

ANNEX
INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS
(POLAR CODE)

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PREAMBLE

1 The International Code for Ships Operating in Polar Waters has been developed to supplement existing IMO instruments in order to increase the safety of ships' operation and mitigate the impact on the people and environment in the remote, vulnerable and potentially harsh polar waters.

2 The Code acknowledges that polar water operation may impose additional demands on ships, their systems and operation beyond the existing requirements of the International Convention for the Safety of Life at Sea (SOLAS), 1974, the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto as amended by the 1997 Protocol (MARPOL), and other relevant binding IMO instruments.

3 The Code acknowledges that the polar waters impose additional navigational demands beyond those normally encountered. In many areas, the chart coverage may not currently be adequate for coastal navigation. It is recognized even existing charts may be subject to unsurveyed and uncharted shoals.

4 The Code also acknowledges that coastal communities in the Arctic could be, and that polar ecosystems are, vulnerable to human activities, such as ship operation.

5 The relationship between the additional safety measures and the protection of the environment is acknowledged as any safety measure taken to reduce the probability of an accident will largely benefit the environment.

6 While Arctic and Antarctic waters have similarities, there are also significant differences. Hence, although the Code is intended to apply as a whole to both Arctic and Antarctic, the legal and geographical differences between the two areas have been taken into account.

7 The key principles for developing the Polar Code have been to use a risk-based approach in determining scope and to adopt a holistic approach in reducing identified risks.

INTRODUCTION

1 Goal

The goal of this Code is to provide for safe ship operation and the protection of the polar environment by addressing risks present in polar waters and not adequately mitigated by other instruments of the Organization.

2 Definitions

For the purpose of this Code, the terms used have the meanings defined in the following paragraphs. Terms used in part I-A but not defined in this section shall have the same meaning as defined in SOLAS. Terms used in part II-A but not defined in this section shall have the same meaning as defined in Article 2 of MARPOL and the relevant MARPOL Annexes.

- 2.1 *Category A ship* means a ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions.
- 2.2 *Category B ship* means a ship not included in category A, designed for operation in polar waters in at least thin first-year ice, which may include old ice inclusions.
- 2.3 *Category C ship* means a ship designed to operate in open water or in ice conditions less severe than those included in categories A and B.
- 2.4 *First-year ice* means sea ice of not more than one winter growth developing from young ice with thickness from 0.3 m to 2.0 m.
- 2.5 *Ice free waters* means no ice present. If ice of any kind is present this term shall not be used.
- 2.6 *Ice of land origin* means ice formed on land or in an ice shelf, found floating in water.
- 2.7 *MARPOL* means the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto as amended by the 1997 Protocol.
- 2.8 *Medium first-year ice* means first-year ice of 0.7 m to 1.2 m thickness.
- 2.9 *Old ice* means sea ice which has survived at least one summer's melt; typical thickness up to 3 m or more. It is subdivided into residual first-year ice, second-year ice and multi-year ice.
- 2.10 *Open water* means a large area of freely navigable water in which sea ice is present in concentrations less than 1/10. No ice of land origin is present.
- 2.11 *Organization* means the International Maritime Organization.
- 2.12 *Sea ice* means any form of ice found at sea which has originated from the freezing of sea water.
- 2.13 *SOLAS* means the International Convention for the Safety of Life at Sea, 1974, as amended.
- 2.14 *STCW Convention* means the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended.

2.15 *Thin first-year ice* means first-year ice of 0.3 m to 0.7 m thickness.

3 Sources of hazards

3.1 The Polar Code considers hazards which may lead to elevated levels of risk due to increased probability of occurrence, more severe consequences, or both:

- .1 ice, as it may affect hull structure, stability characteristics, machinery systems, navigation, the outdoor working environment, maintenance and emergency preparedness tasks and malfunction of safety equipment and systems;
- .2 experiencing topside icing, with potential reduction of stability and equipment functionality;
- .3 low temperature, as it affects the working environment and human performance, maintenance and emergency preparedness tasks, material properties and equipment efficiency, survival time and performance of safety equipment and systems;
- .4 extended periods of darkness or daylight as it may affect navigation and human performance;
- .5 high latitude, as it affects navigation systems, communication systems and the quality of ice imagery information;
- .6 remoteness and possible lack of accurate and complete hydrographic data and information, reduced availability of navigational aids and seamarks with increased potential for groundings compounded by remoteness, limited readily deployable SAR facilities, delays in emergency response and limited communications capability, with the potential to affect incident response;
- .7 potential lack of ship crew experience in polar operations, with potential for human error;
- .8 potential lack of suitable emergency response equipment, with the potential for limiting the effectiveness of mitigation measures;
- .9 rapidly changing and severe weather conditions, with the potential for escalation of incidents; and
- .10 the environment with respect to sensitivity to harmful substances and other environmental impacts and its need for longer restoration.

3.2 The risk level within polar waters may differ depending on the geographical location, time of the year with respect to daylight, ice-coverage, etc. Thus, the mitigating measures required to address the above specific hazards may vary within polar waters and may be different in Arctic and Antarctic waters.

4 Structure of the Code

This Code consists of Introduction, parts I and II. The Introduction contains mandatory provisions applicable to both parts I and II. Part I is subdivided into part I-A, which contains mandatory provisions on safety measures, and part I-B containing recommendations on safety. Part II is subdivided into part II-A, which contains mandatory provisions on pollution prevention, and part II-B containing recommendations on pollution prevention.

Figures illustrating the Antarctic area and Arctic waters, as defined in SOLAS regulations XIV/1.2 and XIV/1.3, respectively, and MARPOL Annex I, regulations 1.11.7 and 46.2; Annex II, regulations 13.8.1 and 21.2; Annex IV, regulations 17.2 and 17.3; and Annex V, regulations 1.14.7 and 13.2

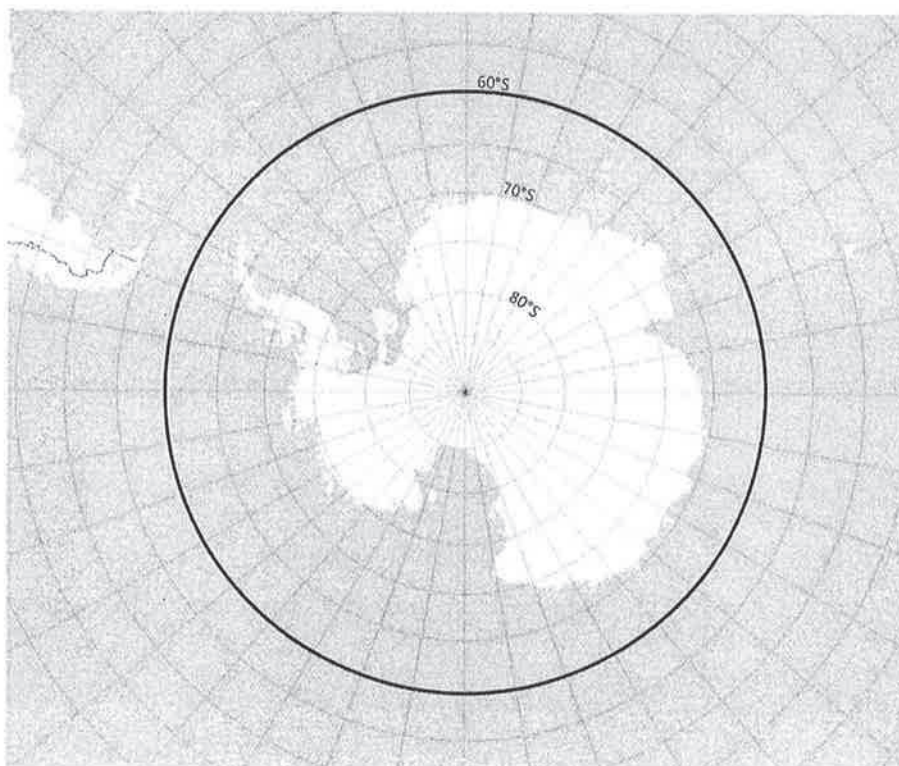


Figure 1 – Maximum extent of Antarctic area application

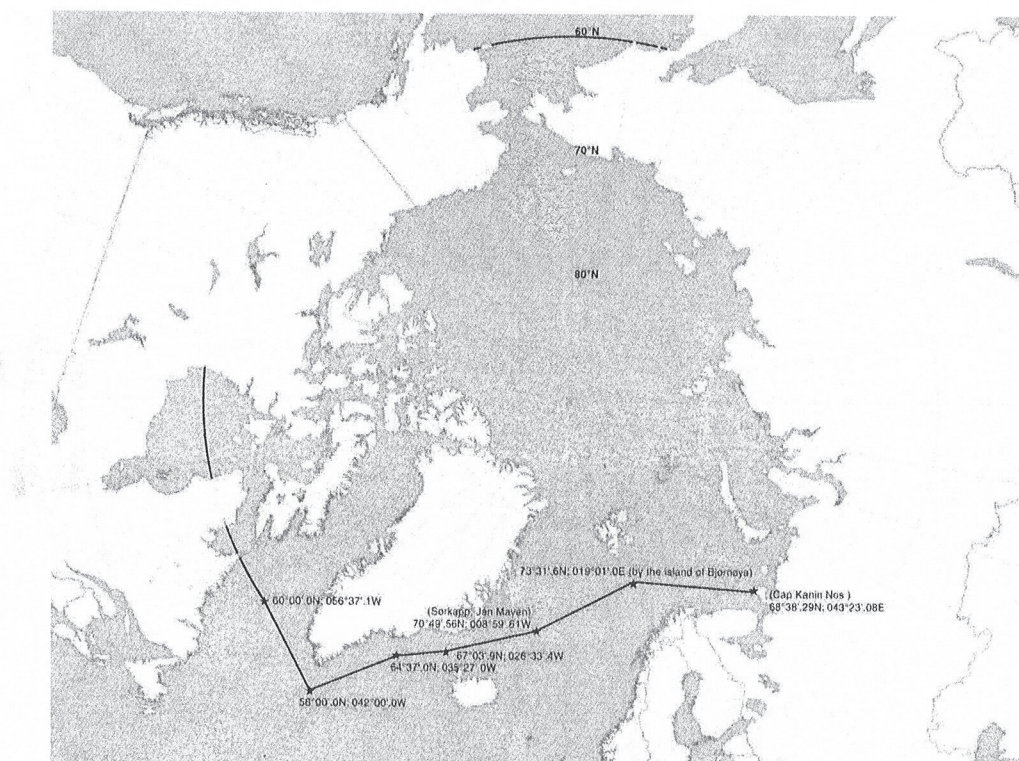


Figure 2 – Maximum extent of Arctic waters application

PART I-A

SAFETY MEASURES

CHAPTER 1 – GENERAL

1.1 Structure of this part

Each chapter in this part consists of the overall goal of the chapter, functional requirements to fulfil the goal, and regulations. A ship shall be considered to meet a functional requirement set out in this part when either:

- .1 the ship's design and arrangements comply with all the regulations associated with that functional requirement; or
- .2 part(s) or all of the ship's relevant design and arrangements have been reviewed and approved in accordance with regulation 4 of SOLAS chapter XIV, and any remaining parts of the ship comply with the relevant regulations.

