International Standard

ISO 6185-3

Third edition
2024-04

# Inflatable boats —

# Part 3: Boats with a length of the hull less than 8 m with a motor power rating of 15 kW and greater

*Bateaux pneumatiques —*

*Partie 3: Bateaux d'une longueur de coque inférieure à 8 m et d'une puissance moteur assignée supérieure ou égale à 15 kW*



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# Foreword

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

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This document was prepared by Technical Committee ISO/TC 188, *Small craft*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 464, *Small Craft*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 6185-3:2014), which has been technically revised.

The main changes are as follows:

— Type VII and VIII boats now distinguished only by design category, not by power;

— definitions updated to reflect current practice;

— Type VIII (category) boats are permitted a greater range of heel angle to achieve the minimum required righting moment;

— to reflect the increase in power and speed, in-water performance tests may be conducted at less than full power and in smaller waves;

— crew are recommended not to sit on tubes when operating at high-speed or in waves higher than 2 m, regardless of their design category;

— addition of requirements for design and testing of lifting points.

A list of all parts in the ISO 6185 series can be found on the ISO website.

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

The ISO 6185 series is subdivided into four parts as shown below. It excludes:

— boats with a tube consisting of a single buoyancy chamber;

— boats < 1 800 N buoyancy;

— boats made from unsupported materials > 12 kN inflated buoyancy and powered by engines > 4, 5 kW.

It is not applicable to:

— aquatic toys;

— inflatable liferafts.

ISO 6185-1:

— Type I Boats with $L_H$ < 8 m propelled exclusively by manual means.

— Type II Powered boats with $L_H$ < 8 m with a power ≤ 4, 5 kW.

— Type III Canoes and kayaks with $L_H$ < 8 m.

— Type IV Sail boats with $L_H$ < 8 m with a sail area ≤ 6 $m^2$.

ISO 6185-2:

— Type V Powered boats with $L_H$ < 8 m with power 4,5 kW < $P$ ≤ 15 kW

— Type VI Sail boats with $L_H$ < 8 m with sail area > 6 $m^2$.

This document (ISO 6185-3):

— Type Vll Powered boats with $L_H$ < 8 m in design category C or D with power ≥ 15 kW.

— Type Vlll Powered boats with $L_H$ < 8 m in design category B with power ≥ 15 kW.

ISO 6185-4:

— Type IX Powered boats (design categories C and D) with 8 m < $L_H$ ≤ 24 m with power ≥ 15 kW.

— Type X Powered boats (design category B) with 8 m < $L_H$ ≤ 24 m with power ≥ 75 kW.

NOTE ISO 6185-4 applies only to rigid inflatable boats with 8 m < $L_H$ ≤ 24 m. For non-rigid inflatables with a length of hull in this range, this document can be applied.

# Inflatable boats —

# Part 3:
# Boats with a length of the hull less than 8 m with a motor power rating of 15 kW and greater

## 1 Scope

This document specifies the minimum safety characteristics required for the design, materials, manufacture and testing of inflatable boats and rigid inflatable boats with a length of the hull, $L_H$ in accordance with ISO 8666 less than 8 m with a motor power rating of 15 kW and greater.

This document is applicable to the following types of boats intended for use within the operating temperatures of –20 °C to +60 °C:

— Type VII: Powered boats, fitted with a buoyancy tube on the port and starboard sides, suitable for navigation in conditions of design categories C and D.

— Type VIII: Powered boats, fitted with a buoyancy tube on the port and starboard sides, suitable for navigation in conditions of design category B.

This document excludes single-chambered boats and boats with tubes made from unsupported materials, and does not apply to aquatic toys and inflatable liferafts.

Boats with tubes made from aluminium, roto-moulded polyethylene, fibre reinforced plastic or other rigid materials are excluded from this document.

## 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.

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2411, *Rubber- or plastics-coated fabrics — Determination of coating adhesion*

ISO 3011, *Rubber- or plastics-coated fabrics — Determination of resistance to ozone cracking under static conditions*

ISO 4674-1, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods*

ISO 4675, *Rubber- or plastics-coated fabrics — Low-temperature bend test*

ISO 7840, *Small craft — Fire-resistant fuel hoses*

ISO 8099-1, *Small craft — Waste systems — Part 1: Waste water retention*

ISO 8099-2, *Small craft — Waste systems — Part 2: Sewage treatment systems*

ISO 8469, *Small craft — Non-fire-resistant fuel hoses*

ISO 8847, *Small craft — Steering gear — Cable over pulley systems*

ISO 8848, *Small craft — Remote mechanical steering systems*

ISO 9093, *Small craft — Seacocks and through-hull fittings*

ISO 9094, *Small craft — Fire protection*

ISO 10087, *Small craft — Craft identification — Coding system*

ISO 10088, *Small craft — Permanently installed fuel systems*

ISO 10239, *Small craft — Liquefied petroleum gas (LPG) systems*

ISO 10592, *Small craft — Remote hydraulic steering systems*

ISO 11105, *Small craft — Ventilation of petrol engine and/or petrol tank compartments*

ISO 11591, *Small craft — Field of vision from the steering position*

ISO 11592-1, *Small craft — Determination of maximum propulsion power rating using manoeuvring speed — Part 1: Craft with a length of hull less than 8 m*

ISO 11812, *Small craft — Watertight or quick-draining recesses and cockpits*

ISO 12215-1, *Small craft — Hull construction and scantlings — Part 1: Materials: Thermosetting resins, glass-fibre reinforcement, reference laminate*

ISO 12215-2, *Small craft — Hull construction and scantlings — Part 2: Materials: Core materials for sandwich construction, embedded materials*

ISO 12215-3, *Small craft — Hull construction and scantlings — Part 3: Materials: Steel, aluminium alloys, wood, other materials*

ISO 12215-5, *Small craft — Hull construction and scantlings — Part 5: Design pressures for monohulls, design stresses, scantlings determination*

ISO 12216:2020/Amd 1:2022, *Small craft — Windows, portlights, hatches, deadlights and doors — Strength and watertightness requirements — Amendment 1*

ISO 12217-1:2022, *Small craft — Stability and buoyancy assessment and categorization — Part 1: Non-sailing boats of hull length greater than or equal to 6 m*

ISO 13297, *Small craft — Electrical systems — Alternating and direct current installations*

