

GUIDELINES FOR

SHIPS OPERATING IN POLAR WATERS

2010 EDITION

Electronic Edition



INTERNATIONAL
MARITIME
ORGANIZATION

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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 suction. 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 routing, 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.

* 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)*

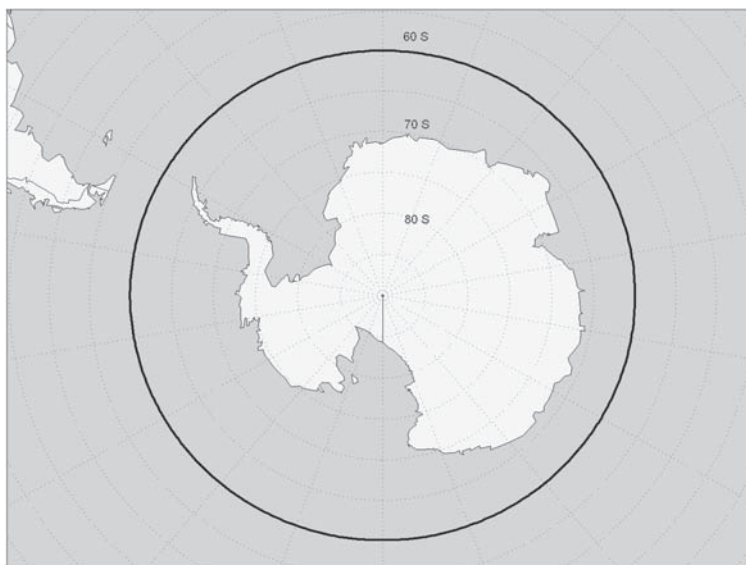


Figure 2 – Maximum extent of Antarctic waters application (see paragraph G-3.4)*

* 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.

* 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.

* 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_r , as defined in SOLAS regulation II-1/7-2, has $s_r = 1$ 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.