THE REPUBLIC OF LIBERIA
LIBERIA MARITIME AUTHORITY

Office of
Deputy Commissioner
of Maritime Affairs

Marine Notice

SAF-009
Rev. 01/26

TO: **ALL SHIPOWNERS, OPERATORS, MASTERS AND OFFICERS OF MERCHANT SHIPS AND AUTHORIZED CLASSIFICATION SOCIETIES**

SUBJECT: **Implementation, Survey and Certification under the International Code for Ships Operating in Polar Waters (Polar Code)**

Reference:
(a) SOLAS 1974, as amended, Chapter XIV
(b) MARPOL 73/78, as amended
(c) Resolutions MSC 385(94) and MEPC. 264(68) - Polar Code
(d) STCW 1978, as amended
(e) IACS Recommendation No.189 - Recommendation for determining the equivalent level of safety required by the Polar Code
(f) Resolution MSC.532(107) - Amendments to SOLAS Chapter XIV - Safety Measures for Ships Operating in Polar Waters
(g) Resolution MSC.538(107) - Amendments to the Polar Code

Supersedes: **Marine Notice SAF-009, dated 09/23**

The following changes have been included:

a) Added new reference (e).
b) The Background, and Sections 2.4.1 and 2.7.3 have been amended to refer to reference (e) as a standard offering an equivalent level of safety.
c) The Applicability Section has been amended to incorporate the amendments in reference (f) and (g).

PURPOSE:

The purpose of this Marine Notice is to provide guidance on implementing the requirements for ships operating in polar waters due to the additional demands for safety and protection of the marine environment imposed by the Polar Code.

BACKGROUND:

With increasing ship operations and shipping traffic in the polar waters, and following several incidents in recent years, there has been a focus towards increasing the safety of vessel design and operations.

The Polar Code has been on the IMO's agenda since the 1990s, initially as non-mandatory guidance. Now, in response to increased operations and traffic in polar waters, it has been developed and made mandatory.

The Polar Code comprises a set of additions to SOLAS (new chapter XIV) and MARPOL Conventions, that is implemented through amendments to both these Conventions.

It contains the introduction, and two corresponding parts:

1. The Introduction is applicable to both parts and includes the sources of hazards which shall be taken into account when carrying out an operational assessment;

2. Part I-A contains the mandatory requirements on safety measures for ships (safe design and operation of ships) and forms an add-on to the SOLAS requirements.

3. Part 1-B contains recommendations on safety measures for ships;

4. Part II-A contains the pollution prevention measures (environmental protection of the polar regions) and is implemented through amendments to MARPOL Annexes I, II, IV and V; and

5. Part II-B contains recommendations on pollution prevention measures.

The Polar Code uses ship Categories to identify application of certain requirements based on anticipated hazards encountered for the expected operating environment. Three ship Categories are defined:

– 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.

– 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.

– 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.

The ship Category is a reflection of the expected severity of ice conditions that the ship is anticipated to operate in. The definitions in the Introduction part of the Code uses general ice descriptions based on World Metrological Organization (WMO) nomenclature.

The principal intention of the ship Categories is to group ships by their ability to operate safely in ice – ships intended to operate in more severe conditions (Category A and B ships) having additional requirements to mitigate the perceived additional hazards.

Category A ships should be considered ships which are IACS Polar Class PC5 or above (PC4, PC3, PC2, PC1) or ships with an equivalent level of safety, such as **reference (e)**.

Category B ships should be considered ship which are IACS Polar Class PC7 or PC6 or ships with an equivalent level of safety, such as **reference (e)**.

Category C: are ships which are ice strengthened and non-ice strengthened ships which do not fall into Category A or B. As such, ships of Category C may, or may not have an ice class, depending on the ice conditions that they are anticipated to operate in

It is to be noted that the ship Category is a result of the ice class assigned to the ship and not vice versa. 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.

APPLICABILITY:

Regardless of flag, the Polar Code applies to all ships carrying SOLAS certification that intend to operate in polar waters.

Part I applies to all new vessels whose keel is laid on or after 1 January, 2017, and to in-service vessels from their first intermediate or renewal survey after 1 January, 2018. Guidance on the initial survey for issuance of the Polar Ship certificate and maintenance surveys of the Polar Ship certificate is provided in **MSC.1/Circ.1562**.

Part II applies to all vessels operating in Polar waters from 1 January 2017.

SOLAS Chapter XIV has also been amended (**see reference (f)**) to apply the code to:

1. Fishing vessels of 24 metres in length overall and above;
2. Pleasure yachts of 300 gross tonnage and upwards not engaged in trade; and,
3. Cargo ships of 300 gross tonnage and upwards but below 500 gross tonnage.

These vessels, constructed on or after 01 January 2026 need to comply with the requirements in new Chapters 9-1 and 11-1, contained in the amendments to the Polar Code adopted by **Resolution MSC.538(107), reference (g)**. Those vessels constructed before 1 January 2026 shall meet the relevant requirements of chapters 9-1 and 11-1 the Polar Code by 1 January 2027.

The Polar Code uses a risk based approach with each chapter consisting of a goal, functional requirements to fulfil the goal, and regulations. A functional requirement provides the criteria to be satisfied in order to meet the goal and is developed based on experience, an assessment of existing regulations, and/or systematic analysis of relevant hazards

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.

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.

A ship shall be considered to meet a functional requirements set out in part I 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.

The Polar Code requires an operational assessment described in paragraph 2.2 below to be carried out by the ship’s owner/operator.in determining the scope of its application to a ship and consequently to establish procedures or operational limitations to operate safely in polar waters.

DEFINITIONS:

Definitions have been taken from the Polar Code and the SOLAS and MARPOL Conventions. While the Polar Code has many definitions, some of these, are provided below for operational guidance:

Antarctic area means the sea area south of latitude 60º S as defined in SOLAS XIV/1.2, MARPOL Annexes I/1.11.7, II/13.8.1, IV/17.2, and V/1.14.7.

