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Small craft — Protection from falling overboard and means of reboarding

Petits navires — Prévention des chutes par-dessus bord et remontée à bord

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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 second edition cancels and replaces the first edition (ISO 15085:2003), which has been technically revised. It also incorporates the Amendments ISO 15085:2003/Amd 1:2009 and ISO 15085:2003/Amd 2:2017.

The main changes are as follows:

— simplification of the document's arrangement;

— creation of a new approach with requirements based on risk assessment principles of deck zones;

— definition of "normal operation" and a longer list of functions to ensure safety;

— replacement of requirements for guard-rail and guard-line systems with a single concept of "falling overboard barrier";

— improvement of requirements on high speed craft;

— requirements for toe straps for sailing dinghies;

— amendment of means of reboarding.

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.

Small craft — Protection from falling overboard and means of reboarding

1 Scope

This document specifies the design as well as the construction and strength requirements for safety devices and arrangements intended to minimize the risk of persons falling overboard, and requirements to facilitate reboarding from the water, unaided, on small craft.

This document is applicable to the risk of falling overboard and does not apply to falling within the limits of the deck zone.

This document includes the use of toe straps for hiking out on small sailing boats, but it does not apply to the use of trapezes or similar devices that are designed to allow crew to operate sailing boats with their bodies entirely outside the periphery of the craft.

This document does not apply to the following small craft types:

— canoes, kayaks;

— personal watercraft including powered surfboards.

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 8666:2020, *Small craft — Principal data*

ISO 12217-2:2022, *Small craft — Stability and buoyancy assessment and categorization — Part 2: Sailing boats of hull length greater than or equal to 6 m*

ISO 12217-3:2022, *Small craft — Stability and buoyancy assessment and categorization — Part 3: Boats of hull length less than 6 m*

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
craft
small craft
recreational boat, and other watercraft using similar equipment, of up to 24 m length of hull (L_H)

Note 1 to entry: The measurement methodology for the length of hull is defined in ISO 8666.

[SOURCE: ISO 8666:2020, 3.15, modified — Note 1 to entry added.]

3.2
personal watercraft
watercraft intended for sports and leisure purposes, of less than 4 m in hull length, which uses a propulsion engine having a water jet pump as its primary source of propulsion and designed to be operated by a person or persons sitting, standing, or kneeling on, rather than within the confines of a hull

Note 1 to entry: The measurement methodology for the length of hull is defined in ISO 8666:2020.

[SOURCE: ISO 13590:2022, 3.1]

3.3
design category
description of the sea and wind conditions for which a boat is assessed to be suitable

Note 1 to entry: The design categories are specified in ISO 12217-1.

3.4
sailing boat
craft (3.1) for which the primary means of propulsion is by wind power, having reference sail area $(A_S) \geq 0{,}07(m_{LDC})^{2/3}$

Note 1 to entry: A_S is expressed in m^2 and m_{LDC} is expressed in kg.

[SOURCE: ISO 8666:2020, 3.11, modified — Note 1 to entry added.]

3.5
non-sailing boat
craft (3.1) for which the primary means of propulsion is other than by wind power, having reference sail area $(A_S) < 0{,}07(m_{LDC})^{2/3}$

Note 1 to entry: A_S is expressed in m^2 and m_{LDC} is expressed in kg.

[SOURCE: ISO 8666:2020, 3.10, modified — Note 1 to entry added.]

3.6
high-speed craft
craft (3.1) having a maximum speed, in knots, greater than 7 $\sqrt{L_H}$ or 25 knots, whichever is the greater

Note 1 to entry: the conversion factor at the first instance: 1 knot = 1,852 km/h.

3.7
working deck
external deck areas defined by the manufacturer for people to stand or walk during *normal operation* (3.27) of the *craft* (3.1), -assigned into different *deck zones* (3.8)

3.8
deck zone
working deck (3.7) area of the *craft* (3.1) where there is a risk of falling overboard during *normal operation* (3.27) of the craft

3.9
safety device
device that is used to prevent falling overboard or provide reboarding functions, either on its own or as a part of a system

Note 1 to entry: Table 2 provides list of safety devices considered by this document.

3.10
slip-resistant surface
surface intentionally provided to increase grip between the foot (or shoe) and the surface of the deck

3.11
foot-stop
feature which provides a barrier or support for the foot

3.12
barrier to falling overboard
permanent structure designed to restrain person from falling overboard made of *guard-rails* (3.13), *guard-lines* (3.14), *coamings* (3.17), bulwark or other elements, or combination of such

3.13
guard-rail
system of rigid structure designed to restrain person from falling overboard

3.14
guard-line
system of flexible lines supported by rigid structures or *stanchions* (3.15) designed to restrain person from falling overboard

3.15
stanchion
upright bar or pole carrying a *guard-rail* (3.13) or *guard-line* (3.14)

3.16
pulpit
pushpit
rigid frame replacing or extending a *guard-rail* (3.13) or *guard-line* (3.14)

3.17
coaming
raised part of the deck or superstructures

3.18
handhold
device or part of the *craft* (3.1) intended to be gripped by hand to reduce the risk of falling overboard, even if it is not its main function

3.19
hooking point
specific device, *jack-line* (3.20) or part of the *craft* (3.1) to which people can directly attach the hook of a safety harness, even if it is not its main function

3.20
jack-line
flexible line or rigid bar intended for the attachment of the line of a safety harness and allowing movement along its length

3.21
reboard
action of a person to climb aboard a *craft* (3.1) from the water

3.22
means of reboarding
rigid or flexible device or part of the hull which allows a person to *reboard* (3.21) unaided

3.23
strong point
fitting on a *craft* (3.1) designed to be used for the attachment of anchor chains, anchor lines, tow lines or warps

3.24
body support
part of the *craft* (3.1) intended to provide support to the body of an occupant while underway

3.25
seat
surface, horizontal or nearly horizontal, intended for a person to sit, with minimum dimensions of 400 mm width by 750 mm length inclusive of clear foot space in front of the seat

3.26
outer deck edge
outboard deck edge at the periphery of the *craft* (3.1)

EXAMPLE Gunwale.

3.27
normal operation
use of the product in the manner for which it is intended, and in accordance with the specifications, instructions and information provided by the manufacturer

3.28
toe strap
device for retaining the crew's feet such that they can hike, i.e. extend their bodies beyond the periphery of the boat, in order to balance the *craft* (3.1), without falling overboard

4 General requirements

4.1 Prevention from falling overboard

To minimize the risk of falling overboard, the craft shall provide safe access to and use of areas required for its safe operation.

According to the type of the craft, the intended use and the design category, there shall be:

— deck zones assigned according to 4.2;

— safety devices installed to these deck zones according to 4.3.

There can be areas which are not intended to accommodate persons during normal operation. Those areas are not considered to be part of the deck zones, but they shall be described in the craft owner's manual.

4.2 Deck zones

Table 1 assigns deck zones to areas of the craft.

The craft shall accommodate the maximum recommended number of persons in a combination of deck zone Z1, and the interior of the craft.

Where different maximum recommended number of persons are assigned to different design categories for a craft, it shall be ensured the requirements of this document are met for each design category.

Table 1 — Deck zones

Deck zones Z1 to Z3		
Z1	**Z2**	**Z3**
Deck areas that require access at any time, including at least the following:	Deck areas that require access at a speed of 4 knots and below, including at least the following:	Deck areas that require access when nearly stationary including at least the following:
— helm position — emergency steering position — emergency controls[a] — manual bilge pump(s) — sail setting equipment[b] — primary controls areas for furling, unfurling, hoisting, dropping sails — main companionway(s) — areas within the zone where persons stand, lean, lay or sit	— engine space — emergency steering installation — tow points — sail hoist, drop areas for non-furling sails — areas within the zone where persons stand, lean, lay or sit — life raft stowage	— mooring strong points — means of reboarding — boarding area — areas within the zone where persons stand, lean, lay or sit
[a] Examples of emergency controls: fuel shut-off release, fire extinguisher release, battery disconnect switch, LPG shut-off valve. [b] Examples of sail setting equipment: main sail and genoa winches.		

