BS EN 16582-2:2015

BSI Standards Publication

Domestic swimming pools

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

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National foreword

This British Standard is the UK implementation of EN 16582-2:2015.

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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Piscines privées à usage familial - Partie 2 : Exigences spécifiques et de sécurité et méthodes d'essai pour piscines enterrées

Schwimmbäder für private Nutzung - Teil 2: Besondere Anforderungen einschließlich sicherheitstechnischer Anforderungen und Prüfverfahren für in den Boden eingelassene Schwimmbäder

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European foreword

This document (EN 16582-2:2015) 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of an identical text or by endorsement, at the latest by February 2016 and conflicting national standards shall be withdrawn at the latest by February 2016.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.

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1 Scope

This part of EN 16582 specifies the specific safety and quality requirements and test methods for domestic partially or fully inground swimming pools in addition to the general requirements of EN 16582-1 and shall be read in conjunction with it. The requirements of this specific standard take priority over those in EN 16582-1.

These requirements and test methods are only applicable to partially or fully inground pool structures, including their means of access.

This European Standard applies to pools with a minimum water depth of more than 400 mm.

This European Standard does not apply to:

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

— paddling pools according to EN 71-8;

— domestic or public use spas.

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 16582-1:2015, *Domestic swimming pools - Part 1: General requirements including safety and test methods*

prEN 16713-2, *Domestic swimming pools - Water systems - Part 2: Circulation systems - Requirements and test methods*

EN ISO 527-4, *Plastics - Determination of tensile properties - Part 4: Test conditions for isotropic and orthotopic fibre-reinforced plastic composites (ISO 527-4)*

EN ISO 14125, *Fibre-reinforced plastic composites - Determination of flexural properties (ISO 14125)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16582-1:2015 and the following apply.

3.1
skimmer (surface water suction)
equipment specially designed to trap, by suction or overflow, the surface layer of the water body in order to bring this water into the filtration system

Note 1 to entry: Skimmers are usually mounted vertically (on the wall at water surface level). Floating skimmers are connected by a floating suction pipe to a suction fitting.

Note 2 to entry: The skimmer is generally equipped with a basket.

3.2
levelling course
horizontal upper part specific to a built or manufactured wall

3.3
flatness
measure of form fault

3.4
deck
fitted surface, contiguous to pool

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

3.5
ground
natural soil, worked or not

3.6
service ability limit states
SLS
states corresponding to conditions beyond which serviceability requirements specified for a structure or a structural element are no longer satisfied

3.7
ultimate limit states
ULS
states associated with collapse or other similar forms of structural failure

Note 1 to entry: These generally correspond to the maximum bearing capacity of a structure or part of a structure.

3.8
ground pressure
all the stresses generated by packed elements of natural origin and in contact with the structure when it is fully or partially buried

3.9
additional pressure (on pool walls)
all the stresses generated by the construction and applied loads, on the backfill, of building works contiguous to the structure when it is buried or partially buried

EXAMPLE Overloads are primarily caused by the deck located around the basin.

3.10
prefabricated structure
set of manufactured units, specifically designed for the production of pools, which may or may not be modular and/or homogeneous

Note 1 to entry: The watertightness of which may be dependent on, or independent of, the support and which shall be used on site specifically according to the manufacturer's recommendations.

EXAMPLE Wooden frameworks, panels (steel, resins, plastics, concrete, stainless steel, etc.), polyester shells, permanent active casing structures designed to be filled with concrete, etc.

3.11
reinforced concrete structure
structure whose walls and bottom consist of concrete and steel reinforcements subject to harmful cracking calculation rules

Note 1 to entry: The cracking calculation rule may vary according to the type of watertightness.

3.12
leakproofing system
internal coating adhering to its structure, providing watertightness

3.13
masonry structure
structure made up of a base slab and walls made by assembling prefabricated blocks, designed for construction

Note 1 to entry: The blocks may be filled with concrete.

3.14
base slab
continuous reinforced concrete base foundation supporting the pool either on the ground or elevated

3.15
life span
period of time a swimming pool structure shall remain serviceable, provided it has been built or installed, maintained and operated according to the manufacturer's instructions

Note 1 to entry: Life span is different from contractual warranty.

