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English Version

Swimming pools - Part 1: Safety requirements for design

Piscines - Partie 1 : Exigences de sécurité pour la
conceptionSchwimmbäder - Teil 1: Sicherheitstechnische
Anforderungen an Planung und Bau

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Contents

Page

Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Classification.....	6
4.1 Swimming pool Type 1	6
4.2 Swimming pool Type 2.....	6
4.3 Swimming pool Type 3.....	7
5 Safety related design factors and requirements	7
5.1 General.....	7
5.2 Layout	7
5.3 Safety-Information-Systems	8
5.4 Materials	9
5.5 General areas for bathers	9
5.6 Specific areas.....	11
5.7 Wave pools	16
5.8 Pool covers.....	16
5.9 First aid rooms	16
5.10 Control points	17
5.11 Storage rooms/areas for water treatment chemicals.....	17
5.12 Plant rooms and related equipment.....	18
Bibliography	20

Foreword

This document (EN 15288-1:2008) has been prepared by Technical Committee CEN/TC 136 "Sports, playground and other recreation equipment", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by March 2009, and conflicting national standards shall be withdrawn at the latest by March 2009.

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 standard EN 15288 "*Swimming pools*" consists of the following parts:

- *Part 1: Safety requirements for design*
- *Part 2: Safety requirements for operation*

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

To provide a swimming pool which can be managed as safely as possible, considerations have to start with careful design. All of those involved in designing new pools or upgrading existing ones will need to give the highest priority to ensuring that they provide users and staff with a facility that is safe. Four steps need to be developed in order to achieve this:

- a) the layout of the pool hall (if any) and the pool basin (including its dimensions, profile and any water features) should be designed so as to make the safe use and supervision of the pool to achieve without complex or costly management arrangements;
- b) the layout of the ancillary areas, including the changing, clothes storage, shower and toilet areas, should be similarly designed for safe use;
- c) the structural elements, materials, finishes and details, including the pool hall enclosure (if any), basin and equipment and the way they are assembled should be those which are the most appropriate to achieving a safe-to-use physical environment;
- d) criteria relevant for the planning of the safe and functionally correct maintenance.

There are specific sources of information from which the technical design and planning standards that are recommended in the design of swimming pools can be obtained. Everyone who is involved in the process of specifying, designing and constructing pools should be familiar with these design and planning standards and should ensure that they are given careful consideration in all pool projects.

It is also important to draw the attention of all of those involved in the design process to the implications of their work for the pool operator. What might be thought a small change in the layout of the pool or in the finishes specified could have a significant impact on the ability of the pool to be used safely. If that change is ill-considered and creates a serious design flaw, the result might be an increase in accidents. More likely it will be an increase in the cost of operating the pool (perhaps through the employment of additional staff) in order to compensate for the resulting problems.

One way of anticipating the management consequences of design decisions is to include a qualified/competent person on the design team. The person should give advice and guidance during the various development stages of the project.

This standard includes requirements, recommendations and notes. While compliance with requirements is mandatory, recommendations indicate best practices and notes give additional information and/or explanations.

1 Scope

This European Standard specifies safety requirements relevant to certain aspects of design and construction of classified pools according to Clause 4. It is intended for those who are concerned with construction, planning and operation of classified swimming pools. It provides guidance about the risks associated by identifying the design characteristics required for a safe environment.

The requirements of this European Standard are applicable to all new classified pools and, as appropriate, to specific refurbishments of classified existing pools.

This European Standard has limited application to classified pools which consist of segregated areas of rivers, lakes or the sea but should be followed where relevant.

2 Normative references

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

EN 1838, *Lighting applications — Emergency lighting*

EN 13451-1:2001, *Swimming pool equipment — Part 1: General safety requirements and test methods*

EN 13451-2, *Swimming pool equipment — Part 2: Additional specific safety requirements and test methods for ladders, stepladders and handle bends*

EN 13451-8:2001, *Swimming pool equipment — Part 8: Additional specific safety requirements and test methods for leisure water features*

ISO 7010, *Graphical symbols — Safety colours and safety signs — Safety signs used in workplaces and public areas*

HD 384.7.702 S2, *Electrical installations of buildings — Part 7: Requirements for special installations or locations; Section 702: Swimming pools and other basins (IEC 60364-7-702:1997, modified)*

