



SLOVENSKI STANDARD
SIST DIN 19643-1:2003

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Priprava bazenske vode za plavalne in kopalne bazene - 1. del: Splošne zahteve

Treatment of the water of swimming-pools and baths - Part 1: General requirements

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Treatment and disinfection of water used in bathing facilities

Part 1: General requirements

DIN
19643-1

ICS 13.060.30

Descriptors: Water treatment, bathing facilities, water quality, disinfection, requirements.

Supersedes DIN V 19644, May 1986 edition, and parts of DIN 19643, April 1984 edition.

Aufbereitung von Schwimm- und Badebeckenwasser –
Teil 1: Allgemeine Anforderungen

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

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Foreword

This standard has been prepared by Technical Committee IV 13 of the *Normenausschuß Wasserwesen* (Water Practice Standards Committee).

This revision of DIN 19643 is in response to article 11 of the *Bundessteuergesetz* (German Federal Communicable Diseases Act) which deals with water for swimming pools and public baths. The *Legionella pneumophila* and trihalomethane (haloform) values specified in the regulation which implements this article (the *Schwimm- und Badebeckenwasserverordnung* (German Regulation on water used in bathing facilities*)) have been incorporated into the present standard.

At the same time, the standard was divided into several parts: The present part specifies general requirements, while subsequent parts deal with different combinations of water treatment methods. Additional parts can now be added to the series as the state of the art develops.

To ensure proper application of this standard, water treatment systems should be designed, built and monitored only by experienced specialists. Attention is drawn to *DVGW-Arbeitsblätter* (DVGW Codes of practice) W 200 and W 201, which specify procedures for certifying water treatment experts.

Amendments

This standard differs from DIN 19643, April 1984 edition, and DIN V 19644, May 1986 edition, as follows:

- a) The standard now consists of four parts.
- b) The standard takes into account the stipulations of the *Schwimm- und Badebeckenwasserverordnung*.
- c) The scope of the standard has been extended to include hot whirlpool baths.
- d) The standard has been brought in line with the state of the art.

Previous editions

DIN 19643: 1984-04; DIN V 19644: 1986-05.

*) Currently at draft stage.

Continued on pages 2 to 26.

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original should be consulted as the authoritative text.

1 Scope

This standard covers water, including seawater, mineral water, spa water, brine (including artificial brine) and thermal water used in all types of bathing facility, including hot whirlpool baths; it does not apply to water in domestic baths.

The purpose of this standard is to ensure a consistently high quality of bath or pool water in terms of hygiene, safety and appearance, in order to prevent damage to human health, particularly as a result of pathogens¹⁾. At the same time, account is also to be taken of the well-being of the bathers (e.g. by minimizing the side effects caused by disinfectants).

To this end, requirements are specified for water quality, water treatment, and the construction, operation and monitoring of bathing facilities.

2 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the titles of the publications are listed below. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

DIN 1045	Structural use of concrete – Design and construction
DIN 1626	Welded, circular, unalloyed steel tubes subject to special requirements – Technical delivery conditions
DIN 1629	Seamless, circular, unalloyed steel tubes subject to special requirements – Technical delivery conditions
DIN 1988-1	Drinking water supply systems – General (DVGW Code of practice)
DIN 1988-2	Drinking water supply systems – Materials, components, appliances, design and installation (DVGW Code of practice)
Supplement 1 to DIN 1988-2	Drinking water supply systems – Summary of standards and other technical rules relating to materials, components and appliances (DVGW Code of practice)
DIN 1988-3	Drinking water supply systems – Pipe sizing (DVGW Code of practice)
DIN 1988-4	Drinking water supply systems – Protection of drinking water and drinking water quality control (DVGW Code of practice)
DIN 1988-5	Drinking water supply systems – Pressure boosting and reduction (DVGW Code of practice)
DIN 1988-6	Drinking water supply systems – Fire fighting and fire protection installations (DVGW Code of practice)
DIN 1988-7	Drinking water supply systems – Measures to prevent corrosion and scale formation (DVGW Code of practice)
DIN 1988-8	Drinking water supply systems – Operation (DVGW Code of practice)
DIN 2448	Seamless steel pipes and tubes – Dimensions and mass per unit length
DIN 2458	Welded steel pipes and tubes – Dimensions and mass per unit length
DIN 2605-1	Steel butt-welding pipe fittings – Elbows and bends with reduced pressure factor
DIN 2605-2	Steel butt-welding pipe fittings – Elbows and bends for use at full service pressure
DIN 2632	PN 10 welding neck flanges
DIN 4046	Water supply – Terminology (DVGW Code of practice)
DIN 4109	Sound insulation in buildings – Requirements and testing
DIN 8061	Unplasticized polyvinyl chloride (PVC-U) pipes – General quality requirements and testing
DIN 8062	Unplasticized polyvinyl chloride (PVC-U, PVC-HI) pipes – Dimensions
DIN 8074	High-density polyethylene (HDPE) pipes – Dimensions
DIN 8077	Polypropylene (PP) pipes – Dimensions
DIN 8078	Types 1 to 3 polypropylene (PP) pipes – General quality requirements and testing
DIN 17440	Technical delivery conditions for stainless steel plate, hot rolled strip, and bars for pressure purposes, drawn wire and forgings
DIN 19532	Unplasticized polyvinyl chloride (PVC-U) pipes for drinking water supply systems – Pipes, fittings and pipe joint assemblies (DVGW Code of practice)
DIN 19605	Fixed-bed filters for water treatment – Design and components
DIN 19606	Chlorine feed systems for use in water treatment – Design and operation
DIN 19624	Precoat filters for water treatment

