



RULES FOR
CLASSIFICATION OF

SHIPS

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS
ADDITIONAL CLASS

PART 6 CHAPTER 12

ENVIRONMENTAL CLASS

JANUARY 2011

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CHANGES IN THE RULES

General

The present edition of the rules includes amendments and additions approved by the Executive Committee as of November 2010 and supersedes the July 2008 edition of the same chapter.

The rule changes come into force as described below.

This chapter is valid until superseded by a revised chapter.

Main changes coming into force 1 July 2011

• Sec.1 General Requirements

- The previous Table A1 has been removed and previous Table A2 has been renumbered accordingly.
- Table A1 has been amended and references to **EO**, **ECO** and **OPP-F** notation have been removed.
- In sub-section element B200, definitions have been revised.
- Table B1 has been updated according to the latest ISO requirements.
- In item C101 a requirement for a “clean manual” has been inserted.
- Previous tables C1, C2 and C3 have been revised according to the new requirements and merged to a new Table C1.
- A new Table C2, Certificate requirements, has been added.

• Sec.2 CLEAN Notation

General: As MARPOL Regulation 12A mostly covers **OPP-F** notation this is not anymore mandatory for **CLEAN**. Some requirements have been clarified (e.g. refrigerants and Ballast Water Management Plan). As option to use of low sulphur fuel, requirements for electric shore connection have been inserted. The recommendation for Green Passport has been removed.

- Two new items, B103 and B104, have been added for better understanding.
- Sub-section element B300 has been re-written and the requirement in B303 has been aligned with Revised MARPOL Annex VI on Sulphur for ECA Areas.
- Sub-section element B400 has been revised and the text has been clarified.
- In item B409, reference to Pt.4 Ch.1 has been corrected.
- Two new items, B502 and B503, have been added.
- In sub-section element C400, requirements have been implemented based on the vessel types.
- In sub-section element C500, the requirements have been revised according to the ballast water convention.
- In sub-section element C800, the requirements have been clarified.
- Previous sub-section element D100 has been deleted and the remaining sub-section element has been renumbered.

• Sec.3 CLEAN DESIGN Notation

General: Requirements on SO_x emissions have been aligned with the revised MARPOL Annex VI. As an alternative to the use of low sulphur fuel in ports, requirements on electric shore connection have been inserted. For the discharge into sea, IBTS requirements have been implemented. For bilge water, requirements on 5 ppm equipment have been inserted. It is now required to have the 5 ppm DNV type approval certificate. Grey water is now considered. Requirements on garbage have been aligned with the latest developments. Sterntube shall now be lubricated with water based (or biodegradable) oil. Finally double hull protection requirements have been clarified.

- In item B303, requirements have been aligned with Revised MARPOL Annex VI on Sulphur for ECA Areas.
- New items B304, B305 and B306, replace previous item B304.
- In item B701, the requirement has been simplified.
- Sub-section element C100 has been completely re-written.
- In item C201, requirements have been aligned with MARPOL Annex II.
- Previous item C403 has been deleted.
- In sub-section element C500, requirements have been aligned with the ballast water convention.
- Sub-section elements C600 to C800 have been completely re-written.
- Sub-section element D100 has been revised and clarified. Implemented according to the UI of Regulation 12A.
- Sub-section element E100 has been completely re-written.

• Sec.4 Electrical Shore Connection

- A new section for optional requirements has been inserted.

Corrections and Clarifications

In addition to the above stated rule requirements, a number of corrections and clarifications have been made to the existing rule text.

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SECTION 1 GENERAL

A. Classification

A 100 Application

101 The rules in this chapter state requirements for design and equipment reducing the environmental impact from emissions to air, discharges to sea, and deliveries to shore from vessels. The requirements are in compliance with or more extensive than those found in international standards currently in force. Vessels complying with the requirements in this chapter may be given the class notation **CLEAN** or **CLEAN DESIGN**.

102 The rules aim at attaining a vessel with controlled environmental standards of design and performance. Compliance with the rules shall be verified through inspection, measurements and sampling of defined environmental parameters in accordance with the requirements of the rules in this chapter and in compliance with identified standards and guidelines.

103 Effects and parameters covered are described in B100 by reference to technical standards and installations, and their operation.

104 Vessels with class notations covered by this chapter shall comply with the requirements specified in Table A1.

Table A1 Requirements for vessels with class notations CLEAN or CLEAN DESIGN		
<i>Subject</i>	<i>Class notation</i>	
	CLEAN	CLEAN DESIGN
Vessels ¹⁾ shall be enrolled in an emergency response scheme administered by the Society, or another recognized classification society	Yes	Yes
Vessels shall hold class notation, NAUT-AW , see Ch.8. or NAUT-OSV(A) , see Ch.20	Not required	Yes
Vessels shall hold class notation RECYCLABLE or equivalent statement of compliance from another recognized classification society	No	Yes

¹⁾ Dry cargo vessel less than 3000 GT and vessels designed for offshore operations with class notation **SF** or better damage stability do not need to meet this requirement.

A 200 Class notations

201 The class notation **CLEAN** identifies the basic requirements for controlling and limiting operational emissions and discharges. The requirements are specified in Sec.2.

202 The class notation **CLEAN DESIGN** identifies additional requirements for controlling and limiting operational emissions and discharges. In addition, this notation specifies design requirements for protection against accidents and for limiting their consequences. The requirements are specified in Sec.3.

B. Definitions

B 100 Definition, main parameters

101 Emissions to air

All emissions to air which are caused by or needed for the operation of the vessel, energy consumers, cargo, passengers, and crew on board a vessel, and any toxic emissions caused by operation, protection and conservation of vessel or cargo.

102 Discharges to sea

All discharges to sea which are caused by or needed for operation of the vessel, energy consumers, cargo, passengers, and crew on board a vessel, and any toxic discharges caused by protection and conservation of vessel or cargo.

103 Deliveries to shore

Delivery of potential pollutants to shore facilities, for controlling, disposal, recycling etc.

104 *Port*

The vessel is considered in port from ordering “stand by” prior to entering port to ordering “full ahead” when leaving the port. The time will be confirmed by entries in the vessel's logbook.

105 *SO_x emission control area (ECA Emission Control Area)*

SO_x emission control areas are defined in the revised MARPOL Annex VI and in the EU Sulphur Directive 99/32/EC as amended (2005/33/EC) with proposed amendments.

B 200 **Definitions and characteristics, systems and components**

201 *Ballast water*

Water with its suspended matter taken on board a vessel to control trim, list, draught, stability or stresses of the vessel.

202 *Ballast water management system*

Any system which processes ballast water such that it meets or exceeds the Ballast Water Performance Standard in Regulation D-2 in the Ballast Water Management Convention. The BWMS includes ballast water treatment equipment, all associated control equipment, monitoring equipment and sampling facilities.

203 *Cargo handling systems*

Cargo handling systems comprise:

- Cargo tank vents for tankers with cargoes where evaporation may occur during loading, transport and discharge. (e.g.: **Tanker for Oil, Tanker for Chemicals, Tanker for Liquefied Gas, Tanker for Oil Products, Offshore Supply Vessels** and **Well Stimulation Vessels**)
- Pumping and piping systems for tankers carrying cargoes that may cause global or local pollution.

204 *Residues of cargo oil and chemicals*

Remains of cargo (oil or chemical contaminated water from cargo tank area, slop tanks and cargo pump room).

205 *Fire-fighting media*

Active fire-fighting media used in fixed fire-fighting systems.

206 *Garbage*

Garbage includes all kinds of provisions, domestic and operational waste excluding fresh fish and parts thereof, generated during normal operation of the vessel and liable to be disposed of continuously or periodically except those substances excluded specifically. Cargo residues from dry cargo vessels are considered as garbage.

Sewage and waste oils are defined separately and not as garbage.

207 *Antifouling systems*

A coating, paint, surface treatment, surface, or device used to control or prevent attachment of un-wanted organisms.

208 *Refrigerants*

Refrigerant media used in cargo refrigeration plants, air conditioning and refrigeration systems onboard all vessels, including domestic stand alone units.

209 *Sewage (black water)*

- drainage and other wastes from all toilets and urinals
- drainage from medical premises (dispensary, sick bay) via wash basins, wash tubs and scuppers located in such rooms
- drainage from spaces containing living animals, or
- other waste waters when mixed with any of the drainage systems defined above.

210 *Grey Water*

- Drainage from dishwasher, galley, shower, laundry, bath, washbasin drains and WC scuppers.

211 *Oil residue (sludge)*

The residual waste oil products generated during the normal operation of a vessel such as those resulting from the purification of fuel or lubricating oil for main or auxiliary machinery, separated waste from oil filtering equipment, waste oil collected in drip trays, and waste hydraulic and lubricating oils.

Waste oils may be dealt with onboard, or pumped ashore. Cargo oil residues in slop tanks, see 204, are considered separate from operational waste oils.

