster and embarkation station and over the sides;
- in alleyways, stairways and exits giving access to the muster and embarkation stations;
- in all service and accommodation alleyways, stairways and exits, personnel lift cars;
- in the machinery spaces and main generating stations including their control positions;
- in all control stations, machinery control rooms, and at each main and emergency switchboard;
- at all stowage positions for firemen's outfits;
- at emergency hospitals, if any;
- 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;
- in all cabins, unless this supplementary lighting has a self-contained source of electrical power in each cabin;

2) for a period of 36 hours:

- the navigation lights and other lights required by the International Regulations for Preventing Collisions at Sea in force; and
- the radio installations

3) for a period of 36 hours:

- all internal communication equipment required in an emergency (see b));
- the fire detection and fire alarm system, the fire door holding and release system; and
- intermittent operation of the daylight signalling lamp, the ship's whistle, the manually operated call points and all internal signals (see c)) 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;

4) for a period of 36 hours:

- one of the fire pumps required by the relevant provisions of Part C, Chapter 4;
- the automatic sprinkler pump, if any; and
- the emergency bilge pump and all the equipment essential for the operation of electrically powered remote controlled bilge valves;
- the sanitary and mechanical ventilation to provide minimum comfortable conditions of habitability;

5) for a period of half an hour:

- any watertight doors required by Pt B, Ch 2, Sec 1, [6] to be power operated together with their indicators and warning signals;
- the emergency arrangements to bring the lift cars to deck level for the escape of persons. The lift cars may be brought to deck level sequentially in an emergency.

b) Internal communication equipment required in an emergency generally includes:

1) 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

2) 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

3) the public address system or other effective means of communication throughout the accommodation, public and service spaces

4) the means of communication between the navigating bridge and the main fire control station.

c) Internal signals required in an emergency generally include:

1) general alarm

2) watertight door indication

3) Fire door indication.

d) The transitional source of emergency electrical power required is to supply at least the following services if they depend upon an electrical source for their operation:

1) for half an hour:

- the lighting required by [2.6.2] a) 1) and a) 2);
- all services required by [2.6.2] a) 3) first two bullets) unless such services have an independent supply for the period specified from an accumulator battery suitably located for use in an emergency.

2) It is also to supply power to close the watertight doors as required by Pt B, Ch 2, Sec 1, [6], but not necessarily all of them simultaneously, unless an

independent temporary source of stored energy is provided.

3) Power to the control, indication and alarm circuits as required by Pt B, Ch 2, Sec 1, [6], for half an hour.

2.7 Escape lighting system

2.7.1

In addition to the emergency lighting required in [2.6.2] a) 1), an escape lighting system is to be provided that is to be switched on automatically in the event of failure of the main and emergency power supply and that can operate for at least three hours.

Note 1: Alternatively, any other means of lighting which is at least as effective may be accepted by the Society.

2.7.2

The escape lighting systems are to be supplied by batteries located within the lighting units that are continuously charged, where practicable, from the emergency switchboard.

Any failure of the lamp will be immediately apparent. Any accumulator battery provided is to be replaced at intervals having regard to the specified service life in the ambient conditions that they are subject to in service.

2.7.3

The escape lighting systems are to:

a) illuminate all escape routes;

b) illuminate lifeboat stations and the sea where life boats and life rafts are to be launched.

2.8 General emergency alarm and public address systems

2.8.1 General emergency alarm system

a) Electrical cables and apparatus for the general emergency alarm system and their power supply are to be arranged so that the loss of the system in any one area due to localised fire is minimised.

b) Where the fire alarm to summon the crew/staff operated from the navigating bridge or fire control station is part of the ship's general alarm system, it is to be capable of being sounded independently of the alarm in the public spaces.

