



NEW PUBLIC POOL DESIGN CHECKLIST

Instructions: For all applicants seeking DHHS licensing of a pool, please have a Maine Licensed Professional Engineer complete the following checklist and include it with the DHHS Pool Application. The checklist is used to ensure that a new public Class A, B, C, or F pool meets all of the design criteria required by the Maine Rules Relating to Public Pools and Spas, 10-144 CMR, Chapter 202, Section 2.B.

Reference: ANSI/NSPI-1 2003: American National Standard for Public Swimming Pools

For questions, please contact the DHHS Environmental and Community Health Program, Engineering, at 207-287-2070.

NEW POOL DESIGN CHECKLIST

Please either check () each item as an indication of compliance with the statement, or write in **N/A** for not applicable. All checkmark locations must have either a () or **N/A**; an application with blank checkmark lines will be returned as incomplete. Checklist must be completed, stamped, signed, and dated by a Maine Licensed Professional Engineer. See page 27.

CODE COMPLIANCE

Pools covered by this standard are constructed to comply with all local, state, and federal codes governing safety and environmental regulations.

GENERAL DESIGN

Plans and Permits

Prior to construction, rehabilitation, or alteration of a permanently installed public swimming pool, plans and specifications have been submitted to the authority (state or local) for review, approval, and issuance of a permit to construct or rehabilitate as required by the authority having jurisdiction.

Materials

Swimming pools and all appurtenances thereto are constructed of materials that are nontoxic to humans and the environment; that are generally or commonly regarded to be impervious and enduring; that will withstand the design stresses; and that will provide a watertight structure with a smooth and easily cleaned surface without cracks or joints, excluding structural joints, or to which a smooth, easily cleaned surface/finish is applied or attached.

Selection of Materials

___ Clean sand or similar material, if used in a beach pool environment, is used only over an impervious surface. The sand area shall be designed and controlled so that the circulation system, maintenance, safety, sanitation, and operation of the overall pool are not adversely affected.

___ Structural design. The structural design is in accordance with accepted engineering practices.

Freeze Protection

___ In climates subject to freezing temperatures, the pool shell and appurtenances, piping, filter system, pump and motor, and other components are designed and constructed to facilitate protection from damage due to freezing.

Surface Condition

___ The surfaces within the pool intended to provide footing for users have a slip-resisting surface and shall not cause injury to the feet during normal use.

Colors and Finishes

___ The colors, patterns, or finishes of the pool interior do not obscure objects or surfaces within the pool.

Accessibility for Persons with Disabilities

___ For Americans with Disabilities Act (ADA) requirements for accessibility for persons with disabilities into public swimming pools, see ADA Accessibility guidelines for buildings and facilities, recreation facilities (ADAAG).

DIMENSIONAL DESIGN

Perimeter Shape

This standard is not intended to regulate the perimeter shape of swimming pools. It is the designer's responsibility to take into account the effect a given shape will have on the safety of the occupants and required circulation to ensure sanitation. All other dimensions, unless otherwise specified, should allow a + 2 inches (51 mm) tolerance.

___ There are no protrusions, extensions, means of entanglement, or other obstructions in the swimming pool areas that may cause the entrapment or injury of the user.

Allowable Construction Tolerances

These construction tolerances are not applicable to Class A pools (intended for use for accredited competitive aquatic events).

___ Finished pool dimensions are held within the following construction tolerances as shown in Table 1.

Table 1 – Construction Tolerances

Design requirements	Construction tolerance allowed
Length – overall	± 3 in. (76 mm)
Width – overall	± 3 in. (76 mm)
Depth - deep area, including diving area	± 3 in. (76 mm)
Depth - shallow area	± 2 in. (51 mm)
Step treads & risers	$\pm 1/2$ in. (13 mm)
Waterline - pools with adjustable weir skimmers	$\pm 1/4$ in. (6 mm)
Waterline - pools with nonadjustable skimming systems (gutters)	$\pm 1/8$ in. (3 mm)
Wall slopes	± 3 degrees
All dimensions not otherwise specified in this standard	± 2 in. (51 mm)
Competitive pools - Class A pools - All dimensional requirements	As governed by sanctioning authority

Floor Slope

___ Floor slopes are in compliance with the following, except the requirements by the ADA Accessibility guidelines (ADAAG).

___ All pool floors slope to the drain.

___ The slope of the floor in the shallow area do not exceed 1 foot in 10 feet in Class C pools or 1 foot in 12 feet in Class B pools in any direction to the point of the first slope change, if a slope change exists.

___ The point of the first slope change is defined as the point at which the floor slope exceeds 1 foot in 10 feet in Class C pools or 1 foot in 12 feet in Class B pools.

___ The slope of the floor from the point of the first slope change to the deep area does not exceed 1 foot in 3 feet.

Walls

___ Where walls join the floor the transitional point or profile comply with the following:

- Walls may intersect with the floor at an angle or a transition profile.
- At water depths between 3 feet to 5 feet (91 cm to 152 cm) the maximum radius is 2 feet 3 inches (69 cm).
- At water depths of 3 feet (91 cm) or less a transitional radius does not exceed 6 inches (15 cm) and is tangent to the wall and may be tangent to or intersecting the floor.

- At water depths greater than 3 feet (91 cm) a transitional radius is tangent to the wall at a point no less than 2 feet and 6 inches (76 cm) below the water surface and may progressively increase from 6 inches (5 cm) to a value capable of being tangent to or intersecting the floor.

Water Depths

___ Water depths for swimming areas is a minimum depth of 3 feet (91 cm) unless the authority having jurisdiction specifies otherwise.

___ Class A pool is designed and constructed to provide the dimensions specified by Federation Internationale de Natation (FINA), U.S.A. Swimming, U.S. Diving, or other appropriate sanctioning body. (See Rules Relating to Public Pools and Spas, 10-144 CMR, Chapter 202 for definition of Pool Classes)

Diving

This standard does not cover diving requirements for Class A pools. This standard covers diving requirements for Class B and Class C pools. (See Rules Relating to Public Pools and Spas, 10-144 CMR, Chapter 202 for definition of Pool Classes)

When diving equipment is installed, it shall conform to the specifications set forth in **DECK EQUIPMENT**, below .

___ Equipment is located in the diving area of the pool on the appropriate ANSI/NSPI pool type (or other water envelopes specified by the diving equipment manufacturer) in accordance with the manufacturer’s installation instructions and the minimum dimensions as shown in figure 1.

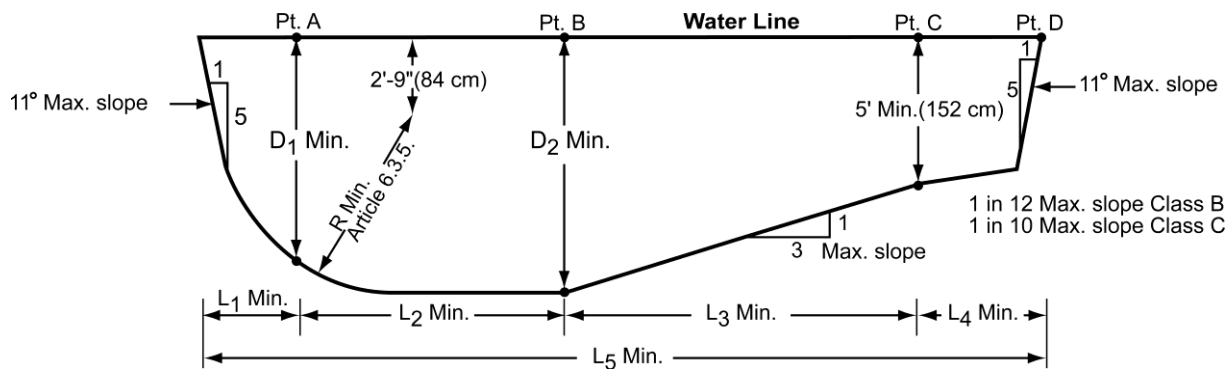


Figure 1 - Construction dimensions for water envelopes for Class B and Class C pools

___ Competitive diving equipment is not installed on Class B and Class C pools.

The manufacturer of the diving equipment shall specify minimum water envelopes for its products. They may refer to the water envelope type of their choice by dimensionally relating their products to Point “A” on that water envelope. Point “A” as shown in figure 1 is designated as the point of origin on the water surface for the water envelope dimension.

___ Point A is a point located on the water surface of pool water envelopes.

___ Point A is a construction location nearest the deep end wall where the minimum water depth D1 is satisfied.

___ Point A, as shown in figure 1 and table 2, shall be the referenced point of origin for all dimensions defining a minimum water envelope.