212 *Oil residue (sludge) tank*

A tank which holds oil residues (sludge) from which sludge may be disposed directly through the standard discharge connection or any other approved means of disposal.

213 *Oily bilge water*

Water which may be contaminated by oil resulting from things such as leakage or maintenance work in machinery spaces. Any liquid entering the bilge system, bilge piping, tank top or bilge holding tanks is considered oily bilge water.

214 *Oily bilge water holding tank*

Means a tank collecting oily bilge water prior to its discharge, transfer or disposal.

215 *Food Waste*

Any spoiled or unspoiled victual substances, such as fruits, vegetables, dairy products, poultry, meat products, food scraps, food particles and all other materials contaminated by such wastes, generated onboard ship, principally in the galley and dining areas.

216 *NO_x-abatement technology*

A system for the purpose of reducing NO_x emissions to air.

217 *SO_x-abatement technology*

An exhaust gas cleaning system for the purpose of removing SO_x from the exhaust (e.g. scrubbers).

B 300 Abbreviations

BCH Code:	Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (Bulk Chemical Code)
CFC:	Chlorofluorocarbons
CFR:	Code of Federal Regulations
GWP:	Global warming potential. (CO ₂ = 1, time horizon 100 years)
HCFC:	Hydrochlorofluorocarbons
HFC:	Hydrofluorocarbons
IACS:	International Association of Classification Societies.
IAPP Certificate:	International Air Pollution Prevention Certificate
IBC Code:	The International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk
IOPP Certificate:	International Oil Pollution Prevention Certificate
ISO:	International Organisation for Standardisation
IMO:	International Maritime Organisation
MARPOL or MARPOL 73/78:	The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 thereto
MSC:	Maritime Safety Committee (IMO)
MEPC:	Maritime Environmental Protection Committee (IMO)
NO _x :	Oxides of nitrogen
ODP:	Ozone depleting potential. (Compared to CFC 11)
SCR:	Selective Catalytic Reduction.
SO _x :	Oxides of sulphur
ECA:	Emission Control Areas
TBT:	Tributyltin (active ingredient in antifouling paint)
TEWI:	Total environmental warming impact.
USCG:	US Coast Guard
VOC:	Volatile organic compound.

B 400 International recommendations, standards and references

401 International recommendations, standards and references have been used as foundation for the rules, although the rule requirements may be more stringent. When setting the emission and discharge limits, and determining the measuring procedure, due consideration has been given to technical and practical limitations inherent in the design and construction of different types of vessels.

402 International recommendations, standards and references with provisions used by the Society when developing the rules are reflected in the references specified in 403 to 412. Unless a particular edition is

explicitly referred to, the latest edition of each standard applies.

403 *General references*

Generally the rules refer to applicable parts of Annexes I, II, IV, V and VI of MARPOL 73/78 consolidated edition 2006. Other references for specific areas are given in 404 to 412.

404 *Antifouling paint*

Requirements for restrictions to use of TBT in antifouling paint refer to International Convention on the Control of Harmful Anti Fouling Systems, adopted by IMO in October 2001 (AFS/CONF/26).

405 *Ballast water*

Requirements for restrictions to transfer of harmful organisms in ballast water refer to International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM/CONF/36).

406 *Cargo handling vapour emission control systems*

Following references are used:

- IMO Standards for Vapour Emission Control Systems, MSC/Circ.585 and revised MARPOL Annex VI, reg. 15
- USCG Title 46, CFR Part 39.

407 *Marine diesel engines*

IMO's "NO_x Technical Code" (IMO MP Conf. 3/35 Res. 2)).

408 *Marine fuel oil sulphur content*

- Revised MARPOL Annex VI, and
- the EU Sulphur Directive 2005/33/EC.

Marine fuel oils shall be specified and tested according to Table B1.

Table B1 Marine fuel oils and sulphur emissions – Specification and testing references	
<i>Specifications of marine fuels</i> ¹⁾	ISO 8217:2010, Petroleum Products – Fuels (Class F).
<i>Sampling</i>	IMO guidelines resolution MEPC.182(59) Guidelines for the sampling of fuel oil for determination of compliance with the revised MARPOL Annex VI
<i>Test method, fuel sulphur content</i>	ISO 8754 and/or Pr EN ISO 14596
<i>Test method, emission sulphur content</i>	ISO 7934/ISO 7935/ISO 11632
1) In case of demonstrated non-availability, previous version of ISO 8217(2005) shall be used.	

409 *Sulphur abatement technologies*

If applicable, sulphur abatement technologies should be verified according to Resolution MEPC.184(59) adopted on 17th July 2009 "Guidelines for on board exhaust gas-SO_x Cleaning system", taking into account local legislation (e.g. EU requirements) and amendments if any.

The sulphur abatement technology must document thoroughly that any waste stream discharged into enclosed ports, harbours and estuaries have no impact on ecosystems, based on criteria communicated by authorities of Port States to the IMO.

410 *Refrigerants and fire-fighting media*

Refers to "Montreal Protocol on Substances that Deplete the Ozone Layer".

411 *Shipboard incinerators*

Refers to IMO res. MEPC.76(40) on Standard specification for shipboard incinerators.

412 *Bilge water separators*

refers to IMO res. MEPC.107(49).

413 *Sewage Treatment Plan*

Refers to MEPC. 159(55)

C. Information and Documentation

C 100 General

- 101** Documentation shall be submitted as required by Table C1.
- 102** Discharge limiting and monitoring equipment shall be certified or type-approved.
- 103** For general requirements to documentation, see Pt.0 Ch.3 Sec.1.
- 104** For a full definition of the documentation types, see Pt.0 Ch. 3 Sec. 2.

C 200 In-service requirements

201 If approved arrangements, equipment or procedures are altered or modified documentation shall be resubmitted for approval.

202 The environmental performance of systems covered by the rules in this chapter shall be verified by inspection, measurements, and sampling, or by other equivalent means in accordance with the requirements of the rules in this chapter and in compliance with identified standards and guidelines. Data shall be gathered and kept onboard in appropriate logbooks for review during periodical surveys as defined in Pt.7 Ch.1 Sec.6 P.

Table C1 – Documentation requirements				
<i>Object / Function</i>	<i>Documentation type</i>	<i>Additional description</i>	<i>For approval (AP) or For information (FI)</i>	<i>Qualifiers</i>
Vessel	Z260 – Vessel certificate	Anti-Fouling System Statement of Compliance	FI	All
	Z260 – Vessel certificate	Certificate or Statement of Compliance for Inventory of Hazardous Materials	FI	DESIGN
	Z260 – Vessel certificate	International Sewage Pollution Prevention Certificate	FI	All
Electric power shore connection	E020 – Principal cable routing sketch		FI	All
	E170 – Electrical schematic drawing		FI	All
	Z060 – Functional description		FI	All
	Z110 – Data sheet	Technical data for major components. Setting of protections.	FI	All
	Z140 – Test procedure for quay and sea trial	Including vessel - harbour control signal interface.	FI	All
Fuel and lubrication oil systems	H210 – Protected tank location drawing	Applicable for all tanks containing oil or oil based liquids.	AP	DESIGN
Fuel oil system	Z160 – Operation manual	Including bunkering procedures.	AP	All
	Z160 – Operation manual	Management plan for control of SO _x emissions, including details of SO _x control methods.	AP	All
Incinerator	Z280 – Type approval certificate		FI	All
	C020 – Assembly or arrangement drawing		FI	DESIGN
Ballast system	Z230 – Ballast water management plan		AP	All
Ballast water treatment system	Z280 – Type approval certificate		FI	DESIGN
Sewage system	S010 – Piping diagram		AP	All
	Z160 – Operation manual	Sewage management plan including sewage discharge log.	AP	All