Arctic waters are as defined in SOLAS Chapter XIV/1.3 and MARPOL Annexes I/46.2, II/21.2, IV/17.3 and V/13.2, but are essentially the sea area north of latitude 60º with exemptions of areas that are ice free due to the effects of the Gulf Stream current**.**

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.

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.

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.

Ice free waters means no ice present. If ice of any kind is present this term shall not be used.

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.

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.

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.

Open water means a large area of freely navigable water in which sea ice is present.

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.
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 10^0C below the lowest MDLT for the intended area and season of operation in polar waters.

Sea ice means any form of ice found at sea which has originated from the freezing.

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 -10^0C.

SURVEY AND CERTIFICATION

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

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

For category C cargo ships, if the result of the operational assessment 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 onboard survey should be undertaken at the next scheduled survey.

Liberia has authorized certain classification societies as Recognized Organizations (RO) for conducting surveys and issuing the Polar Ship Certificates on its behalf. A list of RO's is provided on Liberian Registry website www.liscr.com under the "Maritime" icon "Maritime Services" and "Regulations and Standards Department".

The Polar Ship Certificate shall be drawn up in the form corresponding to the model given in Appendix 1 to this Marine Notice.

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

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 in **MSC.1/Circ.1519**.

In order to comply with the environment-related requirements of the Polar Code, amendments have been introduced to the following certificates, manuals and record books:

.1 Supplement to the International Oil Pollution Prevention Certificate (IOPP Certificate) – Forms A and B. Existing ships constructed before 1 January 2017, operating in polar waters, are allowed to use the existing IOPP certificate until its expiry, as there are no additional structural requirements for existing ships ;

.2 Paragraphs 1.3 and 4.4 of the Standard format for the Procedures and Arrangements Manual to make reference to the requirements of chapter 2 of part II-A of the Polar Code. The amendments to the manual are to be made prior to entering polar waters on or after 1 January 2017. Automatic approval for these amendments remain valid until the first scheduled survey related to the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate) or Certificate of Fitness ; and

.3 Form of Garbage Record Book to make reference to the provisions of chapter 5 of part II-A of the Polar Code.

1.0 REQUIREMENTS

1.1 General

Each ship to which the Polar Code applies and operating in Polar waters shall comply with the mandatory provisions in Part I-A and Part II-A; while giving due consideration to the recommendations in Part I-B and Part II_B.

2.0 Safety Measures (Part I-A)

2.1 Performance Standards

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

2.1.2 For ships operating in low air temperature, a polar service temperature (PST) shall be specified and shall be at least 10^0C 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 polar service temperature.

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

2.2 Operational Assessment

2.2.1 The Operational Assessment is the methodology through which the shipowner/operator evaluates how the ship's characteristics and its equipment (either proposed or existing) can be used to establish operational procedures or operational limitations to mitigate the hazards of operating in polar waters. Operational assessment allows a review of the ship's procedures and equipment against the expected operations and the operational environment. It is to be undertaken by the shipowner/operator in order to enable appropriate means of hazard mitigation identification and implementation in the ship specification/design.

2.2.2 The operational assessment 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 under APPLICABILITY as applicable; and

.3 additional hazards, if identified.

2.2.3 Operational limitations for ice conditions are assigned based on the ship's ability to function safely in ice. Polar Code requires that a methodology be utilized to determine a set of operational limitations for operating in ice.

2.2.4 Guidance on such methodologies is contained in **MSC.1/Circ.1519** – Guidance on methodologies for assessing operational capabilities and limitations in ice. Methodology for decision making support system using "Polar Operational Limit Assessment Risk Indexing System" (POLARIS) is annexed to this IMO circular.

This circular also contains, as a footnote to paragraph 3.4, a description explaining how the link between this methodology and the Certificate should be made. It is recommended that limitations for ice conditions follow the same format as described in MSC.Circ.1519 when being proposed as outcomes of the operational assessment.

2.2.5 In addition other decision making support system may be used according to ship's intended navigation area in polar waters and paying attention to the requirements of coastal State.

a) "Arctic Ice Regime Shipping System (AIRSS)" by Canada
b) "Arctic Zone/time System" by Canada
c) "Ice Passport" by Russia

2.2.6 The results of the operational assessment are to be submitted to the RO for review, and the operational limitations are to be approved. It should be noted that the Operational Assessment is not approved by the Flag Administration. However, because the outputs of the assessment lead to provision of procedures, equipment and Operational Limitations it is important that the Operational Assessment is performed in a structured way and that it is documented.

2.2.7 A model Polar Code Operational Assessment that shipowners/operators may use when conducting the Operational Assessment is provided in Appendix 2 of this Marine Notice.

2.3 Polar Water Operational Manual (PWOM)

2.3.1 The PWOM is required to be carried on board and should be considered an extension of the procedures carried on board as part of the ship's Safety Management System under the ISM Code. The PWOM may either be a stand-alone document or a document which cross-references other procedures carried by the ship. As such the PWOM should be developed and maintained by the shipowner/operator. Although for a new ship, the shipyard may assist in providing valuable information on the capabilities or functionality of the ship's systems to describe in the PWOM, the responsibility for maintaining and updating the PWOM lies with the shipowner/operator.

2.3.2 A model table of contents of the PWOM is included in the Code as Appendix 3 in this Marine Notice.

2.3.3 In order for the outcome of the Operational Assessment to be implemented clearly, the PWOM should contain any specific operational procedures identified by the Operational Assessment that are required to mitigate hazards of operating in polar waters based on the operating envelope defined for the ship's intended trade. In particular it is to be noted that where operational procedures are identified in the Operational Assessment as a means to mitigate hazards in combination with specific equipment (or as an alternative to specific equipment) these procedures are to be included.