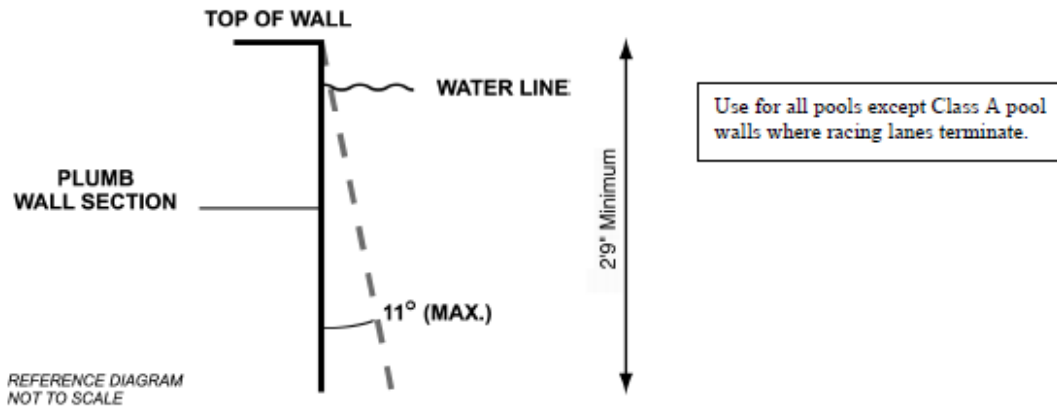


Figure 2 – Maximum allowable wall slope

Table 2 – Minimum water envelopes

Pool type	Minimum dimensions								Minimum width of pool at:		
	D ₁	D ₂	R	L ₁	L ₂	L ₃	L ₄	L ₅	Pt. A	Pt. B	Pt. C
VI	7'-0" (213 cm)	8'-6" (259 cm)	5'-6" (168 cm)	2'-6" (76 cm)	8'-0" (244 cm)	10'-6" (320 cm)	7'-0" (213 cm)	28'-0" (853 cm)	16'-0" (488 cm)	18'-0" (549 cm)	18'-0" (549 cm)
VII	7'-6" (229 cm)	9'-0" (274 cm)	6'-0" (183 cm)	3'-0" (91 cm)	9'-0" (274 cm)	12'-0" (366 cm)	4'-0" (122 cm)	28'-0" (853 cm)	18'-0" (549 cm)	20'-0" (610 cm)	20'-0" (610 cm)
VIII	8'-6" (259 cm)	10'-0" (305 cm)	7'-0" (213 cm)	4'-0" (122 cm)	10'-0" (305 cm)	15'-0" (457 cm)	2'-0" (61 cm)	31'-0" (945 cm)	20'-0" (610 cm)	22'-0" (671 cm)	22'-0" (671 cm)
IX	11'-0" (335 cm)	12'-0" (366 cm)	8'-6" (259 cm)	6'-0" (183 cm)	10'-6" (320 cm)	21'-0" (640 cm)	0 (0 cm)	37'-6" (11.4 m)	22'-0" (671 cm)	24'-0" (732 cm)	24'-0" (732 cm)

NOTE – For definition of pool types see Glossary

Table 3 – Maximum user load

Pool/Deck area	Shallow instructional or wading areas	Deep area (not including the diving area)	Diving area (per each diving board)
Pools with minimum deck area (See 7.1.6 through 7.1.6.1.)	15 sq. ft. per user (1.35 m ² per user)	20 sq. ft. per user (1.8 m ² per user)	300 sq. ft. (27 m ²)
Pools with deck area at least equal to water surface area	12 sq. ft. per user (1.08 m ² per user)	15 sq. ft. per user (1.35 m ² per user)	300 sq. ft. (27 m ²)
Pools with deck area at least twice the water surface area	8 sq. ft. per user (0.72 m ² per user)	10 sq. ft. per user (0.9 m ² per user)	300 sq. ft. (27 m ²)

Rest Ledges

___ Rest ledges along the pool walls are permitted. They must be not less than 4 feet (122 cm) below the water surface. If a ledge is provided it shall be at least 4 inches (10 cm) wide and no more than 8 inches (20 cm) wide.

Maximum User Load

___ The maximum user load of Class B or Class C pools shall be in accordance with table 3.

Wading Pools

___ A wading pool shall be a separate pool with an independent circulation system and physically separated from the main pool as described below.

___ Areas where the water depth at the edge of the pool exceeds 9 inches (23 cm) shall be considered non-entry areas and must be protected by natural or artificial barriers.

___ Floors of wading pools shall be uniform and sloped to drain with a maximum slope of 1 foot in 12 feet (30 cm in 360 cm).

___ The maximum water depth shall be 18 inches (46 cm).

___ The maximum distance from the top of the deck to the water line shall not exceed 6 inches (15 cm).

DECKS AND DECK EQUIPMENT

Decks shall comply with the following as applicable.

___ Deck(s) shall be designed and installed in accordance with the engineering methods required by the authority having jurisdiction.

___ In the absence of specific local requirements, a concrete deck shall be designed and constructed in accordance with the recommended practices of the most recent edition of American Concrete Institute (ACI) Standard 302.1R-96, Guide for concrete floor and slab construction, or in accordance with the requirements of the local authority, the authority having jurisdiction, or both. The deck shall be designed and constructed to meet the applicable requirements of the Americans with Disabilities Act.

___ Decks, ramps, coping, and similar step surfaces shall be slip resisting and cleanable.

___ Special features in or on deck(s) such as markers, brand insignias, or similar materials shall be slip resisting.

___ **Step Risers** for the deck shall be uniform and have a minimum height of 3-3/4 inches (9.5 cm) and a maximum height of 7-1/2 inches (19 cm). A handrail shall be provided for stairs having three or more risers. The minimum tread distance from front to back shall be 11 inches (28 cm).

___ The deck or unobstructed access shall be provided at a minimum of 65% of the pool perimeter to meet the requirement of the 10/20 protection rule (See Google)

___ A minimum 4 feet (122 cm) deck width shall be provided on the sides and rear of any diving equipment. A deck clearance of 3 feet (91 cm) shall be provided around all other deck equipment.

___ The minimum slope of the deck(s) shall be 1/8 inch per 1 foot (3.2 mm per 304.8 mm) for textured, hand-finished concrete decks; 1/4 inch per 1 foot (6.4 mm per 304.8 mm) for exposed aggregate concrete decks; 1/2 inch per 1 foot (12.7 mm per 304.8 mm) for indoor/outdoor carpeting decks; and 3/8 inch per 1 foot (9.5 mm per 304.8 mm) for brick and heavy textures finishes unless an alternate drainage method is provided that prevents the accumulation of pooling of water. (See table 4.)

___ Decks shall be sloped so that standing water shall be no deeper than 1/8 inch (3.2 mm), 20 minutes after the cessation of the addition of water to the deck.

NOTE – Two stacked U.S. quarters can be used to measure the depth. Water should not cover the quarters.

___ The maximum slope of all decks, other than wood decks, shall be 1/2 inch per foot (12.7 mm per 304.8 mm) except for ramps.

___ The maximum slope for wood decks shall be 1/8 inch per 1 foot (3.2 mm per 304.8 mm).

___ Gaps shall be required between deck boards in wood decks and shall be consistent with approved engineering methods with respect to the type of wood used and shall not cause a tripping hazard.

___ The maximum open gap between pool decks and adjoining decks or walkways, including joint material, shall be 3/4 inch (19.1 mm). The difference in vertical elevation

between the pool deck and the adjoining sidewalk shall be 1/4 inch (6.4 mm) unless it conforms to **Decks and Deck Equipment, Step Risers**.

___ Construction joints where the pool coping meets the concrete deck(s) shall be watertight.

___ Construction joints where the pool coping meets the concrete deck(s) shall be installed to protect the coping and its mortar bed from damage as a result of the anticipated movement of adjoining deck(s).

___ Control joints in deck(s) shall be provided to minimize visible cracks outside the control joints due to imposed stresses and/or movement of the slab.

___ Areas where decks join existing concrete work shall be protected by an expansion joint to protect the pool from the pressures of relative movements.

___ The edges of all decks shall be radiused, tapered, or otherwise designed to eliminate sharp corners.

___ **Pressure tests** A pressure test shall be maintained throughout the deck pour and in accordance with **Class A, Class B, Class C, and Class F pools. Class A, Class B, Class C, and Class F pools.**

___ Valves installed in or under any deck(s) shall have access provided for operation, service, and maintenance. Access covers shall be provided.

___ Hose bib(s), with a cross connection control to prevent backflow, shall be provided for rinsing down the entire deck and shall be in accordance with the authority having jurisdiction.

___ Water-powered devices (such as water-powered lifts) shall have a dedicated hose bib (water source).

Deck Equipment

Deck equipment including diving facilities and starting blocks shall comply with the following as applicable.

Table 4 – Typical minimum drainage slope

Surface	Typical minimum drainage slope (inch per foot)
Textured, hand-finished concrete	1/8 in. (3.2 mm)
Exposed aggregate	1/4 in. (6.4 mm)
Carpet	1/2 in. (12.7 mm)
Brick and heavy textures finished	3/8 in. (9.5 mm)

___ A minimum 4 feet (122 cm) deck width shall be provided on the sides and rear of any diving equipment.

Starting Blocks

Starting blocks are intended for competitive swimming and shall conform to Federation Internationale de Natation (FINA), U.S.A. Swimming, National Collegiate Athletic Association (NCAA), or National Federation of State High Schools Associations (NFSHSA).

___ There shall be a completely unobstructed distance of 14 feet (427 cm) above the tip of the diving board or as specified by the diving equipment manufacturer or the authority having jurisdiction.

___ Public pools with diving equipment of 1 meter (39 inches) or greater in height, or pools designed for springboard or platform diving, shall comply with the dimensional design requirements of Federation Internationale de Natation (FINA), U.S. Diving, National Federation of State High Schools Association (NFSHSA) or the appropriate sanctioning body.

Diving equipment. Diving equipment shall be installed in accordance with the manufacturer's specifications.

___ The diving equipment manufacturer shall affix a label to the diving equipment.

___ A label shall be permanently affixed to the diving equipment or jump board and shall include but not be limited to the following:

- The minimum water envelope required for each diving board and diving stand combination,
- Manufacturer's name and address,
- Manufacturer's identification and date of manufacture, and
- The maximum weight of the user, visibly located on the diving board.

