INTERNATIONAL STANDARD

ISO 9650-1

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Small craft — Inflatable liferafts —

Part 1: Type I

Petits navires — Radeaux de survie gonflables —

Partie 1: Type I

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9650-1 was prepared by Technical Committee ISO/TC 188, *Small craft*.

ISO 9650 consists of the following parts, under the general title *Small craft — Inflatable liferafts*:

— *Part 1: Type I*

— *Part 2: Type II*

— *Part 3: Material*

Introduction

This part of ISO 9650 is intended for inflatable liferafts for small craft used for leisure activities. It does not apply to liferafts required for ships under the International Maritime Organisation (IMO) *Safety Of Life At Sea* (SOLAS) Convention.

A liferaft manufactured and maintained in accordance with this part of ISO 9650 should provide:

— a reasonably safe refuge for a shipwrecked person awaiting rescue;

— a reasonable service lifetime, provided a user meets a manufacturer's clearly specified recommendations on stowage and maintenance.

Compliance with this part of ISO 9650 does not imply that a liferaft will be suitable in all circumstances.

A liferaft which complies with this part of ISO 9650 must be constructed in such a manner that maintenance is as easy and straightforward as possible.

A user must be responsible for selecting a liferaft appropriate to the intended circumstances of use. Manufacturers and vendors must inform potential purchasers of the properties of the product, including possible choices (e.g. different equipment packs), limits on normal usage, and recommendations on stowage and maintenance.

The tests in this part of ISO 9650 have been designed to simulate reality as closely as possible. Compliance with a test does not guarantee similar performance in service. For example, compliance with the re-righting tests does not guarantee that a liferaft can be righted at sea by an exhausted person in any circumstances.

Small craft — Inflatable liferafts —

Part 1:
Type I

1 Scope

This part of ISO 9650 specifies the design, performance and marking characteristics, and gives the test methods for inflatable liferafts of Type I:

— having a carrying capacity of 4 to 12 persons;

— applicable on small craft of hull length up to 24 m;

— suitable for launching overboard from a height not exceeding 6 m;

— divided into two groups (group A and group B);

— designed for extended voyages, where high wind and significant wave heights may be experienced, but excluding abnormal conditions such as hurricanes;

— completely self-sufficient;

— prepared to meet serious emergencies without expectation of outside assistance;

— and not voyaging in extreme zones (e.g. Southern Oceans).

Type II liferafts are specified in ISO 9650-2.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 1402, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing*

ISO 6718, *Bursting discs and bursting disc devices*

ISO 17339:2002, *Ships and marine technology — Sea anchors for survival craft and rescue boats*

IMO SOLAS 83, Chapter III, Resolution A.658 (16), Annex 2

SOLAS International Life-Saving Appliance Code (LSA Code)

3 Terms and definitions

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

3.1
operating pressure
pressure determined by the designed reseat pressure of the relief valves, except that, if the actual reseat pressure of the relief valves, determined by testing, exceeds the designed reseat pressure by more than 15 %, the higher figure is used

3.2
full load
load of the number of people corresponding to the maximum capacity (see 5.2.3.2) of the liferaft, each weighing 75 kg, seated at their normal place, or, unless otherwise specified, load of the number of uniformly distributed equivalent masses weighing 75 kg (e.g. bags of sand)

3.3
buoyancy chamber
buoyancy compartment
chamber contributing to the buoyancy of the liferaft

4 General provisions

4.1 Introduction

4.1.1 An inflatable liferaft comprises:

— a structure;

— an inflation system;

— fittings;

— equipment;

— instructions;

— packaging.

4.1.2 The structure of a liferaft comprises:

— at least two independent buoyancy chambers;

— a floor;

— a canopy and a canopy support;

— stabilisation means.

4.1.3 The inflation system comprises:

— an initial inflation system;

— a manual back-up inflation system.

4.1.4 The fittings shall include:

— external lights;

— painter line/mooring line;

— towing point;

— external and internal lifelines;

— righting system;

— boarding facilities;

— sea anchor;

— rescue quoit and line;

— safety knife.

Further fittings may be included, provided the tests of Clause 6 are completed.

4.2 Groups of Type I liferafts

This part of ISO 9650 defines two groups of Type I liferafts according to the expected air-temperature conditions:

— group A liferafts shall be designed to inflate correctly in a air temperature between − 15 °C and + 65 °C;

— group B liferafts shall be designed to inflate correctly in a air temperature between 0 °C and + 65 °C.

This part of ISO 9650 also gives the general and specific requirements that these liferaft groups, their equipment, etc. shall fulfil.

Compliance of the liferaft with this part of ISO 9650 does not guarantee that the liferaft will not overturn.

5 Requirements

5.1 General requirements

Inflatable liferafts of groups A and B, serviced in accordance with the manufacturer's instructions, shall provide adequate protection against the risks incurred and shall satisfy the requirements described in the this part of ISO 9650.