2.3.4 The methodology associated with the limitations specified on the Certificate shall be included in the PWOM. It is recommended that the PWOM not only contain the

methodology, but practical guidance on its use, including examples of the method. Where a methodology is supplemented by additional company or operator specific guidance it is recommended to be included.

2.3.5 The PWOM shall include:

.1 information on the ship-specific capabilities and limitations in relation to the Operational Assessment described above;

.2 or refer to specific procedures to be followed in normal operations and in order to avoid encountering conditions that exceed the ship's capabilities;

.3 or refer to specific procedures to be followed in the event of incidents in polar waters;

.4 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 sub-paragraph .1 above;

.5 or refer to procedures to be followed when using icebreaker assistance, as applicable.

2.3.6 The PWOM shall be reviewed by the RO, prior to issuing the Polar Ship Certificate.

2.4 Ships Structure

2.4.1 The structural provisions (material and scantlings) of the Polar Code are to be applied in accordance with the relevant rules of the International Association of Classification Societies (IACS) or other standards offering an equivalent level of safety based on the polar service temperature. Part I-B of the Code includes overall guidance on the approach to determining an equivalent level of safety; however, it is expected that the ship's classification society will assist the shipowner of existing tonnage in establishing the ship Category, and where necessary, making the case to the Administration.

Reference (e) provides simplified procedures and criteria for determining the equivalent level of safety required by the Code for assigning a polar ship class category to ships not assigned with an IACS Polar Class but ice-strengthened in compliance with another standard. Where a vessel in categories A or B is provided with an equivalency for ice class, the Administration will issue an equivalency letter and the equivalency will be noted on the vessel's Polar Ship Certificate

2.4.2 The Polar Code does not require all ships to have an ice class. Because the polar environment is so varied the Polar Code does not set ice class requirements directly. Instead the ship will be limited, based on the Operational Limitations on the certificate. As the Operational Limitations are to be determined based on a methodology, it follows that such a methodology may be used for selecting the appropriate ice class (and consequently ship Category) based on the anticipated ice conditions from the operating envelope. As can be seen from using methodologies such as POLARIS, ships with no ice strengthening may operate in some light ice

conditions. Furthermore, various areas of the polar regions may not contain ice during certain periods of the yea

2.4.3 Generally an equivalent level of safety is established by comparing the strength of the ship's hull and propulsion machinery (propeller and shafting) and hull material grade requirements against the IACS Polar Class rules. It is anticipated that this will not result in existing ships being assigned a Polar Class – they will retain their existing ice class – but that a ship Category will be assigned for certification and compliance purposes based on the evaluation. Such evaluations for equivalent level of safety may also be used when using class-based methodologies for determining limitations for operating in ice, such as POLARIS.

2.5 Subdivision and Stability

2.5.1 **Stability in intact condition and Ice accretion:** The Polar Code requires added weight due to ice accretion to be considered when assessing the intact stability of the ship. It should be noted that this requirement applies to new and existing ships. However, the Polar Code does not give guidance on how to determine if a ship is "likely" to be subject to ice accretion. The likelihood should be evaluated as part of the Operational Assessment and documented accordingly. The icing allowance included in the Polar Code is extracted from the Intact Stability Code, Chapter 5.3. Chapter 5.3, although stated for fishing vessels, has been used for consideration of ice accretion for Polar vessels historically and includes a chart of regional areas where the ice accretion allowance should be considered. However, the chart does not consider season of operation. As a guide, the Intact Stability Code indicates that slow ice accumulation takes place at ambient temperatures from -1°C to -3°C and below in any wind force. Ice accretion is related to a combination of factors such as area of operation, wind speed, air and seawater temperature

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

Information on the icing allowance included in the stability calculations shall be given in the PWOM. Ice accretion shall be monitored and appropriate measures taken to ensure that the ice accretion does not exceed the values given in the PWOM.

2.5.3 **Damage Stability:** Ships of category A and B, constructed on or after 1 January, 2017, shall have sufficient residual stability to sustain ice-related damages.

2.6 Watertight and Weathertight Integrity

2.6.1 Exposed doors and hatches including their closing appliances shall be provided with means to remove ice and snow accretion. Such solutions could include protection and sheltering of hatches and doors, provision of manual ice removal tools, provision of steam lances or hot water hoses, trace heating of door or hatch seals and heating/recirculation of hydraulic oil. Exposed doors and hatches, including their closing appliances shall be designed to be made accessible by

persons wearing cold weather clothing which may be bulky and hinder manual operation.

2.7 Machinery Installations

2.7.1 When operating in polar waters, machinery installations (equipment and machinery and its associated piping and cabling, including propulsion and auxiliary engines) which are necessary for the safe operation of the ship shall provide functionality under the anticipated environmental conditions:

.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.

2.7.2 Additionally, for ships intending to operate in low air temperatures, machinery installations shall also take into account:

.1 cold and dense inlet air; and

.2 loss of performance of battery or other stored energy device.

2.7.3 Materials used for ships machinery installations when operating at the ships polar service temperature; and scantlings of propeller blades, propulsion line, steering equipment and other appendages of ice-strengthened Category A, B and C ships shall take into account the relevant rules of the International Association of Classification Societies (IACS) or other standards offering an equivalent level of safety, including **reference (e)**.

2.8 Fire Safety/Protection

2.8.1 When operating in polar waters, fire safety systems and appliances including isolation/pressure vacuum valves and two-way portable radio communication equipment shall remain effective and operable, and means of escape shall continue to remain available taking into account:

.1 protection from ice accretion and snow accumulation in exposed locations;

.2 accessibility at all times to local equipment and machinery controls;

.3 the need for persons to wear bulky and cumbersome cold weather gear, where appropriate;

.4 means to remove or prevent ice and snow accretion from accesses; and

.5 suitability of extinguishing media for intended operation.