ISO 13929, *Small craft — Steering gear — Geared link systems*

ISO 14945, *Small craft — Builder's plate*

ISO 14946, *Small craft — Maximum load capacity*

ISO 15084, *Small craft — Anchoring, mooring and towing — Strong points*

ISO 15085:2003/Amd 2:2017, *Small craft — Man-overboard prevention and recovery — Amendment 2*

ISO 16315, *Small craft — Electric propulsion system*

ISO 21487, *Small craft — Permanently installed petrol and diesel fuel tanks*

ISO 23411, *Small craft — Steering wheels*

ISO 25197, *Small craft — Electrical/electronic control systems for steering, shift and throttle*

EN 314-2, *Plywood – Bonding quality – Part 2: Requirements*

## 3 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**
**inflatable boat**
boat achieving all or part of its intended shape and buoyancy by *inflatable buoyancy tubes* (3.5) or *foam-filled buoyancy tubes* (3.6)

**3.2**
**rigid inflatable boat**
**RIB**
*inflatable boat* (3.1) achieving all or part of its intended shape by means of a lower part formed by a rigid structure and an upper, non-rigid, *inflatable buoyancy tube* (3.5) and/or *foam-filled buoyancy tube* (3.6)

**3.3**
**buoyancy**
volume of all chambers which form the inflatable hull, plus any other buoyant component which is permanently fixed to it

Note 1 to entry: The term "permanently fixed" implies detachment is only possible by the use of tools.

**3.4**
**total buoyant volume**
*V*
buoyancy comprising the buoyant volumes of the *inflatable buoyancy tube* (3.5) and the *foam-filled buoyancy tube* (3.6) added to the *permanent inherent buoyancy* (3.7) added to the *permanent sealed buoyancy* (3.8) added to the inherent buoyancy of the rigid parts of the boat

**3.5**
**inflatable buoyancy tube**
buoyancy tube on both port and starboard sides of the hull when the boat is in use, and inflated with air

**3.6**
**foam-filled buoyancy tube**
buoyancy tube on both port and starboard sides of the hull when the boat is in use, and filled with closed cell foam

**3.7**
**permanent inherent buoyancy**
buoyancy provided by materials, contained within the rigid hull and cockpit

**3.8**
**permanent sealed buoyancy**
buoyancy provided by sealed chambers, contained within the rigid hull and cockpit, filled with air

**3.9**
**crew limit**
**CL**
maximum recommended number of persons to be carried when the boat is underway

Note 1 to entry: See Clause 10 for information to be displayed on the builder's plate.

**3.10**
**design category**
description of the sea and wind conditions for which a boat is assessed to be suitable

Note 1 to entry: See ISO 12217-1, ISO 12217-2 and ISO 12217-3 for the description of design categories.

**3.11**
**high-speed boat**
motor boat having a maximum speed, in knots, greater than $7 \times \sqrt{L_H}$ or 25 knots, whichever is the greater

Note 1 to entry: 1 knot = 1,852 km/h.

**3.12**
**seat**
any surface, horizontal or nearly horizontal, where a person may sit

**3.13**
**lifting the boat**
procedure for raising a boat by strong points, usually for attaching to crane or davit

**3.14**
**motor**
all types of motor or engine, whether electric, internal combustion or otherwise

Note 1 to entry: In this document, "engine" refers only to internal combustion engines.

## 4 Symbols and abbreviated terms

| Symbol | Designation | Unit |
|---|---|---|
| $A_{LV}$ | windage area of the hull in profile at the appropriate loading condition | $m^2$ |
| $B_{CL}$ | the maximum transverse distance between outboard extremities of any parts of the crew area, corresponding to the centrelines of the tubes' cross-sectional area | m |
| $B_H$[a] | beam of the hull, measured with the inflatable tubes inflated to nominal pressure | m |
| $B_{IVT}$ | beam between inner vertical tangent of tubes | m |
| CL | crew limit | — |
| $d$ | maximum tube diameter, measured within the straight sections of the buoyancy tube section | mm |
| $F_M$ | material factor for boats that are designed to be lifted | — |
| $F_s$ | minimum force to assess seam strength | N |
| $F_t$ | tear resistance force | N |
| $L_H$[a] | length of the hull, measured with the inflatable tubes inflated to nominal pressure | m |
| $L_{STS}$ | length of the sample buoyancy tube section | m |
| $L_T$ | total length of the buoyancy tube on all sides of the boat | m |
| $m_{LDC}$ | mass of the boat in the maximum load condition[a] | kg |
| $m$ | mass of a constituent part of the boat | kg |
| $m_T$[a] | mass when towed on a trailer | kg |
| $N$ | number of buoyancy chambers | — |
| $p$ | nominal pressure at 20 °C | bar[b] |
| $\rho$ | density of material | $kg/m^3$ |

[a] Definition provided in ISO 8666:2020.

[b] 1 bar = 0,1 MPa = $10^5$ Pa; 1 MPa = 1 $N/mm^2$.

| Symbol | Designation | Unit |
|---|---|---|
| $V$ | total buoyant volume of the boat | $m^3$ |
| $v$ | volume of a constituent part of the boat | $m^3$ |
| $V_c$ | volume of each chamber | $m^3$ |
| $V_T$ | total volume of the buoyancy tube | $m^3$ |

[a] Definition provided in ISO 8666:2020.

[b] 1 bar = 0,1 MPa = $10^5$ Pa; 1 MPa = 1 N/$mm^2$.

# 5 Construction and structural requirements

## 5.1 Structural materials

### 5.1.1 General

For construction and structural assessment, the general requirements in ISO 12215-1, ISO 12215-2 and ISO 12215-3 shall apply.

For flexible floor and buoyancy tube materials, the requirements specified in 5.1.2 shall apply. For plywood parts, the requirements specified in 5.1.3 shall apply.

### 5.1.2 Materials forming the flexible floor and buoyancy tube

#### 5.1.2.1 Requirements

All flexible floor and buoyancy materials shall meet the requirements stipulated in 5.1.2.2 and shall retain their full serviceability within the operating temperature range of –20 °C to +60 °C.

#### 5.1.2.2 Test methods

##### 5.1.2.2.1 Sampling

Carry out the test with test pieces taken from the materials prior to manufacturing the boat. If the boats are vulcanized during manufacture, the test pieces shall also be vulcanized.

