

ISO TC 8/SC 1 N **135**

Date: 2001-11-16

ISO/WD YYYYY

ISO TC 8/SC 1/WG 1

Secretariat: ANSI

Ships and marine technology — Thermal protective aids

Élément introductif — Élément central

Warning

This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Document type: International Standard
Document subtype:
Document stage: (20) Preparatory
Document language: E

Copyright notice

This ISO document is a working draft or committee draft and is copyright-protected by ISO. While the reproduction of working drafts or committee drafts in any form for use by participants in the ISO standards development process is permitted without prior permission from ISO, neither this document nor any extract from it may be reproduced, stored or transmitted in any form for any other purpose without prior written permission from ISO.

Requests for permission to reproduce this document for the purpose of selling it should be addressed as shown below or to ISO's member body in the country of the requester:

*[Indicate :
the full address
telephone number
fax number
telex number
and electronic mail address*

as appropriate, of the Copyright Manager of the ISO member body responsible for the secretariat of the TC or SC within the framework of which the draft has been prepared]

Reproduction for sales purposes may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

Contents

Foreword.....	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Construction	2
5 Performance	3
6 Testing	4
7 Marking	6
8 Production testing	7

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO YYYYY was prepared by Technical Committee ISO/TC 8, *Ships and Marine Technology*, Subcommittee SC 1, *Lifesaving and Fire Protection*.

The **foreword** shall appear in each standard. It shall not contain requirements, figures or tables.

In addition to the appropriate boilerplate text (see above) give as many of the following as are appropriate:

- an indication of any other international organization that has contributed to the preparation of the standard;
- the relationship of the standard to other standards or other documents;

Introduction

A paragraph.

The **introduction** is an optional preliminary element used, if required, to give specific information or commentary about the technical content of the standard, and about the reasons prompting its preparation. It shall not contain requirements.

Ships and marine technology — Thermal protective aids

1 Scope

This International Standard specifies construction, performance, and testing requirements for thermal protective aids (TPA's) carried on ships and in survival craft on ships in compliance with the International Convention for the Safety of Life at Sea (SOLAS) 1974, as amended, and the International Life-Saving Appliance Code (LSA Code). TPA's designed and tested in accordance with this International Standard may be considered to comply with the requirements of the IMO LSA Code.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

[ASTM C 177–76 *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Guarded Hot Plate*

ASTM C 518–76 *Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter.*

ASTM D 1518–77 *Thermal Transmittance of Textile Materials Between Guarded Hot-Plate and Cool Atmosphere.*

ASTM D 1004–66 *Tear Resistance of Plastic Film and Sheeting.*

ASTM D 975–81 *Standard Specification for Diesel Fuel Oils.*

Federal Standard No. 751a *Stitches, Seams, and Stitchings.*

National Bureau of Standards Special Publication 440 *Color, Universal Language and Dictionary of Names.*]

3 Terms and definitions

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

3.1

term

text of the definition

4 Construction

4.1 General

4.1.1 The TPA shall be constructed primarily of a durable insulating or heat reflecting material that meets the thermal insulation requirements in clause 5.1.

4.1.2 The TPA shall be designed to cover the wearer's entire body, except for the area of the mouth, nose, and eyes.

4.2 Seams

4.2.1 Stitching, if used in structural seams of the TPA, shall be lock type stitching [that meets the requirements in Federal Standard No. 751 for one of the following:

- a) Class 300 lockstitch.
- b) Class 700 single thread lock stitch.]

4.2.2 Each seam shall have a strength of at least 225 N when tested in accordance with clause 6.2.4.

4.3 Hardware

All hardware of the TPA shall be of a size and design that allows ease of operation by the wearer. The hardware shall be attached to the TPA in a manner that allows the wearer to operate it easily and that prevents it from attaining a position in which it can be operated improperly.