4.3 Required safety devices

The requirements given in Tables 3 and 4 shall apply. For each option related to a design category, the corresponding safety devices shall be identified by their index number from Table 2.

When required, the safety devices shall fulfil all the requirements of the relevant clause.

In addition to the requirements set in Tables 3 and 4:

— for all craft, the means of reboarding the requirements of Clause 13 shall apply;

— all craft with several working deck levels where the crew can access shall fulfil the requirements of 8.4;

— habitable multihulls susceptible to inversion shall fulfil the requirements of 9.3.

NOTE 1 ISO 12217-1:2022, ISO 12217-2:2022 and ISO 12217-3:2022 provide requirements to define habitable multihulls susceptible to inversion.

Table 2 provides the list of safety devices.

Table 2 — List of safety devices

Index	Safety devices	Clause
1	Slip-resistant surface	Clause 5
2	Foot-stop	Clause 6
3	Handholds	Clause 7
4	Low barriers to falling overboard	Clause 8
5	High barriers to falling overboard	Clause 8
6	Hooking points	Clause 9
7	Falling overboard prevention on high-speed craft (where relevant)	Clause 11
8	Jack-line attachment points	Clause 10

The safety devices requirements given in Table 3 according to deck zones for the relevant length of hull (L_H) and design category of the craft for non-sailing boats shall apply.

NOTE 2 The measurement methodology for the length of hull (L_H) is defined in ISO 8666. Length of hull is expressed in metres (m).

Table 3 — Requirements of safety devices according to deck zones for non-sailing boat

	Options																	
	I			II			III			IV			V			VI		
	Design category																	
	A			B L_H > 8,5 m			B L_H ≤ 8,5 m			B Any L_H			C			D		
	Deck zone			Deck zone			Deck zone			Deck zone			Deck zone			Deck zone		
Safety device index[a]	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓		✓	✓		✓	✓		✓	✓		✓					
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4							✓	✓										
5	✓	✓		✓	✓													
6										✓	✓							
7	✓			✓			✓			✓			✓			✓		
8																		

[a] See Table 2.

The safety devices requirements given in Table 4 according to deck zones for the relevant length of hull (L_H) and design category of the craft for sailing boats shall apply.

NOTE 3 The measurement methodology for the length of hull (L_H) is defined in ISO 8666. Length of hull is expressed in metres (m).

Table 4 — Requirements of safety devices according to deck zones for sailing boat

	Options																	
	VII			VIII			IX			X			XI			XII		
	Design category																	
	A			B and C L_H > 8,5 m			B and C L_H ≤ 8,5 m			C Any L_H[b]			C Any L_H[c]			D		
	Deck zone			Deck zone			Deck zone			Deck zone			Deck zone			Deck zone		
Safety device index[a]	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3	Z1	Z2	Z3
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓		✓	✓		✓	✓		✓	✓		✓	✓				
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4							✓											
5	✓			✓														
6	✓	✓		✓	✓		✓			✓	✓							
8	✓			✓			✓											

[a] See Table 2.

[b] Option X is limited to craft intended for daytime navigation only, i.e. not during the night. This information shall be inserted in the owner's manual.

[c] Option XI is limited to sailing boats, either capsize or knockdown recoverable or fitted with flotation in accordance with ISO 12217-3:2022.

As an exception for non-sailing boats and sailing boats, deck zone Z3 areas where persons do not have an activity as specified in Table 1 and only stand, lean, lay or sit may be fitted without handholds.

Different areas of the deck zones may be assigned different options according to the relevant length of hull (L_H) and design category of the craft.

4.4 General requirements for deck zones

4.4.1 All deck zones

Connection between areas of the deck zones shall be provided. This may include passage through the interior.

Within any deck zone, openings leading directly to water and not provided with a hatch or other protective covering shall be:

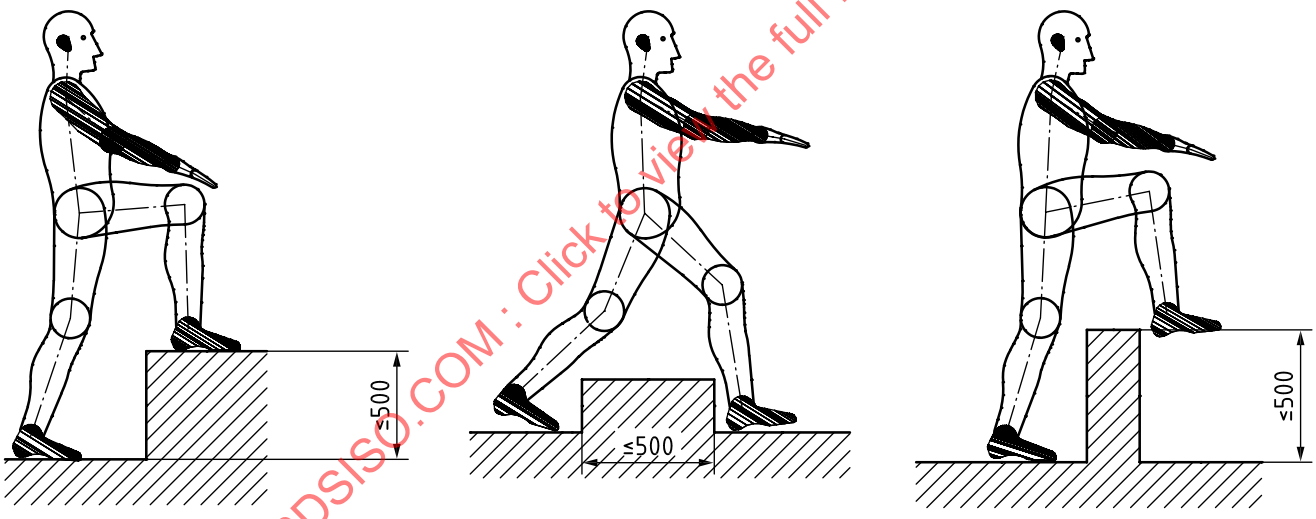
— surrounded by barriers to falling overboard as required in Clause 8; or

— fitted with trampolines or nets.

EXAMPLE Opening between hulls on a catamaran.

Steps shall not be higher than 500 mm [as illustrated in Figure 1 a)] and obstacles shall not be higher or longer than 500 mm [as illustrated in Figures 1 b) and c)].

Dimensions in millimetres



a) Step **b) Long obstacle** **c) High obstacle**

Figure 1 — Diagram illustrating some requirements of 4.4.1

4.4.2 Deck zones Z1 and Z2

The outer periphery areas of deck zones Z1 and Z2, whether longitudinal or transversal, shall:

— be angled transversally less than 15° to the horizontal, when the craft is upright;

— have a minimum width, measured perpendicular to the foot-stop inner limit (or the lateral outer deck edge of the deck if there is no foot-stop), of 100 mm for design category D, 120 mm for category C and 150 mm for categories A and B.

4.5 Requirements for operation and storage temperature of safety devices

4.5.1 Operation temperature

Plastic materials used in safety devices shall be capable of operation in ambient temperature of –20 °C to +60 °C.

4.5.2 Storage temperature

Plastic materials used in safety devices shall be capable of withstanding storage at ambient temperature of –30 °C to +60 °C and shall subsequently be capable of operation in ambient temperature listed in 4.5.1.

5 Slip-resistant surfaces

5.1 General

All deck zones where people can stand or walk shall be fitted with slip-resistant surfaces. Where the deck zone transitions to an appliance, obstruction, step or other design feature, a band of non-slip resistant surface may be used provided that the transition is less than 75 mm wide.

