BS EN 16582-1:2015

BSI Standards Publication

# Domestic swimming pools

## Part 1: General requirements including safety and test methods

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**National foreword**

This British Standard is the UK implementation of EN 16582-1:2015.

The UK participation in its preparation was entrusted to Technical Committee SW/136/8, Swimming pools and aquatic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.



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**Compliance with a British Standard cannot confer immunity from legal obligations.**

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# Domestic swimming pools - Part 1: General requirements including safety and test methods

Piscines privées à usage familial - Partie 1 : Exigences générales et de sécurité et méthodes d'essai

Schwimmbäder für private Nutzung - Teil 1: Allgemeine Anforderungen einschließlich sicherheitstechnischer Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 20 June 2015.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**



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# European foreword

This document (EN 16582-1:2015) has been prepared by Technical Committee CEN/TC 402 “Domestic pools and spas”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2016 and conflicting national standards shall be withdrawn at the latest by February 2016.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document is part of a series of standards dealing with domestic swimming pools which consists of:

— *Part 1: General requirements including safety and test methods;*

— *Part 2: Specific requirements including safety and test methods for inground pools;*

— *Part 3: Specific requirements including safety and test methods for aboveground pools.*

This European Standard has to be read in conjunction with local and national regulations if they exist.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

# Introduction

This part of EN 16582 specifies requirements including safety and test methods that are generally applicable to domestic swimming pools. For specific types of pools these requirements are supplemented or modified by the requirements of specific standards which have been issued as additional parts of this European Standard.

As specific standards exist, this general standard should not be used alone.

The users of this standard could be either in a Business to consumer (B to C) relationship, such as constructors, installers, retailers, etc. or in a Business to business (B to B) relationship, such as manufacturers, suppliers, distributors, etc. Safe products are the basis of the consumers' safety and therefore, this European Standard should take into account the following topics:

— product safety and performance requirements;

— safe construction and installation,

— safe use, which could include information and red flags for consumers (e.g. “Don’t leave your child unattended in the pool”).

Special attention should also be paid to environmental aspects, according to CEN Guide 4 (e.g. minimizing water being wasted, etc.).

## 1 Scope

This European Standard specifies the general safety and quality requirements and test methods for domestic swimming pools. These requirements and test methods are applicable to inground, aboveground or recessed swimming pool structures, including their installation and means of access.

This standard does not apply to:

— pools for public use covered by EN 15288-1;

— spas for domestic or public use;

— paddling pools according to EN 71-8.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 350-2, *Durability of wood and wood-based products - Natural durability of solid wood - Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe*

EN 351-1, *Durability of wood and wood-based products - Preservative-treated solid wood - Part 1: Classification of preservative penetration and retention*

EN 335, *Durability of wood and wood-based products - Use classes: definitions, application to solid wood and wood-based products*

EN 460, *Durability of wood and wood-based products - Natural durability of solid wood - Guide to the durability requirements for wood to be used in hazard classes*

EN 1990:2002, *Eurocode - Basis of structural design*

EN 13451-1:2011, *Swimming pool equipment - Part 1: General safety requirements and test methods*

EN 14843:2007, *Precast concrete products - Stairs*

HD 60364-7-702, *Low-voltage electrical installations - Part 7-702: Requirements for special installations or locations - Swimming pools and fountains*

EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods (ISO 1461)*

EN ISO 4628-2, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 2: Assessment of degree of blistering (ISO 4628-2)*

EN ISO 4628-3, *Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting (ISO 4628-3)*

EN ISO 9227, *Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227)*

CEN/TS 16165, *Determination of slip resistance of pedestrian surfaces - Methods of evaluation*

ISO 20712-1, *Water safety signs and beach safety flags - Part 1: Specifications for water safety signs used in workplaces and public areas*

prEN 16713-3, *Domestic swimming pools - Water systems - Part 3: Treatment - Requirements*

## 3 Terms and definitions

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

**3.1**
**basin**
specific water tank where water-related activities are carried out

**3.2**
**usage class 4 wood**
situation where the wood or wood-based product is in contact with the ground or fresh water and therefore permanently exposed to wetting

**3.3**
**point-of-purchase information**
information given to consumer prior to purchase so that they can make informed choices

**3.4**
**swimming pool kit**
set of compatible and consistent elements of a swimming pool comprising of the pool or the structure, the means of access, the filtration and skimming system with hydraulic connections necessary for its operation, installation and commissioning manual, and the operating and maintenance manual

**3.5**
**inground swimming pool kit**
swimming pool kit, designed to be installed in the ground, with structural elements that ensure intrinsic resistance to internal and external pressures

**3.6**
**aboveground swimming pool kit**
swimming pool kit, designed to be placed on the ground or any suitable flat horizontal surface, with structural elements that ensures intrinsic resistance to internal pressures

**3.7**
**recessed swimming pool kit**
swimming pool kit, designed to be installed in the ground, in a masonry structure or equivalent that ensures resistance to internal and external pressures, if required

**3.8**
**watertightness**
degree to which water is prevented from leaking from the pool shell

**3.9**
**liner**
removable independent pocket, factory-made from flexible, expandable, plasticized poly(vinyl chloride) (PVC-P) membranes, capable of achieving a certain level of watertightness

Note 1 to entry: The liner contributes to the watertightness of a swimming pool in the same way as the parts to be sealed and the pipework.

**3.10**
**coping**
independent add-on feature, which forms the total or partial edge of a pool, on its periphery, on the upper part of the wall

Note 1 to entry: Add-on features with a width greater than or equal to 50 mm are considered as copings.

Note 2 to entry: On some swimming pools, the top coping also functions as the liner lock.

**3.11**
**reinforced membrane**
composite made of various thermoplastic sheets, applied on a layer comprising a reinforcement

**3.12**
**membrane**
sheet made of calendered or extruded, waterproof and gas-pervious, plasticized poly(vinyl chloride) (PVC-P), packaged in rolls, for use in the manufacture of swimming pool liners

**3.13**
**operating and maintenance manual**
operating guide and common recommendations on use for safety and maintenance

**3.14**
**installation and commissioning manual**
document indicating the various installation and commissioning operations

**3.15**
**frame work**
all of the resistant parts that support and/or reinforce the wall in view of forming the peripheral structure

**3.16**
**tool**
hand held device that can be used to secure, perform or facilitate mechanical operations

Note 1 to entry: A screw driver, key or coin are considered as tools.

**3.17**
**pool wall**
generally upright structure serving to enclose or divide water, or to protect an area

**3.18**
**parts to be embedded**
equipment, fixed firmly into the surrounding structure, mainly in the pool that have the specific functions such as water circulation/filtration, lighting, counter-current swimming devices, sound system, air injection, alarm sensors, cameras, portholes, etc.

**3.19**
**swimming pool (pool)**
artificial basin, where water is filtered being disinfected and retains continuous residual disinfection properties, renewed and recycled, as well as all of the equipment strictly necessary for its operation capable of achieving a certain level of watertightness

**3.20**
**structure**
part, or assembly of parts, designed to support loads and provide a sufficient degree of rigidity

[SOURCE: EN 1990:2002, modified]

Note 1 to entry: The structure guarantees the stability and cohesion of a pool.

Note 2 to entry: The "coping" is considered only if it contributes to the strength of the structure.

**3.21**
**effective volume of water**
capacity of the pool tank guaranteed by the manufacturer and determined from the water depth recommended by the manufacturer

**3.22**
**means of access**
design feature to facilitate entry to and/or exit from the basin

**3.23**
**tread**
horizontal component or upper surface of a step

**3.24**
**step**
part of the stairs, or of a ladder, consisting of a tread and possibly a riser

[SOURCE: EN 14843:2007, modified]

**3.25**
**platform**
upper, horizontal tread, connecting the two legs of a ladder

**3.26**
**ladder**
structure used for entering and exiting the water, formed from rails connected by steps or treads, and/or platform(s)

**3.27**
**stair**
succession of horizontal stages (steps or landings) which makes it possible to pass on foot to other levels

[SOURCE: EN 14843:2007, modified]

**3.28**
**pool handrail**
design feature to be gripped or grasped intended to assist the user to balance, to enter, to move around and/or to get out of the water

**3.29**
**grip**
holding of the hand around the entire circumference of a support

Note 1 to entry: See Figure 1.

Note 2 to entry: See Table 6.

[SOURCE: EN 1176-1:2008, 3.15, modified - Note to entry has been added.]

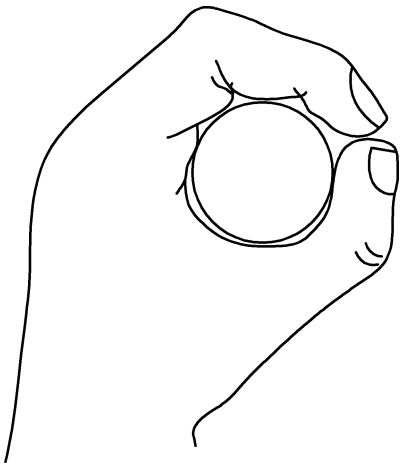


**Figure 1 — Grip**

**3.30**
**grasp**
holding of the hand around part of the circumference of a support

Note 1 to entry: See Figure 2.

Note 2 to entry: See Table 6.

[SOURCE: EN 1176-1:2008, 3.16, modified - Note to entry has been added.]

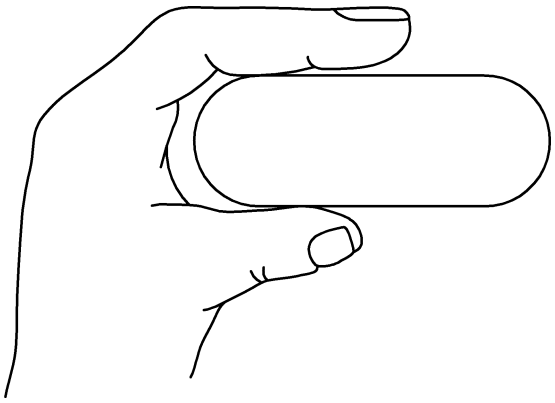


**Figure 2 — Grasp**

**3.31**
**thermosetting polymer shell**
main element of the prefabricated swimming pool (generally a polyester shell), that is a homogeneous structure, which is watertight and whose function is to contain the water

**3.32**
**entrapment**
hazard presented by the situation in which a body, or part of a body, or clothing can become trapped

Note 1 to entry: Entrapment is only considered where the user is not able to free himself/herself.

**3.33**
**laminated polyester or composite materials**
polymeric materials jointly implemented to form a shell structure serving as pool, coating and watertightness

**3.34**
**chemical barrier layer**
technical resin layer immediately under the aesthetic layer, reinforced or not

**3.35**
**aesthetic layer (coating)**
surface in contact with water, generally a resin

Note 1 to entry: Its use is limited to pools whose temperature is lower or equal to 28 °C unless otherwise specified by the manufacturer.

**3.36**
**aesthetic disorders**
staining, stain rings, discoloration due to an aggressive chemical water treatment product or physicochemical parameters of water

**3.37**
**water treatment**
use of chemical products and / or processes associated with filtration ensuring clean and healthy water

Note 1 to entry: the water treatment ensures water quality suitable for swimming according to the series prEN 16713.

**3.38**
**adult supervisor(s)**
parent or responsible adult appointed by a parent

**3.39**
**deck**
fitted surface, contiguous to pool

Note 1 to entry: The loose ground (grass, sand, etc.) is not considered as part of the deck.

# 4 General requirements and test methods

## 4.1 General

In use, installed according to the installation and commissioning manual, the swimming pool shall meet the requirements of this document.

If the pool structure includes any water system covered by the prEN 16713 series, the EN 16582 series shall be read in conjunction with the prEN 16713 series.

Assembled in accordance with the installation and commissioning manual, the electrical installation of any material related to the pool and its surrounding shall also comply with the requirements of HD 60364-7-702 or valid national requirements.

NOTE 1 HD 60364-7-702 applies only for fixed installations.

When a membrane is used as a watertight system, it is not mandatory to have a minimum thickness, however any relevant standards shall apply if they exist.

NOTE 2 For PVCP membrane, EN 15836-1 or EN 15836-2 could apply.

NOTE 3 For composition requirements, the professionals' attention is drawn to the change in the regulations in particular concerning the possible risks inherent with the use of heavy metals.