___ The diving equipment manufacturer shall provide diving equipment use instructions.

___ Diving equipment shall have slipresisting tread surfaces.

Supports for Diving Equipment

___ Supports, platforms, stairs, and ladders for diving equipment shall be designed to carry the anticipated loads. Stairs and ladders shall be of corrosion-resisting material and shall be easily cleanable and with slip-resisting tread. All diving stands higher than 21 inches (53 cm) measured from the deck to the top butt end of the board shall be provided with stairs and/or a ladder. Step treads shall be self-draining.

___ Diving equipment 1 meter high (39 inches) or greater shall be provided with a top guard rail, which shall be at least 30 inches (76 cm) above the diving board and extend to the edge of the pool wall and to the deck surface.

Swimming Pool Slides

Swimming pool slides, when installed, shall comply with the requirements of the U.S. Consumer Product Safety Commission (CPSC) as published in the Code of Federal Regulations, 16 CFR, Part 1207. The manufacturer shall provide installation and use instructions with each slide. Each slide shall be installed in accordance with the manufacturer's instructions.

Play/Water Activity Equipment

When installed, play/water activity equipment shall be installed in accordance with manufacturer's instructions.

Circulation Systems

System

A circulation system consisting of pumps, piping, return inlets and suction outlets, filters, and other necessary equipment shall be provided for complete circulation of water. Wading pools and spas shall have separate dedicated filtering systems.

___ The equipment shall be of adequate size to turn over the entire pool water capacity as specified in table 5. The system shall be designed to give the proper turnover rate based on the manufacturer's recommended maximum pressure and flow rate of the filter with clean media.

Table 5 – Turnover rate

Swimming pool category	Turnover rate
Class A, B, and C pools	1-1/2 times average depth in feet to equal the hours of turnover required to a maximum of 6 hours
Wading pools	1 hour
Public spas	See ANSI/NSPI-2 <i>Standard for public spas</i>

NOTE – The average depth of the pool in accordance with this table determines the minimum turnover rate for each pool class.

___ Water clarity shall be maintained. (See **Water Clarity and Chemistry**) When standing at the pool's edge at the deep end, the main drains at the deepest portion of the pool floor shall be clearly visible and sharply defined. (Clarity is a function of proper filtration and maintenance of proper chemical operational parameters.)

___ Circulation system components that require replacement or servicing shall be accessible for inspection, repair, or replacement and shall be installed in accordance with the manufacturer's specifications.

___ Circulation system components and equipment shall comply with the most recent edition of ANSI/NSF 50 Circulation system components and related materials for swimming pools, spas/hot tubs, or alternate criteria that is acceptable by the authority having jurisdiction.

___ Pool equipment and plumbing shall be supported in accordance with the manufacturer's specifications to prevent damage from misalignment and settlement.

Water Velocity

___ The water velocity in the pool piping shall not exceed 10 feet (304.8 cm) per second for discharge piping (except for copper pipe where the velocity shall not exceed 8 feet (243.8 cm) per second), and 6 feet (182.9 cm) per second for suction piping, and 1-1/2 feet (45.7 cm) per second flow rate through the suction grates.

___ Pool piping shall be sized to permit the rated flows for filtering and cleaning without exceeding the operating head of the pump.

Piping and Fittings

___ The circulation system plastic pipe and fittings shall be nontoxic and shall be able to withstand the design operating pressure and condition of the swimming pool. Plastic pipe shall be process piping and shall be at least schedule 40 PVC weight and shall comply with ANSI/NSF 14 Plastics piping components and related materials or criteria acceptable to the authority having jurisdiction.

___ Pool piping subject to damage by freezing shall have a uniform slope in one direction and shall be equipped with valves for adequate drainage or shall be capable of evacuating water to prevent freezing and possible damage.

___ Equipment shall be designed and fabricated to drain the pool water from the equipment, together with exposed face piping, by removal of drain plugs and manipulating valves, or by other methods. Refer to the manufacturer's specifications for information on draining the system.

Class A, Class B, Class C, and Class F pools. Class A, Class B, Class C, and Class F pools

___ Class A, Class B, Class C, and Class F pools. Class A, Class B, Class C, and Class F pools shall be equipped with a pump suction (vacuum) gauge, filter inlet pressure gauge, filter outlet gauge, and flow meter. Circulation system piping, other than that integrally included in the manufacture of the pool, shall be subject to an induced static hydraulic pressure test (sealed system) at 25 pounds per square inch (psi) for 24 hours (1.8 kg per cm² for 24 hours). The test shall be performed before the deck is poured, and the pressure shall be maintained throughout the deck pour.

___ Each public swimming pool and wading pool shall be equipped with a flow-measuring device that indicates the rate of flow through the filter system. The flow rate measuring device shall read out in gallons per minute (liters per minute) and shall be selected and installed to be accurate within 10% actual flow.

Wading Pools

A wading pool shall be a separate pool with an independent circulation system and shall be physically separated from the main pool as described as follows:

___ Wading areas where the water depth at the edge of the pool exceeds 9 inches (23 cm) shall be considered nonentry areas and must be protected by natural or artificial barriers.

___ Floors of wading pools shall be uniform and sloped to drain with a maximum slope of 1 foot in 12 feet (30 cm in 360 cm).

___ The maximum water depth shall be 18 inches (46 cm).

___ The maximum distance from the top of the deck to the water line shall not exceed 6 inches (15 cm).

Water Clarity and Chemistry

___ The circulation system shall be designed to maintain water clarity and to distribute chemicals as required for pool sanitation (see **Sanitizing Equipment, Chemical Feeder, and Chemical Operational Parameters**). The pool water shall circulate during all hours the pool is open for use, plus any additional time necessary to ensure continuous water clarity and chemical distribution.

Filters

Design

Filters shall be sized to accommodate or exceed the design flow rate of the system and provide water clarity as noted below. See the manufacturer's instructions.

___ Filters shall comply with the most recent edition of ANSI/NSF 50.

___ Filters shall be designed so that filtration surfaces can be inspected and serviced.

___ Maximum flow rate of filters shall not exceed the requirements of the most recent edition of ANSI/NSF 50.

Internal Pressure

___ On pressure-type filters, a means shall be provided to permit the release of internal pressure.

___ Any filter incorporating an automatic internal air release as its principal means of air release shall have a lid(s) that provide(s) a slow and safe release of pressure as a part of this design and shall have manual air releases in addition to automatic releases.

___ A separation tank used in conjunction with a filter tank shall have a manual method of air release or a lid that provides a slow and safe release of pressure as it is opened.

___ The following statement shall be visible and noticeable within the areas of the air release: "Do not start the system after maintenance without first opening the air release and properly reassembling the filter and separation tank and opening the air release valve."

Piping

___ Piping furnished with the filter shall be of suitable material capable of withstanding 1-1/2 times the working pressure. The suction piping shall not collapse when there is a complete shutoff of flow on the suction side of the pump. Piping shall meet the requirements of the most recent edition of ANSI/NSF-50 Circulation system components and related materials for swimming pools, spas/hot tubs.

Pumps and Motors

Performance

___ A pump and motor shall be provided for circulation of the pool water. The pump shall be capable of providing the flow required for filtering the pool water in accordance with **Circulation System** requirements and filter cleaning (if applicable) against the total dynamic head developed by the complete system.

___ Where pumps are within the scope of ANSI/NSF-50, Circulation system components and related materials for swimming pools, spas/hot tubs, they shall comply with the most recent edition.

Horsepower Rating

___ Pump horsepower rating and labeling shall not exceed the brake horsepower of the motor.

Intake Strainers

___ A cleanable strainer or screen shall be provided, upstream of the circulation pump(s), to remove solids, debris, hair, lint, etc., on all pressure filter systems where intake strainers are within the scope of ANSI/NSF-50 Circulation system components and related materials for swimming pools, spas/hot tubs.

Location

___ Pump(s) and motor(s) shall be accessible for inspection and service in accordance with the manufacturer's specifications.

Safety

___ The design, construction, and installation of the pump(s) and component parts shall provide safe operation and service in accordance with the manufacturer's specifications.

Important Safety Consideration

___ The pump shall not be operated if the main drain grate, or anti-vortex plate, is missing, broken, or loose. The swimming pool, spa, hot tub, wading pool, or whirlpool bathtub appliance shall be shut down immediately and remain shut down until a proper repair or replacement has been accomplished.

Mechanical Seals

___ Where a mechanical pump seal is provided, components of the seal shall be corrosion-resisting and capable of operating under conditions normally encountered in pool operation.

Motor Frame Specifications

___ All motors shall have an open, drip-proof enclosure (as defined by ANSI/NEMA-MG1, Motors and generators) and be constructed electrically and mechanically to perform satisfactorily and safely under the conditions of load and environment normally encountered in swimming pool installations.

Service Factor

___ All motor(s) shall be capable of operating the pump under full load with a voltage variation of +10% from the nameplate rating. If the maximum service factor of the motor is exceeded (at full voltage), the manufacturer shall indicate this on the pump curve.

Load Protection

___ All motors shall have thermal or current overload protection, either built in or in the line starter, to provide locked rotor and running protection.

Flooded Inlet Provision

___ Pumps located below the waterline shall have valves installed on suction and discharge lines, in an accessible place, for maintenance and removal of the pump.