3 Terms and definitions

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

3.1

pool/swimming pool

facility, with one or more water areas, intended for swimming, leisure or other water based physical activities

3.2

indoor swimming pool

one or more constructed water areas for bathing enclosed in a building, covered by a roof (fixed or moveable)

3.3

outdoor swimming pool

one or more constructed open-air water areas for bathing

3.4

private use

use of an installation designated solely for the owner's/proprietor's/operator's family and guests including the use connected with renting houses for family use

3.5
public use
use of an installation open to everyone or to a defined group of users, not designated solely for the owner's/proprietor's/operator's family and guests independently from paying an entrance fee

3.6
therapeutic pool
designed to provide medical and physiotherapeutic care under control of a competent person

NOTE Pools destined for fitness and related activities are not considered therapeutic pools.

3.7
pool basin
water tank where water-related activities can take place

3.8
pool surround
walkable area around a pool basin, associated with the use of the basin itself, like circulation areas, areas of entry and exit, etc.

3.9
deck level pool basin
pool basin with the water level at the level of the pool surround

3.10
Finnish overflow
inclined upper side of the pool basin wall, designed to dissipate the wave action, leading the water to the overflow channel

3.11
built in staircase/ladder
staircase/ladder which is integral to the basin construction

3.12
rest ledge
submerged step, recessed or protruding for users to rest on in standing position

3.13
control point
designated space, room or pod, placed at basin deck level or higher, designed to allow control at least of the water leisure features and overview of water areas and pool surrounds

3.14
bather
people in bathing costume and barefoot, or in comparable conditions

4 Classification

4.1 Swimming pool Type 1

Pool where the water-related activities are the main business (e. g. communal pools, leisure pools, water parks, aqua parks) and whose use is "public" according to 3.5.

4.2 Swimming pool Type 2

Pool which is an additional service to the main business (e. g. hotel pools, camping pools, club pools, therapeutic pools) and whose use is "public" according to 3.5.

4.3 Swimming pool Type 3

All pools except:

- pools Type 1;
- pools Type 2;
- pools of private use according to 3.4.

5 Safety related design factors and requirements

5.1 General

The requirements of clause 5 refer to pools which are intended for public use within a defined classification. Optional application of requirements to specific types is explained in the related paragraphs. The requirements apply as far as the selected items are present in the swimming pool.

As safe operation is influenced by safe design, the design shall take into account the facility's use, the activity, planned occupancy and its control. Where minimum requirements are given for different types, the designer shall consider the kind of activity foreseen and, should it be more similar to those of another type, refer to the most severe requirements.

The occupancy ratio shall be defined at the design stage as the sum of the number of users:

- a) generated by the water related areas/activities;
- b) plus the number of users generated by other areas/activities.

NOTE 1 A typical occupancy ratio according to a) for swimming pools Type 1, mainly used for swimming and teaching swimming, would be a minimum of 3 m² of water area per bather.

As swimming and water-related activities carry an inherent risk (e. g. users have bare feet and wear only bathing costumes), the need for specific design requirements shall always be considered.

Facilities designed to meet specific needs or programmes (e. g. competitions, special activities, events) require special consideration.

Also at the design stage, the needs of the following shall be considered:

- c) special users (see Bibliography, e. g. with disabilities);
- d) special installations (e. g. technologies to detect users in a potential risk of drowning video supervision of pool surrounds and/or other areas).

Design construction and operation risk assessment shall be conducted for any refurbishment or alteration work. The assessments have to be developed, updated and implemented as and when required to suit the work stages and any relevant occurrences.

NOTE 2 A review at fixed intervals has proved to be effective. Requirements and advice of the following chapters should be tested for relevance during the analysis.

5.2 Layout

The layout of a facility shall be considered in terms of interaction between its components and between components and users.

Particular attention shall be paid to the intended circulation routes and to the likely behaviour of users.

Significant planning recommendations especially for Type 1 and Type 2 are:

- a) segregation of the barefoot areas, where reasonably practicable;
- b) toilets and showers should be located at the access to the pool basins in order to encourage the users to use them before entering the pool basins;
- c) general circulation routes shall avoid dangerous areas (e. g. deep water, wave pools, pools with high freeboard, areas of potential queuing, e. g. in front of the means of access to water slides) or be suitably segregated from them;
- d) non-swimmers and paddling pools should be segregated or placed at a suitable distance from pools with deeper water;
- e) access to the pool surround should be positioned where the water is shallower;
- f) prevent unauthorized access.