All manufacturers are required to carry out, either internally or via a test laboratory, the tests mentioned in Clause 4 for each new or revised material process.

## 4.2 Tolerances

The indicated dimensions and measurements are given with a tolerance of ± 3% (unless otherwise indicated).

## 4.3 Water leakage

Wherever possible, swimming pools should be built so that they are watertight, as leakage and other water losses may affect the building and surrounding properties.

The maximum leakage is specified in Table 1.

Once installed, the swimming pool shall be watertight according to one of the classes of Table 1 as stated in the point of sale information.

**Table 1 — Watertightness classification**

| Tightness Class | Maximum leakage<br>litre per $m^2$ per day or mm per day |
|---|---|
| $W_0$ | 0 |
| $W_1$ | 1 |
| $W_2$ | 2 |
| $W_3$ | 3 |

The measurement of any water loss should be carried out over a period of 7 days.

The drop in water level excludes evaporation losses, bathing activity, the temperature and humidity throughout the test period (and in the case of outdoor pools, the degree of exposure of the site to wind and sunshine).

Once installed, the swimming pool pipework shall be watertight according to class $W_0$ of Table 1.

If applicable, the balance tank shall meet the minimum watertightness classification of the swimming pool.

## 4.4 Minimum performance requirements for structural materials

### 4.4.1 General

The structural design and materials shall be in accordance with accepted structural engineering practices.

Any combination of different materials in direct contact with each other shall be compatible and not negatively affect each other's properties or structural integrity.

The requirements of this section do not apply to non-structural elements of the swimming pool, including, but not limited to, elements with solely decorative function. When the swimming pool water affects the resistance of the structural material, the requirements for water quality shall be stated and accompany the affected materials.

The parameters mentioned in document prEN 16713-3 shall be met. In addition, there shall be no influence on the water quality according to prEN 16713-3, if the material comes into contact with the pool water.

Selection of materials for the construction of the swimming pool shall be conducted under consideration of external influences, including but not limited to temperature, UV, chemicals (under normal conditions of use) etc., when appropriate, that may influence their structural integrity.

EXAMPLE Materials used for the pool construction and lining are given in Table 2 and Table 3.

**Table 2**

| Pool construction |
|---|
| PVC |
| PVC reinforced membrane (above ground pool) |
| Concrete |
| Styrofoam Formstone |
| GRP one piece pool |
| Composite construction |
| Polypropylene |
| Steel panels |
| Aluminium panels |
| Steel & Aluminium support frames |
| Stainless Steel |
| Glass (complete or min. one side / wall) |
| Wood |
| Brick wall construction (expanded polystyrene, …) |

**Table 3**

| Pool lining |
|---|
| Concrete |
| Liner |
| Tiles |
| Coating |
| GRP |
| PVC |
| Stainless steel |
| Glass |
| Natural stone |
| Polypropylene (PP) |
| Painting |
| Mineral coat |
| PVC reinforced membrane |

### 4.4.2 Specific requirements and testing for corrosion resistance

Any material that may be affected by corrosion (including but not limited to steel, stainless steel, aluminium and other metallic materials) and utilized for the construction of the swimming pool shall be treated for corrosion resistance, if applicable, and shall meet any of the following minimum requirements, as applicable.

The tested metal parts shall be assembled according to the installation instructions.

The tests are conducted according to EN ISO 9227 on all metal parts, coated (organic or inorganic coating) or not coated, contributing to the resistance of the structure's constitutive elements.

The following are excluded:

— elements having only decorative functions;

— elements embedded and/or fixed in concrete provided that they are commercial products commonly used in masonry constructions;

— all non-structural elements;

— hot-galvanized parts with a surface treatment thickness of ≥ 50 µm or prescriptions given in EN ISO 1461

NOTE Hot-galvanized parts with a surface treatment thickness of ≥ 50 µm which correspond more or less to 375 g/m$^2$.

In accordance with EN ISO 9227, subject the structure samples to be tested to salt spray for:

— 192 h for aboveground and recessed swimming pool kits for the parts above the ground;

— 192 h for inground and/or recessed swimming pool kits for the parts in the ground and whose parts to be tested are ≥ 3 mm;

— 400 h for inground and/or recessed swimming pool kits for the parts in the ground and whose parts to be tested are < 3 mm.

On completion of these corrosion tests, all of the products shall meet the visual requirements described below:

— red oxidation: assess the results obtained on steel parts, coated or not, referring to the recommendations of EN ISO 4628-3. The number of red rust pits on the surface shall conform to grade RI 3 or lower;

— white oxidation is accepted on zinc-galvanised, electrogalvanised or bichromated parts;

— green oxidation is accepted on material including copper;

— brown oxidation is accepted on stainless steel;

— the degree of blistering of organic coatings shall not exceed density 2, and the size of any blister shall not exceed size 3 as defined in EN ISO 4628-2.

### 4.4.3 Osmosis resistance of composites and polymers

Dip a 150 mm x 100 mm test sample, immersed to half its height, in distilled water at a constant temperature of 60 °C for 15 d.

Protect the sample on its edges and its rear face, to avoid contact with water.

On completion of this test, no blister (i.e. density 0), porosity, cracking or fibre prominence, shall be detected on the surface after testing, compared to a control specimen as defined in EN ISO 4628-2.

Only the manufacturer is concerned with this test method which shall be applied for each new manufacturing process. This test is only applicable before installation of the product for the end user.

A longer test period may validate a higher integrity of the polymer.

For polyester shells, refer to Annex D for additional requirements.

#### 4.4.4 Wood

Structural elements made of wood or wood-based material shall meet the requirements of use class 4 according to EN 335.

Compatible woods may be chosen according to two distinct approaches:

— using naturally durable woods (excluding sapwood) as defined in EN 350-2, that meet the requirements for use in applicable hazard classes in EN 460.

— using wood with conferred durability (preservation treatments while conserving the sapwood), that meets the requirements for use in applicable hazard classes in EN 351-1.

To achieve the parameters stated in prEN 16713-3, the water treatment has to be adjusted in the case of wooden material in contact with the water.

### 4.5 Injury risks

#### 4.5.1 Small elements, edges and corners

When the swimming pool is being used, any protrusion on accessible parts liable to present a risk of injury shall be protected by a method which in order to be removed, requires the use of a tool or a minimum amount of force of 60 N, with an accuracy of 2 N.

During the installation, equipment made of wood, fibreglass, or other materials shall be free of splinters.

Small accessible and grippable elements shall not fully enter into the template shown in Figure 3 (EN 71-1) or they shall be fixed to the item to which they belong such that they cannot be detached under a force of 60 N, with an accuracy of 2 N, applied in any direction whatsoever.

Dimensions in millimetres

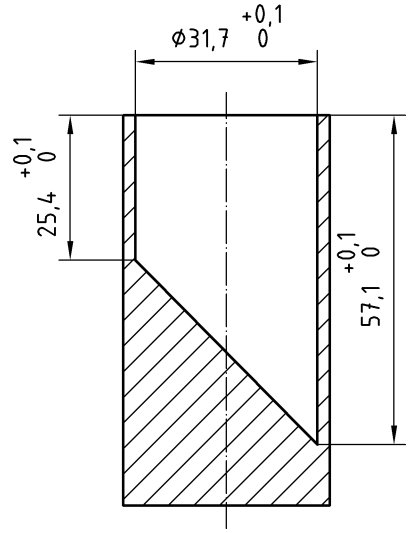



**Figure 3 — Template for small elements**

All edges, protruding parts and corners accessible without use of tools or minimum amount of force of 60 N (±2N) shall be designed not to cause any injury. When necessary they shall be treated appropriately to remove this risk (see Figure 4).

For example, edges can be bevelled or rounded, and surfaces shall be smooth and free from burrs. Examples are provided in Figure 4. If they are due to a wall thickness lower than 4 mm, one of the following requirements applies:

— they shall be folded, rolled or wound in spirals according to Figure 4 d);

— they shall be protected by a plastic coating or by any other suitable means as shown in Figure 4 e).

Dimensions in millimetres

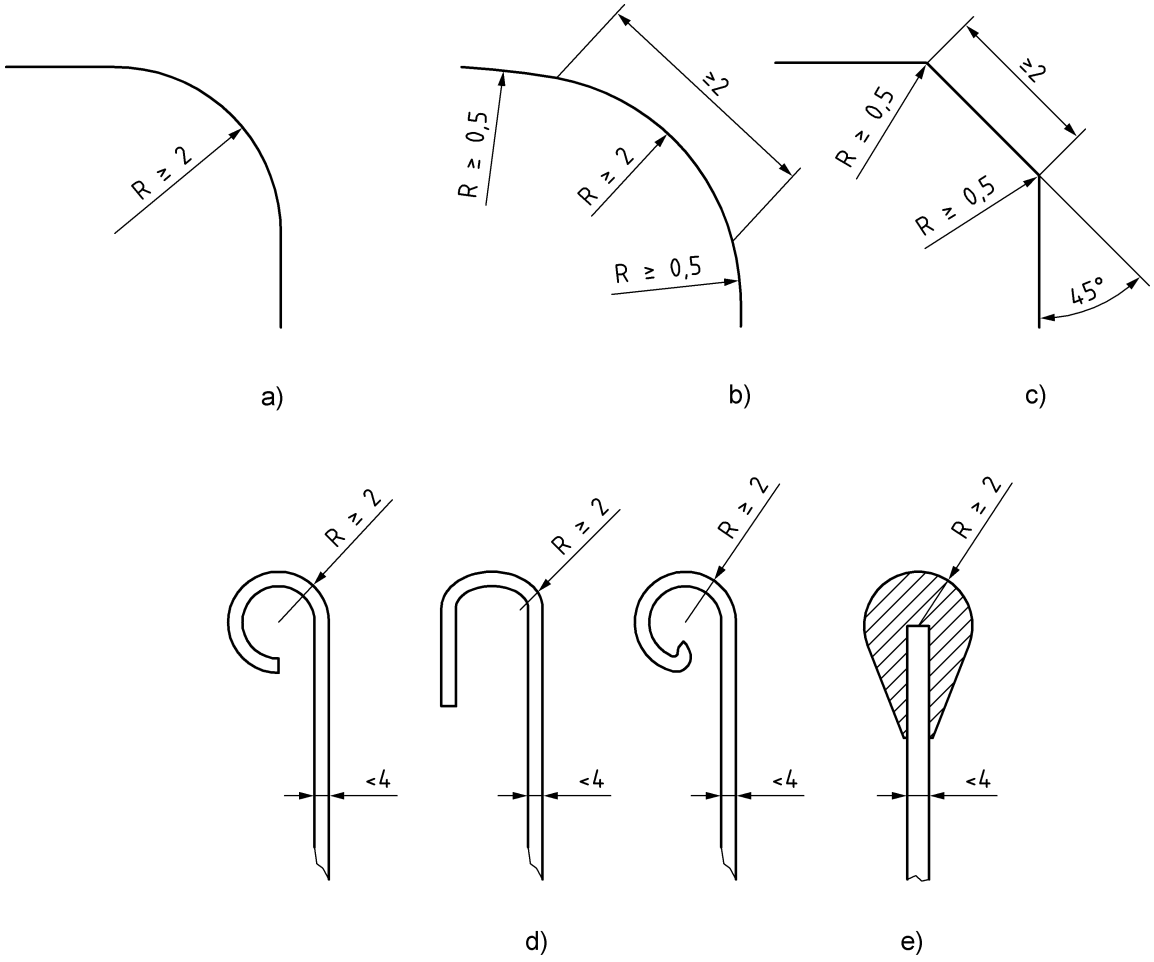



**Figure 4 — Examples of configuration of edges**

### 4.5.2 Permissible openings

#### 4.5.2.1 Principle

To prevent entrapment hazards inside the pool structure, accessible openings with the lowest point located beyond 500 mm below the water surface shall be restricted to the range of opening or gap size dimensions specified in 4.5.2.2 to 4.5.2.4, unless specifically permitted in other clauses/annexes of this standard and/or parts of this standard series.

Test methods for entrapment are given in Annex C.

If the depth of penetration (see 'a' in Figure 5) is less than 10 mm, no requirements apply.

