

Rules for Classification and Construction

VI Additional Rules and Guidelines

12 Environmental Protection



1 Guidelines for the Environmental Service System

The following Guidelines come into force on 1 October 2012.

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Section 1

General Information

A. Scope and Application

1. Scope

1.1 General

These Guidelines aim to reduce the environmental impact of shipping beyond the requirements of the relevant mandatory regulations. The stricter requirements always take into account expected future regulatory requirements.

The goal shall be achieved by assessment and certification of technical processes and installations of mandatory international standards. The core elements of GL's Environmental Service System are the Class Notations:

EP-D (Environmental Passport – Design)

and

EP-O (Environmental Passport - Operation).

In addition an Environmental Passport - Operation Certificate is also an element of the scheme, c.f. 2. for details of application.

Prerequisite for certification of the special environmental protection properties is meeting the following requirements:

- The properties can be achieved by means of commercially available processes and equipment offering high quality and reliability.
- For the purposes of verification, technical standards or reliable technical procedures / methods do exist.

Derived from the systematic analysis of developments in environmental protection and legislation, Germanischer Lloyd continuously develops more stringent environmental requirements for the implementation of new Environmental Service Systems.

The development of the guidelines takes place under continuous supervision and advice of the GL "Technical Committee Environment".

1.2 Environmental Passport - Design

On meeting the technical requirements set out in Section 2, the ship may be assigned the Class Notation **EP-D**. This comprises of the Environmental Passport Certificate, in combination with certificates issued by the flag state and further certificates, statements of compliance and test certificates issued by GL and/or other organizations, as appropriate.

On request, GL will also examine and document in the Environmental Passport - Design Certificate, the environmental protection properties of the ship exceeding the requirements outlined in [D.](#) and [Section 2.](#)

1.3 Environmental Passport - Operation

The Class Notation **EP-O** documents the environmental operational performance of an individual ship.

The relevant requirements are described in [Section 3.](#) The amount of operational emissions is documented in an emission inventory. The inventory, once established and checked for completeness, accuracy and for compliance with applicable IMO thresholds, except where otherwise specified in these Guidelines, will be certified for an agreed time period by Germanischer Lloyd and has to be renewed periodically. Generally a one year period is recommended, however shorter periods may be considered to suit the reporting requirements of the ship / operator, subject to minimum data available for proper assessment.

Accidental emissions into the sea or into the air are not a subject of these Guidelines.

2. Application

These guidelines apply to all ships for which the Environmental Passport is ordered, on or after the publication date of the guidelines, independent of the vessel's age and size.

Ships with GL class will be assigned the Class Notation **EP-D** upon verification of compliance with the requirements.

The Environmental Passport - Operation Certificate is ship specific and may be issued irrespective of the vessel's class.

The Class Notation **EP-O** shall be granted for GL classed vessels exclusively.

B. Definition and Terminology

For the purpose of the present Guidelines, the following nomenclature applies.

Ballast Water means ambient outboard water including suspended matter contained therein taken on board a ship to control trim, list, draught, stability or stresses of the ship.

BWM means Ballast Water Management and comprises mechanical, physical, chemical and biological processes, either singularly or in combination, to remove, render harmless, or avoid the uptake or discharge of harmful aquatic organisms and pathogens within ballast water and sediments.

CFC means Chlorofluorocarbons.

CO₂ means Carbon Dioxide.

ECA stands for Emission Control Area, where the adoption of special mandatory measures for emissions from ships is required to prevent, reduce and control air pollution from NO_x or SO_x and particulate matter or all three types of these emissions.

EEDI means Energy Efficiency Design Index.

EEOI means Energy Efficiency Operational Indicator.

Emission means any release of substances from ships into the atmosphere or sea over a specified area and period of time subject to control by these Guidelines.

FSS Code means International Code for Fire Safety Systems.

Fuel Oil or Oil fuel means any fuel delivered to and intended for combustion purposes for propulsion or operation onboard a ship, including distillate and residual fuels.

GWP means Global Warming Potential (relative measure of the heat absorbing ability of a certain greenhouse gas relative to that of the corresponding mass of carbon dioxide, where the GWP of CO₂ is standardized to 1.0, with values being calculated over a 100-year time horizon).

Harmful Aquatic Organisms and Pathogens means aquatic organisms or pathogens which, if introduced into the sea including estuaries, or into fresh water courses, may create hazards to the environment, human health, property or resources, impair biological diversity or interfere with other legitimate uses of such areas.

HCFC means Hydro Chlorofluorocarbons.

IACS means International Association of Classification Societies.

IBC Code means International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk.

ICE means Internal Combustion Engine.

IGC Code means International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

IHM means Inventory of Hazardous Materials.

IMO means International Maritime Organization.

IMDG Code means International Maritime Dangerous Goods Code.

Incinerator means a shipboard facility designed for the primary purpose of incinerating solid waste generated during the operation of the ship.

MARPOL73/78 means International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, including the Annexes I to VI.

MEPC means Marine Environment Protection Committee.

Montreal Protocol means the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, and the respective amendments between 1990 and 1999.

MSC means Maritime Safety Committee.

NH₃ means Ammonia.

NO_x means Oxides of Nitrogen.

NO_x Technical Code means Technical Code on Control of Emissions of Nitrogen Oxides from Marine Diesel Engines, adopted by Resolution 2 of the 1997 MARPOL Conference, as amended.

ODS means Ozone Depleting Substances defined in Article 1 of the Montreal Protocol.

ODP means Ozone Depletion Potential. The ratio of the impact on ozone of a chemical compared to the impact of a similar mass of CFC-11. Thus, the ODP of CFC-11 is defined to be 1.0.

Oily Bilge Water means water which may be contaminated by oil from maintenance work in machinery spaces or minor leaks. Liquids entering the bilge system may also contain detergents.

Pax means passengers.

SCR means Selective Catalytic Reduction.

Sediment means matter settled out of Ballast Water within a ship.

Sewage means drainage and other wastes from toilets, medical premises via wash basins, wash tubs and scuppers located in such premises, drainage from spaces containing living animals or other waste waters when mixed with the drainages defined above.

Sludge oil means sludge from the fuel oil or lubricating oil separators, waste lubricating oil from main or auxiliary machinery, or waste oil from bilge water separators, oil filtering equipment or drip trays.

