DEVELOPMENT OF A MANDATORY CODE FOR SHIPS OPERATING IN POLAR WATERS

Proposed framework for the Code for ships operating in polar waters

Submitted by Canada

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Introduction

1 The Maritime Safety Committee, at its eighty-sixth session, agreed to include, in the Sub-Committee’s work programme and provisional agenda for DE 53, an item on “Development of a mandatory Code for ships operating in polar waters”.

2 The Sub-Committee is advised/reminded that document DE 41/10 was comprehensive in approach, neutral in language, and yet sufficient in scope to accommodate mandatory provisions.

3 This submission combines the current Guidelines for ships operating in polar waters and concepts taken from document DE 41/10 into the structure of representative recent Codes, i.e. Part A – Mandatory, Part B – Recommendatory.

Outstanding issues

4 The control of shipping section sets out when a qualified Ice Navigator is to be aboard and establishes the level of experience necessary to obtain the qualification. Yet to be in place are the competencies needed as part of the STCW Convention and the related model course.
The qualification endorsement scheme could be based on the classroom/experience approach used for the Master of a tanker.

5 There is a variety of operational control systems in polar waters, namely in Canada, the Russian Federation and the Antarctic Treaty. While a harmonized approach is desirable, the Permit to Operate Certificate can serve as a control document. Annexes 1 and 2 of part A of the proposed Code define the format and content of key documents that must be carried by all vessels operating in polar waters. A valid Safety Certificate would be held by any Polar Class ship and a Permit to Operate would be issued to any ship, including those of Polar Class. This Permit, issued by the Administration, limits the ship’s operating conditions in port/coastal State and international, including Antarctic Treaty, waters.

6 Certain environmental protection measures are already in place in polar waters. The intended application of the Code must reconcile a number of overlapping and possibly conflicting approaches to marine protective measures. Additional details on the application of the proposed Code were provided in document DE 41/INF.8, a discussion paper on the application and impact of the Polar Code.

7 The proposed Code introduces environmental protection measures for ballast water management and hull-fouling specific to ships operating in remote coldwater regions. There are no proposals in the Code dealing with alternative environmental protection measures such as Special Area designation or PSSA that are already included in other IMO Conventions. Control of ship emissions is an open question.

8 The mandatory nature of the proposed Code requires re-examination of the applicability to all ships in polar waters. Will it include application to barges, fishing vessels and pleasure craft, in whole or in part?

9 The intended application covers all ships in polar waters, new and existing. New vessels are to comply with all provisions of part A, and part B as recommendatory. Existing ships are to comply with Divisions 2, 3, and 4 of part A in a phased approach and with part B as far as is reasonable and practicable, but restricted in ice-covered waters by Permit conditions. The grandfathering approach for existing vessels proposes a combination of ship age/date from Code implementation, varying for ships of different Polar Classes. An alternative would be to apply a single (say, 15-year) date for required compliance.

10 The proposed Code prohibits the carriage of pollutants against the shell of any Polar Class ships, except for lower risk areas in double bottoms of PC 6/7 aft of mid-ships. These two classes equate in nominal terms to the top two Baltic Classes, 1A Super and 1A respectively, and could be treated in a similar manner. All other ice class designations would be considered as open water (PC O) for operations in the polar regions.

Action requested of the Sub-Committee

11 The Sub-Committee is invited to use this submission as a starting point for the work of developing a mandatory Code for ships operating in polar waters.

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ANNEX

DRAFT POLAR CODE

CODE FOR SHIPS OPERATING IN POLAR WATERS

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PREAMBLE

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.

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.
3 This Code for ships operating in polar waters is intended to provide that all ship operations in polar waters meet internationally acceptable standards of ship safety and pollution prevention. It has been derived from the harmonization of existing national systems, in recognition of the increasing interest in the use of polar waters as shipping routes and areas for science and resource development, and as important and vulnerable components of the global ecosystem. It is intended to facilitate future research and development into polar shipping in ways which will help its international acceptance.

4 This Code has been assembled to provide, in a single document, mandatory requirements in the introduction and in part A and recommended provisions in part B for safe operation in polar waters. The provisions of the Code assume that vessels comply with existing IMO instruments. Where recommendations in this Code appear to differ from other IMO Codes, the other Codes should be taken as the prevailing instrument.

5 The Code is intended to address those additional provisions deemed necessary for consideration beyond existing requirements of the SOLAS and other Conventions, in order to take into account the climatic conditions of polar waters and to meet appropriate standards of maritime safety and pollution prevention.

6 The provisions of the Code, as well as the technical documents referenced therein, are based on operational experience, field data and research and development. Nevertheless, as polar conditions and traffic levels are evolving rapidly, the Organization will periodically review the Code taking into consideration both experience and further development.

INTRODUCTION

1 Purpose

1.1 The purpose of the Code is to present mandatory and recommendatory measures for ships operating in polar waters in light of their remoteness and the hazards presented by operating in ice to minimize the risk to such ships, to the persons on board, and to the environment. Part A of the Code addresses the mandatory measures and part B contains recommendations and additional guidance.

1.2 The Code clarifies the respective roles and responsibilities of the owners, operators, flag States, coastal States, port States, and for Antarctic waters, Treaty States for ensuring maritime safety and protection of the marine environment.

2 Principles

2.1 The Code aims to promote the safety of navigation and to prevent pollution from ship operations in polar waters.

2.2 The Code recognizes that this is best achieved by an integrated approach, building upon requirements in existing Conventions which cover the design, outfitting, crewing and operation of ships for the conditions which they will encounter outside polar waters by establishing additional provisions, such as crewing by adequate numbers of suitably qualified and trained personnel and operation in a planned and prudent manner with adequate liability provisions.

2.3 The Code takes into account that polar conditions may include sea and glacial ice that can represent a serious structural hazard to all ships. This is the most significant factor in operations in polar waters and is reflected in many of the Code’s provisions. Remoteness is another significant factor to consider.
2.4 The Code addresses the fact that the polar environment imposes additional demands on ship systems, including navigation, communications, life-saving, main and auxiliary machinery, environmental protection and damage control, etc. It emphasizes the need to ensure that all ship systems are capable of functioning effectively under anticipated operating conditions and provide adequate levels of redundancy and safety in accident and emergency situations.\(^1\)

2.5 In addition, the Code recognizes that safe operation in such conditions requires specific attention to human factors including training and operational procedures. All ships operating in ice-covered waters under the Code should carry on board a sufficient number of certified Ice Navigators to guide all operations when ice is present.

2.6 The basic requirements for structure, stability and subdivision, machinery, life-saving appliances, fire protection, ship routeing, navigation systems and equipment, ship reporting, marine traffic management systems, 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.

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

2.8 The combination of hull structural design, material quality, subdivision and segregation measures prescribed in the Code 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.

2.9 Not all ships which enter the Arctic and Antarctic environment 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 Code, 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. 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. These, or other appropriate requirements, will form part of the basis for issuing the Polar Ship Safety Certificate under the Code.

2.10 Ships without Polar Class construction designation may be permitted to operate in polar waters at the discretion of the Administration and affected port, Treaty, and coastal States, and subject to the ships’ compliance with the Code.

2.11 The Code is not intended to infringe on national systems of shipping control until a harmonized system is in place; in addition to applicable sections of the Code, port, Treaty and coastal States may retain local navigation rules and regulations for certain routes and waterways under their jurisdiction taking account local conditions, infrastructure and procedures.

\(^1\) Refer to the Enhanced contingency planning guidance for passenger ships operating in areas remote from SAR facilities (MSC.1/Circ.1184).
2.12 Where the jurisdiction of no coastal or port State applies to the waters to be traversed by a projected voyage in polar waters, flag States, and Port of Origin and/or Destination should be responsible for the safe operation of the ship by assuring its compliance with all relevant aspects of the Code.

2.13 The Code, recognizing the remote and sensitive nature of polar waters, has the intention of providing high standards of environmental protection to address both accidents and normal operations.

2.14 Navigation and communications equipment should be suitable to provide adequate performance in high latitudes, and in areas with limited infrastructure and unique information transfer challenges.

2.15 Administrations may exempt any ship which embodies features of a novel kind from any of the provisions of this Code, the application of which might seriously impede research into the development of such features and their incorporation into ships engaged on international voyages. Any such ship should, however, comply with safety requirements which, in the opinion of that Administration, are adequate for the service for which it is intended and are such as to ensure the overall safety of the ship and which are acceptable to the Governments of the States to be visited by the ship. The Administration which allows any such exemption should communicate to the Organization particulars of same and the reasons it was granted, which the Organization shall circulate to the Contracting Governments for their information.