Outside the areas defined in 4.4.2, glazed appliances in the deck zone area, no larger than 500 mm × 500 mm in size, may be non-slip resistant.

NOTE Glazed appliances are referenced in ISO 12216 (e.g. windows, hatches).

5.2 Requirements for trampolines and nets

Trampolines and nets which are part of the deck zones shall have slip-resistant characteristics.

The junction between the trampolines or nets and the craft shall minimize the risk of foot trapping.

The connection of trampoline and nets to the craft shall support, without failure such that they no longer perform their intended purpose, a uniform load over the area of the trampoline or net, of 3 000 N/m^2 or 50 % of the maximum recommended number of persons, whichever is less.

6 Foot-stops

6.1 General

When required by 4.3, foot-stops shall conform to the requirements of 6.2 to 6.7.

NOTE 1 Bulwarks can be considered as foot-stops.

NOTE 2 Figure 2 shows a few examples of foot-stops.

6.2 Foot-stops requirements

Foot-stops shall be installed continuously at the outer periphery of the deck zones.

Foot-stops may be omitted on the following:

— capsize-recoverable craft;

— where the crew is not intended to walk but only sit when the craft is underway (e.g. a sailing-boat deck edge where the crew hikes);

— the aft limit (perpendicular to the longitudinal axis) of deck zones (e.g. top of transoms);

— front and aft structural beams (perpendicular to the longitudinal axis) of multihulls.

6.3 Minimum foot-stops height and angle

The height (h) of the upper edge of the foot-stop shall be not less than:

— for craft of design category C:

  — 25 mm for sailing boats;

  — 20 mm for non-sailing boats;

— for craft of design category A and B:

  — 30 mm for sailing boats;

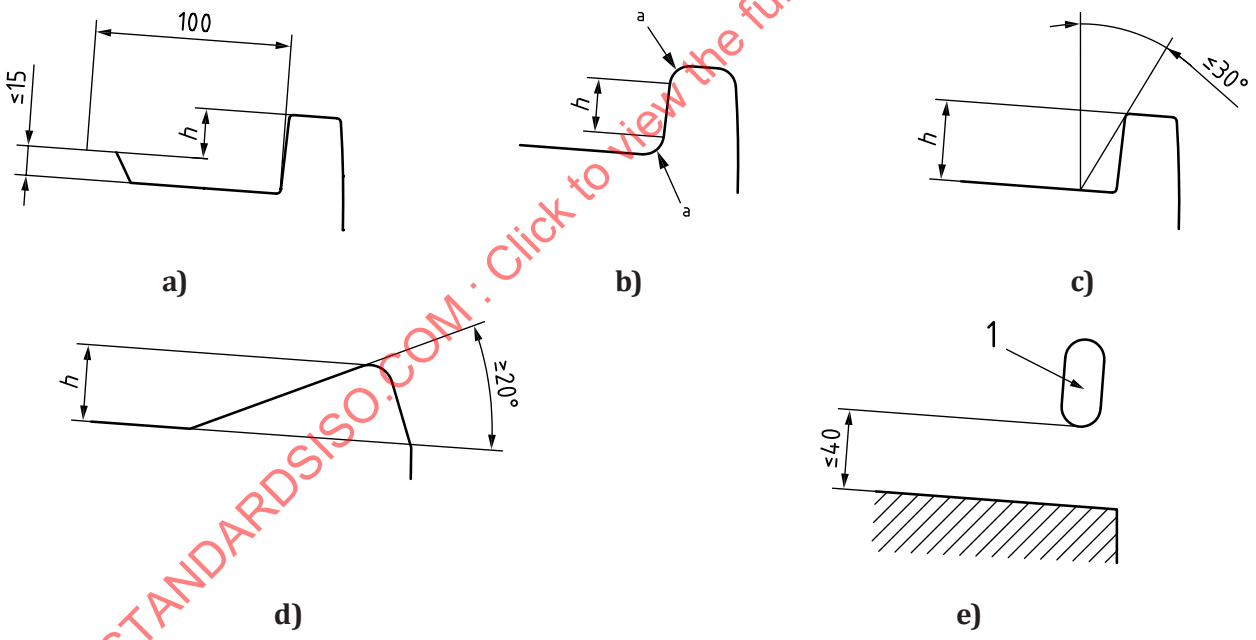
  — 25 mm for non-sailing boats.

The height shall be measured perpendicular to the adjacent deck zone, from the highest point of the deck within 100 mm of the foot-stop, to the highest point of the inner surface of the foot-stop [as illustrated in Figure 2 a)].

If the edges of the foot-stop have a fillet radius greater than 8 mm, the height of the foot-stop shall be measured between the closest points of these fillets [as illustrated in Figure 2 b)].

To stop the foot from slipping outboard, the angle in the internal face (or of a tangent to it) shall not be more than 30° from the vertical [as illustrated in Figure 2 c)], except on non-sailing boats using the device described in 6.4.

Dimensions in millimetres



Key

1 foot-stop above deck level

a Fillet radius > 8 mm.

h height of the foot-stop according to 6.3

Figure 2 — Diagram illustrating the requirements of 6.3, 6.4, 6.5 and 6.6

6.4 Foot-stops made of angled surfaces

Angled surface foot-stops may be used on non-sailing boats of design categories C and D. These surfaces shall have an inclination of not less than 20° from the horizontal and a height according to 6.3 [as illustrated in Figure 2 d)].

These angled surfaces shall be slip-resistant.

6.5 Maximum clearance between deck and foot-stop

If there is a vertical clearance between deck and foot-stop level, the open spaces between the deck level and the bottom of the lowest point of foot-stopping shall not be greater than 40 mm [as illustrated in Figure 2 e)]. Where a bulwark provides the foot-stop function, vertical gap between the deck surface and the bulwark shall not be higher than 100 mm.

6.6 Continuity on the deck zone level in vicinity of foot-stop

Steps in the deck within 100 mm of the foot-stop shall not be higher than 15 mm [as illustrated in Figure 2 a)].

6.7 Gaps in the foot-stop rail

Where there are gaps in the foot-stop rail for stanchions, pulpit feet, cleats, etc. or for water drainage, their length, measured between foot-stops and/or fittings, shall be less than:

— 150 mm distance for craft of 8,5 m and less;

— 250 mm distance for craft greater than 8,5 m.

A fitting that provides an effective foot stop shall be considered as a foot-stop.

EXAMPLE Stanchions, pulpit feet, cleats.

7 Handholds

7.1 General

When required by 4.3, handholds shall conform to the requirements of 7.2 and 7.3.

Handholds, as installed, shall be capable of being grasped by an entire hand without additional action by the user.

Handholds, as installed, shall provide efficient access and use.

NOTE Special provisions on handholds on high-speed craft are provided in Clause 11.

7.2 Location in vicinity of outer deck edge

For all deck zone areas, the handholds shall be located in the inboard vicinity of the outer deck edge and be arranged in such a way that:

— the maximum distance between two adjacent handholds shall not exceed 1,5 m;

— the maximum transverse distance between the outer deck edge and the handhold shall not exceed 1,0 m.

Where the handhold is located inboard of the side deck:

— where deck zones of 300 mm width or less with an adjacent superstructure higher than 450 mm, handholds shall be placed at a minimum height of 450 mm above deck level;

— handholds fitted less than 300 mm inboard from the outer deck edge shall be placed at least 450 mm above deck level, but may be lower than the adjacent superstructure;

— handholds fitted more than 300 mm inboard from the outer deck zone edge may be placed at any height but no more than 1,80 m above deck level.

Where the handhold is located outboard of the side deck:

— handholds shall be placed at least 450 mm above deck level;

— where stairs, ladders or companionways are located within a distance of 1,0 m to the outer deck edge, handholds shall be installed in their vicinity.

