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Ships and marine technology — Personal and group survival kit for use in polar water

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommittee SC 1, *Maritime safety*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document contains detailed specifications for various items of survival equipment carried in personal survival kits (PSK) and group survival kits (GSK) in compliance with the International Code for Ships Operating in Polar Waters (Polar Code) of the International Maritime Organization (IMO).

Under the Polar Code, the ship owner or operator must conduct a risk assessment to decide or adjust the number of kits (PSK and/or GSK) required and equipment carried in the kits for a vessel operating in polar water.

This document provides a minimum requirement for PSK and GSK as per new research available in the marine industry. It is intended to supplement the IMO requirements for lifesaving appliances used in polar waters [4]. This document aims to provide information on how to: increase the chances of survival for all persons in polar waters, reduce the duration of the search phase to minimize exposure time, and increase the ability of a person to self-rescue.

This document is based on the assumption that thermal equilibrium is maintained only by insulation. Active heating may be considered as an alternative design, provided it is serviced and maintained, to ensure its reliability, at the same interval of the survival craft that contains them (see References [5], [6] and [7]) and provided that it is capable of operating continuously for the maximum expected time of rescue (as of IMO MSC.1/Circ.1614, section 4.4)[4]. For cases where alternative designs are used, the thermal resistance formula in 4.3 can be modified since it is based solely on a passive system. While the section on group survival kit does discuss shelters, this document distinguishes between using a survival craft as a shelter and the use of other temporary shelters. It is recognized that when a survival craft is used as a shelter, it is not expected to comply with the requirements found within 6.1.6 to 6.1.9 of this document. In addition, extra consideration is given to ensure it can be properly anchored on snow/ice/land.

Ships and marine technology — Personal and group survival kit for use in polar water

1 Scope

This document specifies design, performance and use of items of survival equipment, as part of a personal survival kit (PSK) and a group survival kit (GSK) that are required by the 1974 International Convention of the Safety of Life at Sea (1974 SOLAS) as amended, in particular chapter XIV (MSC. 386(94)) and the International Code for Ships Operating in Polar Waters (Polar Code - MSC.385 (94) and MEPC.264(68), as amended).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/NEMA FL 1, *Electric torch basic performance document*

ASTM D4772*Standard Test Method for Surface Water Absorption of Terry Fabrics (Water Flow)*

ASTM F659-10, *Standard Specification for Ski and Snowboard Goggles*

ASTM F3340-18, *Standard Test Method for Thermal Resistance of Camping Mattresses Using a Guarded Hot Plate Apparatus*

DIN EN 511, *Protective gloves against cold*

NSF/ANSI 173, *Dietary Supplements*

International Life-Saving Appliance Code (LSA Code), adopted by IMO Resolution MSC.48(66), as amended

IMO MSC 1/Circ. 1614:2019, *Interim guidelines on life-saving appliances and arrangements for ships operating in polar waters*

IMO MSC 81 (70), *Revised recommendation on testing of life-saving appliances*

ISO 12402-8, *Personal flotation devices — Part 8: Accessories — Safety requirements and test methods*

ISO 15831, *Clothing — Physiological effects — Measurement of thermal insulation by means of a thermal manikin*

ISO 18813, *Ships and marine technology — Survival equipment for survival craft and rescue boats*

ISO 20877, *Footwear — Test methods for whole shoe — Thermal insulation*

ISO 23537-1:2022, *Requirements for sleeping bags — Part 1: Thermal and dimensional requirements*

ISO 24444:2019, *Cosmetics — Sun protection test methods — In vivo determination of the sun protection factor (SPF)*

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
clo
relative measure of the ability of insulation to provide warmth

Note 1 to entry: One clo is defined as the amount of clothing required by a resting (sedentary) person to be indefinitely comfortable at ambient conditions where temperature is 21 °C (70 °F), relative humidity is less than 50 per cent, and wind velocity is 250 centimetres per second or about 0,9 kilometres per hour (about 20 feet per minute or just over half a mile per hour). Lowest clo value (0) is that of a nude person, highest practical clo value (4) is that of clothing ensembles made from the fur of animals (fur pants, coat, hood, gloves, etc.). Winter clothing (weighing about 3 kg or 6,6 pounds) has an average clo value of 1, and summer clothing (weighing about 1,8 kg or 3,90 pounds) of 0,6.

3.1.2
group survival kit
GSK
equipment to assist in the survival of the group

3.1.3
habitable environment
ventilated environment that will protect against hypothermia

3.1.4
maximum expected time of rescue
maximum ETR
time adopted for the design of equipment and system that provide survival support for all persons after abandonment and for the maximum expected time of rescue

Note 1 to entry: Maximum ETR shall never be less than five (5) days (PC Part 1A, Paragraph 1.2.7).