SO_x mean Oxides of Sulphur.

STS means Sewage Treatment System

TBT means Tributyltin.

VOC means Volatile Organic Compounds.

C. Documents to be Submitted

1. Documents to be submitted for Environmental Passport - Design

Equivalent information shall be submitted to GL if the following documents are not issued by GL:

- All mandatory certificates according to MARPOL 73/78 and Annexes as amended
- Documentation verifying compliance with MARPOL 73/78 Annexes as applicable
- List of environmentally relevant equipment, and corresponding documents not covered by MARPOL 73/78
- Measurement and assessment reports and documentation issued by authorities and by recognized or accredited bodies
- EEDI Statement of Compliance acc. to GL [Guidelines for Determination of the Energy Efficiency Design Index \(VI-13-1\), Section 2](#)

The following plans shall be submitted, if applicable:

- Fuel oil management plan
- Ballast water management plan
- Garbage management plan
- Details of the refrigeration system
- Details of the fire fighting system
- Details of the incinerator system
- Details of the sewage system
- Vapour emission control system, VOC Management Plan
- Details for emission reduction technologies, such as selective catalytic reduction (SCR) systems

The following certificates for noxious and/or dangerous cargoes shall be submitted if applicable:

- International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk
- International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk
- International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk

2. Documents to be submitted for Environmental Passport - Operation

Information on the emissions of the ship shall be submitted in a format suitable for electronic processing only. Relevant documents and data are described in [Section 3](#).

D. Further Rules and Standards to be Considered

1. GL Rules and Guidelines

- [Machinery Installations \(I-1-2\), Section 11, O.3.](#)
- [Guidelines on Ballast Water Management \(VI-11-10\)](#)
- [Guidelines for Determination of the Energy Efficiency Design Index \(VI-13-1\)](#)

2. National regulations

National regulations more stringent than described in these Guidelines remain applicable.

3. International regulations and codes

All basic requirements to be fulfilled are based upon mandatory and non-mandatory international regulations. A minimum set is defined by the following requirements:

MARPOL 73/78, Annex I-VI (if appl.), as amended:

- Annex I, "Regulations for the Prevention of Pollution by Oil"
- Annex II, "Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk"
- Annex III, "Regulations for the Prevention of Pollution by Harmful Substances Carried by Sea in Packed Form"
- Annex IV, "Regulations for the Prevention of Pollution by Sewage from Ships"
- Annex V, "Regulations for the Prevention of Pollution by Garbage from Ships"
- Annex VI, "Regulations for the Prevention of Air Pollution from Ships"
- Resolution MEPC.184(59), "2009 Guidelines for Exhaust Gas Cleaning Systems"
- Circular MEPC.1/Circ.671 "Guide to good Practice for Port Reception Facility Providers and Users"
- Resolution MEPC.212(63), "2012 Guidelines on the Method of Calculation of the Energy Efficiency Design Index (EEDI) for New Ships"
- Resolution MEPC.214(63), "2012 Guidelines on Survey and Certification of the Energy Efficiency Design Index (EEDI)"
- Resolution MEPC.215(63), "Guidelines for Calculation of Reference Lines for use with the Energy Efficiency Design Index (EEDI)"
- MEPC.1/Circ.684, "Guidelines for voluntary use of the Energy Efficiency Operational Indicator (EEOI)"

SOLAS 74/88, as amended:

- Chapter VII "Carriage of dangerous goods"

Other conventions, as amended:

- "International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001"
- "International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004"
- Resolution MEPC.197(62), "Guidelines for the Development of the Inventory of Hazardous Materials"

If any of the above Regulations is not applicable to the ship, it is also excluded for the purpose of these Guidelines.

E. Classification and Class Notations

The provisions in GL Rules for Classification and Surveys (I-0), Section 2 apply.

Notations of Environmental Passport - Design (**EP-D**) and Environmental Passport - Operation (**EP-O**) are voluntary and may be assigned only to ships in GL Class.

1. Class Notation Environmental Passport - Design

1.1 Character of Class Notation Environmental Passport - Design

The Class Notation **EP-D** will be assigned and included within the Class Certificate and the Environmental Passport - Design Certificate will be issued if all requirements in [Section 2](#) are fulfilled.

If necessary, an interim Environmental Passport - Design Certificate with a validity period of 5 months may be issued. The Environmental Passport - Design and the corresponding Class Notation are valid until the end of the current class period. In case of Environmental Passport - Design renewal for a further class period, the validity of Environmental Passport - Design and class period are identical.

In the event that certain parts of the Environmental Passport - Design lose their validity, the notation will become invalid as a whole and the corresponding Class Notation **EP-D** will be withdrawn. If the necessary surveys and certifications are obtained subsequently, the validity of the Environmental Passport - Design Certificate and the Class Notation **EP-D** will be reinstated to their original validity period.

1.2 Character of Class Notation Environmental Passport-Operation

The Class Notation **EP-O** will be assigned within the Class Certificate and the Environmental Passport - Operation Certificate will be issued if all requirements of [Section 3](#) are fulfilled.

The emissions can be certified only for the period for which the data is reported. An Interim Environmental Passport - Operation Certificate will be issued once the data collection systems have been established to GL's satisfaction. This can be achieved by an "Implementation Survey".

2. Surveys and audits for maintenance of class

All surveys for Environmental Passport - Design and Environmental Passport - Operation will be conducted in accordance to the GL Rules for Classification and Surveys (I-0), Section 3.

2.1 Surveys for Environmental Passport - Design

An initial survey as well as a renewal survey is required in accordance with the provisions of Regulation 4 of Annex IV of MARPOL 73/78.

Additionally to MARPOL 73/78 surveys are conducted as required in Section 2, e.g. for refrigerant systems.

The sewage treatment plant has to be examined and satisfactorily tested in accordance with IMO Resolution MEPC.159(55) to meet the operational requirements referred to in Regulation 9.1.1 of Annex IV of the International Convention for the Prevention of Pollution from Ships, 1973/78 as modified by Resolution MEPC.115(51).

2.2 Survey and audits for Environmental Passport - Operation

An initial survey is conducted. This consists of an office and/or ship audit, if considered necessary. The purpose of the audit is to confirm satisfactory implementation of data collection and transmission procedures; installation of equipment in accordance with [D](#). and Section 3. Compliance with quality management standards like ISO 9001 or ISM is a prerequisite to this audit for Environmental Passport - Operation.