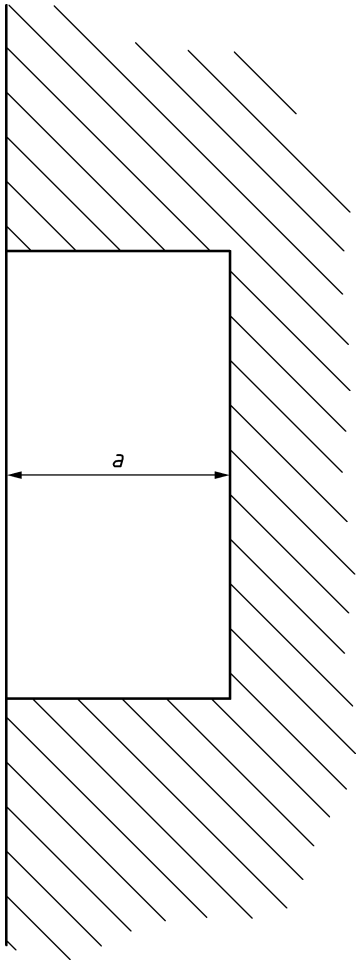



**Figure 5 — Depth of penetration less than 10 mm**

**Key**

a maximum depth penetration : ≤ 10 mm

#### 4.5.2.2 Finger and toe entrapment

Where there is a risk of finger or toe entrapment, the permissible opening shall be ≤ 8 mm or ≥ 25 mm.

#### 4.5.2.3 Head and neck entrapment

Where there is a risk of head or neck entrapment, the permissible opening shall be ≤ 110 mm or ≥ 230 mm.

Where an opening is ≥ 230 mm it should not permit passage to further entrapment hazards.

Where there is a combination of risks, the lesser of the permitted opening sizes shall be used.

#### 4.5.2.4 Other body entrapment

Other permissible openings include the range between 25 mm and 110 mm. When such openings are used for construction or installation reasons, the installer shall alert their customer of a potential risk of entrapment.

## 4.6 Accessibility

### 4.6.1 General

The risk of drowning for children (especially under 5 years) is high and reasonably predictable, either during the bathing period or at other times. Therefore it is recommended for adult supervisors to:

— secure the means of access to the swimming pool; or

— install a protection device; and

— keep the children under constant supervision.

For pools relying on a specific means of egress such means shall not be removed when the pool is in use.

### 4.6.2 Secure access to the swimming pool

The access to the above ground pools or partially buried pools (coming from outside to inside the pool) can be secured by using a safe access according to the requirements stated in 5.4.4. Moreover the swimming pool shall be designed such that, once installed, unauthorised access to the pool for children (especially those under the age of five years) by striding over/climbing over is limited. The secure access to the basin is met when:

— the height between the highest bearing point (according to the requirements stated in 5.5) and the upper level of the finished pool is greater than or equal to 1 100 mm or;

— the height between the ground and the lowest bearing point (according to the requirements stated in 5.5) is greater than or equal to 1 100 mm, or;

— the height between two consecutive bearing points (according to the requirements stated in 5.5) is greater than 1 100 mm.

If:

— the above requirement is not satisfied and/or

— the means of access according to the requirements stated in 5.4.4 is not safe; or

— no means of access is provided with the swimming pool.

Then the manufacturer of the swimming pool shall recommend that the access to the finished swimming pool should be secured by a protection device to prevent children drowning.

To prevent children drowning, inground pool manufacturers shall also recommend to secure the access to the finished pool with a protection device. The following warning "In order to prevent children from drowning, it is recommended to secure the access to the pool with a protection device" shall be present for the consumer in the information before purchase and in the safety instructions.

EXAMPLE Protection devices to secure the access to the swimming pool can be fences, safety covers, enclosures, etc.

NOTE Securing the boundary of the property may be an acceptable way of preventing unauthorized access to the pool.

# 5 Requirements and test methods for means of access

## 5.1 General

All means of access shall fulfil the material requirements of 4.4, if applicable.

Swimming pools intended solely for aboveground installation with a wall height exceeding 850 mm shall be installed with a means of access.

When such mean of access is a pool ladder, then it shall meet the ladder design requirements in 5.4 and the safe access requirements in 4.6.

Pools intended for multiple types of installation shall include a specification or recommendation for appropriate means of access.

## 5.2 Slip resistance

The risk of a slipping accident in a domestic pool is low, due to the following reasons:

— Easily accessible information for users (Annex B);

— Close and permanent adult supervision required (Annex B);

— Reduced number of simultaneous users.

The slip resistance requirements only refer to walking surfaces of slopes, steps and treads located on the inner side of the basin, under the water line or not, and allowing the user to go down into the water.

These requirements do not apply to:

— slopes or steps that are not intended to enter the water ;

— water slides;

— starting platforms;

— diving boards, or

— any similar equipment.

Requirements apply to slopes as a means of access with an inclination of more than 15°.

If the slope declination is less than 15°, the requirements only apply from the water level to 600 mm depth.

The walking surfaces of the relevant means of access have to comply with slip resistance requirements that shall be tested according to the Annex A of CEN/TS 16165. Rating groups are defined in Table 4:

**Table 4**

| Rating group | Critical angle ($\alpha_{barefoot}$ ) |
|---|---|
| A | $12° \leq \alpha_{barefoot} < 18°$ |
| B | $18° \leq \alpha_{barefoot} < 24°$ |
| C | $24° \leq \alpha_{barefoot}$ |

The requirements for the different means of access are given in Table 5:

**Table 5**

| Means | Minimum rating group |
|---|---|
| Treads of ladders | A |
| Steps | A |
| Slopes | B |

A higher rating group may be taken into account by the installer and/or retailer if the swimming pool is to be used by people with mobility issues.

In case there are different walking surfaces on the same tread or step or slope, the choice will be possible between:

— testing each surface (if possible): each one shall comply independently with the standard; or

— testing the whole surface as it is designed.

## 5.3 Crushing and entrapment hazards

When in use, movable parts of the ladder shall have no crushing and shearing points between the movable and/or rigid parts of the ladder, which can cause injury whilst stepping on it.

If the use of the means of access creates a fall height of more than 600 mm above the floor inside and outside the pool, this can lead to a partial fall, resulting in a potential risk of strangulation, therefore the permissible openings shall be between 25 mm and 110 mm, or greater than 230 mm.

## 5.4 Ladders

### 5.4.1 Dimensions

The dimensional requirements relating to ladders are given in Table 6 and in Figure 6, Figure 7, Figure 8a and Figure 8b.

**Table 6**

| | Dimensions (in mm) or angle (°) | Minimum | Maximum |
|---|---|---|---|
| (a) | Usable distance between stiles | 320 | / |
| (b) | Platform depth | 250 | / |
| (c) | Cross-section of parts to be held | | |
| | Grip (see Figure 1) | Shape inscribed in a Ø 25 circle | Shape inscribed in a Ø 50 circle |
| | Grasp (see Figure 2) | / | 60 |
| (d) | Stepping height between 2 treads | / | 330 |
| (e) | Entrapment space between 2 treads | > 45 and < 110 or > 230 | / |
| (f) | Height of the 1st tread[a] in relation to the ground, outside of the pool | / | 400 |
| (g) | Difference between the wall height (including coping) and the height of the last tread for external ladders without platform. | / | 150 |
| (h) | Difference between the pool wall height (including coping) and the height of the last tread for internal ladders. | 150 | 300 |
| (i) | Height of the handrails in relation to the last tread or the platform or the top of the wall (including coping for internal ladders)[c] | 400 | / |
| (j)[b] | Distance between the floor or lower base of the stabilizer and the 1st tread[a] inside the pool | > 45 and < 110 or > 230 | |
| (k) | Angle of inclination of the legs in case of: | | |
| | - detachable ladders | 60 | 75 |
| | - fixed ladders (on the inside of the pool) | 60 | 90 |
| | - fixed ladders (on the outside of the pool) | 60 | 80 |
| (l1) | Space between the submerged treads and the swimming pool wall for fixed ladders | 0 | 8 |
| | | 25 | 110 |
| | | 230 | 270 |
| (l2) | Space between the front edge of the coping and back edge of the top tread | l1 | l1 |
| (m) | Width of the treads[c] | 36 | / |
| (n) | Distance between the ladder bar and the pool wall“. | 0 to 8<br>25 to 110 | 230 |

[a] Stabilizers resting on the ground are not considered as treads.

[b] Both configurations are acceptable depending on the choice.

[c] Depending on the capacity of the user, this distance could be increased.