1.2 Definitions

In addition to the definitions included in the relevant SOLAS chapters and the Introduction of this Code, the following definitions are applicable to this part.

1.2.1 *Bergy waters* mean an area of freely navigable water in which ice of land origin is present in concentrations less than 1/10. There may be sea ice present, although the total concentration of all ice shall not exceed 1/10.

1.2.2 *Escort* means any ship with superior ice capability in transit with another ship.

1.2.3 *Escorted operation* means any operation in which a ship's movement is facilitated through the intervention of an escort.

1.2.4 *Habitable environment* means a ventilated environment that will protect against hypothermia.

1.2.5 *Icebreaker* means any ship whose operational profile may include escort or ice management functions, whose powering and dimensions allow it to undertake aggressive operations in ice-covered waters.

1.2.6 *Ice Class* means the notation assigned to the ship by the Administration or by an organization recognized by the Administration showing that the ship has been designed for navigation in sea-ice conditions.

1.2.7 *Maximum expected time of rescue* means the time adopted for the design of equipment and system that provide survival support. It shall never be less than 5 days.

1.2.8 *Machinery installations* means equipment and machinery and associated piping and cabling, which is necessary for the safe operation of the ship.

1.2.9 *Mean Daily Low Temperature* (MDLT) means the mean value of the daily low temperature for each day of the year over a minimum 10 year period. A data set acceptable to the Administration may be used if 10 years of data is not available.

1.2.10 *Polar Class (PC)* means the ice class assigned to the ship by the Administration or by an organization recognized by the Administration based upon IACS Unified Requirements.

1.2.11 *Polar Service Temperature (PST)* means a temperature specified for a ship which is intended to operate in low air temperature, which shall be set at least 10°C below the lowest MDLT for the intended area and season of operation in polar waters.

1.2.12 *Ship intended to operate in low air temperature* means a ship which is intended to undertake voyages to or through areas where the lowest Mean Daily Low Temperature (MDLT) is below -10°C.

1.2.13 *Tankers* mean oil tankers as defined in SOLAS regulation II-1/2.22, chemical tankers as defined in SOLAS regulation II-1/3.19 and gas carriers as defined in SOLAS regulation VII/11.2.

1.2.14 *Upper ice waterline* means the waterline defined by the maximum draughts forward and aft for operation in ice.

1.3 Certificate and survey

1.3.1 Every ship to which this Code applies shall have on board a valid Polar Ship Certificate.

1.3.2 Except as provided for in paragraph 1.3.3, the Polar Ship Certificate shall be issued after an initial or renewal survey to a ship which complies with the relevant requirements of this Code.

1.3.3 For category C cargo ships, if the result of the assessment in paragraph 1.5 is that no additional equipment or structural modification is required to comply with the Polar Code, the Polar Ship Certificate may be issued based upon documented verification that the ship complies with all relevant requirements of the Polar Code. In this case, for continued validity of the certificate, an on board survey should be undertaken at the next scheduled survey.

1.3.4 The certificate referred to in this regulation shall be issued either by the Administration or by any person or organization recognized by it in accordance with SOLAS regulation XI-1/1. In every case, the Administration assumes full responsibility for the certificate.

1.3.5 The Polar Ship Certificate shall be drawn up in a form corresponding to the model given in appendix I to this Code. If the language used is neither English, nor French or Spanish, the text shall include a translation into one of these languages.

1.3.6 Polar Ship Certificate validity, survey dates and endorsements shall be harmonized with the relevant SOLAS certificates in accordance with the provisions of SOLAS regulation I/14. The certificate shall include a supplement, recording equipment required by the Code.

1.3.7 Where applicable, the certificate shall reference a methodology to assess operational capabilities and limitations in ice to the satisfaction of the Administration, taking into account the guidelines developed by the Organization.

1.4 Performance standards

1.4.1 Unless expressly provided otherwise, ship systems and equipment addressed in this Code shall satisfy at least the same performance standards referred to in SOLAS.

1.4.2 For ships operating in low air temperature, a Polar Service Temperature (PST) shall be specified and shall be at least 10°C below the lowest MDLT for the intended area and season of operation in polar waters. Systems and equipment required by this Code shall be fully functional at the PST.

1.4.3 For ships operating in low air temperature, survival systems and equipment shall be fully operational at the PST during the maximum expected rescue time.

1.5 Operational assessment

In order to establish procedures or operational limitations, an assessment of the ship and its equipment shall be carried out, taking into consideration the following:

- .1 the anticipated range of operating and environmental conditions, such as:
 - .1 operation in low air temperature;
 - .2 operation in ice;
 - .3 operation in high latitude; and
 - .4 potential for abandonment onto ice or land;
- .2 hazards, as listed in section 3 of the Introduction, as applicable; and
- .3 additional hazards, if identified.

CHAPTER 2 – POLAR WATER OPERATIONAL MANUAL (PWOM)

2.1 Goal

The goal of this chapter is to provide the owner, operator, master and crew with sufficient information regarding the ship's operational capabilities and limitations in order to support their decision-making process.

2.2 Functional requirements

2.2.1 In order to achieve the goal set out in paragraph 2.1 above, the following functional requirements are embodied in the regulations of this chapter.

2.2.2 The Manual shall include information on the ship-specific capabilities and limitations in relation to the assessment required under paragraph 1.5.

2.2.3 The Manual shall include or refer to specific procedures to be followed in normal operations and in order to avoid encountering conditions that exceed the ship's capabilities.

2.2.4 The Manual shall include or refer to specific procedures to be followed in the event of incidents in polar waters.

2.2.5 The Manual shall include or refer to specific procedures to be followed in the event that conditions are encountered which exceed the ship's specific capabilities and limitations in paragraph 2.2.2.

2.2.6 The Manual shall include or refer to procedures to be followed when using icebreaker assistance, as applicable.

2.3 Regulations

2.3.1 In order to comply with the functional requirements in section 2.2, the Manual shall be carried on board.

2.3.2 In order to comply with the functional requirements of paragraph 2.2.2, the Manual shall contain, where applicable, the methodology used to determine capabilities and limitations in ice.

2.3.3 In order to comply with the functional requirements of paragraph 2.2.3, the Manual shall include risk-based procedures for the following:

- .1 voyage planning to avoid ice and/or temperatures that exceed the ship's design capabilities or limitations;
- .2 arrangements for receiving forecasts of the environmental conditions;
- .3 means of addressing any limitations of the hydrographic, meteorological and navigational information available;
- .4 operation of equipment required under other chapters of this Code; and
- .5 implementation of special measures to maintain equipment and system functionality under low temperatures, topside icing and the presence of sea ice, as applicable.

2.3.4 In order to comply with the functional requirements of paragraph 2.2.4, the Manual shall include risk-based procedures to be followed for:

- .1 contacting emergency response providers for salvage, search and rescue (SAR), spill response, etc., as applicable; and
- .2 in the case of ships ice strengthened in accordance with chapter 3, procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice.

2.3.5 In order to comply with the functional requirements of paragraph 2.2.5, the Manual shall include risk-based procedures to be followed for measures to be taken in the event of encountering ice and/or temperatures which exceed the ship's design capabilities or limitations.

2.3.6 In order to comply with the functional requirements of paragraph 2.2.6, the Manual shall include risk-based procedures for monitoring and maintaining safety during operations in ice, as applicable, including any requirements for escort operations or icebreaker assistance. Different operational limitations may apply depending on whether the ship is operating independently or with icebreaker escort. Where appropriate, the PWOM should specify both options.

CHAPTER 3 – SHIP STRUCTURE

3.1 Goal

The goal of this chapter is to provide that the material and scantlings of the structure retain their structural integrity based on global and local response due to environmental loads and conditions.

3.2 Functional requirements

In order to achieve the goal set out in paragraph 3.1 above, the following functional requirements are embodied in the regulations of this chapter:

- .1 for ships intended to operate in low air temperature, materials used shall be suitable for operation at the ships' PST; and
- .2 in ice strengthened ships, the structure of the ship shall be designed to resist both global and local structural loads anticipated under the foreseen ice conditions.

3.3 Regulations

3.3.1 In order to comply with the functional requirements of paragraph 3.2.1 above, materials of exposed structures in ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety based on the polar service temperature.

3.3.2 In order to comply with the functional requirements of paragraph 3.2.2 above, the following applies:

- .1 scantlings of category A ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety;
- .2 scantlings of category B ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety;
- .3 scantlings of ice strengthened category C ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account acceptable standards adequate for the ice types and concentrations encountered in the area of operation; and
- .4 a category C ship need not be ice strengthened if, in the opinion of the Administration, the ship's structure is adequate for its intended operation.

CHAPTER 4 – SUBDIVISION AND STABILITY

4.1 Goal

The goal of this chapter is to ensure adequate subdivision and stability in both intact and damaged conditions.

4.2 Functional requirements

In order to achieve the goal set out in paragraph 4.1 above, the following functional requirements are embodied in the regulations of this chapter:

- .1 ships shall have sufficient stability in intact conditions when subject to ice accretion; and
- .2 ships of category A and B, constructed on or after 1 January 2017, shall have sufficient residual stability to sustain ice-related damages.

4.3 Regulations

4.3.1 *Stability in intact conditions*

4.3.1.1 In order to comply with the functional requirement of paragraph 4.2.1, for ships operating in areas and during periods where ice accretion is likely to occur, the following icing allowance shall be made in the stability calculations:

- .1 30 kg/m² on exposed weather decks and gangways;
- .2 7.5 kg/m² for the projected lateral area of each side of the ship above the water plane; and
- .3 the projected lateral area of discontinuous surfaces of rail, sundry booms, spars (except masts) and rigging of ships having no sails and the projected lateral area of other small objects shall be computed by increasing the total projected area of continuous surfaces by 5% and the static moments of this area by 10%.

4.3.1.2 Ships operating in areas and during periods where ice accretion is likely to occur shall be:

- .1 designed to minimize the accretion of ice; and
- .2 equipped with such means for removing ice as the Administration may require; for example, electrical and pneumatic devices, and/or special tools such as axes or wooden clubs for removing ice from bulwarks, rails and erections.

4.3.1.3 Information on the icing allowance included in the stability calculations shall be given in the PWOM.

4.3.1.4 Ice accretion shall be monitored and appropriate measures taken to ensure that the ice accretion does not exceed the values given in the PWOM.