Garbage disposal system	Z160 – Operation manual	Garbage management plan with garbage record book.	AP	All
	Z030 – System arrangement plan	Incinerators and garbage handling arrangement.	AP	DESIGN
Hazardous materials	M080 – Inventory of hazardous materials		AP	DESIGN
Greenhouse gas handling	S010 – Piping diagram	Refrigeration and air conditioning systems.	AP	All
	Z100 – Specification	Fire fighting systems, including data sheet for extinguishing media.	FI	All
	Z110 – Data sheet	Refrigerants.	FI	All
	Z160 – Operation manual	Refrigerant management procedures.	AP	All
NO _x emission prevention	S010 – Piping diagram	Cleaning system and Selective catalytic reduction system.	AP	All
	Z030 – System arrangement plan	Cleaning system and Selective catalytic reduction system.	AP	All
	Z160 – Operation manual	NO _x reducing device technical manual.	AP	All
	Z241 – Measurement report	Test procedure and measurement results for NO _x emission.	AP	DESIGN
	Z270 – Product certificate	Including 'Technical files' for all diesel engines.	FI	DESIGN
	Z270 – Product certificate	EIAPP certificates for applicable diesel engines, applicable for vessels keel laid or with major engine conversion after 2000-01-01.	FI	All
SO _x emission prevention	S010 – Piping diagram	Exhaust gas SO _x cleaning system.	AP	All
	Z030 – System arrangement plan	Exhaust gas SO _x cleaning system.	AP	All
	Z160 – Operation manual	Exhaust gas SO _x cleaning system.	AP	All
Oil pollution prevention	Z180 – Maintenance manual	Oil / water interface oil consumption log.	FI	All
	Z030 – System arrangement plan	Cargo and non-cargo manifold areas, including drip trays and oil spill prevention arrangements.	AP	All
	Z231 – Bilge water and sludge management plan		AP	DESIGN
Cargo piping system	Z030 – System arrangement plan	Side view of manifold arrangement.	AP	All
	Z030 – System arrangement plan	Means to support hoses in way of ship's side abreast of manifolds.	AP	All
Vapour handling and recovery system	Z270 – Product certificate	Alternatively, a statement of compliance with IMO MSC/ Circ.585 or USCG's regulations CFR 46 Pt. 39.	FI	All
Cargo storing arrangements	H210 – Protected tank location drawing	Applicable for all tanks containing oil or oil based liquids.	AP	DESIGN
Cargo compartments cleaning system	S110 – Shadow diagram		AP	DESIGN

Table C2 Certificate requirements			
<i>Object</i>	<i>Certificate type</i>	<i>Additional description</i>	<i>Qualifiers</i>
Bilge separator	DNV type approval certificate		DESIGN
Oily bilge water control and monitoring system	DNV type approval certificate	5 ppm alarm.	DESIGN

SECTION 2 CLASS NOTATION CLEAN

A. Introduction

A 100 General

101 The rules in this section cover emissions to air and give requirements for emissions to air from energy producers, cargo-handling systems and service systems on board the vessel. References are made to national and international recommendations, standards and guidelines on emission criteria in relation to the protection of the environment.

102 The rules in this section cover discharges to sea giving requirements for discharges to sea from energy producers, lubrication and hydraulic systems, cargo/passenger handling systems, waste/sewage systems, underwater antifouling systems and ballast water systems on board vessels. References are made to national and international recommendations, standards and references on discharge criteria in relation to protection of the environment.

103 Documentation required to be submitted for approval and verification of compliance with the rules is specified in Sec.1 C100.

B. Emissions to Air

B 100 General

101 All fuel oils intended for use onboard shall meet the following requirements:

- a) The fuel shall not contain inorganic acid.
- b) The fuel shall not include any added substances or chemical waste which either jeopardises safety of the vessel or the performance of the machinery, is harmful to personnel, or contributes to additional air pollution. This shall not preclude incorporation of small amounts of additives intended to improve some aspects of performance.

102 Fuel oil management and control shall be carried out in accordance with a fuel oil management plan and fuel oil log.

103 The fuel Oil Management Plan shall include description of the fuel oil quality according to 101, sulphur content in the fuel used on board and shall document the qualities of the fuel ordered and the qualities of the received fuel as described by the bunker delivery note, see revised MARPOL 73/78/97, Annex VI, reg. 18.5 and 18.6, and 99/32/EU with amendments.

104 The Fuel Oil Management plan shall incorporate adequate fuel change over procedure to ensure that the fuel utilised at the time when entering a SO_x restriction area is of the required quality. Relevant log books shall provide proof that the fuel of the required quality has been utilized in the relevant areas.

105 The bunker delivery note shall be accompanied by a representative sample of the fuel delivered, sealed and signed by the supplier's representative and the master or officer in charge of the bunker operation. The bunker delivery note shall be retained on board for three years. The fuel sample shall be retained under the vessel's control until the fuel is consumed but not for less than twelve months after the time of delivery.

106 The sampling equipment and test procedures shall comply with the IMO guideline for sampling, based on the standards referred to in Table B1, Sec.1 B408, or equivalent.

B 200 NO_x Emissions

201 Engine emissions for diesel engines with a power output >130 kW installed on all vessels shall comply with Tier II, MARPOL limits. The maximum limits for NO_x per kWh, dependent on engine type as identified by engine r.p.m., is specified in Table B1.

n < 130 RPM	14.4 g/kWh
130 < n < 2000 RPM	44.0 n ^(-0.23) g/kWh
n > 2000 RPM	7.7 g/kWh

202 For engines where NO_x reduction systems are fitted, the system shall be operated and controlled in accordance with procedures incorporating the manufacturer instructions. The system and the relevant NO_x

reducing device Technical Manual (NTM) shall comply with the appropriate IMO guidelines and it will be subject to approval.

Guidance note:

NO_x level measurements

NO_x level measurements on diesel engines, with or without NO_x reduction arrangements, should comply with the methods specified in IMO NO_x Technical Code referred to from revised MARPOL 73/78 Annex VI, or other equivalent methods accepted by the Society. Measurements and tests should be documented, as required by the Society. Where documentation shall be applied for class notation only, independent third party witnessing and verification of tests may be waived.

Engine modification and adjustments

NO_x reductions by modification of engine parameters, water injection, fuel/water emulsification and/or by adjusting engine settings in order to influence the combustion characteristics, should be specified by the engine manufacturer and carried out under his supervision. The chosen combination of modifications and adjustments should aim to avoid an increase in the engine's fuel consumption. The engine shall not be adjusted outside the allowable ranges as specified in the Technical File (where applicable) unless a Direct Measurement and Monitoring device has been fitted and approved by the Society.

Descriptions of any changes affecting the designated engine parameters, including adjustments, parts replacements and modifications to engine parts, shall be recorded chronologically in an engine's record book of engine parameters.

Selective Catalytic Reduction (SCR)

Any requirements related to engine performance where SCR-systems are fitted should be identified and addressed in the required documentation as specified in Sec.1 C100. The relevant documentation should also identify operational temperature limits. The reducing agent and the relevant consumptions should be specified by the manufacturer. If other agent than urea-solution is used, this will be subjected to special consideration.

In the case where the NO_x emission level is used to verify or control the reduction agent injection rate, the level should be detected by an analyser. Measuring equipment used for this purpose should be according to NO_x Technical Code 2008 (edition 2009).

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

B 300 SO_x emissions

301 The requirements in B300 shall apply to any fuel consumed onboard, including but not limited to fuel for diesel engines, boilers, incinerators.

Guidance note:

Incineration of sludge is not subject to the requirement in B300.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

302 SO_x emission limits are generally achieved by use of low sulphur content fuel oil. The maximum sulphur content in fuel oil carried onboard is 3.00% S.

303 When in ports or in SO_x-controlled areas, the allowable maximum sulphur content in fuel oil used is 1.00% S. Changes of fuel type when entering and leaving port, or other SO_x-controlled areas, shall be documented by entries in the vessel's logbook.

304 In areas with local regulations for sulphur content in fuel the stricter requirement shall apply. Changes of fuel type to comply with local regulations shall be documented by entries in the vessel log book.

305 As an alternative to the requirements in items 302, 303 and 304, engines can control the emission of SO_x through an exhaust gas cleaning system or by other methods according to Regulation 4 of revised MARPOL Annex VI. The SO_x content of the exhaust gas shall be verified in accordance with relevant standards (Resolution MEPC 184(59) adopted on 17 July 2009). Such equivalent system shall be dimensioned to ensure continuous compliance when and where operating.

306 When in ports and where applicable, as an alternative to the use of Low Sulphur Fuel, the vessel can use shore connection. In this case requirements as listed in Section 4 shall be fulfilled.

B 400 Refrigerants

401 The emission criteria for refrigerants apply to cargo refrigeration plants, centralised air conditioning and refrigeration systems onboard all vessels. Domestic type stand-alone air conditioning units and refrigerators need to comply with 402, 403 and 404 only.

Guidance note:

Domestic type stand alone units are typically cabin refrigerators, water coolers, ice machines, small air-conditioning units, vending machines, etc.

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402 The emission criteria for refrigerants are limited to requirements related to the properties of the refrigerant used with respect to its ozone depleting potential and to its global warming potential (ODP/GWP)

as defined by the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer.

403 The use of ozone depleting substances is not permitted. The refrigerant may be any of the following:

- HFC
- Natural refrigerants such as NH₃ or CO₂.

The used refrigerant shall comply with: GWP < 3500.

Guidance note:

As an alternative to GWP < 3500 documented equivalent TEWI (Total Equivalent Warming Impact) may be accepted.

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404 A list of all refrigerant systems onboard defined in 401 shall be included in the refrigerant management plan.

405 Refrigerant systems shall have suitable means of isolation to allow maintenance without releasing any bulk quantity of the refrigerant to the atmosphere. Isolating valves should be provided to permit compressor removal and replacement without losing the refrigerant charge. A suitable permanent valve for a recovery connection should be provided on all appliances.