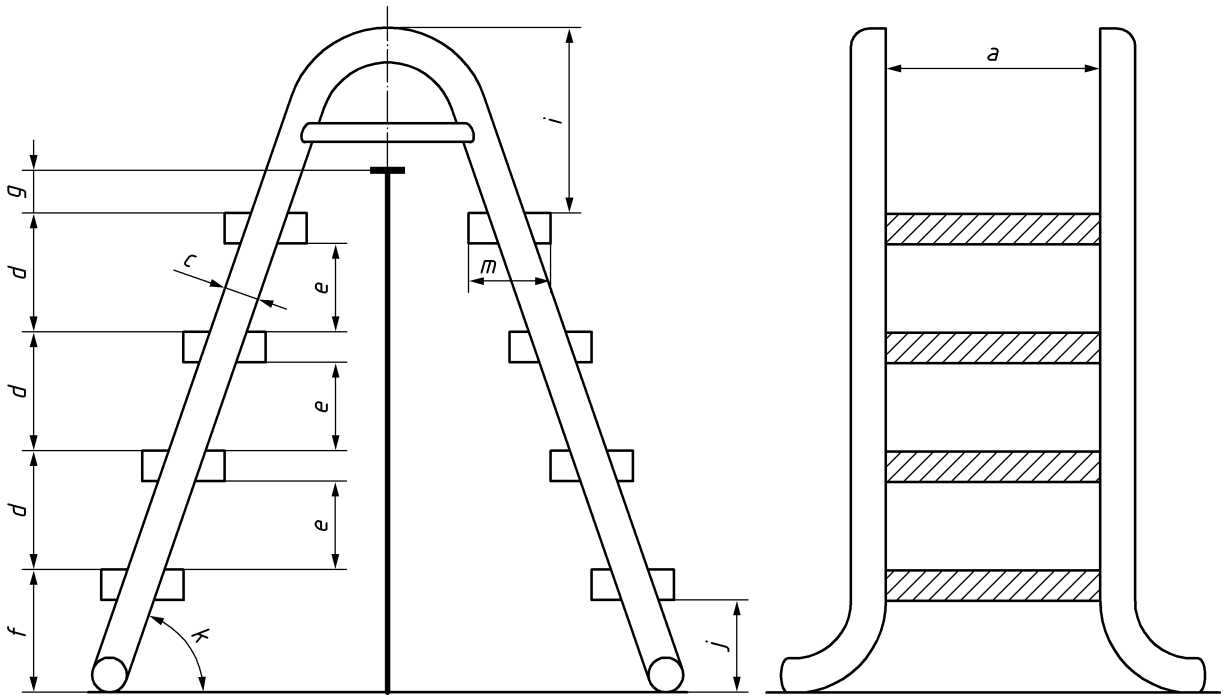



**Figure 6 — Means of access without platform**

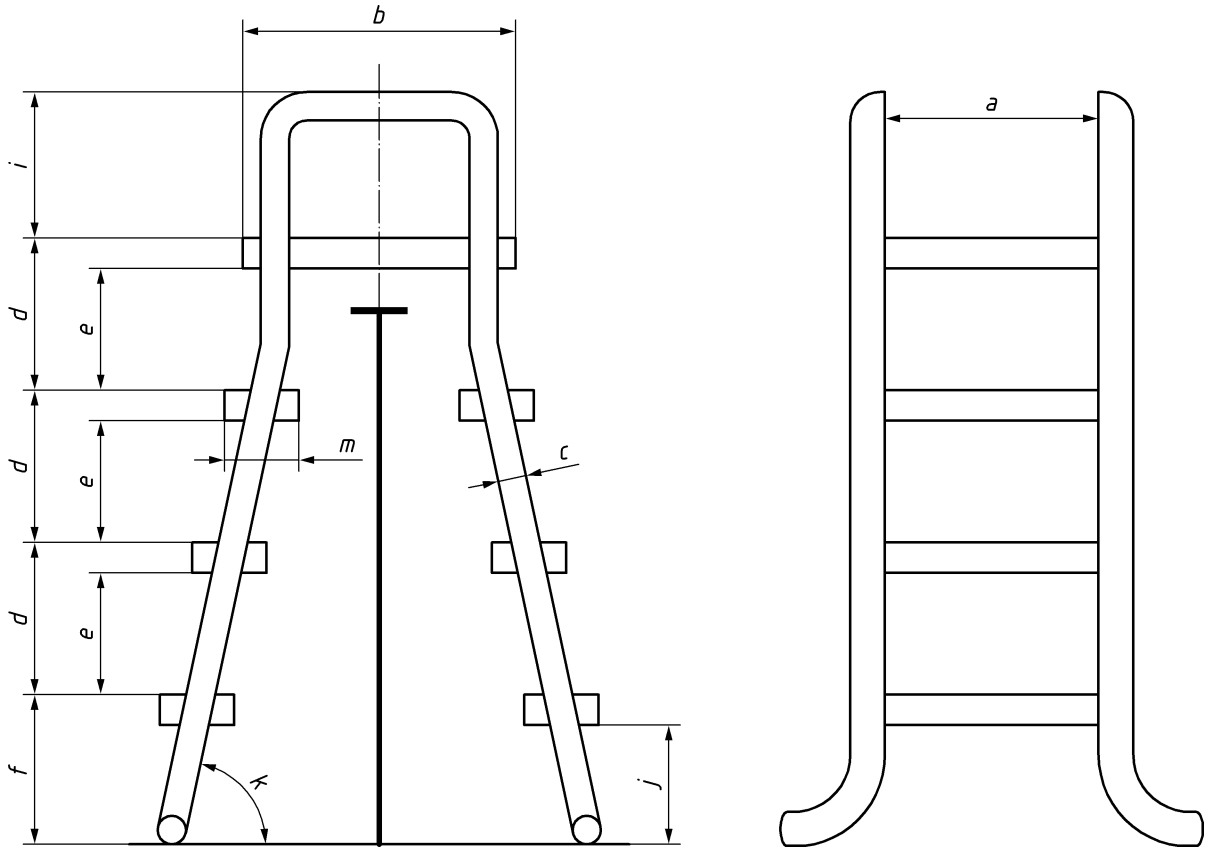
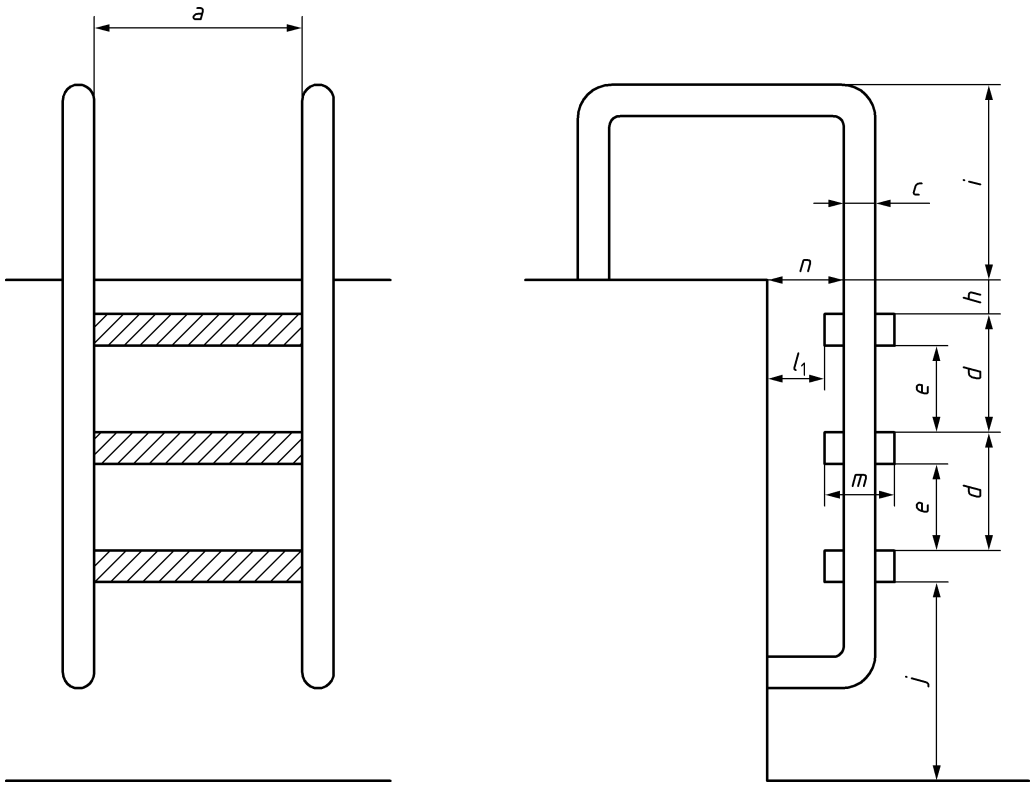
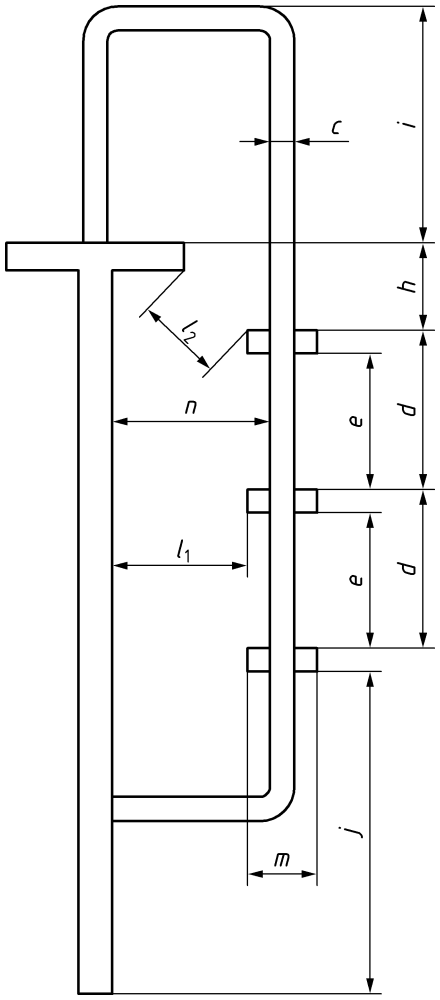



**Figure 7 —Means of access with platform**




**a) Internal means of access / Example 1**




**b) Internal means of access / Example 2**

**Figure 8**

To enhance the safety of fixed ladders, it is recommended:

— that the width of the top tread (m) is at least twice as wide as the remaining treads,

— and that the leading edge of the treads is in the same plane (see Figures 8a and 8b).

Test methods for entrapment are given in Annex C.

### 5.4.2 Load-bearing strength

Apply a minimum force of 1500 N vertically to the centre of the most unfavourable tread for 5 min. Then apply the same force successively to the centre of the platform, if one exists. The test shall be performed over a surface area of 100 mm x 100 mm.

No permanent deformation greater than 1% in relation to the length measured between the stiles shall be observed. Take the measurement within the minute following removal of the force.

For means of access with or without a platform and not attached to the wall, the load test should be performed on a rigid plate.

### 5.4.3 Test for lateral stability of removable ladders

Place the ladder on a plane inclined by 10° in relation to the horizontal, according to Figure 9.

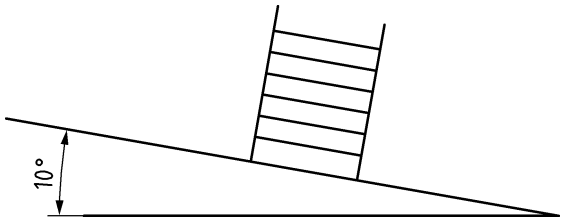



**Figure 9 —Lateral stability test**

On completion of this test, the ladder shall not tip over.

This test does not apply to embedded or fixed ladders.

### 5.4.4 Specific requirements for secured access points to enter the pool

#### 5.4.4.1 General

To meet the requirements in 4.6, the secured means of access to the pool shall comply with the following requirements:

When the means of access is in a secured position, the height between the lowest bearing point of the means of access and the ground shall be greater than or equal to 1100 mm.

A visible marking in usage position reminding that the outer leg shall be removed, or retracted, or lifted after use shall be provided with each secured means of access.

To prevent the risk of unlocking in safe position by children under the age of five years or an unintentional unlocking, the unlocking system shall require at least one manual action with a minimum force of 50 N (applied at the farthest point from the axis for the rotating parts) to be released or depending on the choice:

— require at least two consecutive actions on the unlocking system to release it, the second being dependent on the first, which is performed and maintained; or

— require two separate but simultaneous actions working according to different principles; or

— comprise two unlocking devices at least 1 000 mm away from one another and which shall be activated simultaneously; or

— be inaccessible to a child under the age of five with an unlocking system at an extended length greater than 1500 mm (measurement taken from the ground outside of the protected area).

The use of tools such as a token, a key, a magnetic card, etc. is not considered as being an action as defined above.

The tests shall be performed starting from the safe position to the access position.

The movement of opening the means of access is not considered as an unlocking action. The unlocking system shall be able to be easily operated by adults.

#### 5.4.4.2 Ladders with lifting access

For ladders that can be lifted, provide a blocking device to maintain the ladders in high position. The locking in high position shall be automatic and signalled in a visible or audible manner.

#### 5.4.4.3 Ladders with retractable access

If the outer leg is retractable, this leg or the device that allows the ladder to be retracted shall withstand, in safe position, a tensile pulling force of 100 N, in the direction of separation of the elements.

#### 5.4.4.4 Means of access to the deck (ladder or stairs)

In the case of aboveground swimming pools fitted with a deck, the means of access to the deck shall be detachable or designed so as to meet at least one of the requirements described in 5.4.4.2 (ladders with lifting access) or 5.4.4.3 (ladders with retractable access).

### 5.4.5 Other requirements

The treads shall not be able to rotate around their axis.

Ladders inside the swimming pool shall be equipped with handrails, separated or not from the ladder vertical side supports.

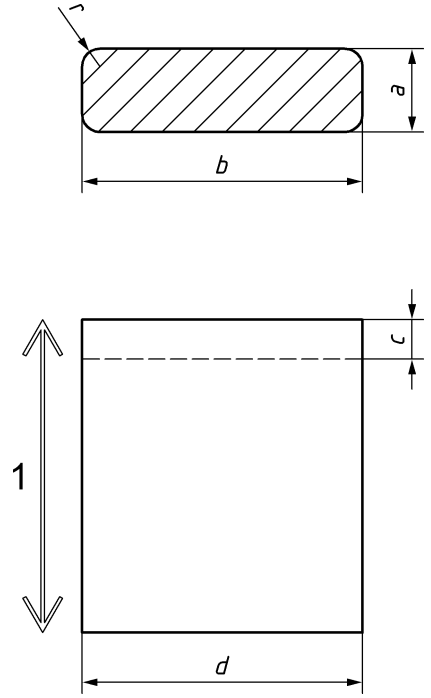
Ladders whose legs have an angle of inclination greater than 75° shall be embedded or fixed.

## 5.5 Bearing points

### 5.5.1 Recessed bearing points

Any opening limited to its lower part by a horizontal or inclined or rounded element, allowing the passage of the template defined in Figure 11, over at least 5 mm is considered as a recessed bearing point. The template shall be presented in all positions: vertical, horizontal, inclined.

This distance of 5 mm is marked on the template either by a groove, or a shoulder, or a line marked with indelible paint (see Figure 10).




Cross-sectional view

Top view

**Key**

a 10 mm
b 35 mm
c 5 mm
d 35 mm
r 2,5 mm

**Figure 10 — Template for bearing point**

### 5.5.2 Raised bearing points

#### 5.5.2.1 Contour

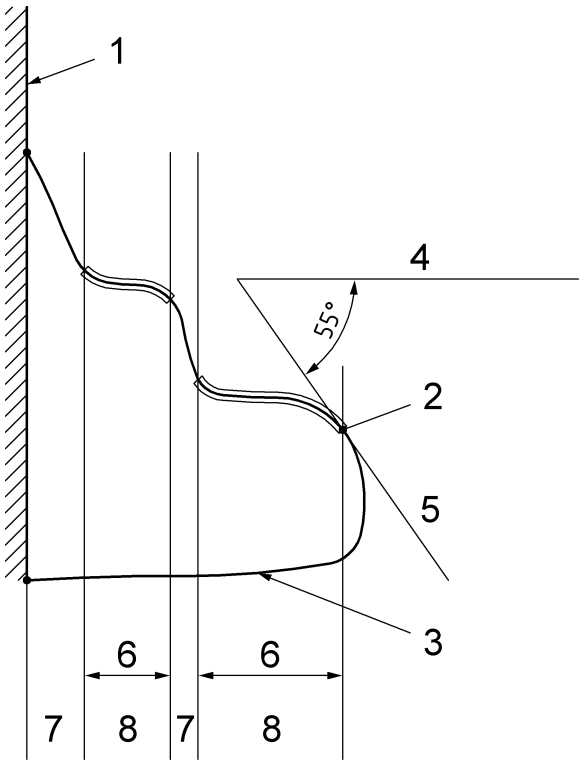
In the control plane, the contour is the envelope curve of all the protuberances appearing in this plane forms the contour. The contour is read from the face to be controlled outwards (see Figure 11).