The periodical survey is conducted to verify the consistency and accuracy of reported data. The survey includes office visits or/and onboard visits to review relevant onboard documentation as required. Random checks of mandatory record books / files are conducted to verify accuracy of submitted data.

Section 2

Environmental Passport Design

A. General

This Section describes the requirements to be fulfilled for the Class Notation **EP-D**. The technical requirements in this section assess characteristics of environmental relevance of ship design and equipment. Following emissions are addressed:

- a) Into the sea:
 - Oil and oily mixtures
 - Noxious and/or dangerous cargo
 - Sewage
 - Garbage
 - Ballast water
 - Anti-fouling systems
- b) Into the air:
 - Carbon Dioxide (CO₂)
 - Nitrogen Oxides (NO_x)
 - Sulphur Oxides (SO_x)
 - Ozone depleting substances (ODS)
 - Refrigeration systems
 - Fire Fighting
 - Shipboard incineration
 - Volatile Organic Compounds
- c) Additional requirements:
 - Inventory of Hazardous Materials

Additional voluntary design features reducing emissions further than required according to these Guidelines can be displayed in the Environmental Passport - Design Certificate at the request of the customer.

B. Emissions into the Sea

1. Oil and oily mixtures

Oil record books shall be provided in a form specified in Appendix III to Annex I of MARPOL 73/78.

The discharge of oily bilge water is prohibited, unless the oil content does not exceed 5 ppm.

All ships shall be equipped with a:

- 5 ppm bilge water separator

- 5 ppm monitor and alarm
- Automatic discharge stopping device

in accordance with the requirements for the equipment as detailed in the GL Rules for [Machinery Installations \(I-1-2\)](#), [Section 11, O.3](#).

Holding tanks shall be provided for collecting oily bilge water prior to its discharge, transfer or disposal ashore. The Holding tank capacity should have adequate capacity with regard to the intended type of service of the ship, to provide the ship the flexibility of operation in ports, coastal waters and special areas without the necessity to discharge or dispose. Guidance on tank capacity is provided within the above mentioned Chapter of GL-Machinery Rules.

2. Noxious and/or dangerous cargoes

For the transportation of noxious and/or dangerous cargoes, the applicable requirements of Annex II and Annex III of MARPOL 73/78, the IGC Code, the IBC Code and the IMDG Code shall be met.

Compliance with these requirements shall be demonstrated by means of the certificates listed in [Section 1, C.1.](#), depending on the ship type and the kind of cargo.

3. Sewage

All requirements according to Annex IV of MARPOL 73/78, Regulations for the Prevention of Pollution by Sewage for ships, apply to all ships. Compliance shall be verified with the International Sewage Pollution Prevention Certificate.

Discharge of sewage into the sea is prohibited unless any of the conditions of Regulation 3 or Regulation 11 of Annex IV of MARPOL 73/78 is applicable.

Standard dimensions of connections for shore discharge shall be in accordance with the data given in Regulation 10 of Annex IV of MARPOL 73/78.

All means of sewage treatment and the capacity of holding tanks on board shall be documented.

4. Garbage

The requirements of MARPOL 73/78, Annex V Regulations for the Prevention of Pollution by Garbage from Ships apply to all ships.

A Garbage Management Plan shall be established in accordance with Regulation 9 of Annex V of MARPOL 73/78 and kept on board. This plan shall provide procedures for the collecting, storing, processing and disposing of garbage, including the use of the

equipment on board. A designated person in charge of carrying out the plan is to be appointed.

Equipment shall be available on board for sorting, minimizing and storing the garbage prior to discharge or incineration.

A Garbage Record Book, comprising all relevant information of the discharge operations or completed incineration, shall be kept on board. All operations and each completed page shall be signed according to Regulation 9 (3) of MARPOL Annex V and the associated Appendix.

Every ship of 12 m or more in length overall shall display placards which notify the crew and passengers of the garbage disposal requirements of regulations 3 and 5 of Annex V of MARPOL 73/78.

Compliance with the above mentioned requirements is confirmed by a Certificate concerning the Prevention of Pollution by Garbage, which is issued by GL

5. Ballast water

All ships shall comply with the requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004) as well as the associated IMO guidelines.

Translocation of non-native organisms in ballast water and sediments of all ships shall be limited to a minimum. During ballasting, the uptake of organisms and sediments shall also be minimized by suitable precautionary measures.

Uptake and discharge of ballast water shall be carefully planned. Sediments in ballast water tanks shall be removed during routine cleaning and disposed safely in adequate reception facilities, ensuring that such sediments do not impair or damage the environment, human health, property or resources.

Ballast water shall be carried in segregated ballast water tanks.

Discharge of untreated ballast water is prohibited, except for special cases approved by the flag state and/or port state administration.

A ballast water management system comprising tanks for ballast water and the associated piping, pumping and treatment system shall be established to implement the treatment (or other method accepted as being equivalent).

A ship-specific ballast water management plan shall be drawn up in accordance with IMO Resolution A.868(20) and IMO MEPC Res. 127(53) – "Guidelines for ballast water management and the development of ballast water management plans" (G4).

The Ballast Water Management Plan is examined in accordance with the GL [Guidelines on Ballast Water Management \(VI-11-10\)](#) for compliance with the IMO resolutions and with other relevant requirements of the class.

A ballast water treatment plant, approved by a flag administration according to IMO Resolution MEPC.174(58), and MEPC.169(57) respectively as well as meeting the requirements of GL Rules for [Machinery Installations \(I-1-2\), Section 11, P.1.6](#) shall be installed.

6. Anti-fouling systems

Application of biocide free anti-fouling paints is recommended.

The application, re-application, installation or use of harmful anti-fouling systems containing organotin compounds which act as biocides is prohibited as of 1 January 2003.

The certification of TBT-free anti-fouling systems on ships shall comply with the "International Convention on the Control of Harmful Anti-Fouling Systems on Ships".

C. Emissions into the Air

The requirements refer to Annex VI, Regulations for the Prevention of Air Pollution from Ships of MARPOL 73/78.