4.3.2 Stability in damaged conditions

4.3.2.1 In order to comply with the functional requirements of paragraph 4.2.2, ships of categories A and B, constructed on or after 1 January 2017, shall be able to withstand flooding resulting from hull penetration due to ice impact. The residual stability following ice damage shall be such that the factor s_i , as defined in SOLAS regulations II-1/7-2.2 and II-1/7-2.3, is equal to one for all loading conditions used to calculate the attained subdivision index in SOLAS regulation II-1/7. However, for cargo ships that comply with subdivision and damage stability regulations in another instrument developed by the Organization, as provided by SOLAS regulation II-1/4.1, the residual stability criteria of that instrument shall be met for each loading condition.

4.3.2.2 The ice damage extents to be assumed when demonstrating compliance with paragraph 4.3.2.1 shall be such that:

- .1 the longitudinal extent is 4.5% of the upper ice waterline length if centred forward of the maximum breadth on the upper ice waterline, and 1.5% of upper ice waterline length otherwise, and shall be assumed at any longitudinal position along the ship's length;
- .2 the transverse penetration extent is 760 mm, measured normal to the shell over the full extent of the damage; and
- .3 the vertical extent is the lesser of 20% of the upper ice waterline draught or the longitudinal extent, and shall be assumed at any vertical position between the keel and 120% of the upper ice waterline draught.

CHAPTER 5 – WATERTIGHT AND WEATHERTIGHT INTEGRITY

5.1 Goal

The goal of this chapter is to provide measures to maintain watertight and weathertight integrity.

5.2 Functional requirements

In order to achieve the goal set out in paragraph 5.1 above, all closing appliances and doors relevant to watertight and weathertight integrity of the ship shall be operable.

5.3 Regulations

In order to comply with the functional requirements of paragraph 5.2 above, the following applies:

- .1 for ships operating in areas and during periods where ice accretion is likely to occur, means shall be provided to remove or prevent ice and snow accretion around hatches and doors; and
- .2 in addition, for ships intended to operate in low air temperature the following apply:
 - .1 if the hatches or doors are hydraulically operated, means shall be provided to prevent freezing or excessive viscosity of liquids; and

- .2 watertight and weathertight doors, hatches and closing devices which are not within an habitable environment and require access while at sea shall be designed to be operated by personnel wearing heavy winter clothing including thick mittens.

CHAPTER 6 – MACHINERY INSTALLATIONS

6.1 Goal

The goal of this chapter is to ensure that machinery installations are capable of delivering the required functionality necessary for safe operation of ships.

6.2 Functional requirements

6.2.1 In order to achieve the goal set out in paragraph 6.1 above, the following functional requirements are embodied in the regulations of this chapter.

6.2.1.1 Machinery installations shall provide functionality under the anticipated environmental conditions, taking into account:

- .1 ice accretion and/or snow accumulation;
- .2 ice ingestion from seawater;
- .3 freezing and increased viscosity of liquids;
- .4 seawater intake temperature; and
- .5 snow ingestion.

6.2.1.2 In addition, for ships intended to operate in low air temperatures:

- .1 machinery installations shall provide functionality under the anticipated environmental conditions, also taking into account:
 - .1 cold and dense inlet air; and
 - .2 loss of performance of battery or other stored energy device; and
- .2 materials used shall be suitable for operation at the ships' PST.

6.2.1.3 In addition, for ships ice strengthened in accordance with chapter 3, machinery installations shall provide functionality under the anticipated environmental conditions, taking into account loads imposed directly by ice interaction.

6.3 Regulations

6.3.1 In order to comply with the functional requirement of paragraph 6.2.1.1 above, taking into account the anticipated environmental conditions, the following applies:

- .1 machinery installations and associated equipment shall be protected against the effect of ice accretion and/or snow accumulation, ice ingestion from sea water, freezing and increased viscosity of liquids, seawater intake temperature and snow ingestion;

- .2 working liquids shall be maintained in a viscosity range that ensures operation of the machinery; and
- .3 seawater supplies for machinery systems shall be designed to prevent ingestion of ice, or otherwise arranged to ensure functionality.

6.3.2 In addition, for ships intended to operate in low air temperatures, the following applies:

- .1 in order to comply with the functional requirement of paragraph 6.2.1.2 above, exposed machinery and electrical installation and appliances shall function at the PST;
- .2 in order to comply with the functional requirement of paragraph 6.2.1.2.1 above, means shall be provided to ensure that combustion air for internal combustion engines driving essential machinery is maintained at a temperature in compliance with the criteria provided by the engine manufacturer; and
- .3 in order to comply with the functional requirements of paragraph 6.2.1.2.2 above, materials of exposed machinery and foundations shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety based on the PST.

6.3.3 In addition, for ships ice strengthened in accordance with chapter 3, in order to comply with the functional requirements of paragraph 6.2.1.3 above, the following applies:

- .1 scantlings of propeller blades, propulsion line, steering equipment and other appendages of category A ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety;
- .2 scantlings of propeller blades, propulsion line, steering equipment and other appendages of category B ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety; and
- .3 scantlings of propeller blades, propulsion line, steering equipment and other appendages of ice-strengthened category C ships shall be approved by the Administration, or a recognized organization accepted by it, taking into account acceptable standards adequate with the ice types and concentration encountered in the area of operation.

CHAPTER 7 – FIRE SAFETY/PROTECTION

7.1 Goal

The goal of this chapter is to ensure that fire safety systems and appliances are effective and operable, and that means of escape remain available so that persons on board can safely and swiftly escape to the lifeboat and liferaft embarkation deck under the expected environmental conditions.

7.2 Functional requirements

7.2.1 In order to achieve the goal set out in paragraph 7.1 above, the following functional requirements are embodied in the regulations of this chapter:

- .1 all components of fire safety systems and appliances if installed in exposed positions shall be protected from ice accretion and snow accumulation;
- .2 local equipment and machinery controls shall be arranged so as to avoid freezing, snow accumulation and ice accretion and their location to remain accessible at all time;
- .3 the design of fire safety systems and appliances shall take into consideration the need for persons to wear bulky and cumbersome cold weather gear, where appropriate;
- .4 means shall be provided to remove or prevent ice and snow accretion from accesses; and
- .5 extinguishing media shall be suitable for intended operation.

7.2.2 In addition, for ships intended to operate in low air temperature, the following applies:

- .1 all components of fire safety systems and appliances shall be designed to ensure availability and effectiveness at the PST; and
- .2 materials used in exposed fire safety systems shall be suitable for operation at the PST.

7.3 Regulations

7.3.1 In order to comply with the requirement of paragraph 7.2.1.1, the following applies:

- .1 isolating and pressure/vacuum valves in exposed locations shall be protected from ice accretion and remain accessible at all times; and
- .2 all two-way portable radio communication equipment shall be operable at the PST.

7.3.2 In order to comply with the requirement of paragraph 7.2.1.2, the following applies:

- .1 fire pumps, including emergency fire pumps, water mist and water spray pumps, shall be located in compartments maintained above freezing;
- .2 the fire main is to be arranged so that exposed sections can be isolated and means of draining of exposed sections shall be provided. Fire hoses and nozzles need not be connected to the fire main at all times, and may be stored in protected locations near the hydrants;
- .3 firefighter's outfits shall be stored in warm locations on the ship; and
- .4 where fixed water-based firefighting systems are located in a space separate from the main fire pumps and use their own independent sea suction, this sea suction shall also be capable of being cleared of ice accumulation.

7.3.3 In addition, for ships intended to operate in low air temperature, the following applies:

- .1 in order to comply with the requirement of paragraph 7.2.2.1, portable and semi-portable extinguishers shall be located in positions protected from freezing temperatures, as far as practical. Locations subject to freezing are to be provided with extinguishers capable of operation at the PST; and
- .2 in order to comply with the functional requirements of paragraph 7.2.2.2 above, materials of exposed fire safety systems shall be approved by the Administration, or a recognized organization accepted by it, taking into account standards acceptable to the Organization or other standards offering an equivalent level of safety based on the PST.

CHAPTER 8 – LIFE-SAVING APPLIANCES AND ARRANGEMENTS

8.1 Goal

The goal of this chapter is to provide for safe escape, evacuation and survival.

8.2 Functional requirements

In order to achieve the goal set out in paragraph 8.1 above, the following functional requirements are embodied in the regulations of this chapter:

8.2.1 *Escape*

8.2.1.1 Exposed escape routes shall remain accessible and safe, taking into consideration the potential icing of structures and snow accumulation.

8.2.1.2 Survival craft and muster and embarkation arrangements shall provide safe abandonment of ship, taking into consideration the possible adverse environmental conditions during an emergency.

8.2.2 *Evacuation*

All life-saving appliances and associated equipment shall provide safe evacuation and be functional under the possible adverse environmental conditions during the maximum expected time of rescue.

8.2.3 *Survival*

8.2.3.1 Adequate thermal protection shall be provided for all persons on board, taking into account the intended voyage, the anticipated weather conditions (cold and wind) and the potential for immersion in polar water, where applicable.

8.2.3.2 Life-saving appliances and associated equipment shall take account of the potential of operation in long periods of darkness, taking into consideration the intended voyage.

8.2.3.3 Taking into account the presence of any hazards, as identified in the assessment in chapter 1, resources shall be provided to support survival following abandoning ship, whether to the water, to ice or to land, for the maximum expected time of rescue. These resources shall provide:

- .1 a habitable environment;

- .2 protection of persons from the effects of cold, wind and sun;
- .3 space to accommodate persons equipped with thermal protection adequate for the environment;
- .4 means to provide sustenance;
- .5 safe access and exit points; and
- .6 means to communicate with rescue assets.

8.3 Regulations

8.3.1 Escape

In order to comply with the functional requirements of paragraphs 8.2.1.1 and 8.2.1.2 above, the following applies:

- .1 for ships exposed to ice accretion, means shall be provided to remove or prevent ice and snow accretion from escape routes, muster stations, embarkation areas, survival craft, their launching appliances and access to survival craft;
- .2 in addition, for ships constructed on or after 1 January 2017, exposed escape routes shall be arranged so as not to hinder passage by persons wearing suitable polar clothing; and
- .3 in addition, for ships intended to operate in low air temperatures, adequacy of embarkation arrangements shall be assessed, having full regard to any effect of persons wearing additional polar clothing.

8.3.2 Evacuation

In order to comply with the functional requirement of paragraph 8.2.2 above, the following applies:

- .1 ships shall have means to ensure safe evacuation of persons, including safe deployment of survival equipment, when operating in ice-covered waters, or directly onto the ice, as applicable; and
- .2 where the regulations of this chapter are achieved by means of adding devices requiring a source of power, this source shall be able to operate independently of the ship's main source of power.