For non-sailing boats with L_H < 6 m, on the outer deck edge, the maximum distance between two adjacent handholds shall not exceed 1,2 m.

7.3 Strength

Handholds, as built and installed, shall withstand a load of 1 500 N, in any direction, at any point, along their length without failure such that they no longer perform their intended purpose.

NOTE This requirement can be verified by test or calculation.

A handhold dedicated to more than one person shall, in addition to the point load above, be designed to withstand an equally distributed load equal to 1 500 N multiplied by the number of people designated to hold at the same time.

8 Barriers to falling overboard

8.1 General

One of the following barriers to falling overboard shall be provided according to the requirements of 4.3:

— low barriers to falling overboard (as specified in Table 2, safety device #4); or

— high barriers to falling overboard (as specified in Table 2, safety device #5).

Barriers to falling overboard shall be installed continuously at the outer periphery of the deck zones.

The barrier to falling overboard shall conform to the relevant requirements of 8.2 to 8.5.

If glass is used as part of the barrier to falling overboard, only high impact resistance glass shall be used.

NOTE 1 High impact resistance glass is specified in ISO 12216:2020, Annex E.

NOTE 2 Figure 3 provides application examples of requirements from 8.1 and 8.2.

8.2 Geometric requirements for barriers to falling overboard

8.2.1 Height of barriers to falling overboard

The minimum height of barriers to falling overboard shall be as specified in Table 5.

Sailing boats shall be fitted with an intermediate guard-rail or guard-wire if it has a high barrier to falling overboard consisting of a guard-rail or guard-wire. The vertical gap between this intermediate line and the deck, foot-stop, bulwark, etc., whichever is higher, shall not exceed that stated in Table 5.

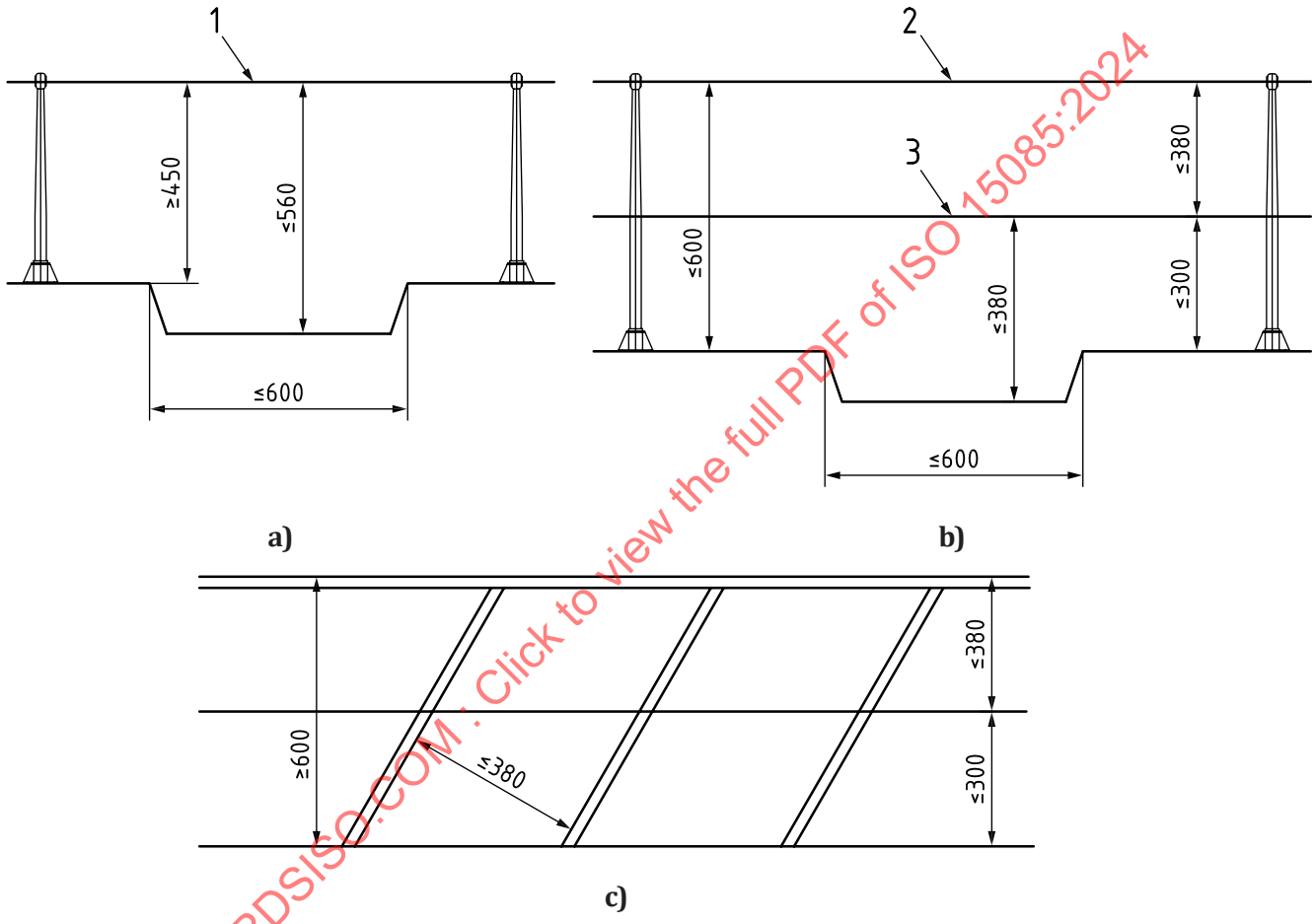
If the deck zone has a change of height in way of the barriers to falling overboard, the lower gap may increase to that stated in Table 5 for no longer than 500 mm measured along the line of the barrier.

Table 5 — Minimum height and gaps requirements of barriers to falling overboard

Type of barrier	Minimum height	Intermediate line maximum height	Maximum lower gap height in case of a change of deck level	Maximum vertical gap above intermediate line[a]	Figure
Low barrier to falling overboard	450 mm	Not applicable	560 mm	Not applicable	Figure 3 a)
Barrier to falling overboard	600 mm	300 mm	380 mm	450 mm	Figure 3 b) and c)

[a] Only for sailing boats.

Dimensions in millimetres



Key

1 low barrier to falling overboard (450 mm)
2 high barrier to falling overboard (600 mm)
3 intermediate line

Figure 3 — Diagram illustrating the requirements of 8.1 and 8.2

8.2.2 Openings in barriers to falling overboard

Permanent openings in barriers to falling overboard may be used provided that the gap does not exceed 150 mm.

To facilitate boarding or reboarding of crew or equipment, non-permanent openings in the barrier to the falling overboard system may be used, provided that permanently fixed and quickly operable mobile sections are fitted in vicinity of these openings. These sections shall be designed so that they cannot open inadvertently.

8.3 Additional requirements for sailing boats

8.3.1 Bow pulpits for sailing boats

Bow pulpits may be open but the opening between the pulpit and any part of the craft shall not be greater than 380 mm.

This requirement shall be checked by presenting a 380 mm circle inside the opening. Figure 4 illustrates this procedure.

