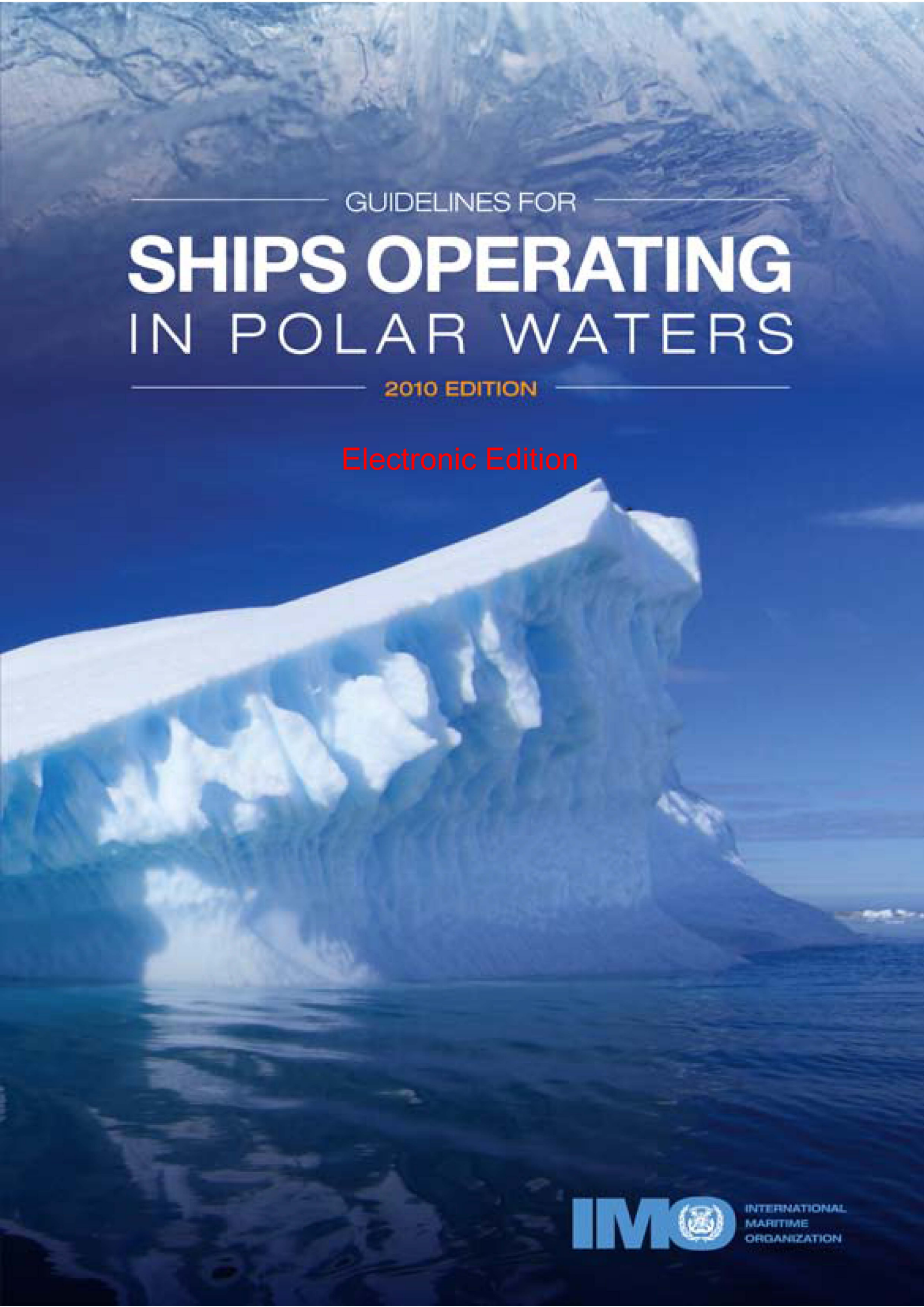
GUIDELINES FOR
SHIPS OPERATING
IN POLAR WATERS
2010 EDITION
Electronic Edition
IMO
INTERNATIONAL
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DEVELOPMENT OF A MANDATORY CODE FOR SHIPS OPERATING IN POLAR WATERS

Polar Code Boundaries for the Arctic and Antarctic. 14 January 2011

Foreword

Over the past 20 years, IMO has developed a raft of requirements, guidelines and recommendations regarding polar ice-covered waters, concerning Arctic and/or Antarctic areas. These relate to maritime safety and prevention of marine pollution, as well as certification of seafarers on ships operating in polar areas.

Navigation in polar waters was first addressed by the Guidelines for ships operating in Arctic ice-covered waters, MSC/Circ.1056–MEPC/Circ.399, approved by the Maritime Safety Committee (MSC) at its seventy-sixth session and the Marine Environment Protection Committee (MEPC) at its forty-eighth session, both in 2002. These guidelines provide requirements additional to those of the SOLAS and MARPOL Conventions for navigation in Arctic waters, taking into account the specific climatic conditions in that area in order to meet appropriate standards of maritime safety and pollution prevention.

The MSC, at its seventy-ninth session in 2004, considered a request by the XXVIIth Antarctic Treaty Consultative Meeting for IMO to consider amending the Guidelines so that they would also be applicable to ships operating in the Antarctic Treaty Area and instructed its Sub-Committee on Ship Design and Equipment (DE) to revise the Guidelines accordingly.

At its fifty-second session in 2009, DE finalized a draft Assembly resolution on Guidelines for ships operating in polar waters, addressing both Arctic and Antarctic areas, which was approved by the eighty-sixth session of MSC and the fifty-ninth session of MEPC. The Guidelines were adopted by the twenty-sixth session of the IMO Assembly in December 2009.

The Guidelines aim at mitigating the additional risk imposed on shipping due to the harsh environmental and climatic conditions existing in polar waters. They address the fact that the polar environment imposes additional demands on ship systems, including navigation, communications, life-saving appliances, main and auxiliary machinery, environmental protection and damage control, and emphasize the need to ensure that all ship systems both are capable of functioning effectively under anticipated operating conditions and provide adequate levels of safety in accident and emergency situations. In addition, the Guidelines recognize that safe operation in such conditions requires specific attention to human factors, including training and operational procedures.

Resolution A.1024(26)

Adopted on 2 December 2009

GUIDELINES FOR SHIPS OPERATING IN POLAR WATERS

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO that, by circular MSC/Circ.1056-MEPC/Circ.399, the Maritime Safety Committee and the Marine Environment Protection Committee, recognizing the need for recommendatory provisions applicable to ships operating in Arctic ice-covered waters, additional to the mandatory and recommendatory provisions contained in existing IMO instruments, approved Guidelines for ships operating in Arctic ice-covered waters (hereinafter referred to as "the Guidelines"),

NOTING that the Maritime Safety Committee, at its seventy-ninth session, considered a request by the XXVIIth Antarctic Treaty Consultative Meeting (ATCM) to amend the Guidelines to render them applicable to ships operating in ice-covered waters in the Antarctic Treaty Area as well,

ACKNOWLEDGING that the polar environment imposes additional demands on ship systems beyond the existing requirements of the International Convention for the Safety of Life at Sea (SOLAS), 1974 and the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol relating thereto (MARPOL 73/78), as amended,

RECOGNIZING the need to ensure that all such systems are capable of functioning effectively under anticipated operating conditions and provide an adequate level of maritime safety and pollution prevention, taking into account the challenges of polar operations,

NOTING ALSO the need for a general update of the Guidelines to take account of technical, technological and regulatory developments since their approval in 2002,

CONSCIOUS OF the necessity to also give special consideration to all ships that only visit polar waters at certain times of the year,

HAVING CONSIDERED the recommendations made by the Maritime Safety Committee at its eighty-sixth session and the Marine Environment Protection Committee at its fifty-ninth session,

1. ADOPTS the Guidelines for ships operating in polar waters, set out in the annex to the present resolution;

2. INVITES all Governments concerned to take appropriate steps to give effect to the annexed Guidelines for ships constructed on or after 1 January 2011;

3. ENCOURAGES all Governments concerned to take appropriate steps to give effect to the annexed Guidelines for ships constructed before 1 January 2011 as far as is reasonable and practicable;

4. RECOMMENDS Governments to bring the annexed Guidelines to the attention of shipowners, ship operators, ship designers, shipbuilders, ship repairers, equipment manufacturers and installers and all other parties concerned with the operation of ships in polar waters;

5. AUTHORIZES the Maritime Safety Committee and the Marine Environment Protection Committee to keep the annexed Guidelines under review and update them as necessary in light of experience gained in their application.

Preamble

P-1 Introduction

P-1.1 Ships operating in the Arctic and Antarctic environments are exposed to a number of unique risks. Poor weather conditions and the relative lack of good charts, communication systems and other navigational aids pose challenges for mariners. The remoteness of the areas makes rescue or clean-up operations difficult and costly. Cold temperatures may reduce the effectiveness of numerous components of the ship, ranging from deck machinery and emergency equipment to sea suctions. When ice is present, it can impose additional loads on the hull, propulsion system and appendages.

P-1.2 Whilst Arctic and Antarctic waters have a number of similarities, there are also significant differences. The Arctic is an ocean surrounded by continents, while the Antarctic is a continent surrounded by an ocean. The Antarctic sea ice retreats significantly during the summer season or is dispersed by permanent gyres in the two major seas of the Antarctic: the Weddell and the Ross. Thus, there is relatively little multi-year ice in the Antarctic. Conversely, Arctic sea ice survives many summer seasons, and there is a significant amount of multi-year ice. Whilst the marine environments of both polar seas are similarly vulnerable, response to such challenge should duly take into account specific features of the legal and political regimes applicable to their respective marine spaces.

P-1.3 The Guidelines for ships operating in polar waters (hereinafter called "the Guidelines") are intended to address those additional provisions deemed necessary for consideration beyond existing requirements of the SOLAS and MARPOL Conventions, in order to take into account the climatic conditions of polar waters and to meet appropriate standards of maritime safety and pollution prevention.

P-1.4 The Guidelines are recommendatory and their wording should be interpreted as providing recommendations rather than mandatory direction.

P-2 Principles

P-2.1 The Guidelines aim to promote the safety of navigation and to prevent pollution from ship operations in polar waters.