8.3.3 Survival

8.3.3.1 In order to comply with the functional requirement of paragraph 8.2.3.1 above, the following applies:

- .1 for passenger ships, a proper sized immersion suit or a thermal protective aid shall be provided for each person on board; and
- .2 where immersion suits are required, they shall be of the insulated type.

8.3.3.2 In addition, for ships intended to operate in extended periods of darkness, in order to comply with the functional requirements of paragraph 8.2.3.2 above, searchlights suitable for continuous use to facilitate identification of ice shall be provided for each lifeboat.

8.3.3.3 In order to comply with the functional requirement of paragraph 8.2.3.3 above, the following applies:

- .1 no lifeboat shall be of any type other than partially or totally enclosed;
- .2 taking into account the assessment referred to in chapter 1, appropriate survival resources, which address both individual (personal survival equipment) and shared (group survival equipment) needs, shall be provided, as follows:
 - .1 life-saving appliances and group survival equipment that provide effective protection against direct wind chill for all persons on board;
 - .2 personal survival equipment in combination with life-saving appliances or group survival equipment that provide sufficient thermal insulation to maintain the core temperature of persons; and
 - .3 personal survival equipment that provide sufficient protection to prevent frostbite of all extremities; and
- .3 in addition, whenever the assessment required under paragraph 1.5 identifies a potential of abandonment onto ice or land, the following applies:
 - .1 group survival equipment shall be carried, unless an equivalent level of functionality for survival is provided by the ship's normal life-saving appliances;
 - .2 when required, personal and group survival equipment sufficient for 110% of the persons on board shall be stowed in easily accessible locations, as close as practical to the muster or embarkation stations;
 - .3 containers for group survival equipment shall be designed to be easily movable over the ice and be floatable;
 - .4 whenever the assessment identifies the need to carry personal and group survival equipment, means shall be identified of ensuring that this equipment is accessible following abandonment;
 - .5 if carried in addition to persons, in the survival craft, the survival craft and launching appliances shall have sufficient capacity to accommodate the additional equipment;
 - .6 passengers shall be instructed in the use of the personal survival equipment and the action to take in an emergency; and
 - .7 the crew shall be trained in the use of the personal survival equipment and group survival equipment.

8.3.3.4 In order to comply with the functional requirement of paragraph 8.2.3.3.4 above, adequate emergency rations shall be provided, for the maximum expected time of rescue.

CHAPTER 9 – SAFETY OF NAVIGATION

9.1 Goal

The goal of this chapter is to provide for safe navigation.

9.2 Functional requirements

In order to achieve the goal set out in paragraph 9.1 above, the following functional requirements are embodied in the regulations of this chapter.

9.2.1 *Nautical information*

Ships shall have the ability to receive up-to-date information including ice information for safe navigation.

9.2.2 *Navigational equipment functionality*

9.2.2.1 The navigational equipment and systems shall be designed, constructed, and installed to retain their functionality under the expected environmental conditions in the area of operation.

9.2.2.2 Systems for providing reference headings and position fixing shall be suitable for the intended areas.

9.2.3 *Additional navigational equipment*

9.2.3.1 Ships shall have the ability to visually detect ice when operating in darkness.

9.2.3.2 Ships involved in operations with an icebreaker escort shall have suitable means to indicate when the ship is stopped.

9.3 Regulations

9.3.1 *Nautical information*

In order to comply with the functional requirement of paragraph 9.2.1 above, ships shall have means of receiving and displaying current information on ice conditions in the area of operation.

9.3.2 *Navigational equipment functionality*

9.3.2.1 In order to comply with the functional requirement of paragraph 9.2.2.1 above, the following applies:

- .1 ships constructed on or after 1 January 2017, ice strengthened in accordance with chapter 3, shall have either two independent echo-sounding devices or one echo-sounding device with two separate independent transducers;
- .2 ships shall comply with SOLAS regulation V/22.1.9.4, irrespective of the date of construction and the size and, depending on the bridge configuration, have a clear view astern;

- .3 for ships operating in areas and during periods where ice accretion is likely to occur, means to prevent the accumulation of ice on antennas required for navigation and communication shall be provided; and
- .4 in addition, for ships ice strengthened in accordance with chapter 3, the following applies:
 - .1 where equipment required by SOLAS chapter V or this chapter has sensors that project below the hull, such sensors shall be protected against ice; and
 - .2 in category A and B ships constructed on or after 1 January 2017, the bridge wings shall be enclosed or designed to protect navigational equipment and operating personnel.

9.3.2.2 In order to comply with the functional requirement of paragraph 9.2.2.2 above, the following applies:

- .1 ships shall have two non-magnetic means to determine and display their heading. Both means shall be independent and shall be connected to the ship's main and emergency source of power; and
- .2 ships proceeding to latitudes over 80° shall be fitted with at least one GNSS compass or equivalent, which shall be connected to the ship's main and emergency source of power.

9.3.3 Additional navigational equipment

9.3.3.1 In order to comply with the functional requirement of paragraph 9.2.3.1, ships, with the exception of those solely operating in areas with 24 h daylight, shall be equipped with two remotely rotatable, narrow-beam search lights controllable from the bridge to provide lighting over an arc of 360°, or other means to visually detect ice.

9.3.3.2 In order to comply with the functional requirement of paragraph 9.2.3.2, ships involved in operations with an icebreaker escort shall be equipped with a manually initiated flashing red light visible from astern to indicate when the ship is stopped. This light shall have a range of visibility of at least two nautical miles, and the horizontal and vertical arcs of visibility shall conform to the stern light specifications required by the *International Regulations for Preventing Collisions at Sea*.

CHAPTER 10 – COMMUNICATION

10.1 Goal

The goal of this chapter is to provide for effective communication for ships and survival craft during normal operation and in emergency situations.

10.2 Functional requirements

In order to achieve the goal set out in paragraph 10.1 above, the following functional requirements are embodied in the regulations of this chapter.

10.2.1 Ship communication

10.2.1.1 Two-way voice and/or data communications ship-to-ship and ship-to-shore shall be available at all points along the intended operating routes.

10.2.1.2 Suitable means of communications shall be provided where escort and convoy operations are expected.

10.2.1.3 Means for two-way on-scene and SAR coordination communications for search and rescue purposes including aeronautical frequencies shall be provided.

10.2.1.4 Appropriate communication equipment to enable telemedical assistance in polar areas shall be provided.

10.2.2 Survival craft and rescue boat communications capabilities

10.2.2.1 For ships intended to operate in low air temperature, all rescue boats and lifeboats, whenever released for evacuation, shall maintain capability for distress alerting, locating and on-scene communications.

10.2.2.2 For ships intended to operate in low air temperature, all other survival craft, whenever released, shall maintain capability for transmitting signals for location and for communication.

10.2.2.3 Mandatory communication equipment for use in survival craft, including liferafts and rescue boats, shall be capable of operation during the maximum expected time of rescue.

10.3 Regulations

10.3.1 Ship communication

10.3.1.1 In order to comply with the functional requirements of paragraph 10.2.1.1 above, communication equipment on board shall have the capabilities for ship-to-ship and ship-to-shore communication, taking into account the limitations of communications systems in high latitudes and the anticipated low temperature.

10.3.1.2 In order to comply with the functional requirements of paragraph 10.2.1.2 above, ships intended to provide icebreaking escort shall be equipped with a sound signaling system mounted to face astern to indicate escort and emergency manoeuvres to following ships as described in the *International Code of Signals*.

10.3.1.3 In order to comply with the functional requirements of paragraph 10.2.1.3 above, two-way on-scene and SAR coordination communication capability in ships shall include:

- .1 voice and/or data communications with relevant rescue coordination centres; and
- .2 equipment for voice communications with aircraft on 121.5 and 123.1 MHz.

10.3.1.4 In order to comply with the functional requirements of paragraph 10.2.1.4 above, the communication equipment shall provide for two-way voice and data communication with a Telemedical Assistance Service (TMAS).

10.3.2 Survival craft and rescue boat communications capabilities

10.3.2.1 For ships intended to operate in low air temperature, in order to comply with the functional requirements of paragraph 10.2.2.1 above, all rescue boats and lifeboats, whenever released for evacuation, shall:

- .1 for distress alerting, carry one device for transmitting ship-to-shore alerts;
- .2 in order to be located, carry one device for transmitting signals for location; and
- .3 for on-scene communications, carry one device for transmitting and receiving on-scene communications.

10.3.2.2 For ships intended to operate in low air temperature, in order to comply with the functional requirements of paragraph 10.2.2.2 above, all other survival craft shall:

- .1 in order to be located, carry one device for transmitting signals for location; and
- .2 for on-scene communications, carry one device for transmitting and receiving on-scene communications.

10.3.2.3 In order to comply with the functional requirements of paragraph 10.2.2.3 above, recognizing the limitations arising from battery life, procedures shall be developed and implemented such that mandatory communication equipment for use in survival craft, including liferafts and rescue boats, are available for operation during the maximum expected time of rescue.

CHAPTER 11 – VOYAGE PLANNING

11.1 Goal

The goal of this chapter is to ensure that the Company, master and crew are provided with sufficient information to enable operations to be conducted with due consideration to safety of ship and persons on board and, as appropriate, environmental protection.

11.2 Functional requirements

In order to achieve the goal set out in paragraph 11.1 above, the voyage plan shall take into account the potential hazards of the intended voyage.

11.3 Requirements

In order to comply with the functional requirement of paragraph 11.2 above, the master shall consider a route through polar waters, taking into account the following:

- .1 the procedures required by the PWOM;
- .2 any limitations of the hydrographic information and aids to navigation available;
- .3 current information on the extent and type of ice and icebergs in the vicinity of the intended route;

- .4 statistical information on ice and temperatures from former years;
- .5 places of refuge;
- .6 current information and measures to be taken when marine mammals are encountered, relating to known areas with densities of marine mammals, including seasonal migration areas;
- .7 current information on relevant ships' routing systems, speed recommendations and vessel traffic services relating to known areas with densities of marine mammals, including seasonal migration areas;
- .8 national and international designated protected areas along the route; and
- .9 operation in areas remote from SAR capabilities.

CHAPTER 12 – MANNING AND TRAINING

12.1 Goal

The goal of this chapter is to ensure that ships operating in polar waters are appropriately manned by adequately qualified, trained and experienced personnel.

12.2 Functional requirements

In order to achieve the goal set out in paragraph 12.1 above, companies shall ensure that masters, chief mates and officers in charge of a navigational watch on board ships operating in polar waters shall have completed training to attain the abilities that are appropriate to the capacity to be filled and duties and responsibilities to be taken up, taking into account the provisions of the STCW Convention and the STCW Code, as amended.