2.8.2 Public address system

a) The public address system is to be one complete system consisting of a loudspeaker installation which enables simultaneous broadcast of messages from the navigation bridge and at least one other location on board for use when the navigation bridge has been rendered unavailable due to the emergency, to all spaces where crew/staff members or guests, or both, are normally present (accommodation and service spaces and control stations and open decks), and to assembly stations (i.e. muster stations).

b) The public address system is to be arranged to operate on the main source of electrical power, the emergency source of electrical power and transitional sources of electrical power as required by [2.6.2].

c) The controls of the system on the navigation bridge are to be capable of interrupting any broadcast on the system from any other location on board.

d) The system is not to require any action by the addressee.

e) It is to be possible to address crew/staff accommodation and work spaces separately from guest spaces.

f) In addition to any function provided for routine use aboard the ship, the system is to have an emergency function control at each control station which:

1) is clearly indicated as the emergency function,

2) is protected against unauthorised use,

3) automatically overrides any other input system or program, and

4) automatically overrides all volume controls and on/off controls so that the required volume for the emergency mode is achieved in all spaces.

g) The system is to be installed with regard to acoustically marginal conditions, so that emergency announcements are clearly audible above ambient noise in all spaces where crew/staff members or guests, or both, are normally present (accommodation and service spaces and control stations and open decks), and at assembly stations (i.e. muster stations).

h) With the ship in normal conditions, the minimum sound pressure level for broadcasting emergency announcements is to be:

1) in interior spaces 75 dB (A) and at least 20 dB (A) above the speech interference level, and

2) in exterior spaces 80 dB (A) and at least 15 dB (A) above the speech interference level.

i) The system is to be arranged to prevent feedback or other interference.

j) The system is to be arranged to minimise the effect of a single failure so that the emergency messages are still audible (above ambient noise levels) also in the event of failure of any one circuit or component.

k) Each loudspeaker is to be individually protected against short-circuits.

l) For cables used for the public address system, see Pt C, Ch 2, Sec 3, [9.6], Pt C, Ch 2, Sec 11, [5.2.1] and Pt C, Ch 2, Sec 11, [5.2.4].

m) All areas of each fire zone are to be served by at least two dedicated loops of flame-retardant cables which are to be sufficiently separated throughout their length and supplied by two separate and independent amplifiers.

2.9 Installation

2.9.1 Section and distribution boards

Cubicles and cupboards in areas which are accessible to any guest are to be lockable.

2.10 Type approved components

2.10.1

Components for Low-Location Lighting systems (LLL) in escape routes are to be type approved or in accordance with [2.10.2].

2.10.2

Case-by-case approval based on the submission of adequate documentation and execution of tests may also be granted at the discretion of the Society.

3 Electrical installations for units with service notation "barge-chemical"

3.1 Application

3.1.1 *(1/6/2021)*

The requirements in this item [3] apply, in addition to those contained in Part C, Chapter 2, to barge-chemical.

3.2 Exemptions

3.2.1 *(1/6/2021)*

The requirements in Pt C, Ch 2, Sec 3, [2.2.1] and [2.3.1] are not applicable in the case of vessels without persons on board.

3.3 Documentation to be submitted

3.3.1 *(1/6/2021)*

In addition to the documentation requested in Pt C, Ch 2, Sec 1, Tab 1, the following are to be submitted for approval:

a) plan of hazardous areas

b) document giving details of types of cables and safety characteristics of the equipment installed in hazardous areas

c) diagrams of tank level indicator systems, high level alarm systems and overflow control systems where requested.

3.4 System of supply

3.4.1 *(1/6/2021)*

Earthed systems with hull return are not permitted, with the following exceptions to the satisfaction of the Society:

a) impressed current cathodic protective systems

b) limited and locally earthed systems, such as starting and ignition systems of internal combustion engines, provided that any possible resulting current does not flow directly through any hazardous area

c) insulation level monitoring devices, provided that the circulation current of the device does not exceed 30 mA under the most unfavourable conditions

d) intrinsically safe systems.

3.4.2 *(1/6/2021)*

In insulated distribution systems, no current carrying part is to be earthed, other than:

a) through an insulation level monitoring device

b) through components used for the suppression of interference in radio circuits.

3.4.3 *(1/6/2021)*

The additional limitations in the choice of the system of supply (type of distribution system) as per SOLAS Ch.II-1 Reg. 45.4.3 apply to ships subject to the SOLAS Convention.

3.5 Electrical equipment

3.5.1 *(1/6/2021)*

Electrical equipment, cables and wiring are not to be installed in hazardous locations unless they conforms with standards not inferior to those given in IEC 60092-502 Standard.

3.6 Earth detection

3.6.1 *(1/6/2021)*

For both insulated and earthed distribution systems a device, or devices, are to be installed to continuously monitor the insulation to earth and to give an audible and visual alarm at a manned position in the event of an abnormally low level of insulation resistance and/or high level of leakage current.

The above is not applicable to systems mentioned in [3.4.1].