4.4 Metal parts

Each metal part of a thermal protective aid shall be of [410] stainless steel, or have salt water and salt air corrosion characteristics equal to or superior to 410 stainless steel, and be galvanically compatible with each other metal part in contact with it.

4.5 Colour

The primary color of the exterior surface of each thermal protective aid shall be vivid reddish orange [(color number 34 of National Bureau of Standards Publication 440)].

4.6 Tear resistance

When tested in accordance with clause 6.2.5, the TPA shall have a tear resistance of at least [45 N].

4.7 Hand and arm construction

The TPA shall be provided with arms and hands. The hand of each TPA shall be a glove that allows sufficient dexterity for the wearer to close and open the zipper or other hardware of the aid and to open and eat typical approved survival rations, unless the glove is removable. The glove may not be removable unless it is attached to the arm and unless it can be secured to the arm or stowed in a pocket on the arm when not in use.

4.8 Retroreflective material

The TPA shall be fitted with at least 200 cm² of approved Type I retroreflective material.

4.9 Sizing

4.9.1 The TPA shall fit persons ranging in weight from 50 kg to 150 kg, and in height from 1.5 m to 1.9 m.

4.9.2 Each TPA shall be designed so that a SOLAS lifejacket can be worn inside it and, when worn, will not damage the TPA and will not adversely affect its performance.

4.10 Storage case

Each TPA shall be provided with a reclosable (zip-lock type) bag or equivalent storage case.

4.11 Instructions

4.11.1 Each TPA shall be provided with instructions for its donning and use in an emergency. The instructions shall be in [English] and shall not exceed 50 words. Illustrations shall be used in addition to the words. The instructions shall include advice as to whether to swim in the TPA or discard it if the wearer is thrown into the water.

4.11.2 The instructions shall be printed on the exterior of the storage case, printed on a waterproof card attached to the storage case, or printed on the TPA and visible through a transparent storage case. The instructions shall also be available in suitable loose-leaf format for inclusion in the ship's training manual.

5 Performance

5.1 Thermal protection

5.1.1 The thermal conductance of the material from which the TPA is constructed shall be not more than 7800 W/(m²K).

5.1.2 The TPA shall be designed and constructed of materials to prevent evaporative heat loss.

5.1.3 The TPA shall function properly at an air temperature of -30 °C to +20 °C.

5.2 Donning time

Each TPA shall be designed to enable a person to don the aid correctly within one minute after reading the donning and use instructions described in clause 4.11.

5.3 Storage temperature

A TPA shall not be damaged by storage in its storage case at any temperature between -30 °C and +65 °C.

5.4 In water performance

The TPA shall be designed to permit the wearer to remove it in the water within two minutes, if it impairs ability to swim.

5.5 Resistance to water penetration

The fabric from which the TPA is constructed shall maintain its water-tight integrity when supporting a column of water 2 m high.

5.6 Oil resistance

Each TPA shall be designed to be useable after 24 hours exposure to diesel oil.

6 Testing

6.1 Mobility and swimming tests

6.1.1 Test subjects

Seven males and three females shall be used in the tests described in clauses 6.1.2 through 6.1.4. The subjects shall represent each of the three physical types (ectomorphic, endomorphic, and mesomorphic). Each subject shall be in good health. The heaviest male subject shall weigh at least 25 kg more than the lightest male subject. The heaviest female subject shall weigh at least 25 kg more than the lightest female subject. The heaviest subject shall weigh 150 ± 5 Kg and the lightest subject shall weigh 50 ± 5 Kg. Each subject shall be unfamiliar with the specific thermal protective aid under test. Each subject shall wear a standard range of clothing consisting of:

- a) Underwear (short sleeved, short legged)
- b) Shirt (long sleeved)
- c) Trousers (not woolen)
- d) Woolen socks
- e) Rubber soled shoes
- f) A SOLAS lifejacket.