12.3 Regulations

12.3.1 In order to meet the functional requirement of paragraph 12.2 above while operating in polar waters, masters, chief mates and officers in charge of a navigational watch shall be qualified in accordance with chapter V of the STCW Convention and the STCW Code, as amended, as follows:

Ice conditions	Tankers	Passenger ships	Other
Ice free	Not applicable.	Not applicable.	Not applicable.
Open waters	Basic training for master, chief mate and officers in charge of a navigational watch.	Basic training for master, chief mate and officers in charge of a navigational watch.	Not applicable.
Other waters	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch.	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch.	Advanced training for master and chief mate. Basic training for officers in charge of a navigational watch.

12.3.2 The Administration may allow the use of a person(s) other than the master, chief mate or officers of the navigational watch to satisfy the requirements for training, as required by paragraph 12.3.1, provided that:

- .1 this person(s) shall be qualified and certified in accordance with regulation II/2 of the STCW Convention and section A-II/2 of the STCW Code, and meet the advance training requirements set out in the table in paragraph 12.3.1;
- .2 while operating in polar waters the ship carries a sufficient number of persons meeting the appropriate training requirements for polar waters to cover all watches;
- .3 this person(s) is subject to the Administration's minimum hours of rest requirements at all times;
- .4 when operating in waters other than open waters or bergy waters, the master, chief mate and officers in charge of a navigational watch on passenger ships and tankers shall meet the applicable basic training requirements set out in the table in paragraph 12.3.1; and
- .5 when operating in waters with an ice concentration of more than 2/10, the master, chief mate and officers in charge of a navigational watch on cargo ships other than tankers shall meet the applicable basic training requirements set out in the table in paragraph 12.3.1.

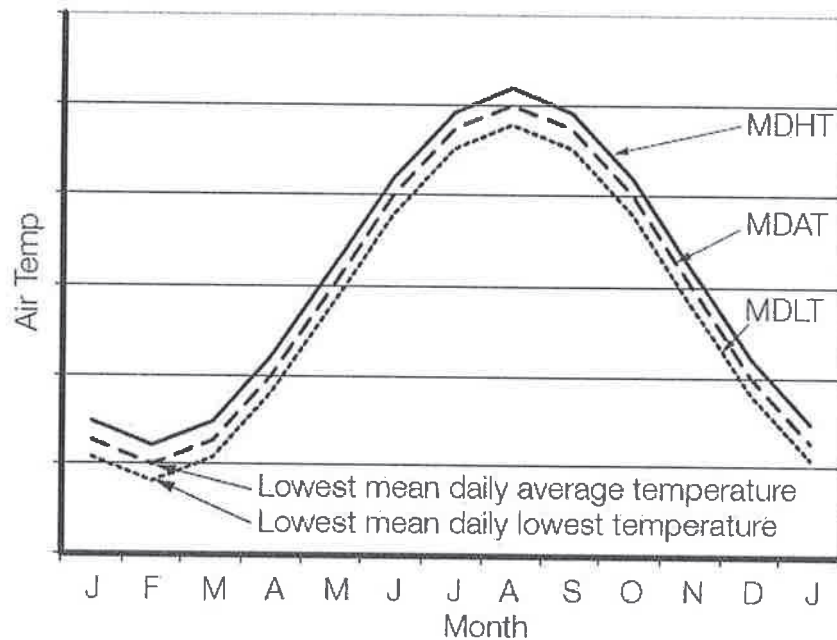
12.3.3 The use of a person other than the officer of the navigational watch to satisfy the requirements for training does not relieve the master or officer of the navigational watch from their duties and obligations for the safety of the ship.

12.3.4 Every crew member shall be made familiar with the procedures and equipment contained or referenced in the PWOM relevant to their assigned duties.

PART I-B

ADDITIONAL GUIDANCE REGARDING THE PROVISIONS OF THE INTRODUCTION AND PART I-A

1 Additional guidance to section 2 (definitions) of the Introduction



Definitions used in the figure above

MDHT – Mean Daily High Temperature

MDAT – Mean Daily Average Temperature

MDLT – Mean Daily Low Temperature

Guidance instructions for determining MDLT:

- 1 Determine the daily low temperature for each day for a 10 year period.
- 2 Determine the average of the values over the 10 year period for each day.
- 3 Plot the daily averages over the year.
- 4 Take the lowest of the averages for the season of operation.

2 Additional guidance to chapter 1 (General)

2.1 Limitations for operating in ice

2.1.1 Limitations for operation in ice can be determined using systems, tools or analysis that evaluate the risks posed by the anticipated ice conditions to the ship, taking into account factors such as its ice class, seasonal changing of ice strength, icebreaker support, ice type, thickness and concentration. The ship's structural capacity to resist ice load and the ship's planned operations should be considered. The limitations should be incorporated into an ice operational decision support system.

2.1.2 Limitations for operating in ice should be determined using an appropriate methodology, if such methodologies exist, have been in use for a number of years and have been validated with service experience. Existing methodologies and other systems may be acceptable to the Administration.

2.1.3 Operation in ice should take into account any operational limitations of the ship, extended information on the ice operational methodology contained in the PWOM, the condition of the ship and ship's systems, historical weather/ice data and weather/ice forecasts for the intended area of operation, current conditions including visual ice observations, sea state, visibility and the judgment of qualified personnel.

2.2 Operational assessment

2.2.1 This guidance is intended to support shipowners carrying out, and Administrations reviewing, the assessment required in part I-A, section 1.5, for operational limitations and procedures for the Polar Ship Certificate.

2.2.2 Steps for an operational assessment:

- .1 identify relevant hazards from section 3 of the Introduction and other hazards based on a review of the intended operations;
- .2 develop a model* to analyse risks considering:
 - .1 development of accident scenarios;
 - .2 probability of events in each accident scenario; and
 - .3 consequence of end states in each scenario;
- .3 assess risks and determine acceptability:
 - .1 estimate risk levels in accordance with the selected modelling approach;
 - .2 assess whether risk levels are acceptable; and

* Reference is made to the techniques in appendix 3 of the *Revised guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process* (MSC-MEPC.2/Circ.12) and standard IEC/ISO 31010 "Risk management – Risk assessment techniques".

- .4 in the event that risk levels determined in steps 1 to 3 are considered to be too high, identify current or develop new risk control options that aim to achieve one or more of the following:
 - .1 reduce the frequency of failures through better design, procedures, training, etc.;
 - .2 mitigate the effect of failures in order to prevent accidents;
 - .3 limit the circumstances in which failures may occur; or
 - .4 mitigate consequences of accidents; and
 - .5 incorporate risk control options for design, procedures, training and limitations, as applicable.

2.3 Performance standards

A system previously accepted based on manufacturer certifications, classification society certifications and/or satisfactory service of existing systems may be acceptable for installation on new and existing ships if no performance or testing standards are accepted by the Organization.

3 Additional guidance to chapter 2 (Polar Water Operational Manual (PWOM))

3.1 Recommendation on the content of the PWOM

3.1.1 The PWOM is intended to address all aspects of operations addressed by chapter 2 of part I-A. When appropriate information, procedures or plans exist elsewhere in a ship's documentation, the PWOM itself does not need to replicate this material, but may instead cross-reference the relevant reference document.

3.1.2 A model table of contents is set out in appendix II.

3.1.3 The model follows the general structure of chapter 2. Not every section outlined below will be applicable to every polar ship. Many category C ships that undertake occasional or limit polar voyages will not need to have procedures for situations with a very low probability of occurrence. However, it may still be advisable to retain a common structure for the PWOM as a reminder that if assumptions change then the contents of the manual may also need to be updated. Noting an aspect as "not applicable" also indicates to the Administration that this aspect has been considered and not merely omitted.

3.2 Guidance on navigation with icebreaker assistance

With respect to navigation with icebreaker assistance, the following should be considered:

- .1 while approaching the starting point of the ice convoy to follow an icebreaker/icebreakers or in the case of escorting by icebreaker of one ship to the point of meeting with the icebreaker, ships should establish radio communication on the VHF channel 16 and act in compliance with the icebreaker's instructions;
- .2 the icebreaker rendering the icebreaker assistance of ship ice convoy should command ships in the ice convoy;

- .3 position of a ship in the ice convoy should be determined by the icebreaker rendering the assistance;
- .4 ship within the ice convoy, in accordance with the instructions of the icebreaker rendering the assistance, should establish communication with the icebreaker by VHF channel indicated by the icebreaker;
- .5 the ship, while navigating in the ice convoy, should ensure compliance with the instructions of the icebreaker;
- .6 position in the ice convoy, speed and distance to a ship ahead should be as instructed by the icebreaker;
- .7 the ship should immediately notify the icebreaker of any difficulties to maintain the position within the ice convoy, speed and/or distance to any other ship in the ice convoy; and
- .8 the ship should immediately report to the icebreaker of any damage.

3.3 Guidance on the development of contingency plans

In developing the ship's contingency plans ships should consider damage control measures arrangements for emergency transfer of liquids and access to tanks and spaces during salvage operations (see also additional guidance to chapter 9).

4 Additional guidance to chapter 3 (Ship structure)

Method for determining equivalent ice class

4.1 The guidance presented below is intended to assist in determining equivalency with standards acceptable to the Organization, as referenced in chapters 3 and 6 of the Code. The methodology is consistent with guidance developed by the Organization* while allowing for the use of a simplified approach.

4.2 The basic approach for considering equivalency for categories A and B ships can be the same for both new and existing ships. It involves comparing other ice classes to the IACS Polar Classes. For ice classes under category C, additional information on comparisons of strengthening levels is available for the guidance of owners and Administrations†. The responsibility for generating the equivalency request and supporting information required should rest with the owner/operator. Review/approval of any equivalency request should be undertaken by the flag State Administration, or by a recognized organization acting on its behalf under the provisions of the Code for Recognized Organizations (RO Code). Several classification societies have developed easy-to-use tools for determination of compliance with the IACS Polar Class structural requirements, as have some Administrations and other third parties.

4.3 The scope of a simplified equivalency assessment (see paragraph 4.6 below) is expected to be limited to materials selection, structural strength of the hull and propulsion machinery.

* Refer to the *Guidelines for the approval of alternatives and equivalents as provided for in various IMO instruments* (MSC.1/Circ.1455).

† Refer to the annex to HELCOM Recommendation 25/7, Safety of Winter Navigation in the Baltic Sea Area, available at www.helcom.fi

4.4 If there is not full and direct compliance, then an equivalent level of risk can be accepted in accordance with guidance provided by the Organization. An increase in the probability of an event can be balanced by a reduction in its consequences. Alternatively, a reduction in probability could potentially allow acceptance of more serious consequences. Using a hull area example, a local shortfall in strength level or material grade could be accepted if the internal compartment is a void space, for which local damage will not put the overall safety of the ship at risk or lead to any release of pollutants.