5.3 Safety-Information-Systems

A Safety-Information-System (visual and aural) shall be considered. They shall be defined for the particular type and destination of the facility and its safety needs, taking into consideration also the operator's risk assessment.

The Safety-Information-System shall consider at least:

- a) the function of each pool;
- b) water depths of the pool;
- c) emergency routes.

The Safety-Information-System shall ensure the perception (acoustic comprehensibility/visibility) for all people who are present at the swimming pool (for acoustic systems, see the relevant standards).

In certain situations, transmission of safety messages can be improved by the use of computer controlled audio equipment (reassigned, emergency based announcement text).

The water depths shall be visually indicated by figures of height ≥ 70 mm and in contrasting colour, located to be visible by all people in the water and by those on the pool surround intending to enter the pool basin. Depth indications shall be placed at least:

- d) at the access to pools;
- e) in locations corresponding to the maximum and minimum depths;
- f) in the middle in case of flat or uniformly sloping bottom, or
- g) where the pool floor profile changes abruptly to a water depth $> 1,5$ m.

Additional functional information are recommended for:

- h) swimmers/non-swimmers areas;
- i) the shallow and deep ends of a basin, where appropriate;
- j) in areas defined for diving.

5.4 Materials

All materials and finishes used shall be suitable for the selected use and the respective surroundings and conditions, and able to withstand conditions of high humidity with occasional saturation and/or corrosiveness without encouraging the growth of bacteria.

The use of stainless steel with statical function in the swimming hall atmosphere which could be subjected to stress corrosion shall be avoided, unless it can be inspected and regularly cleaned. Where stainless steel is used the grade used should be recommended for that case.

Materials and finishing shall be easy to clean, with chemicals when appropriate, to a level of hygiene appropriate to the location. Manufacturer's recommendations are to be considered.

5.5 General areas for bathers

5.5.1 General

The subsequent requirements apply to Type 1 and Type 2 and are recommendations for Type 3.

5.5.2 Circulation areas, floors

Wherever possible, abrupt changes in floor level shall be avoided, particularly in barefoot areas.

Single steps on the circulation routes shall

- a) have a height ≤ 250 mm, with the riser not open; a height ≤ 180 mm is recommended;
- b) have the edge marked by contrasting colour;
- c) have a slip-resistant finish complying with relevant standards/regulations.

Staircases shall comply with relevant standards.

Where ramps on the circulation routes are used, they shall:

- d) have an inclination ≤ 8 %; an inclination 5 % to 6 % is recommended;
- e) have a slip-resistant finish complying with relevant standards/regulations;
- f) be obviously marked at the beginning and end.

Circulation routes shall be designed to ensure a free flow of users, avoiding congestion points, constrictions and obstructions.

Service accesses should be provided separately to general circulation routes (e. g. direct access from the outside).

To prevent ponding in the barefoot areas, floors shall have a suitable and effective draining system. The inclination in direction of the drains shall be between 2 % and 5 %. With an inclination > 3 % particular attention shall be paid to the slip-resistance and to the opportunity to foresee handrails especially for long ramps.

5.5.3 Emergency routes

Design of emergency routes shall comply with relevant regulations, but taking into account also the presence of barefoot users.

5.5.4 Walls, buttresses, pillars

Projections shall be rounded with $r \geq 3$ mm or protected, and sharp edges are not permitted.

Areas of glazing shall be:

- a) made of safety glass able to withstand foreseeable impacts (e. g. caused by water polo balls);
- b) clearly marked to ensure they are visible to users;
- c) designed to be readily cleaned and maintained.

Walls, buttresses and pillars up to 2 m above floor level shall be flush wherever possible, with a non-abrasive finish.

5.5.5 Lighting, illumination and glare prevention

Suitable and sufficient lighting shall be provided throughout the facility, by the use of natural light so far as it is reasonably practicable.

If natural light is used in indoor pools, orientation and direct sunshine effects shall be considered during the design stage.

Natural lighting and artificial illumination shall be designed to minimize reflection in the main direction of view.