2.8.2 Additionally, for ships intending to operate in low air temperatures, fire safety systems and appliances shall be designed to ensure availability and effectiveness under the polar service temperature.

2.8.3 Materials used for exposed fire safety systems and appliances when operating at the ships polar service temperature shall take into account the relevant rules of the International Association of Classification Societies (IACS) or other standards offering an equivalent level of safety.

2.9 Life-saving appliances and arrangements

2.9.1 Life-saving appliances and arrangements shall provide for safe escape, evacuation and survival.

2.9.2 Exposed escape routes shall remain accessible and safe, taking into consideration the potential icing of structures and snow accumulation. Means shall be provided to remove or prevent ice and snow accretion from escape routes, muster stations, embarkation areas, survival craft, its launching appliances and access to survival craft.

.1 additionally, 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

.2 additionally, 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.

2.9.3 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 and taking into account performance standards for operation in polar service temperature.

2.9.4 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.

2.9.5 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.

2.9.6 The Polar Code requires that the Operational Assessment shall identify additional survival resources which address both individual (personal survival equipment) and shared (group survival equipment) for 110% of the persons on board to support survival following abandoning ship to water, to ice or to land. In particular the following points are to be taken into account:

.1 the scenario of abandonment is to be considered. The argument that the ship itself is the best form of refuge cannot be used as a substitute;

.2 consideration of which scenarios are relevant with respect to abandoning to water, land or ice;

.3 land or ice are included together because it is anticipated that remote land may be an alternative refuge to remaining on the ice;

.4 for ice strengthened ships it is anticipated that the Operational Assessment will identify the scenario of both water and ice/land abandonment;

.5 for ships that are not ice strengthened it is considered that generally the ice regimes that these ships will operate in (with respect to ice concentration and thickness) will not support abandonment to ice;

.6 for potential abandonment to ice or land, group survival equipment shall be carried, unless an equivalent level of functionality for survival is provided by the ship's normal life-saving appliances; and

.7 maximum estimated time to rescue for determining the provision and distributions of survival resources, including emergency rations.

2.9.7 In all cases it is recommended that the scenarios for abandonment that are identified in the Operational Assessment are included in the PWOM to assist in voyage planning and crew information.

2.9.8 **MSC.1/Circ.1614/Rev. 1** "Revised interim guidelines on life-saving appliances and arrangements for ships operating in polar waters", provides a possible means of mitigating hazards in order to comply with section 8.3 of part I-A of the Polar Code and are intended to assist ship designers and shipowners/operators in the implementation of the Polar Code. These Interim guidelines are based on the following specific operational assessment criteria:

.1 maximum expected time of rescue;
.2 operation in low air temperatures (ships with an assigned Polar Service Temperature (PST));
.3 operation in ice;
.4 icing of life-saving appliances and arrangements;
.5 the effect of operation in high latitudes;
.6 operation in extended periods of darkness; and
.7 abandonment onto ice or land.

2.10 Safety of Navigation

2.10.1 Ships operating in polar waters shall have means of receiving and displaying current information on ice conditions in the area of operation.

2.10.2 Ice strengthened ships constructed on or after 1 January, 2017, shall have either two independent echo-sounding devices or one echo-sounding device with two separate independent transducers; and in category A and B ice strengthened ships constructed on or after 1 January, 2017, the bridge wings shall be enclosed or designed to protect navigational equipment and operating personnel;

2.10.3 Ice strengthened ships which have sensors projecting below the hull, such as those for measuring speed and distance, shall be protected against ice damage.

2.10.4 For ships operating in polar water 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.

2.10.5 Ships operating in polar water areas, where magnetic compass headings become unreliable due to a weak horizontal component of the earth's magnetic field, 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. Additionally, ships proceeding to latitudes over 80 degrees 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.

2.10.6 Ships operating in polar water areas during periods of darkness shall be equipped with two remotely rotatable, narrow-beam search lights controllable from the bridge to provide lighting over an arc of 360 degrees, or other means to visually detect ice.

2.10.7 For ships operating in polar water areas, where ice accretion is likely to occur on the bridge front windows, an additional provision of window clearing systems shall be provided, which may include:

.1 provision of systems to clean windows at low temperature; or

.2 provision of systems to prevent icing of windows (by heating).

2.10.8 Where the bridge configuration does not provide a clear view astern, an approved camera arrangement mounted astern with a display on the navigation bridge may be considered an alternative solution.

2.10.9 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.

2.10.10 All required navigation equipment must be fully functional at the polar service temperature.

2.10.11 **MSC.1/Circ.1612**, "Guidance for navigation and communication equipment intended for use on ships operating in polar waters, provides recommendations on general requirements and specific performance standards for navigation and communication equipment intended for use on ships operating in polar waters.

2.11 Communication

2.11.1 Ships operating in polar waters shall be able to effectively communicate during normal operations and in emergency situations, which include survival craft.

2.11.2 For all ships operating in polar waters, the Polar Code requires equipment intended for:

.1 Ship-to-shore voice and/or data communications;

.2 Telemedical assistance services, and for receiving ice and meteorological information;

.3 Ship-to-ship voice and/or data communications;

.4 Both maritime and aeronautical two-way voice (121.5 KHz and 123.5 KHz) on scene and search and rescue coordination communication;

2.11.3 The limitations of communications systems in high latitudes and the anticipated low temperature that is available at all points along the intended operating routes shall be considered for the above systems.