Table 1 summarizes the subclause(s) to consider for each main characteristic.

Table 1

Characteristics	Requirements in	Tests methods in
Launching	5.2.1.1	6.2
Inflation	5.2.2	6.3
Buoyancy	5.2.3	
Stability and performance at sea	5.2.4	6.4, 6.5, 6.6, 6.7
Solidity, watertightness, materials	5.2.5	6.8, 6.9
Habitability	5.2.6	
Visibility to rescuers	5.2.7	
Fittings and equipment	5.2.8	
Instructions and marking	5.2.9	
Packaging	5.2.10	

5.2 Detailed requirements

5.2.1 Deployment

5.2.1.1 Launching

The liferaft shall be capable of being dropped into the water from a height of 6 m above the water level without damage, in accordance with 6.2.

5.2.1.2 Properties of the painter line

The painter line shall be positioned at the entrance to the liferaft.

The length of the painter line shall be at least 9 m.

A coloured indication shall be visible at less than 1 m from the firing point.

The painter line shall be efficient and shall be easy to handle and to pull.

The breaking load of the painter line, and of its attachment system to the liferaft, shall not be less than 7,5 kN. The painter-line attachment system shall be constructed so as to not damage the liferaft on failure of the attachment system.

The painter line shall withstand weathering.

5.2.2 Inflation

The liferaft shall inflate within the temperature ranges according to 4.2, during the course of the launching and temperature inflation tests conducted in accordance with 6.2 and 6.3.

5.2.2.1 Initial inflation system - General

The initial inflation system shall be actuated by a pull on the painter line, thereby allowing the release of a pressurised gas. All subsequent force exerted on the painter line shall act directly on the towing point, or any other point offering strength characteristics equivalent to the values required for the painter line (see 5.2.1.2).

This inflation system may be supplemented by an automatic inflation system, i.e. inflation without pulling on the painter line (e.g. hydrostatic pressure-sensitive automatic actuation).

5.2.2.2 Actuation device

The inflation-system mechanism shall attain the fully open position by exerting a pulling force on the painter line, not exceeding 150 N and with a travel not exceeding 200 mm.

The operating device shall be made of corrosion-resistant material capable of withstanding, without damage, a painter load of 450 N. The operating cable assembly shall not cause any wear of the fabric of the buoyancy chambers by abrasion.

5.2.2.3 Inflation gas

5.2.2.3.1 Type of gas

The gas, or mixture of gases, used for inflating the liferafts shall be non-toxic, for example carbon dioxide. The type and quantity shall provide a sufficient rate of inflation to allow the complete system to meet the specified inflation performance requirements for the equipment in which it is installed.

If the gas used is carbon dioxide, its moisture content shall be no more than 150 parts of water per million parts of gas by mass.

5.2.2.3.2 Quantity of gas

The quantity of gas shall be sufficient for the liferaft to inflate and achieve working pressure under low temperatures, as required by 6.3.4.

The quantity of gas in the cylinder shall be such that the internal pressure of the cylinder, at the temperature of + 65 °C, does not exceed the hydraulic test pressure of the cylinder.

5.2.2.4 Gas cylinder

The gas cylinder shall conform to national or international regulations.

It shall be corrosion-proof in accordance with the specifications of ISO 9650-3.

For an inflation system, where a liquefied gas is used, the cylinder shall be fitted with a corrosion-proof bursting disc in accordance with ISO 6718, or with an equivalent safety device to prevent bursting of the cylinder. The bursting disc or the safety device shall operate prior to the internal cylinder pressure reaching the hydraulic test pressure.

5.2.2.5 High-pressure hose assembly (if fitted)

Where a high-pressure hose assembly is used to convey the gas from the cylinder to the buoyancy chamber, it shall meet the following conditions:

a) there shall be no leaks or any sign of deterioration after having been subjected, during at least 1 min, to a hydraulic test in accordance with ISO 1402, under a pressure of 12,5 MPa for liquefied gases and of 20 MPa for non-liquefied gases;

b) it shall operate within a temperature range;

   1) between – 45 °C and + 65 °C inclusive for liquefied gases and carbon dioxide (CO_2);

   2) between – 20 °C and + 65 °C inclusive for non-liquefied gases;

c) at the lowest temperature of each of the ranges defined in b) above, the hose shall be bent through 180° over a mandrel of radius 5 cm and shall meet the requirements of a);

d) the hose assembly shall not be in contact with any sharp edges and shall not show any sign of corrosion when tested in accordance with the test specified in ISO 9650-3;

e) the bursting pressure of the hose assembly shall not be less than 168 % of the hydraulic test pressure.

NOTE A new hose may be used for each operating test.