Dimensions in millimetres

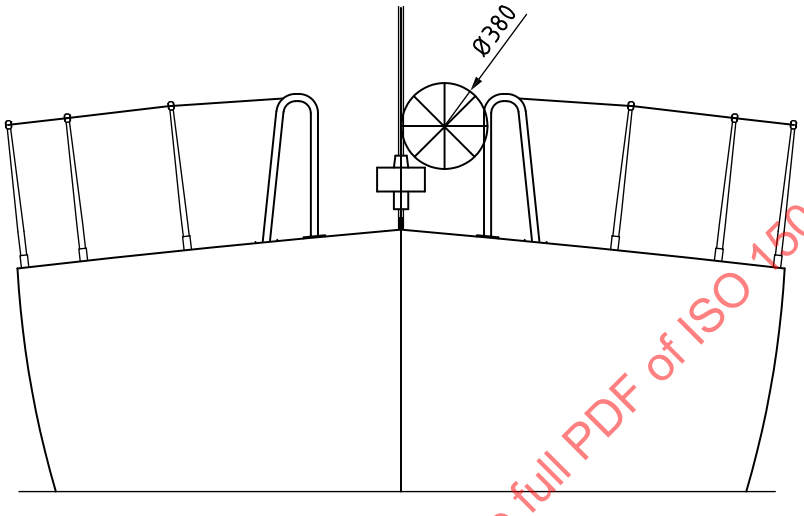


Figure 4 — Diagram illustrating the requirement of 8.3.1

8.3.2 Transom barriers to falling overboard for sailing boats

Transom barriers to falling overboard for sailing boats shall apply either:

— the requirements given in 8.1 and 8.2; or

— the following requirement of this clause.

Where the transverse aft part of the deck zone is a seat, the minimum height requirement for a barrier to falling overboard shall be decreased to:

a) 450 mm for high barrier to falling overboard;

b) 300 mm for low barrier to falling overboard.

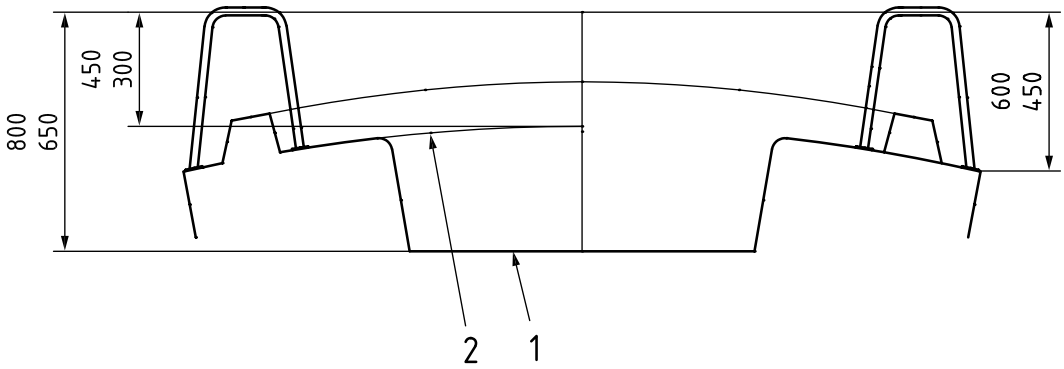
Where the transverse aft part of the deck zone is a cockpit floor, the minimum height requirement for a barrier to falling overboard shall be increased to:

— 800 mm for high barrier to falling overboard;

— 650 mm for low barrier to falling overboard.

Figure 5 illustrates these alternatives.

Dimensions in millimetres



Key

1 cockpit floor

2 seat level

Figure 5 — Transom diagram facing aft, illustrating the requirement of 8.3.2

8.3.3 Forward cross beams of sailing catamarans

On sailing catamarans, the wire/rod and stanchion bracing on forward cross beams may be regarded as a barrier to falling overboard, even if its height varies from the minimum required height to zero at the beam end. The minimum height of this wire/rod at the centreline shall be according to the option of Table 3 and the requirements of Table 5 for barrier to falling overboard height.

Similarly, the height of the longitudinal barrier to falling overboard on the outer edges of the hulls may diminish to zero in vicinity of the forward beam. The minimum height of this longitudinal barrier to falling overboard, except at the vicinity of the forward beam, shall be according to the option of Table 3 and the requirements of Table 5 for barrier to falling overboard height.

The maximum distance between handholds on the transverse and longitudinal barrier to falling overboard shall not be greater than 0,75 m.

8.3.4 Central hull of sailing trimarans

On sailing trimarans, barriers to falling overboard may be omitted on the central hull in the areas where a person falling from the deck zone would land on a trampoline or net as part of the deck zone, which shall have a width of at least 700 mm in these areas.

8.4 Risk of falling overboard from elevated deck zones

Elevated deck zones shall be provided with protection to minimize the risk of falling overboard, according to the requirements of Table 6.

H_1 and H_2 values shall be defined according to Table 7 and function of the barrier to falling overboard type fitted at lower deck edge.

NOTE On fly bridges, the deck zone area, defined by the builder, is usually the fly bridge sole.

Table 6 — Protection required for elevated deck zones

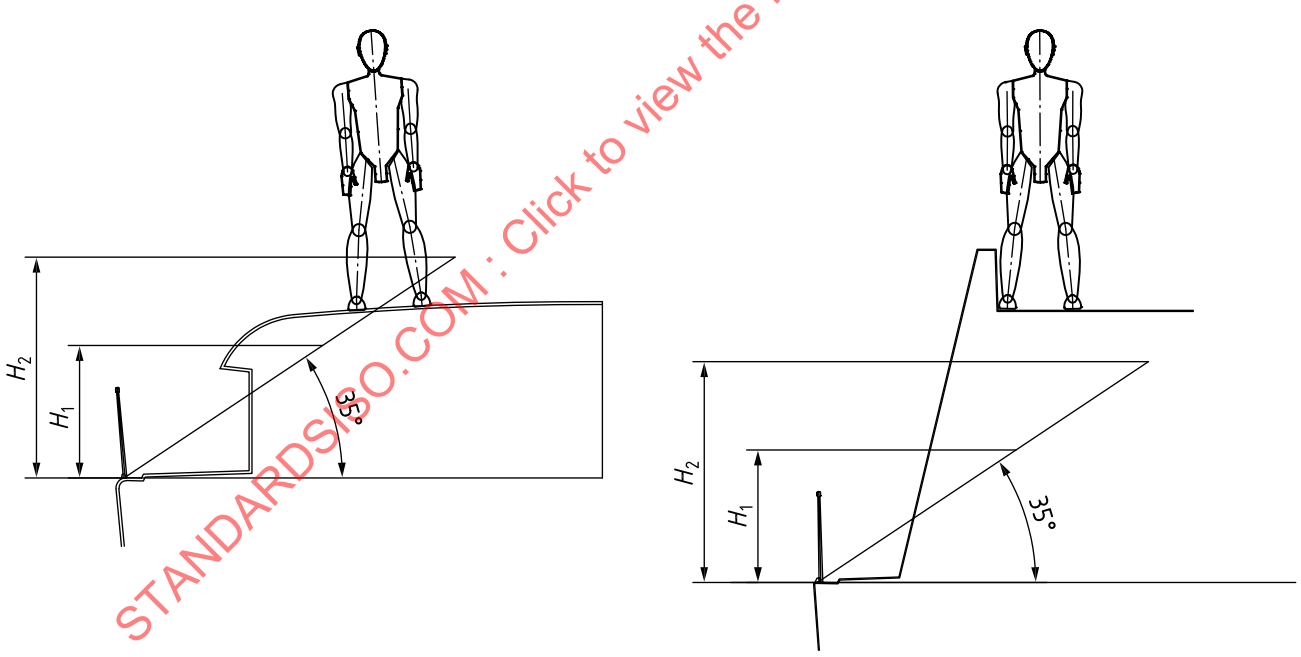
Option from Table 3 or Table 4	Design category	Height of elevated deck relative to:			Figure	Requirements		
		outer lower deck edge[a]	inclined limit line[b]	m_{LC} waterline		Foot-stops	Handholds	Barriers
I, II, III, VII, VIII or IX	Any	Below H_1	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
		Between H_1 and H2	Above	Not applicable	Figure 6 a)	Clause 6	Clause 7	Not applicable
		Above H_2	Above	Not applicable	Figure 6 b)	Clause 6	Not applicable	8.1
V, VI, XI or XII	C or D	Not applicable	Not applicable	≥ 2,0 m	Not applicable	Not applicable	Not applicable	8.1

[a] H_1 and H_2 values are provided in Table 7.