¹⁾ See article 11 of the *Bundesgesetz*.

DIN 19627	Ozone generators for use in water treatment
DIN 19643-2	Treatment and disinfection of water for bathing facilities – Combined adsorption, coagulation, filtration and chlorination method
DIN 19643-3	Treatment and disinfection of water for bathing facilities – Combined coagulation, filtration, ozonization, sorption filtration and chlorination method
DIN 28051	Design of metallic components designed to receive organic coatings and linings for use in process engineering
DIN 28055-2	Organic linings for application to metallic components for use in process engineering – Testing
DIN 30675-1	External corrosion protection of buried pipes – Corrosion protection systems for steel pipes
DIN 30676	Design and application of cathodic corrosion protection of external surfaces
DIN 38402-19	German standard methods for the examination of water, waste water and sludge – General information (group A) – Sampling of water used in bathing facilities (A 19)
DIN 38404-5	German standard methods for the examination of water, waste water and sludge – Physical and physicochemical parameters (group C) – Determination of pH value (C 5)
DIN 50927	Design and application of electrochemical corrosion protection of the internal surfaces of vessels, containers and pipes
DIN EN 900	Chemicals used for treatment of water intended for human consumption – Calcium hyperchlorite for treating water for human consumption*)
DIN EN 901	Chemicals used for treatment of water intended for human consumption – Sodium hyperchlorite for treating water for human consumption*)
DIN EN 937	Chemicals used for treatment of water intended for human consumption – Chlorine
DIN EN 1069-1	Water slides with a height of 2 m and over – Safety requirements and testing methods
DIN EN 1069-2	Water slides with a height of 2 m and over – Instructions
DIN EN 27027	Water quality – Determination of turbidity (ISO 7027 : 1990)
DIN EN ISO 12944-3	Corrosion protection of steel structures by protective paint systems – Part 3: Design considerations (ISO 12944-3 : 1998)
DIN EN ISO 12944-4	Corrosion protection of steel structures by protective paint systems – Part 4: Types of surface and surface preparation (ISO 12944-4 : 1998)
ISO 6107-1 : 1996	Water quality – Vocabulary – Part 1
ISO 10523 : 1994	Water quality – Determination of pH

AD-Merkblätter (AD Instruction sheets)**)

AD-Merkblatt B 1 Zylinder- und Kugelschalen unter innerem Überdruck (Pressurized cylinders and spheres)

AD-Merkblatt B 3 Gewölbte Böden unter innerem und äußerem Überdruck (Vessel dished ends subject to internal or external pressure)

DVGW-Arbeitsblätter (DVGW Codes of practice)***)

DVGW-Arbeitsblatt W 200 Zertifizierung von Unternehmen für Wasseraufbereitungsanlagen – Anforderungen und Prüfung (Certification of water treatment plant manufacturers – Requirements and testing)

DVGW-Arbeitsblatt W 201 Zertifizierung von DVGW-Sachverständigen für Wasseraufbereitung – Anforderungen und Prüfung (Certification of DVGW experts for water treatment – Requirements and testing)