The minimum illumination level for the various areas shall be:

- | | |
|-------------------------------------|----------------------------|
| a) Circulation routes ¹⁾ | 100 ¹⁾ Lux |
| b) Plant rooms | 100 Lux |
| c) Changing rooms, showers, toilets | 100 Lux |
| d) Water areas ¹⁾ | 200 ¹⁾ Lux |
| e) Emergency light | in accordance with EN 1838 |

Where necessary for special illumination effects, lower illumination levels shall be allowed in the circulation routes and above the water areas by provision of supplementary lighting in the event of an emergency and provided suitably increased supervision is ensured.

To increase visibility and improve safety, underwater illumination is recommended for pools with deep water.

NOTE Diving pools and facilities for competition as well as special events purposes, may need different illumination.

For water areas the uniformity ratio of illumination at the water level shall be 0,7. For other areas, illumination shall be reasonably uniform, to avoid shadows and other effects that disturb visibility.

The design of the illumination system shall consider maintenance and repair activities.

All electrical fittings shall be designed and installed in accordance with HD 384.7.702 S2.

¹⁾ Under normal conditions of use.

5.5.6 Acoustic conditions

Acoustic design of indoor swimming pools shall ensure that reverberation time doesn't adversely influence communication.

NOTE Recommended reverberation time range is 1,5 s to 2,0 s.

5.5.7 Pool hall heating and ventilation guidelines

To provide a pool hall climate comfortable and to avoid possible damages to the structures, an air treatment and heating system shall be designed for indoor pools when the natural climate does not provide the appropriate conditions. The design of the air treatment and heating system shall take into account:

- a) the relationship between air temperature and humidity;
- b) the pool water temperature;
- c) the need to minimize concentration of pollutants, specifically those that are detrimental to health and pollute the atmosphere (e. g. chloramines).

NOTE Some typical physical values of the air for indoor swimming pools halls are:

- air temperature: in respect to pool water temperature, between + 0 K and + 4 K;
- relative humidity between 40 % and 80 %, preferred < 60 %;
- air speed in proximity of the users $\leq 0,10$ m/s.

5.5.8 Heated surfaces

If directly heated surfaces (e.g. heated seats, heated walls, convectors) within the reach of users are installed, their temperatures shall not exceed 40°C.

5.6 Specific areas

5.6.1 Pool surrounds

Wherever designed, a pool surround shall grant free flow of users and the avoidance of congestion. For this purpose, the dimensions of the pool surround should be suitably extended corresponding to accesses, exits and features (see Figure 1).

In basins or basin areas the surround shall be designed in such a way, that a suitable distance between a possible casualty in water and the nearest position on the pool surround to start a saving/aiding action is granted. This distance shall be < 20 m, otherwise operational measures shall be taken.

For swimming pools Types 1 and 2, the minimum width of the pool surrounds shall comply with Table 1, therapeutic pools excluded.

For Type 3, Table 1 gives recommended values.

In Figure 1 an example of identification of dimensions of pool surrounds is given.

Table 1 — Minimum width of pool surrounds for swimming pools Types 1, 2, and 3, therapeutic pools excluded

Identification	Description	Type 1	Type 2	Type 3
<i>A</i>	In areas adjoining accesses of users to the pool surround (entering direction: to the basin)	3,0 m	2,5 m	1,25 m
<i>B</i>	In areas adjoining the exits of users from the basin to the pool surround	2,5 m	2,0 m	1,25 m
<i>C</i>	From pool edge to wall in the area of starting blocks	3,0 m	2,5 m	1,25 m
<i>D</i>	From pool edge to wall in the area of diving platforms and diving springboards	4,5 m	2,5 m	1,25 m
<i>E</i>	Minimum free space available for the users to pass where installation/features (e. g. diving platforms, diving springboards, water slides) are installed ^a	1,25 m	1,25 m	1,25 m
<i>F₁</i>	Distance between a diving/swimmers pool basin and a non swimmers pool basin/area, in absence of separations	4,0 m	4,0 m	4,0 m
<i>F₂</i>	Distance between a diving pool and swimmers pool basin/area, in absence of separations	3,0 m	3,0 m	3,0 m
<i>G₁</i>	Circulation routes around pool basins under 300 m ²	1,25 m	1,25 m	1,25 m
<i>G₂</i>	Other circulation routes around pool basins over 300 m ²	1,5 m	1,5 m	1,5 m