P-2.2 The Guidelines recognize that this is best achieved by an integrated approach, based on requirements in existing Conventions which cover the design, outfitting, crewing and operation of ships for the conditions which they will encounter.

P-2.3 The Guidelines take into account that Arctic and Antarctic conditions may include sea and glacial ice that can represent a serious structural hazard to all ships. This is the single most significant factor in Arctic and Antarctic operations and is reflected in many of the Guidelines' provisions.

P-2.4 The Guidelines address the fact that the polar environment imposes additional demands on ship systems, including navigation, communications, life-saving appliances, main and auxiliary machinery, environmental protection and damage control, etc. They emphasize the need to ensure that all ship systems are capable of functioning effectively under anticipated operating conditions and provide adequate levels of safety in accident and emergency situations.*

P-2.5 In addition, the Guidelines recognize that safe operation in such conditions requires specific attention to human factors including training and operational procedures.

P-2.6 The basic requirements for structure, stability and subdivision, machinery, life-saving appliances, fire protection, ship routeing, navigation systems and equipment, radio communication, pollution prevention equipment, liability and safety management systems, as applicable to the different types and sizes of ships which may undertake voyages in polar waters, are obtained from the relevant Conventions.

P-2.7 The standards expressed in the Guidelines have been developed to mitigate the additional risk imposed on shipping due to the harsh environmental and climatic conditions existing in polar waters. The Guidelines should be applied taking into account the nature of the operations that are envisaged.

P-2.8 Not all ships which enter the Arctic and Antarctic environments will be able to navigate safely in all areas at all times of the year. A system of Polar Classes has therefore been developed to designate different levels of capability. In parallel to the development of the Guidelines, the International Association of Classification Societies (IACS) has developed a set of Unified Requirements which, in addition to general classification society rules, address essential aspects of construction for ships of Polar Class.†

P-2.9 The Guidelines are not intended to infringe on national systems of shipping control.

P-2.10 The Guidelines, recognizing the sensitive nature of polar waters, have the intention of providing high standards of environmental protection to address both accidents and normal operations.

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* Refer to the Enhanced contingency planning guidance for passenger ships operating in areas remote from SAR facilities (MSC.1/Circ.1184).

† The Unified Requirements are available at http://www.iacs.org.uk.

Guide

G-1 Layout of the Guidelines

G-1.1 The Guidelines include general, construction, equipment, operational and environmental protection and damage control parts, presented in that order and subdivided into chapters.

G-1.2 This section provides definitions for important terms that are used exclusively within the Guidelines or where any term has more than one meaning in other applicable Conventions. Otherwise, terms have the meanings defined in the Convention(s) relevant to each chapter.

G-1.3 All parts and chapters of the Guidelines should be applied to Polar Class ships. All parts and chapters, with the exception of those dealing with purely construction issues (part A), should be applied to all ships in polar waters. Each chapter notes any additional differentiation of provisions between ship classes specific to that chapter.

G-1.4 Guidance provided in part A of the Guidelines is only intended for new Polar Class ships.

G-2 Key provisions

G-2.1 Only those ships with a Polar Class designation or a comparable alternative standard of ice-strengthening appropriate to the anticipated ice conditions should operate in polar ice-covered waters.

G-2.2 The combination of hull structural design, material quality, subdivision and segregation measures prescribed in the Guidelines and supporting standards should be adequate to reduce the risk of human casualties, pollution incidents or ship losses to acceptably low levels of probability during prudent operations in polar waters.

G-2.3 No pollutants should be carried directly against the shell in hull areas at significant risk of ice impact. Operational pollution of the environment should be minimized by equipment selection and operational practice.

G-2.4 Key safety-related, survival and pollution control equipment should be rated for the temperatures and other conditions which may be encountered in the service intended.

G-2.5 Navigation and communications equipment should be suitable to provide adequate performance in high latitudes, areas with limited infrastructure and unique information transfer requirements.

G-2.6 Sea suction(s) should be capable of being cleared of accumulation of slush ice.

G-3 Definitions

For the purpose of the Guidelines, unless expressly provided otherwise, the terms used have the meanings defined in the following paragraphs. Terms used, but not defined, in the Guidelines are to be interpreted as they are defined in the relevant Conventions.

G-3.1 *Administration* means the Government of the State whose flag the ship is entitled to fly.

G-3.2 *Polar waters* includes both Arctic and Antarctic waters.

G-3.3 *Arctic waters* means those waters which are located north of a line extending from latitude 58°00′.0 N, longitude 042°00′.0 W to latitude 64°37′.0 N, longitude 035°27′.0 W and thence by a rhumb line to latitude 67°03′.9 N, longitude 026°33′.4 W and thence by a rhumb line to Sørkapp, Jan Mayen and by the southern shore of Jan Mayen to the Island of Bjørnøya and thence by a great circle line from the Island of Bjørnøya to Cap Kanin Nos and thence by the northern shore of the Asian continent eastward to the Bering Strait and thence from the Bering Strait westward to latitude 60° N as far as Il'pyrskiy and following the 60th North parallel eastward as far as and including Etolin Strait and thence by the northern shore of the North American continent as far south as latitude 60° N and thence eastward along parallel of latitude 60° N, to longitude 56°37′.1 W and thence to the latitude 58°00′.0 N, longitude 042°00′.0 W (see figure 1).

G-3.4 *Antarctic waters* means those waters which are south of 60° S (see figure 2).

G-3.5 *Ice-covered waters* means polar waters where local ice conditions present a structural risk to a ship.

G-3.6 *COLREG* means the Convention on the International Regulations for Preventing Collisions at Sea, 1972, as amended.

G-3.7 *Company* means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the shipowner.

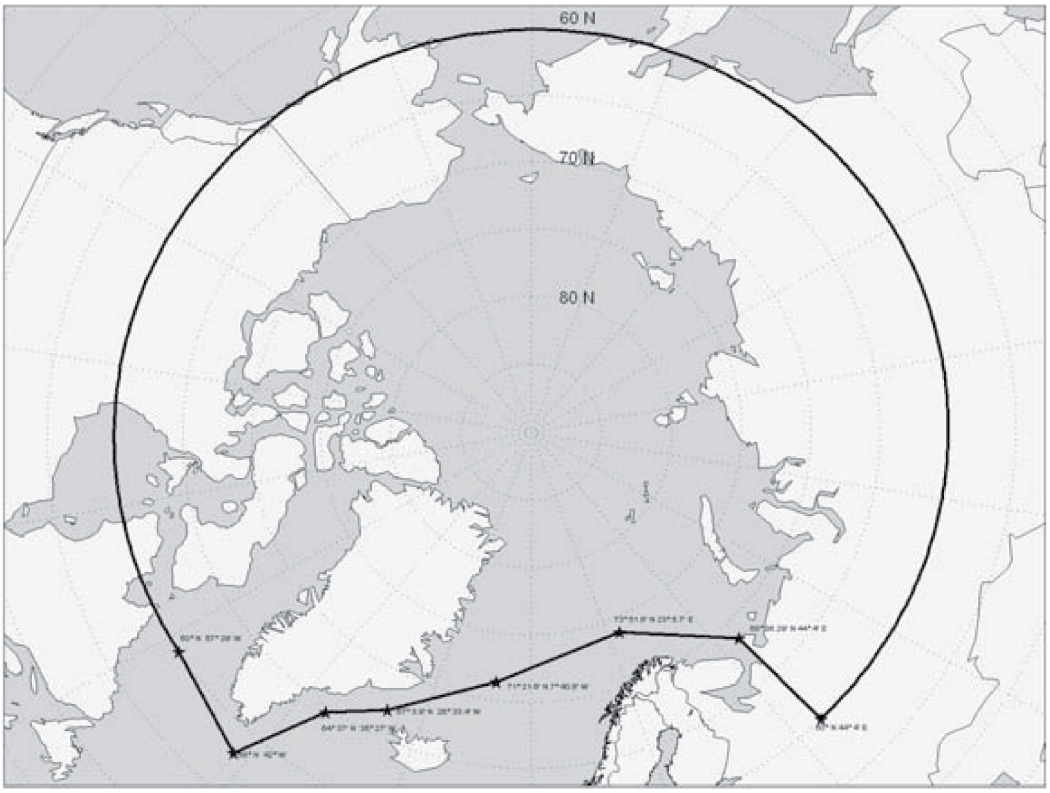

Figure 1 – *Maximum extent of Arctic waters application (see paragraph G-3.3)*[*]

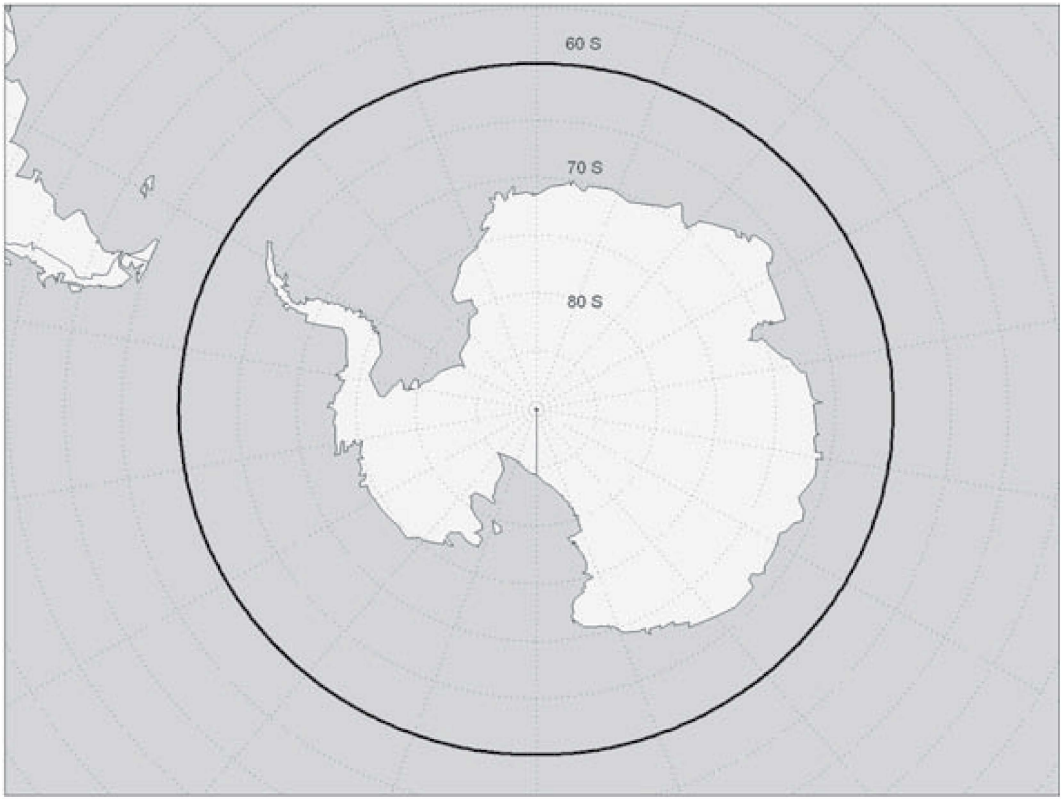

Figure 2 – *Maximum extent of Antarctic waters application (see paragraph G-3.4)*[*]

[*] Maps are for illustrative purposes only.