DVGW-Arbeitsblatt W 270 Vermehrung von Mikroorganismen auf Materialien für den Trinkwasser-Bereich; Prüfung und Bewertung (Microbial growth on materials in contact with drinking water – Testing and evaluation)

DGB-Merkblätter (DGB Codes of practice)****)

DGB-Merkblatt 60.03 Sicherung von Abflußleitungen gegen Andruckkräfte (Protection of drainage pipes against external forces)

DGB-Merkblatt 65.04 Funktionsprüfung von Anlagen zur Aufbereitung und Desinfektion von Schwimm- und Badebeckenwasser (Testing of plants for the treatment and disinfection of water used in bathing facilities)

DGB-Merkblatt 65.06 Wasserspeicher und Überlauftrinne (Water balancing tanks and overflows)

*) Currently at draft stage.

**) Obtainable from *Beuth Verlag GmbH*, D-10772 Berlin.

***) Obtainable from *Wirtschafts- und Verlagsgesellschaft Gas und Wasser mbH*, Postfach 14 01 51, D-53056 Bonn.

****) Issued by the *Deutsche Gesellschaft für das Badewesen e.V.* (German Association for Balneology).

Empfehlungen des Bundesgesundheitsamtes zur Eignungsprüfung für Kunststoffmaterialien im Schwimm- und Badebeckenbereich (Recommendations of the German Federal Health Office on testing the suitability of plastics to be used in bathing facilities), *Bundesgesundheitsblatt* (German Federal Health Gazette), 1998 : **10**, p. 464*)

GUV Publication 18.14 *Sicherheitsregeln für Bäder* (Safety rules for bathing facilities)*)

Unfallverhütungsvorschrift Chlorung von Wasser (German Accident prevention regulation on the chlorination of water)**)

Bundeseseuchengesetz (German Federal Communicable Diseases Act), as of 18 December 1979, *BGBI. I*, p. 2262–81

Schwimm- und Badebeckenwasserverordnung (German Regulation on water used in bathing facilities)

Gefahrstoffverordnung (German Regulation on dangerous substances and materials), as of 26 August 1986, *BGBI.* (German Federal Law Gazette) I, pp. 1470–1487, as amended on 24 June and 19 September 1994

- [1] Seidel, K. M., Lopez Pila, J. M. and Grohmann, A., Disinfection capability in water for swimming and bathing pools: A simple method for their evaluation in practice. Issued by the *Institut für Wasser-, Boden- und Lufthygiene des Umweltbundesamtes*, Postfach 33 00 22, D-14191 Berlin.
- [2] *Unfallverhütungsvorschrift Gase* (German Accident prevention regulation on gases) (VBG 61)**)
- [3] *Richtlinie für die Verwendung von Ozon zur Wasseraufbereitung* (Guidelines for the use of ozone for water treatment)**).
- [4] Zuppke, B. *Hydromechanik im Bauwesen* (Hydromechanics in building construction). Wiesbaden and Berlin: *Bauverlag GmbH*.

3 General

The specifications of this standard ensure that a balance is maintained between the purification and contamination of water, while at the same time taking complicated transportation processes into consideration. Microorganisms introduced by bathers and from the environment are killed by adding an oxidizing disinfectant. The level of disinfection specified here involves a reduction of *Pseudomonas aeruginosa* by a factor of ten to the power of four within 30 seconds [1].

No more than the required concentration of disinfectants is permitted in the pool water.

Water treatment is necessary to remove microorganisms, dissolved or colloidal organic impurities introduced by the bathers, and other impurities introduced from the environment, such as dust. For this purpose, different combinations of processes such as coagulation, filtration, oxidation, adsorption and disinfection are carried out, whereby only those substances specified in this standard may be added. To meet environmental protection requirements, the use of chemicals shall be considered with regard to their type, quality and quantity.

The *Gefahrstoffverordnung* requires suppliers to provide product and safety data sheets containing all relevant information on the chemicals and preparations used, and the operator is required to draw up operating instructions.

The specified water flow through the pool or bath ensures that disinfectants are distributed and an adequate disinfectant level is maintained at all points, especially at the water's surface. Furthermore, microorganisms, impurities and pollutants are removed during treatment. The concentration of substances which cannot be removed by treatment are kept within reasonable limits by means of water exchange.