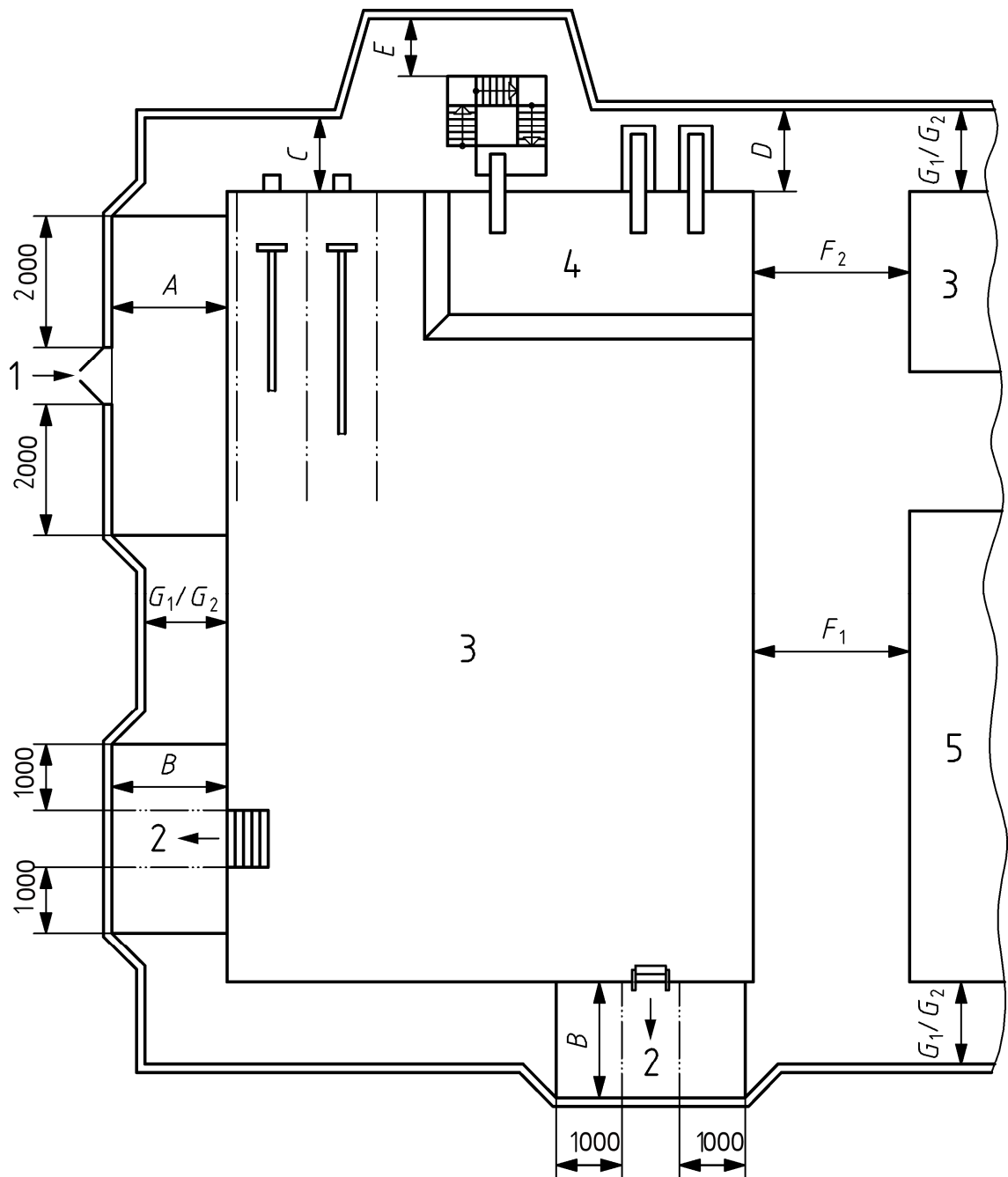
^a In case the diving installation on the pool surround creates the situation of a passage between two walls, the minimum width shall be 1,4 m.

NOTE 1 If the pool surround is designed for extra functions (e. g. activity areas), then the above minimum widths should be increased correspondingly.

The pool surround of therapeutic pools shall be designed in accordance to the specific needs of the therapies and of the users they are designed for. Special attention is recommended to the needs:

- a) for operators to assist the users, also from outside the basin if this is possible (e. g. by pool surround at a level lower than water level);
- b) for easy rescue of users in difficulty.

Dimensions in millimetres



Key

- 1 Entrance to the pool surround
- 2 Exit from basin
- 3 Swimmers pool
- 4 Diving pool
- 5 Non swimmers pool

Dimensions given are minimal.