Unavoidable minimum releases associated with recapture or recycling are acceptable provided recovery units are installed for the evacuation of the system.

406 For refrigerant recovery, compressors shall be capable of evacuating a system charge into a liquid receiver.

When the condenser itself shall be repaired the refrigerant must be transferred to:

- 1) other condenser(s) inside the system:
if the system has two or more condensers, when one of them shall be repaired, the others shall have enough capacity to hold the entire charge of the refrigerant system.
- 2) outside of the refrigerant system:
a dedicated container of sufficient volume is used to house the largest refrigerant circuit of the unit. This container shall be available and permanently located close to the unit. The procedure for how to use the recovery unit shall also be provided onboard.

Additionally, recovery units and associated equipment shall be provided to facilitate evacuation of the system either into existing liquid receivers or into suitable reservoirs.

407 Annual refrigerant leakage shall be as small as possible but not more than 10% of the total refrigerant charge for each system. The leakage shall be documented through recorded consumption figures. The figures shall include topping up due to leakage, as well as renewal of refrigerant during repairs or overhauls. The refrigerant log shall at least include: date, system type, refrigerant type, type of failure, initial system charge, refrigerant added, refrigerant recovered, signature type of inspection performed and corrective actions.

If leakage is observed, corrective measures as detailed in the refrigerant management procedure shall be implemented.

408 Where different types of refrigerants are used, measures shall be taken in order to avoid mixing of these substances.

409 Refrigerants in refrigeration systems shall be controlled in a manner suitable for detection of all types of leakage, through a leak detection system with automatic alarm in the space where the refrigerant could leak, in combination with:

- level measurement in refrigeration system with alarm for low level; or
- logging refrigerant volumes at regular intervals. As a minimum once per week or
- Weekly control of leakages by portable refrigerant detector.
- The log shall be in compliance with the requirements in 407.

Guidance note:

The chosen solution may be in addition to, or in combination with, safety requirements specified in Pt.4 Ch.1. The requirements in this section shall not replace requirements in Pt.4 Ch.1.

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410 The chosen method for detecting leakage should be submitted. A refrigerant management procedure must be implemented, covering as a minimum the following:

- how to monitor the refrigerant system with respect to possible leaks
- how often any such monitoring shall take place
- limits for when corrective actions shall be initiated.
- Procedures detailing the means to control, leakage, venting and disposal of refrigerants.

B 500 Cargo evaporation

501 The criteria for emissions from cargo evaporation apply for tankers carrying crude oil, petroleum products or chemicals with flash point less than 60°C. These emissions are defined as volatile organic compounds, VOC.

502 Vessels shall comply with the revised MARPOL Annex VI Regulation 15.

503 Tanker for oil or oil products and tanker for chemicals shall hold a valid class notation **VCS-2**, see Ch.10 Sec. 1 A200.

B 600 Fire fighting substances

601 Natural substances used in fixed fire fighting systems and extinguishers, are not considered damaging to the atmosphere. If other substances are used in fixed fire fighting systems that may have a global warming potential, the used substance shall comply with:

GWP < 4000

ODP = 0.

Guidance note:

Natural substances: Natural substances: e.g. argon, nitrogen, water spray, high expansion foam, CO₂. Note that CO₂ in this context is considered a natural substance without ODP or GWP since it will utilise CO₂ already present in the atmosphere.

Other substances: E.g. industrial substances including Hydrofluorocarbons (HFC) and Sulphur fluorides.

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B 700 Shipboard incinerators

701 When installed onboard, incinerators shall be Type Approved in accordance with IMO res. MEPC.76(40).

702 All use of incinerators shall be in accordance with the revised MARPOL 73/78, Annex VI, reg. 16, and be recorded in the oil record book referred to in MARPOL 73/78 Annex I, reg. 17 and in the garbage record book referred to in MARPOL 73/78, Annex V, reg. 9(3).

C. Discharges to Sea

C 100 General

101 Compliance with the rules in C shall be verified by means and measures as identified in Sec.1 C. Actual discharges shall be recorded as specified in 200 to 1000.

C 200 Residues of cargo oil and chemicals

201 Discharge criteria for cargo residues apply to tankers carrying crude oil, petroleum products or chemicals.

202 Discharge of contaminated water or cargo residues into the sea shall be limited as far as practicable. Discharges and deliveries to shore shall be documented in the Oil record book, or Cargo record book, for tankers for oil and tankers for chemicals, respectively.

On tankers for chemicals the maximum allowable remaining cargo quantity shall be 0.075 m³ for all pollution categories. The pollution categories are defined in MARPOL Annex II, Regulation 6.

C 300 Cargo handling

301 Tankers for oil or chemicals shall have fitted and implemented means and arrangements to reduce the likelihood of cargo spill on deck reaching the sea.

Gutter plates on both sides of the cargo deck shall be increased in height from a point 0.2 L forward of midship to a termination at the aft end of the cargo deck with the minimum heights given in Table C1.

Vessels greater than 100 000 tonnes DW	forward of 0.2 L:	0.25 m
	aft end:	0.30 m
Vessels smaller than 100 000 tonnes DW	forward of 0.2 L:	0.10 m
	aft end:	0.30 m

To avoid cargo flowing around the accommodation/poop deck, a transverse fishplate shall be arranged at the aft end of the cargo area. At the outer end the transverse fishplate shall have the same height as and be connected to the aft end of the gutter plate.

302 For the collection of possible oil spills during cargo operations on tankers for oil, dry cargo, container ship, ro-ro ships and ferries, the main deck in cargo area shall be fitted with a drainage system with discharge to a deck collecting tank or a slop tank. The drainage system may be arranged either with a manually operated valve, or with an automatic deck scupper drainage system.

The drainage shall be used during cargo operations where spillage may occur, and shall not affect normal deck drainage when at sea. When at sea drainage from the deck area shall be ensured to avoid free surface effects with negative impact on the vessel's stability.

303 On tankers for oil or tankers for chemicals, all cargo manifolds shall be fitted with drip/spill trays with arrangements for draining. The drip/spill trays shall have the following minimum dimensions:

- length: beyond forward and aft ends of the manifold
- width: at least 1.8 m, though such that the spill tray extends at least 1.2 m outboard of the end of the manifold flange
- depth: minimum depth 0.3 m.

304 Tankers for oil or tankers for chemicals shall have fitted means to adequately support hoses in way of vessel's side abreast of manifolds. The support shall preferably be arranged as a horizontal curved plate or pipe section.

305 Tankers for oil or tankers for chemicals shall have fitted a closed sounding system and an overflow alarm which is independent of the closed sounding system.

306 Other vessels carrying oil-containing liquids in bulk shall be equipped with arrangements as specified under Oil bunkering arrangements in C400.

Guidance note:

This applies to e.g. supply vessels and other vessels carrying fuel oils and oil-based mud.

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This requirement does not apply to tanks carrying oily liquids during emergency operations only, e.g. tanks for oil recovered from oil spills at sea.

C 400 Oil bunkering arrangement

401 Fuel oil, lubricating oil, hydraulic oil and other oil bunkering tanks on all vessels shall be equipped with high level alarm to prevent overfilling.

402 Fuel oil, lubricating oil and other oil bunkering stations and other areas where spillage may occur shall be fitted with spill/drip trays to prevent oil escaping to sea. Minimum capacity: 80 litres for vessels between 300 and 1600 GT, 160 litres for vessels larger than 1600 GT. Any spills at the bunker station and overflow through oil tank vent pipes, respectively, shall have a reasonable chance of being trapped by the spill/drip tray.

403 Vent and overflow pipes for fuel oil tanks, lubricating oil tanks, hydraulic oil tanks and overflow tanks shall be fitted with spill/trays with the minimum following capacity: 40 litres for vessels between 300 and 1600 GT, 100 litres for vessels larger than 1600 GT.

The specified minimum volume of the above spill/drip tray shall be obtained under all normal trim and for a maximum heel and trim inclination of +/-15 degrees.

Volume for the pipes shall be deducted from the tray capacity in the volume calculations.

Coaming height shall be minimum 15% of the largest horizontal dimension.

Drawings showing spill/drip trays dimensions and volume calculations shall be submitted for approval.

404 Tanks with no risk of causing environmental contamination due to overfilling need not comply with 401 and 402. Typically this applies to internal tanks, e.g. engine room dirty oil and sludge tanks.

C 500 Ballast water

501 Ballast water discharges from vessels shall comply with the D-1 or D-2 standard of the International Convention for the Control and Management of Ships' Ballast Water and Sediment with amendments and Guidelines.

502 Requirements for the applicable standard given in Pt.6 Ch.18 shall be complied with.

Guidance note:

Requirements for the D-1 standard are given under **BWM-E** class notation while those for the D-2 standard are given under **BWM-T** notation.

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503 Vessels with additional class notations **BWM-E**, **BWM-EP** or **BWM-T** (Pt.6 Ch.18), are considered to fulfil the requirements above.

