International Standard

ISO 25649-6

Floating leisure articles for use on and in the water —

Part 6: Additional specific safety requirements and test methods for Class D devices

Articles de loisirs flottants à utiliser sur ou dans l'eau —

Partie 6: Exigences de sécurité et méthodes d'essai complémentaires propres aux dispositifs de Classe D

Second edition
2024-10

Reference number
ISO 25649-6:2024(en)

Contents

Page

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 83, *Sports and other recreational facilities and equipment*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 136, *Sports, playground and other recreational facilities and equipment,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 25649-6:2017), which has been technically revised.

The main changes are as follows:

— update of the scope;

— update of Clause 2;

— update of Clause 3;

— in 4.2.1, update of the requirements regarding the force to apply for the test method;

— in 4.5.3.1, addition of requirements on the residual buoyancy for structure > 1,5 m height;

— creation of 4.5.5.6 on products with climbing functions;

— creation of 4.5.8.1 on water depth information;

— creation of 4.5.8.2 on water depth calculation for specific products;

— in 4.5.11.1 addition of requirements on the repair kit;

— update of Clause 5;

— update of Annex A,

— creation of Annex B on specific information for devices exceeding 5 m height;

— creation of Annex C and specific requirement for pool use of water parc modules.

A list of all parts in the ISO 25649 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 products described in this document are characterized by their enormous size and intended collective use. Therefore, most safety requirements concentrate on floating stability under full and single sided load, collision of users, entrapment and entanglement issues as well as safety distances and sufficient water depth in relation to jumping and potential falling heights provided by the various “action modules”. Another issue is the assembly of these stand-alone modules to large and complex activity courses. The assembly creates entrapment risks at the interfaces and needs to be assessed under the aspect of closing those interfaces.

Consumer information related to safe use is an important supplement.

Class D devices are applicable to persons older than 36 months who are able to swim. Class D devices are intended to be anchored in position or free floating. They are designed for active use on the water surface. Class D devices are especially designed for active use, including jumping, playing, climbing and any other related activity on the inflatable.

See Annex A for examples of typical products forming Class D. See Figure 1 for interior structure of Class D devices.

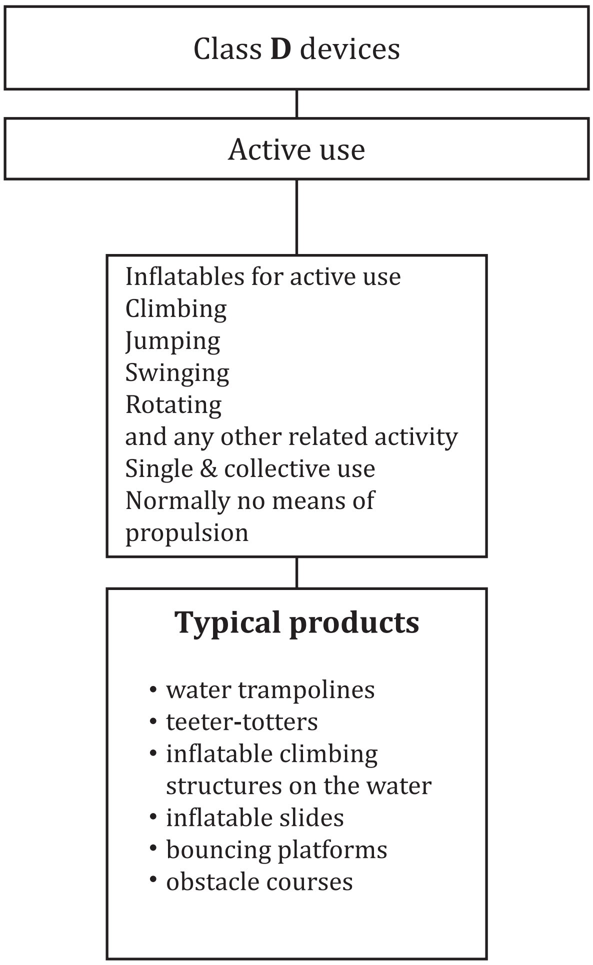


Figure 1 — Interior structure of Class D devices

The risk assessment for this document is shown in Table 1.

Table 1 — Introductory risk analysis

Class	**Typical products**	**Place of usage**	**Function; range of usage; target/ age group**	**Type of movement/ propulsion**	**Position of user in regard to the equipment, elevation above water**	**Predictable misuse**	**Partial risk related to water environment**	**Final risk**	**Protection aims** standard/ regulation
Trampoline D (D1, D2) climbing/ jumping structures	Trampolines on the water of various sizes	Sea shore or close to shore; lakes; smoothly running rivers; big pools; amusement parks	Jumping on devices/in the water, dual use: resting, use as platform all age groups, swimmers	Static use on a determined place, device moored may also be free floating; users jumping; all sorts of movements	Considerable elevation depending on the size of the device and jumping height; entrapment through swimming underneath the structure	Use by non-swimmers; overcrowding; insufficient water depth; impact in water, collision; entrapment through swimming underneath device, lack of supervision (small children)	Collision of persons; collision with objects (anchoring); insufficient water depth; safety distances; dangerous proximity to other objects; shallow water; re-embarking (grab handles)	DROWNING	Age limits; swimmers only; no protruding parts; no entrapment; cushioning; warnings; supervision of small children
	Large floatable structures for action and fun, mainly climbing jumping, rollicking; bouncing castles on water	Sea shore/ close to shore; lakes; rivers; big pools; amusement parks	All age groups, swimmers	Devices static (drifting or moored); users are jumping; climbing; sliding; bouncing; (see also trampolines)	Depending on the size of the device; height up to 4 m are likely; jumps and falls are part of the game	Depending on the size of the device; heights up to 4 m are likely; jumps and falls are part of the game	As above		Supervision; no rules are known for on the water equipment; safety transfers are likely from land-bound toy structures

Floating leisure articles for use on and in the water —

Part 6:
Additional specific safety requirements and test methods for Class D devices

1 Scope

This document specifies safety requirements and test methods related to materials, safety, performance and consumer information for classified floating leisure articles for use on and in the water according to ISO 25649-1:2024.

This document is applicable to Class D floating leisure articles for use on and in water according to ISO 25649-1:2024 regardless whether the buoyancy is achieved by inflation or inherent buoyant material.

NOTE 1 Typical products forming Class D (see Figure A.1 and Figure A.2):

— inflatable climbing structures on the water;

— bouncing platforms;

— inflatable slides;

— water trampolines;

— teeter totters;

— obstacle courses.

NOTE 2 Typical places for application:

— pools;

— lakes, ponds;

— open sea;

— sea shore (no offshore winds, no currents).

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.

EN 913:2018, *Gymnastic equipment — General safety requirements and test methods*

EN 13138-3:2021, *Buoyant aids for swimming instruction — Part 3: Safety requirements and test methods for swim seats into which a user is positioned*

ISO 25649-1:2024, *Floating leisure articles for use on and in the water — Part 1: Classification, materials, general requirements and test methods*

ISO 25649-2:2024, *Floating leisure articles for use on or in the water — Part 2: Consumer information*

ISO 25649-3:2024, *Floating leisure articles for use on and in the water — Part 3: Additional specific safety requirements and test methods for Class A devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 25649-1:2024 and the following 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
residual buoyancy
provision of remaining buoyancy in case of a defect of any buoyancy chamber

3.2
re-embarkation aids
design feature that facilitates getting back on the floating leisure article from an in-water position, regardless whether the buoyant structure is fully inflated or any chamber is deflated

3.3
safety pad
trampoline cover for springs, metal frame and fringe zone of the jumping surface

3.4
available area
area on or inside a floating article that can be unrestrictedly used for user accommodation when taking the intended posture(s)

3.5
load capacity
value stated by the manufacturer representing the maximum load on a buoyant structure under which a safe floating position is assured

3.6
unsupported material
materials that have no reinforcing textiles

3.7
module
functional element of floating leisure articles that can be used as a stand-alone device or integrated with other functional elements into a complex *modular arrangement* (3.8) of any optional shape

Note 1 to entry: The two major types of modules are flat connection modules and action modules.

3.8
modular arrangements
individually and variable combination of single floating leisure article *modules* (3.7), flat connection and action modules in a way that a multi-functional water park is created and can be modified by exchanging an optional number of modules when needed

Note 1 to entry: Action modules include climbing module, water slide module, trampoline module, swing module, etc.

4 Safety requirements and test methods

4.1 General

Construction of a floating leisure article Class D device shall be such that it corresponds in terms of design, dimensions, safety, strength and durability to its intended use. The requirements set out in this document were chosen to ensure compliance with these considerations. When floating leisure articles provide buoyancy in several components, these requirements shall apply to all components. Inflatables shall provide residual buoyancy if one air chamber fails. This residual buoyancy maintains the safety of the device even if its function might be lost. The safety requirements in this document are therefore related to:

— design;

— sizing;

— materials;

— strength;

— performance;

— information.

General and common material related requirements and test method as specified in ISO 25649-1:2024 and ISO 25649-2:2024 shall apply for Class D devices (inflatable or inherent buoyant).

In individual cases, due to the unpredictability of existing and future products, a corresponding choice shall be made by the test house.

With regard to those risks resulting from extreme height, devices exceeding 5 m height shall be submitted to further risks analysis (as stated in Annex B).

4.2 Design of buckles and other fixings

4.2.1 Requirements

If buckles or other detachable fastening devices are used as components of Class D devices in order to attach or connect functional parts or other components, they shall require at least two simultaneous actions for their release or opening in order to prevent an unintended opening. When one of the two sequences of buckle opening relies on pressure, it shall be necessary to apply a force of at least 50 N on this release mechanism.

4.2.2 Test method

Verification shall be executed by the test panel. In case of a locking system based on pressure, the testing shall be done in accordance with EN 13138-3:2021, Annex E.

4.3 Sizing and admissible number of users, maximum load capacity

4.3.1 Product sizing

The device shall not exceed a maximum accessible platform height of 5 m.

See Annex B for specific recommendations related to devices exceeding 5 m maximum height.

4.3.2 User sizing

If a specific size/body weight correlation between user and device is relevant, the marking shall be in accordance with the range of body weights. The size/body weights of the user shall be indicated on the product by completing the relevant boxes of the appropriate safety information symbols “Number of users, adult/children” (Figure 22) and/or “Maximum load capacity” (Figure 27) as specified in ISO 25649-2:2024.

