

INTERNATIONAL
STANDARD

ISO
24452

First edition
2023-02

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

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Reference number
ISO 24452:2023(E)

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Published in Switzerland

Contents

	Page
Foreword.....	v
Introduction.....	vi
1 Scope.....	1
2 Normative references.....	1
3 Terms, definitions, and abbreviated terms.....	2
3.1 Terms and definitions.....	2
3.2 Abbreviated terms.....	3
4 Design and performance requirements.....	3
4.1 General.....	3
4.2 Rationale.....	4
4.3 Goal.....	5
5 Personal survival kits.....	5
5.1 General.....	5
5.2 Protective clothing: hat, gloves, socks, face and neck protection.....	6
5.3 Skin protection cream.....	6
5.4 Thermal protective aid.....	6
5.5 Eye protection: goggles.....	6
5.6 Whistle.....	7
5.7 Drinking mug.....	7
5.8 Multi-tool.....	7
5.9 Polar survival guidance.....	7
5.10 Emergency food and water.....	8
5.11 Carrier bag.....	9
5.12 Immersion suits (extra).....	9
5.13 Heating packs (extra).....	9
5.14 Towels (extra).....	10
6 Group survival kits.....	10
6.1 Shelter.....	10
6.1.1 General.....	10
6.1.2 Lifeboats and liferafts.....	10
6.1.3 Protection from environment.....	10
6.1.4 Thermal protection.....	10
6.1.5 Anchoring.....	10
6.1.6 Shelter structure.....	11
6.1.7 Shelter set up.....	11
6.1.8 Closures.....	11
6.1.9 Sizing.....	11
6.2 Thermal protective aid or similar.....	11
6.3 Sleeping bags and blankets.....	11
6.4 Water, ice and ground insulation.....	12
6.5 Shovels.....	12
6.6 Sanitation.....	12
6.6.1 General.....	12
6.6.2 At sea only.....	13
6.6.3 Going ashore or to ice.....	13
6.7 Stove and fuel.....	13
6.8 Emergency food and water.....	14
6.9 Electric torches (flashlights).....	14
6.10 Waterproof and windproof matches.....	15
6.11 Whistle.....	15
6.12 Signal mirror.....	15
6.13 Spare set of personal survival equipment.....	15

6.14	Group survival equipment container.....	15
6.15	Extra requirements to be included in the GSK.....	17
6.15.1	Wildlife deterrents.....	17
6.15.2	SOLAS equipment.....	17
6.15.3	General supplies.....	18
7	Format of instructional materials.....	18
8	Maintenance and inspection.....	18
Annex A (informative) Personal survival kit.....		19
Annex B (informative) Group survival kit.....		20
Bibliography.....		21

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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.

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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.