C 600 Bilge water

601 Discharge criteria for bilge water apply to all vessels as defined by MARPOL 73/78, Annex I, reg. 14 and 15.

602 In addition to requirements specified by MARPOL Annex I, the vessel shall be arranged with a bilge holding tank with facilities for delivery ashore.

C 700 Garbage

701 Disposal criteria and garbage management plan apply to all vessels as regulated by MARPOL, Annex V, reg. 3, 4, 5, 6 and 9.

C 800 Sewage

801 All vessels shall hold a valid International Sewage Pollution Prevention Certificate or a certificate / statement of compliance with MARPOL 73/78 Annex IV.

802 All vessels shall be equipped with an approved sewage comminuting and disinfecting system (see MARPOL 73/78, Annex IV, reg.9), and a sewage holding tank. Sewage shall at least be treated by comminuting and disinfecting system prior to discharging.

Alternatively the vessel shall be equipped with a sewage treatment system. The sewage treatment system shall be type approved (see MARPOL 73/78, Annex IV, reg.9).

803 Discharge requirements from MARPOL Annex IV reg.11 shall be followed. Sewage treatment and discharge shall be carried out according to approved sewage treatment procedures.

Sewage treatment procedure and log shall be included in the sewage management plan. The plan should also include procedure for using the log.

804 Vessels are not allowed to discharge untreated sewage to sea, except for situations where:

- it is necessary in order to save vessel or life at sea, or
- the vessel or its equipment has been damaged and all reasonable precautions have been taken, before and after the discharge, in order to minimize the effects of the discharge.

805 All sewage discharges, whether to sea or to reception facilities shall be recorded with description of date, location and quantity of sewage discharged. Alternatively start and stop of sewage treatment plant may be logged in place of discharged quantity.

In emergency cases where untreated sewage is discharged to sea, the records shall include information on the vessel's speed and distance to nearest shore at the time of sewage discharge.

806 Sewage system ventilation pipes shall be independent from other ventilation piping systems.

807 Drain from galley shall be fitted with a grease trap, connected to the sludge tank.

C 900 Antifouling

901 The vessel shall carry a Statement of Compliance with International Convention on the Control of Harmful Anti Fouling Systems.

902 Anti fouling paint systems containing TBT as the active ingredient are not permitted.

C 1000 Oil/Water interfaces

1001 Oil/water interfaces considered are:

- tailshaft lubrication
- rudder bearings
- sea water cooled engines
- hydraulically operated equipment.

1002 Oil/water interfaces oil consumption shall be monitored. If evidence of leakage is found, corrective action shall be initiated and recorded in the oil/water interface log.

Guidance note:

The method for monitoring oil/water interface oil consumption may be automatic, or manual. Follow up shall be such that smaller leaks are discovered to enable implementation of corrective action in case such leak is discovered.

This requirement is in addition to the low level alarm for the stern tube lube. oil header tank, ref. Pt.4 Ch.4 Sec.1 Table E1.

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1003 Where non-oil lubricated type bearings are used, no monitoring is required.

D. Other Aspects

D 100 Environmental responsibilities

101 All vessels shall have a responsible Environmental Officer onboard. Name of the officer in charge and relevant duties shall be listed in the Clean Manual. This person shall be responsible for the following:

- compliance with current environmental regulations
- management and control of the procedures and activities relevant to the requirements of this section
- implementation and use of relevant procedures
- upkeep of relevant logs
- training of personnel in relevant environmental practices.

The Environmental Officer may delegate tasks to other personnel but will remain responsible for the environmental conduct of the vessel.

SECTION 3 CLASS NOTATION CLEAN DESIGN

A. Introduction

A 100 General

- 101** The rules cover areas for emissions to air and discharges to sea similar to those described in Sec.2 A100.
- 102** In addition, the design of the vessel is covered by the class notation **CLEAN DESIGN**.
- 103** Documentation required to be submitted for approval and verification of compliance with the rules is specified in Sec.1 C100.

B. Emissions to Air

B 100 General

- 101** Compliance with the rules shall be verified by means and measures as identified in Sec.1 C.
- 102** All fuel oils intended for use onboard shall meet the requirements given in Sec.2 B100.

B 200 NO_x Emissions

- 201** Requirements for NO_x emissions from diesel engines apply to all diesel engines with power output in excess of 130 kW, except emergency diesel engines, engines installed in lifeboats and any other device or equipment intended to be used solely in case of emergency.
- 202** The maximum limits for NO_x per kWh, dependent on engine type as identified by engine r.p.m., is specified in Table B1.

n < 130 RPM	14.4 g/kWh
130 < n < 2000 RPM	44.0 n ^(-0.23) g/kWh
n > 2000 RPM	7.7 g/kWh

- 203** Equipment, arrangements and documentation for NO_x reduction shall be according to Sec.2 B202.

B 300 SO_x emissions

- 301** The requirements in B300 shall apply to any fuel consumed onboard, including but not limited to fuel for diesel engines, boilers, incinerators.

Guidance note:

Incineration of sludge is not subject to the requirement in B300.

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- 302** The maximum sulphur content in fuel oil carried onboard is 2.50% S. In case of demonstrated non-availability, fuel with sulphur content of 3.00% can be used.
- 303** When in ports or in SO_x-controlled areas only, the allowable maximum sulphur content in the fuel oil used is 1.00% S. Changes of fuel type when entering and leaving port, or SO_x-controlled areas shall be documented by entries in the vessel's logbook.
- 304** In areas with local regulations for sulphur content in fuel the stricter requirement shall apply. Changes of fuel type to comply with local regulations shall be documented by entries in the vessel's log book.
- 305** As an alternative to what required in para 302, 303 and 304, engines can control the emission of SO_x through an exhaust gas cleaning system or by other methods according to Regulation 4 of revised MARPOL Annex VI. The SO_x content of the exhaust gas shall be verified in accordance with relevant standards (Resolution MEPC 184(59) adopted on 17 July 2009). Such equivalent system shall be dimensioned to ensure continuous compliance when and where operating.
- 306** When in ports and where applicable, in alternative to the use of Low Sulphur Fuel, the vessel can use electrical shore connection. In this case requirements as listed in Section 4 shall be fulfilled.

B 400 Refrigerants

401 Emission criteria for refrigerants onboard shall comply with requirements given in Sec.2 B400.

402 The refrigerant shall be either a natural refrigerant (e.g. NH₃ or CO₂), or alternatively an HFC complying with:

403 GWP ≤ 1890 and ODP = 0.

Guidance note:

As an alternative to GWP ≤ 1890 documented equivalent TEWI (Total Equivalent Warming Impact) may be accepted.

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404 Design and operational requirements in Sec.2 B405 through 410 shall be complied with.

B 500 Cargo evaporation

501 Criteria for emissions from cargo evaporation apply to tankers carrying crude oil, petroleum products or chemicals with flash point less than 60°C, similar to those required in Sec.2 B500.

502 Vessels shall comply with the Revised MARPOL Annex VI Regulation 15.

503 Tanker for oil or oil products and tanker for chemicals shall hold a valid class notation **VCS-2**, see Ch.10 Sec. 1 A200.

B 600 Fire fighting substances

601 Natural substances used in fixed fire fighting systems are not considered damaging to the atmosphere. If other substances are used in fixed fire fighting systems that may have a global warming potential, the used substance shall comply with:

GWP < 1650

ODP = 0.

Guidance note:

Natural substances: Natural substances: e.g. argon, nitrogen, water spray, high expansion foam, CO₂. Note that CO₂ in this context is considered a natural substance without ODP or GWP since it will utilise CO₂ already present in the atmosphere.

Other substances: E.g. industrial substances including Hydrofluorocarbons (HFC) and Sulphur fluorides.

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B 700 Shipboard incinerators

701 Incinerator shall be installed, unless the vessel will have enough capacity for 100% delivery to shore.

702 Incinerators shall be designed, constructed and operated according to design and operational criteria for incinerators specified in Sec.2 B700.

C. Discharges to Sea

C 100 General

101 Compliance with the rules in C shall be verified by means and measures as identified in Sec.1 C. Actual discharges shall be recorded as specified in Sec.1 C.

102 Vessels with class notations **Tanker for Oil** or **Tanker for Chemicals** shall as a minimum have a double skin arrangement in the cargo area complying with MARPOL 73/78, Annex I, reg. 19, 20 and 21. Tank- and piping arrangement and hull subdivision shall be such that ballast tanks or piping systems are not contaminated by cargo.

103 Vessels with class notation **Tanker for Oil** with the deadweight of less than 5000 tonnes shall as a minimum have a double skin arrangement in the cargo area complying with the dimensions given in MARPOL 73/78, Annex I, reg. 19.6. Single skin cargo wing tanks are not accepted.

104 Hull arrangement including cargo tanks for other vessels carrying oil-containing liquids in bulk shall comply with requirements in D100.