Devices shall be marked according to their size and/or number of permitted users and maximum load capacity as specified in ISO 25649-1:2024 and ISO 25649-2:2024.

Devices including dual or multiple use (e.g. jumping on a trampoline or lying rest) shall include markings in accordance with ISO 25649-2:2024 for all intended functions.

4.3.3 Space per person per trampoline

4.3.3.1 Requirements

Class D products shall be labelled with the intended posture of the user(s) [lying/sitting/standing and relaxing or jumping (for multiple use bounce platforms or trampolines)] and the maximum permissible number of users recommended by the manufacturer.

The minimum space for a user in lying posture shall correspond to a flexible template (adult/child) the dimensions of which are specified in ISO 25649 1:2024, A.1.1. The minimum space for a sitting user shall correspond to the template (adult/child) as specified in ISO 25649 1:2024, A.1.2. In cases of combined use (sitting and lying), the template for a lying person shall be applied to determine the available area.

For multiple use bounce platforms or trampolines, the maximum number of jumpers shall correlate with the space available for each jumper. A 1,5 m jumping surface diameter is required per jumper. Each increase of jumping surface by 1,5 m shall allow for an increase of one more jumper. The total number of jumpers shall however not exceed three persons. The minimum space for a user in relaxing position should correspond to a flexible template (adult/child), the dimensions of which are specified in ISO 25649-1:2024, A.1. The minimum space for a sitting or lying user shall correspond to the template (adult/child) as specified in ISO 25649-1:2024, A.1. The maximum permissible number of users shall be recommended by the manufacturer.

In deviation to other specifications related to land-based trampolines, a 1,5 m jumping circle diameter per person can be accepted considering experience over a period of 10 years without accidents related to this space per person and the fact that the trampolines in question shall meet a high level of fall protection requirements (covering of rigid objects on the surface according to 4.5.13).

The total number of users determined by the template shall not exceed the load capacity and floating stability of the device.

4.3.3.2 Test method

Testing shall be done by applying the relevant lying/sitting templates as specified in ISO 25649-1:2024, A.1. Templates shall be stretched out over the area available to the user without overlapping. Templates may be arrayed to optimize the number of users without exceeding the load capacity of the device. Check for appropriate labelling in accordance with safety information symbols "Number of users, adult/children" (Figure 22) and/or "Maximum load capacity" (Figure 27) as specified in ISO 25649-2:2024.

4.4 Components

4.4.1 Valves and stoppers (special requirements for Class D)

All Class D floating leisure articles shall be fitted with non-return valves. Valves should meet the relevant requirements in ISO 25649-1:2024, 5.9.

In deviation to ISO 25649-1:2024, the protrusion of the valve and stopper shall not exceed 20 mm above the surrounding surface when the device has been inflated. When accessible during intended use, protruding parts of valves shall be rounded and not create entanglement or entrapment (see ISO 25649-1:2024, 5.4).

When tested in accordance with 4.2.2, the inflatable device shall not collapse due to a sudden loss of air pressure.

The valves shall be located in a safe place that does not obstruct the use of the products and shall be positioned such that it cannot easily be opened by an individual. If placement shall be in visible view and located where it is easily reachable, then a locking system for the valve or a valve apron (permanent covering) shall be used.

The valves should have no hazardous parts that result in entrapment (such as loose strings).

4.4.2 Test method

Visual inspection and assessment shall be by assessment panel.

4.5 In water performance

4.5.1 Class D devices, floating stability

4.5.1.1 Requirements

All Class D floating leisure articles shall provide sufficient buoyancy and buoyancy distribution to bear the weight of the intended number of users and meet the intended functions. Devices shall float stable with all admitted passengers represented by the test subjects, as specified in ISO 25649-1:2024, 5.5. Test subjects shall be placed on the device, adopting the posture representing the most uneven load distribution (multiple postures if applicable). Test in accordance with 4.5.1.2.

The capability of stable floating performance shall be marked on the product via the appropriate safety information symbol “Floating stability/balancing” (Figure 32) as specified in ISO 25649-2:2024.

4.5.1.2 Test method

The maximum number of test subjects according to manufacturer’s declaration (adults, children) shall be placed within the available area in a way most likely to cause failure but without stretching (see ISO 25649-1:2024, 5.5.4 and 5.5.5, posture 1.1, and adjust). The test procedure, i.e. loading and body posture, shall cover all intended functions of a device.

4.5.2 Floating devices not claiming to provide floating stability

4.5.2.1 Requirements

a) Residual buoyancy shall be sufficient to keep all permissible users afloat when holding on to the device.

b) The achievable floating position shall enable users to keep their airways above water without using swimming strokes or any other active movements to keep them afloat except holding to the device.

c) These means shall be available and reachable for each permissible user after immersion.

4.5.2.2 Test method

Testing shall be made by the assessment panel in accordance with ISO 25649-1:2024, 5.5.

4.5.3 Buoyancy and amount of residual buoyancy

4.5.3.1 Requirement

The amount of buoyancy shall be sufficient to keep the number of permissible users safely afloat even if one air chamber fails to allow the user(s) enough time to reach safety. When tested in accordance with 4.5.3.2, the device shall provide stable floating position. If the structure is > 1,5 m height and the user can enter it, a minimum of two air chambers shall be provided.

4.5.3.2 Test method

In compliance with the specified number of permissible users, test subject shall take position. Open all valves. The number of permissible users should stay afloat if any air chamber fails so that each permissible user can disembark to a safe position.

Verification shall be by assessment panel.

4.5.4 Minimum buoyancy for floating leisure articles claiming floating stability when fully inflated

4.5.4.1 Requirements

The device shall keep a minimum buoyancy when the admissible number of users according to the manufacturer and to weight dimension as specified in ISO 25649-1:2024, Annex A, is on the floating leisure article.

4.5.4.2 Test methods

The maximum number of test subjects according to manufacturer's declaration (adults, children) shall be displayed within the available area. Check whether the floating leisure article provides nominative buoyancy.

Assessment shall be by assessment panel.

4.5.5 Carrying handles and climbing facilities

4.5.5.1 Carrying handles

Any carrying handle shall withstand a pulling force of 750 N when tested in accordance with 4.5.5.2.2.

4.5.5.2 Climbing handles, strength and safety distances

4.5.5.2.1 Requirements

Climbing facilities in form of grab handles shall withstand a pulling force of 1 000 N when tested in accordance with 4.5.5.2.2.

The distance between the surface and the grab handle shall not exceed 30 mm ± 10 mm if the handle is loaded with a force of 300 N vertically to the surrounding surface.

Cylindrically shaped grab handles shall have a diameter of not less than 20 mm and the protrusion above the surrounding surface shall not exceed 30 mm ± 10 mm when loaded as specified above.

Climbing facilities in form of pocket handles shall provide an inner width of at least 100 mm and a grab barrier of 30 mm ± 10 mm (see Figure 2 and Figure 3).

Dimensions in millimetres

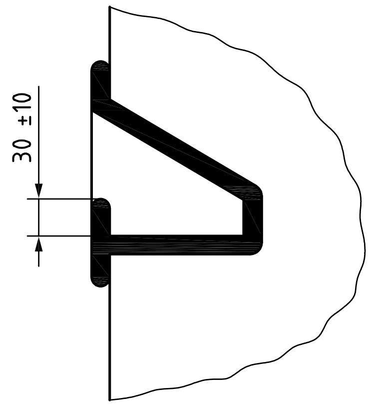


Figure 2 — Climbing handle, pocket version

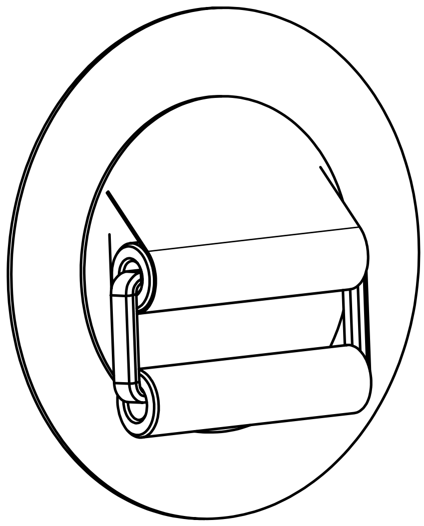


Figure 3 — Grab handle

If a climbing installation above a height of 2 m provides a platform area greater than 3 m × 3 m, this area should offer grab handles for users.

4.5.5.2.2 Test methods

Check by visual inspection and measuring.

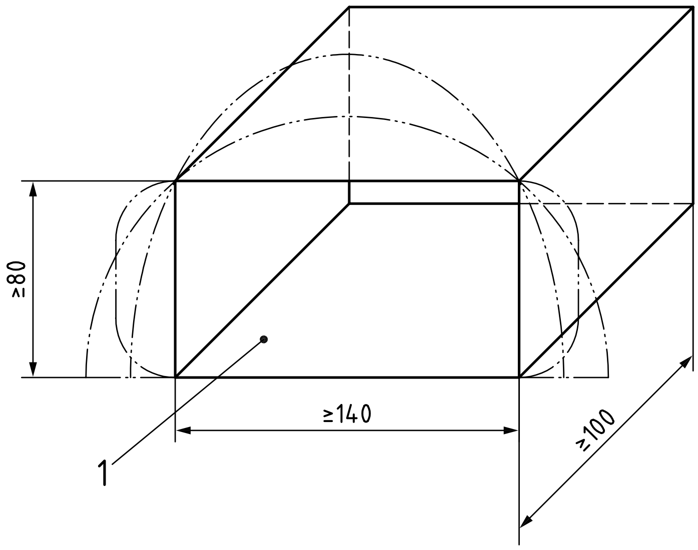
Apply test force of 1 000 N in the direction most likely to cause failure.

Apply test force of 300 N for measuring the safety distance. This force shall be applied in the middle of the handle by using a load application device (e.g. a strap) of 20 mm in width.

4.5.5.3 Foot holds for climbing

Foot holds shall be preferably designed in the form of foot pockets. The interior minimum dimensions shall be as shown in Figure 4.

Dimensions in millimetres



Key

1 foot/foot pocket

Figure 4 — Minimum interior dimensions for foot pockets

Footholds in form of facilities attached onto the surface of the floating leisure article shall provide a minimum step depth of ≥ 80 mm and an inner minimum width of ≥ 140 mm. The protrusion above the surrounding surface shall be ≥ 100 mm.