5.2.2.6 Valves

5.2.2.6.1 Topping-up inflation valves

All inflatable compartments, including canopy supports, but excluding, where fitted, boarding ramps, shall be provided with a topping-up non-return valve allowing the compartments to be inflated by a bellows or a pump.

5.2.2.6.2 Non-return valve

Sufficient non-return shall be provided at gas inlets to comply with 5.2.3.1.

5.2.2.6.3 Relief valve

The number and location of relief valves shall be such that the pressure is limited in all the inflatable compartments.

Relief valves shall be able to be sealed off temporarily according to the manufacturer's instructions. The relevant outlet should not discharge inside the liferaft.

The relief valves shall be positioned so that they can be sealed off temporarily from the interior of the raft, the canopy opening or the lookout position, in such a way that this can be achieved without leaving the interior of the raft.

5.2.3 Buoyancy

5.2.3.1 Number of compartments

The main buoyancy chamber shall be divided into not less than two separate compartments, each inflated through a non-return inflation valve on each compartment.

The buoyancy chambers shall be so arranged that, in the event of any one of the compartments being damaged or failing to inflate, the intact compartments shall be able to support, with positive freeboard over the liferaft's entire periphery, the number of persons which the liferaft is permitted to accommodate, each having a mass of 75 kg and seated in their normal positions.

5.2.3.2 Carrying capacity

The number of persons which a liferaft shall be permitted to accommodate shall be equal to the lesser of:

a) the greatest whole number obtained by dividing by 0,096 the volume, measured in cubic metres, of the main buoyancy tubes (which for this purpose shall not include the arches or the thwarts, if fitted) when inflated; or

b) the greatest whole number obtained by dividing by 0,372 the inner horizontal cross-sectional area of the liferaft, in square metres, measured to the innermost edge of the buoyancy tubes; or

c) the number of persons having an average mass of 75 kg, all wearing fully inflated 150 N lifejackets, that can be seated with sufficient comfort and headroom.

5.2.3.3 Freeboard

The freeboard, measured at various peripheral points of the liferaft, inflated to its design operating pressure, under calm water conditions, with its full load, shall be at least 250 mm on a 4 person capacity liferaft and 300 mm for all larger liferafts.

5.2.3.4 Flooding resistance

The liferaft, inflated to its design operating pressure, under calm water conditions, with its full load, shall be able to be filled with water up to the top of the upper buoyancy chamber and shall keep its shape without deterioration or serious deformation.

5.2.4 Stability and performance at sea

5.2.4.1 Stability — General

The liferaft shall be so constructed that, when fully inflated and floating with the canopy uppermost, it is stable in a seaway.

The stability of the liferaft, when loaded with its full complement of persons and equipment, shall be such that it can be towed at speeds of up to 3 kn in calm water.

If the stability is achieved by means of water pocket(s), it/they shall comply with the following requirements:

a) the pocket(s) shall be of a highly visible colour;

b) the pocket(s) shall be designed to comply with 6.4;

c) the pocket(s) shall have an aggregate capacity of at least 220 L for liferafts with a capacity of up to 10 persons;

d) the pocket(s) for liferafts certified to carry more than 10 persons shall have an aggregate capacity of not less than ($20 \times N$) L, where N = number of persons carried; and

e) the pocket(s) shall be positioned symmetrically round the circumference of the liferaft. Means shall be provided to enable air to readily escape from underneath the liferaft.

5.2.4.2 Stability under dissymmetrical loading

The liferaft, inflated to its operating pressure, under calm water conditions, shall neither turn over nor be flooded when all the passengers, each wearing a fully inflated 150 N lifejacket, are grouped together first at any point on the liferaft, then at its opposite point.

5.2.4.3 Boarding stability

Two persons onboard, each wearing a fully inflated 150 N lifejacket, shall be able to take on board, under calm sea conditions, a third person wearing a fully inflated 150 N lifejacket and floating on his/her back, completely immobile, without the liferaft capsizing or being flooded.

5.2.4.4 Stability in a seaway

The liferaft shall be constructed in such a manner that, once inflated and floating upright with the canopy erected and sea anchor streamed, it remains stable in a seaway.

5.2.4.5 Towing performance

The towing point shall be suitable for a towing line of a diameter up to 18 mm (or as an alternative, tubular tape of up to 16 mm width).

The liferaft, inflated to its design operating pressure, under calm water conditions, with its full load, shall not be damaged and shall not capsize or be swamped when towed by the towing line at a speed of 3 kn, the sea anchor not being streamed.

5.2.4.6 Righting

Each capsized liferaft shall be able to be righted by a single person. This requirement is considered to be fulfilled if the righting test described in 6.5 is performed with success.

5.2.4.7 Boarding

The liferaft shall be designed so that as the persons will be able to board the liferaft alone from the water.