[b] Line inclined at 35° above the horizontal and passing through the outer lower deck edge as illustrated in Figure 6.

Table 7 — Values of H_1 and H_2 according to barrier to falling overboard type

Barrier to falling overboard required height mm	Height H_1 mm	Height H_2 mm
Low barrier to falling overboard = 450	750	1 200
High barrier to falling overboard = 600	900	1 500



a) Deck zones located at a height between H_1 and H_2

b) Deck zones located higher than H_2

Figure 6 — Diagram illustrating the requirement of 8.4

8.5 Barrier to falling overboard design and strength requirements

8.5.1 General requirements

As installed, the barrier to falling overboard system shall withstand an 1 820 N static load applied over a contact length which shall not exceed 100 mm at any location, in an outboard horizontal direction, without failure such that it no longer performs its intended purpose.

8.5.2 Requirements for guard-rails or low guard-rails

Guard-rails shall be capable of supporting, at any point along their top, the following outboard forces perpendicularly to the guard-rail local direction, with the corresponding results:

— A horizontal force of 280 N, with a deflection at the force level not greater than 50 mm measured at the top of the device. If the fitting has play, the deflection shall be measured from the end of movement. There shall be no permanent deformation of the guard-rail or support after the force has been taken off. Where there is play in the assembly, it shall not be more than 40 mm measured between its extremes;

— A horizontal force of 560 N without breaking.

Conformity with these requirements shall be demonstrated by calculation or test. In the case of a test, the test may be made on the craft or with the guard-rail and its supports placed in a test jig.

8.5.3 Requirements for guard-lines

The strength of the high guard-lines, low guard-lines and intermediate guard-lines shall fulfil the requirements of Table 8.

Table 8 — Summary of strength requirements for high guard-lines, low guard-lines and intermediate guard-lines

Design category	Guard-line minimum ultimate strength N
A	13 000
B and C	9 000
NOTE The approximate diameters given below are those of the wire only and do not include any sheathing: — approximate 1 19 AISI 316 steel wire diameter may be 4 mm for A design category; — approximate 1 19 AISI 316 steel wire diameter may be 3,5 mm for B and C design category; — approximate 7 19 AISI 316 steel wire diameter may be 5 mm for A design category; — approximate 7 19 AISI 316 steel wire diameter may be 4,5 mm for B and C design category.	

The resistance of a wire having the indicated diameter shall be checked with the wire manufacturer.

If a synthetic line is used, it shall be chafe resistant or protected against chafing, particularly in bearing areas on stanchions and pulpits.

Due to ageing, ultraviolet rays or chafe, the synthetic line shall be periodically inspected or replaced. The period between inspections or maintenance, and the actions to be performed, shall be indicated in the owner's manual (as specified in Clause 14).

Where a material type permits a diameter smaller than 3,5 mm, sheathing shall be fitted on the guard-line to increase its diameter to 3,5 mm or greater.

Guard-lines shall be tightened to provide a firm support. Devices shall be fitted to tension the guard-line.

Any device forming part of the guard-lines beyond its attachment point shall withstand, as installed, the ultimate loads defined in Table 8. These requirements shall be verified by test or calculation.

8.5.4 Requirements for stanchions or guard-line supports

8.5.4.1 Spacing

Stanchions or guard-line supports shall be designed and installed such that the distance between two supports, measured along the line, is not greater than 2,20 m.

8.5.4.2 Strength

Stanchions or guard-line supports shall be capable of supporting, at their top, the following outboard forces applied perpendicular to the guard-line local direction, with the corresponding results:

— A horizontal force of 280 N with a deflection under load of the stanchion or support not greater than 50 mm at the force level measured at the top of the device. If the fitting has play, the deflection shall be measured from the end of movement.

— A horizontal force of 560 N without breaking.

Assessment of the stanchions for the above requirements shall be made without installed lines.

These requirements shall be verified by calculation or test, for at least one sample of the device (stanchion or guard-line support, base, fixture system). In the case of a test, to measure the deflection and strength, the stanchion and its support shall be installed either:

— on the craft;

— on a test jig.

8.5.4.3 Fixture and disposition of stanchion and guard-line supports

Stanchions/line supports shall be:

— mechanically secured in their supports (the tension of the guard-lines is not considered to satisfy this requirement);

— angled outboard less or equal to 10° from the vertical, at all points 50 mm above the deck.

Guard-lines shall be held vertically and horizontally by the stanchion/line support.

9 Hooking points

9.1 General

Hooking points required by 4.3 shall fulfil the relevant requirements of 9.2 to 9.5.

If a handhold is considered as a hooking point, it shall conform to the requirements of 9.4 and 9.5.

9.2 Location

Hooking points shall be located as follows:

a) within 1 m of the edge of the main companionway hatch/door;

b) within 2 m of all-weather deck steering positions;

c) within 2 m of the mast of sailing boats;

d) within 2 m of the winch positions of sailing boats;

e) within 2 m of the windlass or towing strong point(s);

f) within 2 m of the life-raft stowage;

g) no more than 3 m apart from each other.

9.3 Location for habitable multihull craft susceptible to inversion

Habitable boats susceptible to inversion shall be fitted with hooking points accessible when inverted:

— within 1 m of each escape hatch;

— within 2 m to life-raft stowage point(s);

— no more than 3 m apart from each other.

NOTE ISO 12217-1:2022, ISO 12217-2:2022 and ISO 12217-3:2022 provide requirements to define habitable multihulls susceptible to inversion.

9.4 Size

Hooking point eyes that are designed to accept a harness shall be inscribed within a circle of 15 mm. The cross-section of the material to which the harness may be clipped shall be no larger than 12,5 mm.

9.5 Strength

Hooking points shall withstand, without failure such that they no longer perform their intended purpose, a horizontal force of 3 600 N for craft of design category C and 6 000 N for craft of design category A and B. This requirement shall be verified by test or calculation. Jack-lines may be attached to hooking points if these conform to the requirements of 10.3.

Devices not specifically designed for the purpose may be used as hooking points but shall have the required strength.

EXAMPLE Cleat, pulpit foot stanchion base.

10 Attachment points for jack-lines

10.1 General

Where required by 4.3, attachment points for jack-lines shall conform to the requirements of 10.2 and 10.3.

10.2 Fitting

Attachment points for jack-lines shall be fitted on deck, port and starboard, to provide secure fixing for jack-lines. These lines shall be long enough to allow the movement needed for craft operation.

Jack-lines may be fitted in sections, but each section of jack-line shall be as long as practicable. Attachment points shall be fitted at the ends of each section.

Devices not specifically designed for the purpose may be used as jack-line attachment points but shall have the required strength.

EXAMPLE Cleat, pulpit foot stanchion base.