#### 5.5.2.2 Control plane

In the appropriate control area, the control plane is the vertical plane intersecting the protuberances (see Figure 11).

#### 5.5.2.3 Potential bearing area

The potential bearing area is all the consecutive points forming a part of the contour. Each of these points has a tangent inclined with respect to the horizontal at an angle of less than 55°. Overhanging faces are not potential bearing surfaces (see Figure 11).




**Key**

| | | | |
|---|---|---|---|
| 1 | face to be controlled | 5 | tangent |
| 2 | point on the contour | 6 | emergences |
| 3 | overhanging face | 7 | safe surfaces |
| 4 | horizontal | 8 | potential bearing surfaces |

**Figure 11 —Definition of surfaces**

#### 5.5.2.4 Safe surfaces

Safe surfaces are surfaces constructed with an angle of incline 55° or more from the horizontal, therefore not presenting stepping surfaces (see Figure 11).

#### 5.5.2.5 Type of raised bearing point

The following are considered as bearing points:

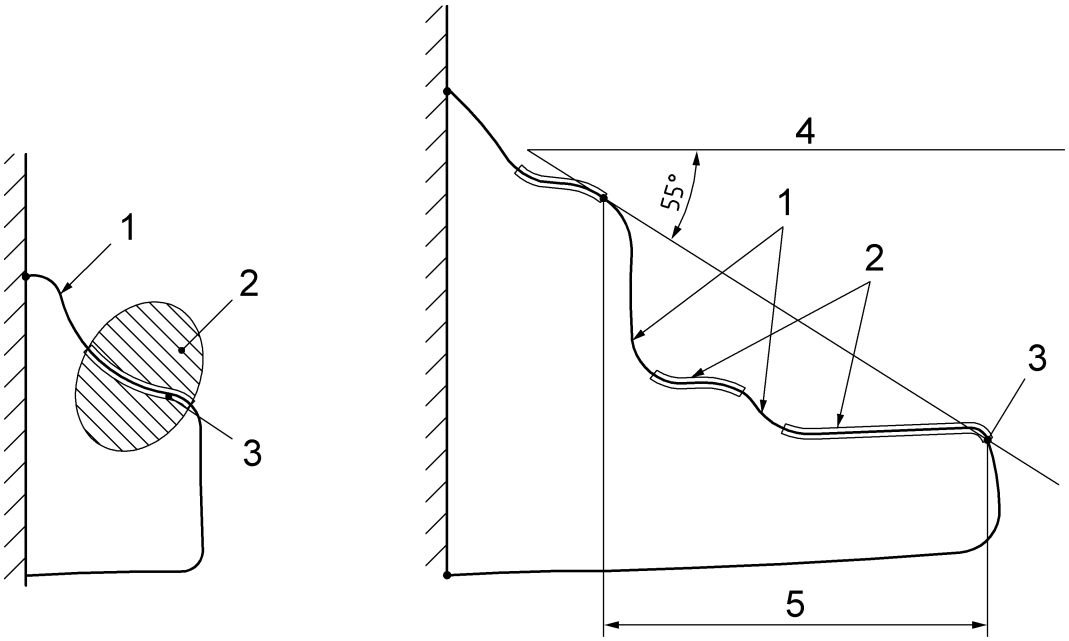
— all potential adjoining bearing surfaces whose emergence in relation to the end of a safe area is greater than 15 mm (raised bearing point of type 1);

— all potential adjoining bearing surfaces whose emergence in relation to the end of a safe area is greater than 5 mm and whose surface area is greater than 175 mm² (raised bearing point of type 2). The minimum surface area of 175 mm² considered is understood as the projection of the bearing point on a horizontal plane;

— all areas made up of one or more safe surfaces and potential bearing surfaces, whose tangent at two points, not intersecting the contour, is inclined with respect to the horizontal at an angle of less than 55°, meeting one or more of the following conditions (raised bearing point of type 3 – Figure 12):

  — the emergence between the 2 points of contact of the tangent is greater than 15 mm;

— the projected surface of the bearing point, delimited by the 2 points of contact of the tangent, is greater than 175 $mm^2$ and the emergence between these two points is greater than 5 mm.




**Key**

1 contour
2 projected surface
3 potential bearing area

**a)**

**Key**

1 safe area
2 potential bearing area
3 point of contact
4 horizontal
5 emergence

**b)**

**Figure 12 — Illustration of raised bearing point type 3**

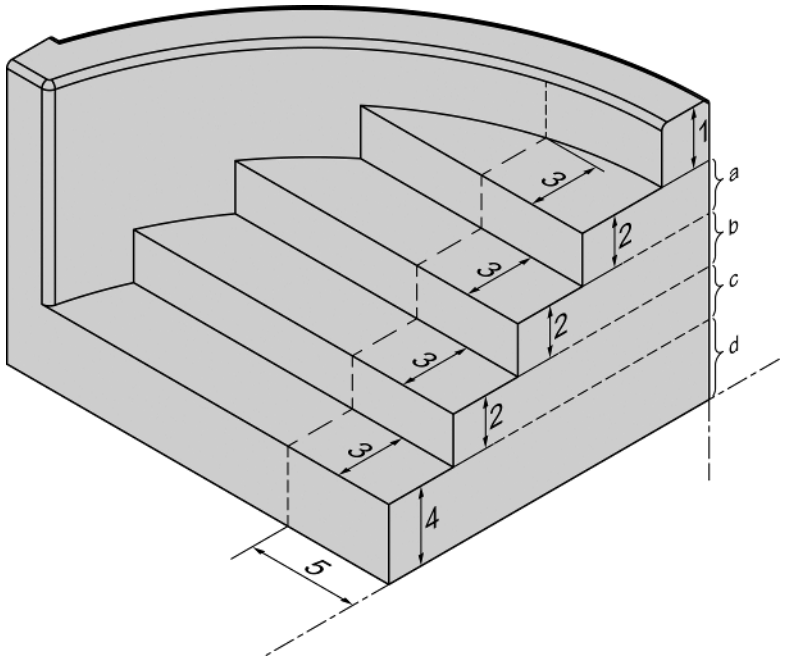
## 5.6 Submerged stairs

### 5.6.1 General

The dimensional requirements relating to submerged stairs are given in Table 7 and in Figure 13.

**Table 7**

| | Dimensions (in mm) | Minimum | Maximum |
|---|---|---|---|
| (1) | Height from the pool surround to the first step | / | 400 [a] |
| (2) | Height between 2 steps | / | 330 |
| (3) | Step depth (Regardless of the shape of the step / See also dimension 5) | 210 (Absolute minimum),<br>recommended 250 | / |
| (4) | Height from the last step to the pool bottom | / | / |
| (5) | Step width on both side of the stair centre line with the required step depth (See dimension 3) | 160 | / |
| [a] Where the height between the top step and the walkable surface area is higher than 400mm then a handrail shall be installed. This maximum height shall be ≤ 450mm (without tolerances). | | | |




**Key**

a 1st step
b 2nd step
c 3rd step
d 4th step

**Figure 13 —Illustration of dimensions for 4 steps submerged stairs**

Stairs installed in a pool area with a depth greater than or equal to 1 300 mm shall have a minimum of 3 internal steps excluding the walkable surface and the pool bottom.

A bench seat or a sitting area is not considered as a means of access. However, where a bench seat is used as a means of access to and from the pool, it has to fulfil the requirements of this clause.

The installation and bracing instructions shall be supplied with stairs.

The constituent material or coating of the stairs shall allow easy maintenance.

#### 5.6.2 Built-in stairs

Built-in stairs that are part of the swimming pool structure shall conform to the general characteristics as defined in 4.4 and 5.4.2.

#### 5.6.3 Fitted stairs

Stairs fitted inside the volume formed by the wall shall comprise a means of fastening that guarantees perfect stability and shall not affect the general characteristics as defined in 4.4 and 5.4.2.

### 5.7 Handrails

If a handrail is installed, the cross section of parts designed to be gripped can be round, oval, a rounded rectangle or elliptical and shall be between 25 mm and 50 mm.

## 6 Instructions for the consumer

### 6.1 General principles

All documents shall contain:

— the following statement: "Please read carefully and keep for future reference";

— the information to identify the model of the basin, swimming pool or swimming pool kit to which the document relates;

— the name and contact information of the person responsible for placing the product on the market (manufacturer, distributor or importer).

All instructions shall be legible, clear, comprehensible to the buyer and written in official national languages where the product is sold.

For better comprehension, the use of illustrations is recommended.

When the instructions contain several pages, the manual(s) shall be documented with numbered pages.

The cautions and warnings shall be highlighted.

Illustrations, if any, shall be placed such that they can be seen while the text referring to them is being read.

The visuals shall not contradict the requirements included in this document.

Where it is not specified in other rules and/or it does not conflict with existing regulations, the manufacturer's instructions need to be considered.

## 6.2 Self-built/installed pools

### 6.2.1 Point-of-purchase information

To allow the buyer to make a choice, the point-of-purchase information shall indicate the following at least:

— the reference to this document and its following parts if applicable;

— the kit type : “Inground or aboveground or recessed swimming pool kit”;

— the commercial name or reference;

— the dimension of the water body (see models in Figure 14);

— the maximum effective water depth (see models in Figure 14);

— the maximum total overall dimension (see models in Figure 14);

— the effective volume of water;

— all indications regarding the construction of reinforcement works related to the kit type;

— the composition of the swimming pool kit (examples: pool structure, ladder, filtration system, etc.);

— the number of people required for the installation;

— the approximate time required to install the swimming pool kit, excluding earthworks and filling;

— the warranty period(s) of the provided elements of the swimming pool kit;

— the following or equivalent warning: "The use of a swimming pool implies compliance with the safety instructions described in the operating and maintenance guide. In order to prevent drowning or other serious injuries, pay particular attention to the possibility of unexpected access to the swimming pool by children under 5 years by securing the access to it, and, during the bathing period, keep them under constant adult supervision";

— the tightness class (according to Table 1).;

— safety information and/or pictograms related to the following:

  — awareness of the risk of drowning in the swimming pool;

  — adult supervision of children;

  — awareness of the risk of diving, if applicable.

NOTE A quotation is considered as information delivered at the point of purchase.

The seller shall indicate to the purchaser that they should consult the local building code for any applicable installation requirements.

### 6.2.2 Installation and commissioning manual

The installation and commissioning manual shall contain all of the information necessary for a correct and complete installation, and in particular the following information:

— ground preparation including, if appropriate, specific recommendations concerning the type of soil;

— the number of people required for the installation;

— the approximate time required for the entire installation, excluding earthworks and filling;

— the list of all of the parts and the description of the installation phases in chronological order;

— the list of the tools required for the installation and of the materials complementary to the installation of the swimming pool kit as well as their use;

— the address or telephone number where the consumer can obtain additional information during the installation of the swimming pool kit, in the event of problems;

— all of the structural works necessary for the proper construction of the structure.

#### 6.2.3 Operating and maintenance manual

The swimming pool kit shall be accompanied by an operating and maintenance manual. These manuals shall contain all of the information necessary for a correct use of the pool structure.

The operating and maintenance manual shall also contain:

— the safety instructions (see Annex B);

— recommendations concerning the filling level;

— if appropriate, recommendations concerning the need to monitor bolts and screws; splinters or any sharp edges;

— a warning about the hazards resulting from complete emptying of the basin;

— recommendations on winterising and long-term storage;

— irrespective of materials used for swimming pool construction, accessible surfaces have to be checked regularly to avoid injuries.