Four adults of differing physiques and with at least one of each gender, each wearing a shirt, trousers, offshore foul-weather suit and a fully inflated 150 N lifejacket, shall be able to climb aboard, in accordance with 6.6.

5.2.4.8 Performance with sea anchor deployed

The liferaft shall not be damaged and shall not capsize or be flooded when the test with the sea anchor deployed is carried out in accordance with 6.7.

5.2.4.9 Manoeuvrability

The liferaft, in calm sea conditions and normally inflated, loaded with the necessary equipment and with its full load of persons, shall be able to move forward under the action of the passengers with the supplied paddles, over a distance of 20 m in less than 2 min.

5.2.5 Solidity, watertightness, materials

5.2.5.1 Resistance to excess pressure

The liferaft shall be capable of resisting a pressure equal to three times the operating pressure in accordance with 6.8.1.2.

5.2.5.2 Pressure retention of the buoyancy chambers and of the canopy support

The buoyancy chambers, the canopy support and, if fitted, the inflatable floor shall be sufficiently airtight, in order to conserve the operating pressure during use.

This requirement is considered to be fulfilled when the pressure conservation test in 6.8.1 is complied with.

5.2.5.3 Watertightness of the canopy

The canopy shall be sufficiently watertight, in order to prevent any significant entry of water into the liferaft during rough weather.

This requirement is considered to be fulfilled when the watertightness test in 6.9 is complied with.

Canopy entrances shall be designed to be easily and quickly closed and opened.

5.2.5.4 Boarding from a height

The liferaft, inflated to its operating pressure, under calmwater conditions, shall be able to withstand, without any visible damage, the falling onto the canopy and in the liferaft entrance of a bag of sand weighing 75 kg from a height of 3 m above the water level, and this as many times as its carrying capacity.

5.2.5.5 Cordages and lifelines

The liferaft shall be equipped with internal and external lifelines allowing shipwrecked persons to cling onto them.

All cordages and webbing shall be rot-proof, resistant to weathering and to oils and petroleum products.

Cordage shall be of a colour contrasting with the main body of the liferafts.

Cordage and webbing shall be attached to the liferaft in such a manner that, if forcibly detached, the liferaft structure shall comply with the other requirements.

The breaking load of a lifeline and of the fastening points shall be at least 2 kN.

The lifelines shall be able to be grabbed without injuring the hand or slipping. Rope-type lifelines shall have a diameter of at least 8 mm and webbing-type lifelines shall be at least 25 mm wide.

5.2.6 Habitability

5.2.6.1 Floor

The liferaft floor shall be watertight.

On group A liferafts, the floor shall include thermal insulation. If the thermal insulation is achieved by a floor having one or more inflatable compartments, the latter shall be able to be deflated and reinflated by the occupants.

5.2.6.2 Canopy

The canopy shall erect automatically on inflation of the liferaft, and shall remain erected even in the case of deflation of either of the buoyancy chambers.

The canopy shall be fitted with a device for collecting rainwater when a "> 24 h equipment" pack is fitted.

All liferafts shall be equipped with ventilation means which allow the renewal of the air inside the liferaft.

5.2.6.3 Habitability and lookout means

All liferafts shall be equipped with lookout means.

Provision shall be made for an occupant to make horizontal observations through 360°.

A clear plastic window in the canopy may be included but shall not be substituted for a closable lookout aperture.

A test shall be carried out to ensure that there is adequate headroom for the maximum design complement when all persons are seated.

For this test, the persons shall have an average weight of 75 kg, shall include at least two persons of height 1,85 m, and shall each wear sailing clothes with an offshore foul-weather suit and a fully inflated 150 N lifejacket. A seated person shall not be forced to incline his head or torso forwards from a natural sitting posture.

5.2.6.4 Interior lighting

There shall be interior lighting providing a luminous intensity sufficient for the occupants to read the instructions.

5.2.7 Visibility to rescuers

5.2.7.1 Canopy colour

The colour of the exposed portions of canopy shall be in the range from yellow to red, excluding components such as cordages, webbing, zips and other fittings.

5.2.7.2 Retro-reflective material

A minimum surface area of 1 500 cm^2 of retro-reflective material shall be fixed to the liferaft approximately 2/3 to the upper half of the canopy, and approximately 1/3 to the outer part of the liferaft bottom.

The retro-reflective material shall comply with IMO SOLAS 83, Chapter III, Resolution A.658 (16), Annex 2.

5.2.7.3 External lighting

5.2.7.3.1 General

The liferaft shall be equipped with an external marker lamp at the top of the canopy.

The external lamp shall light automatically when the liferaft inflates in the water and shall incorporate suitable means of manual control to save discharging the battery in daytime.

The external lamp shall be firmly attached to the canopy and shall provide either a continuous beam of light in accordance with 5.2.7.3.2 or a flashing light in accordance with 5.2.7.3.3.