G-3.8 *Conning position* means the stations in which the ship's steering control and devices for ahead or astern operations are located.

G-3.9 *Escort* means any ship with superior ice capability in transit with another ship.

G-3.10 *Escorted operation* means any operation in which a ship's movement is facilitated through the intervention of an escort.

G-3.11 *IACS* means the International Association of Classification Societies.

G-3.12 *Ice Navigator* means any individual who, in addition to being qualified under the STCW Convention, is specially trained and otherwise qualified to direct the movement of a ship in ice-covered waters.

G-3.13 *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.

G-3.14 *International voyages* means voyages in international waters, as defined in chapter I of the 1974 SOLAS Convention, as amended.

G-3.15 *ISM Code* means the International Management Code for the Safe Operation of Ships and for Pollution Prevention, as amended.

G-3.16 *ICLL* means the International Convention on Load Lines, 1966.

G-3.17 *MARPOL* means the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol relating thereto (MARPOL 73/78), as amended.

G-3.18 *Organization* means the International Maritime Organization.

G-3.19 *Polar Class* means the class assigned to a ship based upon IACS Unified Requirements.

G-3.20 *Polar Class ship* means a ship for which a Polar Class has been assigned.

G-3.21 *Pollutant* means any substance controlled by MARPOL which, if introduced into the sea, is liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

G-3.22 *Recognized organization* means an organization recognized by an Administration in accordance with IMO resolutions A.739(18) and A.789(19).

G-3.23 *Ship* means any vessel required to comply with the 1974 SOLAS Convention.

G-3.24 *SOLAS* means the International Convention for the Safety of Life at Sea, 1974, as amended.

G-3.25 *STCW* means the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended.

G-3.26 *Unified Requirements* means IACS Unified Requirements concerning Polar Class (UR-I).

G-3.27 *WMO* means the World Meteorological Organization.

G-3.28 *Working liquids* means any substances that are pollutants used for the operation of the ship's machinery.

G-3.29 *2008 IS Code* means the International Code on Intact Stability, 2008, as adopted by resolution MSC.267(85).

Chapter 1
General

1.1 Application

1.1.1 Except where specifically stated otherwise, these Guidelines provide guidance for ships operating in Antarctic waters or while engaged in international voyages in Arctic waters.

1.1.2 Part A of the Guidelines provides guidance for new Polar Class ships.

1.1.3 Parts B, C and D of the Guidelines provide guidance for Polar Class and all other ships.

Table 1.1 – *Class descriptions*

POLAR CLASS	GENERAL DESCRIPTION
PC 1	Year-round operation in all ice-covered waters
PC 2	Year-round operation in moderate multi-year ice conditions
PC 3	Year-round operation in second-year ice which may include multi-year ice inclusions
PC 4	Year-round operation in thick first-year ice which may include old ice inclusions
PC 5	Year-round operation in medium first-year ice which may include old ice inclusions
PC 6	Summer/autumn operation in medium first-year ice which may include old ice inclusions
PC 7	Summer/autumn operation in thin first-year ice which may include old ice inclusions

Note: Ice descriptions follow the WMO Sea-ice nomenclature.*

1.1.4 All Polar Class ships and the equipment to be carried in accordance with the Guidelines should be designed, constructed and maintained in compliance with applicable national standards of the Administration or the appropriate requirements of a recognized organization which provide an equivalent level of safety† for its intended service. Special attention should be drawn to the need for winterization aspects. Ships intending to operate as an icebreaker are to receive special consideration.

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* The WMO Sea-ice nomenclature is available at http://www.jcomm-services.org.

† Refer to SOLAS chapter II-1 and to the IACS Unified Requirements concerning Polar Class.

1.1.5 The structures, equipment and arrangements essential for the safety and operation of the ship should take account of the anticipated temperatures.

1.1.6 Special attention should be given to essential operating equipment and systems and safety equipment and systems. For example, the potential for ice building up inside the ballast tanks and sea chests should be considered. The life-saving and fire-extinguishing equipment specified in part B of the Guidelines, when stored or located in an exposed position, should be of a type that is rated to perform its design functions at the minimum anticipated air temperature. In particular, attention is drawn to the inflation of life-saving equipment and the starting of engines in lifeboats and rescue boats.

1.1.7 Operations in polar waters should take due account of factors such as: ship class, environmental conditions, icebreaker escort, prepared tracks, short or local routes, crew experience, support technology and services such as ice-mapping, availability of hydrographic information, communications, safe ports, repair facilities and other ships in convoy.

1.1.8 Equipment, fittings, materials, appliances and arrangements may deviate from the provisions of the Guidelines provided that their replacement is at least as effective as that specified in the Guidelines.

1.1.9 The provisions of the Guidelines do not apply to any warship, naval auxiliary, other vessels or aircraft owned or operated by a State and used, for the time being, only on government non-commercial service. However, each State should ensure, by the adoption of appropriate measures not impairing operations or operational capabilities of such vessels or aircraft owned or operated by it, that such vessels or aircraft act in a manner consistent, so far as is reasonable and practicable, with the Guidelines.

1.2 Ice navigator

1.2.1 All ships operating in polar ice-covered waters should carry at least one Ice Navigator qualified in accordance with chapter 14. Consideration should also be given to carrying an Ice Navigator when planning voyages into polar waters.

1.2.2 Continuous monitoring of ice conditions by an Ice Navigator should be available at all times while the ship is underway and making way in the presence of ice.*

* Refer to the Guidelines for voyage planning, as adopted by resolution A.893(21), and the Guidelines on voyage planning for passenger ships operating in remote areas, as adopted by resolution A.999(25).

Part A
Construction provisions

Chapter 2
Structures

2.1 General

2.1.1 All ships should have structural arrangements adequate to resist the global and local ice loads characteristic of their Polar Class.*

2.1.2 Each area of the hull and all appendages should be strengthened to resist design structure/ice interaction scenarios applicable to each case.

2.1.3 Structural arrangements should aim to limit damage resulting from accidental overloads to local areas.

2.1.4 Polar Class ships may experience in-service structural degradation at an accelerated rate. Structural surveys should, therefore, cover areas identified as being at high risk of accelerated degradation, and areas where physical evidence such as coating breakdown indicates a potential for high wastage rates.

2.2 Materials

2.2.1 Materials used in ice-strengthened and other areas of the hull should be suitable for operation in the environment that prevails at their location.

2.2.2 Materials used in ice-strengthened areas should have adequate ductility to match the selected structural design approach.

2.2.3 Abrasion and corrosion resistant coatings and claddings used in ice-strengthened areas should be matched to the anticipated loads and structural response.

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* Refer to the IACS Unified Requirements concerning Polar Class.

Chapter 3
Subdivision and stability

3.1 General

3.1.1 Account should be taken of the effect of icing in the stability calculations in accordance with the 2008 IS Code.

3.2 Intact stability in ice

3.2.1 Suitable calculations should be carried out and/or tests conducted to demonstrate the following:

.1 the ship, when operated in ice within approved limitations, during a disturbance causing roll, pitch, heave or heel due to turning or any other cause, should maintain sufficient positive stability; and

.2 ships of Polar Classes 1 to 3 and icebreakers of all classes, when riding up in ice and remaining momentarily poised at the lowest stem extremity, should maintain sufficient positive stability.

3.2.2 "Sufficient positive stability" in paragraphs 3.2.1.1 and 3.2.1.2 means that the ship is in a state of equilibrium with a positive metacentric height of at least 150 mm, and a line 150 mm below the edge of the freeboard deck as defined in the applicable provisions of the ICLL is not submerged.

3.2.3 For performing stability calculations on ships that ride up onto the ice, the ship should be assumed to remain momentarily poised at the lowest stem extremity as follows:

.1 for a regular stem profile, at the point at which the stem contour is tangent to the keel line;

.2 for a stem fitted with a structurally defined skeg, at the point at which the stem contour meets the top of the skeg;

.3 for a stem profile where the skeg is defined by shape alone, at the point at which the stem contour tangent intersects the tangent of the skeg; or

.4 for a stem profile of novel design, the position should be specially considered.

3.3 Stability in damaged conditions

3.3.1 All Polar Class ships should be able to withstand flooding resulting from hull penetration due to ice impact. The residual stability following ice damage should be such that the factor s_i, as defined in SOLAS regulation II-1/7-2, has $s_i = 1$ for all loading conditions.

3.3.2 The ice damage extent to be assumed when demonstrating compliance with paragraph 3.3.1 should be such that:

.1 longitudinal extent 0.045 of deepest ice waterline length if centred forward of the point of maximum beam on the waterline, and 0.015 of waterline length otherwise;

.2 transverse extent is 760 mm measured normal to the shell over the full extent of the damage;

.3 vertical extent the lesser of 0.2 of draft at the upper waterline,* or of longitudinal extent;

.4 the centre of the ice damage may be located at any point between the keel and 1.2 times the deepest ice draft; and

.5 the vertical extent of damage may be assumed to be confined between the keel and 1.2 times the deepest ice draft.

3.3.3 Damage as defined in paragraph 3.3.2 is to be assumed at any position along the side shell.

3.3.4 For ships of Polar Classes 6 and 7 not carrying polluting or hazardous cargoes, damage as defined in paragraph 3.3.2 may be assumed to be confined between watertight bulkheads, except where such bulkheads are spaced at less than the damage dimension.