##### 5.1.2.2.2 Resistance to liquids

Carry out the test in accordance with ISO 1817 on the external side of the material using IRM 901 oil (A) and salt water (B) as specified in Table 1.

In both cases (A) and (B), the change in mass per unit area shall not exceed 100 g/$m^2$ following the stipulated period of contact with the test liquid at a temperature of 70 °C ± 2 °C.

**Table 1 — Duration of tests**

| Parameter | A | B |
|---|---|---|
| Test liquid | IRM 901 oil[a] | Salt water[b] |
| Period of contact (hours) | (22 ± 0,25) | ≥ 336 |

[a] IRM 901 oil has replaced ASTM oil No. 1.

[b] Components of salt water: distilled water +30 g of sodium chloride per litre.

#### 5.1.2.2.3 Resistance to ozone

Carry out the test as specified in ISO 3011 on the external face of the material in contact with the ambient environment as specified below:

— Exposure time: 72 h

— Temperature of test: 30 °C ± 2 °C

— Concentration: a volume fraction of $0{,}5 \times 10^{-6}$

— Mandrel diameter: five times the material thickness

There shall be no signs of cracking on completion of the test when test samples are examined under 10 × magnification.

#### 5.1.2.2.4 Resistance to cold

The material shall satisfy the requirements of ISO 4675 at a temperature of −20 °C.

#### 5.1.2.2.5 Tear strength

Carry out the test as specified in ISO 4674-1, method B.

The minimum value of tear resistance, $F_t$, in newtons, is given by Formula (1):

$$F_t = 0{,}375\ d\ (1{,}14\ p + 0{,}14) \quad (1)$$

In all cases, $F_t$ shall be not less than 75 N.

#### 5.1.2.2.6 Coating adhesion

Prepare and carry out the test on the material in accordance with ISO 2411 at room temperature and a machine rate of 100 mm/min ± 10 mm/min. The minimum adhesion value shall be 40 N per 25 mm.

#### 5.1.2.2.7 Seam strength testing of buoyancy chambers

Join two pieces of the material together in the same manner as used in the boat construction (method, material, dimensions) to form a 50 mm-wide test piece. Apply the minimum seam force, $F_s$, at 60 °C over a period of 4 h. Where more than one method of seam construction is used in the manufacture of the boat, carry out the test for each method.

The minimum seam force, $F_s$, in newtons, is given by Formula (2):

$$F_s = 3{,}75\ d\ (1{,}14\ p + 0{,}14) \quad (2)$$

There shall be no slipping or other failure at any part of the seam.

### 5.1.3 Wood

#### 5.1.3.1 General requirements

Wood parts contributing to the integrity of the boat shall comply with requirements specified in ISO 12215-3 and ISO 12215-5.

#### 5.1.3.2 Plywood

In addition to the general requirements in 5.1.3.1, plywood parts contributing to the integrity of the boat shall conform to requirements of EN 314-2.

## 5.2 Buoyant material used in foam-filled buoyancy tubes

### 5.2.1 General

The foam selected to fill buoyancy tubes shall have the stiffness required to support crew and sea loads.

Buoyant materials used in foam-filled buoyancy tubes shall conform to the tests prescribed in 5.2.2.

### 5.2.2 Tests

#### 5.2.2.1 General

Ten samples of the buoyant material shall be subject to the tests prescribed in 5.2.2.2 to 5.2.2.3. They shall be at least 300 $mm^2$ and of the same thickness as used in the buoyancy tube.

Six of the samples shall be used for the water absorption test in 5.2.2.3.

#### 5.2.2.2 Tests for stability under temperature cycling

Eight samples shall be alternately subjected for 8 h to surrounding temperatures of −30 °C and +65 °C. The following procedure shall be used:

a) store the samples for 8 h at +65 °C, to be completed on the first day;

b) remove the samples from the warm chamber that same day and leave them exposed under ordinary room conditions until the next day;

c) store the samples in a cold chamber for 8 h at −30 °C, to be completed the second day;

d) remove the samples from the cold chamber that same day and leave them exposed under ordinary room conditions until the next day.

Repeat the procedure until 10 cycles of steps a), b), c), and d) have been made.

The samples shall be carefully examined at the end of the tests and shall not show any visible sign of external change of structure.

Furthermore, two of the samples shall be cut open and shall not show any visible sign of internal change of structure.

#### 5.2.2.3 Tests for water absorption

The tests shall be carried out in fresh water and the sample shall be immersed for seven days under a 1,25 m head of water.

The tests shall be carried out on:

a) two samples as supplied;

b) eight samples which have been subjected to the temperature cycling as prescribed in 5.2.2.2.

The results shall state the mass in kilograms that each sample can support out of the water after one and seven days immersion (the selection of a test method suitable for obtaining this result directly or indirectly is left to the discretion of the testing body). The reduction of buoyancy shall not exceed 16 % for samples that have been exposed to the diesel oil conditioning and shall not exceed 5 % for all other samples. The samples shall show no visible sign of damage such as shrinking, cracking, swelling, dissolution.

NOTE 1 The determination of water absorption can be carried out according to ISO 2896.

NOTE 2 Material complying with IMO Resolution MSC.81(70)[3] is considered to satisfy this requirement.

## 5.3 Lifting the boat

### 5.3.1 General

Boats are not required to have attachments for lifting but when fitted they shall comply with the requirements of this subclause.

The use of lifting devices and their associated fittings such as straps and lifting slings shall be described in the owner's manual.

### 5.3.2 Fittings for lifting of the boat (if applicable)

Lifting attachment components and their foundations within the boat and lifting slings (if supplied as standard or optional equipment) shall be designed to withstand together, in the boat's intended lifting configuration, the force induced when lifting at least:

a) $5 \times F_M \times (m_T$ + mass of crew for boats lifted with crew aboard);

b) $3 \times F_M \times m_T$ for boats lifted without crew;

where $F_M = 1{,}0$ for metal lifting components and 1,2 for non-metal lifting components.

### 5.3.3 Complete boat overload test

The boat shall be lifted in its intended lifting configuration for 5 min, with at least the following load:

a) $1{,}5 \times (m_T$ + mass of crew for boats lifted with crew aboard) for every unit of production;

b) $1{,}5 \times m_T$ for boats lifted without crew for the type test only.