The water treatment methods and water flows specified here help maintain a high quality of bath or pool water, and ensure that the bathing facility meets the relevant hygiene requirements.

4 Concepts

Table 1: Concepts

No.	Term	Definition
4.1	Water treatment	Treatment of water to ensure its quality is appropriate for its intended use and that it meets certain requirements.
4.2	Effectiveness of water treatment	The effectiveness of water treatment is determined by using potassium permanganate to check the oxidizability of the raw water and that of the treated water, assuming the microbiological, physical and chemical requirements are met.
4.3	Pool flow	The flow in the pool due to the supply and removal of water. This flow initiates mixing and transport processes which ensure the disinfectant is distributed throughout the pool water and the pollutants are discharged.

(continued)

*) Obtainable from *Carl Heymanns Verlag KG*, Luxemburger Straße 449, D-50939 Köln.

***) Issued by the *Hauptverband der gewerblichen Berufsgenossenschaften e.V.* (Federation of German industrial employers' liability insurance associations), D-53757 St. Augustin.

Table 1 (concluded)

No.	Term	Definition
4.4	Pool water	The water in the swimming or bathing pool.
4.5	Load capacity factor, k	Ratio of rated pollution load to volumetric flow.
4.6	Disinfection	Killing certain microorganisms by means of oxidizing disinfectants.
4.7	Filtrate	Treated water before disinfectant is added.
4.8	Filling water	The water used for the initial filling and for topping up.
4.9	Auxiliary parameters	Free chlorine, combined chlorine, oxygen reduction potential, pH value and, for water containing bromides and iodides, free and combined halogens.
4.10	Rated pollution load, N	The number of bathers per hour, used as a basis for the design of pools. It is equal to the product of the load capacity factor and the flow.
4.11	Water area per person, a	The theoretical water surface area assigned to an individual.
4.12	Specific frequency, n	Bather turnover per hour.
4.13	Supply water*)	Water treated by adding an oxidizing disinfectant.
4.14	Retention	Delay in the removal of pollutants from the pool.
4.15	Raw water	The water fed to the treatment plant.
4.16	Sludge liquor	The water resulting from backwashing filters.
4.17	Swell water	Pool water flowing into the overflow as a result of disturbance of the water surface.
4.18	Pool or bath	Basin with a continuous flow of water in which several people are present either simultaneously or consecutively.
4.19	Swimming or bathing facility	Totality of pools and baths, their fittings, and the technical facilities for treating the pool or bath water.
4.20	Backwashing water	The water used to backwash filters.
4.21	Overflow water	Portion of water being constantly discharged over the edge of the pool.
4.22	Combined method	A combination of water treatment and disinfection processes.
4.23	Flow, Q	Volume of water flowing through a certain cross section per unit time.
4.24	Pollutants	The inorganic and organic substances and microorganisms which enter the pool water.

*) Term as defined in ISO 6107-1.

5 Water quality requirements

5.1 General

The methods specified in the standards entitled 'German standard methods for the examination of water, waste water and sludge' (DIN 384.. series) shall be used where applicable to determine the parameters which characterize water quality. These methods should also be used for reference purposes for the in-house monitoring of water quality.

In some cases, other methods of examination are applicable for sea and mineral water.

Sampling shall be carried out in accordance with DIN 38402-19.

5.2 Filling water requirements

The filling water shall meet the general health requirements laid down for drinking water. In the case of sea water and brine, the natural salt content is considered to be harmless, while in the case of water in officially recognized spa resorts, other natural constituents are also regarded as being acceptable. Substances which interfere with the water treatment shall be removed in separate plants. In some cases, the water should be treated in a separate plant, especially if the filling water contains higher than usual concentrations of humic substances or the following values are exceeded:

iron: 0,1 mg/l (1,8 mmol/m³);

manganese: 0,05 mg/l (0,9 mmol/m³);

ammonium: 2 mg/l (110 mmol/m³);

polyphosphate as phosphorus: 0,005 mg/l (0,16 mmol/m³).