3 Definitions

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

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

3.2 Polar waters includes both Arctic and Antarctic waters.

3.3 Arctic waters means those waters which are located north of a line from the latitude 58°00'0 N and 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).

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

3.5 Ice-covered waters means polar waters where local ice conditions present a structural risk to a ship where ice covers more than one-tenth of the water’s surface.
3.6 **COLREG** means the International Regulations for Preventing Collisions at Sea, 1972, as amended.

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

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

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

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

3.11 **Existing ship** means a ship that is not a new ship.

3.12 **IACS** means the International Association of Classification Societies.

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

3.14 **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 and whose Polar Ship Safety Certificate is endorsed with this notation.

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

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


3.18 **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.

3.19 **New Ship** means a ship:

   .1 the contract for which is placed not more than six months before the date of entry into force of this Code;

   .2 the keel of which is laid, or which is at a similar stage of construction, after the date of entry into force of this Code, or

   .3 the delivery of which is not less than one year after the date of entry into force of this Code.

3.20 **Organization** means the International Maritime Organization.
3.21  *Polar Class* means the notation assigned to a ship based upon the IACS Unified Requirements.

3.22  *Polar Class ship* means a ship for which a Polar Class has been assigned.

3.23  *Polar Class O (PC O)* means a notation assigned to an open water vessel.

3.24  *Polar Ship Safety Certificate* means a certificate issued on behalf of the Administration to a ship that is in compliance with the provisions of part A of the Code.

3.25  *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.

3.26  *Port State* means a State whose Exclusive Economic Zone includes any destination port of a ship where such port lies within polar waters.

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

3.28  *Ship* means any vessel required to comply with the 1974 SOLAS Convention or other vessels to be defined.

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


3.31  *Unified Requirements* means IACS Unified Requirements for Polar Class Ships (UR-I).

3.32  *WMO* means the World Meteorological Organization.

3.33  *Working liquids* means any substances that are pollutants used for the operation of the ship’s machinery.

Figure 1 – Maximum extent of Arctic waters application (see paragraph 3.3)²

Figure 2 – Maximum extent of Antarctic Waters application (see paragraph 3.4)²

² Maps are for illustrative purposes only.
PART A – MANDATORY REQUIREMENTS

CHAPTER 1 – GENERAL

1.1 Application

1.1.1 Except where specifically stated otherwise, ships operating in Antarctic waters or while engaged in international voyages in Arctic waters shall meet the provisions of this part.

1.1.2 Requirements of the Code are applicable to ship types and sizes according to the provisions of the relevant Conventions and Protocols. Where no Convention applies, the Code applies to ships in excess of limits specified in regulation 2 of chapter I and regulation 10, chapter 2 of Annex I to the MARPOL Convention, but will not apply to ships below those limits. The provisions of the Code 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 Code.

1.2 General Requirements Application

1.2.1 All aspects of construction and equipment of Polar Class ships not covered by this Code or recognized organizations shall be designed, constructed and maintained in accordance 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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<th>POLAR CLASS</th>
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<tr>
<td>PC 1</td>
<td>Year-round operation in all ice-covered waters</td>
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<tr>
<td>PC 2</td>
<td>Year-round operation in moderate multi-year ice conditions</td>
</tr>
<tr>
<td>PC 3</td>
<td>Year-round operation in second-year ice which may include multi-year ice inclusions</td>
</tr>
<tr>
<td>PC 4</td>
<td>Year-round operation in thick first-year ice which may include old ice inclusions</td>
</tr>
<tr>
<td>PC 5</td>
<td>Year-round operation in medium first-year ice which may include old ice inclusions</td>
</tr>
<tr>
<td>PC 6</td>
<td>Summer/autumn operation in medium first-year ice which may include old ice inclusions</td>
</tr>
<tr>
<td>PC 7</td>
<td>Summer/autumn operation in thin first-year ice which may include old ice inclusions</td>
</tr>
<tr>
<td>PC O</td>
<td>Operation in open water</td>
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Note: Ice descriptions follow the WMO Sea Ice Nomenclature.

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Refer to SOLAS chapter II-1 and to the IACS Unified Requirements for Polar Class Ships.
1.2.2 Companies, designers, and Administrations should ensure that any ship’s Polar Class is matched to the requirements of the intended voyage or service. In particular, the structures, equipment and arrangements essential for the safety and operation of the ship should take account of the expected air temperatures, which for certain seasons and areas may occasionally go down to -50°C.

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

1.2.4 No pollutants shall 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.

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

1.2.6 Sea suction(s) should be capable of being cleared of accumulation of slush ice.

1.2.7 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 Division 2 of part A of the Code, when stored or located in an exposed position, shall 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. Such equipment shall be approved by the Administration and marked with [00 -XX°C •0] indicating the rated temperature.

1.2.8 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.

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

1.3 Certification

1.3.1 A certificate called a Polar Ship Safety Certificate shall be issued after completion of an initial or renewal survey to a ship which complies with the requirements of part A and, as appropriate, part B of the Code. The Certificate shall be issued or endorsed either by the Administration or by any person or organization recognized by it. In every case, that Administration assumes full responsibility for the Certificate.

1.3.2 A Contracting Government to the SOLAS Convention may, at the request of the Administration, cause a ship to be surveyed and, if satisfied that the requirements of the Code are complied with, shall issue or authorize the issue of a certificate to the ship and, where appropriate, endorse or authorize the endorsement of a certificate on the ship in accordance with the Code. Any certificate so issued shall contain a statement to the effect that it has been issued at
the request of the Government of the State the flag of which the ship is entitled to fly, and it shall have the same force and receive the same recognition as a certificate issued under 1.3.1.

1.3.3 The certificate shall be similar to the model given in annex 1 to part A of this Code. If the language used is neither English nor French, the text shall include a translation into one of these languages.

1.3.4 The Polar Ship Safety Certificate shall be issued for a period specified by the Administration which shall not exceed five years, in accordance with SOLAS Convention requirements for surveys and certification.

1.3.5 The privileges of the Code may not be claimed in favour of any Polar Class Ship unless it holds a valid certificate.

1.4 Permitting

1.4.1 A ship shall not operate in polar waters unless a Permit to Operate in Polar Waters is issued and valid. This Permit shall be issued to all ships, and is in addition to the Polar Ship Safety Certificate.

1.4.2 The Permit to Operate in Polar Waters is issued by the Administration to stipulate conditions of the operation of the ship and is drawn up on the basis of the information specified inter alia in chapter 14 of this Code. It should also stipulate constraints on the operation of the ship including limiting ice conditions, rated temperature for safety and navigating equipment, mode of ice operation, escort characteristics and other factors which may apply to the areas and seasons of operation, routes, and services in which the ship is permitted to operate.

1.4.3 Specific limitations and conditions associated with the operation of ships of all classes and types may be applied to voyages falling in whole or part under the jurisdiction of a port or coastal State. Companies should ensure that appropriate annexes are obtained for the general Permit to Operate wherever such requirements exist.

1.4.4 A port State may inspect the ship and audit its documentation for the sole purpose of verifying its compliance with the matters certified by and conditions associated with the Permit to Operate in Polar Waters. Where deficiencies are shown by such an audit, the Permit to Operate ceases to be valid until such deficiencies are corrected or otherwise resolved.

1.4.5 The Permit to Operate in Polar Waters should be valid for a period of one year from the date of issue.

1.4.6 The Permit to Operate in Polar Waters should be that of the model given in annex 2 to part A of this Code. If the language used is neither English nor French, the text should include a translation into one of these languages.

1.4.7 The Permit to Operate in Polar Waters is conditional on the ship being crewed with the minimum number of properly trained and certified crew members specified on the Permit to Operate.

1.4.8 Polar Class ships may experience in-service structural degradation at an accelerated rate. Comprehensive structural surveys shall therefore be undertaken prior to the issue or renewal of a Polar Ship Safety Certificate.
1.5 Control of shipping

1.5.1 No ship shall operate in polar ice-covered waters without an Ice Navigator:

.1 qualified in accordance with part A – chapter 14 of this Code; and

.2 for voyages in polar waters, who has served on a ship in the capacity of master or person in charge of the deck watch for a total period of at least 50 days, of which 30 days shall have been served in Arctic or Antarctic waters respectively, while the ship was in ice conditions that required the ship to be assisted by an icebreaker or to make manoeuvres to avoid concentrations of ice that might have endangered the ship.