3.4 Subdivision

3.4.1 Subject to paragraphs 3.4.2 and 3.4.3, no Polar Class ship should carry any pollutant directly against the outer shell. Any pollutant should be separated from the outer shell of the ship by double skin construction of at least 760 mm in width.

3.4.2 All Polar Class ships should have double bottoms over the breadth and the length between forepeak and afterpeak bulkheads. Double bottom height should be in accordance with the rules of the classification societies

* Refer to the IACS Unified Requirements concerning Polar Class.

3.4.3 Double bottoms in ships of Polar Classes 6 and 7 may be used for the carriage of any working liquids where the tanks are aft of midships and within the flat of bottom.
3.4.4 All Polar Class ships with icebreaking bow forms and short forepeaks may dispense with double bottoms up to the forepeak bulkhead in the area of the inclined stem, provided that the watertight compartments between the forepeak bulkhead and the bulkhead at the junction between the stem and the keel are not used to carry pollutants.

CHAPTER 4
ACCOMMODATION AND ESCAPE MEASURES

4.1 General

4.1.1 All personnel accommodation should be designed and arranged to protect the occupants from unfavourable environmental conditions and minimize risk of injury during normal (including ice transiting or icebreaking) operations and emergency conditions.

4.1.2 All personnel accommodation, public spaces and the equipment installed in them should be designed so that each person making proper use of them will not suffer injury during normal open water operations, designed ice transiting modes of operation, and emergency manoeuvring conditions.

4.1.3 Ships of Polar Classes 1 to 5 inclusive should have sufficiently available and reliable facilities to maintain a life sustaining environment in the event of an emergency and/or of extended ice entrapment.

4.2 Public address systems and other safety items

4.2.1 The public address system and the general emergency alarm system should be audible over the loudest ambient noise level occurring during ice transiting, icebreaking or ramming.

4.2.2 Ships of Polar Classes 1 to 3 inclusive, icebreakers and ships intended to be used in the ramming mode should be designed with adequate provisions to ensure the safety of personnel using shower facilities. Such facilities should include non-slip decking, three rigid sides, handholds and insulation from exposed hot water pipes.

4.2.3 Galley facilities should be provided with grab rails projecting from the front on cooking equipment for use by the crew during ice operations.

4.2.4 Equipment designed to heat oil for cooking purposes such as deep fat fryers should be located in a position suitably separated from hotplates or other hot surfaces. Such appliances should also be secured to the deck or other fixed structure and provided with an oil tight lid or closure to prevent splashing or spillage during ice operations.

4.3 Escape measures

4.3.1 All means of escape from accommodation or interior working spaces should not be rendered inoperable by ice accretion or by malfunction due to low external ambient air temperatures.

4.3.2 All escape routes should be dimensioned so as not to hinder passage for persons wearing suitable polar clothing.

4.3.3 Escape routes should be designed to minimize the distance between their exit to an open deck and the survival equipment to which they lead.

CHAPTER 5
DIRECTIONAL CONTROL SYSTEMS

5.1 All Polar Class ships should be provided with directional control systems of adequate strength and suitable design to enable efficient operation in polar ice-covered waters.

5.2 For the purpose of this chapter, a directional control system includes any device or devices intended either as a primary or auxiliary means of steering the ship. The directional control system includes all associated power sources, linkages, controls and actuating systems.

5.3 Attention is drawn to the interaction between directional control systems and propulsion systems. Where such interaction occurs or where dual purpose components are fitted, the provisions of chapters 7 and 8 should also be complied with, as applicable.

CHAPTER 6
ANCHORING AND TOWING ARRANGEMENTS

6.1 General

All Polar Class ships should be capable of anchoring and providing limited assistance in the case of debilitating damage or breakdown, towards the prevention of a catastrophic loss or pollution incident. The capability of ships to provide assistance should be considered of prime importance, having due regard to the lack of repair facilities, the limited number of dedicated towing ships available and the response time that may be required by a dedicated towing ship to be able to provide effective assistance in polar ice-covered waters.

6.2 Anchoring arrangements

6.2.1 Ships of Polar Classes 1 to 5 inclusive and all icebreakers of all classes should, as far as is practicable, be designed to protect the anchor from being dislodged from its stowed position and from jamming or damaging the hull by direct impact with ice.

6.2.2 Anchoring systems should be provided with an independent means of securing the anchor so that the anchor cable can be disconnected for use as an emergency towing bridle.

6.3 Towing arrangements

6.3.1 All Polar Class ships designed to perform dedicated towing operations and all icebreakers should be equipped with line throwing apparatus in addition to that required for life-saving. This apparatus should be capable of delivering messenger lines for the transfer of towing equipment. Such line throwing apparatus should not be of the powder/rocket type, in order that it may be safely used to make a transfer to a tanker.

6.3.2 All Polar Class ships designed to perform dedicated towing operations should be provided with a quick release system, operable from the conning position.

6.3.3 Where fitted, close-coupled bow to stern towing arrangements should comprise strengthened bow plating on the towed ship, appropriate towing slings, non-interfering positioning of bower anchors and disallowance of bulbous bows. In this case, arrangements should be provided for securing the anchor in the stowed position.

6.4 Emergency towing arrangements[7]

6.4.1 All Polar Class ships should be capable of receiving emergency towing assistance.

6.4.2 Where appropriate, towing arrangements should facilitate connection and release of a towline and provide bollards, fairleads, and other components suitable for the size of ship on which they are fitted.

[7] Refer to the Guidelines for owners/operators on preparing emergency towing procedures (MSC.1/Circ.1255).

CHAPTER 7
MAIN MACHINERY

7.1 General

7.1.1 The design, rating, installation, operation and maintainability of shipboard engineering systems should be suitable for navigation in polar ice-covered waters[8].

7.1.2 In the event of damage, malfunction or failure of any machinery component, means should be provided to control and limit any resulting emission of pollutants to within the confines of the ship's hull.

7.1.3 Special attention should be drawn to the fact that harsh weather conditions often occur in polar waters and that the propulsion effect plays a significant role in relation to the steering ability.

7.1.4 The layout and construction of machinery essential for the safe operation of the ship should be such that repairs which can be affected using the resources on board may be completed safely and effectively. Ventilation systems should provide sufficient air at an appropriate temperature for the operation of machinery.

7.1.5 For Polar Class ships which may be laid up in polar waters, materials for all systems with the potential of polluting should be suitable for preventing pollution at the lowest ambient temperatures to which they may be subjected and should be suitable to avoid pollution and ensure safe operation on re-activation of the systems.

7.2 Main propulsion systems

7.2.1 The main propulsion machinery should be designed so that the effects of loads with the potential to damage the system are limited to those components which can be readily repaired, replaced or reset. The reliability and availability of the equipment and systems should be considered.

7.2.2 Main propulsion machinery and all auxiliary machinery essential to the propulsion system, should be:

.1 designed for loads and vibrations resulting from propeller/hull/rudder-ice interactions;

.2 located to provide protection from freezing spray, ice and snow; and

.3 designed to operate when the ship is inclined at any combined angle of heel or trim that may be expected during operations in ice.

7.2.3 Stern tube bearings, seals and main propulsion components located outside the hull should not leak pollutants. Non-toxic biodegradable lubricants are not considered to be pollutants.

[8] Refer to the IACS Unified Requirements for Polar Class Ships.

8.1.1 The installed propulsive power should be sufficient to ensure that the ship can navigate safely and with effective icebreaking capability, as appropriate, without risk of structural damage or pollution under the design ice, weather and anticipated operational conditions.

8.1.2 Piping and intake systems associated with the main propulsion plant and auxiliary machinery essential to the propulsion system should be designed so as not to be affected by the impact of the polar environment.

CHAPTER 8
AUXILIARY MACHINERY SYSTEMS

8.1 General

8.1.1 Equipment and systems should be designed so that personnel exposure to cold temperatures and other environmental hazards during normal operations including routine maintenance is minimized.

8.1.2 Ventilation systems should provide sufficient air for the operation of auxiliary machinery, air conditioning and heating purposes.

8.2 Materials

8.2.1 Materials used in equipment and systems should be suitable for operation in the environment which prevails at their location. In particular, equipment or systems which are essential for preventing pollution or for safe operation of the ship when:

.1 located outside and above the waterline in any ship operating condition; or

.2 in unheated locations inside,

should not be susceptible to brittle fracture within the range of operating conditions.

8.2.2 Essential equipment or systems required for the safe operation of the ship or systems required for preventing pollution, located within spaces which, upon failure of the primary heating system, could be subject to outside ambient air temperatures should be:

.1 provided with an independent source of heat; and

.2 fabricated from materials that will not be susceptible to brittle fracture under the anticipated loads and temperatures.

8.2.3 For Polar Class ships which may be laid up in polar waters, materials for all systems with the potential to pollute should be suitable for preventing pollution at the lowest ambient temperatures to which they may be subjected and should be suitable for avoiding pollution and ensuring safe operation on re-activation of the systems.

CHAPTER 9
ELECTRICAL INSTALLATIONS

9.1 Electrical installations should be subject to the provisions listed in chapters 4, 7 and 8 regarding design for operation in polar ice-covered waters and for the provision of emergency heat and power.

9.2 Precautions should be taken to minimize risk of supplies to essential and emergency services being interrupted by the inadvertent or accidental opening of switches or circuit breakers due to vibrations or accelerations during icebreaking operations.

9.3 Emergency power for communications equipment provided by battery should be provided with a means whereby the batteries are protected from extreme low temperatures.

9.4 Emergency power batteries including the reserve source of energy for the radio installation, including those stored in deck boxes, should be secured in a position where excessive movement is prevented during ice-transiting operations and explosive gas ventilation is not restricted by the accumulation of ice or snow.

9.5 Control systems based on computers and other electronic hardware installations necessary for the proper functioning of essential equipment should be designed for redundancy and resistance to vibration, dampness and low humidity.[9]

PART B
EQUIPMENT
CHAPTER 10
FIRE SAFETY

10.1 Fuel and other flammable fluid tanks and systems

Refuelling of ships should be carried out while taking into account the special conditions imposed by low temperatures and ice conditions, where applicable.

10.2 Ventilation

Closing apparatus for ventilation inlets and outlets should be designed and located to protect them from ice or snow accumulation that could interfere with the effective closure of such systems.

10.3 Fire detection and extinguishing systems

10.3.1 Fire-extinguishing systems should be designed or located so that they are not made inaccessible or inoperable by ice or snow accumulation or low temperature such that:

[9] Such equipment should be approved in accordance with relevant international standards.