4.5.5.4 Openings

Openings, normally created by tubes and pipes, shall be < 8 mm and > 25 mm.

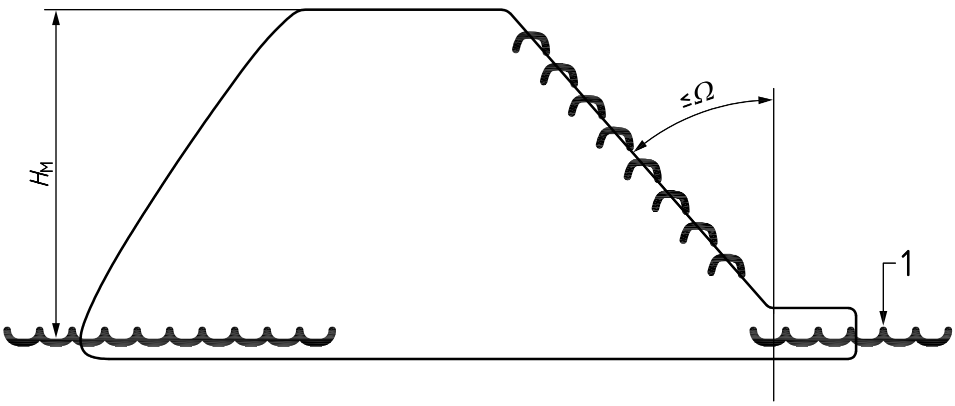
4.5.5.5 Test methods

Apply specified pulling forces in the direction most likely to cause failure. Dimensions of edges and corners shall be checked by measuring and visual inspection. Openings shall be tested with cylindrical test probes of 8 mm and 25 mm diameter. Both probes shall not pass from the same opening

Protruding parts causing entanglement shall fulfil test methods as specified in ISO 25649-1:2024, 5.4.2.

4.5.5.6 Products with climbing facilities

In order to mitigate potential falls, the minimum inclination angle (Ω) according to Figure 5 for Class D modules with one or more climbing functions shall be ≥ 45° if the vertical height (H_M) above water level (1) of this module exceeds 2 m and the potential fall does not end in the water but on the surface of surrounding structures.



Key

H_M height of module

Ω inclination angle (minimum 45°)

1 water level

Figure 5 — Example of climbing module with climbing function(s) – (side view)

4.5.5.7 Test method

It is recommended to perform a visual inspection and measuring by appropriate means (e.g. laser and electronic clinometers).

4.5.6 Re-embarkation from the water

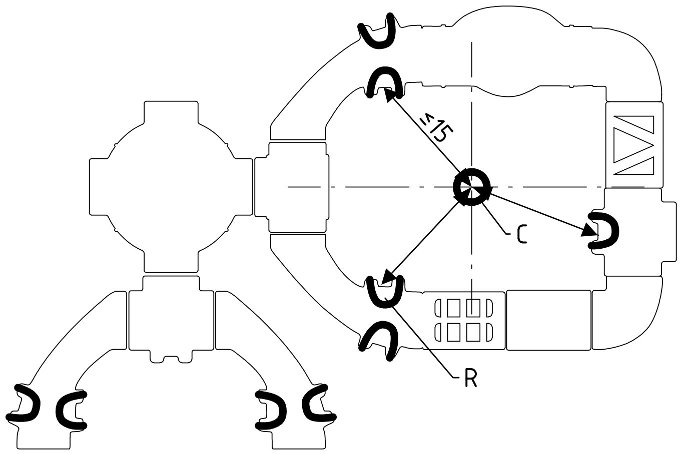
4.5.6.1 Requirements

Floating leisure articles shall be designed such that a normal user (test subject) is able to re-embark on the device. Testing shall be done in accordance with 4.5.6.2. Any re-embarkation aid such as ladders, climbing handles, steps or platforms shall be able to withstand the weights and forces of its intended users.

These re-embarkation aids shall not be hazardous if one of the permissible users collides with it or falls on top of it.

Modules or modular arrangements which can surround users with their shape (circle or square shapes creating centre pools) need to provide at least one access point within 15 m of any point in the centre pool, with clear marking such as by colour or arrow print, as shown in Figure 6.

Dimension in meters



Key

C centre of inner area

R re-embarkation aid (example)

[a] Maximal distance between C and R is 15 m.

Figure 6 — Example of re-embarkation aids for modules or modular arrangements

4.5.6.2 Test method

All test subjects of the test panel shall show that it is possible to climb back onto the floating leisure article. Assessment shall be by assessment panel. Any re-embarkation aids used shall conform to torso entrapment requirements in accordance with ISO 25649-1:2024, 5.3.

Adults may assist children to re-embark.

4.5.7 Anchorage

4.5.7.1 Provision of information and instruction

The supplier of aqua park equipment or modules shall provide the operator with all information required to perform a safe and sufficiently anchored installation in accordance with this guidance. Installation should withstand a wind force of at least Beaufort 5. The conditions to achieve this are set out in Annex D in this document.

4.5.7.2 Guidelines

Annex D provides guidelines for addressing the requirement 4.5.7.1

4.5.8 Water depth

4.5.8.1 General requirements

The minimum water depth shall be given by the manufacturer in the instruction's manual.

To ensure safe diving, the manufacturer shall give information about the minimum water depths underneath the floating leisure article (see safety information symbol "Required minimum water depth underneath object" in accordance with ISO 25649 2:2024, Figure 28).

4.5.8.1.1 General calculation

The minimum water depth D_{min} shall be calculated according to Formula (1):

$$D_{min} = \frac{H_D + H_P}{2} \quad (1)$$

where

H_D is the height of product in m;

H_P is the height of one person in m (average 1,80 m).

For trampolines, the water depth shall be calculated according to Formula (2):

$$D_{min} = \frac{H_D + H_{Pt} + b_{max}}{2} \quad (2)$$

where

H_D is the height of product in m;

H_{Pt} is the height of one test person in m (average of the test subjects);

b_{max} is the maximum bounce (average of the performance of the test subjects).

4.5.8.1.2 Specific calculation for children

The calculation and thus the required minimum water depth can be modified in cases where a modular arrangement or single module is restricted in use for persons with a maximum body height of 1,60 m (e.g. children or youngsters).

In this case, the necessary water depth D_{min} shall be calculated according to Formula (1), where the parameter "H_P" shall be set to 1,60 m.

Also, in this case, the access to such shallow water modular arrangements or single modules shall be controlled by supervising staff before entrance.

4.5.8.2 Determination of bouncing height

To determine the parameter b_{max} in 4.5.8.1.1, the trampoline shall be installed according to manufacturer's instructions and positioned on the water. For test purposes, a measuring device as shown in Figure 7 shall be fitted to the trampoline.

Dimensions in millimetres

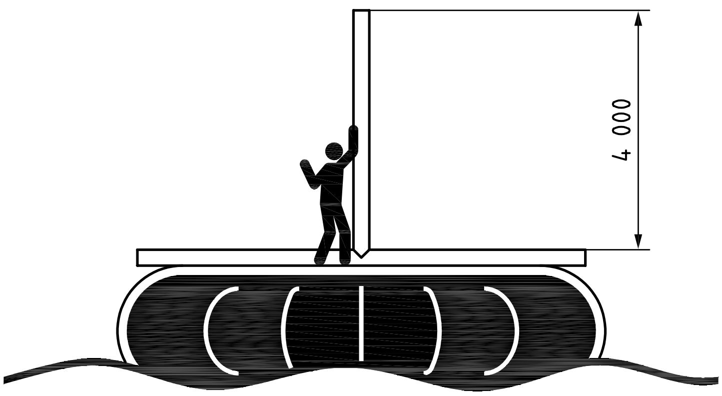


Figure 7 — Determination of bouncing height

A test person representing the average body height and body weight (50th percentile) of the designated user group shall perform test jumps.

a) Test person shall stand upright on the centre of the trampoline and mark a meter stick (see Figure 7) at the highest reachable point with his arm vertically lifted and index finger stretched out. During this procedure, the feet remain statically on the surface.

b) Test person makes 10 jumps, sliding with his hand and index finger along the meter stick and marking the achieved jumping heights.

The maximum bouncing height (b_{max}) is the distance between the initial marking and the highest marking on the meter stick.

4.5.9 Horizontal safety distance with surrounding area

4.5.9.1 General requirement

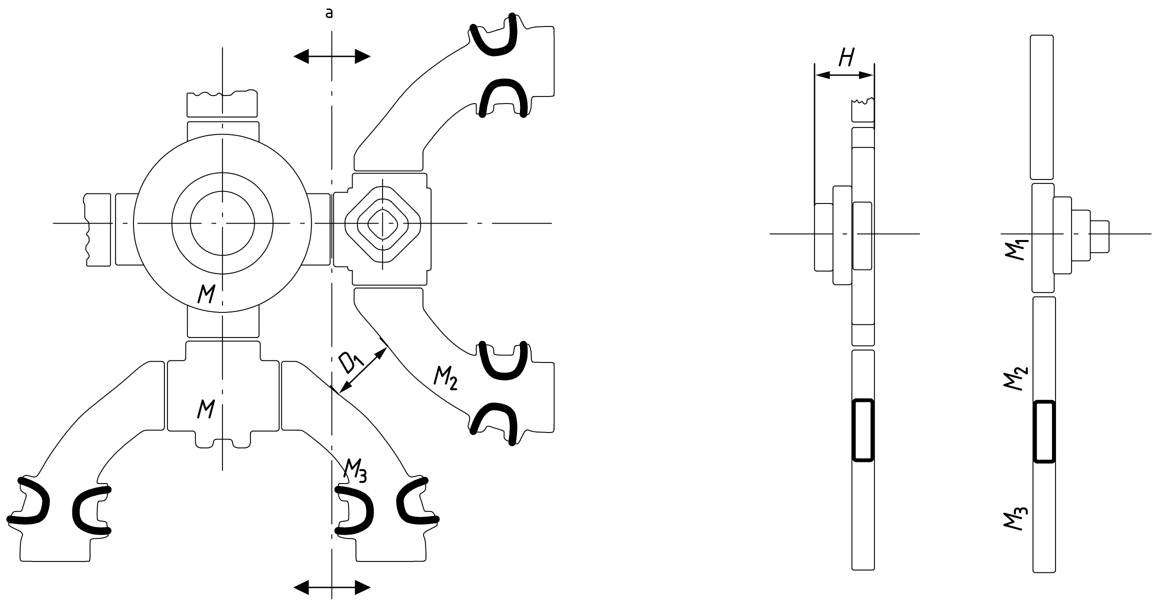
The safety distance to any other solid object in proximity of the device shall not be less than 3 m.