5.2.7.3.2 Continuous beam

The lamp shall provide light in a horizontal beam subtending an angle of at least 10° vertically and 360° horizontally, with a luminous intensity not less than 4,3 cd during a continuous period of at least 12 h.

NOTE Additional areas of light may be provided, such as a vertical cone or a surface extending over the entire hemisphere above the horizontal.

5.2.7.3.3 Flashing light

The lamp shall emit a flashing light which shall flash at a rate of not less than 50 and not more than 70 flashes per minute for a minimum of 12 h. Each flash shall have an effective luminous intensity of not less than 4,3 cd, measured in any direction above the horizontal.

The effective luminous intensity should be taken as:

$$\frac{\int_{t_2}^{t_1} I \times \mathrm{d}t}{0{,}2 + (t_2 - t_1)}$$

where

t_1 is the time, in seconds, at the beginning of the flash;

t_2 is the time, in seconds, at the end of the flash;

I is the instantaneous intensity;

0,2 is the Blondel-Rey constant, in seconds.

5.2.8 Fittings and equipment

5.2.8.1 General

The means for survival are provided by the proper operation of the liferaft, its fittings and equipment.

5.2.8.2 Fittings

5.2.8.2.1 Boarding means

Liferafts designed to carry 8 persons or less shall have at least one entrance.

Liferafts designed to carry over 8 persons shall possess 2 entrances, able to be used simultaneously without jeopardising the stability of the liferaft.

In addition to the grab lines referred to in 5.2.5.5, at least one entrance shall be fitted with a boarding ramp, rigid inflatable, or semi-rigid, or equivalent means, capable of supporting a person weighing 75 kg, to enable a person of not more than average physical ability, to board the liferaft unaided from the sea. The system shall be tested according to 6.6.

5.2.8.2.2 Sea anchor

At least one sea anchor shall be provided, complying with ISO 17339:2002, except for 4.2 and 5.4.

5.2.8.2.3 Rescue quoit

Provision shall be made for a rescue quoit or a throwing sock in the interior of the liferaft near to the boarding entrance. It shall be attached to a floating line at least 30 m in length, the other end of the line being secured to the liferaft. The line shall be suitably arranged in order to allow the rescue quoit to be rapidly thrown to the maximum distance.

The breaking strength of the lifebuoy, of the floating line and of its attachment system shall not be less than 1,0 kN. The minimum internal diameter shall be 100 mm.

5.2.8.2.4 Safety knife

A safety knife shall be securely stowed in a visible manner in the vicinity of the painter-line attachment.

The knife shall be secured to the liferaft by a line of sufficient length, to enable the painter line to be cut. The knife shall be stowed, so as not to damage the liferaft on inflation, or when the latter is launched. It shall be so designed that it does not damage the liferaft if accidentally dropped. It shall be sufficiently buoyant in order to float in water.

5.2.8.2.5 Equipment stowage

Appropriate stowage for equipment shall be provided.

5.2.8.3 Equipment

Independently of the sea conditions which may be encountered, which determine the group of liferaft to be used (see 4.2), the pack of equipment is to be chosen according to the time likely to be spent onboard before being rescued.

Two types of minimal packs are defined in Table 2, according to whether this time may be greater than 24 h or not. Specifications of the items to include in the pack are listed in Table 2.

NOTE The items in Table 2 constitute the minimum pack; other pack types may contain additional items.

Table 2 — Minimal required equipment

Equipment	Pack 1 > 24 h	Pack 2 < 24 h	In liferaft	In liferaft or in grab bag
Portable buoyant baler easily operable by hand	1	1	X	
Sponge	2	2	X	
Pair of buoyant paddles with handles (not mitts) tied into raft adjacent to an entrance	1	1	X	
First-Aid Kit including at least 2 tubes of sunscreen. All dressings must be capable of being effectively used in wet conditions. The first-aid kit shall be clearly marked and shall be re-sealable	1	0		X
Whistle	1	1	X	
Waterproof torch with 6 h duration and separate battery and bulb or complementary torch	2	1	X	
Signaling mirror	1	1	X	
Anti-seasickness pills, per person	6	6		X
Seasickness bag with simple effective closure system, per person	1	1		X
Red hand flares in accordance with SOLAS LSA Code Chapter III, 3.2	6	3	3 min	X
Red parachute flares in accordance with SOLAS LSA Code Chapter III, 3.1	2	2	1 min	X
Thermal protective aids in accordance with SOLAS LSA Code Chapter III, 2.5	2	0		X
Repair outfit to enable survivors to repair leaks in any or all of the inflatable compartments. Repair systems must work when wet and be capable of being applied during violent motion	1	1	X	
Air pump or bellows which shall be simple, robust and complete, with all necessary connections (loose parts shall be captive to the main apparatus) ready for instant use to enable air to be pumped into any or all of the inflatable compartments. The air pump or bellows shall be designed and built specifically for easy operation by hand	1	1	X	
Drinking water per person, in containers of each not more than 500 mL	1,5 L	0	0,5 L	X[a]
Food per person	10 000 kJ	0		X

[a] Drinking water in the grab bag (if any) may be replaced with a desalinisator device.