More detailed information may be provided with each element of the swimming pool kit (as defined in 3.4).

### 6.3 Constructed / installed pools by professionals

#### 6.3.1 Point-of-purchase information

To allow the buyer to make a choice, the point-of-purchase information shall indicate at least the following:

— the reference to this document and its following parts if applicable;

— the commercial name or reference;

— the dimension of the water body (see models in Figure 14);

— the maximum effective water depth (see models in Figure 14);

— the maximum total overall dimension (see models in Figure 14);

— the effective volume of water;

— the warranty period(s) of the installed products;

— the following or equivalent warning: "In order to prevent drowning and other serious injuries:

  — The use of a pool implies compliance with the safety instructions described in the operating and maintenance guide.

  — Pay particular attention to the possibility of unexpected access to the swimming pool by children under 5 years by securing the access to it.

  — During the bathing period, keep them under constant adult supervision."

— the tightness class (according to Table 1).

NOTE A quotation is considered as information delivered at the point of purchase.

#### 6.3.2 Operating and maintenance manual

The swimming pool shall be accompanied by an operating and maintenance manual. These manuals shall contain the information necessary for the correct use of the pool structure. The operating and maintenance manual shall also contain:

— the safety instructions (see Annex B);

— recommendations concerning the filling level;

— if appropriate, recommendations concerning the need to monitor bolts and screws; splinters or any sharp edges;

— a warning about the hazards resulting from complete emptying of the basin;

— recommendations on winterising and long-term storage.

### 6.4 Means of access

#### 6.4.1 Point-of-purchase information

If the means of access is sold alone (not included in the swimming pool kit), the point-of-purchase information specific to the means of access shall indicate at least the following, in order to allow the buyer to make a choice:

— the reference to this document;

— the type of means of access, e.g.:

  — secured means of access

  — unsecured means of access

— the commercial name or reference;

— illustrations repeating the overall dimensions of the product;

— stepping height and width of the wall, if appropriate;

— if appropriate, any indication concerning the construction of onsite reinforcement works for installing the means of access;

— the warranty period(s) of the means of access.

A handrail may be proposed with the means of access in case of use by people with mobility issues.

#### 6.4.2 Operating and maintenance manual

The operating and maintenance manual of the means of access, if supplied alone, shall contain at least the following information:

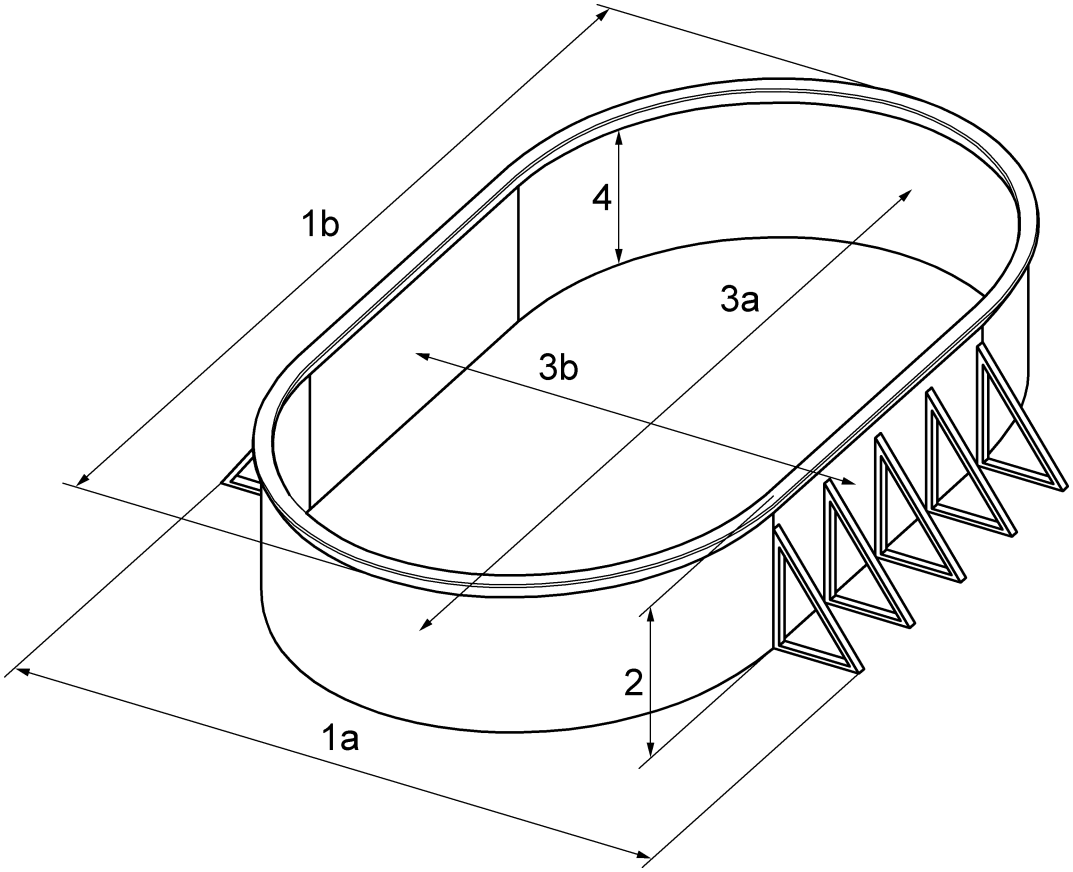
— the instructions regarding the winterising of the means of access itself;

— an indication of the maximum allowable weight;

— a clarification on the fact that the means of access shall not be used for other purposes;

— if appropriate, recommendations concerning the need to monitor bolts and screws, splinters or any sharp edges.

### 6.5 Examples illustrating pool sizes

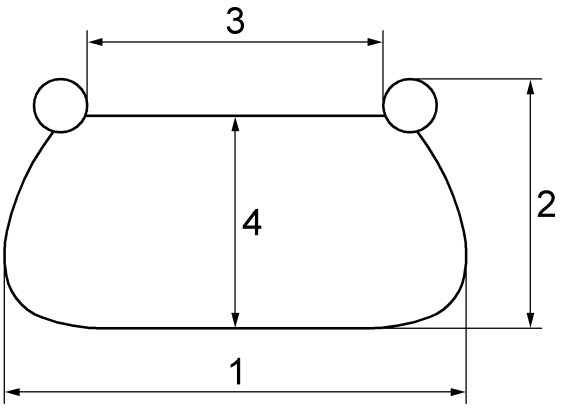



**Key**

1a space necessary for installation
1b outer dimensions of the upper edge
2 overall height
3 dimension of the water body (diameter, width (3b) and length (3a))
4 maximum effective water depth

NOTE Maximum total overall dimensions (1a x 1b x 2).

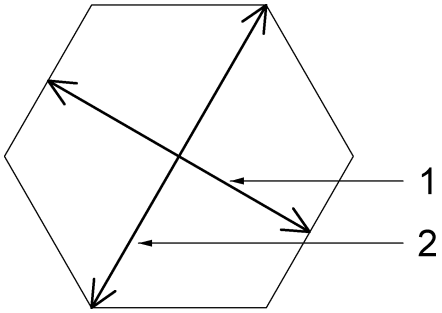
**a) Illustration of overall pool dimensions**




**Key**

1 space necessary for installation
2 overall height
3 dimensions of the water body
4 maximum effective water depth

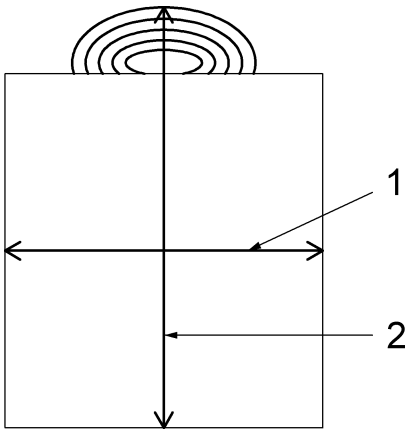
**b) Cross-section of aboveground swimming pool**




**Key**

1 water body dimension minimum measurement
2 water body dimension maximum measurement

**c) Top view of a polygonal swimming pool kit**




**Key**

1 water body dimension minimum measurement
2 water body dimension maximum measurement

**d) Top view of a swimming pool kit fitted with a Roman staircase**

**Figure 14 — Examples of water body dimensions**

## 7 Safety signage

All swimming pools (whether manufactured or constructed) shall be provided with:

— the safety sign in Figure 15 and/or the following text: " Keep children under supervision in the aquatic environment ", and

— the safety sign in Figure 16 and/or the following text: "No diving" where applicable.

Instructions shall be given to affix the safety sign on the pool and/or the text within 2 000 mm of the pool in a prominent visible position.

**Figure 15 — Safety sign – ISO 20712-1:—, WSM002, Keep children under supervision in the aquatic environment**

**Figure 16 — Safety sign ISO 20712-1:—, WSP005, No diving**

# Annex A
(informative)
# Swimming pool structures

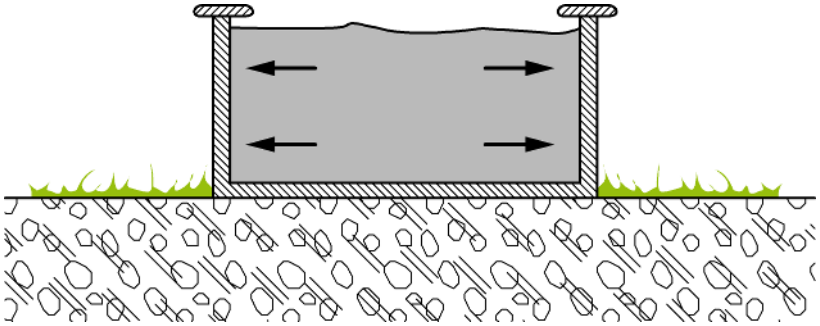


**Figure A.1 — Aboveground pool, to be placed on the ground, and designed to ensure resistance to internal pressure (shall comply with EN 16582-1 and EN 16582-2)**

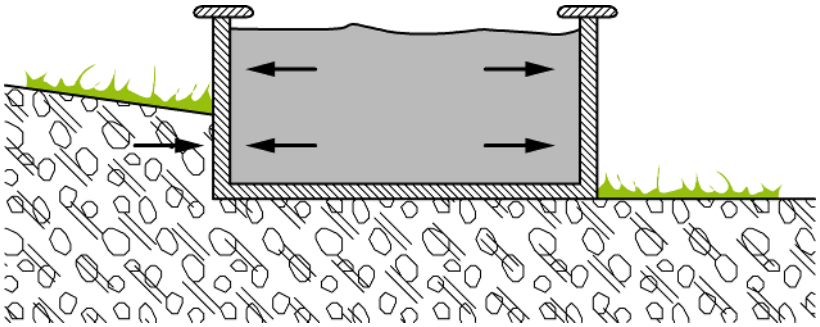


**Figure A.2 — Partially buried aboveground pool, designed to ensure resistance to internal and external pressures (shall comply with EN 16582-1, EN 16582-2 and EN 16582-3)**

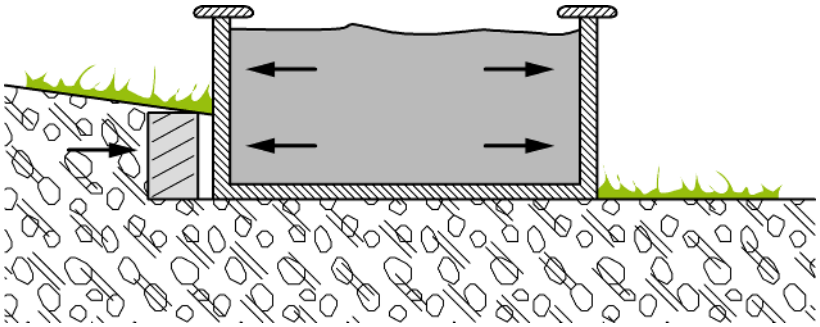


**Figure A.3 — Partially buried recessed pool that ensures resistance to internal pressure, designed to be installed in the ground, in a masonry structure or equivalent that ensures resistance to external pressure (shall comply with EN 16582-1 and EN 16582-3)**