3.16
datum point
prescribed, fixed, construction reference point, from which levels and lengths, depths and heights are measured accurately

4 Mechanical resistance performance requirements

4.1 General

4.1.1 General

It is important to take into account the specific requirements of coatings or means of leakproofing or watertightness from the structure design stage.

Whatever the type of structure under consideration, it shall be dimensioned to resist reasonably foreseeable load configurations, such as:

— ground and additional pressures on partially or totally buried and empty pools,

— hydrostatic pressures on a swimming pool which is filled before backfilling, if allowed by the manufacturer's instructions.

The pool structure shall comply at least with the following requirements taking into account that other regulations may apply.

NOTE The load configurations are defined as per series EN 1990 (in SLS and ULS).

4.1.2 Permanent loads

4.1.2.1 Dead weight

The dead weight (G) of the structural elements is to be considered in the case of partially buried pools.

G is null in the case of completely buried structures.

4.1.2.2 Ground pressure

The pressure exerted by the ground on the structure varies with the depth notated Z:

$$P_{\text{ground}}(z) = K.\rho.g.z$$

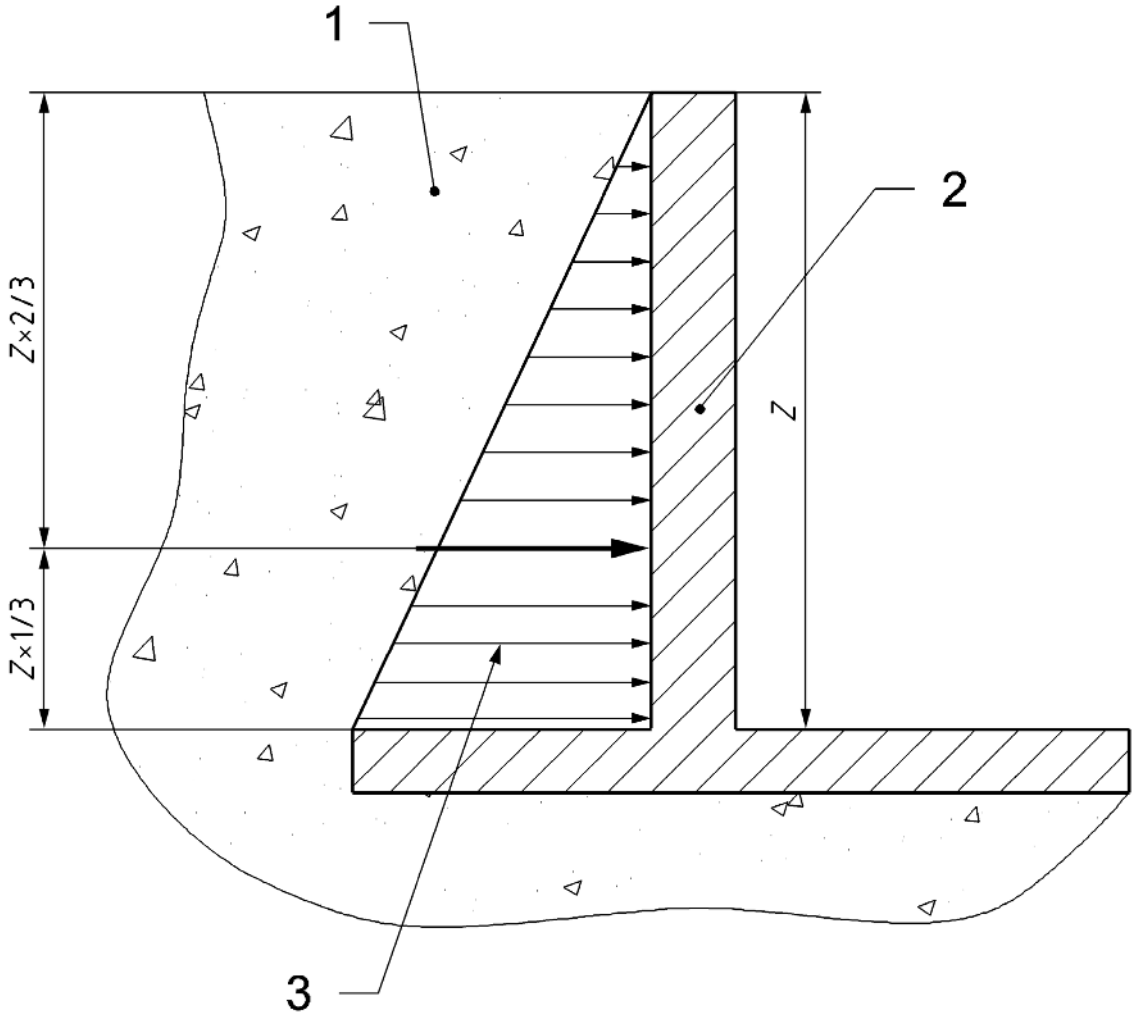
NOTE 1 This formula does not take ground water pressure into consideration which is to be addressed during installation with an appropriate drainage system when necessary.