After the test, the boat shall be inspected and shall be found to be free from signs of permanent deformation or structural failure.

## 5.4 Strength of the boat's structure

### 5.4.1 General

The strength of the boat's structure shall be assessed by one of the test options shown in Table 2.

Where applicable, testing shall be performed with the boat assembled in accordance with the supplied instructions and inflated to the nominal pressure.

**Table 2 — Structural test options**

| Test option | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Boat type | VII | | | VIII | |
| Category | C or D | | | B | |
| Arrangement | Non-rigid inflatable | Rigid inflatable | | Rigid inflatable | |
| Tube attachment and structure | In-water test (5.4.3) | Attachment test (5.5)[a] | Drop test (5.4.2) | Attachment test (5.5)[a] | Drop test (5.4.2) |
| Rigid structure | — | ISO 12215-5 or other relevant structural rules determined by classification societies | | ISO 12215-5 or other relevant structural rules determined by classification societies | |

[a] In the case of Annex A (Test B), the test may be stopped at the load $3 \times m_t$ (where $m_t$ is given in Annex A) if reached before failure.

### 5.4.2 Drop test (rigid inflatable boats only)

#### 5.4.2.1 Requirement

Closely examine the boat at the end of the test.

There shall be no structural failures in the form of fractures, cracks, tears, separation, etc. on any part of the hull or boat component, such as the cockpit or thwarts, and including any boundary interface such as floor/hull, cockpit/transom, buoyancy tube/hull, etc.

#### 5.4.2.2 Test method

Prepare the boat to the fully loaded ready-for-use condition ($m_{LDC}$). The distribution of this load shall represent the boat fitted with motor(s) of the maximum power rating and the crew (CL) seated in their normal positions.

Consecutively drop the loaded boat from a height of:

— 2,0 m for Type VII which are not high-speed boats;

— 2,5 m for all Type VIII and all high-speed boats.

The drop height shall be measured from water to the lowest point of the boat.

The boat shall be dropped into the water using three different boat attitudes:

a) horizontal;

b) bow down 45°;

c) stern down 45°.

### 5.4.3 In-water testing

#### 5.4.3.1 Requirement

The boat shall be equipped with any load-bearing accessories offered as standard or optional equipment.

Test the boat, in the manner described in 5.4.3.2.2, fitted with motor(s) of the maximum power rating.

Closely examine the boat at the end of the test period.

There shall be no:

a) structural failures in the form of fractures, cracks, tears, separation, etc. on any part of the hull and floor or and including any boundary interface such as floor/hull, cockpit/transom, buoyancy tube/hull, etc.;

b) structural failures in the form of fractures, cracks, tears, separation, etc. on any boat component, such as the cockpit or thwarts;

c) damage to any accessory or to the method of attachment to the boat;

d) signs of abrasion that can result in subsequent structural damage or failure.

#### 5.4.3.2 Test methods

##### 5.4.3.2.1 General

Use the remote steering system if it is supplied as optional or standard equipment.

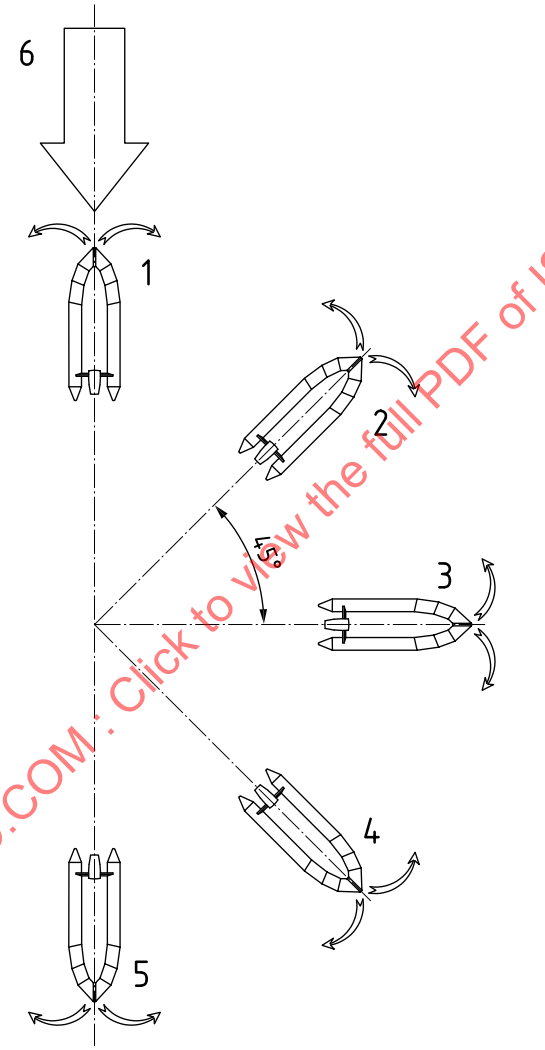
Use the helm and crew-member seating systems if they are supplied as standard or optional equipment.

Head the boat directly upwind and then successively downwind on courses of approximately 45° separation (see Figure 1). This will give a minimum of at least five separate courses encountering a head-on, bowquarter, beam, sternquarter and following sea condition. Turn the boat sharply towards the end of each course to port and starboard (see Figure 1).

#### 5.4.3.2.2 Testing

With the boat uniformly loaded up to the fully loaded displacement condition ($m_{LDC}$) operate the boat between 75 % and 100 % of the maximum power rating, in waves of 600 mm for category C and 300 mm for category D, or larger for a minimum period of 45 minutes.

All fitted accessories shall be clearly seen to have satisfied the requirements of 5.6.1.






**Key**

| | | | |
|---|---|---|---|
| 1 | upwind course | 4 | sternquarter course |
| 2 | bowquarter course | 5 | downwind course |
| 3 | beam-wind course | 6 | true wind |

**Figure 1 — In-water performance test**

## 5.5 Buoyancy tube attachment strength test (type test only)

### 5.5.1 General

The strength of the buoyancy tube attachment is paramount to safe operation of an inflatable boat and shall be sufficiently strong for its intended use. The purpose of this testing is to simulate loads in a closed environment that can be experienced in normal use to show if the attachment system is of sufficient strength.

### 5.5.2 Requirement

The attachment system of the buoyancy tube to the rigid structure shall be tested in accordance with either of the test methods described in Annex A.