When the liferaft is inflated, the equipment pack shall be easily accessible.

The equipment pack shall be protected against infiltration of water.

The equipment pack included in the liferaft shall be captive by a line to the inside of the raft.

Every package and closure shall be capable of being opened easily by a person wearing the gloves of an immersion suit (to simulate cold, wet, numbed hands) and without an implement of any kind. All packaging materials shall be impervious to water. All packaging shall have readily resealable closures.

All items shall (except where essential) be without sharp corners, sharp edges and unnecessary protrusions which could injure survivors or cause damage to the liferaft fabric.

In conformity with Table 2, some equipment items may be supplied separately in a grab bag which shall be stowed on board the parent vessel in a readily accessible location.

In this case, the liferaft shall have a marking that indicates that the grab bag is required in addition to the liferaft.

The grab bag shall be brightly coloured and able to float for 30 min in the water when fully packed.

When launching in water from a height equal to 6 m, no deterioration of the grab bag or of the equipment it contains shall occur.

The grab bag shall have handles suitable for carrying and means of attaching to the inflated raft.

The grab bag shall have a marking indicating that equipment contained in the bag shall be examined in accordance with the manufacturer's instructions and that dated equipment shall be replaced as required.

5.2.9 Instructions and marking

5.2.9.1 General

All instructions and markings shall be comprehensible to the potential users. The use of pictograms is strongly recommended.

5.2.9.2 Information supplied to the owner

Each liferaft shall be provided with the following information, either on the liferaft, or in an owner's manual:

a) carrying capacity, i.e. number of persons;

b) manufacturer's name or trademark;

c) conformity to ISO 9650-1, with identification of the group according to 4.2 and of the pack type according to 5.2.8.3;

d) date of initial commissioning;

e) type of onboard equipment or list of the items contained;

f) liferaft serial number;

g) transport and storage advice;

h) description of liferaft;

i) liferaft use instructions, including in particular:

1) how to launch the liferaft and inflate it;

2) how to right the liferaft;

3) diagram of the inflated liferaft with the locations of the knife, sea anchor, lifebuoy (quoit) and inflation points;

4) first measures to be taken as soon as the persons have boarded the liferaft, including in particular:

i) disengage the painter line and move away from the parent vessel;

ii) deploy the sea anchor to resist capsize;

iii) close the liferaft entrance;

iv) maintain the liferaft in good condition, by bailing out the water, inflating or deploying the insulated bottom (if fitted and if requiring manual deployment), checking for absence of leaks and repairing if required;

j) advice on survival onboard, maintenance and servicing of the liferaft.

5.2.9.3 Operating handbook (in the interior of the liferaft)

Indelibly printed instructions, written in a language comprehensible to the potential users, shall be provided in the interior of the liferaft on a durable waterproof medium and shall cover the following:

a) type of onboard equipment or the list of items contained;

b) use of the liferaft;

c) how to survive onboard;

d) how to right the liferaft after capsizing;

e) diagram of the inflated liferaft with the locations of the knife, painter fixing, sea anchor, throwing line, equipment, and all inflation points;

f) first measures to be taken as soon as the persons have boarded the liferaft, for example:

1) disengage the painter line and move away from the parent vessel;

2) deploy the sea anchor to resist capsize;

3) close the liferaft entrance;

4) maintain the liferaft in good condition, by bailing out the water, inflating or deploying the insulated bottom (if fitted and if requiring manual deployment), checking for absence of leaks and repairing, if required.

5.2.9.4 Service record sheets (in the interior of the liferaft and the pack)

Information about the servicing history (type of interventions, date and name of the service station with its stamp and signature, etc.) shall be recorded inside the liferaft.

5.2.9.5 Marking

The liferaft and its valise or canister shall bear the information specified in Table 3.

These markings shall be visible, clear and indelible and shall have no harmful effect on adjacent materials.

All instructions and markings shall be written in a language that is comprehensible to the potential users. The use of pictograms is strongly recommended.

It is permitted to mark this information on a securely attached seawater-resistant label.

Provision shall be made for marking each liferaft with the name of the owner or the name and port of registry of the vessel to which it is to be fitted, in such a form that the vessel identification can be changed at any time without opening the container.