The minimum unit weight of the ground is considered:

$$\rho.g = 18 \text{ kN/m}^3$$

NOTE 2 This value corresponds to the unit weight of ground usually encountered in Europe.

Coefficient K is 0,3 and corresponds to an angle of repose of 30°.



Key

1 earth/ground
2 pool structure
3 pressure exerted by the ground

Figure 1 — Ground pressure

4.1.3 Variable loads

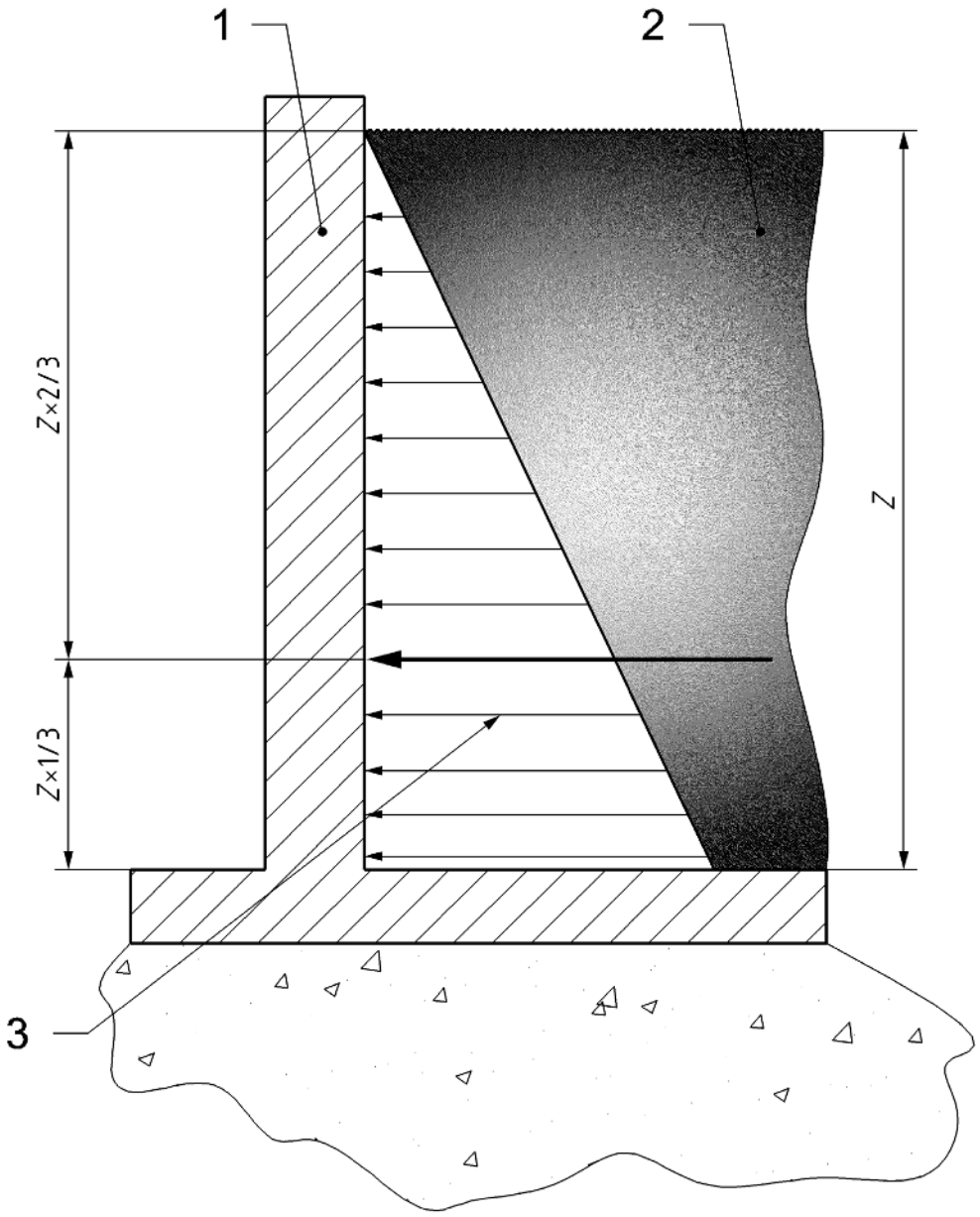
4.1.3.1 Hydrostatic pressure

The pressure exerted by water on the wall varies with depth, notated Z:

$$P_{water}(z) = \rho.g.z$$

The dead weight of water is considered:

$$\rho.g = 10\ kN/m^3$$



Key

1 pool structure
2 pool water