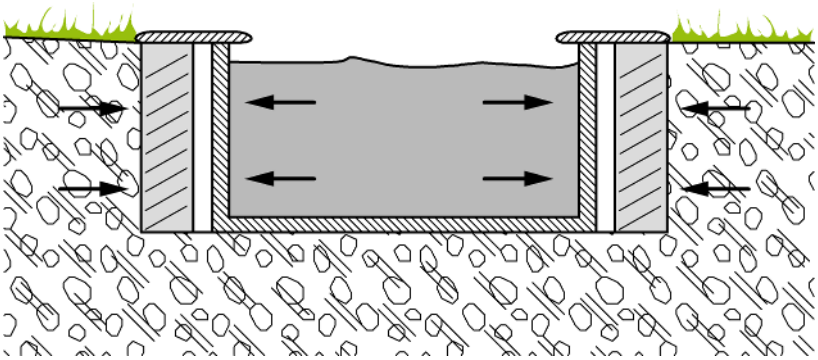


**Figure A.4 — Recessed pool that ensures resistance to internal pressure, designed to be installed in the ground, in a masonry structure or equivalent that ensures resistance to external pressure (shall comply with EN 16582-1 and EN 16582-3)**

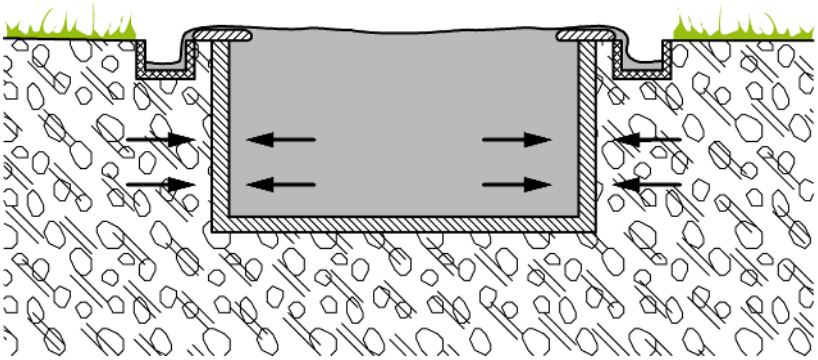


**Figure A.5 — Inground pool, to be placed in the ground, and designed to ensure resistance to internal and external pressure (shall comply with EN 16582-1 and EN 16582-2)**

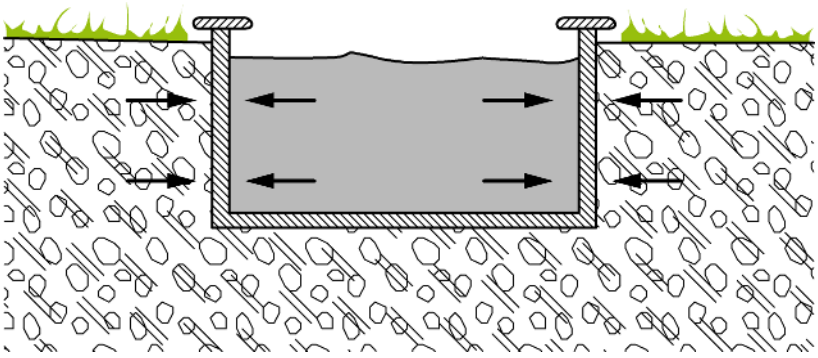


**Figure A.6 — Inground pool, to be placed in the ground, and designed to ensure resistance to internal and external pressure (shall comply with EN 16582-1 and EN 16582-2)**

# Annex B
(informative)
# Safety information in the owner's manual and instruction sheets accompanying the swimming pool

This annex provides examples of safety information regarding the risks associated with swimming pools and related instructions for proper and safe use of swimming pools.

The safety information provided to consumers / end users shall include at least the following wording (or their equivalent):

Carefully read, understand, and follow all information in this user manual before installing and using the swimming pool. These warnings, instructions, and safety guidelines address some common risks of water recreation, but they cannot cover all risks and dangers in all cases. Always use caution, common sense, and good judgment when enjoying any water activity. Retain this information for future use.

**Non Swimmers safety**

— Continuous, active, and vigilant supervision of weak swimmers and non-swimmers by a competent adult is required at all times (remembering that children under five are at the highest risk of drowning);

— Designate a competent adult to supervise the pool each time it is being used;

— Weak swimmers or non-swimmers should wear personal protection equipment when using the pool;

— When the pool is not in use, or unsupervised, remove all toys from the swimming pool and its surrounding to avoid attracting children to the pool.

**Safety devices**

— It is recommended to install a barrier (and secure all doors and windows, where applicable) to prevent unauthorized access to the swimming pool;

— Barriers, pool covers, pool alarms, or similar safety devices are helpful aids, but they are not substitutes for continuous and competent adult supervision.

**Safety equipment**

— It is recommended to keep rescue equipment (e.g. a ring buoy) by the pool;

— Keep a working phone and a list of emergency phone numbers near the pool.

**Safe use of the pool**

— Encourage all users especially children to learn how to swim;

— Learn Basic Life Support (Cardiopulmonary Resuscitation - CPR) and refresh this knowledge regularly. This can make a life-saving difference in the event of an emergency;

— Instruct all pool users, including children, what to do in case of an emergency;

— Never dive into any shallow body of water. This can lead to serious injury or death;

— Do not use the swimming pool when using alcohol or medication that may impair your ability to safely use the pool;

— When pool covers are used, remove them completely from the water surface before entering the pool;

— Protect pool occupants from water related illnesses by keeping the pool water treated and practicing good hygiene. Consult the water treatment guidelines in the user's manual;

— Store chemicals (e.g. water treatment, cleaning or disinfection products) out of the reach of children;

— Use the signage as outlined below;

— Removable ladders shall be placed on a horizontal surface.

Signage (in Figure B.1 a) and Figure B.1 b) shall be displayed in a prominent position within 2 000 mm of the pool.

**a)** **b)**

**Figure B.1**

Signage (in Figure B.2) is recommended to be displayed in a prominent position within 2 m of the pool.

**Figure B.2 — Wear personal flotation devices**

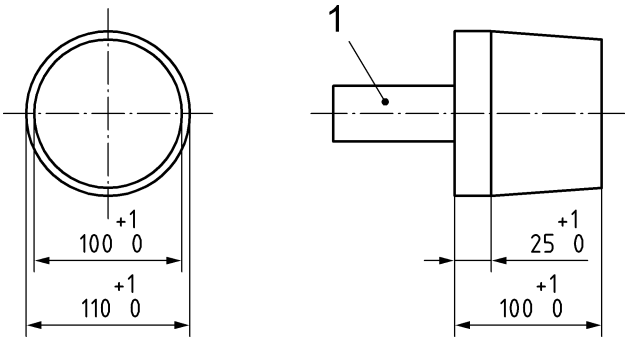
# Annex C
(normative)
# Methods of test for entrapment

## C.1 Head and neck entrapment

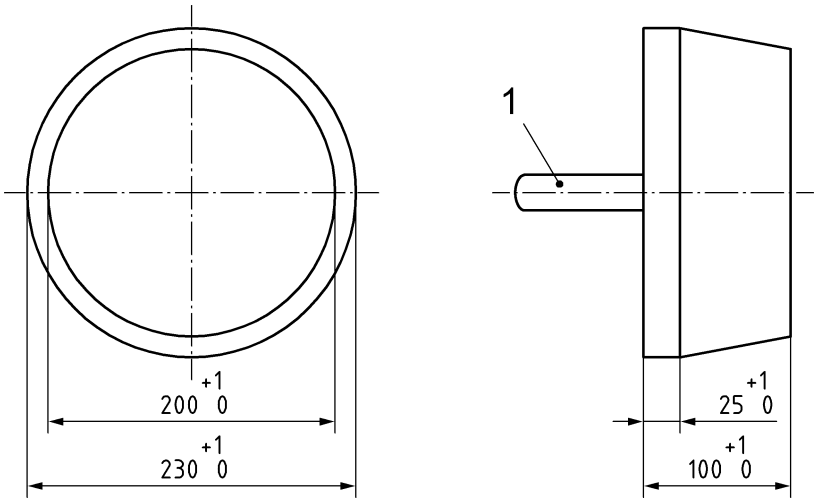
### C.1.1 Apparatus

Probes A and B, as illustrated in Figure C.1.

Dimensions in millimetres




**a) Probe A**




**b) Probe B**

**Key**
1 handle

**Figure C.1 — Probes for determination of head and neck entrapment**

### C.1.2 Test method

Under normal operating conditions apply successively probes A and B to the minimum cross-section of each opening, applying a force of 200 N. Record and report if the probes pass or do not pass through the opening. If probe A passes through the opening; note the clearance dimension.

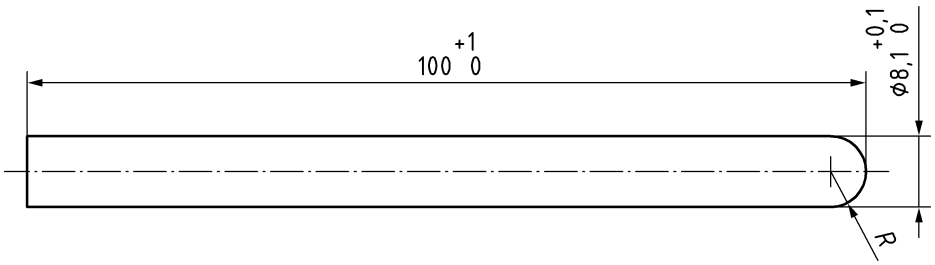
## C.2 Finger and toe entrapment

### C.2.1 Apparatus

Probe C, as illustrated in Figure C.2.

Probe D, as illustrated in Figure C.3.

Dimensions in millimetres




**Key**
*R* radius

**Figure C.2 — Probe C for determination of finger and toe entrapment**

### C.2.2 Test method

Under normal operating conditions apply probe C to the minimum cross-section of the opening, rotating the probe and moving it through the conical arc shown in Figure C.4, whilst applying a force of 50 N. Record and report if the probe passes or does not pass through the opening.

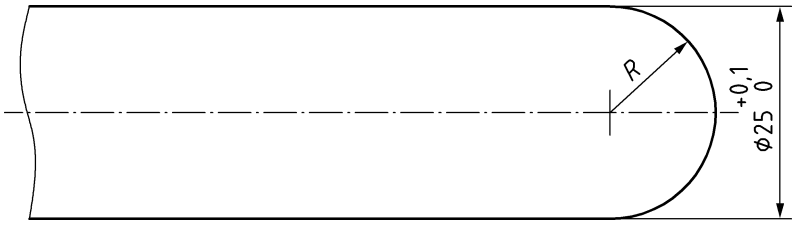
## C.3 Foot and hand entrapment

### C.3.1 Apparatus

Probe D, as illustrated in Figure C.3.

Probe A, as illustrated in Figure C.1.

Dimensions in millimetres




**Key**

*R* radius

**Figure C.3 — Probe D for determination of foot and hand entrapment**

### C.3.2 Test method

Under normal operating conditions apply successively probes A and D to the minimum cross-section of the opening, applying a force of 50 N. Probe D shall also be rotated and moved through the conical arc shown in Figure C.4. Record and report if the probes pass or do not pass through the opening.

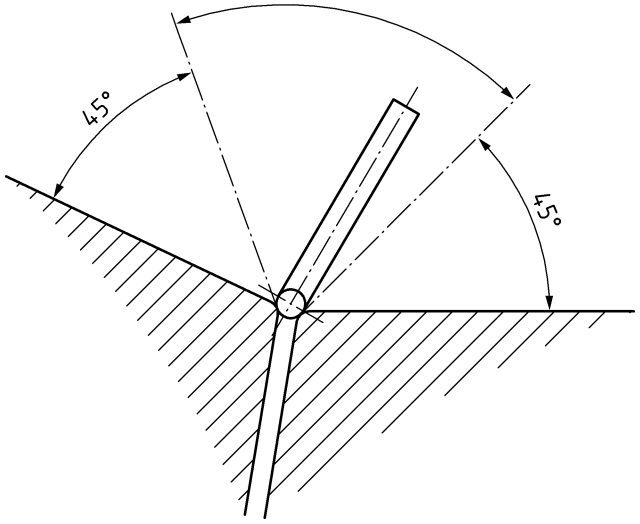



**Figure C.4 — Rotation of probes C and D**

# Annex D
(informative)
# Aesthetic aspects on composite shells

## D.1 General

In the particular case of pools prefabricated using composite materials (polyester, epoxi-vinylester resins, etc.), the life expectancy of basins depends on each step of the product life-cycle: manufacturing, installation and maintenance (according to the requirements provided by the manufacturer).