These regulations shall not apply to:

- Emissions necessary for the purpose of securing the safety of a ship or saving life at sea, or
- Emissions resulting from damage to a ship or its equipment; see Annex VI, Regulation 3 of MARPOL 73/78.

1. Carbon Dioxide (CO₂) / Energy Efficiency

As concluded in the 2nd IMO GHG Study, MEPC 59/INF10, greenhouse gases emitted by international shipping contributed an equivalent of about 2.7 % to the global CO₂ emissions in 2007.

IMO developed the EEDI as a technical measure to successively improve a ship's efficiency. The index indicates the ship specific CO₂ emission per cargo capacity and distance sailed.

For the assignment of the **EP-D** notation an EEDI-Certificate is a requirement for the ship types defined in the Energy Efficiency Regulations of MARPOL Annex VI as amended and as described in GL [Guidelines for Determination of the Energy Efficiency Design Index \(VI-13-1\)](#).

Compliance with the above mentioned requirements is confirmed by the EEDI Statement of Compliance, which is issued by GL.

2. Nitrogen Oxides (NO_x)

The requirements refer to MARPOL Annex VI, NO_x Technical Code 2008. The requirements apply to diesel engines with a power output of more than 130 kW.

The requirements do not apply to marine diesel engines used solely for emergency purposes, such as diesel engines in lifeboats and emergency diesel engines.

Operation of each marine diesel engine to which these Guidelines apply is prohibited unless the emission of nitrogen oxides (calculated as the total weighted emissions of NO₂) from the engine is within the following Tier II limits according to MARPOL Annex VI:

- 14.4 g/kWh when n is less than 130 rpm
- 44.0 *n^{-0.23} g/kWh when n is 130 or more but less than 2000 rpm
- 7.7 g/kWh when n is 2000 rpm or more

where n is the rated engine speed measured in crankshaft revolutions per minute (rpm).

The operation of a marine diesel engine exceeding the applicable limit is prohibited unless an exhaust gas cleaning system or any other equivalent method, as approved by GL in accordance with the NO_x Technical Code 2008, is applied to the engine in order to reduce on-board NO_x emissions to at least the limit specified above.

Testing, survey and certification of marine diesel engines to ensure compliance with the NO_x emission limits shall be carried out according to the NO_x Technical Code 2008.

Any alternative technical solution according to Annex VI, Regulation 4 for NO_x reduction is permitted provided the requirements are fulfilled.

On request and on a voluntary basis, the average weighted NO_x emission value can be calculated from onboard measurements, if practicable. The measurements shall be performed according to the requirements of the NO_x Technical Code 2008. The measurements shall be carried out by an accredited control laboratory that is competent in the field of emission measurements on internal combustion engines and boiler plants running on gaseous and liquid fuels (e.g. accredited under the terms of EN ISO/IEC 17025, as applicable). The results shall be presented in a measurement report in accordance to ISO 8178-6 (2000).

The technical file of any marine diesel engine containing at least the information specified in section 2.4 of the NO_x Technical Code 2008 shall be approved and kept on board. Emphasis shall be laid on the description of a practicable system of onboard NO_x verification procedures which form the basis for periodical surveys.

3. Sulphur Oxides (SO_x)

The requirements refer to Revised MARPOL Annex VI, Regulation 14 as amended by Resolution MEPC.176(58) and apply to all ships.

Design and arrangement requirements for fuel tanks are provided in GL Rules for [Machinery Installations \(I-1-2\)](#), [Section 10, B.](#) and [Section 11, G.10.](#) and 11.

It is recalled (c.f. [Section 1, D.2.](#)) if national or regional regulations more stringent than MARPOL Annex VI are required, these regional regulations remain applicable.

Exhaust gas cleaning systems may be used to reduce the emissions of SO_x, provided that the requirements of Resolution MEPC.170 (57) – "Guidelines of Exhaust Gas Cleaning Systems" are met.

Any alternative technical solution according to MARPOL Annex VI, Regulation 14 for SO_x reduction is permitted provided such technical solution is at least as effective in terms of emission reduction as required by Resolution MEPC.184(59), "2009 Guidelines for Exhaust Gas Cleaning Systems", taking also into account MEPC.1/Circ.671 "Guide to good Practice for Port Reception Facility Providers and Users".

4. Ozone depleting substances (ODS)

4.1 Refrigeration systems

General information concerning the construction and installation of refrigerant systems is provided by GL Rules for [Refrigerating Installations \(I-1-10\)](#).

The following requirements are applicable to refrigerant plants used for cargo refrigeration, gas liquefaction, air conditioning, provision cooling and catering systems on all ships.

The requirements are not applicable to any stand-alone refrigerant or air conditioning systems, such as those found in galleys, pantries, bars, crew accommodation or technical spaces.

Refrigerant systems shall be filled with environment friendly refrigerants. The use of natural refrigerants such as NH₃, CO₂ and others is recommended.

The use of ozone-depleting refrigerants is not allowed. Exception will be made to the hydrochlorofluorocarbons (HCFC) in existing ships until 1 January 2020. The global warming potential (GWP) of any refrigerant used on board shall not exceed 3800.

Refrigerant systems shall be arranged with a suitable means of protection to prevent the release of any substantial quantity of the refrigerant.

Consumption, disposal and leaks of refrigerants shall be documented.

For each system, the annual refrigerant leakage rate shall not exceed 10 % of its total charge.

A continuous monitoring system for leak detection appropriate for the type of refrigerant shall be provided in dedicated refrigeration machinery spaces. An alarm shall be given when the refrigerant concentration exceeds the lowest measurable limit. The alarm shall be linked to the general machinery alarm system.

Maintenance procedures shall include regular function testing of leak detection systems.

Maintenance, servicing and repair work shall be carried out without releasing any substantial quantity of refrigerant.

For the purpose of refrigerant recovery, at least one refrigerant compressor of each system shall be capable of evacuating the system into a liquid receiver or gas cylinders dedicated to this purpose. The capacity of the refrigerant receiver or the gas cylinders shall not be less than a full charge of the largest refrigerant system. Additionally, recovery units shall be provided to evacuate residual quantities from a refrigerant system either into the liquid receiver or into gas cylinders dedicated to this purpose. Recovery units may be permanently installed or of a mobile type.