3 hydrostatic pressure exerted by the pool water

Figure 2 — Hydrostatic pressure

4.1.3.2 Additional pressures (on pool walls) (a concrete pool deck, for example)

A uniform pressure q_h induced by an overload q_v at the head of a block is considered:

$$q_h = K' \cdot q_v$$

The overload at the head of the block is taken as being equal to 250 kg/m² or 2,5 kN/m².

Coefficient K' is taken as being equal to:

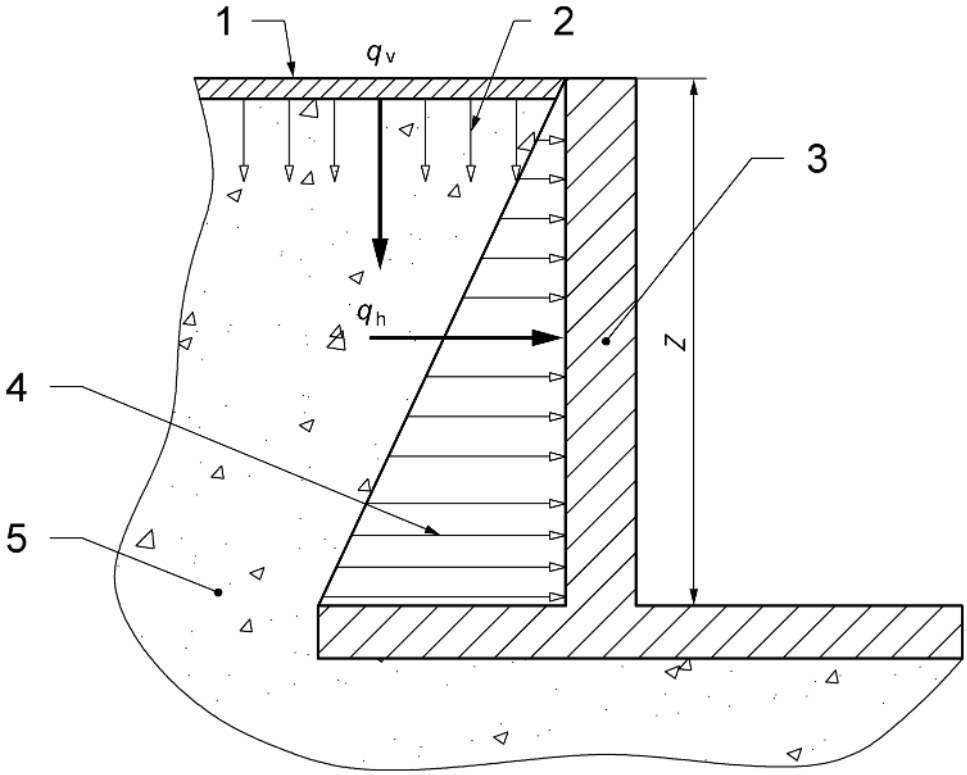
$$K' = \tan^2\left(\frac{\pi}{4} - \frac{\varphi}{2}\right)$$

where

K' = 0,333 is obtained with an angle of repose;

φ = 30° or π / 6 radians, or a pressure on the wall;

q_h = 0,83 kN/m².