4.5 For existing ships, service experience can assist in risk assessment. As an example, for an existing ship with a record of polar ice operations a shortfall in the extent of the ice belt (hull areas) may be acceptable if there is no record of damage to the deficient area; i.e. a ship that would generally meet PC 5 requirements but in limited areas is only PC 7 could still be considered as a category A, PC 5 ship. In all such cases, the ship's documentation should make clear the nature and scope of any deficiencies.

4.6 The process includes the following stages of assessment:

- .1 select the target Polar Class for equivalency;
- .2 compare materials used in the design with minimum requirements under the IACS Polar Class URs; identify any shortfalls; and
- .3 compare strength levels of hull and machinery components design with requirements under the IACS Polar Class URs; quantify levels of compliance.

Where gaps in compliance are identified in steps 1 to 3, additional steps should be necessary to demonstrate equivalency, as outlined below:

- .4 identify any risk mitigation measures incorporated in the design of the ship (over and above the requirements of the Code and IACS URs);
- .5 where applicable, provide documentation of service experience of existing ships, in conditions relevant to the target ice class for equivalency; and
- .6 undertake an assessment, taking into account information from steps 1 to 5, as applicable, and the principles outlined in paragraphs 4.2 to 4.6 above.

4.7 Documentation provided with an application for equivalency should identify each stage that has been undertaken, and sufficient supporting information to validate assessments.

4.8 Where a ship in categories A or B is provided with an equivalency for ice class by its flag State, this should be noted in its Polar Ship Certificate.

5 Additional guidance to chapter 4 (Subdivision and stability)

No additional guidance

6 Additional guidance to chapter 5 (Watertight and weathertight integrity)

No additional guidance.

7 Additional guidance to chapter 6 (Machinery installations)

Refer to additional guidance to chapter 3.

8 Additional guidance to chapter 7 (Fire safety/protection)

No additional guidance.

9 Additional guidance to chapter 8 (Life-saving appliances and arrangements)

9.1 *Sample personal survival equipment*

When considering resources to be included with the personal survival equipment, the following should be taken into account:

Suggested equipment
Protective clothing (hat, gloves, socks, face and neck protection, etc.)
Skin protection cream
Thermal protective aid
Sunglasses
Whistle
Drinking mug
Penknife
Polar survival guidance
Emergency food
Carrying bag

9.2 *Sample group survival equipment*

When considering resources to be included in the group survival equipment, the following should be taken into account:

Suggested equipment
Shelter – tents or storm shelters or equivalent – sufficient for maximum number of persons
Thermal protective aids or similar – sufficient for maximum number of persons
Sleeping bags – sufficient for at least one between two persons
Foam sleeping mats or similar – sufficient for at least one between two persons
Shovels – at least 2
Sanitation (e.g. toilet paper)
Stove and fuel – sufficient for maximum number of persons ashore and maximum anticipated time of rescue
Emergency food – sufficient for maximum number of persons ashore and maximum anticipated time of rescue
Flashlights – one per shelter
Waterproof and windproof matches – two boxes per shelter

Suggested equipment
Whistle
Signal mirror
Water containers & water purification tablets
Spare set of personal survival equipment
Group survival equipment container (waterproof and floatable)

10 Additional guidance to chapter 9 (Safety of navigation)

10.1 Radars equipped with enhanced ice detection capability should be promoted to be used, in particular in shallow waters.

10.2 As the chart coverage of polar waters in many areas may not currently be adequate for coastal navigation, navigational officers should:

- .1 exercise care to plan and monitor their voyage accordingly, taking due account of the information and guidance in the appropriate nautical publications;
- .2 be familiar with the status of hydrographic surveys and the availability and quality of chart information for the areas in which they intend to operate;
- .3 be aware of potential chart datum discrepancies with GNSS positioning; and
- .4 aim to plan their route through charted areas and well clear of known shoal depths, following established routes whenever possible.

10.3 Any deviations from the planned route should be undertaken with particular caution. For example, and when operating on the continental shelf:

- .1 the echo-sounder should be working and monitored to detect any sign of unexpected depth variation, especially when the chart is not based on a full search of the sea floor; and
- .2 independent cross-checking of positioning information (e.g. visual and radar fixing and GNSS) should be undertaken at every opportunity. Mariners should ensure to report to the relevant charting authority (Hydrographic Office) any information that might contribute to improving the nautical charts and publications.

10.4 Ships should be fitted with:

- .1 a suitable means to de-ice sufficient conning position windows to provide unimpaired forward and astern vision from conning positions; and

- .2 an efficient means of clearing melted ice, freezing rain, snow, mist and spray from outside and accumulated condensation from inside. A mechanical means to clear moisture from the outside face of a window should have operating mechanisms protected from freezing or the accumulation of ice that would impair effective operation.

11 Additional guidance to chapter 10 (Communication)

11.1 *Limitations of communication systems in high latitude*

11.1.1 Current maritime digital communication systems were not designed to cover polar waters.

11.1.2 VHF is still largely used for communication at sea, but only over short distances (line of sight) and normally only for voice communication. HF and MF are also used for emergency situations. Digital VHF, mobile phone systems and other types of wireless technology offer enough digital capacity for many maritime applications, but only to ships within sight of shore-based stations, and are, therefore, not generally available in polar waters. AIS could also be used for low data-rate communication, but there are very few base stations, and the satellite-based AIS system is designed for data reception only.

11.1.3 The theoretical limit of coverage for GEO systems is 81.3° North or South, but instability and signal dropouts can occur at latitudes as low as 70° North or South under certain conditions. Many factors influence the quality of service offered by GEO systems, and they have different effects depending on the system design.

11.1.4 Non-GMDSS systems may be available and may be effective for communication in polar waters.

11.2 *Advice for the operation of multiple alerting and communication devices in the event of an incident*

11.2.1 A procedure should be developed to ensure that when survival craft are in close proximity, not more than two alerting or locating devices are activated (as required by regulation 10.3.2) at the same time. This is to:

- .1 preserve battery life;
- .2 enable extended periods of time for the transmission of alerting or locating signals; and
- .3 avoid potential interference.

11.2.2 For satellite distress beacons, although multiple beacon transmissions can be detected successfully by the satellite system, it is not recommended to activate multiple beacons, unless the survival craft operating the beacons are widely dispersed, as this can cause interference on direction-finding equipment.

11.3 *Advice on location and communication equipment to be carried by rescue boats and survival craft*

In determining the equipment to be carried for transmitting signals for location, the capabilities of the search and rescue resources likely to respond should be borne in mind. Responding ships and aircraft may not be able to home to 406/121.5 MHz, in which case other locating devices (e.g. AIS-SART) should be considered.

12 **Additional guidance to chapter 11 (Voyage planning)**

In developing and executing a voyage plan ships should consider the following:

- .1 in the event that marine mammals are encountered, any existing best practices should be considered to minimize unnecessary disturbance; and
- .2 planning to minimize the impact of the ship's voyage where ships are trafficking near areas of cultural heritage and cultural significance.

(see also additional guidance to chapter 9)

13 **Additional guidance to chapter 12 (Manning and training)**

No additional guidance.

**PART II-A
POLLUTION PREVENTION MEASURES**

CHAPTER 1 – PREVENTION OF POLLUTION BY OIL

1.1 Operational requirements

1.1.1 In Arctic waters any discharge into the sea of oil or oily mixtures from any ship shall be prohibited.

1.1.2 The provisions of paragraph 1.1.1 shall not apply to the discharge of clean or segregated ballast.

1.1.3 Subject to the approval of the Administration, a category A ship constructed before 1 January 2017 that cannot comply with paragraph 1.1.1 for oil or oily mixtures from machinery spaces and is operating continuously in Arctic waters for more than 30 days shall comply with paragraph 1.1.1 not later than the first intermediate or renewal survey, whichever comes first, one year after 1 January 2017. Until that date such ships shall comply with the discharge requirements of regulation 15.3 of MARPOL Annex I.

1.1.4 Operation in polar waters shall be taken into account, as appropriate, in the Oil Record Books, manuals and the shipboard oil pollution emergency plan or the shipboard marine pollution emergency plan as required by MARPOL Annex I.

1.2 Structural requirements

1.2.1 For category A and B ships constructed on or after 1 January 2017 with an aggregate oil fuel capacity of less than 600 m³, all oil fuel tanks shall be separated from the outer shell by a distance of not less than 0.76 m. This provision does not apply to small oil fuel tanks with a maximum individual capacity not greater than 30 m³.

1.2.2 For category A and B ships other than oil tankers constructed on or after 1 January 2017, all cargo tanks constructed and utilized to carry oil shall be separated from the outer shell by a distance of not less than 0.76 m.

1.2.3 For category A and B oil tankers of less than 5,000 tonnes deadweight constructed on or after 1 January 2017, the entire cargo tank length shall be protected with:

- .1 double bottom tanks or spaces complying with the applicable requirements of regulation 19.6.1 of MARPOL Annex I; and
- .2 wing tanks or spaces arranged in accordance with regulation 19.3.1 of MARPOL Annex I and complying with the applicable requirements for distance referred to in regulation 19.6.2 of MARPOL Annex I.

1.2.4 For category A and B ships constructed on or after 1 January 2017 all oil residue (sludge) tanks and oily bilge water holding tanks shall be separated from the outer shell by a distance of not less than 0.76 m. This provision does not apply to small tanks with a maximum individual capacity not greater than 30 m³.

CHAPTER 2 – CONTROL OF POLLUTION BY NOXIOUS LIQUID SUBSTANCES IN BULK

2.1 Operational requirements

2.1.1 In Arctic waters any discharge into the sea of noxious liquid substances (NLS), or mixtures containing such substances, shall be prohibited.

2.1.2 Operation in polar waters shall be taken into account, as appropriate, in the Cargo Record Book, the Manual and the shipboard marine pollution emergency plan for noxious liquid substances or the shipboard marine pollution emergency plan as required by MARPOL Annex II.

2.1.3 For category A and B ships constructed on or after 1 January 2017, the carriage of NLS identified in chapter 17, column e, as ship type 3 or identified as NLS in chapter 18 of the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk*, in cargo tanks of type 3 ships shall be subject to the approval of the Administration. The results shall be reflected on the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk or Certificate of Fitness identifying the operation in polar waters.

CHAPTER 3 – PREVENTION OF POLLUTION BY HARMFUL SUBSTANCES CARRIED BY SEA IN PACKAGED FORM

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CHAPTER 4 – PREVENTION OF POLLUTION BY SEWAGE FROM SHIPS

4.1 Definitions

4.1.1 *Constructed* means a ship the keel of which is laid or which is at a similar stage of construction.

4.1.2 *Ice-shelf* means a floating ice sheet of considerable thickness, showing 2 to 50 m or more above sea-level, attached to the coast.

4.1.3 *Fast ice* means sea ice which forms and remains fast along the coast, where it is attached to the shore, to an ice wall, to an ice front, between shoals or grounded icebergs.