3.1.5
mean daily low temperature
MDLT
mean value of the daily low temperature for each day of the year over a minimum 10-year period

Note 1 to entry: A data set acceptable to the Administration may be used if 10 years of data are not available. The average MDLTs at 13 areas of the Antarctic and Arctic areas are illustrated as examples based on data from NASA and NOAA, found in document SDC 1/INF.12 (Canada) or the ABS *Guide for Vessels Operating in Low Temperature Environments,* Appendix 10.

3.1.6
personal survival kit
PSK
equipment for survival of an individual

3.1.7
polar service temperature
PST
temperature specified for a ship which is intended to operate in low air temperature

Note 1 to entry: This temperature shall be set at least 10 °C below the lowest MDLT for the intended area and season of operation in polar waters

3.2 Abbreviated terms

ABS	American Bureau of Shipping
AIS-SART	automatic identification system-search and rescue transponder
ETR	expected time of rescue
IMO	International Maritime Organization
ISM Code	International Safety Management Code
LSA Code	The International Life-Saving Appliance Code
OA	operational assessment
Polar Code	International Code for Ships Operating in Polar Waters (IMO Polar Code)
PWOM	Polar Water Operational Manual
SOLAS	International Convention for the Safety of Life at Sea, 1974, as amended
WIG	water, ice or ground
EPIRB	emergency position indicating radio beacon
VHF Radio	very high frequency radio
GMDSS	Global Maritime Distress and Safety System
SART	search and rescue transponder

4 Design and performance requirements

4.1 General

The operational assessment (OA) and the Polar Water Operational Manual (PWOM) are intended to address all aspects of operations, including the possible abandonment scenario(s) the vessel may face following a review of the intended route within polar regions, seasons of operation, and ice conditions. Following the review and assessment of all of the risks the vessel may encounter, mitigation measures should be developed to address those safety risks.

This document reflects the possible risks that may be found while sailing in polar waters and recommends polar kits to enhance personal and group survival, depending on the abandonment scenario while sailing in cold or ice infested waters or possible abandonment to land or ice. This document uses industry best practice and expertise in survival in cold climates.

All new equipment carried on vessels sailing in polar waters should be tested and approved to the intended operational temperature, understanding that currently IMO does not expand on testing requirements for polar gear.

Figure 1 is designed to help vessel owners/operators choose the most appropriate GSK and PSK to enhance the likelihood of survival for their crew and passengers, depending on the identified hazards and abandonment scenarios.