4.2 Fire fighting

The requirements of IMO Resolution MSC.98 (73), the International Code for Fire Safety Systems (FSS Code), apply to all ships.

The requirements apply to fixed fire extinguishing systems and to portable fire extinguishers.

Fire-fighting systems should be provided with environment friendly fire-fighting substances. The use of natural substances such as CO₂, argon, nitrogen, water etc. is recommended.

The use of halogenated hydrocarbons (Halon) as fire fighting substances is not permitted.

Alternative substances to Halon are permitted, provided that they have a GWP of less than 4000.

5. Vapour emission control systems

The requirements of the revised Annex VI Reg. 15 and IMO "Standards for Vapour Emission Control Systems" (MSC/Circ.585) apply to all vapour emission collection and control systems installed on board.

The requirements refer to all tankers intended for the transportation of volatile products in bulk, such as gasoline, other petroleum products, organic chemicals and crude oil.

The requirements are not applicable to floating production, storage and offloading vessels (FPSO).

All tankers which are subject to vapour emission control shall be provided with a vapour emission collection and control system approved by GL. These tankers shall use such a system during the loading of the said cargoes.

6. Shipboard incineration

The requirements of MARPOL 73/78, Annex VI, Regulation 16, apply to all shipboard incinerators and to their usage.

Type approval in accordance with IMO Resolution MEPC.76(40) is necessary for all incinerators installed on board.

The incineration of garbage shall be documented in the Garbage Record Book.

The incineration of oily residues and oily wastes shall be documented in the Oil Record Book.

D. Ship Recycling

In 2009 the International Convention for the Safe and Environmentally Sound Recycling of Ships ("Hong Kong Convention") was adopted. The aim of this convention is to improve the applied working practice regarding occupational safety and environmental protection related to ship recycling. A significant requirement of the convention is the generation of an Inventory of Hazardous Materials (IHM) for all ships.

An Inventory of Hazardous Materials for all ships is to be prepared based on MEPC.197(62) – "Guidelines for the Development of the Inventory of Hazardous Materials".

Compliance with the above mentioned requirements is confirmed by means of the Statement of Compliance on the Inventory of Hazardous Materials, which is issued by GL.

E. Certification of Additional Environmental Protection Properties

On request, GL may also examine and document in the Environmental Passport - Design Certificate other additional environmental protection properties of the ship exceeding the requirements B. and C., if:

- these are required by national regulations, and/or
- technical verification thereof is possible beyond any doubt by means of recognized testing procedures

Details of the scope and execution for the testing and certification procedures will be decided by GL in each individual case.

Test certificates, statements of compliance and certificates of GL will be included in the Environmental Passport - Design Certificate to document the elevated environmental standard of the ship.

Additional environmental protection properties may be but are not limited to:

- biocide-free coatings;
- cleaning of exhaust gases from particulate matter;
- technically advanced wastewater and / or sewage treatment plants needed to meet special regional legislation (e.g. Alaska Law);
- pollution-free stern-tube seals

Section 3

Environmental Passport Operation

A. General

1. Scope of application

This Section describes the requirements to be fulfilled for the Environmental Passport - Operation Certificate and Class Notation **EP-O**. The operational emissions addressed are released during the normal ship's operation. Compliance with specific operational procedures, employment of technical equipment, recording and monitoring of operational data is stipulated.

The following operational emissions are mandatorily considered for Environmental Passport - Operations:

- a) Into the sea:
 - Oil or oily mixtures
 - Garbage
 - Ballast water
- b) Into the air:
 - Carbon Dioxide (CO₂)
 - Nitrogen Oxide (NO_x)
 - Sulphur Oxide (SO_x)
 - Ozone Depleting Substances (ODS)

The following operational emissions are considered additionally on a voluntary basis for Environmental Passport - Operations (c.f. D.):

- Oil to water interfaces
- Sewage
- Antifouling
- Noxious and/or dangerous cargo

Quantitative emission assessment is based on direct emission measurement or via calculation using related consumables.

The calculation of emission is based on the following formalised mathematical expression valid for emission X generated:

$$E_X = \sum_{i=1}^{n_{\text{voyage leg}}} E_{X,i}$$

Where:

E – amount of emission

X – type of emission

i – voyage leg number

n – total number of voyage legs

A schematic overview of emissions and data categories is provided as annex to this section.

The amount of emissions are summarised in an emission inventory displaying the total amounts of the respective emissions, accumulated for the specified period of time.

Data acquisition and calculated values are based on existing onboard documentation. In order to assess and evaluate the operational emissions, related data in a concise, complete and accurate form is required. Data shall be submitted using a GL-defined electronically retrievable format. A pre-formatted Excel data table containing the required parameters will be provided. The table has to be completed by the ship crew, however, the ship operating office is finally responsible for the data transfer to GL.

Note:

Optionally, GL will provide a more advanced software tool – called GL-EmissionManager - which will assist in emission monitoring, data acquisition and evaluation and of obtained emission data.

B. Emissions into the Sea

1. Oil and oily mixtures

1.1 Scope of application

In accordance with Annex I to MARPOL 73/78 and IMO Resolution MEPC.107(49) Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships this subsection addresses the requirements for reducing the impact on the marine environment by bilge water discharges from vessels.

Residues of cargo oil or chemicals are not within the scope of this subsection.

1.2 Requirements

The discharge of the effluent without dilution is prohibited, unless it does not exceed 15 ppm oil content. The discharge operating hours or discharged volumes of the following equipment and adjacent peripherals shall be logged:

- 15 ppm oily water separator (OWS) (any combination of a separator, filter and coalescer, or single unit designed to produce an effluent with oil content not exceeding 15 ppm)
- 15 ppm monitor and alarm

If a higher standard is used for treating bilge water (e.g. 5 ppm) the corresponding technical documentation has to be submitted.

1.3 Data evaluation

Based on the reported oily water separator operating hours the amount of oil by volume discharge is calculated. The maximum permitted value of 15 ppm is used for calculation. If a higher OWS standard is in operation (5 ppm), the value of 5 ppm is accounted for the calculation.

The mathematical expression for assessing the maximum oil content in bilge water discharged is:

$$V_{Oil} = \dot{V}_{Pump\ capacity\ of\ OWS} \cdot C_{Oil} \cdot t$$

where:

- V_{Oil} is the oil volume in l
- $\dot{V}_{Pump\ capacity\ of\ OWS}$ is the OWS pump capacity in l/h
- C_{Oil} is the remaining oil content in ppm and
- t is the pump operating time in h.