Closely examine the buoyancy tube attachment system and its surrounding area at the end of the test. There shall be no visible damage or tearing.

## 5.6 Strength of principal fitted accessories

### 5.6.1 General

This subclause considers the strength of fittings attached to any part of the boat or tubes, regardless of the means of fastening.

### 5.6.2 Requirement

Accessories and their attachments shall be designed and installed to support the loads defined below:

a) strong points: loads in accordance with ISO 15084;

b) items for the protection from falling overboard and means of reboarding: in accordance with ISO 15085;

c) accessories such as seats and steering consoles: either of the tests in Annex B or, alternatively, to the requirements of ISO 15085.

Each fitted accessory shall be tested and shall hold the load identified above, using either of the test methods described in Annex B.

Closely examine the boat at the end of testing.

There shall be no impairment to airtightness of the buoyancy tubes or water integrity of the boat.

NOTE Cosmetic damage, such as scarring, is permissible.

Where a test is conducted by pull cord which can cut soft materials of the accessory, the diameter of the cord shall be in the range of 8 mm to 12 mm.

# 6 Stability and flotation requirements

## 6.1 General

This clause shall be applied as shown in Table 3.

**Table 3 — Stability and flotation requirements**

| Parameter | Inflatable type | | |
|---|---|---|---|
| | VII | VIII | |
| Design category | C and D | B | |
| Openings | — | ISO 12216 | |
| Cockpit drainage time | — | Quick-draining to ISO 11812 | Self-draining to 6.7 |
| Level flotation | 6.5 | — | 6.5 |
| Stability curves | — | Required[b] | |
| Rolling in beam waves and wind[a] | — | Required[c] | |
| Resistance to waves[a] | — | Required[d] | |
| Heel due to wind action[a] | Required[e] | — | |
| Offset-load test[a] | Required[f] | | |
| Maximum load capacity | 6.2 | | |
| Buoyancy/flotation | 6.4 | | |
| Watertightness | 6.6 | | |

[a] Descriptions of these methods are provided in ISO 12217-1.

[b] ISO 12217-1 outlines methods for generating stability curves, but as the immersed length of tubes can alter as a rigid inflatable boat (RIB) heels, so the traditional in-water inclining experiment can give poor results. Experiments in air can give better results.

[c] Since the cockpit is self-draining, water flooding into the cockpit is not considered to be downflooding. This means that the area below the righting curve is not limited by the angle at which water floods over the tube but can be limited by other downflooding openings as defined in ISO 12217-1:2022, 3.2.1.

[d] The requirement of ISO 12217-1:2022, 6.3.3 paragraph (a) (minimum righting moment of 7 kNm at 30°) shall be achieved before an angle of 35°, or θ ≤ angle of maximum righting moment –5°, whichever is lowest.

[e] The application of ISO 12217-1:2022, 6.4. 'heel due to wind action' is only required for boats where, in the minimum operating condition, the windage profile area $A_{LV} \geq 0{,}5L_H \times B_H$.

[f] 6.3 defines specific procedures for inflatable boats in addition to those given in ISO 12217-1:2022, Clause 6.2.

## 6.2 Maximum load capacity

### 6.2.1 Determination methods

The maximum load capacity shall be determined in accordance with ISO 14946 without exceeding the limits set by:

— the offset load test (see 6.3);

— stability (see 6.3);

— buoyancy (see 6.4).

### 6.2.2 Crew limit

The crew limit (CL) shall not exceed the number of persons for whom seating areas have been assigned or the limitations imposed by 6.3 and 6.4.

For design categories C and D, the number of seating spaces may include the interior floor and buoyancy tubes, when these are used as seating areas, as well as fixed seats.

For design category B, the number of seating spaces shall be limited to the number of fixed seats conforming to 7.3.

All the requirements of this document should be addressed for each CL assigned to each category and for each seating arrangement.

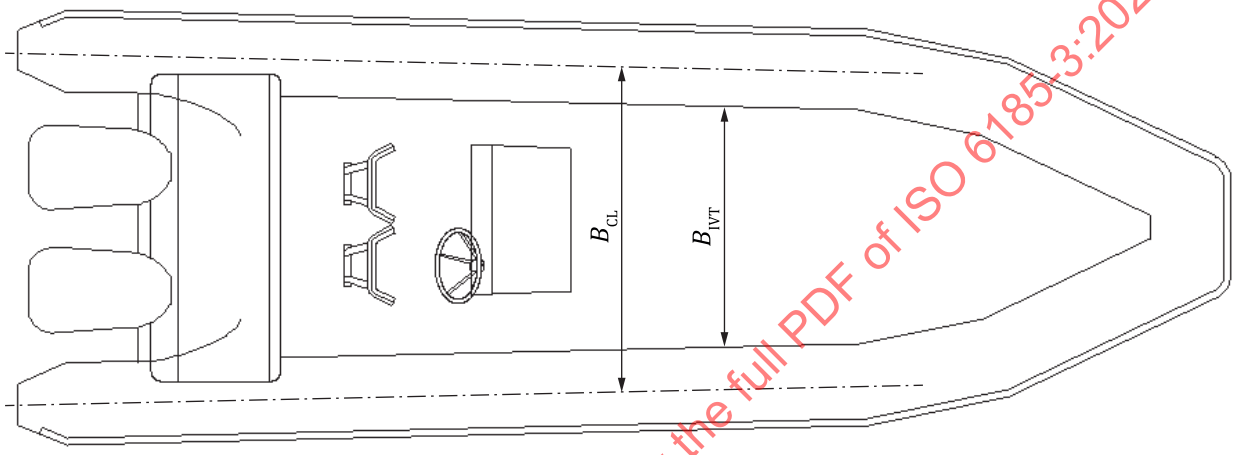
The minimum size of seats and seating areas shall conform to ISO 14946.

## 6.3 Offset load test

The offset load test shall be conducted according to ISO 12217-1 but with the centre of gravity of the seated crew positioned 0,1 m above the top of the buoyancy tube and on the vertical tangent to the inboard face of the buoyancy tube as shown in Figure 2.

If the simplified procedure for the offset load test is being used, the crew heeling moment shall be calculated with $B_{CL}$ measured to the centreline of the tubes for category C and D or to the inner vertical tangent of the tubes for category B, at the widest point.

Since an inflatable boat does not have a deck edge and has generous flotation, the freeboard margin requirement is not applicable.