6.1.2 Donning test

Each subject shall be removed from the view of the other subjects and allowed one minute to examine the TPA and the manufacturer's instructions for donning and use of the TPA in an emergency. At the end of this period, the subject shall attempt to don the TPA as rapidly as possible. If the subject does not don the TPA completely, including gloves and any other accessories, within 60 seconds, the subject shall remove the TPA and, after a demonstration of correct donning, again attempt to don it. At least nine out of ten subjects shall be able to don the TPA completely in 60 seconds on at least one of the two attempts.

6.1.3 Discarding test

6.1.3.1 If the TPA impairs the ability of the wearer to swim, it shall be demonstrated that it can be discarded by the test subjects, when immersed in water, in not more than two minutes.

NOTE Caution: During each of the in water tests prescribed in this section, a person ready to render assistance when needed should be near each subject in the water.

6.1.3.2 Unless the manufacturer specifies in the instructions that the TPA does impair ability to swim and should always be discarded in the water, each subject, wearing a life preserver, shall enter the water and swim 25 meters. Each subject, after sufficient rest to avoid fatigue, shall repeat this test wearing the TPA in addition to the lifejacket. At least nine out of ten subjects shall be able to swim this distance wearing the thermal protective aid in not more than 125% of the time taken to swim the distance wearing only a lifejacket, or the TPA will be determined to impair the ability to swim.

6.1.3.3 If the TPA is determined by the above test or specified by the manufacturer to impair the ability to swim, each subject, after entering the water from a height of one meter, shall attempt to remove the TPA and discard it. At least nine out of ten subjects shall be able to discard the TPA within two minutes.

6.1.4 Temperature cycling and cold donning test

6.1.4.1 Two samples of the TPA, in their storage cases, shall be alternately subjected to surrounding temperatures of $-3 \text{ } 0^{\circ} \text{ C}$ to $+60^{\circ} \text{ C}$. These alternating cycles need not follow immediately after each other, and the following procedure, repeated for a total of ten cycles, is acceptable:

- b) The specimens removed from the warm chamber that same day and left exposed under ordinary room conditions until the next day;
- c) 8 hours conditioning at $-3\text{ }^{\circ}\text{C}$ to be completed the next day
- d) The specimens removed from the cold chamber that same day and left exposed under ordinary room conditions until the next day.

6.1.4.2 At the conclusion of step (c) of the final cycle of cold storage, two test subjects who successfully completed the donning test previously shall enter the cold chamber, unpack and don the TPA's. The TPA's shall not show any damage, such as shrinking, cracking, swelling, dissolution or change of mechanical qualities.

6.2 Physical tests

6.2.1 Water penetration

A sample of the fabric from which the TPA is constructed shall be installed as a membrane at one end of a tube of at least 2.5 cm diameter and 2 m long. The tube shall be fixed in a vertical position with the membrane at the bottom, and filled with water. After one hour the membrane shall continue to support the column of water with no leakage.

6.2.2 Insulation

The material from which the TPA is constructed shall be tested in accordance with the procedures in [ASTM C 177, ASTM C 518, or ASTM D 1518]. The material shall have a thermal conductance of not more than $7800\text{ W}/(\text{m}^2\text{K})$.

6.2.3 Oil resistance

After all its apertures have been sealed, a TPA shall be immersed under a 100 mm head of diesel oil, grade no. [2-D as defined in ASTM D-975], for 24 hours. The surface oil shall then be wiped off and a sample of the material from the TPA shall again be tested in accordance with the procedures in [ASTM C 177 or ASTM C 518]. The material shall retain a thermal conductivity of not more than $7800\text{ W}/(\text{m}^2\text{K})$.

6.2.4 Seam strength

Each different type of seam used in a TPA shall be tested in accordance with clauses 6.2.4.1 through 6.2.4.3.