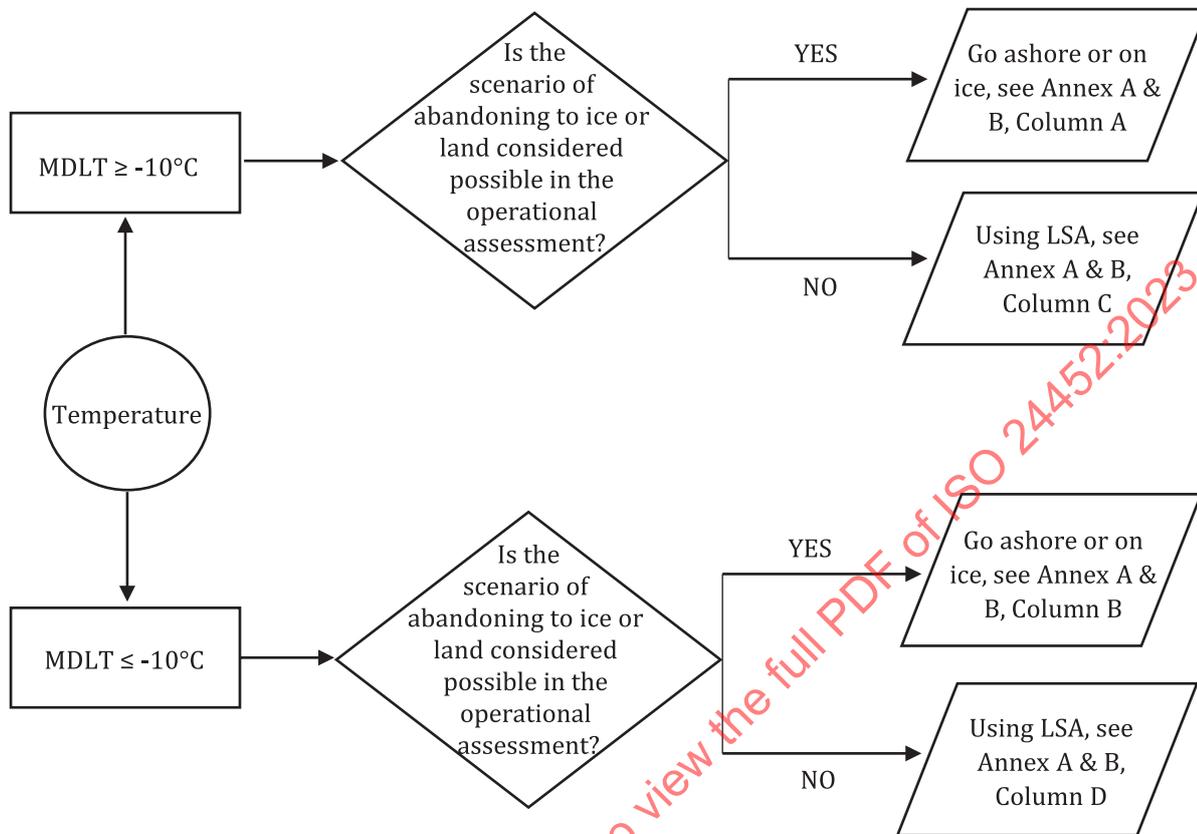


Figure 1 — How to choose the survival kit

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 $55 \text{ W}\cdot\text{m}^{-2}$ - $65 \text{ W}\cdot\text{m}^{-2}$) 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 $0,756 \text{ m}^2\text{K}\cdot\text{W}^{-1}$ (4,88 clo) where the MDLT $\geq -10 \text{ }^\circ\text{C}$ or in accordance with the following [Formula \(1\)](#) for vessels with a PST

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

where

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

T_{PS} is the polar service temperature ($^\circ\text{C}$).

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 $^\circ\text{C}$	Total system thermal resistance $\text{m}^2\text{K}\cdot\text{W}^{-1}$	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).

5.2 Protective clothing: hat, gloves, socks, face and neck protection

The protective clothing ensemble, when worn in its entirety, shall cover all parts of the body except for the eyes. It shall be made from materials which provide the minimal thermal insulation even when exposed to wind and when it is wet. When worn with the eye protection (goggles), no part of the body shall be exposed.

In order to prevent frostbite of the extremities, the following equipment shall be provided:

- a) thin wool or similar material gloves, suitable for wearing underneath insulating gloves/mittens and sufficiently thin to allow manual dexterity sufficient to use the multitool provided in the PSK;
- b) insulated gloves/mittens conforming to DIN EN 511 (at least convective: 4, contact: 4, permeability: 1);
- c) boots conforming to ISO 20877;
- d) full head covering (e.g. three-hole balaclava);
- e) neck warmer (suitable for also covering the mouth, unless an additional mask is provided);
- f) thermal underwear (top and bottom or one piece, long sleeves and full length leg covering);
- g) wool or similar material socks that remain warm if wet;
- h) shirt/sweater;
- i) trousers/long underpants;
- j) jacket/parka with hood;
- k) wind and rain protective layer if not provided by the trousers and jacket.

All personal protective clothing shall be appropriately sized for all persons on board. Another option would be to provide a coverall in replacement of the trousers and jacket, which shall provide an equivalent level of protection.

5.3 Skin protection cream

Sun protection cream is not required for vessels intending to operate exclusively in polar waters during periods of 24 h of darkness. For vessels not operating exclusively in 24 h darkness, sun protection cream shall be at least SPF 30 in accordance with ISO 24444. The volume should be at least 40 mL·day⁻¹. Volume requirement cannot be reduced by increasing SPF. The sun cream container shall be squeezable with an easy dispensing nozzle/cap unless dispensed by other means (e.g. aerosol bottle).

5.4 Thermal protective aid

Thermal protective aids (TPAs) shall comply with ISO 18813 and MSC.81 (70). At least one TPA shall be provided.

5.5 Eye protection: goggles

The Polar Code Part I-B, 9.1 contains a list of suggested equipment, where "sunglasses" is listed. For the purpose of this document, "sunglasses" is replaced with "eye protection". The specifications given here for eye protection shall fulfil the requirement of "sunglasses".