4.2 Operational requirements

4.2.1 Discharges of sewage within polar waters are prohibited except when performed in accordance with MARPOL Annex IV and the following requirements:

- 1 the ship is discharging comminuted and disinfected sewage in accordance with regulation 11.1.1 of MARPOL Annex IV at a distance of more than three nautical miles from any ice-shelf or fast ice and shall be as far as practicable from areas of ice concentration exceeding 1/10; or
- 2 the ship is discharging sewage that is not comminuted or disinfected in accordance with regulation 11.1.1 of MARPOL Annex IV and at a distance of more than 12 nautical miles from any ice-shelf or fast ice and shall be as far as practicable from areas of ice concentration exceeding 1/10; or

- .3 the ship has in operation an approved sewage treatment plant certified by the Administration to meet the operational requirements in either regulation 9.1.1 or 9.2.1 of MARPOL Annex IV, and discharges sewage in accordance with regulation 11.1.2 of Annex IV and shall be as far as practicable from the nearest land, any ice-shelf, fast ice or areas of ice concentration exceeding 1/10.

4.2.2 Discharge of sewage into the sea from category A and B ships constructed on or after 1 January 2017 and all passenger ships constructed on or after 1 January 2017 is prohibited, except when such discharges are in compliance with paragraph 4.2.1.3 of this chapter.

4.2.3 Notwithstanding the requirements of paragraph 4.2.1, category A and B ships that operate in areas of ice concentrations exceeding 1/10 for extended periods of time, may only discharge sewage using an approved sewage treatment plant certified by the Administration to meet the operational requirements in regulation 9.1.1 or 9.2.1 of MARPOL Annex IV. Such discharges shall be subject to approval by the Administration.

CHAPTER 5 – PREVENTION OF POLLUTION BY GARBAGE FROM SHIPS

5.1 Definitions

5.1.1 *Ice-shelf* means a floating ice sheet of considerable thickness, showing 2 to 50 m or more above sea-level, attached to the coast.

5.1.2 *Fast ice* means sea ice which forms and remains fast along the coast, where it is attached to the shore, to an ice wall, to an ice front, between shoals or grounded icebergs

5.2 Operational requirements

5.2.1 In Arctic waters, discharge of garbage into the sea permitted in accordance with regulation 4 of MARPOL Annex V shall meet the following additional requirements:

- .1 discharge into the sea of food wastes is only permitted when the ship is as far as practicable from areas of ice concentration exceeding 1/10, but in any case not less than 12 nautical miles from the nearest land, nearest ice-shelf, or nearest fast ice;
- .2 food wastes shall be comminuted or ground and shall be capable of passing through a screen with openings no greater than 25 mm. Food wastes shall not be contaminated by any other garbage type;
- .3 food wastes shall not be discharged onto the ice;
- .4 discharge of animal carcasses is prohibited; and
- .5 discharge of cargo residues that cannot be recovered using commonly available methods for unloading shall only be permitted while the ship is en route and where all of the following conditions are satisfied:
 - .1 cargo residues, cleaning agents or additives, contained in hold washing water do not include any substances classified as harmful to the marine environment, taking into account guidelines developed by the Organization;

- .2 both the port of departure and the next port of destination are within Arctic waters and the ship will not transit outside Arctic waters between those ports;
- .3 no adequate reception facilities are available at those ports, taking into account guidelines developed by the Organization; and
- .4 where the conditions of subparagraphs 5.2.1.5.1, 5.2.1.5.2 and 5.2.1.5.3 of this paragraph have been fulfilled, discharge of cargo hold washing water containing residues shall be made as far as practicable from areas of ice concentration exceeding 1/10, but in any case not less than 12 nautical miles from the nearest land, nearest ice shelf, or nearest fast ice.

5.2.2 In the Antarctic area, discharge of garbage into the sea permitted in accordance with regulation 6 of MARPOL Annex V shall meet the following additional requirements:

- .1 discharges under regulation 6.1 of MARPOL Annex V shall be as far as practicable from areas of ice concentration exceeding 1/10, but in any case not less than 12 nautical miles from the nearest fast ice; and
- .2 food waste shall not be discharged onto ice.

5.2.3 Operation in polar waters shall be taken into account, as appropriate, in the Garbage Record Book, Garbage Management Plan and the placards as required by MARPOL Annex V.

PART II-B

ADDITIONAL GUIDANCE REGARDING THE PROVISIONS OF THE INTRODUCTION AND PART II-A

1 Additional guidance to chapter 1

1.1 Ships are encouraged to apply regulation 43 of MARPOL Annex I when operating in Arctic waters.

1.2 Non-toxic biodegradable lubricants or water-based systems should be considered in lubricated components located outside the underwater hull with direct seawater interfaces, like shaft seals and slewing seals.

2 Additional guidance to chapter 2

Category A and B ships, constructed on or after 1 January 2017 and certified to carry noxious liquid substances (NLS), are encouraged to carry NLS identified in chapter 17, column e, as ship type 3 or identified as NLS in chapter 18 of the *International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk*, in tanks separated from the outer shell by a distance of not less than 760 mm.

3 Additional guidance to chapter 5

In order to minimize the risks associated with animal cargo mortalities, consideration should be given to how animal carcasses will be managed, treated and stored on board when ships carrying such cargo are operating in polar waters. Reference is made in particular to the *2012 Guidelines for the implementation of MARPOL Annex V* (resolution MEPC.219(63), as amended by resolution MEPC.239(65)) and the *2012 Guidelines for the development of garbage management plans* (resolution MEPC.220(63)).

4 Additional guidance under other environmental conventions and guidelines

4.1 Until the *International Convention for the Control and Management of Ships' Ballast Water and Sediments* enters into force, the ballast water management provisions of the ballast water exchange standard, set out in regulation D-1, or the ballast water performance standard, set out in regulation D-2 of the Convention should be considered as appropriate. The provisions of the *Guidelines for ballast water exchange in the Antarctic treaty area* (resolution MEPC.163(56)) should be taken into consideration, along with other relevant guidelines developed by the Organization.

4.2 In selecting the ballast water management system, attention should be paid to limiting conditions specified in the appendix of the Type Approval Certificate and the temperature under which the system has been tested, in order to ensure its suitability and effectiveness in polar waters.

4.3 In order to minimize the risk of invasive aquatic species transfers via biofouling, measures should be considered to minimize the risk of more rapid degradation of anti-fouling coatings associated with polar ice operations. Reference is made in particular to the *2011 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species* (resolution MEPC.207(62)).

Table: Example of matters related to anti-fouling systems taken into consideration by some ice-going ships
(this table is used by some operators of ice-going ships)

	Hull	Sea chest
Year round operation in ice-covered polar waters		• Abrasion resistant coating. • Compliant with the AFS Convention. Thickness of anti-fouling system to be decided by shipowner.
Intermittent operation in ice-covered polar waters	• Abrasion resistant low friction ice coating. • In sides, above bilge keel, max thickness of anti-fouling system 75 µm, to protect hull between application of anti-fouling system and next anticipated voyage to ice-covered waters. In bottom area thickness to be decided by shipowner. Composition of anti-fouling system should also be decided by the shipowner.	• Compliant with the AFS Convention. Thickness of anti-fouling system to be decided by shipowner.
Category B and C ships	• Compliant with the AFS Convention. Thickness of anti-fouling system to be decided by shipowner.	• Compliant with the AFS Convention. Thickness of anti-fouling system to be decided by shipowner.

APPENDIX I

Form of Certificate for Ships operating in Polar Waters

POLAR SHIP CERTIFICATE

This Certificate shall be supplemented by a Record of Equipment for the
Polar Ship Certificate

(Official seal)

(State)

Issued under the provisions of the

International Convention for the Safety of Life at Sea, 1974, as amended

under the authority of the Government of

(name of the State)

by _____
(person or organization authorized)

Particulars of ship*

Name of ship.....
Distinctive number or letters.....
Port of registry.....
Gross tonnage.....
IMO number.....

* Alternatively, the particulars of the ship may be placed horizontally in boxes.

THIS IS TO CERTIFY:

- 1 That the ship has been surveyed in accordance with the applicable safety-related provisions of the International Code for Ships Operating in Polar Waters.
- 2 That the survey showed that the structure, equipment, fittings, radio station arrangements, and materials of the ship and the condition thereof are in all respects satisfactory and that the ship complies with the relevant provisions of the Code.

Category A/B/C* ship as follows:

Ice Class and ice strengthened draught range

Ice Class	Maximum draught		Minimum draught	
	Aft	Fwd	Aft	Fwd

- 2.1 Ship type: tanker/passenger ship/other*
- 2.2 Ship restricted to operate in ice free waters/open waters/other ice conditions*
- 2.3 Ship intended to operate in low air temperature: Yes/No*
- 2.3.1 Polar Service Temperature:°C/not applicable*
- 2.4 Maximum expected time of rescuedays
- 3 The ship was/was not* subject to alternative design and arrangements in pursuance of regulation XIV/4 of the Convention.
- 4 A Document of approval of alternative design and arrangements for structure, machinery and electrical installations/fire protection/life-saving appliances and arrangements* is/is not* appended to this Certificate.
- 5 Operational limitations
The ship has been assigned the following limitations for operation in polar waters:
 - 5.1 Ice conditions:
 - 5.2 Temperature:
 - 5.3 High latitudes:

* Delete as appropriate.

This certificate is valid until subject to the annual/periodical/intermediate* surveys in accordance with section 1.3 of the Code.

Completion date of the survey on which this certificate is based:
(dd/mm/yyyy)

Issued at
(Place of issue of certificate)

.....
(Date of issue)

.....
(Signature of authorized official
issuing the certificate)

(Seal or stamp of the issuing authority, as appropriate)

Endorsement for annual, periodical and intermediate surveys*

THIS IS TO CERTIFY that, at a survey required by regulation 1.3 of the Code, the ship was found to comply with the relevant requirements of the Code.

Annual survey: Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

Annual/Periodical/Intermediate* survey: Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

Annual/Periodical/Intermediate* survey: Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

Annual survey:

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

Endorsement to extend the certificate if valid for less than 5 years where regulation I/14(c) of the Convention applies*

The ship complies with the relevant requirements of the Convention, and this certificate shall, in accordance with regulation I/14(c) of the Convention, be accepted as valid until.....

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

Endorsement where the renewal survey has been completed and regulation I/14(d) of the Convention applies*

The ship complies with the relevant requirements of the Convention, and this certificate shall, in accordance with regulation I/14(d) of the Convention, be accepted as valid until.....