3.7 Precautions against inlet of gases or vapours

3.7.1 *(1/6/2021)*

Suitable arrangements are to be provided, to the satisfaction of the Society, so as to prevent the possibility of gases or vapours passing from a gas-dangerous space to another space through runs of cables or their conduits.

3.8 Electrical equipment permitted in hazardous areas

3.8.1 *(1/6/2021)*

Electrical equipment permitted in hazardous areas is that indicated in Pt C, Ch 2, Sec 3, [10.1.4], Pt C, Ch 2, Sec 3, [10.1.5] and Pt C, Ch 2, Sec 3, [10.1.6].

3.8.2 *(1/6/2021)*

In addition to the requirements of [3.8.1], in Zone 1 and Zone 2 the installation of the following is permitted: hull fittings containing the terminals or shell plating penetrations for anodes or electrodes of an impressed current cathodic protection system, or transducers such as those for depth sounding or log systems, provided that such fittings are of gas-tight construction or housed within a gas-tight enclosure, and are not located adjacent to a cargo tank bulkhead. The design of such fittings or their enclosures and the means by which cables enter, as well as any testing to establish their gas-tightness, are to be to the satisfaction of the Society. The associated cables are to be protected by means of heavy gauge steel pipes with gas-tight joints.

3.8.3 *(1/6/2021)*

Enclosed or semi-enclosed spaces (not containing a source of hazard) having a direct opening, including those for ventilation, into any hazardous area, are to be designated as the same hazardous zone as the area in which the opening is located.

Electrical installations are to comply with the requirements for the space or area into which the opening leads.

Note 1: For openings, access and ventilation conditions affecting the extent of hazardous areas, see IEC Standard 60092-502.

3.9 Hazardous area classification

3.9.1 *(1/6/2021)*

For hazardous area classification see:

a) Tab 1 for barge-oil carrying flammable liquids having:
- a flash point not exceeding 60°C, or
- a flash point exceeding 60°C, heated to a temperature above their flash point, or
- a flash point exceeding 60°C, heated to a temperature within 15°C of their flash point;

b) Tab 2 for barge-oil carrying flammable liquids having a flash point exceeding 60°C, unheated or heated to a temperature below and not within 15°C of their flash point.

4 Electrical installations for units with service notation "barge-liquefied gas" and units with service notation "barge-LNG Bunker"

4.1 Application

4.1.1 *(1/6/2021)*

The requirements in this item apply, in addition to those contained in Part C, Chapter 2, to ships with the service notation barge-liquefied gas and barge-LNG Bunker.

4.2 Exemptions

4.2.1 *(1/6/2021)*

The requirements in Pt C, Ch 2, Sec 3, [2.2.1] and [2.3.1] are not applicable in the case of vessels without persons on board.

4.3 Documentation to be submitted

4.3.1 *(1/6/2021)*

In addition to the documentation requested in Pt C, Ch 2, Sec 1, Tab 1, the following are to be submitted for approval:

a) plan of hazardous areas

b) document giving details of types of cables and safety characteristics of the equipment installed in hazardous areas

c) diagrams of tank level indicator systems, high level alarm systems and overflow control systems where requested.

4.4 System of supply

4.4.1 *(1/6/2021)*

Earthed systems with hull return are not permitted, with the following exceptions to the satisfaction of the Society:

a) impressed current cathodic protective systems

b) limited and locally earthed systems, such as starting and ignition systems of internal combustion engines, provided that any possible resulting current does not flow directly through any hazardous area

c) insulation level monitoring devices, provided that the circulation current of the device does not exceed 30 mA under the most unfavourable conditions

d) intrinsically safe systems.

4.4.2 *(1/6/2021)*

In insulated distribution systems, no current carrying part is to be earthed, other than:

a) through an insulation level monitoring device

b) through components used for the suppression of interference in radio circuits.

4.4.3 *(1/6/2021)*

The additional limitations in the choice of the system of supply (type of distribution system) as per SOLAS Ch.II-1 Reg. 45.4.3 apply to ships subject to the SOLAS Convention.

4.5 Earth detection

4.5.1 *(1/6/2021)*

For both insulated and earthed distribution systems a device, or devices, are to be installed to continuously monitor the insulation to earth and to give an audible and visual alarm at a manned position in the event of an abnormally low level of insulation resistance and/or high level of leakage current.