1.5.2 Training in operating in ice-covered waters via simulation may be substituted for up to 10 days of on-job training as required in 1.5.1.2 above on a one day for one day basis.

1.6 Liability Insurance

1.6.1 All ships operating in polar waters shall maintain insurance or other financial security in the sums fixed by applying the limits of liability prescribed in the latest amendments to the relevant Conventions that cover liability for damage.

1.6.2 If insurance or other financial security is not maintained for a government ship to which the Code applies, the ship shall carry an insurance certificate issued by that government stating government ownership and that the ship’s liability is covered within the limit prescribed in accordance with 1.6.1.

DIVISION 1– CONSTRUCTION PROVISIONS

CHAPTER 2 – STRUCTURES

2.1 General

2.1.1 All ships shall have structural arrangements adequate to resist the global and local ice loads characteristic of their Polar Class, or, if not a Polar Class ship, the ice loads likely to be encountered for the voyages to be undertaken.

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

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

2.2 Materials

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

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4 Refer to the IACS Unified Requirements for Polar Class Ships.
2.2.2 Materials used in ice-strengthened areas shall 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.

CHAPTER 3 – SUBDIVISION AND STABILITY

3.1 General

3.1.1 Account shall 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 shall 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, will maintain sufficient positive stability; and

2. ships of Polar Classes 1 to 3, all ships with equivalencies to Polar Classes 1 to 3, and icebreakers of all classes, when riding up in ice and remaining momentarily poised at the lowest stem extremity, will 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 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 ships of Polar Class or equivalent shall 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 $s_t$, as defined in SOLAS regulation II-1/7.2, has $s_t = 1$ 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\(^5\), 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 or ship with a Polar Class equivalency may carry any pollutant directly against the outer shell. Any pollutant shall be separated from the outer shell of the ship by double skin construction of at least 760 mm in width.

3.4.2 All new ships with Polar Class notation shall have double bottoms over the breadth and the length between forepeak and afterpeak bulkheads. Double bottom height shall be in accordance with the rules of the classification societies in force. Double bottoms may not be used for the carriage of pollutants except where a double skin construction complying with paragraph 3.4.1 is provided, or where working liquids are carried in way of main machinery spaces in tanks not exceeding 20 m\(^3\) individual volume.

3.4.3 Double bottoms in ships of Polar Classes 6 and 7 or ships with equivalencies to Polar Classes 6 or 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 ships with Polar Class notation or equivalency ships that have 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.

\(^5\) Refer to the IACS Unified Requirements for Polar Class Ships.
CHAPTER 4 – ACCOMMODATION AND ESCAPE MEASURES

4.1 General

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

4.1.2 Ships of Polar Classes 1 to 5 inclusive shall be designed and insulated to retain adequate heat within a portion (“citadel”) of the accommodation to maintain essential services if the main power source is lost. Emergency heating for this portion of the accommodation should be provided from an emergency power source. The portion of the accommodation so configured should be of sufficient size to shelter the ship’s full complement.

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 shall be designed with adequate provisions to ensure the safety of personnel using shower facilities. Such facilities shall include non-slip decking, three rigid sides, handholds and insulation from exposed hot water pipes.

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

4.3 Escape measures

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

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

CHAPTER 5 – DIRECTIONAL CONTROL SYSTEMS

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

CHAPTER 6 – ANCHORING AND TOWING ARRANGEMENTS

6.1 Anchoring arrangements

6.1.1 Ships of Polar Classes 1 to 5 inclusive and all icebreakers of all classes shall, 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.
6.1.2 Anchoring systems on Polar Class ships 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.

6.2 Towing arrangements

6.2.1 All ships designed to perform dedicated towing operations shall be provided with a quick release system, operable from the conning position.

6.2.2 All Polar Class ships designed to perform dedicated towing operations and all icebreakers shall be equipped with line-throwing apparatus in addition to that required for life-saving. This apparatus shall 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 Emergency towing arrangements\(^6\)

6.3.1 All Polar Class ships shall be capable of receiving and providing emergency towing assistance.

CHAPTER 7 – MAIN MACHINERY

7.1 General

7.1.1 The design, rating, installation, operation and maintainability of shipboard engineering systems shall be suitable for the intended operations when navigating in polar waters\(^7\).

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

7.1.3 For ships which may be laid up in polar waters, materials for all systems with the potential of polluting shall be suitable for preventing pollution at the lowest ambient temperatures to which they may be subjected and shall be suitable to avoid pollution and ensure safe operation on reactivation of the systems.

7.2 Main propulsion systems

7.2.1 Main propulsion machinery and all auxiliary machinery essential to the propulsion system, shall 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

\(^6\) Refer to the Guidelines for owners/operators on preparing emergency towing procedures (MSC.1/Circ.1255).

\(^7\) Refer to the IACS Unified Requirements for Polar Class Ships.
.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.

7.2.2 Sterntube bearings, seals and main propulsion components located outside the hull shall not leak pollutants. Non-toxic, biodegradable lubricants are not considered to be pollutants.

7.2.3 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.

CHAPTER 8 – AUXILIARY MACHINERY SYSTEMS

8.1 General

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

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

8.2 Materials

8.2.1 Materials used in equipment and systems shall 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,

shall 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.

CHAPTER 9 – ELECTRICAL INSTALLATIONS

9.1 Electrical installations on ships shall 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 Emergency power for communications equipment provided by battery shall be provided with a means whereby the batteries are protected from extreme low temperatures.

9.3 Control systems based on computers and other electronic hardware installations necessary for the proper functioning of essential equipment shall be designed for redundancy and resistance to vibration, dampness and low humidity.\(^8\)

9.4 Emergency power batteries including the reserve source of energy for the radio installation, including those stored in deck boxes, shall 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.

**DIVISION 2 – EQUIPMENT**

**CHAPTER 10 – FIRE SAFETY**

10.1 Fire detection and extinguishing systems

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

.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.

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

10.2 Fire pumps and associated equipment for Polar Class ships

10.2.1 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 shall be capable of being cleared of accumulations of slush ice.

10.2.2 Fire pump(s) including emergency fire pump(s) shall be adequately protected from freezing for minimum temperature for the intended voyage.

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

\(^8\) Such equipment should be approved in accordance with relevant international standards.
10.2.4 Hydrants shall be positioned or designed to remain operable under all anticipated temperatures. Ice accumulation and freezing should be taken into account.

10.2.5 All hydrants shall be equipped with an efficient two-handed valve handle.

10.3 Protection against ice build-up

10.3.1 To reduce the risk of loss of stability, any system, including scuppers, drains, pipes or alternative pumping system, and the associated overboard discharges, shall be adequately protected from freezing and ice accumulation. These systems shall provide effective operation in the lowest temperature in which the ship is expected to operate.

10.4 Firefighters’ outfits

10.4.1 Sufficient firefighters’ outfits shall be readily available to the accommodation area and elsewhere as appropriate.

10.4.2 In addition to the firefighters’ outfits provided in accordance with paragraph 10.4.1, one spare firefighter’s outfit shall 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 shall be provided, taking into account the intended voyage.

11.1.2 Training in the use of all emergency equipment, as appropriate, shall be included as an element of the operating procedures and drills described in chapter 13. Where appropriate, dedicated training equipment shall 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 shall 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 shall 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 shall 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) shall be carried to cover at least 110% of the persons on board the ship.

11.2.5 Personal survival kits shall be appropriate for the expected conditions and shall 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 shall be appropriate for the expected conditions and shall be stored so that they may be easily retrieved and deployed in an emergency situation.