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

Endorsement to extend the validity of the certificate until reaching the port of survey or for a period of grace where regulation I/14(e) or I/14(f) of the Convention applies*

This certificate shall, in accordance with regulation I/14(e)/I/14(f)* of the Convention, be accepted as valid until

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

Endorsement for advancement of anniversary date where regulation I/14(h) of the Convention applies*

In accordance with regulation I/14(h) of the Convention, the new anniversary date is

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

In accordance with regulation I/14(h) of the Convention, the new anniversary date is

Signed:
(Signature of authorized official)

Place:

Date:
(Seal or stamp of the authority, as appropriate)

* Delete as appropriate.

Record of Equipment for the Polar Ship Certificate

This record shall be permanently attached to the Polar Ship Certificate

RECORD OF EQUIPMENT FOR COMPLIANCE WITH THE INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS

1 Particulars of ship

Name of ship:.....

Distinctive number or letters:.....

2 Record of equipment

2.1 Life-saving appliances

1	Total number of immersion suits with insulation:	.....
1.1	for crew	.....
1.2	for passengers	.....
2	Total number of thermal protective aids	.....
3	Personal and Group Survival Equipment	.....
3.1	Personal survival equipment – for number of persons	.....
3.2	Group survival equipment – for number persons	.....
3.3	Total capacity of liferafts in compliance with chapter 8 of the Polar Code	.....
3.4	Total capacity of lifeboats in compliance with chapter 8 of the Polar Code	.....

2.2 Navigation equipment

1	Two independent echo-sounding devices or a device with two separate independent transducers	.....
2	Remotely rotatable, narrow-beam search lights controllable from the bridge or other means to visually detect ice	.....
3	Manually initiated flashing red light visible from astern (for ships involved in icebreaking operations)	.....
4	Two or more non-magnetic independent means to determine and display heading	.....
5	GNSS compass or equivalent (for ships proceeding to latitudes over 80 degrees)	.....

2.3 Communication equipment

1	Sound signaling system mounted to face astern to indicate escort and emergency manoeuvres to following ships as described in the International Code of Signals (for ships intended to provide ice breaking escort)	.....
2	Voice and/or data communications with relevant rescue coordination centres	.....
3	Equipment for voice communications with aircraft on 121.5 and 123.1 MHz	.....
4	Two-way voice and data communication with a Telemedical Assistance Service (TMAS)	.....
5	All rescue boats and lifeboats, whenever released for evacuation, have a device (for ships certified to operate in low air temperature):	.....
5.1	for transmitting vessel to shore alerts	.....
5.2	for transmitting signals for location	.....
5.3	for transmitting and receiving on-scene communications	.....
6	All other survival craft have a device:	.....
6.1	for transmitting signals for location	.....
6.2	for transmitting and receiving on-scene communications	.....

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at.....
(Place of issue of the Record)

.....
(Date of issue) (Signature of duly authorized official issuing the Record)

(Seal or stamp of the issuing authority, as appropriate)

APPENDIX II

Model table of contents for the Polar Water Operational Manual (PWOM)

SAFETY MEASURES

1 OPERATIONAL CAPABILITIES AND LIMITATIONS

Chapter 1 Operation in ice

1.1 Operator guidance for safe operation

Guidance: The PWOM should establish the means by which decisions as to whether ice conditions exceed the ship's design limits should be made, taking into account the operational limitations on the Polar Ship Certificate. An appropriate decision support system, such as the Canada's Arctic Ice Regime Shipping System, and/or the Russian Ice Certificate as described in the Rules of Navigation on the water area of the Northern Sea Route, can be used... Bridge personnel should be trained in the proper use of the system to be utilized. For ships that will operate only in ice-free waters, procedures to ensure that will keep the ship from encountering ice should be established.

1.2 Icebreaking capabilities

Guidance: The PWOM should provide information on the ice conditions in which the ship can be expected to make continuous progress. This may be drawn, for example from numerical analysis, model test or from ice trials. Information on the influence of ice strength for new or decayed ice and of snow cover may be included.

1.3 Manoeuvring in ice

1.4 Special features

Guidance: Where applicable, the PWOM should include the results of any equivalency analyses made to determine polar ship category/ice class. The Manual should also provide information on the use of any specialized systems fitted to assist in ice operations.

Chapter 2 Operation in low air temperatures

System design

Guidance: The PWOM should list all ship systems susceptible to damage or loss of functionality by exposure to low temperatures, and the measures to be adopted to avoid malfunction.

Chapter 3 Communication and navigation capabilities in high latitudes

Guidance: The PWOM should identify any restrictions to operational effectiveness of communications and navigational equipment that may result from operating in high latitudes.

Chapter 4 Voyage duration

Guidance: The PWOM should provide information on any limitations on ship endurance such as fuel tankage, fresh water capacity, provision stores, etc. This will normally only be a significant consideration for smaller ships, or for ships planning to spend extended periods in ice.

2 SHIP OPERATIONS

Chapter 1 Strategic planning

Assumptions used in conducting the analyses referred to below should be included in the Manual.

1.1 Avoidance of hazardous ice

Guidance: For ships operating frequently in polar waters, the PWOM should provide information with respect to periods during which the ship should be able to operate for intended areas of operation. Areas that pose particular problems, e.g. chokepoints, ridging, as well as worst recorded ice conditions should be noted. Where the available information is limited or of uncertain quality, this should be recognized and noted as a risk for voyage planning.

1.2 Avoidance of hazardous temperatures

Guidance: For ships operating frequently in polar waters, the PWOM should provide information with respect to, the daily mean daily low temperature as well as the minimum recorded temperature for each of the days during the intended operating period. Where the available information is limited or of uncertain quality, this should be recognized as a risk for voyage planning.

1.3 Voyage duration and endurance

Guidance: Procedures to establish requirements for supplies should be established, and appropriate safety levels for safety margins determined taking into account various scenarios, e.g. slower than expected steaming, course alterations, adverse ice conditions, places of refuge and access to provisions. Sources for and availability of fuel types should be established, taking into account long lead times required for deliveries.

1.4 Human resources management

Guidance: The PWOM should provide guidance for the human resources management, taking into account the anticipated ice conditions and requirements for ice navigation, increased levels of watch keeping, hours of rest, fatigue and a process that ensures that these requirements will be met.

Chapter 2 Arrangements for receiving forecasts of environmental conditions

Guidance: The PWOM should set out the means and frequency for provision of ice and weather information. Where a ship is intended to operate in or in the presence of ice, the manual should set out when weather and ice information is required and the format for the information.

When available, the information should include both global and localized forecasts that will identify weather and ice patterns/regimes that could expose the ship to adverse conditions.

The frequency of updates should provide enough advance notice that the ship can take refuge or use other methods of avoiding the hazard if the conditions are forecast to exceed its capabilities.

The PWOM may include use of a land-based support information provider an effective method of sorting through available information, thereby providing the ship only with information that is relevant, reducing demands on the ship's communications systems. The manual may also indicate instances in which additional images should be obtained and analysed, as well as where such additional information may be obtained.

2.1 *Ice information*

Guidance: The PWOM should include or refer to guidance on how radar should be used to identify ice floes, how to tune the radar to be most effective, instructions on how to interpret radar images, etc. If other technologies are to be used to provide ice information, their use should also be described.

2.2 *Meteorological information*

Chapter 3 Verification of hydrographic, meteorological and navigational information

Guidance: The PWOM should provide guidance on the use of hydrographic information as further described in the additional guidance to chapter 10.

Chapter 4 Operation of special equipment

4.1 *Navigation systems*

4.2 *Communications systems*

Chapter 5 Procedures to maintain equipment and system functionality

5.1 *Icing prevention and de-icing*

Guidance: The PWOM should provide guidance on how to prevent or mitigate icing by operational means, how to monitor and assess ice accretion, how to conduct de-icing using equipment available on the ship, and how to maintain the safety of the ship and its crew during all of these aspects of the operation.

5.2 *Operation of seawater systems*

Guidance: The PWOM should provide guidance on how to monitor, prevent or mitigate ice ingestion by seawater systems when operating in ice or in low water temperatures. This may include recirculation, use of low rather than high suctions, etc.

5.3 *Procedures for low temperature operations*

Guidance: The PWOM should provide guidance on maintaining and monitoring any systems and equipment that are required to be kept active in order to ensure functionality; e.g. by trace heating or continuous working fluid circulation.

3 RISK MANAGEMENT

Chapter 1 Risk mitigation in limiting environmental condition

1.1 *Measures to be considered in adverse ice conditions*

Guidance: The PWOM should contain guidance for the use of low speeds in the presence of hazardous ice. Procedures should also be set for enhanced watchkeeping and lookout manning in situations with high risks from ice, e.g. in proximity to icebergs, operation at night, and other situations of low visibility. When possibilities for contact with hazardous ice exist, procedures should address regular monitoring, e.g. soundings/inspections of compartments and tanks below the waterline.

1.2 Measures to be considered in adverse temperature conditions

Guidance: The PWOM should contain guidance on operational restrictions in the event that temperatures below the ships polar service temperature are encountered or forecast. These may include delaying the ship, postponing the conduct of certain types of operation, using temporary heating, and other risk mitigation measures.

Chapter 2 Emergency response

Guidance: In general, where the possibility of encountering low air temperatures, sea ice, and other hazards is present, the PWOM should provide guidance on procedures that will increase the effectiveness of emergency response measures.

2.1 Damage control

Guidance: The PWOM should consider damage control measures arrangements for emergency transfer of liquids and access to tanks and spaces during salvage operations.

2.2 Firefighting

2.3 Escape and evacuation

Guidance: Where supplementary or specialized life-saving equipment is carried to address the possibilities of prolonged durations prior to rescue, abandonment onto ice or adjacent land, or other aspects specific to polar operations, the PWOM should contain guidance on the use of the equipment and provision for appropriate training and drills.

Chapter 3 Coordination with emergency response services

3.1 Ship emergency response

Guidance: The PWOM should include procedures to be followed in preparing for a voyage and in the event of an incident arising.

3.2 Salvage

Guidance: The PWOM should include procedures to be followed in preparing for a voyage and in the event of an incident arising.

3.3 Search and rescue

Guidance: The PWOM should contain information on identifying relevant Rescue Coordination Centres for any intended routes, and should require that contact information and procedures be verified and updated as required as part of any voyage plan.

Chapter 4 Procedures for maintaining life support and ship integrity in the event of prolonged entrapment by ice

Guidance: Where any ship incorporates special features to mitigate safety or environmental risks due to prolonged entrapment by ice, the PWOM should provide information on how these are to be set up and operated. This may include, for example, adding additional equipment to be run from emergency switchboards, draining systems at risk of damage through freezing, isolating parts of HVAC systems, etc.

4.1 System configuration

4.2 System operation

4 JOINT OPERATIONS

Chapter 1 Escorted operations

Guidance: The PWOM should contain or reference information on the rules and procedures set out by coastal States who require or offer icebreaking escort services. The Manual should also emphasize the need for the master to take account of the ship's limitations in agreeing on the conduct of escort operations.

Chapter 2 Convoy operations