.1 equipment, appliances, systems and extinguishing agents should be protected from freezing for minimum temperature for the intended voyage;

.2 precautions should be taken to prevent nozzles, piping and valves of any fire-extinguishing system from becoming clogged by impurities, corrosion or ice build-up; and

.3 exhaust gas outlets and pressure vacuum arrangements should be protected from ice build-up that could interfere with effective operation.

10.3.2 Water or foam extinguishers should not be located in any position that is exposed to freezing temperatures. These locations should be provided with extinguishers capable of operation under such conditions.

10.4 Fire pumps and associated equipment for Polar Class ships

10.4.1 Where a fixed fire-extinguishing system or alternative fire-extinguishing system situated in a space separate from the compartment containing the main fire pumps utilizes its own independent sea suction, this sea suction should be capable of being cleared of accumulations of slush ice.

10.4.2 Fire pump(s) including emergency fire pump(s) should, wherever reasonable and practicable, be installed in heated compartment(s) and in any event should be adequately protected from freezing for minimum temperature for the intended voyage.

10.4.3 Isolating valves should be located so that they are accessible. Any isolating valves located in exposed positions should not be subject to icing from freezing spray. The fire main should be arranged so that external sections can be isolated and draining devices should be provided.

10.4.4 Hydrants should be positioned or designed to remain operable under all anticipated temperatures. Ice accumulation and freezing should be taken into account.

10.4.5 All hydrants should be equipped with an efficient two-handed valve handle.

10.5 Protection against ice build-up

Components of the fire-fighting system which may be exposed to icing that could interfere with the proper functioning of that component should be adequately protected.

10.6 Firefighters' outfits

10.6.1 Sufficient firefighters' outfits should be readily available to the accommodation area and elsewhere as appropriate. Such firefighters' outfits should be stored in warm positions as widely separated as practical.

10.6.2 In addition to the firefighters' outfits provided in accordance with paragraph 10.6.1, one spare firefighter's outfit should be provided. The spare outfit should be stored in a warm location on the ship.

CHAPTER 11
LIFE-SAVING APPLIANCES AND SURVIVAL ARRANGEMENTS

11.1 General

11.1.1 Adequate supplies of protective clothing and thermal insulating materials should be provided, taking into account the intended voyage.

11.1.2 Training in the use of all emergency equipment, as appropriate, should be included as an element of the operating procedures and drills described in chapter 13. Where appropriate, dedicated training equipment should be carried to avoid compromising the performance of the emergency equipment itself.

11.2 Categories of life-saving equipment

11.2.1 Ships operating in polar waters should carry life-saving appliances and survival equipment according to their environmental conditions of operation.

11.2.2 Personal survival kits (PSKs) as described in section 11.3 should be carried whenever a voyage is anticipated to encounter mean daily temperatures below 0°C.

11.2.3 Group survival kits (GSKs) as described in section 11.4 should be carried whenever a voyage is anticipated to encounter ice conditions which may prevent the lowering and operation of survival craft.

11.2.4 Sufficient PSKs and GSKs (as applicable) should be carried to cover at least 110% of the persons on board the ship.

11.2.5 Personal survival kits should be stored so that they may be easily retrieved in an emergency situation. Arrangements such as storage in dedicated lockers near the assembly stations may be considered.

11.2.6 Group survival kits should be stored so that they may be easily retrieved and deployed in an emergency situation. Any containers should be located adjacent to the survival craft and liferafts. Containers should be designed so that they may be easily moved over the ice and be floatable.

11.3 Personal survival kit (PSK)

11.3.1 A sample of the contents of a personal survival kit is listed in the table below.

Table 11.1
Contents of the personal survival kits

Equipment	Quantity
Clothing	
Head protection (VP)[10]	1
Neck and face protection (VP)	1
Hand protection – Mitts (VP)	1 pair
Hand protection – Gloves (VP)	1 pair
Foot protection – Socks (VP)	1 pair
Foot protection – Boots	1 pair
Insulated suit (VP)	1
Approved immersion suit	1
Thermal underwear (VP)	1 set
Miscellaneous	
Handwarmers	240 hours
Sunglasses	1 pair
Survival candle	1
Matches	2 boxes
Whistle	1
Drinking mug	1
Penknife	1
Handbook (Polar Survival)	1
Carrying bag	1

11.3.2 The following notice should be displayed wherever personal survival kits are stored:

NOTICE

CREW MEMBERS AND PASSENGERS ARE REMINDED THAT THEIR PERSONAL SURVIVAL KIT IS FOR EMERGENCY SURVIVAL USE ONLY. NEVER REMOVE ITEMS OF SURVIVAL CLOTHING OR TOOLS FROM THE PERSONAL SURVIVAL KIT CARRYING BAG – YOUR LIFE MAY DEPEND ON IT.

11.3.3 Personal survival kits should not be opened for training purposes. Equipment for training purposes should be provided in accordance with paragraph 11.1.2.

11.4 Group survival kit (GSK)

11.4.1 A sample of the contents of the group survival kit is listed in the table below.

[10] VP means “vacuum packed”.

Table 11.2
Contents of the group survival kits (GSK)

Equipment	Quantity
Group equipment	
Tents	1 per 6 persons
Air mattresses	1 per 2 persons
Sleeping bags (VP)[11]	1 per 2 persons
Stove	1 per tent
Stove fuel	0.5 litres per person
Fuel paste	2 tubes per stove
Matches	2 boxes per tent
Pan (with sealing lid)	1 per stove
Fortified health drinks	5 packets per person
Flashlights	1 per tent
Candles and holders	5 per tent
Snow shovel	1 per tent
Snow saw and snow knife	1 per tent
Tarpaulin	1 per tent
Foot protection – Booties	1 per person
GSK container	1
Spare personal equipment	(1 set per GSK container, which may be considered as part of the 110% as specified in paragraph 11.2.4)
Head protection (VP)	1
Neck and face protection (VP)	1
Hand protection – Mitts (VP)	1 pair
Hand protection – Gloves (VP)	1 pair
Foot protection – Socks (VP)	1 pair
Foot protection – Boots (VP)	1 pair
Insulated suit (VP)	1
Thermal underwear	1 pair
Handwarmers	1 set
Sunglasses	1
Whistle	1
Drinking mug	1

11.5 Lifeboats

11.5.1 All lifeboats should be either of the partially or totally enclosed type to provide adequate shelter from the anticipated operating environment.

11.5.2 The capacity of lifeboats should be evaluated with regard to operability, accessibility, seating capacity and overall space, considering the needs of personnel wearing suitable polar clothing.

[11] VP means “vacuum packed”.

11.5.3 Any ice accretion should be regularly removed from the lifeboats and launching equipment to ensure ease of launching when required. An icing removal mallet should be available in the vicinity of the lifeboats.

11.5.4 All lifeboat engines should be equipped with a means to ensure they will start readily when required at the minimum anticipated operating temperature.

11.5.5 The lifeboat engine fuel oil should be suitable for operation in the minimum anticipated operating temperature.

11.5.6 Drinking water should be stored in containers that allow for expansion due to freezing.

11.5.7 Consideration should be given to the provision of additional emergency rations to account for high rates of energy expenditure under polar conditions.

11.6 Liferafts

11.6.1 Any ice accretion should be regularly removed from the liferafts, cradles and launching equipment to ensure ease of launching and inflation when required. An icing removal mallet should be available in the vicinity of the liferafts.

11.6.2 Ships should carry in a warm space in the vicinity of the liferafts manual inflation pumps that are proven to be effective in the anticipated air temperatures.

11.6.3 Air or other proven cold temperature gas should be used for the inflation of life-saving equipment according to their environmental conditions of operation.

11.6.4 Consideration should be given to the provision of additional emergency rations to account for high rates of energy expenditure under polar conditions.

11.7 Protection from wildlife

Consideration should be given to protection from wildlife in areas where encounters are likely.

CHAPTER 12
NAVIGATIONAL EQUIPMENT

12.1 Application

It should be noted that the provisions prescribed in this chapter are not to be considered in addition to the requirements of SOLAS chapter V. Rather, any equipment fitted or carried in compliance with the requirements of SOLAS chapter V may be considered as part of the recommended equipment complement detailed in this chapter. Unless specifically provided in this chapter, the performance standards and other applicable guidance for equipment and systems contained in this chapter should be applied in accordance with SOLAS chapter V, as amended.

12.2 Compasses

12.2.1 Magnetic variations in high latitudes may lead to unreliable readings from magnetic compasses.

12.2.2 Gyro-compasses may become unstable in high latitudes and may need to be shut down.

12.2.3 Companies should ensure that their systems for providing reference headings are suitable for their intended areas and modes of operation, and that due consideration has been given to the potential effects noted in paragraphs 12.2.1 and 12.2.2. For operations in polar waters, ships should be fitted with at least one gyro-compass and should consider the need for installation of a satellite compass or alternative means.

12.3 Speed and distance measurement

12.3.1 All ships should be fitted with at least two speed and distance measuring devices. Each device should operate on a different principle in order to provide both speed through the water and speed over ground.

12.3.2 Speed and distance measuring devices should provide each conning position with a speed indication at least once per second.

12.3.3 Speed and distance measurement device sensors should not project beyond the hull and should be installed to protect them from damage by ice.

12.4 Depth sounding device

All ships should be fitted with at least two independent echo-sounding devices which provide indication of the depth of water under the keel. Due account should be taken of the potential for ice interference or damage to any device designed to operate below the waterline.

12.5 Radar installations

12.5.1 All ships should be fitted with a total of at least two functionally independent radar systems. One of these should operate in the 3 GHz (10 cm, S-band) frequency range.

12.5.2 Radar plotting systems that may be installed should have the capability of operating in both the sea and the ground stabilized mode.

12.6 Electronic positioning and electronic chart systems

12.6.1 All ships should be provided with an electronic position fixing system.

12.6.2 A satellite system (GPS or GLONASS or equivalent) should be fitted on any ship intending to navigate in areas outside of reliable coverage by a terrestrial hyperbolic system.

12.6.3 Systems described in paragraphs 12.6.1 and 12.6.2 should provide input to allow for continuous representation of the ship's speed provided by a speed and distance measuring device according to paragraph 12.3, and the ship's course provided by a compass according to paragraph 12.2.