Eye protection shall protect the eyes from both the sun and from the harmful effects of wind/blowing snow. Eye protection shall be in accordance with ASTM F659-10.

Eye protection shall be formed such that prescription glasses can be worn underneath without degrading the protection.

Eye protection shall be dual lens and shall be polarized such that only vertically polarized light is permitted through to limit glare typical in maritime and snow-covered regions.

5.6 Whistle

Whistles shall be made from material (e.g. synthetic peas) that does not absorb moisture or stick to a person's mouth in cold weather. Whistles shall be shatter resistant and with a lip-seal or equivalent, to prevent loss of air in extreme cold; multi tone; constructed to assist holding the grip while wearing survival suit and/or mittens; and allow for hands-free use. The whistle blow shall produce a minimum of 100 decibel in accordance with ISO 12402-8.

Whistles, as described above, shall be attached to a lanyard at least 0,9 m long. If the lanyard is designed to be worn around the neck, the lanyard shall have a weak link. An equivalent auditory signal, such as a horn, may be provided instead, if designed for use in polar temperatures.

5.7 Drinking mug

Mugs shall be designed and made from a material that do not freeze to the lips while drinking but can be placed on a stove, open fire, or another heat source to thaw frozen contents. This can be achieved by removable insulating materials (e.g. a plastic lid). Mug size shall be small enough to be used with one hand while wearing the gloves/mittens provided in the protective clothing. This shall be applicable to all size options for the protective clothing. Alternatively, the mug can be provided with a handle that is sufficiently sized to be used while wearing the protective clothing gloves/mittens.

Mug shall have a re-sealable lid. The lid need not be attached to the mug while the contents of the mug are being thawed.

5.8 Multi-tool

The Polar Code Part I-B,9.1 contains a list of suggested equipment; a "penknife" is listed in that suggested equipment and is replaced in this document with "multi-tool". The multi-tool following the specifications given here shall fulfil the requirement of a penknife.

Multi-tools shall be rust-proof with the following tools that fold away into a small package weighing no more than 300 g:

- a) locking knife, 5 cm – 7 cm;
- b) can opener;
- c) bottle opener;
- d) scissors;
- e) pliers (needle-nosed);
- f) flat screwdriver (~5 mm);
- g) #2 Phillips screwdriver¹⁾;
- h) wood saw.

5.9 Polar survival guidance

Polar survival guidance should be in the form of one or more booklets, printed on tear- and water-resistant material.

1) #2 Phillips screwdriver is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Polar survival guidance shall contain information relevant for the PST, including at least the following information:

- a) specification sheet for all the equipment in the PSK that contains the Polar survival guidance, including (as applicable) rated temperatures and sizes;
- b) how to use each item provided in the PSK and the GSK, including the extra equipment suggested in this document;
- c) how to survive using the applicable GSK or other lifesaving appliances, including the survival craft;
- d) ventilation of shelters (if applicable);
- e) how to recognize the effects of cold on the human body, and possible solutions to minimize these effects using the equipment provided;
- f) use of communication equipment, including conserving battery life (EPIRB, airband radio, VHF radios, GMDSS, SARTs);
- g) managing wildlife (if applicable);
- h) use of heating packs (if applicable);
- i) how to start a fire;
- j) verifying/ensuring ice thickness is sufficient to support the mass of survivors (if applicable).

5.10 Emergency food and water

Emergency food shall consist of food rations, water, and anti-seasickness medication in accordance with IMO MSC.1/Circ. 1614:2019, Annex, paragraphs 3.2.2, 3.2.3, and 3.2.4 respectively. The emergency food shall also include multivitamins sufficient for the maximum ETR. A minimum of one day of rations and water shall be supplied in the PSK, provided the GSK or LSA contains the remainder.

There are currently no documents for multivitamins for survival, but multivitamins shall be in accordance with the specifications contained in NSF/ANSI 173 or an equivalent standard.

If the survival crafts or GSK are supplied with food, water, and medications in accordance with MSC.1/Circ. 1614, the quantities of food rations, water, and anti-seasickness medication in the PSK can be reduced to enough for 1 day, otherwise the PSK shall have sufficient supplies for the maximum ETR.

Food rations shall contain at least 5 000 kJ of energy per person per day for ships operating in polar regions. Consideration of new or special types of packaging for food rations (e.g. self-heating pack) may be a suitable option to enhance the chance of survivability, provided that they meet the energy requirement.