Inlets and Outlets

Entrapment Avoidance

___ The suction outlet(s) including covers, fittings, and hardware shall be designed in accordance with the manufacturer's specifications to provide protection from body and hair entrapment. (See appendix G, Entrapment avoidance.)

Testing and Certification

___ Suction outlet(s) (other than skimmers) that measure less than 12 inches x 12 inches (144 sq. in.) (30.5 cm x 30.5 cm = 930 cm²) shall be provided with covers that have been tested by a nationally recognized testing laboratory and comply with the most recent edition of ASME/ANSI A112.19.8M Suction fittings for use in swimming pools, wading pools, spas, hot tubs, and whirlpool bathtub appliances.

Outlets per Pump

___ If a single or multiple pump suction system is located below the waterline and any one of the suction outlets becomes blocked, the flow through the remaining suction outlet shall be designed to accommodate 100% of the circulation turnover rate. If located at the waterline, a single suction outlet (such as a skimmer, overflow grate, infinity wall, etc.) shall be permitted provided it is vented to the atmosphere.

Water Velocity

___ Water velocity through suction grates shall be permitted to exceed 1.5 ft/s (0.4m/sec) if the grate(s) comply with the most recent edition of ASME/ANSI A112.19.8M.

Performance

___ Inlets and outlet(s) shall be provided and arranged to produce a uniform circulation of water and maintain the distribution of sanitizer residual throughout the pool.

Number of Inlets

___ The number of return inlets shall be based on a minimum of one return inlet per 300 square feet (27.87m²) of pool surface area, or fraction thereof. Return inlet fittings shall be of sufficient size or quantity to allow a full turnover rate of the circulation system in accordance with the manufacturer's specifications for return inlets.

Inlets Outlet Design

___ Inlets and outlets from the circulation system shall be designed so that they do not constitute a hazard to the user.

Grates

___ The pool shall not be operated if any outlet grate is missing, broken, or secured in such a way that it is removable without the use of tools, unless removal still provides the equivalent means of protection.

Types of Systems

___ If a suction outlet system, such as a filtration system booster system, automatic cleaning system, solar system, etc., has a single suction outlet, or multiple suction outlets that are capable of being isolated by valves, each suction outlet shall protect against bather entrapment by any of the following:

- an anti-entrapment cover that complies with the most recent edition of ASME/ANSI A112.19.8M.

- a 12 inch x 12 inch (30.5 cm x 30.5 cm) grate or larger, which allows a maximum flow rate not to exceed 1.5 feet per second (fps) (46 cm per second); or
- alternate designs or means that produce equivalent protection.

NOTE – See *Guidelines for Addressing Entrapment Hazards with Pools and Spas*, U.S. Consumer Product Safety Commission, Publication # 363-009801, (301) 504-0400 or www.cpsc.gov/cpsc/pub/pubs/363.pdf

Accessibility

___ Where provided, the vacuum cleaner fitting(s) shall be located in an accessible position(s) at least 6 inches (152 mm) and no greater than 18 inches (457 mm) below the minimum operating water level or as an attachment to the skimmer(s).

Entrapment Avoidance for Wading Pools

___ If a wading pool has a suction outlet system below the water line, a minimum of two hydraulically balanced suction outlet(s) (suction fittings) with anti-entrapment covers per swimming pool suction line, shall be provided. Wading pool outlet covers measuring less than 12 inches x 12 inches or less than 144 square inches (30.5 cm x 30.5 cm = 930 cm²) shall be the anti-entrapment type and shall comply with the most recent edition of ASME/ANSI A112.19.8M, or all of this section on **Inlets and Outlets** shall apply.

Surface Skimming Systems

___ A surface skimming system shall be provided on all public swimming pools. The surface skimming system shall be designed and constructed to skim the pool surface when the water level is maintained within the operational system.

___ Skimming devices shall be designed and installed so as not to constitute a hazard to the user. When equalizer lines are used, they shall have an anti-entrapment cover or other entrapment protection in accordance with the most recent edition of ASME/ANSI A112.19.8M. Skimmer covers located on a walking surface shall be securely seated, slip resistant, of sufficient strength to withstand normal deck use, and not constitute a tripping hazard.

___ Where **Automatic Surface Skimmers** are used as the sole overflow system, at least one surface skimmer shall be provided for each 500 square feet (46 m²) or fraction thereof of the water surface area. Recessed areas such as stairs, swimouts, and spas shall not be considered in the calculation. When skimmers are used, they shall be located to maintain effective skimming action.

___ A single pump circulation system shall be designed to handle a minimum of 100% of the pool turnover rate through skimmers.

___ A multiple pump circulation system shall be designed to handle a minimum 100% of the pool turnover rate through the skimmers.

___ When an equalizer line is used, the opening at the pool wall shall be covered with a fitting to prevent hair entrapment in accordance with the most recent edition of ANSI/ASME A112.19.8M.

___ When a perimeter-type surface skimming system is used as the sole surface skimming system, it shall extend around a minimum of 50% of the pool. (See **Automatic Surface Skimmers**, above)

___ When perimeter surface skimming systems are used, they shall be connected to the circulation system with a system surge capacity of not less than 1 gallon for each square foot (40.7 liters per square meter) of pool surface. The capacity of the perimeter overflow system and related piping may be considered as a portion of the surge capacity.

___ The hydraulic capacity of the surface skimming overflow system shall be capable of handling 100% percent of the circulation flow.

Electrical and Illumination Requirements

Codes

___ Electrical requirements shall meet the requirements of the most recent edition of the National Electrical Code (NEC)®, and as adopted by the authority having jurisdiction.

Lighting

___ During periods of operation sufficient illumination shall be provided to allow visibility of all portions of the pools, including the bottom. Illumination shall be provided by natural and/or artificial means.

___ Overhead lighting shall provide a minimum of three-foot (91 cm) candles of illumination at the pool water surface and the adjacent deck area.

___ Underwater lighting shall provide a minimum of 1/2 watt per square foot (5.4 watts per m²) of pool water surface.

___ Underwater lighting requirements may be waived when the overhead lighting provides a minimum of 15-foot (457 cm) candles of illumination at the pool water surface.

Heaters

Important Safety Consideration

___ Fossil fuel appliances, like swimming pool heaters, produce poisonous carbon monoxide gas as a by-product of combustion. Proper venting of exhaust gases and the correct sizing of gas meters, gas supply piping, makeup air intakes, etc. are critical installation considerations in preventing potential carbon monoxide gas poisoning or loss of life.

___ This section pertains to appliances using either fossil fuels, such as natural gas, propane (LPG), and #2 fuel oil, or electric heating equipment for heating pool water.

___ Heaters shall be tested and comply with the requirements of the most recent editions of ANSI-Z21.56 Gas fired pool heaters and/or UL 1261, Standard for electric water heaters for pools and tubs. Heat pumps shall comply with the most recent edition of UL 1995 Standard for heating and cooling equipment and be accepted by a recognized testing facility.

___ Heaters shall be sized in accordance with the manufacturer's specifications.

Installation.

___ Heater(s) shall be installed in accordance with all federal, state, and local codes as well as the manufacturer's specifications.

___ A means shall be provided to monitor pool water temperature.

___ Public access to controls shall not be allowed.

Support

___ The heater shall be installed on a surface with sufficient structural strength to support the heater when it is full of water and operating. The heater shall be stationary after plumbing, gas, and/or electrical connections are completed.

Combustible Surfaces

___ If the heater requires a non-combustible surface per the manufacturer, it shall be placed on cement or other accepted surface per the most recent edition of ANSI-Z21.56, or federal, state, and local codes.

___ All heaters shall be installed and maintained with the minimum clearances to combustibles for which the heater has been tested as specified by the manufacturer.

Ventilation

___ The heater shall have ventilation in order to ensure operation.

Important Safety Consideration

___ Fossil fuel appliances, like swimming pool heaters, produce poisonous carbon monoxide gas as a by-product of combustion. Proper venting of exhaust hoses and the correct sizing of gas meters, gas supply piping, makeup air intakes, etc., are critical installation considerations in preventing potential carbon monoxide gas poisoning or loss of life.

___ Makeup air. When installing a fossil fuel heater indoors, proper openings to the room area are a necessity. The heater shall be installed in accordance with federal, state, or local codes and the manufacturer's specifications.

Heating Energy Source

Natural Gas Energy Supply

___ The heater gas supply piping shall comply with the manufacturer's specifications and the most recent edition of ANSI/NFPA 54, National fuel gas code.

___ Important safety consideration. Install a gas cock, properly sized and readily accessible outside the cabinet, to stop the flow of natural gas at the heater for service or emergency shutdown.

Propane Energy Supply

___ Whenever a propane (LPG) appliance is installed, special attention shall be given to ensure that the storage tank, supply piping, and regulator shall be adequately sized to ensure operating fuel pressures as specified by the appliance manufacturer. Consult the fuel supply company and ensure that the system is installed in accordance with the most recent edition of ANSI Z223.1/NFPA 58 National fuel gas code.

___ Propane appliances located in a pit or enclosed area shall be installed in accordance with the most recent edition of ANSI/NFPA 54.

___ Important safety consideration. Install a gas cock, properly sized and readily accessible outside the cabinet, to stop the flow of propane (LPG) at the heater for service or emergency shutdown.

Electrical Energy Supply

___ Electric heating appliances shall be installed in accordance with the most recent edition of the National Electrical Code 1999 (NEC®) and any federal, state, or local codes.