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>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Clothing</strong></td>
<td></td>
</tr>
<tr>
<td>Head protection (VP)⁹</td>
<td>1</td>
</tr>
<tr>
<td>Neck and face protection (VP)</td>
<td>1</td>
</tr>
<tr>
<td>Hand protection – Mitts (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Hand protection – Gloves (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Foot protection – Socks (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Foot protection – Boots</td>
<td>1 pair</td>
</tr>
<tr>
<td>Insulated suit (VP)</td>
<td>1</td>
</tr>
<tr>
<td>Approved immersion suit</td>
<td>1</td>
</tr>
<tr>
<td>Thermal underwear (VP)</td>
<td>1 set</td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
<td></td>
</tr>
<tr>
<td>Handwarmers</td>
<td>240 hours</td>
</tr>
<tr>
<td>Sunglasses</td>
<td>1 pair</td>
</tr>
<tr>
<td>Survival candle</td>
<td>1</td>
</tr>
<tr>
<td>Matches</td>
<td>2 boxes</td>
</tr>
<tr>
<td>Whistle</td>
<td>1</td>
</tr>
<tr>
<td>Drinking mug</td>
<td>1</td>
</tr>
<tr>
<td>Penknife</td>
<td>1</td>
</tr>
<tr>
<td>Handbook (Polar Survival)</td>
<td>1</td>
</tr>
<tr>
<td>Carrying bag</td>
<td>1</td>
</tr>
</tbody>
</table>

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.

⁹ VP means “vacuum packed”.
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.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Tents</td>
<td>1 per 6 persons</td>
</tr>
<tr>
<td>Air mattresses</td>
<td>1 per 2 persons</td>
</tr>
<tr>
<td>Sleeping bags (VP)(^{10})</td>
<td>1 per 2 persons</td>
</tr>
<tr>
<td>Stove</td>
<td>1 per tent</td>
</tr>
<tr>
<td>Stove fuel</td>
<td>0.5 litres per person</td>
</tr>
<tr>
<td>Fuel paste</td>
<td>2 tubes per stove</td>
</tr>
<tr>
<td>Matches</td>
<td>2 boxes per tent</td>
</tr>
<tr>
<td>Pan (with sealing lid)</td>
<td>1 per stove</td>
</tr>
<tr>
<td>Fortified health drinks</td>
<td>5 packets per person</td>
</tr>
<tr>
<td>Flashlights</td>
<td>1 per tent</td>
</tr>
<tr>
<td>Candles and holders</td>
<td>5 per tent</td>
</tr>
<tr>
<td>Snow shovel</td>
<td>1 per tent</td>
</tr>
<tr>
<td>Snow saw and snow knife</td>
<td>1 per tent</td>
</tr>
<tr>
<td>Tarpaulin</td>
<td>1 per tent</td>
</tr>
<tr>
<td>Foot protection – Booties</td>
<td>1 per person</td>
</tr>
<tr>
<td>GSK container</td>
<td>1</td>
</tr>
<tr>
<td><strong>Spare personal equipment</strong></td>
<td>(1 set per GSK container, which may be considered as part of the 110% as specified in paragraph 11.2.4)</td>
</tr>
<tr>
<td>Head protection (VP)</td>
<td>1</td>
</tr>
<tr>
<td>Neck and face protection (VP)</td>
<td>1</td>
</tr>
<tr>
<td>Hand protection – Mitts (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Hand protection – Gloves (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Foot protection – Socks (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Foot protection – Boots (VP)</td>
<td>1 pair</td>
</tr>
<tr>
<td>Insulated suit (VP)</td>
<td>1</td>
</tr>
<tr>
<td>Thermal underwear</td>
<td>1 pair</td>
</tr>
<tr>
<td>Handwarmers</td>
<td>1 set</td>
</tr>
<tr>
<td>Sunglasses</td>
<td>1</td>
</tr>
<tr>
<td>Whistle</td>
<td>1</td>
</tr>
<tr>
<td>Drinking mug</td>
<td>1</td>
</tr>
</tbody>
</table>

11.5 Lifeboats

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

\(^{10}\) VP means “vacuum packed”.
11.5.2 All lifeboats carried by Polar Class ships shall be of the fully enclosed type.

11.5.3 Other ships which are equipped with partially enclosed boats should carry tarpaulins or equivalent of sufficient size to provide complete coverage of the lifeboats, and suitable structure to support them.

11.5.4 Any ice accretion shall be regularly removed from the lifeboats and launching equipment to ensure ease of launching when required.

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

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

11.6 Liferafts

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

11.6.2 Any ice accretion shall be regularly removed from the liferafts, cradles and launching equipment to ensure ease of launching and inflation when required.

11.6.3 Ships shall 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.

CHAPTER 12 – NAVIGATIONAL EQUIPMENT

12.1 Application

12.1.1 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 required 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 For operations in polar waters, ships shall be fitted with at least one gyro-compass.

12.2.2 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 of part B.

12.2.3 For operations in polar waters, due consideration shall be given to the need for installation of a satellite compass or alternative means of navigation.
12.3 Speed and distance measurement

12.3.1 All ships shall be fitted with at least two speed and distance measuring devices. Each device shall 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 shall provide each conning position with a speed indication at least once per second.

12.4 Depth sounding device

12.4.1 All Polar Class ships shall be fitted with at least two independent echo-sounding devices which provide indication of the depth of water under the keel. Due account shall 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 shall be fitted with at least two functionally independent radar systems. One of these shall operate in the 3 GHz (10 cm, S-band) frequency range.

12.6 Electronic positioning and electronic chart systems

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

12.6.2 A satellite system (GPS or GLONASS or equivalent) shall 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 shall 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.

12.7 Automatic identification system (AIS)

12.7.1 All ships not required by SOLAS to be provided with an automatic identification system should be provided with an automatic identification system.

12.8 Rudder angle indicator

12.8.1 On Polar Class ships, separate rudder angle indicators shall be provided for each rudder on ships with more than one independently operable rudder.

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 shall be installed to provide, as far as is practicable, all-round illumination suitable for docking, astern manoeuvres or emergency towing.
12.9.3 Polar Class 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 shall be capable of use from any conning position. The flashing light shall 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 shall be at least as specified for stern lights in COLREG.

12.10 Vision enhancement equipment

12.10.1 All Polar Class ships shall 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 shall 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 shall have operating mechanisms protected from freezing or the accumulation of ice that would impair effective operation.

12.10.3 On Polar Class ships, all indicators providing information to the conning positions should be fitted with means of illumination control to ensure readability under all operating conditions.11

12.11 Ice routeing equipment

12.11.1 All ships in polar ice-covered waters shall be provided with equipment capable of receiving ice and weather information charts and receiving and displaying ice imagery.

12.12 Hull Stress Indicator

12.12.1 Ships of Polar Classes 1 to 3 inclusive shall be fitted with hull stress indication which should have continuous deflection readings available at Conning Positions. Such deflections should be presented to immediately alert the person in control of the ship both visually and audibly that structural components of the hull are experiencing stress levels approaching maximum allowable limits.

12.13 Communications

12.13.1 All ships operating in polar waters shall be fitted with communications equipment which is capable of providing reliable communications at all points along the intended operating routes, taking account of the limitations of shore stations and the unique environmental conditions which may affect equipment performance.

12.13.2 All communications equipment, including antennas and connections shall be properly constructed, shock-mounted and secured to withstand ice-transiting motions appropriate to the ship’s intended operations. The equipment shall be protected from severe environmental conditions including icing and temperature variations.

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11 Refer to the Performance standards for the presentation of navigation-related information on shipborne navigational displays, as adopted by resolution MSC.191(79).
12.13.3 Due to the difficulty in satellite communications in high and low latitudes, all ships of Polar Classes 1 to 5 inclusive shall be provided with a MF (300 - 3000 KHz) and an HF (3 - 30 MHz) radio installation.

12.13.4 Ships of Polar Classes 1 to 5 inclusive, all icebreakers, and other ships designed to provide icebreaking escort shall be equipped with a special icebreaking horn mounted to face astern to indicate escort and emergency manoeuvres to following ships as described in the International Code of Signals.

DIVISION 3 – OPERATIONAL

CHAPTER 13 – OPERATIONAL ARRANGEMENTS

13.1 Documentation

13.1.1 All ships operating in polar waters shall carry on board at all times a valid Polar Ship Safety Certificate, a valid Permit to Operate in Polar Waters, a ship operating manual and an Ice Navigator training manual, as appropriate, for all Ice Navigators, as specified in section 13.3.

13.2 Ship operational control

13.2.1 All passenger vessels operating in polar waters shall 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).

13.2.2 The Administration shall issue a Permit to Operate in Polar Waters when it is satisfied that the operator has made adequate provision from the point of view of safety and pollution prevention, and shall revoke the Permits to Operate if such provisions are not maintained to its satisfaction. Specific items to be considered include, but are not limited to:

.1 the suitability of the operating parameters and capabilities of the ship for the intended service;

.2 the arrangements made by the ship for obtaining weather and ice information for the voyage;

.3 the arrangements made by the ship for complying with operational control according to the method adopted by the port State, coastal State or Antarctic Authority as appropriate; and

.4 the adequacy of the crew complement to operate the ship, deploy and crew survival craft, supervise passengers, vehicles and cargo in both normal and emergency conditions as defined in the Permit to Operate. Ice Navigators should be provided as specified in chapter 1.