Figure 1 — Example of identification of dimensions of pool surrounds

The pool surround shall also be designed to avoid contamination of the pool water by water flowing on the floor (e. g. rain in outdoor pools; water dripping from the users; floor/gutter washing water; chemicals in washing water).

NOTE 2 For deck level pools, this can be achieved if the floor slopes away from the overflow channel and to a drain to waste. It should be possible to divert the overflow channel to a waste-drain to lead the washing water to waste. For skimmer pools, this can be achieved by raising the pool edge (e. g. by a coping).

5.6.2 Pool basin edge

5.6.2.1 Deck level pool basins

On deck level pools the pool basin edge shall be marked by a contrasting colour.

Where a Finnish overflow is used, its inclination shall be $\leq 10\%$ towards the pool basin.

The surface finish of the submersed/flooded walkable area between the pool basin edge and the overflow channel shall comply with Rating group 24° of EN 13451-1:2001.

Deck level pools shall have a gripping system, at least in form of finger hold, at least 15 mm deep on the pool basin edge all around the pool, see EN 13451-1:2001, 4.3.4.

5.6.2.2 Pool basins with freeboard

On pool basins with freeboard the pool basin edge shall be distinguishable from the pool surround. The hand-grip shall be located on the pool basin vertical wall or on the pool basin edge, in the area from the water level upwards to + 300 mm. Where handrails are used, they shall comply with EN 13451-1.

5.6.3 Pool basin (pool tank)

5.6.3.1 Pool basin (pool tank) floor

Areas with a water depth $\leq 1,35$ m are non-swimmer areas.

In those areas:

- a) abrupt changes in depth are not permitted, except for staircases;
- b) the gradient of the basin floor shall be $\leq 10\%$.

NOTE Pool basin floor inclination $\leq 6\%$ is generally recommended, and $\leq 5\%$ in pool basin areas with a water depth $< 0,8$ m.

c) the slip resistance of the floor shall comply:

- in water depth $< 0,8$ m to Rating group 18° of EN 13451-1:2001;
- in water depth 0,8 m to 1,35 m to Rating group 12° of EN 13451-1:2001;

d) changes in inclination (from horizontal to inclined, or from one inclination to another) shall be marked by a contrasting colour and/or with a floor finish of different tactile quality;

e) the surface finish of the basin floor in areas with a water depth $\leq 1,35$ m shall not cause discomfort to the users walking on it (e. g. due to the quality of floor tiling, to the edges of the tiles and to the grout).

Areas with a water depth $> 1,35$ m are swimmer areas.

Where in a walkable area the water depth changes from 1,35 m to deeper water, this shall be marked on the pool basin floor by a conspicuous line.

Wherever a means of a physical segregation of a non-swimmers area is foreseen it shall be placed at least 0,5 m before the border of the swimmers area.

5.6.3.2 Pool basin (pool tank) walls

Pool basin walls shall be vertical, smooth and free from structural protrusions at least from the top down to 1,5 m, except for the rest ledges.

NOTE 1 Particular attention should be paid to the quality of wall tiling, to avoid discomfort and risk of injuries from the edges of the tiles and from the grout.

NOTE 2 In the areas designed for turning, slip resistant surfaces should be provided.

Where a rest ledge is provided, it shall be:

- a) between -1,00 m and -1,35 m from water surface;
- b) designed with a minimum depth of 100 mm if recessed;
- c) designed with a maximum width of 150 mm if protruding.

NOTE 3 The provision of rest ledges should be considered in water areas where the depth is $\geq 1,40$ m.

Wherever built-in recessed staircases are used, they shall:

- d) be fitted with handle bends according to EN 13451-2;
- e) have steps at least 250 mm deep, equally spaced vertically between 140 mm and 300 mm, not overlapping each other and with no open raise.

Wherever built-in ladders are used, they shall:

- f) be fitted with handle bends according to EN 13451-2;
- g) have steps at least 150 mm deep and equally spaced at a vertical distance between 230 mm and 300 mm.

Wherever ramps are used as means of entry and exit, the floor finish shall comply with Rating group 24° of EN 13451-1:2001.

In basins destined for training and competitive swimming:

- h) staircases shall not interfere with the swimming lanes;
- i) recessed built-in ladders are allowed;
- j) manufactured ladders shall be of the recessed type, see EN 13451-2.