The above is not applicable to systems mentioned in [4.4.1].

4.6 Precautions against inlet of gases or vapours

4.6.1 *(1/6/2021)*

Suitable arrangements are to be provided, to the satisfaction of the Society, so as to prevent the possibility of gases or vapours passing from a gas-dangerous space to another space through runs of cables or their conduits.

4.7 Electrical equipment permitted in hazardous areas

4.7.1 *(1/6/2021)*

Electrical equipment permitted in hazardous areas is that indicated in Pt C, Ch 2, Sec 3, [10.1.4], Pt C, Ch 2, Sec 3, [10.1.5][and Pt C, Ch 2, Sec 3, [10.1.6].

4.7.2 *(1/6/2021)*

In addition to the requirements of [4.7.1], in Zone 1 and Zone 2 the installation of the following is permitted: hull fittings containing the terminals or shell plating penetrations for anodes or electrodes of an impressed current cathodic protection system, or transducers such as those for depth sounding or log systems, provided that such fittings are of gas-tight construction or housed within a gas-tight enclosure, and are not located adjacent to a cargo tank bulkhead. The design of such fittings or their enclosures and the means by which cables enter, as well as any testing to establish their gas-tightness, are to be to the satisfaction of the Society. The associated cables are to be protected by means of heavy gauge steel pipes with gas-tight joints.

4.7.3 *(1/6/2021)*

Enclosed or semi-enclosed spaces (not containing a source of hazard) having a direct opening, including those for ventilation, into any hazardous area, are to be designated as the same hazardous zone as the area in which the opening is located.

Electrical installations are to comply with the requirements for the space or area into which the opening leads.

Note 1: For openings, access and ventilation conditions affecting the extent of hazardous areas, see IEC Standard 60092-502.

4.8 Hazardous area classification

4.8.1 *(1/6/2021)*

For hazardous area classification see Tab 3.

4.9 Submerged cargo pumps

4.9.1 Exception *(1/6/2021)*

Submerged cargo pumps are not permitted in connection with the following cargoes:

- diethyl ether
- vinyl ethyl ether
- ethylene oxide
- propylene oxide
- mixtures of ethylene oxide and propylene oxide.

4.9.2 Submerged electric motors *(1/6/2021)*

a) Where submerged electric motors are employed, means are to be provided, e.g. by the arrangements specified in paragraph 17.6 of the IGC Code, to avoid the formation of explosive mixtures during loading, cargo transfer and unloading.

b) Arrangements are to be made to automatically shut down the motors in the event of low liquid level. This may be accomplished by sensing low pump discharge pressure, low motor current, or low liquid level. This shutdown is to be alarmed at the cargo control station. Cargo pump motors are to be capable of being isolated from their electrical supply during gas-freeing operations.

4.10 Product classification

4.10.1 Temperature class and explosion group *(1/6/2021)*

Tab 4 specifies temperature class and explosion group data for the products indicated in Chapter 19 of the IGC Code. The data shown in brackets have been derived from similar products.

Table 3 : Classification of hazardous areas for tankers carrying flammable liquefied gases *(1/6/2021)*

Spaces		Hazardous area
No.	Description	
1	Cargo containment systems	Zone 0
2	Hold spaces where cargo is carried in a cargo containment system requiring a secondary barrier	Zone 0
3	Hold spaces where cargo is carried in a cargo containment system not requiring a secondary barrier	Zone 1
4	Space separated from a hold space where cargo is carried in a cargo containment system requiring a secondary barrier by a single gas-tight steel boundary	Zone 1
5	Cargo pump and cargo compressor rooms	Zone 1
6	Areas on open deck, or semi-enclosed spaces on open deck, within 3 m of any cargo tank outlet, gas or vapour outlet, cargo manifold valve, cargo valve, cargo pipe flange, cargo pump and cargo compressor room ventilation outlets and cargo tank openings for pressure release provided to permit the flow of small volumes of gas or vapour mixtures caused by thermal variation	Zone 1
7	Areas on open deck, or semi-enclosed spaces on open deck above and in the vicinity of any cargo gas outlet intended for the passage of large volumes of gas or vapour mixture during cargo loading and ballasting or during discharging, within a vertical cylinder of unlimited height and 6 m radius centred upon the centre of the outlet, and within a hemisphere of 6 m radius below the outlet	Zone 1
8	Areas on open deck, or semi-enclosed spaces on open deck, within 1,5 m of cargo pump and cargo compressor room entrance, cargo pump and cargo compressor room ventilation inlet, openings into cofferdams or other zone 1 spaces	Zone 1
9	Areas on open deck within spillage coamings surrounding cargo manifold valves and 3 m beyond these, up to a height of 2,4 m above the deck	Zone 1
(1) For ships subject to the SOLAS Convention, an area within 2m beyond the 3m of cargo tank ventilation outlets which permit the flow of small volumes of vapour gas mixtures caused by thermal variation is to be considered Zone 2		