4.5.9.2 Test method

Pull the device to the closest location to the solid object in proximity and check by measurement.

4.5.9.3 Specific safety distances between modules or modular arrangements

In order to provide sufficient space for swimming action or to escape, the distance (D_1) between adjacent modules of a modular arrangement that are not directly connected (e.g. M_2 and M_3) shall be at least 1 m, as shown in Figure 8.



a) Module – Top view

b) Module – Side view in section

Key

M_n module

D_1 minimum safety distance between adjacent modules (see M_2 and M_3)

H height of module

a Course of section / direction of view.

Figure 8 — Example of safety distances between modules

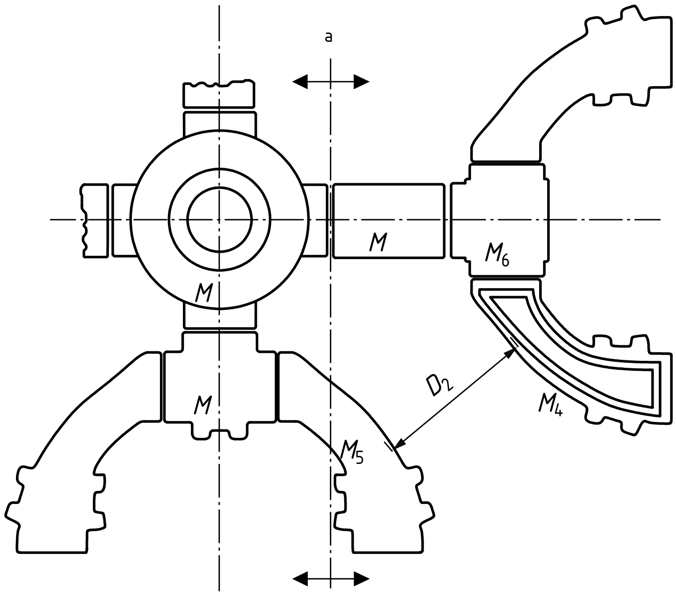
4.5.9.4 Test method

It is recommended to perform a visual inspection and measuring by appropriate means.

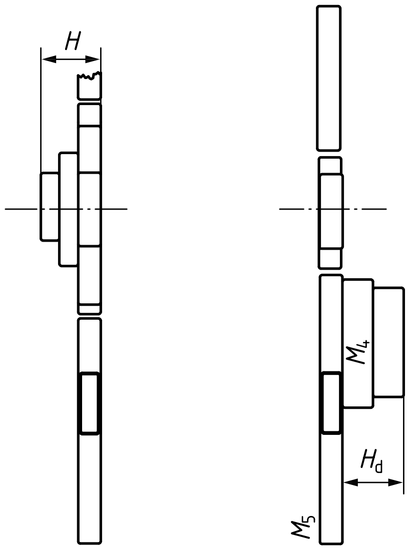
4.5.9.5 Safety distances between modules in correlation to falling height

In order to prevent collision with objects in case of an accidental fall, the distance (D_2) between adjacent modules of a modular arrangement shall be at least 3 m if the accessible height difference (H_d) of these modules (e.g. M_4 and M_5) is more than 1,80 m. See Figure 9.

This requirement is not applicable for modules that are directly attached to each other (e.g. M_4 and M_6 in Figure 9).



a) Module – Top view



b) Module – Side view in section

Key

M module

M_4/M_6 modules directly attached

D_2 minimum safety distance between adjacent modules (e.g. M_4 and M_5)

H height of module

H_d height difference between directly attached modules (e.g. M_4 and M_6)

[a] Course of section / direction of view.

Figure 9 — Example of safety distances between modules in correlation to falling height

4.5.9.6 Test method

It is recommended to perform a visual inspection and to measure by appropriate means.

4.5.10 Visibility

4.5.10.1 Requirements

When sliding or jumping down any object of Class D, the structure shall be of the kind that the landing area can easily be checked for clearance to avoid collision that causes injury.

If a surface ≥ 6 m^2 area is used for a product, then the safety information symbols “Do not swim underneath the structure” (Figure 13) and “Do not jump if water is not clear” (Figure 14) (as specified in ISO 25649-2:2024) shall be clearly visible on the product.

4.5.10.2 Test method

Practical and visual assessment shall be by the assessment panel.

4.5.11 Repair kit

4.5.11.1 Requirements

All Class D devices used as a standalone product shall be equipped with a repair kit and repair instructions.

NOTE For modules or modular arrangements, manufacturer can calculate an appropriate amount of repair material in one unit.

4.5.11.2 Test method

Testing shall be by visual examination.

4.5.12 Springs, protection against corrosion, durability

4.5.12.1 Requirements and protection against corrosion

Springs of devices shall be protected against corrosion (e.g. powder coating). After durability testing in accordance with 4.5.12.2, there shall be no damage of the protection against corrosion when the spring is examined by naked eye. This requirement is not applicable for springs made of stainless steel.

4.5.12.2 Test method

Using an adequate test machine, springs (if applicable) shall be expanded for 50 000 cycles to a minimum of 25 % increase in their original length. Subsequently, they shall be inspected visually.

4.5.12.3 Durability and requirements

After testing in accordance to 4.5.12.2 there shall be no break or any other visible damage. Testing is applied to 5 springs out of the total quantity of springs used in the device.

4.5.13 Safety pad for trampolines and buoyancy platforms

4.5.13.1 Requirements

If a trampoline, buoyancy platform, etc. is equipped with springs, then a safety pad covering the springs and frames shall be provided. This safety pad shall be at least twice the width of the springs and prevent the user from getting trapped between the springs and the metal frame. Safety pads shall remain in position while the product is in use. The foam or other material used for the safety pad shall not absorb water. The foam or other material shall conform to EN 913:2018. All metallic parts shall be covered by the safety pad as specified in EN 913:2018. The safety pad shall be of a different colour than the jumping surface or main body of the product. A jumping mat shall have a centre point marking in a contrasting colour in the centre of the mat.

The safety pad shall be designed and positioned so that the inner and outer overlap of the springs is equal. The safety pad shall be affixed onto the structure (e.g. trampoline) to prevent lifting or displacement during use, which can allow entrapment.

If the jumping surface is attached directly to the product, then a gap no bigger than 3 cm shall be open. If the platforms are shown to be used also as a water trampoline, then they shall conform to the same requirements (i.e. safety information symbols, anchoring).

4.5.13.2 Test method

In accordance with EN 913:2018 an overload test shall be performed. Use a test probe.

The centre point marking shall be verified by a visual inspection of the assessment panel.

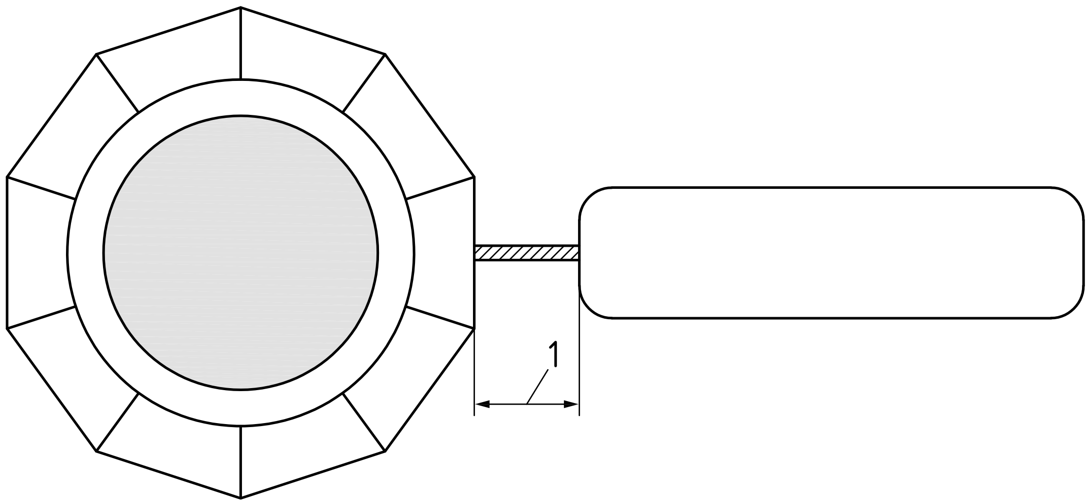
4.5.14 Connection of inflatable components

4.5.14.1 Requirements

If more than one Class D device is connected to another (e.g. modules or modular arrangements), then there shall be no entrapment or squeezing hazard for hand, leg or body of a user between the connected parts. This requirement is deemed to be met if the distance of connected parts is not wider than 25 mm under a horizontal pulling force. For connected products which are moving when in action, the space may be > 25 mm. The connection shall be freely rotating and only have one connection and not result in any entrapment. For connections of inflatable components, see Figures 10 and 11.

4.5.14.2 Test method

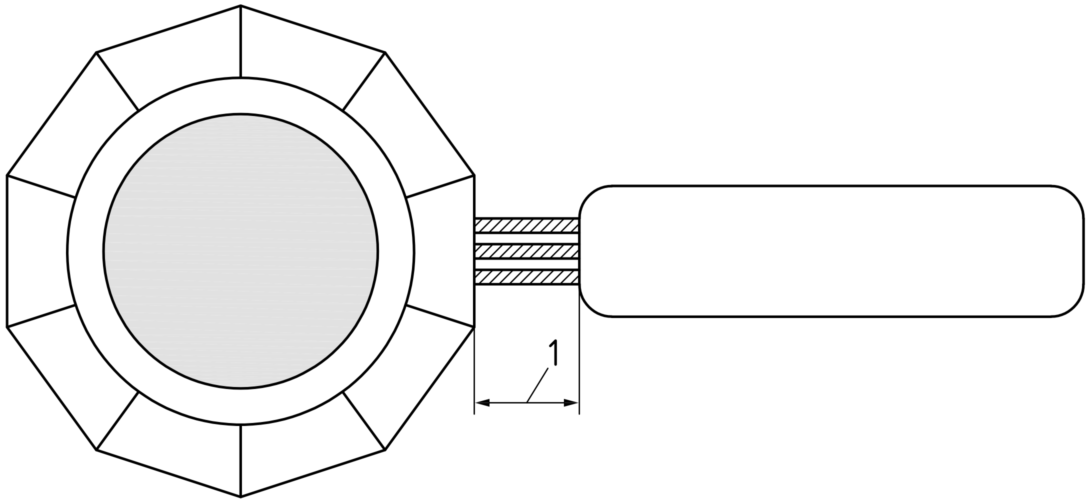
Apply a pulling force of 200 N and check the distance via an appropriate test probe. Perform intended function of the action product and check for entrapment.