___ The heater shall be grounded and bonded to reduce the hazard of electric shock.

___ The energy source for the heater shall be installed in compliance with all applicable codes.

Heater Circulation System

___ Water flow through the heater, any by-pass plumbing, any back-siphoning protection, and the use of heat sinks shall be done in accordance with the manufacturer's specifications and local codes.

___ Special consideration. When required by the manufacturer, the heater shall be installed with an automatic "cool down" switch to ensure that the pump continues to run (for the time period specified by the manufacturer) after the heater shuts off.

Water Supply

Water Quality

___ The water supply serving the pool, which may come from a variety of sources, shall meet the requirements of article 1 and article 17. For additional information, see appendix A before the pool is used.

NOTE – Many municipalities use monochloramine as the residual disinfectant. The use of this water for makeup will add combined chlorine and may result in the need for breakpoint chlorination.

Makeup Water

___ Makeup water to maintain the pool water level and water used as a vehicle for sanitizers or other pool chemicals, for pump priming, or for other such additions to the pool, shall be from a potable water source.

___ No direct mechanical connection shall be made between the potable water supply and the swimming pool, chlorinating equipment, or the system of piping for the pool, unless it is protected against backflow and back-siphonage in a manner approved by the state or local authority, or through an air gap meeting the most recent edition of ANSI A112.1.2, Air gaps in plumbing systems or other equivalent means approved by the state or local authority.

___ An over-the-rim spout, if used, shall be located under a diving board, adjacent to a ladder, or otherwise properly shielded so as not to create a hazard. Its open end shall have no sharp edges and shall not protrude more than 2 inches (5 cm) beyond the edge of the pool. It shall be separated from the pool water by an air gap at least 1.5 pipe diameters from the pipe outlet to the rim.

Waste Water Disposal

Backwash Water or Pool Draining Water

___ Backwash water or pool draining water shall be discharged to the sanitary or storm sewer, or into an approved disposal system on the premise, or by other means approved by the state or local authority. No direct connections shall be made between the end of the backwash line and the disposal system. An appropriate air-gap shall be provided.

Water Salvage

___ Filter backwash water may be returned to the pool if the backwash water has been filtered to remove particles and treated to eliminate coliform bacteria and waterborne pathogens, provided this procedure has been approved by the state or local authority.

Waste Post Treatment

___ When necessary, filter backwash water and pool drainage water shall be treated chemically or through the use of settling tanks to eliminate or neutralize chemicals,

diatomaceous earth (DE), or contaminants in the water that exceed the limits set by the state or local effluent discharge requirements.

Sanitizing Equipment, Chemical Feeders, and Chemical Operational Parameters

Equipment Standards

___ Sanitizing equipment shall comply with the requirements of the most recent edition of ANSI/NSF-50 Circulation system components and related materials for swimming pools, spas/hot tubs, and shall be capable of introducing a sufficient quantity of a U.S. EPA-registered sanitizer to maintain the appropriate levels in this article, under all conditions of intended use.

___ Pools shall be required to have an independent sanitizing feed system installed and functioning in compliance with **Pool Water**, below. Supplemental feeding of sanitizers or other treatment chemicals shall be in accordance with label directions and shall be avoided when the pool is in use. Supplemental feeding of sanitizers via the skimmer basket(s) shall be avoided when the pool is in use. Undissolved sanitizer shall not be present within the skimmer basket when the pool is in use.

___ The **Pool Water** shall contain sanitizer residuals at all times, as per **Chemical and Operational Parameters**, that can be easily measured by simple and accurate field tests. Only EPA-registered sanitizers with appropriate state and local registration shall be used.

Chemical Feeders

___ The installation and use of chemical feeders shall conform to the following:

___ A chemical feed system shall be installed in accordance with the manufacturer's specifications.

___ Chemical feed pumps shall be wired so they cannot operate unless there is adequate return flow to properly disburse the chemical throughout the pool as designed.

Training

___ Personnel responsible for the operation of the chemical feed equipment shall be properly trained in the operation of that equipment, the procedure for performing and interpreting the necessary chemical field tests, and the appropriate emergency procedures (see appendix E, Use of elemental chlorine).

Testing

___ Every public pool shall maintain a simple and accurate test kit capable of measuring pH and sanitizer residuals as per **Chemical and Operational Parameters**. In addition, every public pool shall have the means of determining total alkalinity, calcium hardness, and cyanuric acid (if used). The method used in determining the free available chlorine residual shall be such that chloramines or other oxidizers that may be present in the pool do not affect the determination.

___ Where the addition of chemicals required to maintain pH value and the sanitizer residual of the pool water is controlled by automatic sensing devices and the pH value and the sanitizer residual are automatically determined and displayed or continuously recorded, the operator shall at least once every day determine, by means of manual test methods, the pH value and the free available and the total chlorine residuals or bromine residual to ensure that the automatic sensing devices continue to maintain proper control of the pH value and the sanitizer residual. The results of the manual testing and automatic sensing devices shall be recorded.

Chemical Operational Parameters

___ All pools covered by this standard shall be built and equipment installed such that when properly operated they comply with the following water quality standards and/or those required by the appropriate state or local authority. Additional chemical operational parameters are included in appendix A.

___ All swimming pools when in use shall be continuously treated with a sanitizer to ensure that one of the following shall be met:

- there is a residual of free chlorine maintained ideally between 2 ppm (2 mg/kg) and 4 ppm (4 mg/kg), but shall not be less than 1 ppm (1 mg/kg) nor more than 10 ppm (10 mg/kg) and combined chlorine level, as measured by the difference between total chlorine and free chlorine, shall not exceed 0.2 and is preferably 0; or
- there is a residual of total bromine in all parts maintained preferably between 4 ppm (4 mg/kg) and 6 ppm (6 mg/kg), but not less than 2 ppm (2 mg/kg), or more than 10 ppm (10 mg/kg).

___ The pH of the water should be maintained between 7.4 and 7.6, but shall not exceed 7.8 or less than 7.2. Maintaining total alkalinity as per appendix A will help control pH within the required range.

___ Bacteria shall not exceed the levels set and monitored by the state and local health departments.

___ Water clarity shall be maintained such that the deepest part of the pool and/or main drain is clearly visible and sharply defined when viewed from the pool's edge.

Visitor and Spectator Area (Classes A and B only)

Visitor and Spectator Areas

___ There shall be separation between the spaces used by visitors in street clothes and those spaces used by bathers. The visitor and spectator area shall not be located within the pool perimeter enclosure unless it is physically segregated from the space used by bathers. The design of spectator facilities shall comply with the requirements of the authority having jurisdiction.

Toilet Facilities

___ Toilet facilities may be shared by spectators and pool users when the toilet facility is designed to accommodate the total capacity of both groups.

Entry, Exits, Pool Stairs, Swimouts, Underwater Benches and Special Features

NOTE – For ADA requirements, see U.S. ADA Accessibility guidelines (ADAAG). (For more information on the U.S. Department of Justice Americans with Disabilities Act, visit the ADA web site at www.usdoj.gov/crt/ada/adahom1.htm)

Entry/Exit

___ All pools shall have at least two means of entry/exit located so as to serve both ends of the pools.

___ Where water depths are 24 inches (61 cm) or less at the pool wall, such areas shall be considered as providing their own natural mode for entry/exit.

___ A means of entry/exit shall be provided in the shallow end of all pools and may consist of either pool stairs, a ramp, or a beach entry.

___ The second means of entry/exit shall consist of one of the following: steps/stairs, ladders, grab rails with treads (recessed), ramps, beach entries, swimouts, or other designs that provide the minimum utility as specified in this standard.

___ Swimming pools over 30 feet (914 cm) in width shall provide entries/exits on both sides of the deep area of the pool.

___ If the pool is designed for use with diving equipment, the entries and exits, pool stairs, ladders, underwater benches, special features, and other accessories shall be located outside the minimum diving water envelope as shown in figure 3.

___ All treads shall have slip-resisting surfaces.

___ If any of these means of entry/exit are to qualify as an ADA means of entry/exit, they shall meet the ADA requirements. See U.S. ADA Accessibility guidelines (ADAAG).