13.2.3 Ships navigating in polar waters shall make a daily report to the Administration giving the ship's position and its condition. The Administration may direct a ship in these waters to proceed to any place or to take any action as may be justified by ice or weather conditions or by the condition of the ship.
13.2.4 In polar waters where coastal States, port States or Antarctic Authorities exercise rights of control under international law with regard to the high seas, ships shall make a daily report to that State and act according to its direction.

13.3 Emergency response service

13.3.1 Ships operating in [ice-covered] polar waters shall have access to a shore-based computerized emergency response service that will be able to provide advice on action to take, that will mitigate damage.

13.4 Operating and training manuals

Operating manual

13.4.1 The operating manual, or supplementary manual in the case of ships not normally operating in polar waters, shall contain at least the following information on issues directly related to operations in such waters.

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 the Code;

.9 information regarding the handling of the ship as determined in accordance with chapter 16 of the Code (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; and

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

**Training manual**

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

.1 the Code 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 shall be incorporated as annexes to the manual.

13.4.3 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.

13.5 Operating procedures

13.5.1 Training equipment shall be maintained in good condition.

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

13.5.3 The Master shall ensure that before the ship leaves port and at all times during the voyage, all Personal Survival Kits and Group Survival Kits are complete, in working order, and ready for immediate use.

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

13.5.5 On or before departure, passengers shall be instructed in the use of personal protective equipment and the action to be taken in an emergency in the unique environment of polar waters. The attention of the passengers should be drawn to the emergency instructions required by the SOLAS Convention.
CHAPTER 14 – CREWING

14.1 General

14.1.1 All ships operating in polar ice-covered waters shall carry at least one Ice Navigator qualified in accordance with section 14.2.

14.1.2 Continuous monitoring of ice conditions by an Ice Navigator shall be available at all times while the ship is underway and making way in the presence of ice.12

14.1.3 All of the ship’s officers shall 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 level of competence and the training considered necessary in respect of the master and each crewmember shall meet minimum standards, in respect of the particular type and class of ship concerned and the service intended.

14.2 Ice Navigator qualifications and training

14.2.1 The Ice Navigator shall have documentary evidence of having satisfactorily completed an approved training programme in ice navigation.13

14.2.2 Such a training programme, based on competences established by the STCW Code, shall 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; icebreaking operations and effect of ice accretion on vessel stability.

14.2.3 Qualifications of an ice-navigator shall include documentary evidence of having completed on-the-job training, as set out in section 1.5.

14.2.4 The Administration shall issue a Certificate of Ice Watchkeeper to persons with a valid deck certificate who have also completed successfully the required course of study for Ice Navigators. The certificate of competency of these persons shall be endorsed for full accreditation as an Ice Navigator by the Administration on completion of 30 days’ experience as a deck watchkeeper while the ship is underway and making way in the presence of ice, and an additional 20 days in polar ice to obtain the designation of Arctic or Antarctic Ice Navigator.

14.2.5 Endorsements shall be revalidated every five years. Endorsements may be revalidated once the bearer establishes that the person has had 30 days of Ice Navigator experience within the preceding five-year period. The Administration shall establish procedures for revalidation.

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

13 Refer to the model course for Ice Navigation to be developed by the Organization.
CHAPTER 15 – EMERGENCY EQUIPMENT

15.1 Medical equipment

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

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

15.2 Damage control and repair equipment

15.2.1 All icebreakers and ships of Polar Classes 1 to 5 shall 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.

DIVISION 4 – ENVIRONMENTAL PROTECTION

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 shall be included in the ship’s operating manual as described in chapter 13, and those under accident conditions into the Shipboard Oil Pollution Emergency Plan (SOPEP) according to MARPOL. The procedures shall 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 shall be provided for crew members as specified in chapter 13.

16.2 Equipment and materials

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

16.2.2 All ships shall have the capability to contain and clean up minor deck spills and contain minor over side spills. An inventory of such equipment shall be included in the SOPEP, along with directions for safe use and guidelines to assist in determining when such use is warranted. The SOPEP shall 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, shall 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 shall 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 shall 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 shall 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 shall be capable of being securely locked together to prevent inadvertent disconnection.

16.3 Procedures for the protection of the environment under normal operations

16.3.1 Procedures for the protection of the environment under normal operations shall 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.

16.4 Waste systems

16.4.1 Taking into account the shortage or absence, respectively of coastal waste reception facilities in polar waters, all ships should have sufficient and adequate equipment and facilities on board for the processing and storage of waste for the anticipated duration of the voyage.

16.4.2 Where waste processing systems are normally utilized, ships should have adequate redundancy or back-up storage capability to prevent pollution due to the malfunctioning, failure, or substandard performance of such systems.

16.5 Ballast Water Management

16.5.1 Measures set out in the Ballast Water Management Convention shall be carried out before and after entering polar waters.

16.5.2 Measures include:

.1 Deep ocean exchange

.2 Treatment with a treatment system that has been tested and proven effective at the lowest temperature in which the vessel is expected to operate

.3 Retention

.4 Off-loading to shore facilities (where available).
16.6 Hull-fouling

16.6.1 Vessels and offshore installations that have been stationary in polar waters for a period of months shall have hull and sea-chests cleaned *in situ* before moving to a new location.
ANNEX 1

POLAR SHIP SAFETY CERTIFICATE

This Certificate should be supplemented by a Permit to Operate in Polar Waters.

[Official Seal] [State]

Issued under the provisions of the

CODE FOR SHIPS OPERATING IN POLAR WATERS

Resolution MSC XX(YY)

under the authority of the Government of

(full designation of the State)

by …………………………………………………..

(full official designation of the competent person or organization authorized by the State)

Particulars of the ship

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Drafts at which Polar Class is valid

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THIS IS TO CERTIFY:

1. That the above mentioned ship has been duly surveyed in accordance with the applicable provisions of the Code for ships operating in polar waters and is assigned a Polar Class ……

2. That the survey showed that the structure, equipment, fittings, radio station arrangements, and materials of the ship and the condition thereof are in all respects satisfactory and that the ship complies with the relevant provisions of the Code.

3. That the life-saving appliances are [in compliance with the Code] and are provided for a total number of …… Persons and no more as follows: …………………………………………………………………… …………………………………………………………………… …………………………………………………………………… ……………………………………………………………………

This Certificate is valid until…………………..

Issued at …………………………………… on ……………………………………

(Place of issue of Certificate) (Date of issue)

(Signature of authorized official issuing the Certificate)
Endorsement for periodical surveys

This is to certify that, at a survey required by ?? of the Code, this ship was found to comply with the provisions of the Code.

Periodical survey: Signed: …………………………………………………
(Signature of authorized official)
Place: …………………………………………………
Date: …………………………………………………
(Seal or stamp of Issuing Authority, as appropriate)

Periodical survey: Signed: …………………………………………………
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(Signature of authorized official)
Place: …………………………………………………
Date: …………………………………………………
(Seal or stamp of Issuing Authority, as appropriate)

Endorsement to extend the Certificate if valid for less than 5 years

This ship complies with the relevant requirements of the Code and this Certificate should be accepted as valid until ……………………..

Signed: …………………………………………………
Place: …………………………………………………
Date: …………………………………………………
(Seal or stamp of Issuing Authority, as appropriate)
PERMIT TO OPERATE IN POLAR WATERS

Issued under the provisions of the

CODE FOR SHIPS OPERATING IN POLAR WATERS

Resolution MSC XX(YY)

under the authority of the Government of

(full designation of the State)

by ..................................................

(full official designation of the competent person
or organization authorized by the State)

Particulars of the ship

Name of ship ....................................... Port of registry.........................

Distinctive number or letters ............... IMO Number .........................

Date keel laid* .................................

Gross tonnage................................. Deadweight ..........................

Net tonnage ................................. Shaft Power (kW) ..................

Polar Class (if any).............................. Classification Society Designation............

Ship type ........................................ Limiting ambient temperature........º Celsius

THIS IS TO CERTIFY:

That the above-mentioned ship is permitted to navigate in polar waters in the regions:

....................................................................................................................