NOTE 4 In pools for teaching, stairs running along a part of the basin should be considered, with steps rise ≤ 160 mm and depth ≥ 300 mm.

Protruding parts shall comply with EN 13451-1.

NOTE 5 The possibility of technical support for supervision (e. g. computer assisted supervision, underwater video supervision, underwater windows) should be considered at the design stage.

5.6.3.3 Prevention of risks from lightning

Each swimming pool shall be equipped with a local equipotential net, complying with HD 384.7.702 S2.

Each indoor swimming pool as well as service buildings in outdoor pools shall be equipped with an effective lightning protection system, complying with valid regulations.

Swimming pools including connected indoor/outdoor basins shall be equipped:

a) with an electrical conductive closure between indoor and outdoor pool parts, connected to the equipotential net;

NOTE The device can be a door, a full faced grid, a mesh, etc.

b) with a barrier (e. g. a floating line), installed in the indoor part at a distance ≥ 2 m from the closure, preventing access from the pool users.

5.7 Wave pools

The requirements of 4.5.1 of EN 13451-8:2001 shall be complied with. In addition, when rest ledges, stairs or ramps are designed, they shall be recessed.

At least one suitable surveillance position has to be identified, with full view over the water area and fitted with an emergency stop device to stop the wave machinery. If more emergency stop devices are installed, restarting shall be possible only from one defined position.

5.8 Pool covers

The requirements of this clause shall be complied with until a specific European standard on pool covers is available.

Controls of a mechanically operated pool cover shall be installed in a position with view on the pool to be covered. A motorised closing shall be operated by a dead man button.

When in their working position, pool covers:

a) shall withstand a vertical load of 1 000 N over an area of 0,5 m \times 0,5 m in the most unfavourable position,

b) shall extend over the complete water surface of a pool basin, otherwise access to the pool shall be prevented.

NOTE 1 When closed, the possibility of securing the front end of a cover should be considered.

NOTE 2 Particular attention should be paid to the storage of a pool cover when not in use to help prevent the quality of water from getting worse at the subsequent use of the cover itself.

5.9 First aid rooms

First aid rooms shall be provided on the basis of the results of a preliminary risk assessment, to be carried out at the design stage.

NOTE 1 The type and use of the pool, the planned use and categories of users should be considered in the risk assessment.

First aid rooms, where they are provided, shall be designed in such a way that:

- a) the floor area is $\geq 8 \text{ m}^2$, and there is enough storage for first aid equipment;
- b) the height is $\geq 2,5 \text{ m}$;
- c) if a treatment couch is planned, there is enough space for staff to attend to treatments;
- d) in indoor pools, the temperature in the room is independent from the pool hall;
- e) communication equipment is available, to enable assistance to be called immediately and directed to the location of the accident/incident;
- f) a washing basin with cold and hot water is installed;
- g) the route from the first aid room to emergency vehicles is as direct as possible, with a width $\geq 1,2 \text{ m}$ and room to transport someone on a spineboard or stretcher.

NOTE 2 Wherever possible, the route to emergency vehicles should not be visible to swimming pool users and there should be no staircases in its path.

5.10 Control points

Control points shall be designed to allow control at least of the water features and to ensure a good overview of water areas and pool surrounds.

Every control point shall be fitted with communication equipment to enable assistance to be called immediately.

The temperature of indoor pool control rooms shall be independent from that of the pool basin hall.

Control rooms can be combined with first aid rooms, provided they are designed appropriately.

5.11 Storage rooms/areas for water treatment chemicals

Storage rooms/areas for pool water treatment chemicals shall:

- a) be provided for Type 1 pools and are recommended for Types 2 and 3;
- b) be specifically designated and not be plant rooms, unless the chemicals carry no risk of fire and are contained in retention bunds of suitable design, complying to proper segregation/separation requirements;
- c) be designed in accordance with the material data sheets of the chemicals used to provide clean and dry storage with effective segregation/separation for their compatibilities and considering also the risk of fire;
- d) consider proper and safe transport of chemicals;
- e) provide also retention bunds of suitable design to store bulk chemicals and liquids at normal pressure. Retention bunds shall be able to contain 110 % of the volume of the liquid chemical;
- f) provide storage for solid chemicals, suitably raised from the floor level;
- g) be at the same level as the delivery point, or accessed directly from the outside;

NOTE 1 Access by ramps rather than steps is preferred.

h) have suitable and adequate ventilation. Where mechanical ventilation is provided, an alarm in case of malfunction shall be installed;

NOTE 2: Natural ventilation is preferred as far as technically possible.