Table 3 — Information on the manufacturer's identification plate and on the valise or canister

Marking on the liferaft	Marking on valise or canister
a) number of persons; b) manufacturer's name or trademark; c) conformity to ISO 9650-1; d) serial number and date of manufacture.	a) number of persons; b) manufacturer's name or trademark; c) conformity to ISO 9650-1; d) date of last service and identification of service station; e) recommended service interval; f) liferaft type and group; g) liferaft serial number; h) maximum launching height (6 m); i) information on the painter-line length (pictogram or plain written information); j) launching instructions (pictograms or plain written text); k) if a separate grab bag, list of equipment inside the liferaft and the list of equipment in the grab bag.

5.2.10 Packaging

The liferaft and its equipment shall be packed inside a valise or canister.

Appropriate means shall be provided for reasonable ease of handling the liferaft in its valise or canister.

5.2.11 Servicing

Liferafts shall be regularly serviced by manufacturer-approved service stations.

Manufacturers shall:

a) ensure that their liferafts are designed and constructed to be suitably serviced in accordance with their recommendations;

b) determine and publish service recommendations including maximum service intervals;

c) offer to the consumer a list of approved service stations;

d) ensure that each service station approved by them for servicing and repairing their liferafts possesses qualified persons who have been suitably trained by them, and to whom they have issued the certificates required for performing these tasks and who are familiar with all changes or new techniques;

e) place at the disposal of the service stations:

   1) a servicing manual;

   2) the modifications made to the servicing manuals, as well as the servicing-related bulletins and instructions;

   3) the appropriate materials and spare parts.

The service stations shall inspect, in accordance with the manufacturer's instructions:

a) the structure;

b) the inflation system;

c) the equipment in the liferaft, except the equipment in the grab bag if existing;

d) the packaging.

A detailed list of the points to be serviced, the procedures to be followed, the items to be replaced, etc. shall form the subject of a precise documentation supplied to the service station.

All items having an expiry date shall normally be changed when this date arrives prior to the next scheduled service, barring any specific listed cases.

All inspections carried out shall be recorded and kept by the station.

The servicing date, the name of the service station, its stamp and signature shall figure on a document given to the owner and on the service record placed in the liferaft.

6 Test methods

6.1 General

The following tests shall be satisfactorily completed on a representative sample of each raft.

Weights used in the following tests may be bags filled with water or sand.

6.2 Launching test

A launching test for each type of packaging shall be carried out under the following conditions.

Position the complete liferaft, packaged in a valise or canister, at a height of 6 m above the water.

Attach the painter line to a fixed point so that it pays out when the liferaft drops.

Let the liferaft drop into the water and leave it to float for 30 min, then inflate it by pulling on the painter line. Measure the time taken:

a) by the buoyancy chambers to inflate to their final shape and for the canopy to fully deploy;

b) to reach the design operating pressure.

The buoyancy chambers shall be inflated to their final shape and the canopy support deployed within 60 s of actuating the inflation device, enabling persons to board.

The operating pressure shall be achieved within 3 min of actuating the inflation device.

Remove the liferaft from the water and inspect it. No deterioration of the liferaft, or of its equipment, likely to affect the use of the liferaft shall be observed.

6.3 Inflation tests under temperature

6.3.1 Generalities

These tests shall be carried out for each packaging type according to the procedures described in 6.3.2, 6.3.3 and 6.3.4.

6.3.2 Ambient-temperature test

Let the liferaft packaged in its valise or canister stand for 24 h at an ambient temperature of (20 ± 2) °C.

Inflate the liferaft by pulling on the painter line.

The buoyancy chambers shall be inflated to their final shape and the canopy deployed within 60 s of actuating the inflation device, enabling persons to board.

The operating pressure shall be achieved within 3 min of actuating the inflation device.

NOTE This test may be omitted provided neither the water nor air temperatures during the launching test exceed 22 °C.

6.3.3 High-temperature test

Each type of liferaft shall be tested according to the procedure described below.

Place the liferaft, packaged in its valise or canister, in a preheated chamber set at + 65 °C and leave it for at least 7 h at + 65 °C.

Inflate the liferaft by pulling on the painter line to trigger the firing mechanism.

Inspect the liferaft for any defects that could give problems with the intended use of the raft.

There shall be no evidence of seam slippage, constructional defects, valve dysfunction or material deterioration as a result of the tests.

The maximum pressure shall be recorded and shall not exceed that required for the pressure test described in 6.8.1.2.

6.3.4 Low-temperature test

Each type of liferaft shall be tested according to the procedure described below.

Place the liferaft, packaged in its valise or canister, in a precooled chamber set at −15 °C (group A liferafts) or at 0 °C (group B liferafts) and leave it for at least 24 h.

Stay in this room at the temperature of −15 °C (group A liferafts) or of 0 °C (group B liferafts), and inflate the liferaft by pulling on the painter line to trigger the firing mechanism.

The buoyancy chambers shall be inflated to their operating pressure and the canopy deployed within 5 min of actuating the inflation device, enabling persons to board.

Inspect the liferaft for any defects that could give problems with the intended use of the raft.