2.11.4 For ships intended to operate in low air temperature, the Polar Code requires additional communications equipment for survival craft:

.1 Rescue boats and lifeboats, when released for evacuation, shall each carry:

.1 a device for transmitting ship-to-shore alerts. This could be complied with by a dedicated manual EPIRB for all rescue boats and lifeboats (in addition to the EPIRBs required by SOLAS Ch. IV);

.2 a device for transmitting signals for location, such as SART or AIS-SART for all rescue boats and lifeboats. Compliance with this requirement implies compliance with SOLAS Regulations III/6.2.2 and IV/7.1.3; and

.3 on-scene radio communication device such as dedicated two-way VHF apparatuses for all rescue boats and lifeboats. These apparatuses can also be used for compliance with SOLAS Regulations. III/6.2.1 and IV/4 if clearly addressed in written procedures.

.2 Life rafts shall each carry:

.1 a device for transmitting signals for location, such as dedicated SART or AIS-SART for all rafts; and

.2 On-scene radio communication device such as dedicated two-way VHF apparatuses for all liferafts

.3 Icebreakers that provide escort services shall have a sound signaling system (horn) that faces astern to indicate maneuvers to following ships.

2.11.5 Most areas of the polar regions are defined as GMDSS Sea Area A4. However, there are sea areas in the polar regions which have A1, A2 or A3 coverage (see Annex 5 of the GMDSS Manual, 2017 edition, for additional details). Ships operating in Sea Area A4 need compliance with A4 requirements unless within coverage of A1 or A2. (A4: requires fixed equipment: two VHF/DSC + two sets of MF/HF/DSC/ NBDP).

2.11.6 The effects of cold temperature on battery capacity for survival craft communication systems shall be considered to ensure that they can remain available for operation during the maximum expected time of rescue. Hence, procedures to preserve battery power must be developed and included in the PWOM.

2.11.7 The local Maritime Rescue Coordination Centre (MRCC) should be identified for the anticipated areas of operation and the means of communication with the MRCC(s) confirmed.

2.11.8 It is recommended that means of contact with MRCC(s) are included in the PWOM, along with procedures for rational use of SAR/AIS-SART and manual EPIRBs to prevent unnecessary activation of several units at the same time.

2.11.9 All required communication equipment must be fully functional at the polar service temperature.

2.12 Voyage Planning

2.12.1 When operating in polar water, the Company, master and crew shall be 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.

2.12.2 in considering a route through polar waters, the voyage plan shall take into account:

.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 (Refer to MEPC/Circ.674 on Guidance document for minimizing the risk of ship strikes with cetaceans);

.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 (Refer to MEPC/Circ.674 on Guidance document for minimizing the risk of ship strikes with cetaceans);

.8 national and international designated protected areas along the route; and

.9 operation in areas remote from search and rescue (SAR) capabilities (Refer to MSC.1/Circ.1184 on Enhanced contingency planning guidance for passenger ships operating in areas remote from SAR facilities and resolution A.999(25) on Guidelines on voyage planning for passenger ships operating in remote areas).

2.13 Manning and Training

2.13.1 Ships operating in polar waters shall be appropriately manned by adequately qualified, trained and experienced personnel.

2.13.2 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 Chapter V/4 of the STCW Convention and meet the standards of competence for basic training and advanced training as set forth in A-V/4-1 and A-V/4-2 of the STCW Code, as amended, for ship types and ice conditions as described in part I-A, Chapter 12 of the Polar Code..

2.13.3 The Administration will allow for the use of a person(s) other than the master, chief mate, or officers of the navigational watch to satisfy the requirements of part I-A, Chapter 12 of the Polar Code for training under certain specified conditions depending on ice concentrations and the type of ship.

2.13.4 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.

2.13.5 **Transitional provisions**

.1 Until July 1, 2020, persons with at least 3 months in total of sea service as a member of the deck watch at the operational or management level or as an ice advisor within polar waters or in waters with acceptable ice conditions* in the preceding five years before July 01, 2018, may apply for a Basic training for personnel on ships operating in Polar Waters Certificate of Proficiency without having to complete the training in 5.12.2 above; and

Liberia will accept up to a maximum of 2 months of sea service in waters with acceptable ice conditions*.

* "Acceptable ice conditions" means: Ice conditions that require the vessel to make maneuvers to avoid concentrations of ice that might endanger the vessel or affect its progression.

.2 Until July 1, 2020, persons with at least 3 months in total of sea service as a member of the deck watch at the management level or as an ice advisor within polar waters or waters with acceptable ice conditions* in the preceding five years before July 1st 2018, may apply for an Advanced training for personnel on ships operating in Polar Waters Certificate of Proficiency without having to complete the training in 5.12.2 above.

Up to 2 months of sea service in waters with acceptable ice conditions* may be accepted to fulfill the 3 months requirement.

* "Acceptable ice conditions" means: Ice conditions that require the vessel to make maneuvers to avoid concentrations of ice that might endanger the vessel or affect its progression.

3.0 Pollution Prevention Measures (Part II-A)

3.1 For implementation of MARPOL Annexes I, II, IV and V in polar waters, please refer to Marine Notices **POL-001** and **POL-013** and **MEPC.1/Circ.856**.

* * * * *

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

Office of
Deputy Commissioner
of Maritime Affairs

THE REPUBLIC OF LIBERIA
LIBERIA MARITIME AUTHORITY

Issued under the provisions of the

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

under the authority of the Government

THE REPUBLIC OF LIBERIA

(name of the State)

by ----------

(*person or organization authorized)*)

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

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[1] 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.

[1] Subject to regulation 1.3 of the International Code for Ships Operating in Polar Waters.

Category A/B/C[2] ship as follows:

Ice Class and Ice Strengthened Draft Range

Ice class	**Maximum draft**		**Minimum draft**	
	Aft	Fwd	Aft	Fwd

2.1 Ship type: tanker/passenger ship/other[2]

2.2 Ship restricted to operate in ice free waters/open waters/other ice conditions[2]

2.3 Ship intended to operate in low air temperature: Yes/No[2]

2.3.1 Polar Service Temperature: ……..°C/Not Applicable[2]

2.4 Maximum expected time of rescue …….days

3 The ship was/was not4 subjected to an alternative design and arrangements in pursuance of regulation(s) XIV/4 of the International Convention for the Safety of Life at Sea, 1974, as amended.