6.2.4.1 Test equipment

The following equipment shall be used in this test:

- a) A chamber in which air temperature can be kept at $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ and in which relative humidity can be kept at $50\% \pm 5\%$.
- b) A device to apply tension to the seam by means of a pair of top jaws and a pair of bottom jaws. Each set of jaws shall grip the material on both sides so that it does not slip when the load is applied. Each front jaw shall be 25 mm wide by 25 mm long. The distance between the jaws before the load is applied shall be 75 mm.

6.2.4.2 Test samples

Each test sample consists of two pieces of the material from which the TPA is constructed, each of which is 100 mm square. The two pieces shall be joined by a seam as shown in figure 1. For each type of seam, 5 samples shall be tested. Each sample may be cut from a TPA or may be prepared specifically for this test.

NOTE One type of seam is distinguished from another by the type and size of stitch or other joining method used (including orientation of warp and fill, if any) and by the type and thickness of the materials joined at the seam.

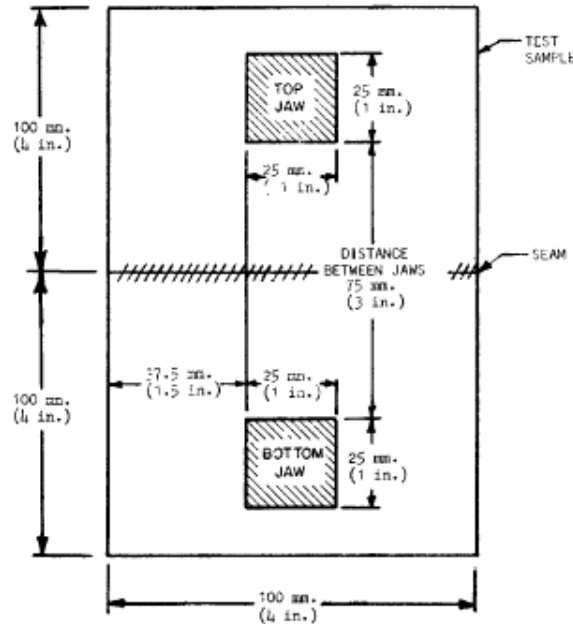


Figure 1 — Configuration for testing of seam strength

6.2.4.3 Test procedure

Each sample shall be conditioned for at least 40 hours at $25 \text{ }^{\circ}\text{C} \pm 2 \text{ }^{\circ}\text{C}$ and $50\% \pm 5\%$ relative humidity. Immediately after conditioning, each sample shall be mounted individually in the tension device as shown in figure 1. The jaws shall be separated at a rate of 5 mm/second. The maximum force to achieve rupture shall be recorded. The average force at rupture shall be at least 225 N.

6.2.5 Tear resistance

The tear resistance of the material from which a TPA is constructed shall be determined by the method described in [ASTM D 1004]. If more than one material is used, each material shall be tested. If varying thicknesses of a material are used in the TPA, samples representing the thinnest portion of the material shall be tested. If multiple layers of a material are used in the aid, samples representing the layer on the exterior of the TPA shall be tested. Any material that is a composite formed of two or more materials bonded together is considered to be a single material. The average tearing strength of each material shall be at least [45 N].

7 Marking

7.1 Each TPA shall be marked with:

- the words "Thermal Protective Aid";
- the name of the manufacturer;
- the model;
- the date of manufacture, or a lot number from which the date of manufacture may be determined;

e) relevant approval information.

7.2 Each storage case shall be marked with the words “Thermal Protective Aid”, or the thermal protective aid shall have a similar marking which is visible through a transparent storage case.

8 Production testing

8.1 One out of every 100 TPA's produced shall be given a complete visual examination. Samples shall be selected at random from a production lot of 100 TPA's. The sample fails if the visual examination shows that the TPA does not conform to the approved design.

8.2 If a defect in the TPA is detected upon visual examination, 10 additional samples from the same lot shall be selected at random and examined for the defect.

8.3 If one or more of the 10 samples fails the examination, each TPA in the lot shall be examined for the defect for which the lot was rejected. Only thermal protective aids that are free of defects may be considered to comply with this International Standard.