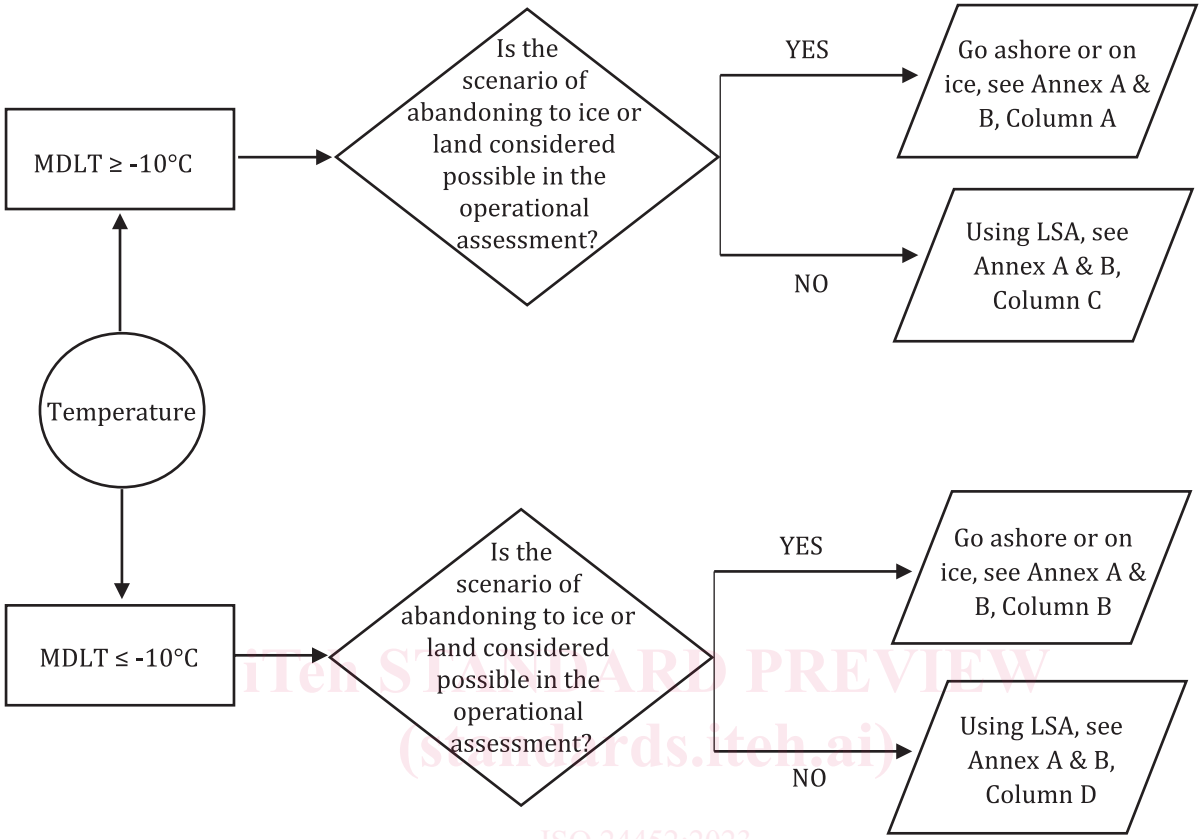

Figure 1 — How to choose the survival kit

4.2 Rationale

Survival following a ship abandonment in polar regions is generally accepted to be more challenging than survival in typical maritime situations. This is due to two main factors – harsher environmental conditions and remoteness, both of which can result in an extended survival period as survivors await rescue. With this in mind, this document offers guidance for personal and group survival equipment which is necessary to help ensure the success of an extended survival period in polar regions.

There are two anticipated stages to survival:

1) initial stage involving setting up for survival where individuals are expected to be active;

2) extended survival stage where it is anticipated that individuals attempt to conserve energy by sitting/sleeping, interspersed with periods of activity.

Equipment used in PSK and GSK shall be capable of operating reliably in the expected environmental conditions and for the expected survival period.

The total system thermal resistance values given in 4.3 are in relation to a stationary (sitting) person at rest who is not sleeping. Sleeping is assumed to be done in the sleeping bags/blankets provided in the GSK. The total system thermal insulation shall include all aspects of the protective clothing as well as the provided shelter, but shelter heating or personal heating packs are not to be considered.

4.3 Goal

The goal of this document is to provide information on the content of PSK and GSK to increase the chances of survival for all persons in polar regions and increase the probability of being found. Of particular importance is the survival microclimate where the amount of heat loss from a stationary person is compensable (approximately 55 $W \cdot m^{-2}$-65 $W \cdot m^{-2}$) without excessive shivering. This can be achieved through either ensuring that the person is wearing an adequate amount of protective clothing to provide insulation sufficient to achieve this level of compensable heat loss, or by creating a microclimate (such as the inside of a temporary shelter) where the ambient air temperature is greater than the external environment, thus reducing the need for wearing extra insulation. The only heat source to be considered is the occupants of the shelter, as explained in the introduction of this document.

Practically, the goal of achieving a compensable level of heat loss is accomplished by increasing the amount of insulation worn by a person while simultaneously creating a microclimate with an air temperature greater than what is outside the temporary shelter. The warmer the air temperature a person is in, the less clothing insulation required to ensure their heat loss remains at a compensable level.

The minimum overall total system thermal resistance (all equipment in PSK plus GSK/LSA without the sleeping bags/blankets) shall not be less than 0,756 $m^2K \cdot W^{-1}$ (4,88 clo) where the MDLT ≥ −10 °C or in accordance with the following Formula (1) for vessels with a PST.

$$R_{th} = (-0{,}073 \cdot T_{PS} + 3{,}42) \cdot 0{,}155 \qquad (1)$$

where

R_{th} is the thermal resistance ($m^2K \cdot W^{-1}$);

T_{PS} is the polar service temperature (°C).

If thermal resistance values are above 0,779 (equivalent to ~ 5 clo), the lifesaving appliances seating or the space in the shelter is to be considered and adjusted as necessary.

Table 1 — Minimum overall total system thermal resistance to achieve compensable heat loss for a given polar service temperature

Polar service temperature °C	Total system thermal resistance $m^2K \cdot W^{-1}$	clo value clo
−20	0,756	4,89
−30	0,870	5,03
−40	0,982	6,34
−50	1,096	7,07

The complete list of personal and group survival equipment can be found in Annex A and B, following the considerations in Clauses 5 and 6 of this document.

5 Personal survival kits

5.1 General

If Table A.1 specifies “require” for the corresponding equipment described below, the equipment is required. If “recommend” is indicated, the equipment is recommended guidance. If "-" is stated, this equipment does not apply to the vessel and its intended operation.

The entire contents of the PSK inside the carrier bag shall weigh less than 30 % of a person’s weight (82,5 kg in the LSA Code) when fully packed (not including immersion / anti-exposure suit).