4 A Document of approval of alternative design and arrangements for structure, machinery and electrical installations/fire protection/life-saving appliances and arrangements4 is/is not4 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: .....

This certificate is valid until . . . . . subject to the annual/periodical/intermediate surveys in accordance with section 1.3 of the Code[2].

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[2]

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[2] survey:

Signed: …….
(Signature of authorized official)

Place: …….

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

Annual/Periodical/Intermediate[2] survey:

Signed: …….
(Signature of authorized official)

Place: …….

Date: …….
(Seal or stamp of the authority, 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 applies28

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[2]

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[2]

This certificate shall, in accordance with regulation I/14(e)/l/14(f)7of the Convention, be accepted as valid until.....

Signed: .....
(Signature of authorized official)

Place: .....

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

Endorsement for advancement of anniversary date where regulation l/14(h) of the Convention applies[2]

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)

2 Delete as appropriate

Record of Equipment for the Polar Ship Certificate

This record shall be permanently attached to the
Polar Ships 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; and	.....
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 2
Model Polar Waters Operational Assessment

Table of Contents

1. General Information

1.1 Background

1.1.1 The Polar Code was developed by the International Maritime Organization (IMO) to provide for safe ship operations in polar waters and the protection of the Polar environment by addressing risks present in Polar waters not adequately mitigated by other IMO instruments. The Polar Code covers both safety and pollution prevention measures.

1.1.2 Provisions of Polar Code are made mandatory under the

a) SOLAS Convention with the addition of new chapter XIV IMO Resolution MSC.386(94));

b) MARPOL Convention with amendments to Annexes I, II, IV, and V (IMO Resolution MEPC.265(68)).

1.2 Overview of the Code

1.2.1 The Polar Code consists of the Introduction, part I and part II. The Introduction contains mandatory provisions applicable to both parts I and II.

1.2.2 Part I covers the safe design and operation aspects of ships in Polar Regions. Part I is subdivided into:

a) Part I-A, which contains mandatory provisions on safety measures; and

b) Part I-B containing recommendations on safety.

1.2.3 Part II considers the environmental protection of the Polar Regions. Part II is subdivided into:

a) Part II-A, which contains mandatory provisions on pollution prevention; and

b) Part II-B containing recommendations on pollution prevention.

1.2.4 The Code defines three levels of ship categories. The ship category is a reflection of the expected severity of ice conditions that the ship is anticipated to operate in. The definition in the Introduction part of the Code uses general ice descriptors based on World Metrological Organization (WMO) nomenclature.

a) Category A Ship
A ship designed for operation in polar waters in at least medium first-year ice, which may include old ice inclusions.

b) Category B Ship
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.

c) Category C Ship

A ship designed to operate in open water or in ice conditions less severe than those included in Categories A and B.

1.2.5 The Polar Code is, in part, goal-based rather than purely prescriptive. This means that it describes an expected result without specifying how to achieve it. Shipowners/designers are expected to comply using a suitable combination of processes, procedures, equipment and systems which will depend on ship's required operation capabilities. Key elements of the Polar Code includes requirements for defining operational limitations and performing operational assessment.

1.3 Applicability

1.3.1 Polar Code applies to all ships carrying SOLAS certification that intend to operate in Polar Regions.

1.3.2 Part I applies to all new vessels whose keel is laid on or after 1 January 2017, and to in-service vessels from their first intermediate or renewal survey after 1 January 2018.

1.3.3 Part II applies to all vessels operating in Polar waters from 1 January 2017.

2. Operational Limitations

2.1 General

2.1.1 Polar Code introduces a concept of Operational Limitations, which are to be included on the Polar Ship Certificate (PSC).

2.1.2 It is recognized that within the Polar Regions there are significant variations in terms of hazards to shipping, primarily associated with variability of environmental conditions (such as low temperature, or the presence of sea ice) but also associated with remoteness and latitude.

2.1.3 Operational Limitations are set for each polar code ship for:

a) Ice Conditions
b) Temperature
c) Latitude

2.1.4 In addition the Polar Code requires a maximum "Expected Time to Rescue" (ETR) to be defined (and also included on the PSC).

2.1.5 Designing a ship with suitable equipment, systems and characteristics to mitigate the hazards of the extremes and remoteness of the entire polar environment would be difficult and inappropriate for ships not intended to operate in those extreme polar conditions. Since the ships will be limited in their operations based on its characteristics, writing details of the limitations on the certificate allows recording of this characteristics. For example, with respect to latitude, ships will be restricted to lower latitudes if they do not carry appropriate equipment to ascertain position (position fixing / heading).

2.1.6 As Operational Limitations are directly linked to the ship's characteristics it is important to ensure the specification for the ship (e.g. ice class, Polar Service Temperature (PST),

maximum ETR) align with where and when the ship is expected to operate in Polar Regions. This validation of the specification for the ship (or the existing ship's characteristics) against the design operating conditions are recommended to form part of the Operational Assessment.

2.2 Ice Conditions

2.2.1 Operational limitations for ice conditions are assigned based on the ship's ability to function safely in ice. Polar Code requires that a methodology be utilized to determine a set of operational limitations for operating in ice.

2.2.2 Guidance on such methodologies is contained within MSC.Circ.1519 – Guidance on methodologies for assessing operational capabilities and limitations in ice. Methodology for decision making support system using *"Polar Operational Limit Assessment Risk Indexing System" (POLARIS)* is annexed to this IMO circular. This circular also contains, as a footnote to paragraph 3.4, a description explaining how the link between this methodology and the Certificate should be made. It is recommended that limitations for ice conditions follow the same format as described in MSC.Circ.1519 when being proposed as outcomes of the operational assessment.