....................................................................................................................

within the polar waters comprising the territorial waters and EEZs of the following Port/Coastal States or Antarctic Treaty Protocol:

....................................................................................................................

....................................................................................................................

This permit is valid until..................

(Date)

This permission is granted subject to the condition that the above mentioned ship will abide by the navigational control established by the Port/Coastal States or the Antarctic Treaty Protocol as named above for the particular regions to be navigated by the ship and subject to the restrictions, conditions and limitations of operation included overleaf and on the attached annexes. The permission is issued following consultation with the Administrations of the Port/Coastal State or Antarctic Treaty Protocol listed overleaf.

Issued at ............................................. on .............................................

(Place of issue of Certificate)  (Date of issue)

(Signature of authorized official issuing the Certificate)
Conditions of operation

………………………………………………
(Port/Coastal State or Antarctic Treaty Protocol)
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(Reference document/Correspondence) (Date)
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PART B – RECOMMENDATORY MEASURES

CHAPTER 1 – GENERAL

1.1 Nothing in this part of the Code should be read or interpreted in conflict with any of the provisions of part A of this Code and that the aforesaid provisions always prevail and override any unintended inconsistency which may have been inadvertently expressed in this part of the Code. The guidance provided in this part of the Code should always be read, interpreted and applied in a manner which is consistent with the aims, objectives, principles, and definitions established in the Preamble, Introduction and part A of this Code.

1.2 The purpose of this part is to provide guidance in the application of part A of this Code and recommendatory provisions based on the precautionary approach.

DIVISION 1 – CONSTRUCTION PROVISIONS

CHAPTER 2 – STRUCTURES

CHAPTER 3 – STABILITY AND SUB-DIVISION

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 operating in ice-covered waters 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 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 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 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.

5.2 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

6.1.1 All Polar Class ships shall 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 Towing arrangements

6.2.1 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.

6.3 Emergency towing arrangements

6.3.1 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.

CHAPTER 7 – MAIN MACHINERY

7.1 General

7.1.1 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.

7.1.2 The layout and construction of machinery essential for the safe operation of the ship should be such that repairs which can be effected 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.

14 Refer to the Guidelines for owners/operators on preparing emergency towing procedures (MSC.1/Circ.1255).
7.1.3 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.

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. Overdimensioning and/or redundancy should be considered.

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

CHAPTER 9 – ELECTRICAL INSTALLATIONS

9.1 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.

9.2 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.\(^{15}\)

DIVISION 2 – EQUIPMENT

CHAPTER 10 – FIRE SAFETY

10.1 Fuel and other flammable fluid tanks and systems

10.1.1 Refuelling of ships should be carried out taking into account the special conditions imposed by low temperatures and ice conditions.\(^{16}\)

10.2 Ventilation

10.2.1 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.

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\(^{15}\) Such equipment should be approved in accordance with relevant international standards.

10.3 Fire pumps and associated equipment

10.3.1 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.

10.3.2 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.

10.3.3 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.

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

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

10.4 Firefighters’ outfits

10.4.1 The Administration may require additional sets of low temperature personal equipment and breathing apparatus, having due regard to the size and type of the ship and the nature of the operations. Where more than one fireman’s outfit is carried, additional outfits should be stored in widely separated positions.

10.4.2 The fireman’s outfit should possess the following features:

.1 Protective clothing should be of a water resistant material with an air permeable moisture barrier.

.2 The clothing should remain pliable and protect the wearer from exposure to low temperatures and wind chill.

.3 Boots should be waterproof, fitted with toe protector caps and slip resistant soles, and remain pliable and protect the wearer from exposure to low temperatures and wind chill.

.4 The rigid helmet should be fitted with a detachable head covering that protects all parts of the head from exposure to low temperatures and wind chill.

.5 Safety lamps (hand lanterns) should meet the requirements of the SOLAS Convention at low temperatures.

.6 A breathing apparatus of an approved type suitable for use at low temperatures as specified in annex 1 to part B.
CHAPTER 11 – LIFE-SAVING APPLIANCES AND SURVIVAL ARRANGEMENTS

11.1 General

11.1.1 Containers for personal or group survival kits required pursuant to chapter 11 of part A 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.

11.1.2 Guidance on the suitability of items for inclusion in personal or group survival kits is provided in annex 2 to this part – Life-saving Appliances and Survival Equipment.

11.2 Lifeboats

11.2.1 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.

11.2.2 An icing removal mallet, or other effective means of ice removal, should be available in the vicinity of the lifeboats.

11.2.3 All lifeboat engines should be tested to at least -30°C.

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

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

11.3 Liferafts

11.3.1 An icing removal mallet, or other effective means of ice removal, should be available in the vicinity of the liferafts.

11.3.2 Air or other proven cold temperature gas should be used for the inflation of life-saving equipment at ambient temperatures to at least -30°C.

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

11.4 Protection from wildlife

Consideration should be given to protection from wildlife in areas where encounters are likely.
CHAPTER 12 – NAVIGATIONAL EQUIPMENT

12.1 Application

12.1.1 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.

12.3 Speed and distance measurement

12.3.1 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

12.4.1 All ships shall be fitted with at least two independent echo-sounding devices which provide indication of the depth of water under the keel. Due account shall 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 Radar plotting systems that may be installed should have the capability of operating in both the sea and the ground stabilized mode.

12.5.2 All radar installations should be fitted with daylight radar screens.

12.6 Electronic positioning and electronic chart systems

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

12.7 Automatic identification system (AIS)

12.8 Rudder angle indicator

12.8.1 Where not required by part A of this Code, 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 The searchlights described in paragraph 12.9.1 of part A should be fitted with an adequate means of de-icing to ensure proper directional movement.

12.9.2 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.\(^\text{17}\)

12.11  Ice routeing equipment

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

12.12  Navigation and communications equipment

12.12.1 Navigation and communications equipment shall be suitable to provide adequate performance in high latitudes, areas with limited infrastructure and unique information transfer requirements.

12.13  Communications

12.13.1 All ships should ensure that they have an adequate means of de-icing and melting snow that could effect proper operation of sound signalling apparatus as required by COLREG.

\(^{17}\) Refer to the Performance standards for the presentation of navigation-related information on shipborne navigational displays, as adopted by resolution MSC.191(79).
DIVISION 3 – OPERATIONAL

CHAPTER 13 – OPERATIONAL ARRANGEMENTS

13.1 Operating and training manuals

13.1.1 With respect to contingency planning in the event that the ship suffers ice damage, the manual should conform to guidelines developed by the Organization.18

13.1.2 The operating manual should contain 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.

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.

13.3 Drills and emergency instructions

13.3.1 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 Evacuation drills

13.4.1 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 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.

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18 Refer to the Guidelines for the structure of an integrated system of contingency planning for shipboard emergencies, adopted by resolution A.852(20).
13.4.3 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;\(^\text{19}\) 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.

13.5 Rescue boat drills

13.5.1 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.

13.5.2 As far as is reasonable and practicable, rescue boats should be launched each month as part of the evacuation drill with their assigned crew aboard and manoeuvred in the water, with due consideration of the dangers of launching into polar waters if applicable.

13.5.3 If rescue boat launching drills are carried out with the ship making headway, such drills should be practised in sheltered waters only and under the supervision of an officer experienced in such drills.\(^\text{20}\)

13.6 Fire drills

13.6.1 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.

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

13.7 Damage control

13.7.1 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.

13.8 Survival kits

13.8.1 To keep training equipment 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.

\(^{19}\) Refer to the Guide to cold water survival (MSC.1/Circ.1185).

\(^{20}\) Reference is made to resolution A.624(15) concerning guidelines in training for the purpose of launching lifeboats and rescue boats for ships making headway through the water.
CHAPTER 14 – CREWING

14.1 General

14.1.1 The crewing of all ships in polar waters should take account of the specific requirements listed in this chapter and in chapters 1 and 14 of part A, and also of the relative lack of shore and support infrastructure which may be available to assist in any operations.

14.1.2 All ships operating in polar waters not required by part A to carry at least one Ice Navigator qualified in accordance with part A – chapter 14, section 14.2 should consider carrying an Ice Navigator when planning voyages into polar waters.

14.1.3 All of the ship’s 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.

CHAPTER 15 – EMERGENCY EQUIPMENT

15.1 Reserve supplies

15.1.1 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 Damage control and repair equipment

15.2.1 Single screw ships should specially consider measures (e.g., redundancy) if intending to voyage in ice-covered waters where conditions impose a risk of damage to machinery components.