If a continuous monitoring and data storage system for the oil content is installed, the calculation of discharged oil volume via the in-situ measured oil content will be accepted by GL, as an alternative evaluation method, too.

2. Garbage

2.1 Scope of application

This Section covers the requirements for the prevention of garbage disposal at sea as set forth in Annex V to MARPOL 73/78 Regulations for the Prevention of Pollution by Garbage from Ships.

In order to accurately monitor amounts of the solid and hazardous (liquid and solid) waste accumulated, a description of waste generated is required. Data recording is accepted in the form of the Garbage Record Book, as outlined in the Appendix to Annex V of MARPOL 73/78. It is recognised that the figures provided are based on estimates.

2.2 Requirements

All operations as documented in the Garbage Record Book, comprising the relevant information of the discharge criteria shall be reported.

If a shipboard incinerator is used, the estimated amount per waste category incinerated should be logged. This information should also include solid and liquid hazardous waste where applicable (Ref.: shipboard waste catalogue or European waste catalogue and MARPOL categories).

If incinerator ash is disposed shore side, information with regard to the amount and the heavy metal content of the respective batch shall be provided.

2.3 Data evaluation

The total amount of garbage is calculated based on the individual garbage categories as reported.

The mathematical expression for assessing the total volumes of waste recorded is:

$$\sum_{j=1}^6 V_i^j = V_{i\ Sea} + V_{i\ Air} + V_{i\ Land}$$

where:

- j is the waste category acc. to MARPOL and
- V_i are the corresponding amounts of waste discharged in m^3 .

3. Ballast water

3.1 Scope of application

This Chapter covers requirements of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (2004), IMO BWM/CONF/36, and associated IMO guidelines, aimed at the prevention of re-locating non-native, pathogenic aquatic organisms via ballast water and sediment uptake and discharge operations.

3.2 Requirements

To facilitate the assessment and administration of ballast water exchange (and treatment procedures, if applicable), any operation carried out shall be logged in the Ballast Water Record Book in accordance with the entries in Appendix II to the Convention (IMO BWM/CONF/36).

If any exemption on ballast water exchange or treatment is applicable, this should be documented also.

Actions taken to comply with any additional measures (e.g. when the vessel is trading in areas where additional measures based on national legislation apply or when designated areas are identified where ballast water exchange should be carried out) should also be recorded in the Ballast Water Record Book.

All operations as documented in the Ballast Water Record Book shall be reported to GL.

3.3 Data evaluation

The total amount of ballast water is drawn up based on the individual Ballast Water Record Book entries as reported.

At present, no further evaluation of the ballast water procedures nor their efficiency is being performed.

C. Emissions into the Air

1. Carbon dioxide (CO₂) emission

1.1 Scope of application

CO₂ emissions under these Guidelines refer to the chemical reaction when burning carbon containing ship fuels.

The fuel consumption of all installed internal combustion engines, gas turbines, boilers and incinerators shall be determined.

The Energy Efficiency Operational Indicator (EEOI) may be calculated as indicator for operational transport efficiency acc. MEPC.1/Circ.684 based on submitted data of each voyage leg as outlined in 1.2.

Within the context of this Chapter the term 'fuel' is defined as any carbon containing liquid, gaseous, or solid combustible material, e.g. HFO, MGO, LNG, coal, etc. consumed during ships operation.

The fuel consumption for incineration shall be covered as well. The CO₂-emissions from burned garbage or any waste streams are not covered by this Guideline.

1.2 Requirements

For the determination of a ship's CO₂-emissions the following parameters shall be recorded for every voyage leg:

- Total fuel consumption (i.e. main engine(s), aux. engine(s), boiler(s)) including the respective fuel type
- Time and geographical position for start and completion of each fuel change over and beginning as well as end of voyage legs
- Amount of transported cargo in the appropriate unit depending on ship type and purpose, e.g. cargo mass, lane meters, pax, TEU, volume)
- Distance sailed

1.3 Data evaluation

The content of the carbon dioxide released with the exhaust gas during the voyage leg will be determined from the above mentioned parameters as follows:

$$E_{CO_2} = \sum_i FC_{i,j} \cdot C_{FCO_2j}$$

where:

- E_{CO_2} is the mass of the CO₂ emission t
- $FC_{i,j}$ denotes the consumption of fuel type j on voyage leg i t
- C_{FCO_2} is the CO₂ conversion factor derived from IMO Resolution MEPC.212(63) according to the fuel type burned.

With the above mentioned data the EEOI for a ship may be calculated acc. to MEPC.1/Circ.684 for a period representing the typical operational pattern of the ship.

On the basis of the acquired data an EEOI Certificate may be issued one year after initial survey and after the first periodically survey. The EEOI Certificate is valid for one year. The EEOI value for the ship remains until the subsequent year or the next periodical survey.

2. Nitrogen oxide (NO_x) emissions

2.1 Scope of application

This chapter refers to NO_x emissions generated from internal combustion processes.

The results of NO_x emission determination vary depending on the accuracy and/or method of data acquisition. Parameters including engine design, engine load, fuel type and quality result in a different total mass emitted.

Three different options are provided for the acquisition and evaluation of NO_x-emissions from marine diesel engines subject to regulation 13 of Annex VI to MARPOL 73/78:

- on board measurement and monitoring method
- calculation based on main- and auxiliary engine load data
- acquisition of total fuel consumption parameter, operating hours and specific NO_x values as derived from the engine's NO_x-technical file

NO_x-emissions generated from continuous combustion processes - like boilers - are relatively constant compared to reciprocating combustion engines.