Key

1 pool surround
2 overload pressure exerted by the pool surround
3 pool structure
4 additional pressure exerted on pool wall
5 ground

Figure 3 — Additional pressure

4.1.4 Examined combinations

4.1.4.1 Notations

— G: dead weight of the structure.

— P_{ground}: ground pressure.

— P_{water}: water pressure.

— q_h: additional pressure.

The following combinations shall be considered with the following coefficients:

Table 1 — Combinations

Name	Type	Load case	Coeff. [-]
ULS1	Linear- ultimate limit state	*Pground*	1,35
		q_h	1,50
ULS2	Linear- ultimate limit state	*Pwater*	1,20
SLS1	Linear –serviceability limit state	*Pground*	1,00
		q_h	1,00
SLS2	Linear –serviceability limit state	*Pwater*	1,00

4.1.4.2 Serviceability Limit States (SLS)

SLS1: Pool empty.

SLS 1 load: $G + P_{ground} + q_h$.

SLS2: Pool filled, not backfilled.

SLS 2 load: $G + P_{water}$.

4.1.4.3 Ultimate Limit States (ULS)

ULS1: Pool empty

ULS 1 load: 1,35 G + 1,35 P_{ground} + 1,5 q_h

ULS2: Pool filled, not backfilled

ULS 2 load: 1,35 G + 1,20 P_{water}

4.1.5 Requirements

Only the SLS load combination has to be taken into account.

The structures, whatever their nature, shall withstand the combinations specified in 4.1.4 with a distortion limit of L/200, with L being the distance between 2 successive supports.

NOTE L/200 is a current limit for bent parts, making it possible to ensure that the distortions remain barely perceptible.

For the structure under consideration, a design note or test results confirming these values shall be available. The tests are carried out in accordance with the loading case defined in 4.1.4.

4.2 Prefabricated structures specific requirements

4.2.1 General requirement

Prefabricated structures shall be installed in accordance with the manufacturer's recommendations.

4.2.2 Polyester shells

Specific test methods for polyester shells, relative to the structure's properties are available.

Only each new manufacturing process and new swimming pool shapes are concerned by this method in the following three steps:

Step n°1:

Complete traceability of product.

EXAMPLES:

— Materials, components identification, product sample, filing; or

— EN ISO 9001.

Step n°2:

Measure of mechanical characteristics relative to laminated material, with a reference sample intended to establish the manufacturing specifications (master sample).

— EN ISO 14125 (flexion);

— EN ISO 527-4 (traction).

The sample shall be taken exclusively on a new finished factory product (no laboratory product).

The sample has to be in accordance with factory production.

Each modification concerning the laminated shell shall satisfy this second step.

If results of mechanical tests are higher than, or equal to, the master sample, the next step (step 3) will not be necessary.

Step n°3:

Conformity to 4.1 shall be checked by:

— physical test with complete structure; or

— modelling by finite element analysis or other mathematical calculation methods.

This step shall be performed for every new shape.

NOTE For test methods refer to the bibliography.

4.3 Reinforced concrete structures specific requirements

Reinforced concrete structures shall be dimensioned at least according to the Eurocode. If this is not applicable, the structures have to be calculated in order to achieve an equivalent Eurocode required performance.

4.4 Masonry structures specific requirements

Masonry structures shall be dimensioned at least according to the Eurocode. If this is not applicable, the structures have to be calculated in order to achieve an equivalent Eurocode required performance.

4.5 Life span

The structures, whatever their type, shall fulfil the requirements of Clause 4 for a minimum of 10 years, as of the first time that they are filled with water.