At least 2 l of fresh water per person per day shall be supplied: de-salting apparatus or means to melt ice or snow may supply the amount exceeding the requirements of the LSA Code. There should be a tank or a container of adequate size to collect water from the de-salting apparatus and rainwater collectors.

If desalination devices are used, they are rated to operate in air, at a temperature of the PST or -20°C , whichever is the lowest value, for non-low air temperature vessels, and on sea water at $-2,8^{\circ}\text{C}$. Water supplies can also be supplemented with water purification tablets.

Containers for water shall be re-sealable and not break or leak when the contents freeze in any orientation.

Given that survival for extended periods may depend on many factors aside from simply the caloric or energy value in rations provided, multivitamins may also be helpful to maintain healthy conditions in survival situations and therefore help improve overall survivability.

5.11 Carrier bag

The carrier bag shall²⁾:

- a) be large enough to carry all the contents of the PSK enclosed inside;
- b) be watertight if dropped in slush/water;
- c) be made of a material that will remain pliable and not crack at:
 - i) -10 °C for vessels with an MDLT $\geq -10\text{ °C}$ or
 - ii) the PST.
- d) have a zipper / closure made of corrosion resistant material;
- e) float if dropped in fresh water while fully packed;
- f) have straps that allow the bag to be comfortably carried over the shoulder or on the back;
- g) have a strap or other means to attach an immersion suit or anti-exposure suit carrying bag such that both can be easily carried as one;
- h) be adequately labelled to include type of gear with recommended storage conditions, if appropriate.

5.12 Immersion suits (extra)

Insulated immersion suits shall be provided for every person who has a role in providing support following abandonment ashore or to ice, unless a TPA is provided. This is designed to be worn while performing activities which require significant movement without becoming damaged. Existing vessels need not carry additional suits for those persons already allocated immersion suits to meet pre-existing carriage requirements. All immersion suits shall be the insulated type.

When immersion suits are provided to others, not assuming a role of providing support, they shall be properly sized.

For MDLT $\leq -10\text{ °C}$, insulation level for the entire ensemble (which may include the immersion suit) to be specified to meet PST requirements.

5.13 Heating packs (extra)

While heating packs are intended to help persons warm up a specific area of the body and provide an extra layer of safety and a psychological boost, they should not be used to replace/reduce any element of the overall system insulation. Heating of the hands also leads to better dexterity which can aid in survival/self-rescue.

Heating packs shall be consistent with the overall PSK and GSK/LSA model. For example, heating packs may only be battery-electric if the GSK/LSA has a means of re-charging, or the battery life is sufficient for the maximum ETR.

Heating packs shall be sized accordingly so they can fit inside the gloves/mittens provided with the PSK and heat up to at least 38 °C (but should not be so hot as to burn the skin).

Sufficient heating pack resources shall be available for heating to at least 30 °C for the maximum ETR. Heating packs should also be sufficient for heating both hands simultaneously.

Iron powder packs, when used, shall be at least 5 cm x 10 cm.

Where battery power is used, protection from over charging shall be provided where applicable.

²⁾ A drop test is not required for testing the carrier bag. Testing of tightness can be performed by laying the carrying bag in water on all possible sides.

Sodium-acetate heating pads shall not be used to meet the heating pack requirements.

Charcoal or petroleum powered individual warmers shall not be used.

Hot water bottles can be used if the GSK/LSA is equipped with a means of melting snow / heating water by providing additional fuel for the stove. Drinking water shall not be used in hot water bottles.

Other heating packs can be considered provided the risk of fire is acceptable and the heating pack does not produce gas or fumes that can be hazardous in a confined space of a GSK or LSA.

5.14 Towels (extra)

Towels shall be lightweight but highly absorbent material of not less than 1 m². Towels shall be tested in accordance with ASTM D4772 and have an absorbency of at least 75 %.

If an individual becomes wet by condensation, sweat, rain etc., the chance of survival in cooler temperatures is dramatically reduced. A towel is provided as a means for individuals to dry themselves.

6 Group survival kits

6.1 Shelter

6.1.1 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 specified, this equipment does not apply to the vessel and its intended operation.