Key

1 gap and connection

Figure 10 — Module with one connection



Key

1 gap and connections

Figure 11 — Module with more than one connection

4.5.15 Swimming in close proximity and under extra-large floating leisure articles

4.5.15.1 Floating structure

In addition to the prohibition to swim under extra-large floating objects of a size ≥ 6 m^2 (see safety information symbol "Do not swim underneath the structure", ISO 25649-2:2024, Figure 13), the adjacent underwater area of such objects shall be smooth and shall not provide:

a) openings, caverns or flexible slits into which a child's or adult's body or body parts can slip and get trapped;

b) any protrusion with which parts of the bathing dress, ribbons around a person's neck, etc. can get entangled;

c) meshes or nets underneath the structure.

4.5.15.2 Means of connection

Means of connection, e.g. a branched rope harness and/or the anchoring rope, connecting the floating structure to its ground fixation point, shall not cause entrapment or entanglement. This requirement is deemed to be met if an opening is big enough to allow the passage of a cylindrical test rod of 25 mm diameter (adults finger) but small enough not to allow the passage of a cylindrical test rod of 42 mm (child's hand), or if the opening is smaller than 8 mm. If branched ropes form an opening this opening shall allow the passage of the adult torso probe as specified in ISO 25649-1:2024, 5.2.1.4. Means of connection in a distance greater than 200 cm from the base of a floating structure are exempted from these requirements.

4.5.15.3 Test method

Testing shall be by visual and tactile inspection of the product in its ready-for-use configuration with all means of fixation attached. The measurement and application of test probes shall be in accordance with ISO 25649-1:2024, 5.2 to 5.5 if needed.

4.5.16 Specific requirements for swing devices as an end-module or used as a stand-alone module

4.5.16.1 General requirements

In order to mitigate falls or collisions when swinging, the maximum falling height (H_f) of Class D swing modules shall not exceed 3 m height when measured in accordance with Figure 12.

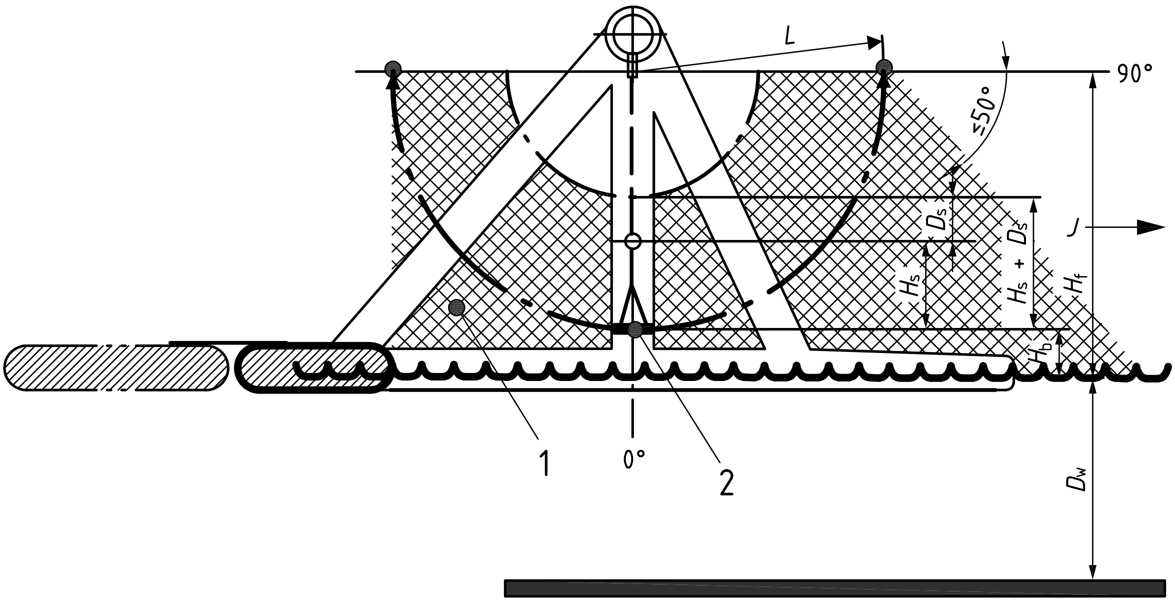
In addition:

— the modules shall be designed in a way that a potential fall ends into water;

— the modules shall be installed on a minimum water depth (D_w) of at least 1,80 m;

— the space between the swing columns (chequered area in Figure 12) shall be free from any obstacles causing collision with the user when swinging;

— the safety distance (D_s) shall be 0,5 m.



Key

D_s safety distance
H_s sitting height (max. user (adult male 95 % = 98,5 cm))
H_f falling height
H_b swing board base height
D_w water depth
L length of swing suspension
J jumping direction
1 free space (chequered area)
2 swing board or seat (user in sitting position)

NOTE 1 Swing-end-modules can include intentional jumps from any swing height in the direction as indicated.

NOTE 2 See Annex B for swings exceeding an overall height of 5 m.

Figure 12 — Example of module with swing function (section view)

4.5.16.2 Test method

It is recommended to perform a visual inspection and to measure by appropriate means.

4.6 Pool use of water park modules or modular arrangements

The use of water modules into indoor and outdoor pools shall follow the requirements in Annex C.

5 Instruction manual

All Class D devices used as a standalone product shall be equipped with an instruction manual.

For modular arrangements, the manufacturer may provide one instruction manual for the whole structure, including instruction for the single products and the entire arrangement.

This shall show clearly how to assemble and disassemble the products. The following warning instructions and safety information symbols as specified in ISO 25649-2:2024 shall also be included.

a) Swimmers only.

b) Required minimum water depth of .... m.

c) Do not jump onto the Class D device from a different object (e.g. jumping platform) or jump from the Class D device onto another object.

d) Do not use in darkness.

e) Do not use in shark-infested water or in water that can contain other marine life dangerous to humans.

f) If used in an indoor pool, make sure that there is enough clearance space to the ceiling.

g) Always inspect the area around and under the device before each use to ensure that the water is deep enough and free of rocks, logs, sand bars and underwater obstructions for at least 3 m in all directions.

h) Ensure appropriate air pressure is maintained while the product is in use. Check pressure as required by manufacturer frequently especially on very hot or cold days.

i) Allow not more than ... persons on the device at the same time (age: ... years and older).

j) Always anchor the ... securely on all ... anchor points before it is used.

k) Never use the device in rough surface water conditions, during high winds or when there is thunderstorm (e.g. lightning).

l) Inspect the device before each use and replace any worn, defective or missing parts.

m) The device is not designed to be used as a life-saving device.

n) Do not use in strong currents and secure against wind in accordance with anchoring information (strong wind = Beaufort 6).

o) The use of the device by children shall be under constant adult supervision.

p) Diving and swimming underneath the device is forbidden.

q) Take off watches, rings and other sharp objects before use.

r) Cleaning, set up, inflation, deflation, maintenance and storage information needs to be included with each device.

s) The use of buoyancy vests in open water facilities is recommended.

6 Exclusions

Exemptions and deviations shall be considered for the application of this document.

6.1 Exemptions

Floating leisure articles of Class D covered by this document are exempted from the following requirements included in ISO 25649-1:2024:

— specifications with regards to towing devices as identified in ISO 25649 1:2024, 5.8;

— specifications on pressure tests for unsupported material (see ISO 25649 1:2024, 5.12.2.1);

— specifications on heat tests for unsupported material (see ISO 25649 1:2024, 5.12.3);

— specifications on air tightness for unsupported material (see ISO 25649 1:2024, 5.12.4);

— requirement for test pieces to be taken from the constituent materials (see ISO 25649 1:2024, Clause 6): the test piece for Class D devices can also be from the same “run” of material which can be provided by the manufacturer;

— specifications on mechanical requirements for unsupported material (see ISO 25649 1:2024, 6.4);

Floating leisure articles of Class D covered by this document which are not sold directly to the ultimate consumer (commercial use) are exempted from requirements of ISO 25649 2:2024, 4.2.

6.2 Deviations

Floating leisure articles of Class D covered by this document shall consider the following deviations from requirements included in ISO 25649 1:2024.

— Pressure gauge according to ISO 25649 1:2024, 5.6.1 applies with the deviation that, in case of a device designed for electrical air pump inflation, e.g. by an integrated air pump or pump interface, a pressure gauge (manometer) should be provided by the supplier. A pressure gauge should be also provided if the volume of the device exceeds the capacity of manual inflation and requires an electrical air pump.

— If various devices are intended for a combined installation the supplier shall provide only one pressure gauge (manometer) for the entire combined installation and not for each single device (see ISO 25649 1:2024, 5.6.1).

— For jam points in accordance to ISO 25649 1:2024, 5.11.1, the requirements in 4.5.14 should be taken into consideration.

Annex A
(informative)

Examples of typical products forming Class D

Figure A.1 and Figure A.2 show examples of Class D products.