10.3 Strength

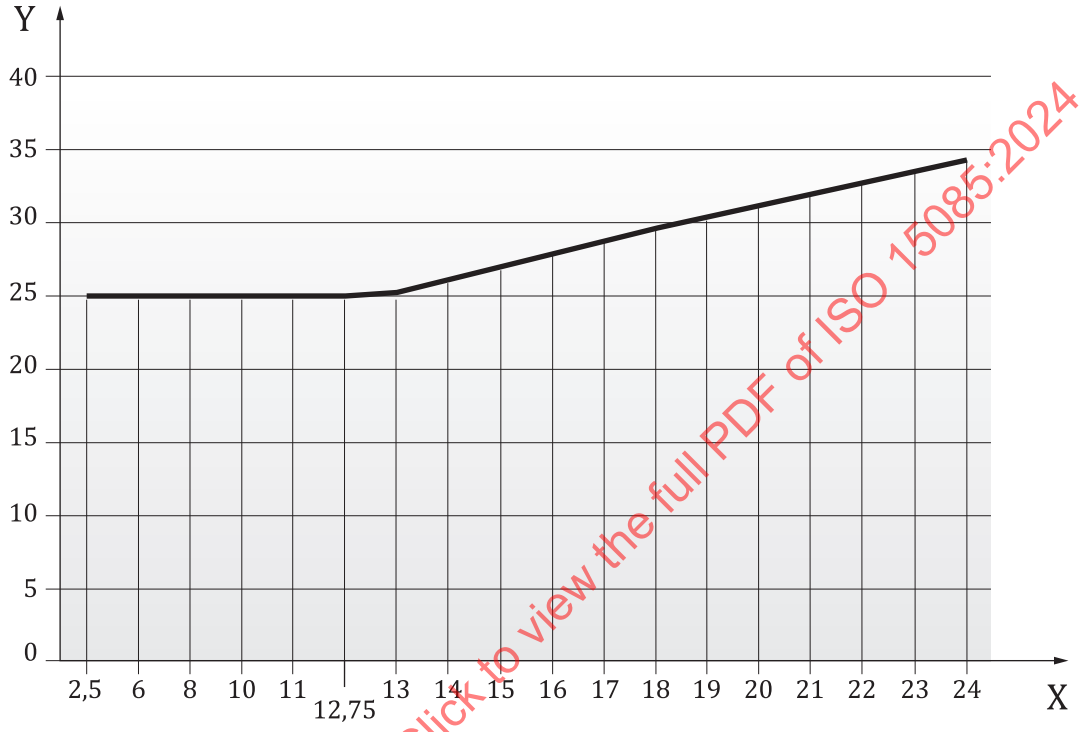
Attachment points for jack-lines shall withstand, without failure such that they no longer perform their intended purpose, a horizontal force of 20 000 N applied in the direction of, and up to, an angle of 30° from a line connecting them. This requirement shall be verified by test or calculation.

11 Prevention of falling overboard from high-speed craft

11.1 General

High-speed craft of any design category shall be fitted with means of support for each of its occupants to maintain upright posture, when the craft is underway, minimizing the possibilities of occupants being thrown overboard in case of sharp turns, strong acceleration or movements in the sea.

Figure 7 provides an illustration of maximum speeds according to the length of hull from which a craft is considered as a high-speed craft.



Key

X length of hull, L_H (m)

Y maximum speed (knots)

Figure 7 — Maximum speed from which a craft is considered as a high-speed craft

One of the following options shall be provided for each occupant:

— one handhold, as required in Clause 7, plus body support as required in 11.3;

— one or two handholds, as required in Clause 7, allowing simultaneous gripping of both hands.

NOTE Each occupant can stand, lean, sit or lie.

11.2 Additional requirements for handholds

When an occupant position requires simultaneous gripping of both hands, the handhold device(s) shall allow a minimum separation of 200 mm between hands.

Where round tubing is used as a handhold designated for high-speed craft body support, the diameter shall be in the range 19 mm to 38 mm.

11.3 Body support

When occupants are seated, the body support shall have a minimum backrest height of 120 mm above the rigid seat bottom or, when a cushion is fitted, from the top of the fully compressed seat cushion.

If the occupants are sitting or riding astride a seat, i.e. riding, the body support shall be provided either:

— by the requirements of the paragraph above;

— by the action of the knees.

If the occupants are standing or leaning, as a minimum, the body support shall provide support only for the back or the torso.

11.4 Seat fixing strength

Where a seat structure is permanently fitted to the craft by means of an attachment system, the seat and the attachment system shall conform to the strength requirements given in Annex A.

12 Toe straps for sailing dinghies

As an alternative to options XI and XII handhold requirements in deck zone Z1 (see 4.3), sailing boats may be fitted with toe straps.

The location of the toe straps shall allow the intended crew to hike safely at the intended position.

Each section of a toe strap (i.e. between attachments) shall, as installed, withstand a vertical load of 1 000 N per number of crew that will use that section.

13 Means of reboarding

13.1 General requirements

All craft shall be designed with a means to facilitate reboarding by a person in the water unaided.

This means of reboarding shall be provided by one of the following:

a) a rigid ladder according to 13.2;

b) a non-rigid ladder according to 13.3;

c) another dedicated device other than a ladder;

d) a design of the craft which enables reboarding from the water without a dedicated device.

If the means of reboarding is deployable, any device which activates the deployment shall not be located higher than 500 mm above the waterline. A flexible activation device (e.g. a rope) shall be fixed not higher than 500 mm above the waterline. Its ability to be deployed by a person in the water unaided shall be demonstrated. Deployable devices shall be active even if the engine is stopped or with any primary energy fault.

Items b), c) and d) shall be tested according to 13.4 as installed.

Where deployable, the means of reboarding shall not require a force greater than 100 N to be activated.

Propeller propulsion systems shall not be used as the means of reboarding.

CAUTION — Attention shall be paid to the location of the means of reboarding relative to possible danger from propeller(s).

The means of reboarding shall lead directly to a Z3 deck zone.

NOTE 1 The handhold(s) can be a part of the reboarding means.

NOTE 2 The means of reboarding can also lead to a Z2 or Z1 deck zone.

13.2 Requirements for rigid ladder

Where a rigid ladder is provided as the means of reboarding:

a) it shall not swing away from the person in the water under load so as to hinder reboarding;

b) it shall not be angled beyond vertical, as installed, where the bottom of the ladder would be further from the user than the top portion of the ladder;

c) its steps or rungs shall have a slip resistant treading depth of at least 25 mm [as illustrated in key 6 in Figure 8 a)];

d) its steps or rungs shall have:

   1) a maximum spacing of 305 mm [as illustrated in key 3 in Figure 8 a)];

   2) a minimum rung width of 100 mm per foot, and a minimum total width of 200 mm [as illustrated in key 4 in Figure 8 a)];

   3) a horizontal tread clearance from adjacent structure of at least 100 mm [as illustrated in key 5 in Figure 8 a)].

e) the bottom step or rung shall be at least 560 mm below the waterline, with the craft at rest in m_{LC} condition as defined in ISO 8666:2020;

f) it shall allow a hand grip clearance from adjacent structures of at least 32 mm;