12.6.4 Where fitted, electronic charting systems should be able to use position input from systems compliant with paragraphs 12.6.1 and 12.6.2.

12.7 Automatic identification system (AIS)

All ships should be provided with automatic identification system (AIS).

12.8 Rudder angle indicator

12.8.1 Separate rudder angle indicators should be provided for each rudder on ships with more than one independently operable rudder.

12.8.2 In ships without a rudder, indication should be given of the direction of steering thrust.

12.9 Searchlights and visual signals

12.9.1 All ships operating in polar waters should be equipped with at least two suitable searchlights which should be controllable from conning positions.

12.9.2 The searchlights described in paragraph 12.9.1 should be installed to provide, as far as is practicable, all-round illumination suitable for docking, astern manoeuvres or emergency towing.

12.9.3 The searchlights described in paragraph 12.9.1 should be fitted with an adequate means of de-icing to ensure proper directional movement.

12.9.4 All ships that may be involved in an escort of more than one ship following in an ice track should be equipped with a manually initiated flashing red light visible from astern to indicate when the ship is stopped. This should be capable of use from any conning position. The flashing light should have a range of visibility of at least two (2) nautical miles. The colour and frequency of the flashing light should be according to standards given in COLREG. The horizontal and vertical arcs of visibility of the flashing light should be as specified for stern lights in COLREG.

12.10 Vision enhancement equipment

12.10.1 All ships should be fitted with a suitable means to de-ice sufficient conning position windows to provide unimpaired forward and astern vision from conning positions.

12.10.2 The windows described in paragraph 12.10.1 should be fitted with 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.

12.10.3 All persons engaged in navigating the ship should be provided with adequate protection from direct and reflected glare from the sun.

12.10.4 All indicators providing information to the conning positions should be fitted with means of illumination control to ensure readability under all operating conditions.[12]

12.11 Ice routeing equipment

12.11.1 All ships should be provided with equipment capable of receiving ice and weather information charts.

12.11.2 All ships operating in polar waters should be fitted with equipment capable of receiving and displaying ice imagery.

PART C
OPERATIONAL
CHAPTER 13
OPERATIONAL ARRANGEMENTS

13.1 Documentation

All ships operating in polar waters should carry on board at all times a ship operating manual and training manual, as appropriate, for all Ice Navigators, as specified in paragraph 13.3.

13.2 Ship operational control

13.2.1 The ship should not be operated outside the worst intended conditions and design limitations which should be included in the operational guidelines.

13.2.2 All passenger vessels operating in polar waters should take account of the distance from search and rescue facilities and of the "Enhanced contingency planning guidance for passenger ships operating in areas remote from SAR facilities" (MSC.1/Circ.1184).

13.3 Operating and training manuals

Operating manual

13.3.1 The operating manual, or supplementary manual in the case of ships not normally operating in polar waters, should contain at least the following information on issues directly related to operations in such waters. With respect to contingency planning in the event that the ship suffers ice damage, the manual should conform to guidelines developed by the Organization:[13]

[12] Refer to the Performance standards for the presentation of navigation-related information on shipborne navigational displays, as adopted by resolution MSC.191(79).

[13] Refer to the Guidelines for the structure of an integrated system of contingency planning for shipboard emergencies, as adopted by resolution A.852(20).

Normal operation

.1 principal particulars of the ship;

.2 loading procedures and limitations including any applicable recommendations against carrying pollutants in tanks and compartments against the hull envelope, maximum operational weight, position of centre of gravity and distribution of load necessary for operation in polar waters;

.3 acknowledgment of changes in standard operating procedures for radio equipment and navigational aids applicable to Arctic and Antarctic operations;

.4 operating limitations for the ship and essential systems in anticipated ice conditions and temperatures;

.5 passage planning procedures accounting for anticipated ice conditions;

.6 deviations in standard operating procedures associated with operation of propulsion and auxiliary machinery systems, remote control and warning systems and electronic and electrical systems made necessary by operations in polar waters;

Risk management

.7 deviations in standard damage control procedures made necessary by operations in polar ice-covered waters;

.8 evacuation procedures into water, onto ice, or into a combination of the two, with due regard to chapter 11 of these Guidelines;

.9 information regarding the handling of the ship as determined in accordance with chapter 16 of these Guidelines (Environmental protection and damage control);

.10 maximum towing speeds and towing loads where applicable;

.11 procedures for checking the integrity of hull structure;

.12 description and operation of fire detection and fire-extinguishing equipment in a polar environment;

.13 details arising from the standards of chapter 3 of the Guidelines (Subdivision and stability) likely to be of direct practical use to the crew in an emergency; and

.14 guidance taking into account the results of any risk or failure analysis reports developed during the ship's operational history and its design limits and redundancy features.

Training manual

13.3.2 The training manual should cover all aspects of ship operation in polar waters listed below plus other related information considered necessary by the Administration:

.1 the Guidelines for ships operating in polar waters;

.2 ice recognition;

.3 navigation in ice; and

.4 escorted operation.

Instructions for drills and emergency instructions as detailed in section 13.4 should be incorporated as annexes to the manual.

13.3.3 The Company should ensure that any additional documentation referenced in the training manual and required to provide a full understanding of its contents is on board the ship when operating in polar waters.

13.4 Drills and emergency instructions

13.4.1 Onboard instruction and operation of the ship's evacuation, fire and damage control appliances and systems should include appropriate cross training of crew members with appropriate emphasis to changes to standard procedure made necessary by operations in polar waters.

13.4.2 *Evacuation*

13.4.2.1 Evacuation drill scenarios for crew members should be varied so that different emergency conditions are simulated, including abandonment into the water, onto the ice if appropriate, or a combination of the two.

13.4.2.2 Each evacuation craft drill should include:

.1 exercises in passenger control in cold temperatures as appropriate;

.2 checking that all personnel are suitably dressed;

.3 donning of immersion suits or thermal protective clothing by appropriate crew members;

.4 testing of emergency lighting for assembling and abandonment; and

.5 giving instructions in the use of the ship's life-saving appliances and in survival at sea, on the ice or a combination of both, as appropriate.

13.4.2.3 Rescue boat drills should be conducted as far as is reasonable and practicable with due consideration of the dangers of launching into polar ice-covered waters, if applicable.

13.4.2.4 Individual instructions may cover different parts of the ship's life-saving system, but all the ship's life-saving equipment and appliances should be covered within any period of one month on passenger ships and two months on cargo ships. Each member of the crew should be given instructions which should include but not necessarily be limited to:

.1 problems of cold shock, hypothermia, first-aid treatment of hypothermia and other appropriate first-aid procedures;[14] and

.2 special instructions necessary for use of the ship's life-saving appliances in severe weather and severe sea conditions on the ice or in a combination of water and ice cover.

13.4.3 *Fire drills*

13.4.3.1 Fire drill scenarios should vary each week so that emergency conditions are simulated for different ship compartments, with appropriate emphasis on those changes to standard procedures made necessary by operations in polar waters and low temperatures.

13.4.3.2 Each fire drill should include elements required by SOLAS plus additional elements made necessary by operation in a polar environment.

13.4.4 *Damage control*

Damage control drill scenarios should vary each week so that emergency conditions are simulated for different damage conditions with appropriate emphasis to those conditions resultant from operations in polar waters.

13.4.5 *Survival kits*

13.4.5.1 Where PSK and/or GSK are fitted, additional kits for training and demonstration purposes should be provided in accordance with paragraph 11.3.3.

13.4.5.2 Training equipment should be maintained in good condition. A number of sewing kits and replacement parts (buttons, boot laces, etc.) should be kept on board for the purpose of minor repair to training kit items.

13.4.5.3 PSK and GSK inspections should be carried out no less frequently than on an annual basis.

CHAPTER 14
CREWING

14.1 General

14.1.1 The crewing of all ships in polar waters should take account of the provisions listed in this chapter, and also of the relative lack of shore and support infrastructure which may be available to assist in any operations.

[14] Refer to the Guide to cold water survival (MSC.1/Circ.1185).

14.1.2 Ice Navigators should be provided as noted in chapter 1.

14.1.3 All of the ship's officers and crew should be made familiar with cold weather survival by training or self-study of course material or publications addressing the measures set forth in section 13.4.

14.1.4 The ship's deck and engine officers should be trained in ship operations in ice-covered waters, as appropriate.

14.2 Ice Navigator qualifications and training

The Ice Navigator should have documentary evidence of having satisfactorily completed an approved training programme in ice navigation[15]. Such a training programme should provide knowledge, understanding and proficiency required for operating a ship in polar ice-covered waters, including recognition of ice formation and characteristics; ice indications; ice manoeuvring; use of ice forecasts, atlases and codes; hull stress caused by ice; ice escort operations; ice-breaking operations and effect of ice accretion on vessel stability. Qualifications of an Ice Navigator should include documentary evidence of having completed on-the-job training, as appropriate, and may include simulation training.

CHAPTER 15
EMERGENCY EQUIPMENT

15.1 Medical equipment

15.1.1 All ships should be provided with an adequate number of first-aid kits and equipment with contents suitable to the onboard location and the recognized provisions for personnel safety hazards of such locations.

15.1.2 With respect to the nature of the voyage, ship operations and the ability to communicate and obtain timely assistance of medical aid or medical evacuation, exemptions of certain medical equipment, medicines and facilities may be considered unreasonable or unnecessary.

15.1.3 Crews operating in polar waters should be provided with appropriate equipment and training to safely evacuate an individual in a medical emergency from the ship.

15.2 Reserve supplies

15.2.1 Special consideration should be given to the reserve supply of fuel and lubricants taking into account the effect of heavy ice on fuel consumption.

15.2.2 Single screw ships may require special consideration (redundancy) in remote areas where conditions impose a risk of damage to machinery components.

[15] Refer to the model course for Ice Navigation to be developed by the Organization.

15.3 Damage control and repair equipment

15.3.1 All icebreakers and ships of Polar Classes 1 to 5 should carry the following emergency equipment:

.1 portable gas welding and cutting equipment with a reserve of consumables; and

.2 portable electro-submersible pump of 100 tonnes/h capacity with a set of hoses.

15.3.2 Where built-up propellers are used, consideration should be given to the carriage of spare blades and of equipment facilitating removal and replacement.