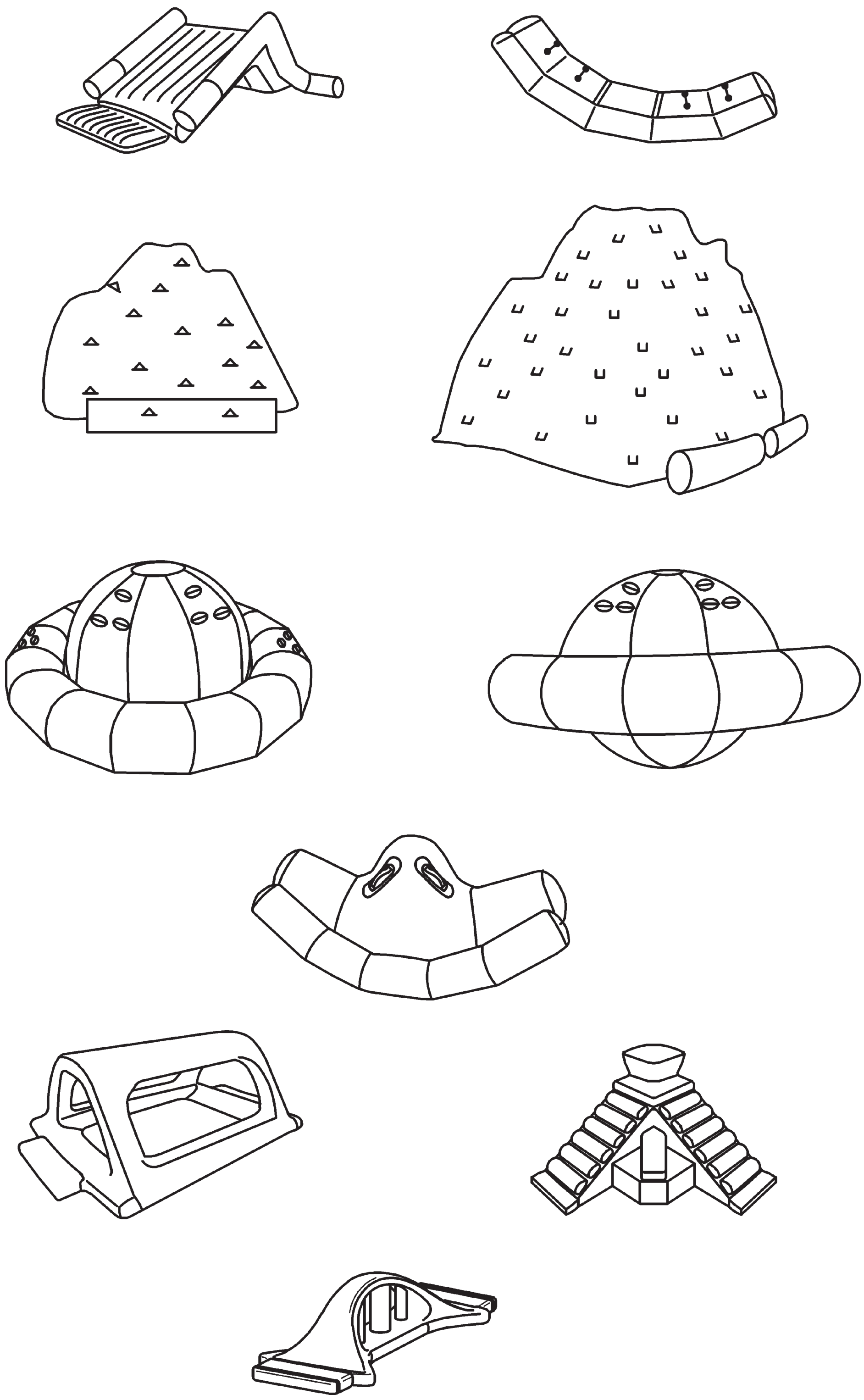


Figure A.1 — Examples of climbing structures

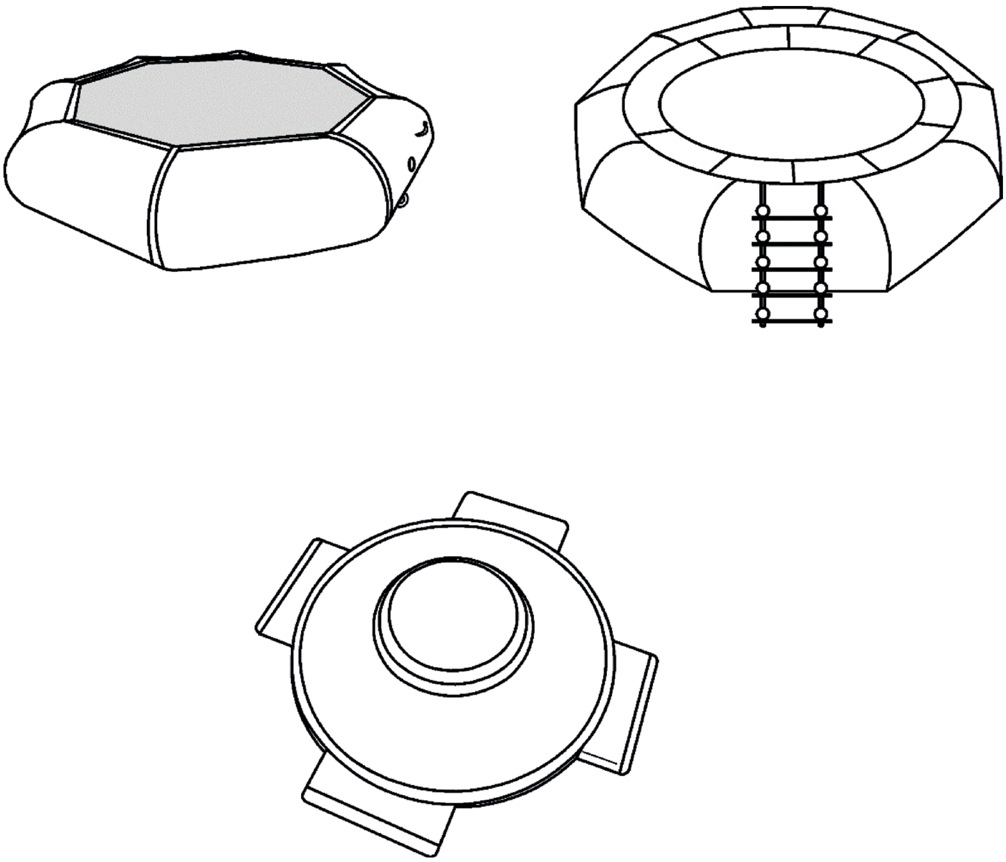


Figure A.2 — Examples of jumping structures

Annex B
(normative)

Specific information for devices exceeding 5 m height

B.1 General

Bigger and higher devices are being developed. These devices are used as stand-alone devices or as modules of a larger modular arrangement.

The use of the ISO 25649 series alone is not sufficient to attest the safety of devices higher than 5 meters, thus additional recommendations shall be applied. If these devices are installed in a modular arrangement or are intended for use as stand-alone devices, it is necessary to conduct a risk analysis which considers the risks and risk preventions resulting from extreme height / size, as well as any special and individual circumstances resulting from the given environment.

For devices higher than 5 m, the risk analysis can lead to additional and/or deviating means of technical, informational and safety conditions of use, as well as means of supervision which supplement ISO 25649-1:2024, ISO 25649-2:2024 and this document's specifications.

B.2 Additional recommendations for devices exceeding 5 m height

It is recommended to apply the following safety operations to address foreseeable risks in case of use of devices exceeding 5 m height. This list is not exhaustive.

— Risk analysis, considering the specific nature of the product and the circumstances of intended use.

— User control with regard to age and capabilities to cope with these devices.

— Surveillance of installation and use.

— Static stability under all environmental condition for which the device is intended.

— Emergency provisions.

— Reference to applicable national or regional safety regulations.

— Protection against fall or restriction of free falling height.

— Protection against dangerous speed, collision, impacts, etc.

— Others resulting from specific individual conditions.

Annex C
(normative)

Pool use of water park modules or modular arrangements

C.1 General

The pool application brings the device into the most restrictive surroundings. When water park modules are used in indoor or outdoor pools, collision becomes a dominant risk. Based on the guiding hazard-based approach of the ISO 25649 series, the collision hazard is dealt with by specified safety distance to hazardous objects regardless of the place of use and regardless of the kind of product. The distance to hazardous objects is not only necessarily the pool edge. The requirement is impartial and applies for any object within the safety distance.

Pool use provokes the fastening of water park modules, most commonly, the entrance module, directly to the pool edge or pool wall, resulting in no common safety distance. This annex specifies requirements and test methods which constitute a set of conditions under which a direct wall attachment can be tolerated.

In addition, this annex considers the circumstances which occur when trespassing from the solid ground of the pool floor to a less stable floating object.

Moreover, the direct access from land to the floating object eliminates the “natural” selection of non-swimmers, although it is acknowledged many leisure facilities operate an admissions policy that must be applied for water park sessions. An installation with 3 m distance from land excludes non-swimmers which are forced to swim to the water park.

Other hazardous circumstances can occur if the entrance and exit zones overlap if pool use does not allow a circle or one-way traffic with separate entrance and exit.

Additional consideration shall be given to the matter of egress or access points. In case of an emergency, it shall be possible for users to find a hold or access to climb back onto the structure or to easily exit the pool by pool edge or ladder.

Requirements in this annex apply regardless of pool size and type of pool (indoor or outdoor).

If not otherwise stated, requirements specified in ISO 25649-1:2024 and ISO 25649-2:2024 apply.