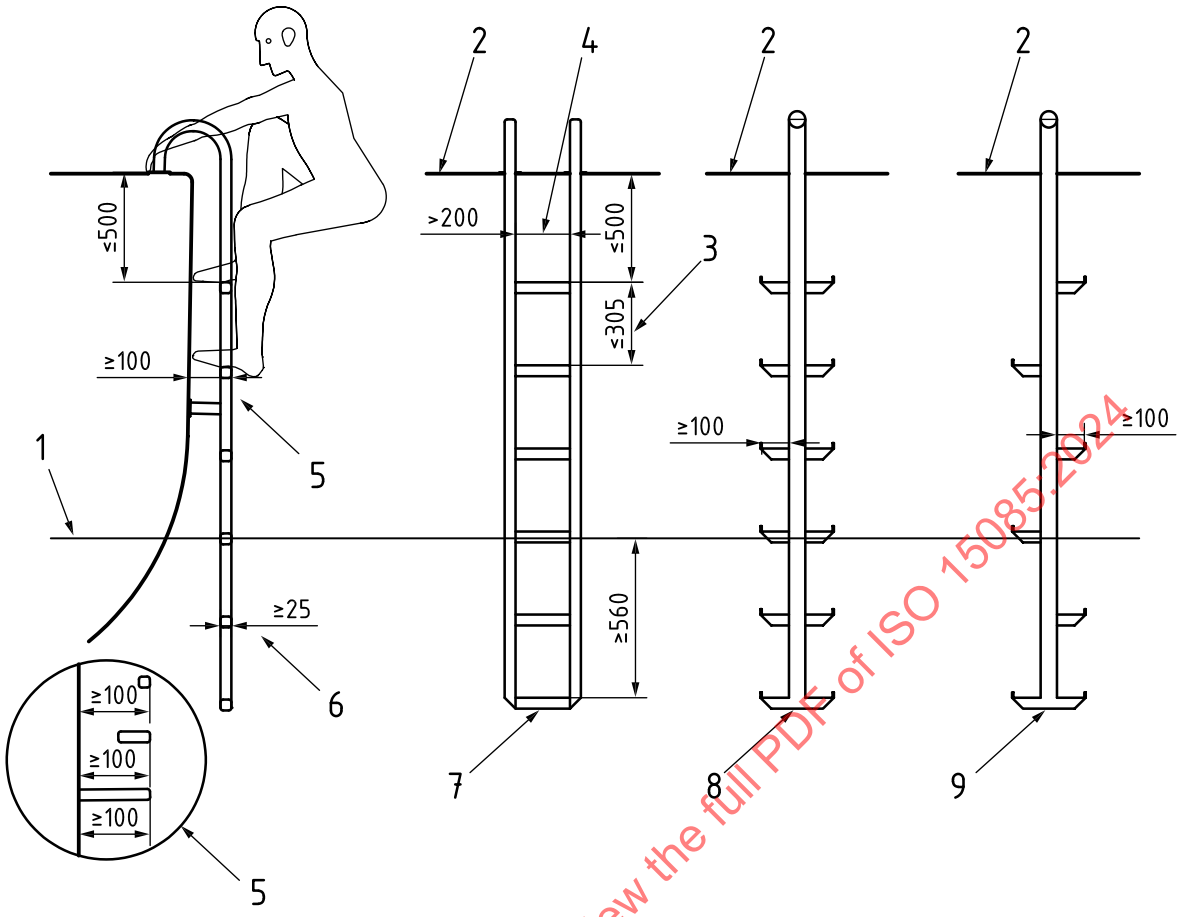
g) it shall have handhold(s) that can be reached either on the ladder or in its vicinity; the first handhold shall be located not more than 500 mm from the upper step or rung;

h) its highest point or top step/rung shall be located not more than 500 mm below the adjacent area leading to a Z3 deck zone;

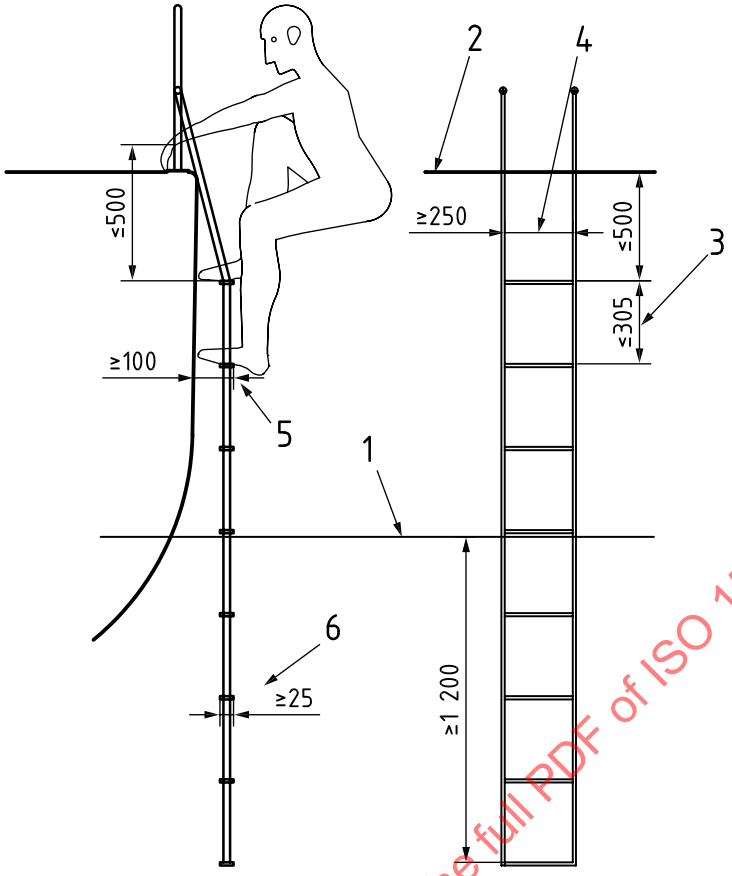
i) its strength when deployed and secured shall still fulfil its purpose when subject to a vertical force of 1 800 N applied to any point of the step or rung and to its fixing system.

It may be used without being tested provided that it conforms to all of the above requirements, as installed and when deployed [as illustrated in Figure 8 a)].

Dimensions in millimetres



a) Rigid ladder



b) Non-rigid ladder

Key

1	waterline	6	stem/rung treading depth
2	working deck level	7	classic ladder with two side rails
3	step/rung spacing	8	diver's type ladder- centre rail with symmetric steps
4	step/rung length/span	9	diver's type ladder – centre rail with non-symmetric steps
5	step/rung horizontal clearance with hull		

Figure 8 — Dimensional requirements for ladders

13.3 Requirements for non-rigid ladder

A non-rigid ladder shall, as installed and when deployed [as illustrated in Figure 8 b)]:

— conform to the requirements of 13.2 c), d) 1), h), g) and i);

— have rigid rungs at least 250 mm wide measured inside between the vertical straps [as illustrated in key 4 in Figure 8 b)];

— be attached by at least two separate points spaced not less than the rung width;

— have the bottom step or rung at least 1 200 mm below the waterline, with the craft at rest in m_{LC} condition as defined in ISO 8666:2020;

— have the submerged steps or rungs with negative buoyancy to help achieve the ladder geometry.

13.4 Reboarding test

The reboarding test, where required, shall consist of a physical test performed by one person alone in the water, with the craft at rest and floating freely in m_{LC} condition as defined in ISO 8666. The person shall have a mass of at least 82,5 kg wearing a personal flotation device according to Table 9 that is inflated.

For craft with L_H < 6 m, during the test the craft may swamp, provided that it passes the one-person test specified in ISO 12217-3:2022, C.4.2, for non-sailing boats, or the capsize recovering test as described in ISO 12217-3:2022, 7.5, for sailing boats.

After the test, the reboarding means shall be re-usable. Where a ladder or another device is used, it shall show no permanent deformation.

Table 9 — Personal flotation device for the reboarding test

Craft design category	Minimum performance level
A and B	150 N
C	150 N, except 50 N for craft required to pass a capsize recovering test[a]
D	50 N
[a] As defined in ISO 12217-2:2022 and ISO 12217-3:2022.	

14 Owner's manual

An owner's manual shall be provided with the craft. It shall include at least the items specified in Table 10 as required in the relevant clauses and subclauses of this document.

Areas of the craft not intended to be occupied by crew shall be illustrated in the craft owner's manual.

NOTE Requirements for owner's manuals are provided in ISO 10240.

Table 10 — Requirements for owner's manual

Clause or subclause	Required indication in owner's manual
4.1	A text or a sketch in the owner's manual shall indicate the deck zone area(s) defined by the boat builder and when they can be occupied (at any time, at low speed, at rest).
4.3, Table 4, option X	If option X is used, a sentence in the owner's manual shall indicate that the craft is only intended for daytime sailing and not at night.
8.5.3	Where relevant, information on maintenance requirements shall be provided for guard-lines, pointing out the need for periodic inspection of synthetic wires for UV degradation and chafe that may necessitate replacement.
Clause 13	A description of the means of reboarding and how to deploy it shall be provided, with the following dedicated warning: During normal operation of the craft, means of reboarding shall be readily accessible to, or deployable by, a person in the water unaided. NOTE The term "readily accessible" means capable of being reached quickly and safely for effective use under emergency conditions without the use of tools."