**Key**

$B_{CL}$ beam between centreline of tubes' cross-sectional area

$B_{IVT}$ beam between inner vertical tangent of tubes

**Figure 2 — Position of the seated crew**

## 6.4 Buoyancy requirements

### 6.4.1 Total buoyant volume

The total buoyant volume ($V$) in $m^3$ comprises:

a) for non-rigid inflatable boats:

   1) all chambers which form the inflatable hull;

   2) any other inflatable chamber which is permanently fixed to it;

b) for rigid inflatable boats:

   1) the buoyancy of tubes;

   2) permanent inherent buoyancy;

   3) permanent sealed buoyancy;

   4) inherent buoyancy of the rigid parts of the boat.

Inherent buoyancy ($v$) of the rigid parts of the boat shall be either measured or calculated or estimated using Formula (3):

$$v = \frac{m}{\rho} \tag{3}$$

The density, $\rho$, may be taken from Table 4.

**Table 4 — Material densities**

| Material | Density ($\rho$) kg/m$^3$ |
|---|---|
| Aluminium alloys | 2 700 |
| GRP laminate | 1 500 |
| Flotation foam materials | 40 |
| Structural foam materials | 80 |
| Balsa core materials | 150 |
| Teak | 640 |
| Miscellaneous equipment | 2 000 |
| Diesel engines | 5 000 |
| Petrol engines | 4 000 |
| Outboard motors | 3 000 |
| Plywood | 600 |
| Hypalon | 1 400 |

The total buoyant volume ($V$) in m$^3$ shall be as shown in Formula (4):

$$V > \frac{k \times m_{\mathrm{LDC}}}{1\ 000} \tag{4}$$

where $k$ is:

— 1,33 for boats assessed to design category B;

— 1,2 for boats assessed to design category C;

— 1,1 for boats assessed to design category D.

The total volume of the buoyancy tubes shall not comprise less than 50 % of the required total buoyant volume of the boat and shall be located at the outer periphery of both sides of the boat.

### 6.4.2 Buoyancy determination

Total buoyant volume shall be determined by measuring or calculating the volume of the closed cell foam buoyancy tubes, the volume of the inflatable buoyancy tubes and other inflatable elements at the nominal working pressure, permanent inherent buoyancy, permanent sealed buoyancy and inherent buoyancy of the rigid parts of the boat.

### 6.4.3 Sub-division of the inflatable buoyancy tubes (chambers)

The buoyancy of the inflatable buoyancy tube shall be contained within a number of separate buoyancy chambers. The minimum number of chambers shall be as specified in Table 5.

**Table 5 — Minimum number of chambers in buoyancy tube**

| Maximum motor power rating<br>kW | Dimensional factor<br>$L_H \times B_H$ | Minimum number of buoyant chambers<br>($N$) |
|---|---|---|
| 15 to 45 | ≤ 8 | 3 |
| | > 8 | 4 |
| > 45 | ≤ 8 | 4 |
| | > 8 | 5 |

The volume of each chamber ($V_c$), with internal partition bulkheads in the neutral position, shall be within ±20 % of the mean chamber volume expressed as the total volume of the buoyancy tube ($V_T$) divided by the number of buoyancy chambers ($N$).

In the case of RIBs where the bow chamber is symmetrical around the centreline and clear of the water at maximum load, the bow chamber volume shall be within 25 % of the mean chamber volume.

Where a chamber is split into smaller sub-sections (e.g. where a door is fitted in the topsides), the sub-sections may be considered together as one chamber for the purpose of the mean chamber volume requirement.

Ancillary inflatable chambers that are not permanently fixed to the hull shall not be included in the above calculation.

### 6.4.4 Nominal pressures (inflatable buoyancy tubes)

The nominal pressure of the inflatable buoyancy tubes ($p$) shall be specified. If there is a variation of pressure for individual chambers, the information shall be provided. These pressures shall be indicated in the owner's manual (see Clause 11) and on the builder's plate (see Clause 10).

The nominal pressure shall be consistently expressed in Pascals.

NOTE Other units can be stated alongside the pressure in Pascals.

### 6.4.5 Valves (if applicable)

#### 6.4.5.1 Inflation

The assemblies shall be made of corrosion-resistant materials and shall not be capable of damaging the boat materials.

The type and arrangement of the inflation valves fitted to an inflatable boat shall ensure that:

a) the valves are readily accessible for connection of the inflation device whether the boat is on land or in the water;

b) the valves do not inconvenience the persons in their predetermined seating positions;

c) the valves do not interfere with the operation of the boat;

d) the valves do not interfere with loading and unloading of the boat;

e) the valves cannot be damaged or torn off by lines, safety ropes or movable components of the boat construction or by normal movements of the passengers and load;

f) the valves are equipped with a cap that can independently seal the valve and that the cap is connected to the valve in a secure manner that prevents it from being accidentally lost;

g) a controlled reduction in buoyancy chamber pressure and of measuring that pressure is possible.

#### 6.4.5.2 Deflation

Deflation of the hull and tubes shall be carried out by manual operation, either by using the inflation valve or by using a separate device.

Where separate devices are fitted, these shall be made of corrosion-resistant materials and shall not be capable of damaging the boat material. The design and location of such devices shall meet the requirements of 6.4.5.1 a) to g) inclusive.

The deflation of any one chamber shall not cause a loss of air from any of the remaining chambers.

### 6.4.6 Strength of the inflatable buoyancy tube

#### 6.4.6.1 Requirement

The inflatable parts shall remain airtight after each of the tests described in this subclause.

NOTE Requirements for the attachment of the tube are provided in 5.6.

#### 6.4.6.2 Test temperature

All tests shall be performed at a temperature of 20 °C ± 10 °C, unless specified otherwise.

#### 6.4.6.3 Heat test

Assemble the inflatable parts and inflate to a pressure of 1,2 times the nominal pressure. Place the inflatable parts in a heat chamber, set at 60 °C, for a period of 6 h. On completion of the test period, remove the inflatable parts from the heat chamber and allow to cool down to ambient temperature. Test the airtightness of the inflatable parts in accordance with the test specified in 6.4.6.5.

Alternatively, sample individual inflated pieces of all the different types of the inflatable parts used in the boat may be tested provided they are representative of the production type. For inflatable buoyancy tubes, the minimum length of the sample piece shall be no less than 1 m.