Spaces		Hazardous area
No.	Description	
10	Areas on open deck over all cargo tanks (including ballast tanks within the cargo tank area) where structure restricts natural ventilation and to the full breadth of the ship plus 3 m fore and aft of the forward-most and aft-most cargo tank bulkhead, up to a height of 2,4 m above the deck	Zone 1
11	Compartment for cargo hoses	Zone 1
12	Enclosed or semi-enclosed spaces in which pipes containing cargoes are located	Zone 1
13	Enclosed or semi-enclosed spaces in which pipes containing cargo products for boil-off gas fuel burning systems are located, unless special precautions approved by the Society are provided to prevent product gas escaping into such spaces	Zone 1
14	Areas of 1,5 m surrounding open or semi-enclosed spaces of Zone 1 **(1)**	Zone 2
15	Areas 4 m beyond the cylinder and 4 m beyond the sphere defined in item 7	Zone 2
16	Spaces forming an air-lock	Zone 2
17	Areas on open deck extending to the coamings fitted to keep any spills on deck and away from the accommodation and service areas and 3m beyond these up to a height of 2,4m above the deck	Zone 2
18	Areas on open deck over all cargo tanks (including all ballast tanks within the cargo tank area) where unrestricted natural ventilation is guaranteed and to the full breadth of the ship plus 3 m fore and aft of the forward-most and aft-most cargo tank bulkhead, up to a height of 2,4 m above the deck surrounding open or semi-enclosed spaces of Zone 1	Zone 2
19	Spaces forward of the open deck areas to which reference is made in item 10 and item 18, below the level of the main deck, and having an opening on the main deck or at a level less than 0,5 m above the main deck, unless: a) the entrances to such spaces do not face the cargo tank area and, together with all other openings to the spaces, including ventilation system inlets and exhausts, are situated at least 5 m from the foremost cargo tank and at least 10 m measured horizontally from any cargo tank outlet or gas or vapour outlet; and b) the spaces are mechanically ventilated	Zone 2
20	Areas within 2,4 m of the outer surface of a cargo tank where such surface is exposed to the weather	Zone 2

(1) For ships subject to the SOLAS Convention, an area within 2m beyond the 3m of cargo tank ventilation outlets which permit the flow of small volumes of vapour gas mixtures caused by thermal variation is to be considered Zone 2

Table 4 : Temperature class and explosion group of certain products *(1/6/2021)*

Product name	Temperature class	Explosion group	Product name	Temperature class	Explosion group
Acetaldehyde	T4	II A	Methane	T1	II A
Ammonia anhydrous	T1	II A	Methyl acetylene propadiene mixture	T4	II A
Butadiene	T2	II B	Methyl bromide	T3	II A
Butane	T2	II A	Methyl chloride	T1	II A
Butane/propane mixture	T2	II A	Monoethylamine	T2	II A
Butylenes	T3	II A	Nitrogen	NF	NF
Chlorine	NF	NF	Pentane (all isomers)	(T2)	(II A)
Diethyl ether	T4	II B	Pentene (all isomers)	(T3)	(II B)
Dimethylamine	T2	II A	Propane	T2	II A

Product name	Temperature class	Explosion group	Product name	Temperature class	Explosion group
Ethane	T2	II A	Propylene	T2	II B
Ethyl chloride	T2	II A	Propylene oxide	T2	II B
Ethylene	T2	II B	Refrigerant gases	NF	NF
Ethylene oxide	T2	II B	Sulphur dioxide	(T3)	(II B)
Ethylene oxide propylene oxide mixture (max. 30% mass/mass ethylene oxide)	T2	II B	Vinyl chloride	T2	II A
Isoprene	T3	II B	Vinyl ethyl ether	T3	II B
Isopropylamine	T2	II A	Vinylidene chloride	T2	II A