C.2 Safety distances

C.2.1 General

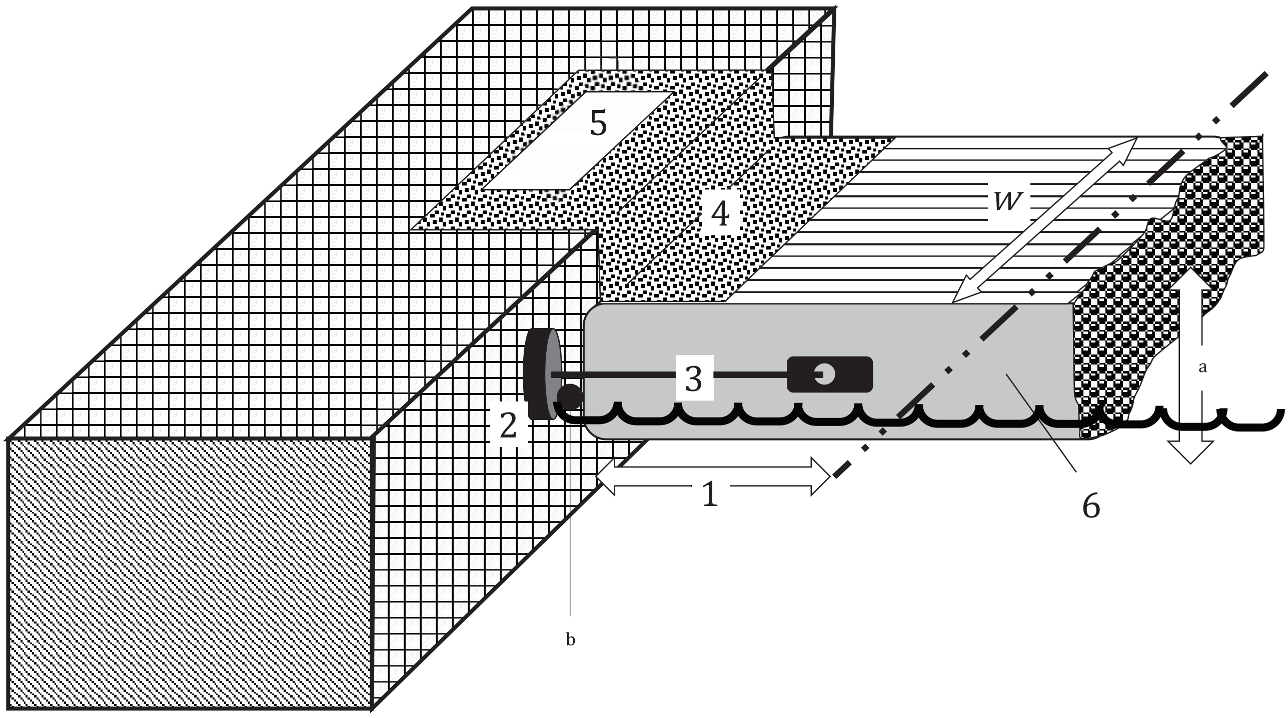
In deviation to ISO 25649-1:2024, 5.2 the access/entrance module of water park arrangements installed in pools may be directly and without safety distance attached to a pool wall and provide access to the arrangement without swimming.

C.2.2 Testing

The wall fastening as shown in Figure C.1 shall be carried out in a way that there is no gap between wall and floating access that provokes foot entrapment. See ISO 25649-1:2024, 5.2.1.3.

C.3 Water park access or egress zone in case of direct wall fastening

In deviation to 4.5.9, water park arrangements may be attached directly to the pool edge or pool wall if the requirements in C.4 to C.11 are met.



Key

1 zone without any elevation 2,5 m long

2 wall fastening, e.g. vacuum-suction anchor

3 attachment rope and bearing at module, capable to cope with module-movements

4 cushioning mat (fixed against displacement)

5 warning (e.g. ‘swimmers only’)

6 entrance module of a water park system

W width

[a] Expected vertical movements of module under load.

[b] No gap between wall and module front.

Figure C.1 — Access or egress zone in case of direct wall fastening

C.4 Cushioning of access zone

C.4.1 General

In order to provide protection against injury in case of fall, the access zone shall be cushioned as shown in Figure C.1.

C.4.2 Testing

Testing shall be by visual inspection.

C.5 Exclusion of non-swimmers (warning by indicative safety technique)

C.5.1 General

In order to highlight and make it evident that the water park should be used by swimmers only, the access zone of a water park directly attached to the pool wall shall inform users of the restriction to swimmers only. As a minimum, signs informing users should be positioned at the entrance which, in addition, may be monitored by supervisory personnel or lifeguards.

C.5.2 Testing

Testing shall be by visual inspection.

C.6 Elevations protruding from the entrance module or entrance platform

C.6.1 General

Within the first 2,5 m from the entry point onto the structure there shall be no component allowing an elevated position of the user. The width "*W*" (see Figure C.1) shall be minimum 2 m.

C.6.2 Testing

Testing shall be by measurement and visual inspection.

C.7 Sideways safety distances in relation to possible jump or falling height

C.7.1 General

In deviation to 4.5, depending on the provided falling height or jumping height, the minimum sideways distance to any hazardous objects (e.g. hard objects) shall be:

— 3,0 m for a jumping height or falling height > 1,8 m

— 2,5 m for a jumping height or falling height < 1,8 m

If swing or trampoline modules are part of the arrangement, the extended radius of action shall be considered when verifying the safety distance to the next hard object.

C.7.2 Testing

Testing shall be by measurement and visual inspection.

C.8 Points to get hold in an emergency, access points

C.8.1 General

Water park arrangements installed in pools:

— shall provide means to get hold for users when in the water;

— shall provide the possibility to climb back onto the floating structure.

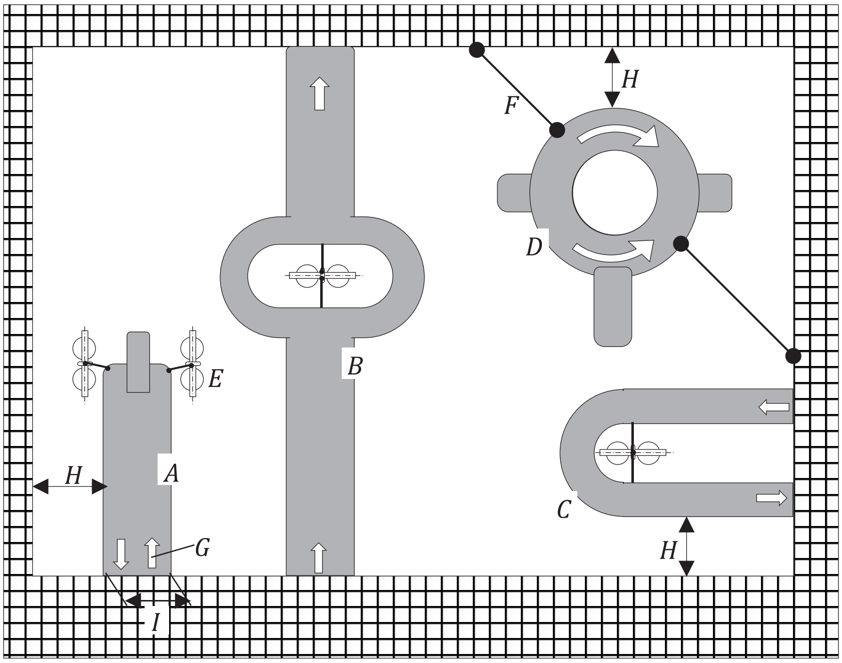
C.8.2 Testing

Testing shall be by visual inspection.

C.9 Direction of flow (one-way flow, two-way flow)

C.9.1 General

Depending on the configuration of the water park arrangement (see Figure C.2) the flow of users through the arrangement shall be as specified in this subclause.



Key

A peninsula type (linear)

B wall to wall type (linear)

C U-shape type (circular)

D circular type (circular, free floating, multiple access/egress points, no compulsory flow, IN/OUT at any access/egress point, fixation by lateral ropes or vacuum-suction anchors)

E vacuum-suction anchor (floor)

F positioning by lateral ropes

G flow regulation

H min. distance to hazardous objects 2,5 ... 3,0 m

I min. width

Figure C.2 — Main configurations or fastenings of pool-positioned water park arrangements

A general specification on the need of supervision and expert control during the use of water park is required.

For peninsula type water parks, users not willing to jump or slide at the end of the structure into the water and swim back are forced to walk back against the flow of incoming users. A further risk of collision can result from those users climbing back at any other access points along the sides of the structure.

A requirement organizing the flow of incoming and outgoing users can help avoid collisions. See proposed traffic arrows in Figure C.2.

Type A water park arrangements shall indicate the preferred sides for incoming and outgoing users.

In case of types B to D, the risk of congestion and thus collision of users shall be avoided by supervision through pool staff. The flow of users shall be indicated by marking the entrance and exit.

C.9.2 Testing

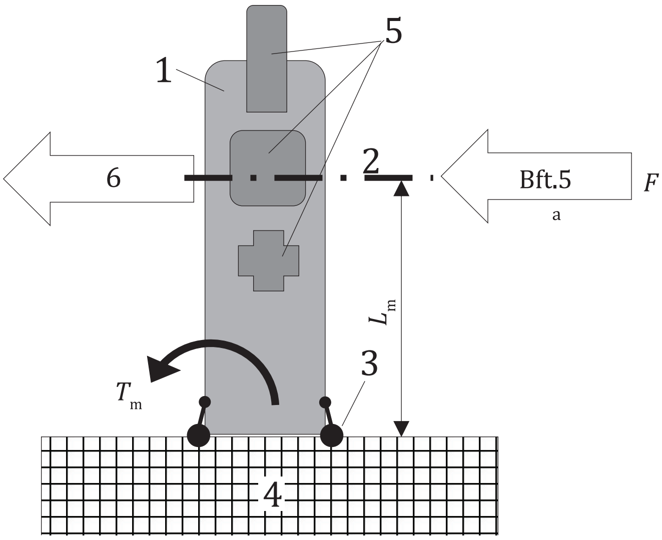
Testing shall be by measurement and visual inspection.

C.10 Resistance to wind loads in case of outdoor-pool installations

C.10.1 General

In contrast to wind loads on free floating water park arrangements (see 4.5.7) the wall-mounted installations are not stressed by tensile forces but by combined turning moments (horizontal and vertical), stressing the fastening components at pool wall or pool edge and the floating leisure article.

The risks due to wind load, including breaking away or capsizing, remain. Also, wind force Beaufort 5 is kept as applicable maximum.



Key

1 peninsula water park arrangement

2 centre of area, point of wind force application

3 wall fastening components

4 wall or edge of outdoor pool

5 superstructures of different kinds

6 test force simulating

a Wind direction: vertical to structure, wind force F and test force F_t.

L_m length of lever from centre of area to wall fastening components

F wind load/wind force resulting from Beaufort 5 on exposed surface

T_m turning moment

Figure C.3 — Peninsula-type water park arrangement attached to wall of outdoor pool

C.10.2 Testing

Wall-mounted water park arrangements shall withstand a wind load resulting from Beaufort 5 on the total wind exposed area of the arrangement without capsizing or getting teared off from the intended place of the wall fastenings. To calculate the force F acting in the area centre of a given arrangement apply the Formula (C.1).

The turning moment T_m shall be calculated using Formula (C.1):

$$T_m = F \times L_m \left(N_m \right) \tag{C.1}$$

See Figure C.3.

C.10.3 Testing by practical method

a) Calculate the wind exposed area.

b) Calculate the force acting in the area centre, consider wind directions most likely to cause failure.

c) Calculate the turning moment acting on the fastening components.

d) Apply the calculated turning moment to the arrangement fastening interface.