#### 6.4.6.4 Overpressure test

Inflate each chamber of the buoyancy tube to 1,5 times the nominal pressure for 30 min. When separate chambers have common envelope parts (e.g. internal partition bulkheads), these chambers shall be individually tested with adjacent chambers deflated. No damage or rupture shall occur, and the boat shall be tested for airtightness as described in 6.4.6.5.

#### 6.4.6.5 Airtightness test

Support or insulate the boat from the floor and do not expose it to any draught of air or direct sunlight. Inflate the boat (all chambers) for 30 min to a pressure of 1,2 times the nominal pressure (see 6.4.4) in order to pre-stretch the boat. Then reset the pressures to the nominal pressure for a further 30 min period in order to stabilize conditions. Reset the pressures to the nominal pressure and record the ambient temperature and atmospheric pressure. Following a test period of 24 h, the pressure drop shall not be greater than 20 % in any chamber. After the pressure stabilizes to the nominal pressure, record the final ambient temperature and atmospheric pressure.

The temperature difference between the start of the test and the test readings shall not exceed ±5 °C.

The atmospheric pressure difference between the start of the test and the test readings shall not exceed ±1 %.

For each rise or fall in ambient temperature of 1 °C, an allowance of 0,004 bar may be respectively subtracted from, or added to, the recorded boat pressure.

## 6.5 Level flotation when swamped

When the boat in the fully loaded ready-for-use condition is filled to overflowing with water, it shall float with not more than 10° trim from the unswamped fully loaded ready-for-use condition waterline and with more than 2/3 (two thirds) of $L_H$ above the water.

All compartments shall be filled with water during this test except for:

— buoyancy tubes;

— any other inflatable chamber;

— permanent inherent buoyancy;

— permanent sealed buoyancy;

— watertight spaces with closures which are excluded from the list of downflooding openings.

NOTE The term "downflooding opening" is defined in ISO 12217-1:2022, 3.2.1.

For the purpose of assessment of flotation, the mass of the motor(s) shall correspond to the maximum motor power defined by the builder as given in ISO 12217-1:2022, Tables F.1 and F.2.

This requirement shall be demonstrated either by physical test or by calculation.

If using the physical test, vulnerable items such as motors may be replaced with an appropriate mass at the appropriate location as described as follows:

a) For outboard motors, ISO 12217-1:2022, Tables F.1 and F.2, columns 2 and 4, give the appropriate replacement mass to be used with respect to motor power for petrol engines. A heavier mass may be used if it is recorded in the owner's manual. A mass of 86 % of the motor dry mass shall be used for diesel, jet-propulsor or electric outboards, if these are supplied as the standard outfit. Boats equipped for use both with and without an outboard motor shall be tested in both conditions.

b) For inboard motors, the replacement mass shall be lead, steel or iron of a mass equal to 75 % of the installed mass of the motor and sterndrive.

c) Replacement masses shall, as far as practicable, have the same position of centre of gravity as the actual motor.

## 6.6 Watertightness

### 6.6.1 Openings and flooding

Windows, portlights, doors, hatch covers and other openings in the hull, cockpit and superstructures whose defect can lead to flooding the interior of the boat shall conform to ISO 12216.

Seacocks and through-hull fittings shall comply with ISO 9093.

NOTE The term "fully enclosed boat" is defined in ISO 12217-1:2022, 3.1.6.

### 6.6.2 Hull (below deck) drainage

If the boat is fitted with a transom, it shall be equipped with at least one drainplug or one bailing system.

A means shall be provided for draining the interior part of the hull (bilge).

Means to prevent the accidental discharge of oily waste shall be provided.

#### 6.6.3 Watertightness test (not applicable to self-draining boats)

##### 6.6.3.1 Requirement

Closely examine the boat at the end of the test.

There shall be no evidence of water within the bilge/below deck.

##### 6.6.3.2 Test method

Ensure that there is no water within any part of the boat. Prepare the boat to the fully loaded ready-for-use condition ($m_{LDC}$). The distribution of this load shall represent the boat fitted with motor(s) of the maximum power rating and the crew (CL) seated in their normal positions.

Allow the boat to remain static in the water for 20 min.

### 6.7 Cockpit draining time assessment (Type VIII boats only)

#### 6.7.1 Requirements

The Type VIII boat shall be capable of self-draining within 5 min when tested as in 6.7.3 or when assessed by calculation as in 6.7.4.

#### 6.7.2 Self-draining test requirement

Closely examine the boat at the end of the test described in 6.7.3.

The cockpit shall drain, in the required time, to the moment when the level of water above the bottom of each cockpit area is at or below 100 mm above the waterline or cockpit sole, whichever is lower.

#### 6.7.3 Test method

Ensure that there is no water within the boat. Prepare the boat to the fully loaded ready-for-use condition ($m_{LDC}$). The distribution of this load shall represent the boat fitted with motor(s) of the maximum power rating and passengers seated in their normal positions. Close any cockpit drains and scuppers while filling. Fill the cockpit areas with water until it starts to flow out overboard. Open the cockpit drains and scuppers and check that the cockpit drains in less than 5 min by gravity or forward motion of the boat but without using any manual or electric bilge pump or draining device.

#### 6.7.4 Quick-draining calculation requirement

Calculate the draining time in accordance with ISO 11812.

## 7 Requirements for safe operation

### 7.1 Determination of maximum motor power and manoeuvring speed

All boats shall conform to ISO 11592-1.

### 7.2 Prevention of falling overboard and recovery

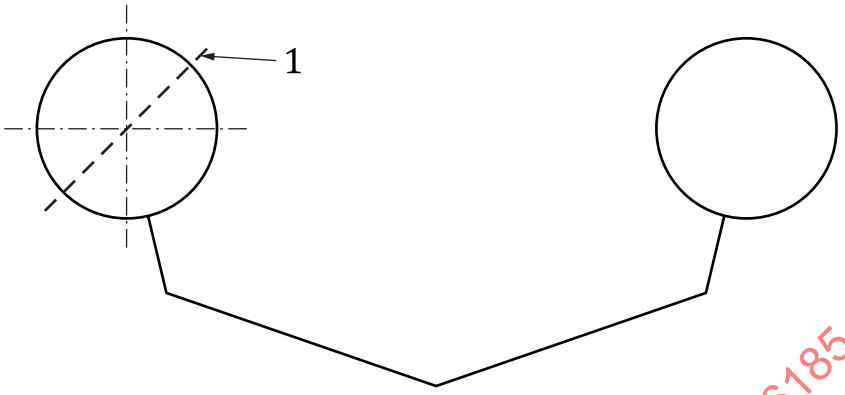
#### 7.2.1 General

All boats shall be designed and provided with a combination of devices to minimize the risk of falling overboard in accordance with ISO 15085.