- i) be located away from areas open to public, ventilation intakes and doors or windows leading onto public areas, to reduce the risk of any toxic fumes drawn there;
- j) be clearly marked, warning of the possible danger, and being accessible only to authorized staff;
- k) be fitted with first-aid devices (e. g. anti-contamination equipment like showers, eye-wash facilities) in conformity with the chemicals used and valid regulations.

Where the use of chlorine gas is planned, this shall be stored in a specially designed, gas leakage proof room which shall be at least at the same level as the surroundings. The exit of this room shall be at least 3,0 from other room openings at the same level and at level 5,0 m away from lower-lying room openings. In the case of leakage from a gas container, the spreading of gas into neighbouring rooms must be prevented. The room shall be equipped:

- 1) with an alarm for the case of escaping gas;
- 2) with an appliance for the safe diversion of the gas;
- 3) with equipment for the precipitation or neutralisation of the escaped gas, including a signal that indicates when the operation is finished.

Transport pipes of chlorine gas shall be at a negative pressure in respect to the surroundings.

Appropriate safety signs should be selected and displayed at the entrance to the storage room.

For proper use of safety signs in chemical storage, see ISO 7010.

5.12 Plant rooms and related equipment

5.12.1 General

Plant rooms shall be designed in compliance with valid building regulations, paying particular attention to the specific features of the technical installations.

NOTE There should at least be investigations of the need for specific access (as direct access from the outdoor or specific access for maintenance), of building requirements connected to the presence of chemicals in use, of the possibility of achieving suitable environmental characteristics and of the possibility of proper drainage.

Plant rooms shall also incorporate adequate safety equipment related to the specific hazards and activities to be carried out (e. g. automatic fire extinguishers).

The plan of the installed equipment shall be clearly shown and shall include the location of all the components as well as the direction of flow of the fluids.

The design of the technical plant shall consider the space needed for

- a) the equipment;
- b) proper operation;
- c) repair and maintenance;
- d) possible substitution of equipment.

5.12.2 Filtration plant room and related equipment

The design of the room/area and of the equipment for the filtration plant shall take into consideration the need for proper installation of the equipment, especially the need to load filter media, operation and maintenance, and the possible need to change the vessels.

The design of the filtration plant shall allow safe servicing by pool staff.

5.12.3 Disinfection and pH control plant room and related equipment

When automatic disinfection and pH control plants are planned, their design shall conform to the following requirements:

- a) dosing systems shall be specific for each chemical;
- b) dosing systems shall fail to safety and require specific restarting;
- c) dosing lines shall be protected and identified and shall be marked with the direction of flow;
- d) injection points for different chemicals shall be far enough apart;
- e) suitable interlocking between dosing and main circulation systems shall be provided (e. g. dosing units shall be operating only when there is a suitable water flow in the main circulation lines);
- f) tanks and containers of chemicals serving the dosing pumps shall be in separate retention bunds, each capable of holding at least 110 % of the chemical stored. Bunded areas should be clearly marked, giving details of the contents.

NOTE 1 The use of automatic dosing and control systems is preferred.

NOTE 2 When possible, the complete equipment for disinfection and pH control should be installed in a different room from the filtration plant.

NOTE 3 If the use of chlorine gas is planned, particular attention should be paid to all design aspects related to safety, including the possibility and the consequences of an accident.

5.12.4 Flocculation equipment

Flocculation, when required as an enhancement of water quality, shall be continuous in pools Type 1 and preferred for Types 2 and 3.

For Types 1, 2 and 3, automatic dosing equipment is preferred.

The application point shall be:

- a) as far in front of the filter as it is practicable, to ensure good mixing before the flow reaches the filter media;
- b) in a position suitable to ensure proper distribution to one or more filters;
- c) in a position suitable to avoid interference to the readings of the analysers;
- d) remote to dosing points of incompatible chemicals.

NOTE Typical values are:

- action time ≥ 10 s;
- flow speed of the water in the return pipes $< 1,5$ m/s;
- mixing area provided immediately following the injection point;
- water speed in each filter < 30 m/h.

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