The tensile force creating the calculated turning moment can be applied at any appropriate place of the structure. The result of this force multiplied with the achieved lever shall match with the calculated value.

Testing of other main configurations or fastenings of pool-positioned water park arrangements (see Figure C.3) shall be executed likewise following the principle specified in C.10.

In case of failure, the fastening may be strengthened by adding additional means of fixation i.e. vacuum suction anchors or lateral stay ropes. Testing of free-floating water park modules installed in outdoor pools shall be done according to the principles specified in Clause 4.5 of this document.

C.10.4 Testing by supplier's declaration / certificate

Manufacturers or suppliers may prove the compliance with C.10 by their internal documentation.

C.11 Out of service conditions

The service on water park arrangements installed in outdoor pools shall be terminated and the arrangement secured or flattened (deflated) if the wind force acting on this floating leisure article exceeds Beaufort 5.

Annex D
(informative)

Anchorage

D.1 General

When positioned on open waters, water park arrangements as well as single water park modules can be exposed to strong wind loads and forces due to waves. For the sake of safety regarding the devices themselves and third parties in the surroundings, water parks shall be secured against wind drift and tearing off modules which can be blown away.

To achieve this, state of the art includes mooring via concrete blocks which, in combination with holding ropes, constitute an “anchor point”. It is however difficult to calculate and predict the strength of such an anchor point without practical investigation concerning its local or individual holding power. The many local parameters such as the property of the sea bed, the technical means of connection and the type of anchor hinder a reliable calculation or prediction.

Clause 5 on provision of information and instruction refers to the long-term experience of suppliers from which the local operator can derive knowledge for the safe anchoring of above-mentioned installations.

For such cases where this experience is not available or the local conditions are of extreme nature, this annex provides and recommends a method which combines practical experimental investigations concerning the local conditions with a calculation regarding the determination of the needed number of anchoring points.

This annex is based on a maximum wind force up to Beaufort 6. In case of stormy conditions, the water park may be protected against damage by deflation etc. The cessation of operation or service for the public applies earlier. On wind speeds above Beaufort 5, the facility should be set out of service for public use.

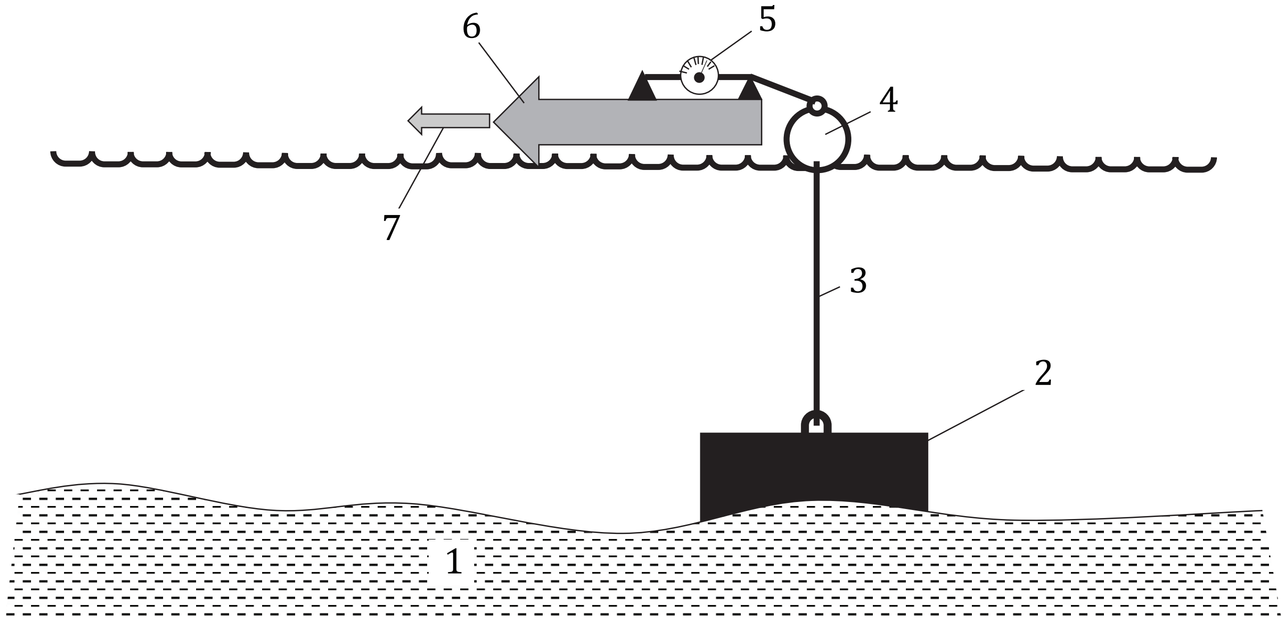
D.2 Specific strength R_l of a single anchor point on the sea bed, local reference anchor point

Considering the local conditions (including nature of sea bed, water depth, type of anchoring devices etc.) the strength of a representative local anchoring point shall be determined as specified in D.7. The result of this provides the local reference strength of an anchor point R_l when tested according to D.3 without displacement.

This reference holding strength R_l constitutes the base value for the calculation of the total number of needed anchoring points in order to fix a certain single module or a certain modular arrangement safely at the chosen position. For this purpose, a service wind speed of Beaufort 5 and a specific wind load of 68,9 N/m^2 is specified. On wind speeds above Beaufort 5, the facility should be set out of service for public use.

D.3 Testing

At the position of the chosen module or modular arrangement, the means of anchoring provided by the supplier shall be lowered to the sea bed. After a subsidence period according to suppliers’ instruction, the provided anchor rope shall be loaded with a horizontal pulling force until the anchor (anchor of any kind) starts to slip (see Figure D.1).



Key

1 sea bed at place of installation
2 anchoring device of any kind
3 anchor rope, chain etc.
4 attachment buoy (attachment of test rope)
5 pulling force measuring device
6 boat or other means to apply a pulling force
7 local anchoring strength of one reference anchoring point "R_l"

Figure D.1 — Load test on reference anchor point

D.4 Calculation of wind load (L_w) per single module

Measure the largest wind exposed surface of a module and calculate the wind load using Formula (D.1):

$$L_w = 68{,}9 \times A_{Ms} \tag{D.1}$$

where

L_w is the total wind load (N);

A_{Ms} is the largest wind exposed surface of a module.

D.5 Calculation of wind load (L_w) per modular arrangement

Select the number of modules constituting the intended arrangement. Measure the largest wind exposed surface A_{Ma} of this arrangement and calculate the wind load using Formula D.2:

$$L_w = 68{,}9 \times A_{Ma} \tag{D.2}$$

where

L_w is the total wind load;

A_{Ma} is the largest wind exposed area of a modular arrangement.

D.6 Calculation of the minimum number of anchoring points on the sea bed $N_{a\ min}$

The minimum number of anchoring points on the sea bed $N_{a\ min}$ shall be calculated using Formula (D.3)

$$N_{a\ min} = \frac{L_w}{R_l} \tag{D.3}$$

where

$N_{a\ min}$ is the minimum number of anchoring points of a modular arrangements under Beaufort 5.

D.7 Strength of attachment fittings on a module

All class D-products shall be equipped with attachment fittings for connecting the anchor rope(s). Theses fittings are constituted by anchor plate(s), buckle(s) or any other connecting element for the attachment of the anchor rope(s).

This (these) connecting element(s) shall be capable to withstand the wind resulting from D.4 or D.5 without break or damage. The floating facility shall stay at a wind speed of Beaufort 5 and including all admissible users on it at the intended position. The strength of each single connecting element shall be at least 1 000 N.

Specific instructions and/or graphical symbols related to the various options of the anchoring and anchor attachment to the module or modular arrangement or entire facility shall be included in the instructions.

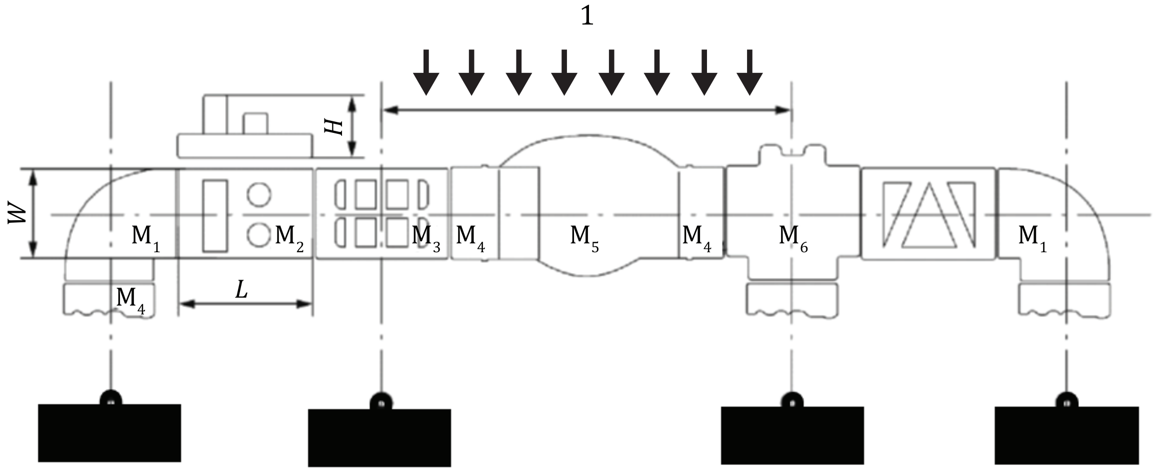
D.8 Testing

Apply at each connecting element a pulling force of 1 000 N in a direction vertical to the surrounding surface.

D.9 Anchorage of modular arrangements

A module or modular arrangement (example shown in Figure D.2) shall provide at least the calculated number of anchor points according to D.6 per module or modular arrangement. Inside an arrangement it is not needed to anchor each single module.

The number of modular arrangements or single modules determines the total number of needed anchoring points on the sea bed providing each anchoring point meets at least the required reference strength R_l according to D.2.



Key

1	wind load
M	module
M1/M6	modules directly attached
H	height of module
W	width of module
L	length of module

Figure D.2 — Example of a modular arrangement consisting of modules M3, M4, M5, M6

Bibliography

[1] EN 71-1, *Safety of toys — Part 1: Mechanical and physical properties*

ICS 97.220.40

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