6.1.2 Lifeboats and liferafts

For cases where survival is expected to take place at sea only, the lifeboat/liferaft shall be considered the shelter and an additional shelter is not required. If a liferaft is used on the ice, the PWOM and the polar survival guidance in the PSK shall have procedures to verify/ensure ice thickness is sufficient to support the mass of the fully loaded liferaft with all occupants and equipment.

Subclause [6.1](#) applies to shelters used ashore or on the ice. If a liferaft or lifeboat is used on the ice or land, it shall meet these requirements. If it is anticipated that extended survival may involve a move to the ice or land, a liferaft or lifeboat may be used as shelter as long as they are capable of being set down directly on ice or pulled up onto land/ice manually and rest relatively flat/level on that surface.

6.1.3 Protection from environment

Shelters shall protect occupants from precipitation, freezing spray, wind, and the sun. Shelters are also to provide a safe habitable environment inside which enables control of CO₂ at safe levels while avoiding exposure to the effects of the external environment.

6.1.4 Thermal protection

Shelters in combination with the personal protective clothing shall provide sufficient thermal insulation for the PST (-20 °C for vessels with an MDLT ≥ -10 °C). See thermal resistance value requirements in [4.3](#).

6.1.5 Anchoring

Shelters shall be capable of anchoring to the ice, snow, or frozen ground. Anchors shall be provided, suitable to properly secure the shelters, including if the liferaft is intended to be used. If tools are required to secure the anchors in place, they shall also be provided.

6.1.6 Shelter structure

Shelter structures shall be capable of withstanding:

- a) at least $30 \text{ m}\cdot\text{s}^{-1}$ winds, including anchoring arrangements;
- b) the mass of 1 cm of freezing rain;
- c) the force equivalent to a load of snow shovelled against the shelter up to a height of 1 m or 75 % of the shelter height, (whichever is less), snow density shall be taken as $300 \text{ kg}\cdot\text{m}^{-3}$. The base of the snow piled against the shelter should be taken as at least 40 cm thick.

The shelter shall block the wind for the occupants inside the shelter such that the wind inside the shelter does not exceed $0,3 \text{ m/s} \pm 0,1 \text{ m/s}$ while exterior winds are $30 \text{ m}\cdot\text{s}^{-1}$, irrespective of the direction of the wind relative to the shelter, in accordance with ISO 23537-1:2022, 5.1.3, and ISO 15831.

Shelter structure shall be of an international or vivid reddish orange, or at a comparably highly visible colour on all parts where this assists detection at sea, on land or on ice.

Other options providing an equivalent level of protection may be considered. Extra consideration shall be taken to properly anchor the shelter on snow/ice/land.

6.1.7 Shelter set up

Shelters shall be capable of being erected while wearing the protective clothing provided in the PSK, in winds up to $10 \text{ m}\cdot\text{s}^{-1}$ while at the PST ($-20 \text{ }^\circ\text{C}$ for vessels with an MDLT $\geq -10 \text{ }^\circ\text{C}$).

6.1.8 Closures

Shelter closures shall be operable by occupants inside and outside while wearing gloves/mittens provided in the PSK.

6.1.9 Sizing

Shelter sizing shall be such that there is sufficient floor space for at least 50 % of occupants to lie down while the other 50 % are sitting. This sizing can be based on the size of the mat, if mat insulations are used.

The inner surface of the roof shall be such that a 2 m tall person can move about on his/her knees without contacting the ceiling. This is an average height of approximately 1,5 m from floor to ceiling.

There is no maximum or minimum occupancy limit, but the overall survival system shall be considered, taking into account thermal energies of persons within the shelter and redundancy in the event a shelter fails. Overall, there shall be sufficient shelter for 110 % of all persons onboard the vessel.

6.2 Thermal protective aid or similar

Requirements for TPAs are as outlined in 5.4. Emergency blankets may be used in the place of the TPAs only for the GSK, if they are made of waterproof material and have a thermal conductance as prescribed in the LSA Code, section 2.5.1.

6.3 Sleeping bags and blankets

If survival is expected to take place on ice or land, one sleeping bag shall be provided for every two persons onboard the vessel. Persons onboard the vessel shall be taken as 110 % of actual maximum number of persons onboard. Sleeping bags shall be in accordance with ISO 23537-1 and be tested with a "comfort" level rating at the PST ($-20 \text{ }^\circ\text{C}$ for vessels with a MDLT $\geq -10 \text{ }^\circ\text{C}$).