5.3 Treated water and bath or pool water requirements

Table 2: Summary of requirements

Subclause	Parameter	Unit	Treated water		Pool water	
			Mini- mum	Maxi- mum	Mini- mum	Maxi- mum
5.3.1	Microbiological requirements					
5.3.1.1	<i>Pseudomonas aeruginosa</i> at (36 ± 1) °C	1/(100 ml)	—	n.d. ²⁾	—	n.d. ²⁾
5.3.1.2	<i>Escherichia coli</i> at (36 ± 1) °C	1/(100 ml)	—	n.d. ²⁾	—	n.d. ²⁾
5.3.1.3	<i>Legionella pneumophila</i> at (36 ± 1) °C	1/ml 1/(100 ml)	— —	— n.d. ²⁾ , ³⁾	— —	n.d. ²⁾ , ⁴⁾ —
5.3.1.4	Colony-forming units (CFU) at (20 ± 2) °C	1/ml	—	20	—	100
5.3.1.5	Colony-forming units (CFU) at (36 ± 1) °C	1/ml	—	20	—	100
5.3.2	Physical and chemical requirements					
5.3.2.1	Colour (based on spectral absorption coefficient at $\lambda = 436$ nm)	1/m	—	0,4	—	0,5
5.3.2.2	Turbidity (to be measured as in DIN EN 27027)	FNU ⁵⁾	—	0,2	—	0,5
5.3.2.3	Water clarity	—	—	—	Clear view of the bottom of the entire pool or bath	
5.3.2.4	pH value ⁶⁾ Fresh water Sea water		6,5 6,5	7,6 7,8	6,5 6,5	7,6 7,8
5.3.2.5	Nitrate concentration above that of filling water ⁷⁾	mmol/m ³ mg/l	— —	— —	— —	322 20
5.3.2.6	Oxidizability of Mn VII → II above that of filling water, expressed as O ₂ content ⁸⁾	mg/l	—	0	—	0,75
	KMnO ₄ consumption above that of filling water, expressed as KMnO ₄ content ⁸⁾	mg/l	—	0	—	3
5.3.2.7	Redox potential ⁹⁾ against Ag/AgCl 3,5 m KCl					
5.3.2.7.1	in fresh water a) for pH from 6,5 to 7,3 b) for pH from 7,3 to 7,6	mV mV	— —	— —	750 770	— —
5.3.2.7.2	in sea water a) for pH from 6,5 to 7,3 b) for pH from 7,3 to 7,8	mV mV	— —	— —	700 720	— —
5.3.2.8	Redox potential ⁹⁾ for water containing more than 5 000 mg/l chloride and for water containing more than 0,5 mg/l bromide or iodide	mV	—	—	Limits to be determined experimentally	
5.3.2.9	Free chlorine ⁶⁾ , ¹⁴⁾ a) Pools other than hot whirlpool baths b) Hot whirlpool baths	mg/l mg/l	0,3 0,7	As required	0,3 ¹⁰⁾ 0,7 ¹⁰⁾	0,6 ¹⁰⁾ 1,0 ¹⁰⁾
5.3.2.10	Combined chlorine ¹¹⁾ , ¹³⁾ , ¹⁴⁾	mg/l	—	0,2	—	0,2
5.3.2.11	Haloforms, expressed as chloroform content ¹¹⁾ , ¹³⁾	mg/l	—	—	—	0,020 ¹²⁾

See page 7 for footnotes.

(continued)

Table 2 (concluded)

- 2) n.d. – not detectable.
- 3) In filtrate at a bath or pool water temperature of 23 °C or higher.
- 4) Applies to water for hot whirlpool baths, pools with air-injection systems (e.g. jacuzzi), and any other water that has a temperature of 23 °C or higher.
- 5) FNU: formazine nephelometric unit.
- 6) More stringent requirements may be specified in other parts of the DIN 19643 standards series.
- 7) Not applicable to pool water treated with ozone.
- 8) If the oxidizability of the filtrate is less than that of the filling water for an unoccupied pool, this lower value shall be used as the reference value; if, however, the oxidizability of the filling water is less than 0,5 mg/l O₂ or less than 2 mg/l KMnO₄, these values shall be used as reference values. If treatment with ozone is involved, the values shall be doubled.
- 9) A stationary measuring instrument and recorder capable of being read to an accuracy of 20 mV and of continuous measurement shall be installed to measure the redox potential. If the values drop below the limit value (around 50 mV), the operation of the treatment plant shall be checked. When reporting measurements, the reference electrode or the conversion made shall be stated.
- 10) These concentrations only apply if lower values are not specified for the combined methods described in the other standards of the DIN 19643 series. Under certain operating conditions, higher concentrations may be necessary to meet the microbiological requirements. In such cases, the cause of this need shall be investigated and a remedy provided. The concentrations of free chlorine in the pool water shall not, however, exceed 1,2 mg/l.
- 11) Existing systems that do not meet these requirements should be retrofitted within five years following publication of this standard.
- 12) Higher concentrations are permitted in outdoor facilities due to the higher level of chlorination needed to meet health requirements.
- 13) Does not apply to cold-water plunge pools with a volume of 2 m³ or less and which have a continuous filling water flow.
- 14) In the case of water containing bromides and iodides, free and combined bromine or iodine shall be expressed as chlorine.