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

DIVISION 4 – ENVIRONMENTAL PROTECTION

CHAPTER 16 – ENVIRONMENTAL PROTECTION AND DAMAGE CONTROL

16.1 Equipment and materials

16.1.1 Hoses and flexible pipes should be manufactured out of materials retaining adequate strength and elasticity characteristics at the minimum anticipated operating temperature.
ANNEX 1 to PART B

BREATHING APPARATUS

It is recommended that additional self-contained breathing apparatus such as required by chapter 14 of the International Codes for carrying Dangerous Cargoes in Bulk and Liquefied Gases in Bulk, for personnel protection, should also comply with the low temperatures recommendations outlined for Fireman’s equipment described in 10.4 of part B where necessary for ships operating in polar waters.

Any special air compressor providing means to recharge fixed and portable breathing apparatus air bottles should provide suitable high pressure air of the required purity and minimum moisture content.

A low pressure line system with hose connection for use with breathing apparatus, including pressure reduction devices and mean to recharge fixed air bottles and breathing apparatus air bottles should be adequately protected from malfunction due to low operational temperatures to which the ship could be subjected.

Emergency escape respiratory protection should not be used for fire fighting or cargo handling purposes and should be marked to that effect, and should be suitable for use in sub-zero conditions as required.
ANNEX 2 TO PART B

LIFE-SAVING APPLIANCES AND SURVIVAL EQUIPMENT

Summer Season Requirements

1 The following items are considered to be life-saving appliances and as such the quality of workmanship and construction should be to the highest standards Manufacturers may propose alternate designs provided they demonstrate equivalent capabilities.

2 Head protection

A touque or alternate should be supplied to provide protection for the head. Good insulating properties and speed of drying are important design criteria. The material used should be a natural fibre or suitable synthetic fibre material. It should be of sufficient length to be rolled down over the ears and face.

3 Neck and face protection

A scarf should be supplied to provide protection for the neck and face. The scarf should be approximately 1.8 metres in length and 15 cm in width. A neck warmer may be considered as an alternative. Good insulating properties and speed of drying are important design criteria. The material used should be a natural fibre or suitable synthetic fibre.

4 Hand protection

Gloves should be supplied in a range of sizes to provide protection for the hands when dexterity is required. The most important feature of the design is ease of manipulation of the fingers. The glove wrist should extend up at least one third of the forearm length. Although insulation and waterproofing are desired features, they are secondary of importance. The material used should be a natural fibre or suitable synthetic fibre material.

5 Foot protection

Heavyweight socks should be provided in a range of sizes. These socks should be made of natural fibres (such as wool or silk) or synthetic fibres or some blend of natural and synthetic fibres. The socks should extend up at least to mid-calf.

6 Insulated suit

6.1 Pants should be supplied to provide adequate insulation in cold temperatures. An approximate insulation thickness of 1 cm is considered to be acceptable. These pants should incorporate the following features:

- Two large thigh pockets (about 17 cm wide and 22 cm deep) should be provided and should have large Velcro fastened flaps.

- Ankle cuffs should be provided and reinforced for heavy wear with leather trim. The ankles should be snug fitting to the footwear worn underneath using an adjustable elastic or drawstring arrangement.
.2 Reflective tape should be sewn onto the pant leg seam to ensure a high degree of visibility.

A snug fitting waistband should be fitted with an adjustable elastic or drawstring arrangement and suspenders or be of the Farmer John style.

6.2 A parka should be supplied to provide adequate insulation in cold temperatures. An approximate insulation thickness of 1 cm is considered to be acceptable. These parkas should incorporate the following features:

.1 A fur hood should be fitted and extend 15 cm in front of the face. The hood should be fastened by Velcro along the underside of the tunnel.

.2 Breast and side pockets should be provided, with large covering flaps, Velcro fastening and double stitched for increased wear resistance.

.3 Wrist cuffs should be fitted and snug fitting to the arm; the cuffs should be elasticized or include a drawstring.

.4 Reflective tape should be sewn onto the arms and back of the parka to ensure a high degree of visibility.

.5 The parka should have an adjustable drawstring in the waistband.

6.3 Alternate designs of insulated suits may be considered provided they incorporate the important features described above.

6.4 Eiderdown offers the greatest degree of thermal insulation per unit weight and is the most compressible of suitable insulating materials (easily vacuum packed). The outer shell should be both wind and water resistant and orange in colour.

7 Survival candle

A beeswax candle should be provided which should feature minimum bulk, no toxic emissions when burning and maximum light and heat output. The candle should include a set of cooking brackets, which clip onto the rim of the candle housing.

8 Matches

Boxes of waterproof matches containing a minimum of 50 matches should be provided. Each box should be sealed in a waterproof wrapping. The matches should be of the windproof type with large heads.

9 Pen knife

A two-blade pen knife should be provided.

10 Survival handbook

A survival handbook should be provided, sealed in a waterproof wrapping.
11 Personal survival kit carrying bag

A Personal Survival Kit Carrying Bag should be provided, designed to contain all items of equipment for the designated Personal Survival Kit. The Carrying Bag design should incorporate grab handles, a shoulder strap and a zip closure. The material of construction should be water resistant/repellent, easily pliable and extremely durable (double stitching of seams). The bag should be orange in colour and have reflective tape sewn in to ensure a high degree of visibility from all angles. The Personal Survival Kit contents and their size should be clearly stencilled on the Carrying Bag; lettering to be a minimum of 12.5 mm in height.

Unlimited Season Requirements

The following items are considered to be life-saving appliances and as such the quality of workmanship and construction should be to the highest standards. Manufacturers may propose alternate designed provided they demonstrate equivalent capabilities.

12 Head protection

A touque or alternate should be supplied protection for the head. Good insulating properties and speed of drying are important design criteria. The material used should be a natural fibre or suitable synthetic fibre material. It should be of sufficient length to be rolled down over the ears and face.

13 Neck and face protection

A scarf should be supplied to provide protection for the neck and face. The scarf should be approximately 1.8 metres in length and 15 cm in width. A neck warmer may be considered as an alternative. Good insulating properties and speed of drying are important design criteria. The material used should be a natural fibre or suitable synthetic fibre.

14 Hand protection – mitts

Mitts should be supplied in a range of sizes to provide adequate hand insulation for extreme cold air temperatures. These mitts should be of the gauntlet style, the outer shell should be durable and water repellent (such as nylon), the inner shell should be of a natural fibre or synthetic blend. The Preferred design features:

14.1 The backhand of the mitt outer shell should incorporate a wool pad (lambs wool or synthetic equivalent).

14.2 The palm of the mitt outer shell should be durable yet pliable; soft leather (horsehide or pigskin) is recommended but an equivalent synthetic material will be acceptable.

14.3 The wrist cuff should be fitted with means to make a snug fit around the wrist; an adjustable elastic or drawstring arrangement is recommended.

14.4 A nylon cord should be provided and used to connect the mitts together by their cuff-loops. The cord must be long enough to be threaded up one sleeve, across the shoulders and down the other sleeve to prevent loss of the mitts when they are removed to use the bare or gloved hands.
15 **Hand protection – gloves**

Gloves should be supplied in a range of sizes to provide protection for the hands when dexterity is required. The most important feature of the design is ease of manipulation of the fingers. The gloves wrist should extend up at least one third of the forearm length. Although insulation and waterproofing are desired features, they are of secondary importance. The material used should be a natural fibre or suitable synthetic fibre material.

16 **Foot protection – socks**

Heavyweight socks should be provided in a range of sizes. These socks should be made of natural fibres (such as wool or silk) or synthetic fibres or some blend of natural and synthetic fibres. The socks should extend at least up to the mid-calf height.

17 **Foot protection – boots**

Insulated boots should be supplied to provide protection for the feet. The design should be suitable for use in the extreme cold air temperatures and should be comprised of: the boot, felt and plastic inserts (to raise the feet off the ground) and a felt sock or liner.

18 **Insulated suit**

18.1 Pants should be supplied to provide adequate insulation in cold temperatures. An approximate insulation thickness of 3 cm is considered to be acceptable. The outer shell should be both wind and water resistant and orange in colour. These pants should incorporate the following features:

.1 Two large thigh pockets (about 17 cm wide and 22 cm deep) should be provided and should have large Velcro fastened flaps.

.2 Ankle cuffs should be provided and the ankles should be snug fitting to the footwear worn underneath using an adjustable or drawstring arrangement.