PART D
ENVIRONMENTAL PROTECTION AND DAMAGE CONTROL
CHAPTER 16
ENVIRONMENTAL PROTECTION AND DAMAGE CONTROL

16.1 General

16.1.1 The following provisions concerning environmental protection and damage control equipment are made with due regard to the lack of waste reception and repair facilities, communications limitations, unique navigational and environmental hazards and limited response capabilities of available assistance in polar waters.

16.1.2 Procedures for the protection of the environment under normal operations should be included in the ship's operating manual as described in chapter 13, and for those under accident conditions in the Shipboard Oil Pollution Emergency Plan (SOPEP), according to MARPOL. The procedures should be tailor-made to cover the remoteness and other environmental factors particular to Antarctic and Arctic waters.

16.1.3 Training and drills covering environmental protection and damage control procedures should be provided for crew members as specified in chapter 13.

16.2 Equipment and materials

16.2.1 All ships navigating in polar waters should be adequately equipped and their crews properly trained to provide effective damage control and minor hull repair.

16.2.2 All ships should have the capability to contain and clean up minor deck spills and contain minor over side spills. An inventory of such equipment should be included in the SOPEP, along with directions for safe use and guidelines to assist in determining when such use is warranted. The SOPEP should also establish personnel responsibilities for equipment deployment, oversight, maintenance and provide for crew training in equipment usage.

16.2.3 Damage control equipment, provided in accordance with paragraph 16.2.1, should be sufficient to enable a ship, as far as is practicable, to make temporary repairs to a minor hull breach or to take precautionary measures to prevent escalation of damage or flooding, so that the ship may proceed to a location where more substantial repairs can be effected.

16.2.4 Icebreakers and ships of Polar Classes 1 to 5 inclusive should be provided with material, tools and equipment capable of effecting more substantial repairs and damage control activities, as described in chapter 15.

16.2.5 Hoses and flexible pipes should be manufactured out of materials retaining adequate strength and elasticity characteristics at the minimum anticipated operating temperature.

16.2.6 All hoses used for transfer purposes from the ship to another ship or to shore should have the connection between the hose and the hose couplings made in an efficient and strong fashion to minimize the possibility of pollution due to failure of this connection. Couplings between hose sections should be capable of being securely locked together to prevent inadvertent disconnection.

16.3 Procedures for the protection of the environment under normal operations

Procedures for the protection of the environment under normal operations should take into account any applicable national and international rules and regulations and industry best practices related to operational discharges and emissions from ships, use of heavy grade oils, strategies for ballast water management, use of anti-fouling systems, and related measures.

SUB-COMMITTEE ON SHIP DESIGN & EQUIPMENT
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DEVELOPMENT OF A MANDATORY CODE FOR SHIPS OPERATING IN POLAR WATERS

Polar Code Boundaries for the Arctic and Antarctic

Submitted by FOEI / IFAW / WWF / Pacific Environment

SUMMARY

Executive summary:	In this paper FOEI, IFAW, WWF, and Pacific Environment propose further consideration of the definitions to be used for Arctic and Antarctic waters in the development of a mandatory Polar Code.
Strategic direction:	5.2
High-level action:	5.2.1
Planned output:	5.2.1.19
Action to be taken:	Paragraph 13
Related documents:	DE 53/18/3, DE 54/13/3, DE 55/12

Introduction

1 At the 54th meeting of the IMO Sub-Committee on Ship Design and Equipment (DE 54), a Working Group on Development of a Mandatory Polar Code was established. In its report, the Working Group concluded "that the definitions of Arctic and Antarctic waters as defined in the present Guidelines, as set out in resolution A.1024(26), serve the purpose for the present discussion in defining the general geographical scope of application of the Code … while noting that such definitions might have to be revisited once the Code is further developed, recognized that any intent to change such definitions would have certain repercussions, in particular as these might already be defined in existing IMO mandatory instruments, e.g., Antarctic in MARPOL, and any deviation might in fact not be possible. In this context, the group agreed that any change to such definitions will most likely need to be supported by submissions to the appropriate IMO body." This paper[1] proposes definitions of Arctic and Antarctic waters based on the physical and biological characteristics of these environments and strongly supports the adoption of an ecosystem-based approach to the management of shipping in polar waters.

[1] The preparation of this paper for the IMO's DE Sub-Committee was assisted by the Whale & Dolphin Conservation Society (WDCS) and by the Antarctic and Southern Ocean Coalition (ASOC), an umbrella NGO (whose members include FOEI, IFAW and WWF) with expert observer status at the Antarctic Treaty Consultative meetings (ATCM) and meetings of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR).

Arctic – an Illogical Geographic Boundary for Polar Waters

2 Resolution A.1024(26) includes the following map identifying the Arctic boundary of the Polar Guidelines, including an arbitrary line at 60 degrees North across the Bering Sea:

Figure 1 – Maximum extent of Arctic waters application (see paragraph G-3.3)[2]

3 The rationale for defining Arctic waters by a straight line across the Bering Sea excluded key areas with similar environmental characteristics to higher latitudes. Meanwhile, various Arctic Council bodies have established differing boundaries for the Arctic based on criteria that are relevant to their respective remits. They include the Emergency Prevention, Preparedness and Response Working Group (EPPR), the Conservation of Arctic Flora and Fauna (CAFF), the Arctic Monitoring and Assessment Program (AMAP), and the Arctic Human Development Report (AHDR). If properly developed, the Polar Code will include protections to avoid negative consequences of shipping impacts that are relevant to each of these Arctic Council bodies' remits. And, as the following map shows, none of these Arctic Council bodies' definition of Arctic waters follow an arbitrary straight line at 60 degrees North across the Bering Sea. Indeed, each of these boundaries extends to the south to encompass the Aleutian Islands.

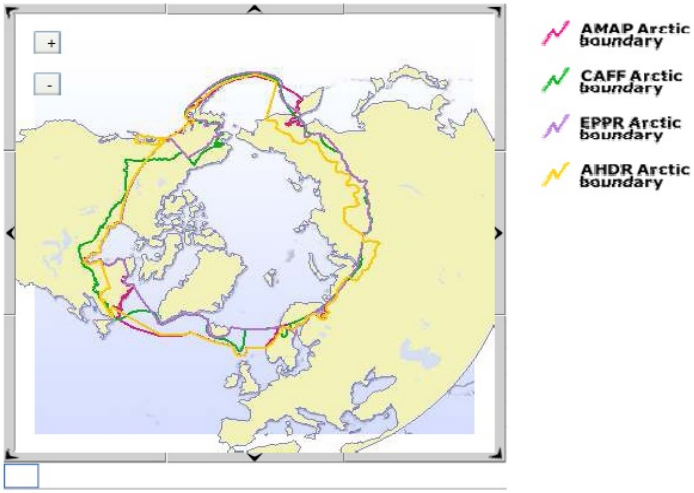

Figure 2 – Four maps of the Arctic used by the Arctic Council.

4 During the development of the Polar Code some delegations have noted that ice is often not present in many parts of the Arctic, including in the area north of 60 degrees North.

However, in the Pacific Ocean ice extends well below 60 degrees North latitude (see figure 3). Seasonal ice, including massive ice floes, can be present in the Sea of Okhotsk, along Sakhalin Island, Russia, and even to Hokkaido, leading Japan to establish the Institute for Low Temperature Science and the Ice Floes Research Laboratory at Hokkaido University, and to initiate shipping regulations for ice conditions in its territorial waters.

5 Sea ice extent should be the primary determiner of the Code boundary in the Arctic. However, in order to provide sufficient environmental protection, the boundary should extend beyond the median sea ice extent (see figure 3 below) and instead encompass the region's maximum sea ice extent, or its 'ice-prone' waters (based on, for example, a twenty-year timeframe, with updated revisions as needed). Thus, the Code's Pacific boundary should be modified to extend to the Aleutian and Kiril Islands and include relevant waters within the Sea of Japan.

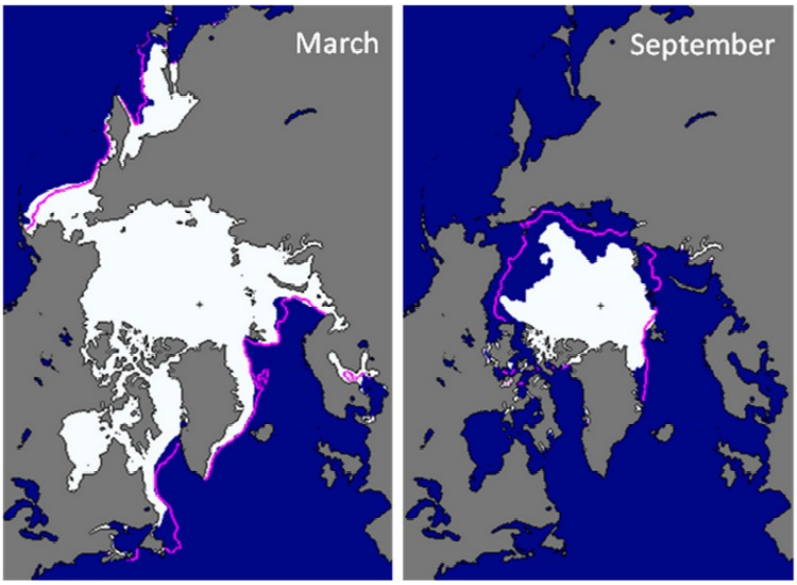

Figure 3 - Sea ice extent in March 2010 (left) and Sept. 2010 (right). The magenta line indicates the median maximum and minimum extent of ice cover in the month provided for the period 1979–2000. Perovich, D., et al., Sea Ice Cover, *in* Arctic Report Card: *Update for 2010*, (2010), at http://www.arctic.noaa.gov/reportcard/seaice.html.

Figure 4 - Sea Ice in Sea of Okhotsk, north of Hokkaido, Japan (Satellite image by Jesse Allen, NASA).