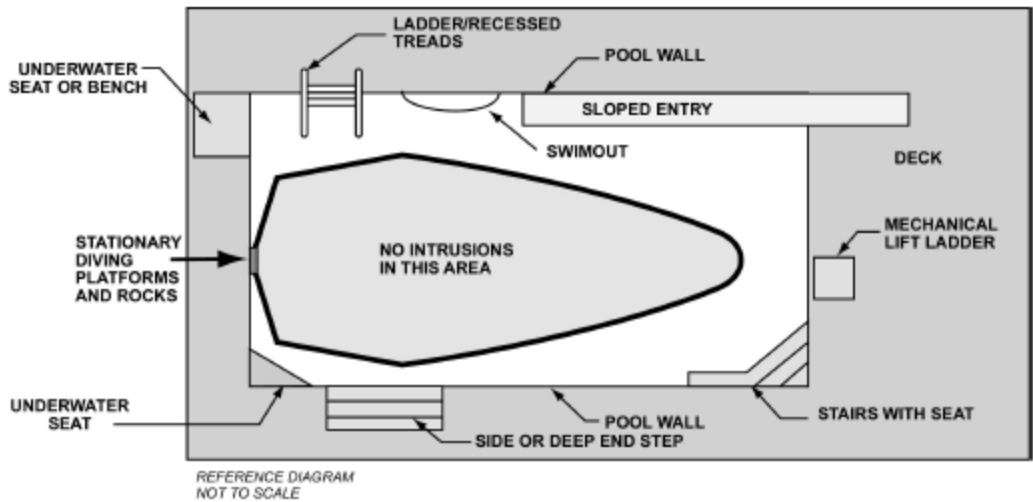


Figure 3 – Minimum diving water envelope

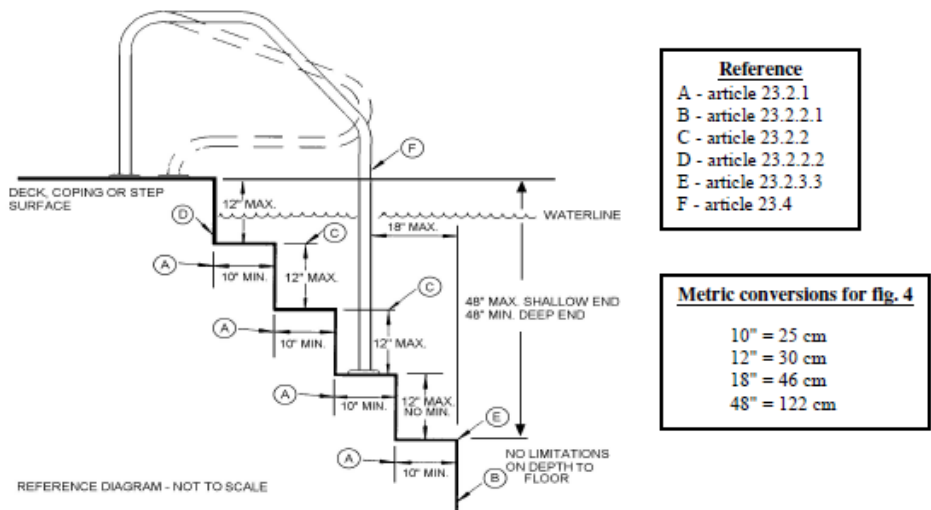


Figure 4 – Pool stairs – side view

Pool Stairs.

___ The design and construction of stairs into the pool in either shallow or deep water, including recessed pool stairs, shall conform to the following. See figure 4.

___ Treads shall have a minimum width of 24 inches (61 cm) at the leading edge. Treads shall have a minimum unobstructed surface area of 240 square inches (1548 cm²) and a minimum unobstructed horizontal depth of 10 inches (254 mm) at the center line.

___ All risers at the center line, except for the bottom riser, shall have a maximum uniform height of 12 inches (305 mm).

___ The bottom riser height is allowed to vary to the floor.

___ The vertical distance from the pool coping, deck, or step surface to the uppermost tread shall be a maximum of 12 inches (305 mm).

___ When stairs are located in water depths over 48 inches (1.2 m), the lowest tread shall be no less than 48 inches (1.2 m) below the deck and shall be recessed in the pool wall.

Shallow End Detail for Beach and Sloping Entries

___ Sloping entries used as a pool entrance shall not exceed 1 foot in 10 feet (30 cm in 300 cm) slope.

___ Sloping entries are permitted to be used in conjunction with steps and benches.

___ Where benches are used in conjunction with sloping entries, the vertical riser distance shall not exceed 12 inches (305 mm). For steps used in conjunction with sloping entries all requirements of **Pool Stairs** shall apply.

___ A vertical drop exceeding 12 inches (305 mm) inside a sloping entry shall be protected by a handrail.

___ Beach and sloping entries surfaces shall be of slip-resisting materials.

Handrails

If handrails are used they shall conform to the following:

___ Handrails shall be made of corrosion-resisting materials.

___ Handrails shall be installed so they cannot be removed without the use of tools.

___ The leading edge of hand-rails/handholds facilitating stairs and pool entry/exit shall not exceed 18 inches (457 mm) back from the vertical face of the bottom riser.

___ The outside diameter of handrails shall be a minimum of 1-1/4 inches (25 mm) and maximum of 1-7/8 inches (4.8 cm) in diameter.

Pool Ladder Design and Construction.

Design and construction of ladders shall conform to the following:

___ All steps and ladders shall be located outside the minimum diving water envelope (see figure 3).

___ All ladder treads shall have slip-resisting surfaces.

___ Ladders shall provide two handholds or two handrails.

___ There shall be a clearance of 3 inches (76 mm) minimum and 6 inches (152 mm) maximum between the pool wall and the ladder.

___ The clear distance between ladder handrails shall be 17 inches (432 mm) minimum and 24 inches (610 mm) maximum.

___ There shall be a uniform distance between ladder treads, with a 7 inch (178 mm) minimum distance and 12 inches (305 mm) maximum.

___ Ladder treads shall have a minimum horizontal uniform depth of 2 inches (51 mm).

Recessed Treads

The design and construction of recessed treads in the pool wall shall conform to the following:

___ All recessed treads shall have slip resisting surfaces

___ Recessed treads at the centerline shall have a uniform vertical spacing of 7 inches (178 mm) minimum and 12 inches (305 mm) maximum.

___ The vertical distance between the pool coping edge, deck, or step surface and the uppermost recessed tread shall be 12 inches (305 mm) maximum.

___ Recessed treads shall have a minimum depth of 5 inches (127 mm) and a minimum width of 12 inches (305 mm).

___ Recessed treads shall drain into the pool.

___ Recessed treads shall be provided with a handrail/grabrail or handhold on each side of the treads.

Underwater Seats, Benches, and Swimouts

The design and construction of underwater seats, benches, and swimouts shall conform to the following:

Swimouts

Swimouts shall meet the requirements listed below:

___ Swimouts shall be designed to be located completely outside of the perimeter shape of the pool. (See figure 3.)

___ The horizontal surface shall be 20 inches (51 cm) maximum below water line.

___ A minimum unobstructed surface equal to that required for the top tread of the pool stairs shall be provided. No other restrictions on sizes apply. (See **Pool Stairs**)

___ When used as an entry/exit access, swimouts shall be provided with a step to meet the pool stair requirements (see **Pool Stairs**).

___ The leading edge shall be visibly set apart.

___ Swimouts are allowed in the deep or shallow area of the pool.

Underwater Seats and Benches

Underwater seats and benches shall conform to the following:

___ Underwater seats and benches shall be located completely inside of the perimeter shape of the pool. (See figure 3.)

___ The horizontal surface shall be 20 inches (51 cm) maximum below water line.

___ An unobstructed surface shall be provided that is a minimum of 10 inches (25 cm) deep and a minimum of 24 inches (61 cm) wide.

___ Underwater seats and benches shall not be used as the required entry/exit access.

___ Underwater seats may be located in the deep area of the pool where diving equipment (manufactured or constructed) is installed, provided they are located outside of the minimum water envelope for diving equipment.

___ Underwater seats and benches are allowed in conjunction with pool stairs.

___ The leading edge shall be visually set apart.

Maine Professional Engineer
Stamp, Signature, and Date :

Signature: _____

Date: _____

GLOSSARY

Adult Supervision: A situation whereby a child at

Abrasion Hazard: A surface that presents an unreasonable risk of irritation to the skin upon contact.

Accessible: 1. Easily and readily exposed for inspection and the replacement of materials and/or parts with the use of tools. 2. Methods providing access to persons with disabilities.

Acid: A liquid or dry chemical used to lower the pH and/or alkalinity of pool or spa water.

Acid Demand: A measure of the amount of acid required to lower the pH to a desired level.

Acid Demand Test: Acid of known strength is added in increments to a measured water sample to determine the amount of acid necessary to make an adjustment in a pool to achieve the desired pH.

Acidic: Having a pH below 7.0. Opposite of basic.

Acid Wash: A procedure using an acid solution to clean an interior surface of a pool with subsequent neutralization of the acid.

Acrylic: A thermoplastic material that can be extruded, injection molded, or vacuum formed into usable shapes and surfaces.

Action Pool: A wave pool in which standing waves are generated in an assortment of patterns.

Activated Carbon: A charcoal-like material used to remove colors, odors, and/or excess oxidizer from water.

Activity Pool: Any pool designed primarily for play activity that uses constructed features and devices including lily pad walks, flotation devices, small slide features, and similar attractions.

Admixture: A material (other than aggregate, cement, or water) added in small quantities to concrete to produce some desired change in properties.

Adult Supervision: A situation whereby a child at rest or play is within the constant sight and hearing of an adult charged with safeguarding the child. Such supervision must be of a nature that is uninterrupted — without absences, voids, or distractions that separate adult from child by distance, obstacles, or any hindrance to sight and sound communication.

AF: See Alkalinity Factor.

Aggregate: Marble dust, sand, rocks, pebbles, colored quartz, dolomite, and other similar materials used as components of concrete or plaster.

Aggressive Water: Water that is corrosive because it is low in pH, and/or calcium hardness, and/or alkalinity.

Air Blower: A device that produces a continuous flow of air.

Air Channel: A system whereby a volume of air is introduced into hollow ducting built into a spa floor, bench, or other location. The air channel is activated by a separate air power unit (blower).

Air Control: A means for spas and hot tubs to regulate air flow in the air induction system, increasing or decreasing hydrotherapy action.

Air Entrainment: Process in which minute air bubbles, ranging in size from 0.01 inches (0.25 mm) to 0.001 inches (0.03 mm) are mixed in a concrete mortar mix. Improves workability and frost resistance of the mix.