.3 Reflective tape should be sewn onto the pant leg seam to ensure a high degree of visibility.

.4 A snug fitting waistband should be fitted with an adjustable elastic or drawstring arrangement and suspenders or be of the Farmer John style.

18.2 A parka should be supplied to provide adequate insulation in cold temperatures. An approximate insulation thickness of 3 cm is considered to be acceptable. These parkas should incorporate the following features:

.1 A hold should be fitted and extend at least 15 cm in front of the face. The hood should be fastened by Velcro along the underside of the tunnel.

.2 Breast and side pockets should be provided, with large covering flaps, Velcro fastening.

.3 Wrist cuffs should be fitted and should be elasticized or include a drawstring.
4. Reflective tape should be sewn onto the arms and back of the parka to ensure a high degree of visibility.

5. The parka should have an adjustable drawstring in the waistband.

18.3 Alternate designs of insulated suits may be considered provided they incorporate the important features described above.

18.4 Eiderdown offers the greatest degree of thermal insulation per unit weight and is the most compressible of suitable insulating materials (easily vacuum packed). The outer shell should be both wind and water resistant and, preferably, orange in colour.

19 Thermal underwear

Thermal underwear should be supplied to provide thermal protection for the body. The underwear should be of the two-piece design consisting of pants (long johns) and shirt (long-sleeved turtle neck). The underwear should be of natural fibre, a suitable synthetic fibre material or a blend.

20 Handwarmers

A 240-hour supply of chemically activated hand warmers should be supplied. The individual packets should be of a size suitable for placing inside a mitt or inside boots.

21 Sunglasses

A pair of polarized sunglasses should be provided to protect against snow-blindness. The glasses should be equipped with a neck cord to prevent loss or damage.

22 Survival candle

A beeswax candle should be provided featuring minimum bulk, no toxic emissions when burning and maximum light and heat output. The candle should include a set of cooking brackets which clip onto the rim of the candle housing.

23 Matches

Boxes of waterproof matches containing a minimum of 50 matches should be provided. Each box should be sealed in a waterproof wrapping. The matches should be of the windproof type with large heads.

24 Whistle

A plastic, pea-less whistle should be provided. The whistle should have a string to facilitate attachment to the parka.

25 Drinking mug

A wide-based drinking mug should be provided. The mug should be durable, made of aluminium or some other material suitable for the application of direct heat from a candle and be
able to withstand the thermal shock of instantaneous temperature variance between boiling liquids (100°C) and cold ambient temperatures of down to -45°C. The mug should be provided with a hinged lid to retain heat.

26 Pen knife

A two-blade pen knife should be provided.

27 Survival handbook

A survival handbook should be provided, sealed in a waterproof wrapping.

28 Personal survival kit carrying bag

A Personal Survival Kit Carrying Bag should be provided, designed to contain all items of equipment for the designated Personal Survival Kit. The Carrying Bag design should incorporate grab handles, a shoulder strap and a zip closure. The material of construction should be water resistant/repellent, easily pliable and extremely durable (double stitching of seams). The bag should be orange in colour and have reflective tape sewn in to ensure a high degree of visibility from all angles. The Personal Survival Kit contents and their size should be clearly stencilled on the Carrying Bag; lettering to be a minimum of 12.5 mm in height. The individual contents of the carrying bag should be placed in two separately tied plastic bags to seal them against any potential water damage.

29 Tents

Tents should be provided. Six-person free-standing tents are preferred. There should be a zippered entrance flap at one end. The zipper should be made of plastic or Teflon; alternately, Velcro strips or ties may be used.

30 Air mattresses

Air mattresses should be supplied to maintain an air cushion between a person and the floor of the tent or liferaft. The mattresses should be self-inflating and be capable of being topped-up by mouth. The mattresses should have a minimum thickness of 3.5 cm. The construction material should be suitable for use in extreme cold air temperatures.

31 Sleeping bags

Sleeping bags should be supplied to provide adequate insulation to protect the body in extremely cold conditions. This corresponds to an insulation thickness of approximately 7.5 cm. Weight, volume, durability and the ability to cope with a range of air temperatures are the important design features. One style of sleeping bag that has proven to be effective is described below:

31.1 A main bag which provides the insulation value, although this can be achieved with a single or multiple bags. Each bag should have a full length zipper of plastic or Teflon. The zipper arrangement should be such that multiple bags may be joined together to form a double occupancy sleeping bag. Bags should be fitted with hanging loops at the foot to facilitate drying.
31.2 An insulated hood should be provided to protect the head. If these hoods are separate components, they should be collared to make an airtight connection with the main bag at the neck. Hoods may also be incorporated as an integral part of the main bag.

31.3 Other designs may be considered if they can be demonstrated to provide an equivalent level of protection.

32 Stove

Stoves capable of operation in extreme cold air temperatures should be supplied. The stove should be stable, compact and lightweight and should preferably include the following features:

i) single burner;
ii) pre-heat loop;
iii) pan supports;
iv) wind screen (aluminium or equivalent);
v) heat reflector (of durable aluminium or equivalent);
vii) fuel bottles (heavy duty aluminium or equivalent);
vii) maintenance kit with parts and tools for repair of the stove; and
viii) stove support pad.

33 Stove fuel

Fuel should be sealed in fuel containers suitable for easy refuelling while wearing gloves. The fuel should be changed annually at the start of each polar shipping season.

34 Fuel paste

Fuel paste should be provided for use in pre-heating the stove burner pan and fuel pre-heat loop before lighting the kerosene fuel. The shelf life of the paste should be checked annually.

35 Pan with sealing lid

A pan should be provided for use with the stove. The pan capacity should be 1 litre and it should have a sealing lid. The pan handle should be non-metallic, or metallic with a non-metallic sheath. The pan should be constructed of a material with excellent heat transfer properties (for example, copper and aluminium transfer heat more efficiently than cast iron).

36 Fortified health drinks

Powdered, fortified health drinks should be provided. The drink mixes should contain vitamin and energy additives.

37 Flashlights

Flashlights should be provided. The flashlights should be constructed of material suitable for operation at air temperatures down to -45°C and should be provided with batteries suitable for long life at low temperatures. The batteries should be date-marked along with the recommended maximum storage life.
38 Candles and holders

Candles should be provided. These candles should be of the long burning variety and should be as compact as possible. Important design features are minimum bulk, no toxic emissions when burning and maximum light and heat output; 100% beeswax is preferred. Holders should be provided for the candles.

39 Snow shovels

Four folding snow shovels should be provided.

40 Snow saw and snow knife

A snow saw and knife should be provided. The saw and knife blades should be at least 60 cm in length.

41 Tarpaulin

A tarpaulin should be provided. The tarpaulin should be at least four metres square and made from a waterproof material.

42 Rifle or shotgun

A rifle or shotgun should be provided for protection against polar bears where appropriate. For the experienced user a short barreled, 12-gauge pump shotgun is recommended. There should be 50 rounds of ammunition with the weapon. The ammunition should be in a waterproof case with a date of purchase marked on it. The weapon should have its own waterproof case and be properly stored. It should be coated with oil or other suitable preservatives so as to be in good condition when needed. The weapon should not need to be cleaned before use.

43 Foot protection – bootees

Insulated bootees should be supplied in a range of sizes to provide protection for the feet in extreme cold air temperatures. The bootees should be light, compressible and of a one-component design. Bootees are essentially heavily insulated socks with a durable sole, which provide a lightweight alternative to insulated boots. Insulation may be either eiderdown or a synthetic material. The bootee sole should be waterproof and include some tread to improve traction on ice. The bootee upper material should be water resistant.

44 Container

The equipment should be assembled in containers, which can be easily handled by two persons. The containers could be of the liferaft container type, coloured orange and be designed in two halves with snap closures and a watertight seal. Other types of containers and sleds are acceptable if they have the same features.

44.1 The container and size of the containers should depend upon the number of crew and passengers and the resultant volume of equipment.
44.2 The size of container, in general, should not exceed the size of a 20-person liferaft container so that it may be easily handled. Experience has shown that such a container may be pulled or otherwise moved over the ice to some safe distance from the ship.

44.3 There should be at least one container on each side of the ship, each with capacity for 55% of the persons on board. There should be an equal number of containers on each side of the ship.

44.4 A list of the group survival kit contents should be clearly stencilled on the container; the lettering a minimum of 12.5 mm in height.