If survival is expected to take place only at sea, a sufficient quantity of blankets shall be provided to cover all survivors and shall have a thermal resistance value of at least $0,310 \text{ m}^2\text{K}\cdot\text{W}^{-1}$ (~ 2 clo). A sleeping bag can be used as a blanket, provided it meets these requirements.

6.4 Water, ice and ground insulation

This subclause applies to shelters in the GSK and liferafts. It does not apply to lifeboats.

Sufficient insulation shall be provided between survivors and the water/ice/ground (WIG).

The WIG insulation can be in the form of an insulated bottom of a liferaft, a fixed insulated bottom of a shelter or insulated mats. Regardless of the method, the insulation shall have an R -Value at least as much as is given by [Formula \(2\)](#), and in accordance with ASTM F3340-18.

$$(R = -0,089 6 \cdot T_{\text{PS}} + 1,898 5) \quad (2)$$

where

R is the R -Value ($\text{m}^2\text{K}\cdot\text{W}^{-1}$);

T_{PS} is the polar service temperature ($^{\circ}\text{C}$).

For vessels not intended to operate in low air temperatures (no PST assigned) the minimum WIG insulation R -Value is 3,69.

If mats are used, the mat shall be large enough for the anticipated size of a person to lie down but should not be smaller than 183 cm x 51 cm. The quantity of mats shall be sufficient for two (2) mats per three (3) people. If mats are used in conjunction with liferafts, the quantity of mats may be reduced to cover the floor area of the liferaft, plus at least one (1) spare mat.

6.5 Shovels

Shovels can have many uses in a polar survival situation on land or ice, such as shoveling snow against the shelter to increase insulation or digging a hole in the snow for sanitation purposes. A shovel has little use on the water; therefore, this is not applicable to abandonment scenarios where going to land or ice is not considered an option.

Each GSK shall have at least 2 shovels.

Shovel material (blade, shaft, and handle) shall remain non-brittle at the PST (-20°C for non-low air temperature vessels).

The shovel shall be a robust design that can withstand shovelling snow and impact on ice but should be 2 kg or less.

The blade area shall be at least 30 cm x30 cm and shaped to be suitable for picking up loose granular snow.

The handle shall be suitably sized for use while wearing the protective clothing in the PSK. For ease of storage, the handle can be telescopic or folding, provided it is sufficiently strong and reliable for the expected uses.

6.6 Sanitation

6.6.1 General

Sufficient supplies shall be provided for 110 % of all persons on board.

6.6.2 At sea only

For lifeboats and liferafts with no intention of going to land or ice the following shall be provided:

- a) One (1) roll of toilet paper per person per five days of maximum ETR (rounded up to the nearest whole number);
- b) watertight container or locker for toilet paper;
- c) hand sanitizer, 50 ml per person per five days. Freezing point of sanitizer shall be at or below the PST ($-20\text{ }^{\circ}\text{C}$ for non-low air temperature vessels);
- d) designated toilet location with a privacy division;
- e) for non-low temperature operation vessels ($\text{MDLT} \geq -10\text{ }^{\circ}\text{C}$):
 - i) waste receptacle that can be pumped or dumped to the ocean through the openings, doors, or hatches;
 - ii) receptacle shall have a means of securing to prevent tipping over in rough weather;
 - iii) handles shall be fitted for persons using the receptacle in rough weather.
- f) for low temperature operation vessels ($\text{MDLT} < -10\text{ }^{\circ}\text{C}$):
 - i) toilet facilities that can be pumped or dumped to the ocean without opening the openings, doors or hatches;
 - ii) toilet facility shall be rigidly attached so as not to tip in rough weather with someone sitting on it;
 - iii) handles shall be fitted for persons using the toilet in rough weather.

6.6.3 Going ashore or to ice

GSKs shall be equipped with the following:

- a) one (1) roll of toilet paper per person per five days of maximum ETR (rounded up to the nearest whole number);
- b) watertight container for toilet paper;
- c) hand sanitizer, 50 mL per person per five days. Freezing point of sanitizer shall be at or below the PST ($-20\text{ }^{\circ}\text{C}$ for non-low air temperature vessels);
- d) one (1) small enclosure for every 50 persons, complying with the requirements in [6.1.3](#), [6.1.5](#), [6.1.6](#) and [6.1.8](#). Alternatively, the shelter can have a designated area that can be separated by a division;
- e) one (1) toilet seat for every 50 persons;
- f) receptacle with attachments for the toilet seat.