Guidance note:

This applies to e.g. supply vessels and other vessels carrying fuel oils and oil-based mud.

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C 200 Residues of cargo oil and chemicals

201 General requirements to discharge of cargo residues are as given in Sec.2 C200.

On tankers for chemicals the maximum allowable remaining cargo quantity shall be 0.05 m³ for pollution categories X, Y and Z. The pollution categories are defined in MARPOL Annex II, Regulation 6.

202 Cargo tanks shall be designed with smooth surfaces and be equipped with cargo wells, or equivalent, for efficient stripping.

Guidance note:

Under-deck longitudinals of slab type are acceptable. Horizontal areas on stiffeners and brackets should be avoided, if possible. Horizontally corrugated bulkhead plating is acceptable with maximum angle of corrugations being 65°. Vertical girders in horizontally corrugated bulkheads will be accepted.

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203 Where applicable on tankers for oil, the COW efficiency shall be such that coverage of minimum 96% is obtained, as documented by shadow diagrams.

C 300 Cargo handling

301 Tankers for oil or chemicals shall have fitted and implemented means and arrangements to reduce the likelihood of cargo spill on deck reaching the sea, as given in Sec.2 C301.

302 For the collection of possible oil spills during cargo operations on tankers for oil the tank deck area shall be fitted with a closed drainage system with discharge to a deck collecting tank or a slop tank. The drainage system may be arranged either with a manually operated valve, or with an automatic deck scupper drainage system.

The drainage shall be used during cargo operations where spillage may occur, and shall not affect normal deck drainage when at sea. When at sea, drainage from the deck area shall be ensured to avoid free surface effects with negative impact on the vessel's stability.

303 On tankers for oil or tankers for chemicals, all cargo manifolds shall be fitted with drip/spill trays with the minimum dimensions as given in Sec.2 C300.

Manifold connections and spill trays shall be fitted with adequate means for closed drainage to a deck collecting tank or slop tank.

304 Tankers for oil or tankers for chemicals shall have fitted means to adequately support hoses in way of vessel's side abreast of manifolds, as given in Sec.2 C300.

305 Tankers for oil or tankers for chemicals shall have fitted a closed sounding system and an overflow alarm which is independent of the closed sounding systems.

306 Other vessels carrying oil-containing liquids in bulk shall be equipped with arrangements as specified in Sec.2 C306.

C 400 Oil bunkering arrangement

401 Fuel oil, lubricating oil and other oil bunkering arrangements shall be as given in Sec.2 C400.

402 Spill/drip trays shall be fitted with closed drainage to a deck collecting tank or slop tank.

C 500 Ballast water

501 Ballast water discharges from vessels shall comply with the D-2 standard of the International Convention for the Control and Management of Ships' Ballast Water and Sediment with amendments and Guidelines.

502 Requirements for the applicable standard given in Pt.6 Ch.18 shall be complied with.

Guidance note:

Requirements for the D-2 standard are given under **BWM-T** notation.

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503 Vessels with additional class notations **BWM-T** (see P.6 Ch.18), are considered to fulfil the requirements above.

C 600 Bilge water and oil residues (sludge)

601 All parts of the bilge water system and sludge system, including pipes, valves, pumps and oil water filtering/separating equipment shall be fitted with labels/colour codes in order to easily identify the different piping systems.

602 The bilge alarm shall be calibrated every 2,5 years at IOPP or Class Certificate intermediate and renewal surveys and set to 5 ppm. Calibration Certificate for 5ppm bilge alarm shall be available onboard for inspection

all the time.

603 Bilge water separator and bilge alarm combined with an automatic stopping device shall be provided for all vessels irrespective of size in a way that no overboard effluent contains more than 5ppm of oil products and oil burning contaminants

604 There should be no interconnections between the sludge tank discharge piping and bilge water piping other than possible common piping leading to the standard discharge connection. Drainages from machinery spaces and other spaces where the oil contaminated water may be present, shall not be pumped directly overboard but be kept in bilge tank(s) for discharge ashore and/or pumped overboard through the 5ppm bilge alarm.

605 The effluent for the 5 ppm bilge alarm should be capable of being returned to the bilge water tank (recycling line).

606 The minimum total capacity of the bilge water tank(s) shall be as given in Table E1.

Table E1 Capacity of bilge water tanks	
<i>Main engine rating (kW)</i>	<i>Minimum Capacity (m³)</i>
Up to 1000	4
Above 1000 up to 20 000	P/250
Above 20 000	40 + P/500
P = main engine rating in kW.	

607 Bilge system of the vessel shall contain Bilge Settling Tank in addition to Bilge Holding tank. Means for surface decanting and bottom sediments drainage leading through the hopper into the sludge tank shall be provided.

608 Boiler soot cleaning and blow down shall lead into the bilge tank or the separate tank installed for this purpose with discharge to overboard through the Bilge Water Separator or to shore facilities.

609 A Processed Clean Bilge Water Tank may be fitted in order to store water that has passed through the bilge water separator, but which can not be discharged overboard during the voyage due to local restrictions.

610 Prior to discharge overboard, water from the Processed Clean Bilge Water Tank shall be led through the 5ppm bilge alarm combined with an automatic stopping device by means of a separate Processed Clean Bilge Water Pump.

611 If overboard effluent through 5ppm bilge alarm come from multiple sources (Bilge Water Separator, Processed Clean Bilge Water Pump, etc.) then interlock shall be provided for all these sources in such a way that only one source is able to discharge overboard at one time.

612 All vessels shall be arranged with collecting tanks and systems for handling oil residues including sludge, waste oil, drain oil etc. (oil residue/sludge tank) in accordance with general requirements of Pt.4 Ch.6 Sec.4 M.

613 The oil being discharged from the oil water separator shall be directed to an oil residue (sludge) tank

614 The sludge tanks should be below the heavy fuel oil and lubricating oil purifiers, if installed. The pipelines from purifiers should, wherever possible, be straight or fitted with a large radius elbow. Drain lines from sludge tanks below purifiers to the bilge tank (or, as an alternative, to the sludge tank) shall be provided with self-closing valves and hoppers.

615 Drain oil shall be collected through fixed drainage arrangement directly to the sludge tanks. If necessary a sludge transfer pump may be used to pump the sludge tank. Drip trays and coamings of sufficient height shall be provided under *all* equipment where oil spill may be present, such as diesel engines, burners, hydraulic motors, pumps, heaters, coolers, filters and tanks in order to contain spillage of oil.

616 The drip trays and coamings for equipment not fitted with closed drainage to the sludge tanks shall be collected in the oil residue collecting tank and this emptying procedure shall be incorporated into the Bilge Water and Sludge Management Plan.

C 700 Garbage

701 Disposal criteria and other requirements for garbage as given in Sec.2 C700 shall be complied with.

702 The vessel shall be equipped and arranged for sorting, minimising and storing garbage prior to incineration or delivery to shore. Vessels shall have sufficient capacity to allow 100% delivery to shore, or incineration where permitted. The vessel shall be equipped and arranged for sorting, collecting, minimising and storing garbage prior to incineration or delivery to shore.

703 In order to increase the recycling of waste on shore, collecting and storing of garbage onboard the vessel shall as a minimum be separated into the following categories:

- Recyclable waste
- Non-Recyclable waste
- Food waste
- Hazardous waste

704 Depending on the shore based waste management facilities in different areas, non-Recyclable wastes can be considered differently. It is recommended that light bulbs, glasses, plastic coated papers, plastic bags, packing materials and crockery are considered as non-Recyclable wastes.

705 Metals, Aluminium cans, plastic, wood and paper products should be treated as Recyclable wastes. In order to be able to fulfil the MARPOL disposal criteria, plastics shall as a minimum be collected and stored in separate containers or bins.

706 Hazardous waste is considered as any type of waste that should be handled in a special manner in order to avoid or minimize its potential danger to human health or the environment, including but not limited to asbestos, plastics containing PCBs, refrigerants, heavy metals (mercury, lead, cadmium, etc), electronics, batteries, oily rags and paints.

707 Food waste, in any form, shall not be discharged into a vessel's sewage treatment plant. It is required that ground food waste to be directed to a holding tank when the vessel is operating within an area where discharge is prohibited. If any design can show that systems can handle black/grey water contaminated with ground food, it will be acceptable as alternative to the discharge into a vessel's sewage treatment plant.

Vessels with class notations **Passenger Ship** or **Car Ferry A** (or **B**) shall not dispose any waste to sea except for food waste when having passed through a grinder or comminuter for food waste and where permitted by international and local legislation.

C 800 Sewage

801 Requirements to sewage discharge and handling as given in Sec.2 C800 shall be complied with, except where superseded by requirements 802 to 804.

802 The vessel shall be equipped with a sewage treatment system. The sewage treatment system shall be type approved according to MEPC.159(55).