Air Induction System: A system whereby a volume of air is introduced into hollow ducting built into a spa floor, bench, or hydrotherapy jets.

Air Switch System: An isolated device that utilizes a pulse of air sent down a tube to remotely operate electrical equipment.

Algae: Microscopic plant-like organisms that contain chlorophyll.

Algicide: Any chemical or material that kills algae. ALGAECIDE.

Algistatic: Able to inhibit the growth of algae.

Alkali: A term applied to bases, usually carbonates, bicarbonates, and hydroxides, that raise the pH and alkalinity when added to water.

Alkaline: Having a pH above 7.0.

Alkalinity: See Total Alkalinity.

Alkalinity Factor (AF): Used to calculate the saturation index of water.

Alum (Aluminum Sulfate) (Al₂SO₄)₃): A compound used to cause suspended solids in the water to form filterable masses (flocculate).

Alteration: See Remodel and Renovate.

Ammonia (NH₃): A chemical compound of hydrogen and nitrogen that combines with free chlorine in pools to form chloramines or combined chlorine. It also combines with free bromine to form bromamines.

Amperage: The strength of a current of electricity expressed in amperes.

Ampere (Amp): A unit of electrical current that is equivalent to a flow of one coulomb per second or to the steady current produced by one volt applied across a resistance of one ohm. It also applies to the strength of a current of electricity expressed in amperes.

Amphoteric: Having the ability to serve as either an acid or a base.

Analog Meter: A testing device in which a needle is used to indicate readings on the dial face.

Ancillary Facility: Area used in conjunction with, or the operation of, a pool such as public dressing, locker, shower, or bathroom area, equipment room, pool deck area or building space intended to be used by pool users.

Antivortex Drain Cover (Antivortex Plate or Cover): A plate or cover that is affixed to the main outlet of a swimming pool or spa that prevents a vortex from forming as water passes through to the main outlet.

Aquatic Recreation Facility: A facility that is designed for free-form aquatic play and recreation. The facilities may include, but are not limited to, wave or surf action pools, leisure rivers, sand bottom pools, vortex pools, activity pools, inner tube rides and body slides, and interactive play attractions.

Available Chlorine: A rating of a chemical's total chlorine content based on a comparison to elemental (gaseous) chlorine having 100% available chlorine.

Backboard: Device for immobilizing a person with a suspected injury to the spinal column.

Back Pressure: Resistance to flow, normally expressed in pounds per square inch (kilograms per square centimeter).

Backwash: The process of cleansing the filter medium and/or elements by the reverse flow of water through the filter.

Backwash Cycle: The time required to backwash the filter medium and/or elements and to remove debris in the filter vessel.

Backwash Rate: The rate of water flow through the filter media per unit of area (U.S. gallons/minute/square feet) of effective filter area. One U.S. gallon per minute per square foot is equivalent to 40.75 liters per minute per square meter.

Bacteria: Single-celled microorganisms of various forms, some of which cause infections or disease.

Bactericide: Any chemical or material that kills bacteria.

Balance: In pools and spas, used to refer to a condition of the water that is neither scaling nor corrosive.

Ball Valve: A device that can partially or totally obstruct the flow of water, using a ball-shaped diverter.

Barrier: A means to limit, delay, or restrict access to a pool, spa, or hot tub. (Refer to ANSI/NSPI-8, Model barrier code for residential swimming pools, spas, and hot tubs, latest edition.)

Base: A chemical used to raise pH and/or total alkalinity of pool or spa water.

Base Demand: A measure of the amount of alkaline material required to raise pH to a predetermined level. This can be accomplished by use of a base demand test, whereby a standard base is added by drop to the pH test solution until the desired pH is reached.

Basic: Having a pH above 7.0. Opposite of acidic.

Bather: Any person using a pool, spa, or hot tub and adjoining deck area for the purpose of water sports, recreation, therapy or related activities. USER.

Bather Load: The number of persons in the pool/spa water at any given moment or during any stated period of time. SWIMMER LOAD.

Batter Board: One of two horizontal boards nailed to a post set up near the proposed corner of an excavation. Cord is attached for locating the exact corner of the excavation.

BCDMH (Bromo Chloro-Dimethyl Hydantoin) Products: Sanitizer product that is used to generate available bromine. Contains available bromine and available chlorine.

Beach Entry: Sloping entry starting above the water line at deck level and ending below the water line. (Does not refer to sand only). ZERO ENTRY.

Beginner's Area: Those areas in pools that are three feet (3') (0.91 meters) or less in water depth.

Bench (Underwater): See Seat.

Bentonite: Highly absorptive and compressible clay material tamped into place to restrict water seepage or suspended in water slurry to keep earth from falling into an excavation.

Biofilm: A community of microorganisms such as bacteria, algae, or fungi that are encased in a gelatinous matrix and usually attached to surfaces. The matrix protects the microorganisms from harsh environmental conditions and confers greater resistance to sanitizers and algicides. SLIME.

Bleach (NaOCl): Sodium hypochlorite. A chlorine source that typically has between 5% and 16% available chlorine. LIQUID CHLORINE.

Bleeder Valve: A device that allows air to be vented from a system.

Blister: An area of raised surface detached from the structural matrix of a material.

Body Coat: A layer of diatomaceous earth or similar materials on a filter element that acts as the filtering media.

Body Feed: A controlled amount of diatomaceous earth or similar materials that is continuously added to the filter element during the course of a filter run to help maintain filter porosity.

Bond Beam: Traditional extra-structural strength or rigidity provided along the top edge of a pool wall.

Bond Failure: Failure of plaster or other surfaces to adhere to the underlying subsurface; delamination.

Bonding, Electrical: The joining of metallic parts to form an electrically conductive path that will ensure electrical continuity.

Booster Pump System: A pump that is completely independent of the filtration and heating system. Used to provide support for hydrotherapy jets, cleaning systems, and gas chlorinators, or special water features.

Bottom Rail: The lower portion of an aboveground pool frame used as a structural retainer for above-ground pool wall.

Break In Grade: Occurs when the slope of the pool floor changes to a greater slope.

Breakpoint Chlorination: The addition of a sufficient amount of chlorine to water to destroy the combined inorganic chlorine present. Normally, the amount added is equal to ten times or more the combined chlorine concentration.

Bridging: Build-up of a body coat on diatomaceous earth filter elements to the point where the body coats of two adjacent elements touch.

Broadcast: A method of applying chemicals into a pool or spa by spreading them uniformly over the water surface.

Bromamines: Bromine-ammonia compounds exhibiting sanitizing properties similar to hypobromous acid.

Bromide: A salt that contains a bromide (Br^-) ion. Bromide becomes hypobromous acid when it reacts with oxidizers such as chlorine, ozone, or persulfates.

Bromine (Br_2): One of several chemicals that yield hypobromous acid when added to water.

Bromine Feeder: A device to add or deliver bromine sanitizer at a controlled rate.

Bromine Generator: See Electrolytic Chlorine/Bromine Generator.

Brown Coat: First coat of plaster applied with a fairly rough texture prior to the finish coat.

BTU: British thermal unit. A unit of measurement used to define the capabilities of heaters. One BTU is capable of raising the temperature of one pound of water by one degree Fahrenheit. One BTU is capable of raising the temperature of one kilogram of water by 1.22 degrees Celsius.

Buffer: Chemical that when dissolved in water will resist pH change. Also a chemical solution used to calibrate pH instrument.

Bullnose: 1. A convex rounding of an object. 2. A brick, stone, or coping with a rounded edge.

Burner: The component of the heater where the combustion of fossil fuel takes place.

Bypass Valve: A valve used to limit or adjust the amount of water flowing through a device in a bypass loop to divert flow to an alternate plumbing path.

Calcification: Formation of calcium carbonate on walls of pools or pipes, or in a filter or heater, due to low solubility of calcium salts.

Calcium Carbonate (CaCO_3): An insoluble calcium compound that is the major component of scale. CaCO_3 occurs normally in limestone, marble, various eggshells, seashells, etc.

Calcium Chloride (CaCl₂): A soluble white salt used to raise the calcium hardness of pool and spa water.

Calcium Hardness: A measure of the amount of calcium dissolved in water and expressed in parts per million (ppm) or milligrams per liter (mg/L) as calcium carbonate.

Calcium Hardness Factor (CF): Used to calculate the saturation index of water.

Calcium Hypochlorite (Ca(OCl)₂): A solid white form of chlorine found in both granular and tablet forms (65% - 75% available chlorine).

Cantilever: A projecting beam supported only at one end.

Capacitor: A device that consists essentially of two conductors (such as parallel metal plates) insulated from each other by a dielectric and that introduces capacitance into a circuit, stores electrical energy, blocks the flow of direct current, and permits the flow of alternating current.

Carbon Dioxide (CO₂): Common gas found in air. Can be used to lower pH in a pool.

Cardiopulmonary Resuscitation (CPR): A lifesaving technique involving both chest compressions and mouth-to-mouth breathing, to circulate oxygen and blood to vital organs.

Cartridge: A replaceable porous element designed to retain suspended particles from water.

Cartridge Filter: A filter that utilizes a porous element that acts as a filter medium.

Catch Pool: A pool or designated section of a pool used as a terminus for waterslide flumes. See Splash Pool.

Caustic: Sodium hydroxide, lye; used in pools, an extremely high pH alkalizer; referring generally to high pH.

Caustic Soda (NaOH): Sometimes called caustic sodium hydroxide or lye. A highly alkaline substance sometimes used to raise pH.