6 Ecosystem considerations should also be taken into account as supplemental factors, after sea ice extent, in establishing the Arctic Polar Code boundary. LMEs are scientifically well accepted ecological units of relatively large proportion – 200,000 km^2 or more – which are defined by criteria like productivity and bathymetry[2]. The LME approach has been used in the context of oil and gas exploitation (see AMAP), as well as in the Arctic Marine Shipping Assessment, where the report identified Arctic LMEs as environmental units in which to assess impacts from ships[3]. LMEs have also been used by the World Bank, UNEP, the Arctic Council (see figure 5), and UNDP[4]. Anthropogenic activity (e.g., shipping, oil & gas drilling, fishing) occurring in a particular marine area should have its environmental impacts evaluated by equivalent or at least comparable frames of reference. Foregoing LMEs is inconsistent with modern scientific environmental management, impairs regional efforts to meet marine resource goals (e.g., the Arctic Council's Arctic Marine Strategic Plan), and diverges from the practices of other U.N. bodies, intergovernmental organizations, and national governments. Moreover, the ecological health of the Bering Sea and Sea of Okhotsk may be imperilled if higher levels of shipping pollution are permitted or risks are not adequately abated in the southern sections of these waters. The demarcation of the Pacific boundary of the Code should have a basis in sound science rather than administrative convenience and/or simply precedent. We believe that, since Pacific ice-prone waters are essentially coextensive with the Bering Sea and Sea of Okhotsk LMEs, the shifting of the present Pacific Code boundary to the southern edge of these respective LMEs (and into the Sea of Japan) has a strong scientific foundation.

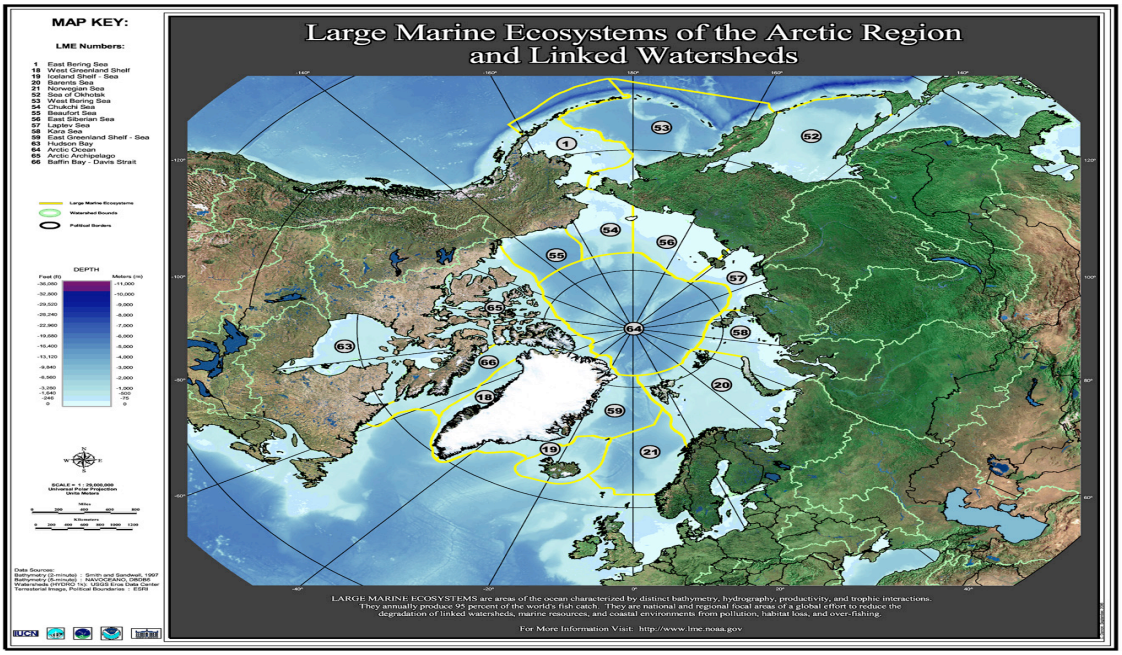

Figure 5 - Large Marine Ecosystems of the Arctic Region and Linked Watersheds[5]

7 As the work of EPPR, CAFF, AMAP and AHDR have shown, the Arctic is no more limited by the presence of ice than deserts are limited by the presence of sand. **Hence, it is clear that the boundary for Arctic waters set out in Resolution A.1024(26) is inadequate.** Geographic boundaries for Arctic waters adapted to the range of hazards and

[2] Siron et al., 2008.
[3] Id.
[4] de Roo et al., 2008.
[5] Map at http://www.pame.is/images/stories/Ecosystem_Approach/17-Arctic-LMEs-2006-new-version.jpg.

consequences that the Polar Code seeks to address, and not the arbitrary and inadequate boundary found in Resolution A.1024(26), are required. In addition, boundary determinations should incorporate appropriate site-specific factors, as needed.

An Ecological Definition of Antarctic Waters

8 The provisions of the Antarctic Treaty are applied to the area south of 60 degrees South Latitude[6], and a similar delineation of the Antarctic has been used by MARPOL to identify the waters covered by the Antarctic Special Area[7] and in the Guidelines for Ships Operating in Polar Waters[8]. The Convention on the Conservation of Antarctic Marine Living Resources, under which Antarctic fishing and fishing vessels are managed, however applies to a wider area (see figure 6)[9] which is broadly consistent with the Antarctic Polar Front (APF), also formerly known as the Antarctic Convergence.

9 The APF is formed where cold, north-flowing Antarctic water meets warmer sub-Antarctic water and sinks below the warmer water. The natural boundary formed between the two water masses creates a natural barrier resulting in marine life south of the Polar Front which is distinct from that to the north of the APF – with the exception of larger migratory marine mammals which are able to cross the APF. It is important that impacts of activities or threats to biodiversity are managed consistently throughout the area to protect the distinct and unique marine wildlife found to the south of the APF.

10 During the 32nd Antarctic Treaty Consultative Meeting (ATCM) in 2009, in addition to recognising the urgent need for a legally binding polar shipping instrument, a Resolution[10] was adopted which required the Chairman of ATCM to request the Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR) to provide its views on asking IMO to amend the Antarctic Special Area to extend its boundary northward to the APF. CCAMLR's Scientific Committee[11] recognised that the aim of the proposal was to extend the protection of the Antarctic marine ecosystem by using an ecosystem boundary and that this was consistent with its custom and practice in defining boundaries for the protection of the marine environment. Some parties believed that the appropriate course of action was for CCAMLR to act first since it is capable of taking action to apply the provisions of MARPOL Antarctic Special Area status to fishing vessels, and then ask IMO to consider extending the provisions of MARPOL Special Area status to the wider IMO community. The proposal for an extension to the Antarctic Special Area currently remains pending.

11 The co-sponsors of this paper submit that biologically an extension of the Antarctic Special Area to the APF would conform to an ecosystem-based approach and aid in ecosystem-based management in the Southern Ocean. It has, though, been argued that such an extension would be difficult to apply or enforce because the APF is not a fixed physical feature and the boundaries of such an extension would not be clear for international shipping. However, the simplest approximation of the boundaries of the Antarctic Convergence would be the CCAMLR boundaries. Alternatively, since the APF is a very clear thermo-barrier with the waters to the south significantly cooler than those of the sub-Antarctic to the north, the Antarctic Special Area could potentially be defined on the basis of sea surface temperature.

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[6] http://www.ats.aq/documents/ats/treaty_original.pdf.
[7] MARPOL Annex I Regulation 1, 11.7 "the Antarctic area means the sea area south of latitude 60° S".
[8] "Antarctic waters means those waters which are south of 60° S". A 26/Res.1024, Guidelines for Ships Operating in Polar Waters.
[9] http://www.ccamlr.org/pu/E/conv/map.htm.
[10] Resolution 1 (2009) ATCM XXXII – CEP XII, Baltimore. Enhancement of Environmental Protection up to the Antarctic Convergence. Adopted 17/04/2009.
[11] Report of the Twenty-eighth meeting of the Scientific Committee, Hobart, Australia. 26 – 30 October, 2009. 9.12 – 9.13.

12 With this information in mind, the co-sponsors submit that the area to which the mandatory Polar Code applies should encompass all waters south of the APF and that for consistency and ease the boundaries be described as for the Convention on the Conservation of Antarctic Marine Living Resources.

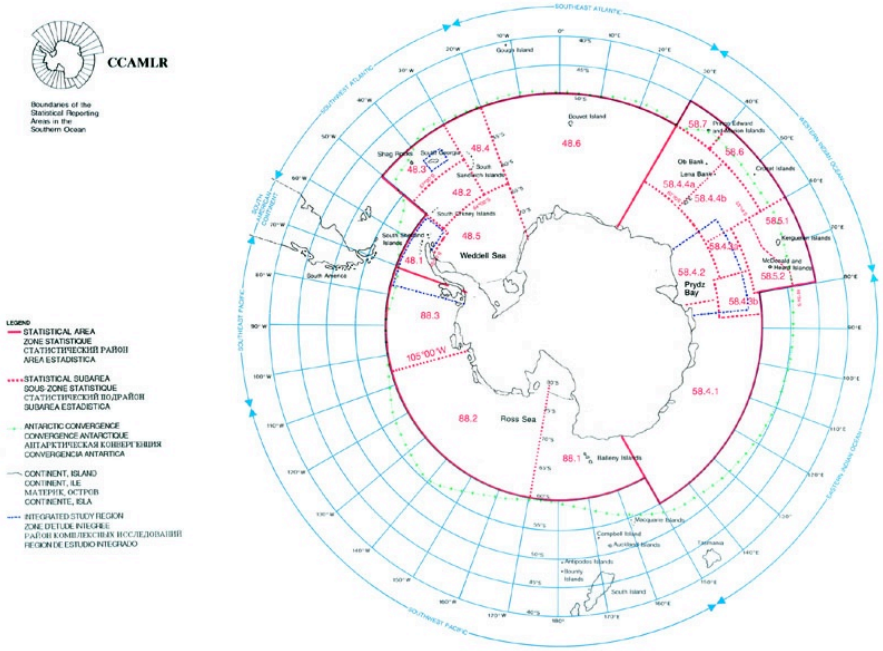

Figure 6 - Map showing the Convention on the Conservation of Antarctic Marine Living Resources Area[12], the APF (named here as Antarctic Convergence), and (visible in some sectors) the 60° S latitude.

Action requested of the Sub-Committee

13 The Sub-Committee is invited to note the information provided and consider further the definitions of Arctic and Antarctic waters based on the physical and ecological characteristics of the environments during its deliberations on the development of a mandatory Polar Code and to support the adoption of an ecosystem-based approach to the management of shipping in polar waters.

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[12] http://www.ccamlr.org/pu/E/conv/map.htm.