803 Grey Water shall be treated in the vessel's Sewage Treatment Plant(s).

804 Vessels sailing in protected areas, like the Black Sea, or in ports where local requirements prohibit any discharge, they shall have sufficient holding capacity to store sewage and grey water onboard.

Relevant documentation shall be provided and it will be evaluated case by case, based on vessel type and number of persons the vessel is certified to carry.

Guidance note:

Ballast tank(s) can be used as temporary holding tanks for treated sewage and treated grey water by means of non-permanent connection. The Ballast Tank(s) can be emptied, to sea by the vessel's ordinary ballast pump system, or to standard sewage shore discharge connection on deck, by means of non-permanent connection. (Non-permanent connections (spool-pieces) shall be used in order to have proper separation between ballast system and MARPOL Annex IV System).

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805 Sewage and grey water holding tank(s) shall be fitted with high level alarm.

C 900 Antifouling

901 Requirements given in Sec.2 C900 shall be complied with.

C 1000 Oil/water interfaces

1001 Requirements to monitoring and control of oil/water interfaces given in Sec.2 C1000 shall be complied with, unless the requirements as listed in Sec.3 C1100 are fulfilled.

C 1100 Stern tube bearing lubricants

1101 The lubricant used for stern tube bearing systems shall be water or biodegradable.

Guidance note:

If biodegradable stern tube oil is used, this will be subject to special consideration. Biodegradable stern tube oils must be classified as "Readily biodegradable" according to test method "OECD 301 A-F" and classified as "non-toxic" according to test method "OECD 201", "OECD 202" and "OECD 203". The test must be carried out by an accredited test institute.

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1102 All relevant drawings documenting the installation of water lubricated stern tube arrangement shall be

submitted for approval.

1103 For the other Oil /water interface systems, requirements given in Sec.2 C1000 shall be complied with.

D. Construction and Design

D 100 Oil tank protection

101 The requirements in D100 and D200 apply to tanks for fuel oil, lubricating oil, hydraulic oil and waste oil (sludge), including overflow tanks. Tanks with capacity below 10 m³ can be located in the double bottom provided that the total capacity of these unprotected tanks will be less than 40 m³.

The requirements also apply to cargo tanks on vessels coming under regulation 2.2 of MARPOL Annex I.

102 Individual tanks shall not have a capacity of over 1500 m³.

103 Tanks shall be located above the moulded line of the bottom shell plating nowhere less than the distance h as specified below:

$$h = B/20$$

or

$$h = 2.0 \text{ m, whichever is the lesser.}$$

The minimum value of $h = 0.76 \text{ m}$.

In turn of the bilge area and at locations without a clearly defined turn of the bilge, the oil fuel boundary line shall run parallel to the line of the midship flat of bottom as shown in Fig.1.

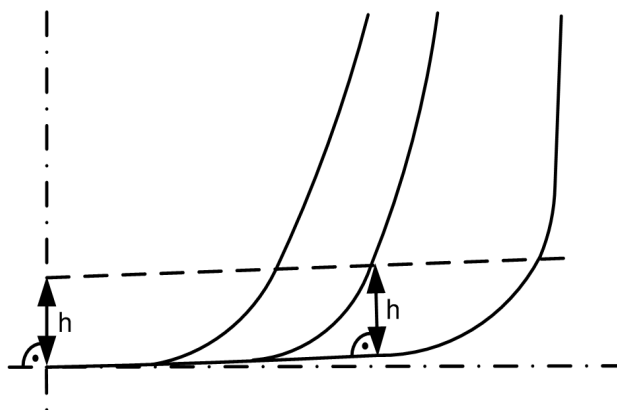


Fig. 1

104 For vessels having an aggregate oil tank capacity below 5000 m³ tanks shall be located inboard of the moulded line of the side shell plating, nowhere less than the distance w which, as shown in Fig.2, is measured at any cross-section at right angles to the side shell, as specified below:

$$w = 0.4 + 2.4 C/20\ 000 \text{ m}$$

Where C is the vessels total volume of oil tanks, in m³, at 98% tank filling.

The minimum value of $w = 1.0 \text{ m}$, however for individual tanks with an oil capacity of less than 500 m³ the minimum value is 0.76 m.

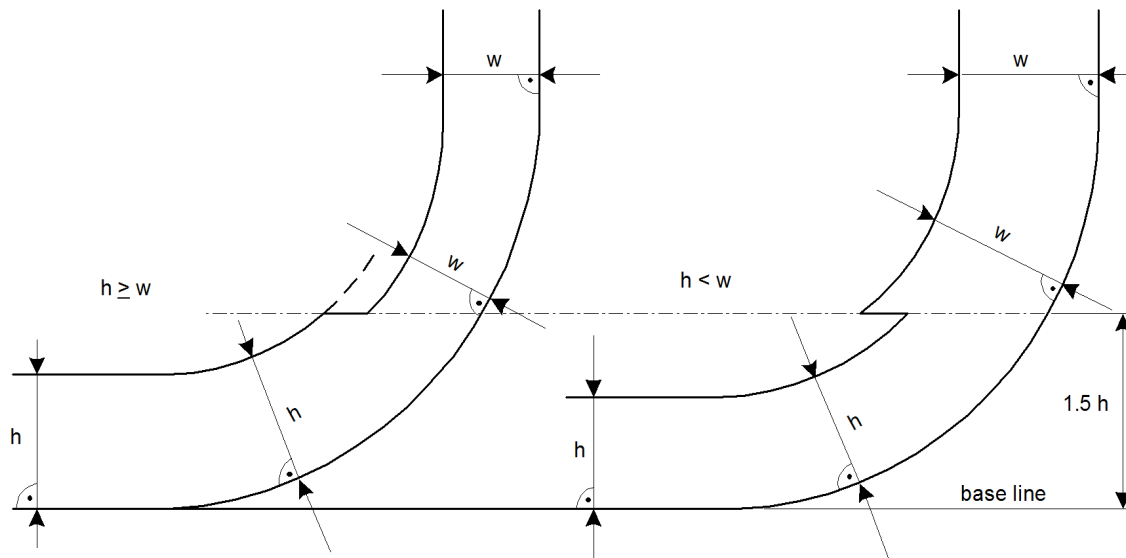


Fig. 2

105 For vessels with an aggregate oil tank capacity of 5000 m³ and over, tanks shall be located inboard of the moulded line of the side shell plating, nowhere less than the distance w which, as shown in Fig.2, is measured at any cross section at right angles to the side shell, as specified below:

$$w = 0.5 + C/20\,000$$

or

$w = 2.0$ m, whichever is the lesser.

The minimum value of $w = 1.0$ m.

106 Combined fuel oil and water ballast tanks shall not be arranged.

107 The skeg is not to be considered as offering protection for the oil tanks.

108 For the area within the skeg's width the distance “ h ” is to be measured perpendicular to a line parallel to the baseline at the intersection of the skeg and the moulded line of the bottom shell plating as indicated in Figure 3.

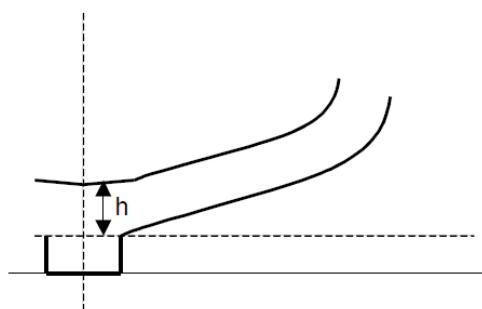


Fig. 3

109 For vessels designed with a permanent trim, the baseline should not be used as a reference point. The distance “ h ” should be measured perpendicular to the moulded line of the bottom shell plating at the relevant frames where fuel tanks are to be protected.

110 For vessels designed with dead rising bottom, the distance “ $1.5h$ ” should be measured from the moulded line of the bottom shell plating but at right angle to the baseline, as indicated in Figure 4.

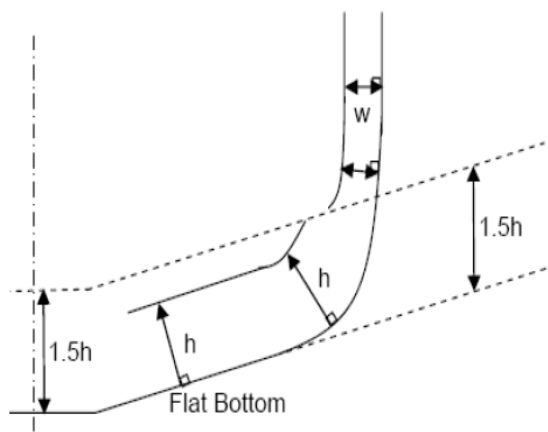


Fig. 4

D 200 Sundry

201 Lines of oil piping located at a distance from the vessel's bottom less than h , as defined in 103, or from the vessel's side less than w , as defined in 104 and 105 shall be fitted with valves or similar closing devices within or immediately adjacent to the tank. These valves shall be capable of being brought into operation from a readily accessible enclosed space the location of which is accessible from the navigation bridge or the propulsion machinery control position without traversing exposed freeboard or superstructure decks. The valves shall close in case of remote control system failure (fail to close) and shall be kept closed at sea at any time when the tank contains oil except when they may be opened during transfer operations.