6.7 Stove and fuel

Stove(s) are for cooking/warming food and liquids and not intended as a heat source for heating the shelter. The stove/fuel should be sufficient for the maximum number of persons ashore/on ice and the maximum ETR.

There shall be at least one (1) stove unit for each shelter. The number of heating locations on the stove shall be appropriate for the number of persons in the shelter but shall not be less than one (1) heating location per 12 persons. A heating location is defined as a position on the stove where a pot or kettle can be positioned for heating food or melting snow/ice, e.g. a burner on a gas stove.

Each heating location on the stove shall produce sufficient heat to boil (100 °C) one (1) litre of water from ambient temperature (21 °C) in five minutes or less at sea level. If the stove has multiple heating locations, each location shall meet the water boiling requirements while all are being tested simultaneously. The amount of fuel required to perform this test on a single heating location shall be considered 1 unit of fuel for the purposes of this subclause.

A method of shielding the heating location from the wind shall be provided. Pots or equivalent means of melting snow/ice shall be provided, and they shall be compatible with the stove(s) provided. One (1) pot per stove heating area shall be provided (not less than two pots total per GSK). Pots shall have thermally insulated handles. Holders or equivalent shall be provided for placing the drinking mug required in 5.7 on the stove to warm contents. If possible, the holder should be able to take multiple mugs simultaneously.

Four (4) units of fuel, per person per day of the maximum ETR shall be provided, unless hot water heating packs are provided, then the fuel required shall be eight (8) units per person per day of the maximum ETR. Per person shall be taken as 110 % of actual maximum number of persons onboard.

The fuel and ignition system shall be suitable for operation at the PST, or -20 °C for non-low air temperature operations. If the stove is electrical and powered by a generator, the generator shall be proven to reliably start and run at the PST or -20 °C for non-low air temperature operations.

In all cases, the following risks shall be considered and mitigated. Additionally, a fire extinguisher shall be available within the GSK to mitigate the following risks:

- a) fire within the shelter;
- b) CO₂ build-up within the shelter;
- c) smoke within the shelter;
- d) CO build-up within the shelter;
- e) noxious gasses within the shelter.

6.8 Emergency food and water

The requirements given in 5.10 shall be met for 110 % of persons onboard the vessel and for the maximum ETR. The emergency food and water supplies can be entirely in the PSKs with none in the GSK or one (1) day supply in the PSK and the remainder in the GSK.

The LSA inventory may also be taken into consideration. A desalination device (see 5.10) or a stove (see 6.7) to melt water is a useful supplementary device that may be employed.

6.9 Electric torches (flashlights)

The water-proof electric torch required in liferafts or lifeboats may cover this requirement provided the performance of the torch meets the requirements below.

At least one (1) electric torch shall be provided for every shelter. Energy sources (e.g. batteries) and light emitting device (e.g. bulb) shall be suitable for operation at the PST (-20 °C for non-low air temperature vessels). If the light emitting device is not replaceable, two (2) electric torches per shelter shall be provided. If the light emitting device is replaceable, one (1) spare light emitting device shall be provided.

Sufficient energy resources (e.g. batteries) shall be provided for continuous operation during hours of darkness for the maximum ETR. Hours of darkness can be calculated from the time of sunset to the time of sunrise. If recharging resources are used, the rated capacity of the energy capturing device shall be at least double what is required to recharge the electric torch energy storage if it is completely depleted. For example, if solar panels are used to charge the electric torch during the day, the panels shall be rated for capturing double the amount of energy needed to charge a fully depleted electric torch, considering the hours of daylight available. The energy sources shall be sufficient for no less than

12 hours of continuous use per night and suitable for operation every night for the maximum ETR. If the energy sources are of a manually operated type (i.e. crank style) units are acceptable as long as they can be operated when charge is needed.

The electric torch shall be suitable for Morse code signalling (S.O.S.) and shall be capable of being operated while wearing the gloves/mittens provided in the protective clothing.

Electric torches shall meet ANSI/NEMA FL 1 with the following parameters:

- a) light output shall be 90 lm or more;
- b) light output vs beam intensity shall be between 20 and 100 $\text{cd}\cdot\text{lm}^{-1}$ (candela per lumen);
- c) waterproof to at least IPX7;
- d) impact resistant to 1 metre while at the PST ($-20\text{ }^{\circ}\text{C}$ for non-low air temperature vessels).