In addition, the boat shall satisfy the specific requirements for handholds given in 7.2.2 and labelling in 7.2.3.

### 7.2.2 Location of handholds fitted on tubes of high-speed boats

If the manufacturer allows persons to be seated on the buoyancy tubes of high-speed boats (design categories C and D only), two handholds shall be provided per person to assist persons against falling overboard, and at least one handhold, at its greatest extremity when under load (if non-rigid), shall be inboard of the 45° reference line drawn through the centre of the tube as shown in Figure 3.




**Key**

1 45° reference line

**Figure 3 — Location of handholds fitted on tubes**

### 7.2.3 Seating safety sign

Buoyancy tubes shall not be used for seating areas in waves larger than 2 m and/or when operating at speeds exceeding 15 $\sqrt{L_H}$ knots. Boats rated to design category C or B, or capable of such speeds, shall have a safety sign displayed at the helm position in accordance with Figure 4.

NOTE Details for general warning labels are given in ISO 7010.

| | |
|---|---|
| ISO 7010-W001<br>General warning sign |  |
| Supplementary text to read | Buoyancy tubes shall not be used for seating areas in waves larger than 2 m and/or when operating at speeds exceeding 15 $\sqrt{L_H}$ knots. |

**Figure 4 — Warning label — Seating**

## 7.3 Seating and attachment systems (where offered as a standard or optional equipment)

Where seat structure is supplied and permanently fitted to the boat by means of an attachment system, the seat and the attachment system shall meet the strength requirements of 5.6.

Type VIII boats shall have a seat structure and attachment system for each person up to the CL for operation in design category B.

Seating and handholds for Type VIII boats shall provide support for the upright posture for each person up to the CL and be designed to prevent the crew from falling overboard.

Uncushioned locker tops or benches shall not be accepted as seats for operation in design category B.

NOTE With respect to falling overboard, see 7.2.

## 7.4 Field of vision from the helm position

The field of vision from the main helm shall not be obstructed and shall conform to ISO 11591.

## 7.5 Fire protection

Boats shall be designed to minimize the spread of fire and shall be provided with fire-fighting devices, in accordance with ISO 9094.

## 7.6 Rowlocks and oars

### 7.6.1 Requirements

The provision of rowlocks and oars is not mandatory. If they are provided as standard or optional equipment, they shall meet the requirements given in 7.6.2 to 7.6.6.

### 7.6.2 Abrasion damage

The bearing surfaces of the oars and rowlocks shall be free from any roughness likely to cause wear. All external surfaces of the rowlock shall be smooth and free from sharp edges and corners likely to cause damage when the boat is packed.

### 7.6.3 Prevention from loosening

Rowlocks shall be secured against unintended loosening. Means shall be provided for the storage of two oars or paddles.

### 7.6.4 Strength of rowlocks

#### 7.6.4.1 Requirement

There shall be no structural failure of the rowlock or associated fittings when tested as described in 7.6.4.2.

#### 7.6.4.2 Test method

Any cordage used for test purposes shall have a diameter in the range of 8 mm to 12 mm.

Load the rowing fitting, including the rowlock, with a force of 500 N for 1 min in any horizontal direction.

### 7.6.5 Use of the rowlocks and oars

A minimum unrestricted movement of the oars shall be 60° ahead and 60° astern.

When tested as described in 7.6.6, there shall be no structural failures or permanent deformation of any component during the test.

### 7.6.6 Rowing test

When fitted, rowlocks shall be tested as follows:

— Row the boat for a distance of not less than 100 m in the fully loaded ready-for-use condition.

— Examine the rowlock system during and on completion of the test and measure the unrestricted movement of the oars to ensure it conforms to 7.6.5.

# 8 Installation requirements

## 8.1 Motor and motor spaces

### 8.1.1 Inboard motors

Where fitted, inboard motor(s) shall be installed in an enclosure separated from living quarters in a manner to minimize the risk of fire and spread of fires as well as the hazards from toxic fumes, heat, noise or vibration.

Parts of the motor that need frequent inspection and/or servicing shall be readily accessible.

### 8.1.2 Outboard motors

Outboard motors shall be installed in accordance with manufacturer's instructions.

All outboard motors shall have a device to prevent starting in gear, except if a throttle limiting device is fitted to limit the thrust to 500 N at the time of starting the motor.

NOTE Detailed requirements for start-in-gear protection are provided in ISO 11547.

## 8.2 Ventilation of petrol engine and/or petrol tank compartments (where applicable)

Natural ventilation shall be provided for petrol tank compartments with a remaining volume of 3 l or greater, in accordance with ISO 11105.

## 8.3 Electrical installations (where offered as standard or optional equipment)

Electrical systems shall be designed and installed so as to ensure proper operation of the boat under normal conditions of use and shall be such as to minimize risk of fire and electric shock.

Type VIII boats shall be fitted with an electrical system.

Electrical systems shall conform to ISO 13297.

Where fitted, electrical propulsion systems shall conform to ISO 16315.

## 8.4 Fuel systems

The choice of materials and arrangements of permanently installed fuel systems shall be appropriate for marine use in the conditions appropriate for the boat's design category.

Permanently installed fuel systems shall conform to ISO 10088.

Fixed fuel tanks shall conform to ISO 21487.

Fuel hoses shall conform to ISO 7840 or ISO 8469.

## 8.5 Remote steering system (where offered as standard or optional equipment)

Type VIII boats shall be fitted with a remote steering system fitted by the boat manufacturer.

Steering wheels shall conform to ISO 23411.

Steering systems shall conform to ISO 8847, ISO 8848, ISO 13929, ISO 10592 or ISO 25197 as appropriate for the system type.

For boats fitted with a single inboard motor and remote steering systems, a manual means of emergency steering at reduced speed shall be provided (e.g. an oar, a paddle or other means).