According to Excise Duty on Emissions of NO_x 2011, Circular no. 14/2011 S, Excise Duty Codes NX and NO, Oslo, 7 January 2011 the amount of NO_x by burned fuel type emitted from boilers during operation is stipulated as follows:

NO _x value	Unit	Fuel type
9.6	kg (NO _x) / t	HFO
4.5	kg (NO _x) / t	hard coal
3.6	kg (NO _x) / t	light oil
3.6	kg (NO _x) / t	marine gas oil/diesel
3.6	kg (NO _x) / t	heavy distillate
1.8	kg (NO _x) / t	bio fuel, virgin fuel (dry solids)
2.4	kg (NO _x) / t	bio fuel, recycled wood (dry solids)
1.7	g (NO _x) / Sm ³	natural gas, gas boilers
2.8	g (NO _x) / Sm ³	natural gas, converted boilers
2.0	g (NO _x) / Sm ³	LPG, gas boilers
3.4	g (NO _x) / Sm ³	LPG, converted boilers

For turbines a specific amount of NO_x/kWh emitted during operation is defined as:

NO _x value	Unit	Fuel type
Turbines		
16	g (NO _x) / Sm ³	gas
25	kg (NO _x) / t	liquid energy product
Low NO _x turbines		
1.8	g (NO _x) / Sm ³	gas

Note

Sm³ means standard cubic meter, i.e. at 15 °C and 1 bar.

In addition to the above, NO_x values for continuous combustion design data of the manufacturer are accepted.

Nitrogen oxides released as a result of shipboard waste incineration processes are not covered by this guideline.

2.2 Requirements

The first compliance option is the on board determination of NO_x as mentioned above. The average weighted NO_x emission value can then be calculated. The measurement device shall be in accordance with the requirements of the NO_x Technical Code 2008 and the equipment shall be certified by a Recognized Organisation. The testing of the measuring device must have been carried out by an accredited measurement laboratory that is competent in the field of emission measurements on internal combustion engines and boiler plants running on gaseous and liquid fuels (e.g. accredited under the terms of EN ISO/IEC 17025, as applicable). The results of the tests shall be provided in a test report duly signed by the responsible laboratory.

The data derived from the NO_x onboard measurement device shall be reported and made available electronically.

If onboard measurement devices are not fitted than the following parameters shall be reported for each voyage leg:

- Total fuel consumption in (i.e. main engine(s), aux. engine(s), boiler(s)) including the respective fuel type
- Operating hours of the aggregates (preferable with engine load statistics)
- Operating hours of boilers including fuel type

2.3 Data evaluation

If an on-board measurement and monitoring method is not available, NO_x-emissions are calculated on the basis of the rated power output per main and/or auxiliary engine operated. The respective values will be derived from the EIAPP Certificates available on board the ship for the respective engines.

From the NO_x-data for the specific load points in the EIAPP-Certificate the one that is closest to the calculated mean power value per voyage leg is used.

If the keel of the ship was laid before 1 January 2000, no EIAPP-Certificate or comparable and no specific NO_x-values are available, a generic NO_x value will be taken. This generic value for this purpose is defined as 30 % above the Tier I standard limit curve depending on engine rated speed.

For the determination of the ermitted mass of NO_x the following equations should be used:

$$\overline{P}_i = \frac{FC_i}{SFC_i \cdot t}$$

where:

- \overline{P}_i is the average engine load in kW
- FC_i denotes the fuel consumption during one voyage leg i in t

- SFC_i is the specific fuel consumption in g/kWh
- t operating hours of the respective aggregate

E_{NO_x} can be determined in a second step:

$$E_{NO_x} = \sum_{k=1}^{n_{engines}} \sum_{i=1}^{n_{voyages}} \bar{P}_{i,k} \cdot sNO_{x_k} \cdot t_i$$

where:

- E_{NO_x} denotes the mass of the NO_x -emissions in kg
- \bar{P}_i is the average engine load in kW
- sNO_x is the NO_x -value from the EIAPP-Certificate in g NO_x /kWh and
- t_i are the operating hours of the respective aggregate

3. Sulphur oxide (SO_x) emissions

3.1 Scope of application

The requirements in this subsection refer to all ships subject to Regulation 14 of revised Annex VI to MARPOL, as amended by resolution MEPC.176(58).

The sulphur content of any fuel oil used on board ships in general shall not exceed:

- 3.50 % of mass on and after 1 January 2012
- 0.50 % of mass on and after 1 January 2020

While ships are operating within an (Sulphur) Emission Control Area, the sulphur content of fuel oil used on board ships shall not exceed:

- 1.00 % of mass on and after 1 July 2010; and
- 0.10 % of mass on and after 1 January 2015

It is also recalled (c.f. Section 1, D.2.) if national or regional regulations more stringent than MARPOL Annex VI, Reg. 14 are required, these regional regulations remain applicable.

A fuel oil management system shall be installed to document:

- Maximum sulphur content of the fuel oil intended for combustion purposes as delivered to the ship, according to above mentioned criteria.
- Representative fuel oil samples taken from the ship's bunker manifold.
- Records of any purchase order.
- Bunker delivery notes are kept on board and retained for at least three years.
- The samples of fuel oil are kept on board and retained for at least twelve months from the date of delivery.

Any alternative technical solution according to MARPOL Annex VI, Regulation 14 for SO_x reduction is permitted provided such technical solution is at least as effective in terms of emission reduction as required by Resolution MEPC.184(59), "2009 Guidelines for Exhaust Gas Cleaning Systems", taking also into account MEPC.1/Circ.671 "Guide to good Practice for Port Reception Facility Providers and Users".

Oxides of Sulphur released as a result of shipboard waste incineration processes are not covered by this guideline.

3.2 Requirements

The sulphur content of any fuel oil used on board, as documented by its supplier (Annex VI, Reg.18), shall be reported for each leg of the voyage. Determination of SO_x emissions requires acquisition of the following parameter:

- Total fuel consumption per type of fuel
- Time and geographical position for start and completion of fuel change over
- Distance sailed
- Geographical position

If exhaust gas cleaning systems are used to reduce the emissions of SO_x , compliance with the requirements of Resolution MEPC.170(57), as amended by Resolution MEPC.184(59), "Guidelines of Exhaust Gas Cleaning Systems", and their effectiveness in terms of emission reduction as required by this Annex, including any of the standards set forth in regulations 13 and 14 shall be demonstrated by reporting the (continuous) emission monitoring data collected over a meaningful period of time.

Guidance on demonstration of compliance on SO_x emissions are provided in Resolution MEPC.184(59), "Guidelines of Exhaust Gas Cleaning Systems", also for the washwater monitoring data recording and the washwater residues, if applicable.