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6 Design and structural requirements

6.1 General

The design and construction of the facility shall ensure the correct functioning of the plant and the maintenance of the required water quality. This will mean close cooperation between the architect and specialist engineer. Reference is made here to the relevant regulations (e.g. *Länder* building regulations, regulations on the discharge of waste water, local bye-laws, health authority requirements).

The requirements set out here apply only to baths or pools designed to this standard.

6.2 Pool or bath design

Pools and baths shall be designed in such a manner that all hydraulic requirements are met.

6.3 Water balancing tanks

Water balancing tanks should be closed or covered, vented and have an overflow. They shall be capable of being completely drained and shall be accessible for cleaning. They should be situated below the water level in the bath or pool so that adequate gradients can be provided for the inlet pipes.

6.4 Contact surfaces

Materials which come into contact with water (e.g. pool linings, pool covers, water slides and similar equipment, mortar joints and sealing compounds) shall not affect the water quality as specified in table 2 and shall not undergo any physicochemical reaction with the water or permit the growth of microorganisms and phytoplankton, nor shall they impede water treatment. The use of coverings made of wood or textiles of all kinds (including plastic turfs) is not permitted (cf. *Empfehlungen des Bundesgesundheitsamtes zur Eignungsprüfung für Kunststoffmaterialien im Schwimm- und Badebeckenbereich*).

6.5 Technical equipment rooms

6.5.1 General

Since the size and furnishing of these rooms affect the economic operation of the bathing facility, it is crucial that they be designed taking the operational needs of the facility into consideration.

Sufficiently large access openings, haul routes and entrances both to and within the building will be necessary for installation, repair and maintenance purposes. Machinery shall be protected against frost damage, especially in outdoor pools.

Equipment rooms shall be adequately ventilated and floor drains shall be arranged in accordance with the requirements of the treatment and disinfection procedure. The room lighting shall be designed taking into account the needs of the plant personnel. All relevant safety regulations (including *GUV* Publication 18.14) shall be observed, especially with regard to escape routes and emergency lighting.

6.5.2 Room for filter system

The floor area and clear room height required for setting up and assembling the filter system shall be designed to suit the chosen filter type, allowance being made for the working space required for maintenance and inspection.

In the case of cylindrical casings for DIN 19605 filters, which have a height of 2 m, the necessary clear room height is to be calculated by equation (1), as follows:

$$H = 0,6 D + 2,9 \quad (1)$$

where

H is the clear room height, in m;

D is the casing diameter, in m.

Higher casings will require greater room heights.

A clearance of 60 cm from other installations shall be maintained above the casing. Steel casings shall be accessible from all sides so that a protective coating can be applied. Working space shall be provided for staff and their equipment alongside the filter so that filter material can be installed and removed.

In the case of DIN 19624 filters, the necessary room height, including the space required for maintenance above the casing, is given by equation (2):

$$H = f \cdot D + 3,1 \quad (2)$$

where

f is a factor which is

0,7 for D from 0,75 m to 1,6 m and

0,4 for D above 1,6 m up to 2,3 m.

For H and D , see equation (1).

The space provided for pumps, pipework and valves for connecting filter casings to the supply system shall be in keeping with an optimal hydraulic design.

Open filters shall be separated from other equipment rooms (e.g. by glass walls).

6.5.3 Chemical feeder room

Sufficient space shall be provided next to the room in which the filter system is installed for setting up the chemical feeders and for storing the chemicals and ancillary equipment.