202 Suction wells in oil tanks may protrude into the double bottom below the boundary line defined by the distance h provided that such wells are as small as practicable and the distance between the well bottom and the bottom shell is not less than $0.5h$.

D 300 Ship operation requirements

301 In the event of failure in the main propulsion system, alternative means of propulsion shall be available to allow the vessel to maintain manoeuvrability. This may be satisfied by vessels having **EP** class notation or a double drive train (engine shafting and propeller) and rudder system arrangement, or through a thruster arrangement. Any other propulsion arrangement will be subject to special consideration, ref. Sec.1. Table A1.

302 Vessels for which alternative means of propulsion is demonstrated not applicable (e.g. tankers), are not subject to 301.

Guidance note:

Vessels fulfilling the requirements specified for the class notation **RP** and **EP**, see Ch.2, satisfy this requirements.

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E. Other Aspects

E 100 Ship recycling

101 All vessels shall hold and maintain an Inventory of Hazardous Materials as required by the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Vessels (SR/CONF/45) and any subsequent additions or amendments hereto adopted at the relevant time. The Inventory of Hazardous Materials shall be prepared using the most recent Guidelines Resolution MEPC. 179(59).

102 Inventory of Hazardous Materials must be examined separately. Statement of Compliance with SR/CONF/45 shall be submitted.

103 Vessels which hold class notation **RECYCLABLE** (Ch.27) fulfil the requirements of E100.

104 The vessel shall be subject to an initial survey before a Statement of compliance according to the convention is issued.

E 200 Environmental responsibilities

201 Requirements to a responsible Environmental Officer as defined in Sec.2 D200 shall be complied with.

SECTION 4 ELECTRICAL SHORE CONNECTIONS

A. General

A 100 Introduction

101 This document is related to the design, installation, operation and verification of electrical shore connections intended for regular use in harbour for all types of vessels. Typical design intention is vessels following regular routes with frequent visits to the same ports, with port calls lasting more than 4 hours.

102 All electrical installations shall follow the requirements to electrical installations with respect to electrical safety (i.e. human safety and fire hazards), as given in Pt.4 Ch.8.

This guidance addresses additional technical details that need to be considered.

A 200 Availability

201 Availability of the shore power supply depends on the utility systems onshore. In addition, discriminative protection in the vessel's electrical distribution may not be functional while powered by a shore connection. Hence, use of shore power supply during loading and unloading operations in port must be evaluated with respect to criticality of electric power supply. This guidance does not consider any critical cargo operations, and assumes that the vessel will stay safe if a power interruption occurs.

A 300 Voltage and frequency

301 When a vessel is powered by shore power supply, the system voltage and frequency of the vessel must match the system voltage and frequency of the shore utility supply

A 400 Short circuit power from shore

401 A vessel's electrical distribution system is designed for a maximum short circuit current with respect to mechanical strength and circuit breaker rating. The system's discriminative properties (i.e. that the circuit breaker closest to a short circuit will trip, leaving the healthy part of the vessels electrical distribution system operational) depends on maximum and minimum values of the prospective short circuit current of the electric generation and distribution system onboard. In order to maintain discriminative protection in the vessel's distribution system, the shore power supply must have a short circuit capacity within the max and min values of the vessel's network. Typically when frequency converter is used, it is difficult or impossible to get high enough short circuit level. Therefore it is not required to have discrimination in order to fulfil these requirements.

A 500 Adoption / Adaptation

501 A shore power connection is not safe to use unless verification has been done assessing the interface between the specific vessel and the specific port with respect to voltage, frequency, short circuit power, and control system interface. Each vessel shall be designed and verified for each port where it will use the electrical shore connection.

A 600 Certification / Verification

601 A vessel's stay in port is not covered by class requirements to availability. The vessel is deemed safe as long as it is moored. Shore power supply system is therefore only considered by class on basis of its basic electrical safety, and operational features are not considered.

602 Component certification of electrical components necessary for the shore connection is generally not requested. An exception is the shore connection cable which shall be delivered with NV product certificate or be Type Approved. Verification is performed by document review and site survey.

B. System requirements

B 100 Criticality

101 When the power supply depends on the shore utility system, the vessel's operator must evaluate the consequence of loss of power during port stay. E.g. loss of power (blackout) can occur, hence critical operations must be considered before started.

B 200 System Earthing

201 The vessel's designed system earthing is to be maintained also in shore connection operation. The

selected design solution must be described in the documentation of the system. Additionally, regardless of chosen solution, there must be installed a protection that disconnects the shore power supply, both the shore side circuit breaker and the main switchboard feeder breaker, whenever an earth fault current flows in the protective earthing wire of the shore power cable.

202 There shall also be a monitoring system ensuring proper connection between shore ground and hull.

B 300 Main switchboard, shore connection incoming feeder

301 The main switchboard's incoming feeder shall have an under-voltage trip, disconnecting the shore power supply in case of loss of power on the incoming feeder.

B 400 Stand by generator

401 While the shore connection is supplying power to the vessel, at least one of the vessel's generators shall be in stand by. I.e. this generator shall be automatically started and connected to the main switchboards in case of blackout (loss of power supply from shore).

B 500 Transfer of power

501 In order to transfer power between the vessel's supply and shore, means for synchronization shall be arranged in the main switchboards.

B 600 Shore connection box

601 A separate shore connection box is not required if the main switchboards breaker has overcurrent protection. The short circuit protection of the cable between the shore supply circuit breaker and the main switchboard's shore power incoming feeder shall be performed by the short circuit protection on the shore side supply system.

B 700 Control system

701 A control system shall be arranged onboard the vessel for the shore connection system. This system shall trip both shore side breaker and main switchboard incoming feeder in case of:

- high mechanical tension of the shore connection cable
- earth fault
- short circuit / overcurrent
- shore side under voltage
- cable break
- failure of protecting earthing connection.

702 There shall be an interlock preventing closing of shore circuit breaker unless shore connection is connected and earthing switch opened.

B 800 Emergency disconnection

801 An independent system for emergency disconnection shall be arranged with emergency stop push buttons at the cable entry at vessels side and in the engine control room.

B 900 Power transformers on board

901 If a power transformer is installed onboard for adaptation of the shore connection system voltage and the main switchboard voltage, the transformer shall include overvoltage protection, protecting the vessel against lightning impulse over voltages.

902 Overvoltage protection shall be arranged for lower-voltage systems supplied through transformers from high-voltage systems.

Guidance note:

Direct earthing of the lower voltage system, or the use of voltage limitation devices, are considered adequate protection. Alternatively, an earthed screen between the primary and secondary windings may be used. See Pt.4 Ch.8 Sec.3 D400 regarding current and voltage transformers.

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B 1000 Instrumentation

1001 Shore connection shall be equipped with the following instrumentation:

- a phase sequence indicator
- a voltmeter and
- a Ampere meter.

B 1100 Earthing switch

Upon opening of the shore side circuit breaker an earth switch shall automatically connect all phases of the cable to earth, to discharge the cable and ensure connection to earth. It shall not be possible to open the earth switch unless the shore connection is connected and protective earth connection between the vessel and shore is verified.

C. Installation requirements

C 100 Marking

101 All high voltage equipment shall be marked with high voltage warning sign

D. Cable

D 100 General

101 All cables shall be DNV type approved or case by case approved.

E. Port requirements

E 100 Isolating transformer

101 The shore supply power shall be delivered by a transformer giving galvanic separation from the shore earthing system. Further primary /secondary windings shall be separated for lightning protection.

102 Overvoltage protection shall be arranged for lower-voltage systems supplied through transformers from high-voltage systems.

Guidance note:

Direct earthing of the lower voltage system, or the use of voltage limitation devices, are considered as adequate protection. Alternatively, an earthed screen between the primary and secondary windings may be used. See Pt.4 Ch.8 Sec.3 D400 regarding current and voltage transformers.

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F. Cable and cable management

F 100 General

101 Shore connection cable can be arranged either onboard the vessel or situated at key. In both situations a cable handling system must be arranged.

F 200 Cable handling

201 There shall be installed equipment enabling efficient cable handling and connection. The arrangement shall be designed in such a way that the number of persons involved is kept to a minimum and connection is as easy as possible. The equipment shall ensure mechanical tension control of the cable and provide interlock to the cable control system.

F 300 Plugs

301 The shore connection cable shall be connected by plug connection. Plugs shall be designed in such a way that incorrect connection is not possible. Further connection with power on should not be possible.

G. Certificate of compliance

G 100 General

101 Each vessel shall be designed and verified towards each port where it will use the electrical shore connection, and this shall be included in the certificate.