3.3 Data evaluation

Assuming a constant fuel consumption and no change in sulphur content over a voyage leg i the total emissions of sulphur oxides will be calculated according the following equation:

$$E_{SO_x} = \sum_{k=1}^{n_{engines}} \sum_{j=1}^{n_{Fuels}} \sum_{i=1}^{n_{voyages}} F_{C_{i,j,k}} \cdot C_{F_{SO_x}} \cdot C_{S_{i,j,k}}$$

where:

- E_{SO_x} is the mass of the SO_x emission in t
- F_{C_i} denotes the fuel consumption on voyage leg i in t
- C_S is the sulphur content of the fuel used in m/m

- $C_{F\ SO_x}$ is the SO_x conversion factor derived from molar mass equation and is: 1.998

4. Ozone depleting substances

4.1 Scope of application

The following requirements are applicable to refrigerant plants used for cargo refrigeration, gas re-liquefaction, air-conditioning, provision cooling and catering systems on all ships subject to the requirements of Annex VI to MARPOL 73/78.

The requirements are not applicable to any stand-alone refrigeration or air conditioning systems, such as those found in galleys, pantries, bars, crew accommodation or technical spaces.

4.2 Requirements

An up to date refrigerants log book shall be made available on board the ship.

Consumption should be broken down according to refrigerant group and type. Also the ODS type shall be documented in compliance with revised MARPOL Annex VI, Reg. 12, which will enable monitoring of the ODS according to CFC-11 equivalent.

4.3 Data evaluation

Methods other than drawing up entries from the refrigerant log book and/or ODS Record Book for the data evaluation are currently not applied.

D. Certification of Additional Environmental Protection Properties

This Section refers to a reporting of environmental related emission data on voluntary basis. The following requirements are not a mandatory part for the certification for Environmental Passport - Operation.

1. Oil to water interface

1.1 Scope of application

In accordance with Annex I to MARPOL 73/78; "Regulations for the Prevention of Pollution by Oil" this subsection addresses the requirements for reducing the impact on the marine environment by oil discharges from vessels.

Oil to water interface includes any mechanical or other equipment where seals or surfaces may release small quantities of oil to the sea. Examples include stern tubes, controllable pitch propellers, stabilizers and so forth.

The prevention of pollution during transfer of oil cargo is not covered here.

1.2 Requirements

Oil to water interface detectors for a rapid and accurate monitoring and logging of oil levels are to ensure the detection of eventual leakages in a timely and sustainable manner. Data shall be submitted to GL in an electronically retrievable format for every voyage leg.

1.3 Data evaluation

Recorded data indicating the amounts of lost oil or refill shall be reported.

2. Sewage

2.1 Scope of application

This Section addresses operational aspects of reducing adverse effects to the marine environment by sewage discharges as set forth in Annex IV to MARPOL 73/78; "Regulations for the Prevention of Pollution by Sewage from Ships".

2.2 Requirements

The following parameter shall be documented for at least every voyage leg:

- Date, hour and geographic position for every discharge operation performed
- Speed
- Quantity of untreated sewage discharged
- Quantity of treated sewage discharged (where applicable)
- Permeate discharge
- Sewage Record Book

2.3 Data evaluation

Based on the reported sewage treatment system (STS) operating hours the amount of sewage discharge is calculated.

The mathematical expression for assessing the sewage amount is:

$$V_{\text{Sewage}} = \dot{V}_{\text{Pump capacity of STS}} \cdot t$$

where:

- V_{Sewage} is the sewage volume in m^3
- $\dot{V}_{\text{Pump capacity of STS}}$ is the STS pump capacity in m^3/h
- t is the pump operating time in h

3. Anti-fouling Systems

3.1 Scope of application

This Section of the guideline addresses requirements aiming at the reduction of deformative, neurotoxic, genetic and other adverse effects in marine species as a result of the application of harmful anti-fouling systems containing organotin compounds.

The below mentioned requirements are derived from the "International Convention on the Control of Harmful Anti-fouling Systems on Ships" (AFS Convention).

3.2 Requirements

Vessels with the Class Notation Environmental Passport - Operation are required to carry a statement on compliance with the "International Convention on the Control of Harmful Anti-fouling Systems on Ships".

The certification of TBT-free anti-fouling systems on ships shall be in accordance with the "International

Convention on the Control of Harmful Anti-Fouling Systems on Ships".

3.3 Data evaluation

No method for data evaluation is currently applied.

4. Noxious and/or dangerous cargo

4.1 Scope of application

For the transportation of noxious and/or dangerous cargoes, the applicable requirements of Annex II and Annex III of MARPOL 73/78, the IGC Code, the IBC Code and the IMDG Code shall be met.

4.2 Requirements

Chemical check lists in accordance with the CSI guideline should be applied.

4.3 Data evaluation

No method for data evaluation is currently applied.

Overview for mandatory Parameters for Environmental Passport Operation – Certificate

		Emissions into the Air				Emissions into the Sea		
		Carbon Dioxide	Oxides of Nitrogen	Oxides of Sulphur	Refrigerants	Bilge Water	Ballast Water	Garbage
Master Data to be recorded								
Arrival Date	YYYY-MM-DD	✓	✓	✓	✓	✓	✓	✓
Departure Date	YYYY-MM-DD	✓	✓	✓	✓	✓	✓	✓
Tradelane	-	✓	✓	✓	✓	✓	✓	✓
Primary Data								
Fuel Consumed	HFO	✓	✓	✓	✓	✓	✓	✓
	MGO	✓	✓	✓	✓	✓	✓	✓
Sulphur Content	m / m or %			✓				
Refrigerant	kg				✓			
Engine Load	Main		✓					
	Aux		✓					
OWS / OCM	ohrs					✓		
	l / ohrs					✓		
Incinerator	ohrs							✓
	m ³ / CAT							✓
Discharges to Sea	treated						✓	✓
	untreated						✓	✓
Secondary Data								
Distance Sailed	nm	✓	✓	✓		✓	✓	✓
Geographic Position	Deg	✓		✓		✓	✓	✓
Nominal Capacity	TEU	✓						
Chemicals	-							the use of chemicals has to be documented
Abbreviations:								
ohrs	operating hours							OWS Oily Water Separator
CAT	acc. to MARPOL garbage categorie							OCM Oil Content Meater