2.2.3 In addition other decision making support system may be used according to ship's intended navigation area in polar waters and paying attention to the requirements of coastal state.

a) "Arctic Ice Regime Shipping System (AIRSS)" by Canada
b) "Arctic Zone/time System" by Canada
c) "Ice Passport" by Russia

2.3 Temperature

2.3.1 Operational limitations for temperature are assigned based on the ship's ability (in terms of equipment, systems and materials) to function safely in low air temperatures. Polar Code makes a differentiation between ships that are intended to operate in low air temperatures and ships that are not.

2.3.2 Ships that are intended to operate in areas where the lowest mean daily low temperature (MDLT) is −10°C or warmer during the season of operation are not considered as operating in low air temperature. This is indicated in section 2.3 of the Polar Ship Certificate.

2.3.3 Where ships are intended to operate in areas where the lowest MDLT is colder than −10°C during the season of operation, a PST should be specified by the owner/operator, based on an examination of temperature data for the area of operation. The PST should be set a minimum of 10°C lower than the lowest MDLT for the area and season of operation identified in the operating envelope.

2.3.4 Validation of this specified temperature (or, for an existing ship, the design temperature that the ship was designed to) should form part of the operational assessment.

2.4 Latitude

2.4.1 Operational limitations for high latitudes are assigned based on the ability of the communication equipment on the ship to function effectively (transmit/receive) at high latitudes and the ship's ability to navigate/determine course heading at high latitudes.

2.4.2 Paragraph 10.3.1.1 of Part IA of the Polar Code requires equipment for effective ship-to-ship and ship-to-shore communication at all points along the intended operational route. Part IB of the Polar Code includes additional guidance on the operability of communication systems at high latitude:

"The theoretical limit of coverage for GEO (Geo Stationary) 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."

For Example:

Low Earth orbit (LEO) systems (such as, Iridium Satellite System), can be carried as supplementary communication equipment for operation close to the poles.

2.4.3 For navigation, the Polar Code requires a global navigation satellite system (GNSS) for ships operating above 80° latitude (paragraph 9.3.2.2.2 of Part IA of the Polar Code). The Polar Code Record of Equipment provides for an entry to indicate if a GNSS is provided for if operations above 80° latitude are expected.

2.4.4 Both communication and navigation rely on the functionality of the onboard equipment and it is this functionality (or lack of) that will limit high-latitude operation. As part of the operational assessment, the specification of this equipment should be reviewed and evaluated against the design operating conditions.

3. Operational Assessment

3.1 General

3.1.1 Paragraph 1.5 of the Polar Code requires an "Operational Assessment" to be carried out in order to establish procedures or Operational Limitations. As all ships will have Operational Limitations on the Polar Ship Certificate, the Operational Assessment is required for all ships. In addition, paragraph 8.2.3.3 of the Polar Code requires an assessment to be undertaken to establish appropriate survival resources following abandoning of ship..

3.1.2 The Operational Assessment is intended to cover:

a) Validation of the Operational Limitations, to be mentioned in Polar Ship Certificate

b) Establish Operational Procedures

c) Establish Survival Resources

3.1.3 Validation of the Operational Limitations

3.1.3.1 It is the responsibility of shipowner/operator to specify appropriate design features and operational procedures for the operating environment associated with their anticipated trade. Identification of the area and season of operation in polar waters and associated environmental conditions (temperature, ice conditions), is to be done to establish the ship's required design parameters (ice class, PST, latitude and maximum expected time to rescue).

3.1.5.2 Identification done above essentially sets the applicable requirements for the Polar Code. The Operational Limitations required by the Polar Code are defined based on the anticipated environmental conditions expected by the shipowner/operator in the assessment.

3.1.4 Establish Operational Procedures

3.1.4.1 Depending on the operating environment, for mitigating polar hazards, equipment or systems, or operational procedures, or a combination of both may be provided.

3.1.4.2 The Operational Assessment is to be used by the shipowner/operator to establish what operational procedures are required (which will subsequently form part of the Polar Water Operations Manual (PWOM) content) and what equipment and systems are required (which will form part a new ship's specification or an existing ship's design features).

3.1.5 Establish Survival Resources

3.1.5.1 Chapter 8 of the Polar Code requires survival resources to be determined for abandonment onto water, land or ice. The Operational Assessment is to be used to identify which abandonment scenarios are appropriate and what equipment, systems and procedures are required.

3.1.6 The operational assessment is to output:

a) A report to describe the process undertaken and the decisions made by the shipowner/operator in terms of mitigating polar hazards through equipment and/or procedures.

b) develop the operational limitations which constitute the contents of the Polar Ship Certificate, including ice condition, temperature, high latitude and other limitations;

c) develop the operational procedures for the ship and its equipment which constitute the contents of the PWOM;

d) A list of equipment identified as means of meeting Polar Code requirements and addressing the risk of polar hazards.

e) determine the survival sources for abandonment onto ice or land.

3.2 Steps for an Operational Assessment

3.2.1 Guidance on undertaking the Operational Assessment can be found in Part I-B of the Code.

"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; and
.2 assess whether risk levels are acceptable; and

.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."

3.3 Identification of Hazards

3.3.1 Sources of hazards are identified in the Introduction to the Polar Code. The relevance of these sources of hazards is to be determined, primarily, by the environmental conditions. For example, ice accretion is a hazard source but if the ship is not likely to operate in areas subject to ice accretion then the ice accretion hazard is not relevant. Thus, relevant hazards can be filtered by considering the environmental conditions.

3.3.2 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.