There are some aesthetic aspects in this type of pool that might happen due to a manufacturing problem (process or raw materials, although the compliance with the requirements of the present document allows limited manufacturing disorders), due to an incident occurring during transportation from the factory to the site, due to an installation fault or caused by improper maintenance, or misuse by the pool owner.

This Annex, although not being exhaustive, has been established to allow an efficient identification of defects that might have been caused in any of the steps mentioned above. Some of these aesthetic defects may have been caused by an internal structural defect, but this is not always the cause. In the same way, some aesthetic defects can lead to a structural problem, depending on its nature. Therefore it is recommended (in case of doubt) not to undertake any measure without having previously obtained the manufacturer's advice.

This document includes a list of mechanical defects (affecting only the aesthetic layer), durability and visual characteristics of laminated composite in uniform structures (monobloc shell or not, with one or more reported polyester items).

## D.2 Scope

This document, unless otherwise specified by the manufacturer, is only applicable for polyester shells with water temperature lower or equal to 28 °C. If a temperature higher than 28 °C is allowed by the manufacturer, he will also decide about the applicability of this annex.

Sometimes, a small difference in colour might appear between submerged areas and areas above the water level. This phenomenon is quite normal. In fact, different stains could appear on polyester shells, but these stains may or may not have a consequence on structural integrity. The aim of this annex is to help to identify possible origins of those stains when they appear after the commissioning and first use of the pool.

In general, many of these defects or stains, when they are not due to manufacturing or installation faults, can be easily avoided with good pool maintenance, constant pool water level and proper water treatment according to prEN 16713-3 and/or national regulations (which is the owner’s responsibility).

## D.3 Operating requirements and maintenance

### D.3.1 General

Maintenance is a major responsibility of the pool owner.

Despite good mechanical properties which shall be guaranteed by the manufacturer, the pool aesthetic coating is subjected to aging due to external aggressors. Although this applies to any type of pool, it is especially important in the case of composite pools.

### D.3.2 Operating requirements

It is recommended not to fill the pool with catchment water, drilling, or drainage wells: these waters generally contain polluted organic substances with nitrates and phosphates. Filling pools with water from the public network is advised.

A pool is never to be drained, even partially, without professional advice. If pool draining is necessary, it shall be done according to specific rules, or instructions. When draining the pool, it shall not remain empty for more than 72 hours (unless otherwise advised by the manufacturer) and all precautions shall be taken to maintain the structure in place (shoring if needed) otherwise it could deform due to external pressure.

When emptying the pool, water shall be drained in accordance with local regulations, e.g. storm drainage, etc.

A permanent minimum water level is required to maintain adequate filtration.

### D.3.3 Maintenance

Avoid the following:

— direct contact or overdosing by using treatment products other than the ones indicated in prEN 16713-3 with the aesthetic layer surface (as this may produce irreversible discolouration);

— mechanical shocks (such as blunt objects falling, e.g. parasol bases, garden chairs, scuba diving blocks, etc.) can result in impacts or deep scratches on the aesthetic layer;

— unusual friction of one surface against another;

— prolonged contact of oxidizable metal objects or organic material with the aesthetic layer.

The water line is particularly sensitive to calcareous deposits, metals or other fatty products (sun care products) that become fixed to the aesthetic layer. Regular maintenance (according to the user's manual) of the water line is recommended to prevent the penetration of these deposits in the aesthetic layer, making it impossible to clean.

Regular and meticulous maintenance should be practiced with appropriate products, that are non-abrasive and compatible with the aesthetic coating. It is prohibited to use non-specific (household) cleaning pool products, and/ or abrasives.

### D.3.4 Influence of water quality

Generally, the user should ensure that the compatibility of the products and/or processes chosen to treat pool water (refer to the shell manufacturer's recommendations) according to the series prEN 16713.

Processing methods and/or pool manufacturer's recommendations are to be applied for the good performance and the aesthetic aspect of the coating (layer) in time. Before using, it is vital to refer to the products and processes of the manufacturers, in order to check their compatibility with the aesthetic layer of the shell (if necessary refer to the shell manufacturer). Using methods of these products and processes have to continuously comply with the manufacturer’s instructions and pool manufacturer’s recommendations.

Although generally coming from a public supply network, fill water can also come from a borehole, a storage tank or a well. In these cases, it is imperative to have regular analysis of the water, including physico-chemical, in order to detect the possible presence of metals (iron, copper, manganese) which can have an adverse impact on the aesthetic layer, causing a risk of coloured stains resulting from metallic sulphides. Analysis will then allow the necessary adjustments to ensure clean water quality for bathing and durability of the aesthetic layer. This analysis on fill water quality is to be assessed and approved by the pool manufacturer.

However, it is necessary to prevent any tartaric precipitation and/or metal being formed. The use of limestone sequestering agents (anti limestone) and agent's metal ions sequestering is recommended for this purpose.

**WARNING:** Anti limestone and metal ion sequestering agents often contain phosphorus or phosphorous compounds, which can cause or promote algae growth and/or can have an impact on online measurement (free chlorine, redox potential). Therefore, in the case of online measurement systems, priority should be given to ion exchangers and/or metal (iron) filters in the fill water line (before the water enters the pool).

Copper and silver electrolysis (Cu and Ag) shall not be used on shell pools because it could stain the aesthetic layer. The use of copper sulphate, copper products, and even garden chemical treatment is prohibited. It is the manufacturer's responsibility to include this warning in the user's manual.

Using products and/or treatment processes (other than those defined in prEN 16713-3) shall be validated by a professional, as some irreversible damage on the aesthetic layer could appear with certain combinations.

In the case of disinfection by means of products based on stabilized chlorine or stabilizers only, manufacturer's recommended dosages (which should be in compliance with prEN 16713-3) shall be applied. The renewal of water after cleaning filter shall avoid a cyanuric acid concentration above 75 mg/l. If not, a drain of 30 % (at least) of pool volume is necessary not to damage the aesthetic layer.

When winterizing, refer to the manufacturer's instructions and the user's guide supplied. Do not proceed to a sterilizing shock action just before covering the pool due to the risk of burning the pool coating less than 8 h after the sterilisation shock.

## D.4 Discolourations and possible origins

Despite using suitable materials and considering all the precautions mentioned above, some unusual phenomenon may appear due to aging. It is important to remember that the aesthetic layer undergoes a gradual discoloration due to its aging and UV radiation.

The following reasons can cause an accelerated discolouration to appear:

— use of unsuitable water treatment products and processes not in compliance with prEN 16713-3 and manufacturer's recommendations;

— various abnormal friction (tide pool, wintering floats, automatic cleaner and brush, etc.);

— high water temperature;

— influence of materials and manufacturing process.

Some different colouration could appear between the submerged area and other areas, this is normal.

## D.5 Stains and possible origins

Because of the many influences, as mentioned before, it is quite difficult to determine the origin of stains. Stains appearing on the pool surface are rarely in the depth of the aesthetic coating.

The following table shows possible origin of stains once the pool is in normal operation. In order to find the possible origins, it is useful to take the measures described in the chart below. If these do not lead to any success, there might be possible influences due to manufacturing processes.

**Table D.1 — Possible origin of stains and recommended solutions**

| Kind of stains | Possible operational origin of the stain | Possible solution |
|---|---|---|
| Whitish stains at the pool bottom | - inappropriate water treatment<br>- decomposition of organic substances (humus, branches, leaves) directly in contact with the aesthetic layer. The effect is more pronounced when the contact has been extended. | They are irreversible and cannot be repaired |
| Whitish stains at the pool bottom and walls | - excessive concentration of chemical products | They are irreversible and cannot be repaired |
| Whitish stains at the water line | - calcareous deposits | The prevention of these deposits is possible by using calcareous sequestering agents and pH balance maintenance.<br>Cleaning is possible before inlay with help of an appropriate product, solvent-free and non-abrasive, and taking care not to scratch the coating.<br>The T. H (water hardness) shall be controlled in order to reduce the phenomenon, e.g. with a pre-installed ion exchanger. |
| | - use of unsuitable chemicals and/or abrasives | Irreversible and untreated frosted or faded areas |
| Brown, blue, black stains or rust on the bottom and pool walls | - algae presence | |
| | - the decomposition of organic substances (leaves, detritus, vegetation) | It can be prevented by a regular maintenance of the pool (clean sweep) |
| | - Use of copper sulphate, pure or not, and Cu/Ag process | Irreversible. These products are not allowed in this type of pool |
| | - accidental presence in the pool of oxidizable metal components (metal filings...) | |
| | - an increase of stray electrical currents in the water because of the lack of a functional ground to evacuate them out of the pool | Pool earthing [a]: the grounding of pool water can limit the appearance of this phenomenon. The grounding has to be done on a ground stick other than the earth safety equipping the house. This functional earth will only allow stray currents to be evacuated, in order to limit the power lift of the pool water. |
| | - metal migration through the aesthetic layer (gel coat based on cobalt) | |

| Kind of stains | Possible operational origin of the stain | Possible solution |
|---|---|---|
| | - presence of metal ions (copper, iron, manganese ...) in too high concentrations, dark insoluble metal sulphides | To avoid large concentrations of metal ions, which may contribute to permanent stain formation on the pool aesthetic surface, it is recommended to use metal ion sequestering agents.[b] |
| | - presence of sunscreen or cosmetic products floating on water surface, hydrocarbons combustion, wood or charcoal, car exhaust fumes, aircraft exhaust fumes, or any other pollution from direct and indirect environment of the pool. | |
| Green stains | With an organic origin, these stains are only related to the presence of living organisms (algae, fungi, etc.) and may mean a significant disorder of related water treatment | Refer to operating instructions and advice given by the pool manufacturer, filtration equipment, or chemicals. |
| Pink stains | Generally located on sealing parts, it is due to the presence of bacteria growing on constituents of these plastic parts and may be related to water treatment.<br>In the case of using PHMB for sterilization, with a copper presence, there is a risk of pink staining. | |
| Yellow stains | presence of pollen or red algae, agricultural treatment, fatty products (sunscreen or cosmetics), organic residual (plant degradation) or pollution | |
| | some chalk compaction used in chemical products (pebble shape), tablets | |
| | in the case of a pool treated with bromine, the combination of a higher treatment dosage than recommended by the manufacturer and pH below 6,9, can cause staining of the decorative layer (from yellow to brown) | In most cases this staining is irreversible |
| | a shock sterilization with an oxidizer product can lead to gas formation that burns the pool surface not in contact with the water | It is vital to act as soon as the stains appear. Consult the pool manufacturer who will give the procedure depending on the kind of stain |

[a] WARNING: [The earthing of the pool promotes corrosion of metal parts. If no electrical current is transported to the pool, no earthing is required – see DIN VDE 0100-702.]

[b] Warning: metal ion sequestering agents often contain phosphorus or phosphorous compounds, which can cause or promote algae growth and/or can have an impact on online measurement (free chlorine, redox potential). Therefore, in the case of online measurement systems, priority should be given to metal (iron) filters in the fill water line (before the water enters the pool).

## D.6 Repair of the aesthetic coating

The aesthetic coating is a polymer material that can be repaired. Depending on its age, a difference of colour can appear between the repaired part and the existing part.

In case of repairs, the feasibility and choice of the solution should be made by a professional (manufacturer).

## D.7 Mechanical disorders affecting only the aesthetic layer

### D.7.1 Aesthetic cracks

Aesthetic cracks are cracks or starring phenomenon affecting only the aesthetic layer due to an excessive mechanical constraint on a small surface of the pool (similar to a stamping phenomenon which is irregularly distributed across the surface).

Provided that aesthetic cracks from manufacturing or transportation can be easily identified before installation and commissioning, when aesthetic cracks appear during the normal use of the pool, they are due to installation procedures.

### D.7.2 Surface protuberances

They are normally bubbles affecting aesthetic layers in a submerged area, or affecting all the pool. These bubbles are normally non-structural defects when using a proper chemical barrier layer and their origin is normally linked to an excessive water temperature (according to manufacturer's recommendations) and / or not sufficient and equal tempering processes.

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