There shall be no evidence of seam slippage, constructional defects, valve dysfunction or material deterioration as a result of the tests.

6.4 Testing of stabilisation means

a) Inflate the liferaft to the design operating pressure, supporting it in the air in such a manner that 2 water pockets, diametrically opposed (or fairly close to the diameter), are suspended freely with a 300 mm space between the support and the pocket attachment.

Load each water pocket with a weight equivalent to three times the mass of water that it can contain, and extend the test for 1 h. Visually inspect each water pocket and its attachment. The latter shall not show any sign of failure.

b) Inflate the liferaft to the design operating pressure, supporting it in the air. Immerse a dry water pocket in the water for 25 s, raise vertically and measure. The pocket shall contain at least 60 % of its total water capacity.

For tests a) and b), all water pockets having different dimensions, shapes or attachments shall be tested.

NOTE Tests a) and b) may be carried out on an appropriate rig, allowing the testing of a water pocket having identical dimensions and attachments to those used on the liferaft.

6.5 Righting test

This test is carried out on a normally inflated liferaft in a swimming pool, in water deep enough so that the person cannot touch the bottom.

Overturn the liferaft and leave a team of 4 adults to attempt to right it. The latter shall preferably not be good swimmers and shall have different physiques.

Each team member shall wear a shirt, trousers, offshore foul-weather suit and a fully inflated 150 N lifejacket.

Each person shall swim 50 m before attempting to right the liferaft, and there shall be no rest period between the swimming and the righting attempt.

Each team member (of each gender) shall be able to right the liferaft unaided.

6.6 Boarding test

This test is carried out on the same liferaft, under the same conditions and by the same team as for the righting test in 6.5.

Each person shall wear a fully inflated 150 N lifejacket.

Each person shall swim 50 m before attempting to board the liferaft, and there shall be no rest period between the swimming and the boarding attempt.

Each person shall be able to board the liferaft unaided.

6.7 Towing test with sea anchor deployed

After having inflated the liferaft normally in calm water, deploy the sea anchor, then tow the liferaft at a speed of 3 kn, using 30 m of tow line.

Stop and resume towing, jolting forward several times.

During this test:

a) the sea anchor shall remain deployed in a stable position beneath the water surface during towing or in calm flowing water;

b) the minimum traction exerted on the sea anchor during towing shall be 350 N;

c) in the case of towing in jerks and jolts, the sea anchor shall not become tangled in the shroud lines or tear the opening.

A tensile test will then be performed on the tow buoy rope. The breaking load of the line and of its attachment shall not be less than 7,5 kN.

6.8 Pressure test

6.8.1 Buoyancy chambers and canopy support

6.8.1.1 Test for air-pressure conservation

Inflate to a pressure equal to the operating pressure, then leave to stand for 30 min.

Readjust, if necessary, the design operating pressure, note the ambient temperature, wait 1 h and record the measured final pressure and the ambient temperature.

Apply, if necessary, a correction taking account of the variation in temperature at the rate of 0,4 kPa/°C.

The final pressure, corrected if necessary, shall not be less than 95 % of the initial pressure.

The test is only valid if the temperature variation within the chamber is less than or equal to 3 °C.

The pressure-relief valves shall remain operative during the test.

6.8.1.2 Excess-pressure test

Each inflatable compartment in the liferaft should be tested to a pressure equal to 3 times the operating pressure.

Each pressure-relief valve should be made inoperative, and compressed air should be used to inflate the inflatable liferaft.

If necessary, additional compressed air can be used to maintain the pressure at a constant level in the liferaft.

After pressure stabilization, and after the inflation source has been removed, the test should continue for at least 30 min.

The pressure should not decrease by more than 5 %, determined without compensating for temperature and atmospheric pressure changes, and there should be no seam slippage, cracking or other defect in the liferaft.

6.8.2 **Inflatable floor** (if fitted)

Inflate to an air pressure equal to the design operating pressure, then leave to stand for 30 min.

Readjust, if necessary, the design operating pressure, wait 30 min and record the measured final pressure.

The final pressure shall not be less than 80 % of the initial pressure.

6.9 Canopy watertightness test

Inflate the liferaft to the design operating pressure. Verify that the interior is dry and attach the canopy closures at each entrance in accordance with the manufacturer's instructions.

Direct a jet of water to each entrance for at least 5 min. This jet has a flow rate of (500 ± 50) L/min. It is sent through a hose, of a maximum diameter of 35 mm, from a point 3,5 m away, 1,5 m above the top of the buoyancy chambers.

The quantity of water that has penetrated into the liferaft shall not exceed 5 L.

Bibliography

[1] SOLAS Convention

[2] International Aeronautical and Maritime Search and Rescue Manual (IAMSAR), Vol. III Mobile Facilities

[3] International Code of Signals, as amended pursuant to resolution A.80(IV)

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