6.10 Waterproof and windproof matches

Two boxes of one hundred (100) waterproof and windproof matches shall be provided for each shelter. Matches shall be provided with a watertight enclosure that can be easily opened while wearing the gloves/mittens provided in the PSK.

Additionally, one flint with one strike shall be provided for every shelter.

6.11 Whistle

Every shelter shall be provided with a whistle meeting the requirements given in [5.7](#).

6.12 Signal mirror

The signalling mirror shall comply with ISO 18813. The requirement as stated in the LSA Code can also be used.

6.13 Spare set of personal survival equipment

One complete set of personal survival equipment as described in [Clause 5](#) shall be provided. If the personal survival equipment has different sizes, the equipment included in the GSK shall be a large size.

6.14 Group survival equipment container

The GSK container shall match the planned abandonment scenarios:

- a) If the planned abandonment scenario is to remain in the lifeboat/liferaft on the water (not transition to ice or land), a container may not be needed if the GSK equipment shall be contained within the lifeboat/liferaft, and the requirements of this clause shall not apply.
- b) If a container is used to load and store the GSK equipment in lifeboats/liferafts, the container shall be designed to be easily movable into the lifeboat/liferaft, not cause damage to the lifeboat/liferaft, and utilize the minimum amount of space possible within the survival craft, to allow space for the total complement, which may need to be revised. It is not necessary for the container to meet the below requirements.

- c) All scenarios where a GSK container that is deployed external to the lifeboat or liferaft is used, the following requirements apply:
 - i) The container shall be able to be towed behind the lifeboat or attached to the liferaft with its own painter and the contents of the container that may be needed for survival in a lifeboat/liferaft shall be easily accessible from the lifeboat/liferaft while floating alongside.
- d) The container (including container shell, painter, attachments and handles) shall be durable enough to withstand impacts with:
 - i) ice while being towed by a lifeboat at 5,5 km/h (3 kn), (floating) see paragraph below;
 - ii) ice, rocks and debris while being moved by hand (sliding).

The container shall be waterproof and float when fully loaded. The container shall be brightly coloured and be fitted with retro-reflective material to assist with detection.

Any hatches in the container shall be easily opened while wearing the mittens/gloves in the PSK.

The shell of the container shall be formed in a way that makes it possible for a team of no more than 4 people to be able to transfer the container from floating in the water up onto sea ice that is 1 metre thick (~10 cm freeboard). The ice edge can be prepared in anyway necessary to aid the transition, provided the tools to do this preparation are easily accessible. If any winching mechanisms are used to pull the container onto the ice, more than one anchor point is to be used and be arranged to ensure that no person is at risk of harm if an anchor pulls out of the ice or if cables are released/breaks. The bottom of the container shall be sufficiently smooth that two people can slide the container across a flat snow-covered surface. Snow is assumed to be wind packed and hard. Handles shall be provided for moving the container on the ice, and handles shall be sufficiently sized to be usable while wearing the personal survival equipment mittens/gloves. Hull strength shall be sufficient to withstand impacting a large (considered to be an infinite mass as compared to the loaded container) glacial or multi-year ice floe, while fully loaded and being towed at 5,5 km/h (3 kn) while the air temperature is at the PST (-20 °C for non-low air temperature vessels).

The shell and all fittings of the container shall be made of corrosion resistant material.

If the container is launched by means of a launching appliance, the launching appliance shall not depend on any means other than gravity or stored mechanical power which is independent of the ship's main power supplies, and shall be rated for the fully loaded mass of the container. The launching appliance used to lower the GSK shall meet all the requirements under the LSA Code, Chapter VI. The launching appliance shall be rated for operation at the PST (-20 °C for non-low air temperature vessels).

The container shall be designed to have a positive buoyancy when fully loaded with GSKs. The position and arrangement in conjunction with procedures in the PWOM shall ensure equipment availability upon abandonment. This may include float free arrangements if container is located on an open deck.

If the container is designed so people may need to climb on top, anti-slip tape should be used to prevent them from falling in the water. If stored on the outer deck of the vessel, precautions shall be taken such that its content may not get damage from freezing.

The container shall have a painter line attached that is sufficiently strong to tow the loaded container at 3 kn and is sufficiently long enough to attach to a fitting on the vessel's deck while the container is lowered to the water.

The exterior of the container shall be fitted with a label, placard, or similar stating:

- a) "group survival kit";
- b) manufacturer's name or trademark;
- c) serial number;
- d) name of certification body;