'Sources of Hazards' Section 3 of Introduction to IMO Polar Code	
Para No.	**Type of Hazards**
3.1.1	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;
3.1.2	experiencing topside icing, with potential reduction of stability and equipment functionality;
3.1.3	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;
3.1.4	extended periods of darkness or daylight as it may affect navigation and human performance;
3.1.5	high latitude, as it affects navigation systems, communication systems and the quality of ice imagery information;
3.1.6	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;
3.1.7	potential lack of ship crew experience in polar operations, with potential for human error;
3.1.8	potential lack of suitable emergency response equipment, with the potential for limiting the effectiveness of mitigation measures;
3.1.9	rapidly changing and severe weather conditions, with the potential for escalation of incidents; and
3.1.10	the environment with respect to sensitivity to harmful substances and other environmental impacts and its need for longer restoration.

3.4 Development of Risk Model

3.4.1 Accident Scenarios

3.4.1.1 For relevant hazards, the possible accident scenarios are to be identified, considering operational conditions, environmental conditions, cargo conditions, crew experience, capabilities of the ship and equipment.

3.4.1.2 The typical accident scenarios include, but not limited, to the following:

.1 Typical accident scenarios of the ship operating in ice zones

a) Encountering ice condition which exceeds the design operational capability, thus causing damage of the hull structure, thruster and steering gear;

b) Ice ingestion occurs in the sea water system when the ship navigates in the ice area, thus causing failure of the machinery equipment and malfunction of the fire fighting system;

c) Abandonment of the ship onto ice or land results in malfunction of lifesaving equipment, thus affecting survival of personnel;

d) During navigation near icebergs/glaciers, falling of ice results in damage of the ship and equipment;

e) Improper operation of the ship results in collision with the escort ship and the ship which manages the ice areas;

f) Riding on the ice block or fixed ice, thus causing a reduced stability (small ships).

.2 Typical accident scenarios of the ship operating in low temperatures

a) Brittleness/breaking of the material in low air temperature results in flooding and sinking of the ship, release of pollutants, malfunction of the equipment;

b) Accumulation of ice/snow on the surface of the structure and equipment above the hull waterline results in a reduced stability;

c) Icing on the surfaces of the exposed machinery installations, equipment and the system, freezing of hydraulic fluid or increased viscosity, freezing of grease oil, result in loss of function;

d) Low environmental temperature at work and accommodation spaces results in loss of work ability, hypothermia and death to crew personnel;

e) Expansion of ballast water, fresh water, cargo due to freezing results in damage of the structure;

f) Falling down of the ice blocks from icing on the upper part of the ballast water occurs when the ballast water is discharged results in damage of the structure/system;

g) Activities of personnel in low air temperature, wind, ice environment result in frostbite of all extremities, hypothermia and death.

.3 Typical accident scenarios of the ship operating at high latitude

a) Loss or instability of electronic navigational signals results in yawing, causing grounding, collision with ice floes;

b) Malfunction of magnetic compass and deviation of gyro compass result in yawing, causing grounding, collision with ice floes;

c) Loss or instability of wireless communication, thus unable to provide emergency response, causing escalation of accident;

d) Extended periods of darkness and continuous poor visibility cause collision with ice floes;

e) Extended periods of daylight causes eye hurt and work fatigue to the persons on watch;

f) Deficiency of navigational aid equipment and deficiency or inaccuracy of hydrographic information cause grounding and collision with ice;

g) Deficiency of shore-based emergency response service and lack of repair result in delay in rescue, causing escalation of accident.

3.4.2 Defining Risk Level

3.4.2.1 The identified hazards and their associated accident scenarios under consideration should be ranked to prioritize them and to discard scenarios judged to be of minor significance. The frequency and consequence of the scenario outcome requires assessment. Ranking is to be undertaken using available data, supported by judgment, on the scenarios. A generic risk matrix is shown below. The frequency and consequence categories used in the risk matrix have to be clearly defined. The combination of a frequency and a consequence category represents a risk level. Probability of events in each accident scenario; and consequence of end states in each scenario are to be identified.

		Consequence				
Frequency		None	Minor	Moderate	Major	Catastrophic
	Frequent					
	Sometimes					
	Rare					
	Very rare					
	At no time					

3.4.2.2 Based on the design operational capability of the ship and equipment, each identified accident scenario is to be risk assessed, qualitative analysis of possibility and consequence is to be carried out and risk level is to be determined having regard to the following factors:

a) the design ice class;

b) performance of the equipment and system;

c) anti-cold climate measures;

d) training and experience of the crew;

e) operational experience of polar ship.

3.5 Assessment of Risk and determining acceptability

3.5.1 The appropriate risk control measures are to be taken for the accident scenario with a medium risk, which may include:

a) Developing operational procedure for ship and equipment system;

b) Providing the crew with the training of operating in polar waters;

c) Providing protective measures.

3.5.2 For the accident scenario with a high risk, the following risk control measures are to be considered in addition to the above:

a) Developing operational limitations, for ensuring the ship is operated within the scope of the design operational capabilities;

b) Optimizing the design and arrangement of the system, improving the operational capabilities, eliminating the effect of human factors.

3.6 Operational Assessment Report

3.6.1 Operational assessment report is to consist the following:

a) Basic Information of Ship

b) Operating conditions

c) Description of Ship Operational Assessment Method

d) List of Identified Hazards and accident scenarios

e) Description of Risk Model and Risk assessment of the identified scenarios

f) Abandonment scenarios

g) Risk control measures

4. References

1. International Code for Ships Operating In Polar Waters (Polar Code)

2. MSC.Circ.1519 – Guidance on methodologies for assessing operational capabilities and limitations in ice

3. MSC-MEPC.2/Circ.12 - Revised Guidelines for Formal Safety Assessment (FSA) for rule-making in IMO rule making Process

4. Standard IEC/ISO 31010 "Risk Management - Risk Assessment Techniques’

Appendix 3
Model table of contents for the Polar Waters Operational Manual (PWOM)
SAFETY MEASURES

Division 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

2.1 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.

Division 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 analyzed, 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.

Division 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 lifesaving 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

Division 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

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