6.5.4 Disinfection equipment and ozone generator rooms

Disinfection equipment and ozone generator rooms shall meet the requirements of DIN 19627, the *Unfallverhütungsvorschrift Gase* [2], and the *Richtlinie für die Verwendung von Ozon zur Wasseraufbereitung* [3].

6.5.5 Monitoring equipment room

A room having a floor area of at least 6 m² with a water supply and a laboratory sink shall be provided for the in-house monitoring of the operation of the whole system.

6.5.6 Repairs workshop

A room shall be provided for carrying out maintenance and repair work and for storing spare parts.

7 Requirements for baths and pools

7.1 General

The requirements set out here apply only to baths or pools designed to this standard.

Unless otherwise specified in the clauses below, the pool water temperature shall not exceed 32 °C.

7.2 Diving pools

Diving pools shall have a water depth of at least 3,4 m.

7.3 Swimming pools

Swimming pools shall have a water depth of more than 1,35 m.

7.4 Variable depth pools

Variable depth pools shall be pools with a false bottom whose height can be altered so that the water depth can be varied as a whole or in some areas, depending on use.

7.5 Artificial wave pools

In artificial wave pools, it is possible to alter the depth by draining or topping up the water and storing the differential volume. Every part of the pool, including the wave chamber, shall have treated water constantly flowing through it. If a balancing tank is used to change the level in the pool, and if the time between the level changes exceeds 20 minutes, it will be necessary to pass treated water through it. In any case, the concentration of free chlorine in the stored water shall not drop below the value required for the pool water.

7.6 Pools for nonswimmers

Pools for nonswimmers shall have a water depth between 0,6 m and 1,35 m.

7.7 Pools with water circulation or air injection systems

Only pool water or treated water shall be used to operate water circulation systems (e.g. nozzles, floor bubblers, water cannons, white-water rapids).

Pipes carrying air and water and which may be in contact with treated or pool water shall be capable of being washed with treated or pool water.

Installations having water circulation systems or air injection systems and which can be used at the same time by several individuals (e.g. waterfalls, water fountains) shall have a width of 0,8 m in the area of use.

7.8 Pools with water slides and water slides having a shallow exit area

Pools designed for water slides shall have a water depth of at least 1 m¹⁵⁾ and a minimum water area of 4 m × 6 m. Only pool water or treated water shall be used to operate water slides. If such slides are not associated with a pool, only treated water shall be used to operate water slides with a shallow exit. However, if the slide ends in a pool, the slide may also be operated with pool water.

7.9 Paddling (wading) pools

In paddling pools, the water depth shall not exceed 0,6 m. Water spouts or fountains and similar features shall be operated with an additional quantity of treated water (i.e. increasing the flow specified in table 3).

7.10 Foot baths

Foot baths shall have a water depth between 0,1 m and 0,15 m if box-shaped and about 0,15 m in the centre if trough-shaped. They shall be located so that the bathers have to pass through them on their way to the swimming or bathing pool. An overflow is not necessary.

7.11 Small-scale pools

Small-scale pools (which are intended for nonswimmers) shall have a water area of not more than 96 m² and may be designed for a low pollution load. The increased flow resulting from this low load maintains the required disinfectant level and helps prevent retention.

7.12 Hot whirlpool baths

7.12.1 General

Hot whirlpool baths are pools with a continuous flow in which hot water is made to bubble by injecting air into the areas provided for bathers. They may accommodate a number of bathers at the same time, or one bather after the other. The water temperature shall be about 37 °C.

Hot whirlpool baths may be connected to the treatment system of bathing facilities, provided the flow is increased, or they may be operated by a treatment plant associated with them. In the former case, their flow may be equal to $10 \cdot V$, provided the volume of the swimming pool, V , is at least 150 m³.

7.12.2 Hot whirlpool baths (for restricted access)

Hot whirlpool baths for restricted access shall be located so that the bathers either have no access to other bathing facilities or have access only to those which have a rated pollution load of up to 50 bathers per hour. Clearly identifiable seats shall be installed for users, and a pool volume of not less than 0,4 m³ shall be provided for every seat. The pools shall have a volume of not less than 1,6 m³ and the water depth shall not exceed 1 m.

Pool volumes for whirlpool baths with a specified number of seats are given in table 3.

¹⁵⁾ Cf. DIN EN 1069-1 and DIN EN 1069-2.