5 Performance requirements specific to inground swimming pool watertightness

5.1 Watertightness provided by the structure itself

The structure is considered watertight and shall comply with the watertightness requirements according to EN 16582-1.

5.2 Support dependent watertightness

The structure is considered partially watertight. Its combination with the leakproofing system shall be watertight in compliance with the requirements according to EN 16582-1.

Watertightness is ensured by the structure itself, possibly completed with a non-removable and integral watertightness covering, or by a lining.

The integral watertightness covering and the lining are applied directly on the structure and bonded to it.

5.3 Support independent watertightness

The structure provides only mechanical functions. The coating shall provide watertightness on its own, in compliance with the requirements according to EN 16582-1.

Watertightness is ensured by an element independent of the structure and which can be replaced.

EXAMPLE Liner, membrane, reinforced membrane, laminated polyester, etc.

NOTE In the case of reinforced liners and membranes, refer to EN 15836-1 and EN 15836-2.

6 Means of access

If the means of access replaces part of the structure, it shall fulfil the requirements of Clause 4 and Clause 5, in addition to the requirements of EN 16582-1.

7 Pool structure installation tolerances

7.1 General

7.1.1 General

Dimensions are taken to be at the levelling course, interior measurements.

Once they are in use, the pool structures shall, in relation to the initial request, respect the dimensional tolerances described below.

Measurement shall be taken at a water temperature of 25 °C ± 5 °C.

These tolerances are the maximum acceptable values unless other specific contract or standards apply depending on the material and/or equipment used, e.g. tiles, covers.

A drawing can be part of the contract.

If the pool structure is to receive prefabricated equipment such as liners or covers, these dimensions have to be checked with the specification of the equipment manufacturer before ordering.

7.1.2 Overall dimensions variations

— Dimension variations of a pool less than or equal to 5 m shall not be more than 10 mm per metre (a maximum of ± 30 mm).

— Dimension variations of a pool greater than 5 m shall not be more than 10 mm per metre (a maximum of ± 50 mm).

— Differences between the diagonals for angular symmetrical shaped pools shall not be more than 5 mm per metre.

7.1.3 Depth structure variations

The maximum depth structure variation shall be ± 3 %.

NOTE The water depth is defined in EN 16582-1 and is different from the wall or the structure depth.

7.1.4 Flatness variations

The requirements relating to flatness are valid for flat parts without sharp edges.

a) Wall flatness at the water line:

   — Distance of 2 m: ± 12 mm;

   — Distance of 200 mm: ± 6 mm.

b) Bottom flatness:

   — Distance of 2 m: ± 12 mm;

   — Distance of 200 mm: ± 6 mm.

No sharp edges are allowed on the bottom.

7.1.5 Level variations tolerances

— Maximum difference in operating level between all skimmers: 15 mm.

— Pool horizontal flatness of the levelling courses:

  — all around the pool maximum 25 mm;

  — distance of 2 m: ± 10 mm;

  — distance of 200 mm: ± 3 mm.

For overflow swimming pools, the level of the top edge of the overflow shall be levelled in a way that the flow rate according to prEN 16713-2 or other designed flow rate (whichever is higher) flows continuously all over the complete length into the overflow channel.

If a continuous overflow all over the complete length cannot be ensured, the level of the top edge has to be adjusted accordingly.

The increasing of the flow rate can, in certain particular configurations (e.g. large perimeters of overflow channels), represent a means to obtain a continuous and complete overflow.

Tolerance values for the level of the overflow top edge may be given in national building regulations or standards where applicable.

7.1.6 Datum point tolerances

The datum point(s) shall be agreed in advance of all pool structure installations with the main contractor, sub-contractors or the pool owner.

The variation between the datum points and the position of the pool shall not exceed ± 50 mm or as stipulated in the contract in any plane.

7.2 Submerged stairs or structures

Whenever a staircase is a part of a structure and is submerged, partially or completely, the rules which are used to determine its geometry may depart from the applicable normative building provisions.

A dimensional tolerance of 3 %, (maximum 20 mm), is acceptable as compared with the contractual frame of reference.

NOTE A plan is a contractual frame of reference.

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