Caution: See Signal Word.

Cavitation: Formation of partial vacuums when the pump capacity exceeds water replacement supply.

Cement: A powdered substance of lime and clay generally mixed with water and aggregate to make concrete.

Centrifugal Force: The outward force exhibited by a circular motion.

Centrifugal Pump: A pump to circulate water using an impeller, powered by an electric motor or gasoline engine. The centrifugal force of the spinning impeller creates the flow through the pump.

CF: See Calcium Hardness Factor.

CFU (colony forming units): Used to express the concentration of microorganisms per unit of volume, most often as CFU per ml of bacteria in water.

CFM: Cubic feet per minute (of air). One cubic foot per minute is equivalent to 0.03 cubic meters per minute.

Channelization: The undesirable process whereby filter sand is permeated by tubes or channels of calcified or oily material allowing water to pass freely, without filtration.

Check Valve: A valve allowing flow in one direction and obstructing flow in the other direction.

Chelating Agent: A chemical used to bind (sequester) metals dissolved in water, to prevent them from precipitating and staining pool surfaces. CHELANT.

Chemical Feeder: A device (floating or mechanical) for adding a chemical to pool or spa water.

Chemical Feeder Output Rate: Amount of chemical or active ingredient delivered by a feeder per unit time (for example, pounds of chlorine per hour). One pound per hour is equivalent to 0.45 kilograms per hour.

Children's Pool/Ride: Ride, flume ride, or other slide attraction, at a water theme park, designed primarily for the use of small children.

Chine: That portion of the stave of a hot tub below the bottom of the croze.

Chine Joist: A brace that provides support to the floor of a hot tub.

Chloramines: They are formed when free chlorine combines with nitrogen-containing compounds (for example: perspiration, ammonia). These compounds can cause eye and skin irritation, have strong objectionable chlorine-type odors, and low sanitizing capability. COMBINED CHLORINE.

Chlorinated Isocyanurates (ISOS): Sanitizer products that are self-stabilizing due to release of free available chlorine and cyanuric acid when they dissolve.

Chlorinator: A device to add or deliver a chlorine sanitizer at a controllable rate.

Chlorine: See Calcium Hypochlorite, Sodium Dichlor, Isocyanurates, Sodium Hypochlorite, and Tri-chloro-Iso-Cyanurate.

Chlorine Demand: The amount of chlorine that will be consumed by readily oxidizable impurities in pool or spa water.

Chlorine Gas (Cl₂): A gaseous form of chlorine used to sanitize pools and spas; contains 100% available chlorine.

Chlorine Generator: See Electrolytic Chlorine/Bromine Generator.

Chlorine Neutralizer: A chemical used to reduce chlorine residuals.

Chlorine Residual: See Residual.

Circuit: The complete path of an electric current.

Circuit Breaker: A device designed to open and close an electrical circuit manually and to open a circuit automatically at a predetermined level, thus providing protection to the wiring and electrical components.

Circulation Equipment: The components of a circulation system.

Circulation System: The mechanical components that are a part of a recirculation system on a pool or spa. Circulation equipment may be, but is not limited to, categories of pumps, hair and lint strainers, filters, valves, gauges, meters, heaters, surface skimmers, inlet/outlet fittings, and chemical feeding devices. The components have separate functions, but when connected to each other by piping, perform as a coordinated system for purposes of maintaining pool or spa water in a clear and sanitary condition.

Clarifier: A chemical that causes fine suspended solids in water to combine into filterable clusters. See Flocculant.

Clarity: The degree of transparency of pool water. Characterized by the ease with which an object can be seen through a given depth of water.

Cleat: See Kicker.

Coliform Bacteria: Bacteria found in the intestines and fecal matter of warm-blooded animals. The detection of coliforms is used to indicate the possibility of disease-causing bacteria.

Collector, Solar: An assembly of components used to collect solar energy for heating, i.e., rooftop structure, floating devices, etc.

Combined Chlorine: COMBINED AVAILABLE CHLORINE. See Chloramines.

Commercial/Public Pool: Any pool, other than a residential pool, that is intended to be used for swimming or bathing and is operated by an owner, lessee, operator, licensee, or concessionaire, regardless of whether a fee is charged for use. (Refer to ANSI/NSPI-1, Standard for public swimming pools, latest edition).

Commercial/public pools shall be further classified and defined as follows:

Class A, Competition Pool: Any pool intended for use for accredited competitive aquatic events such as La Federation Internationale De Natation Amateur (FINA), U.S. Swimming, U.S. Diving, National Collegiate Athletic Association (NCAA), National Federation of State High Schools Associations (NFSHSA), etc. The use of the pool is not limited to competitive events.

Class B, Public Pool: Any pool intended for public recreational use.

Class C, Semi-Public Pool: Any pool operated solely for and in conjunction with lodgings such as hotels, motels, apartments, condominiums, etc.

Class D, Other Pool: Any pool operated for medical treatment, therapy, exercise, lap swimming, recreational play, and other special purposes, including, but not limited to, wave or surf action pools, activity pools, splashers pools, kiddie pools, and play areas.

Class D-1, Wave Action Pools: Wave action pools include any pool designed to simulate breaking or cyclic waves for purposes of general play or surfing.

Class D-2, Activity Pools: Activity pools are those pools designed for casual water play ranging from simple splashing activity to the use of attractions placed in the pool for recreation.

Class D-3, Catch Pools: Catch pools are bodies of water located at the termination of a manufactured waterslide attraction provided for the purpose of terminating the slide action and providing a means for exit to a deck or walkway area.

Class D-4, Leisure Rivers: Manufactured streams of near-constant depth in which the water is moved by pumps or other means of propulsion to provide a river-like flow that transports bathers over a defined path that may include water features and play devices.

Class D-5, Vortex Pools: Circular pools equipped with a method of transporting water in the pool for the purpose of propelling riders at speeds dictated by the velocity of the moving stream.

Class D-6, Sand Bottom Pools: Pools that use sand as an interior floor finish over an impervious surface and are equipped to treat and filter the water in the sand areas to maintain a healthful sand condition.

Class D-7, Interactive Play Attractions: Manufactured devices using sprayed, jetted, or other water sources contacting the bathers and do not incorporate standing or captured water as part of the bather activity area.

Class D-8, Amusement Park Attractions: Manufactured features designed for bather interaction or incidental contact with static, splashing, or flowing water.

Class D-9, Natural Bodies of Water: Those natural or man-made aquatic play areas normally regarded as oceans, lakes, ponds, streams, quarries, or bodies of water that the local jurisdiction has designated as Natural Bodies of Water. (The design or construction of these facilities is not included in the scope of ANSI/NSPI standards.)

Class E: Pools used for instruction, play or therapy and with temperatures above 86° F. Public pools may be diving or non-diving. If diving, they shall be further classified into types as an indication of the suitability of a pool for use with diving equipment.

Type VI-IX: Public pools suitable for the installation of diving equipment by type.

Type N: A non-diving public pool. (No diving allowed.)

Competitive Diving Equipment: Competitive diving equipment includes diving boards and adjustable fulcrum-setting diving stands intended for competitive diving.

Coping: The cap on the wall that provides a finishing edge around the pool/spa. Can be formed, cast in place, precast, brick, stone, or pre-fabricated from metal or plastic materials. It may be used as part of the system that secures a vinyl liner to the top of the pool wall.

Copper Sulfate (CuSO₄): A blue inorganic salt, sometimes used as an algicide. BLUESTONE.

Cove: The radius that joins the floor and wall of a pool or spa.

Cover: Something that covers, protects, or shelters a pool, spa, or hot tub. Types of covers are:

Safety Cover: As defined by ASTM in F1346-1991, Standard performance specification for safety covers and labeling requirements for all covers for swimming pools, spas and hot tubs, latest edition, a barrier (intended to be completely removed before entry of users) for swimming pools, spas, hot tubs or wading pools, attendant appurtenances and/or anchoring mechanisms that will, when properly labeled, installed, used, and maintained in accordance with the manufacturer's published instructions, reduce the risk of drowning of children under five years of age by inhibiting their access to the contained body of water and by providing for the removal of any substantially hazardous level of collected surface water. (These covers may be power or manual.)

Solar Cover: A cover that when placed on a pool or spa surface increases the water temperature by solar activity and reduces evaporation and heat loss.

Thermal Cover: An insulating cover used to prevent evaporation and heat loss from pools or spas.

Winter Cover: A cover that is secured around the perimeter of a pool or spa that provides a barrier to debris, when the pool or spa is closed for the season.

Craze: See Surface Checks.

Cross Connection: An unprotected connection between domestic water supply and pool water or other non-potable water, where a contamination of the domestic system could occur.

Cross-Over Deterrent: A feature to deter a person from crossing over a barrier wall or fence to the opposite side (e.g., pointed picket fences).

Cuddle Cove: See Swimout.

Cut Off Head: See Shut Off Head.

Cyanuric Acid: A chemical that reduces the loss of chlorine in water due to the ultraviolet rays of the sun. STABILIZER, ISOCYANURIC ACID, CONDITIONER, TRIAZINETRIONE.

Danger: See Signal Word.

Dead Load: The weight of all permanent structural and nonstructural components of a building, such as walls, floors, roofs, ceilings, stairways, and fixed service equipment.

Deck Dive: A dive performed from the deck area of a pool into five feet (5') (1.52 meters) or more of water depth.

Decks: Those areas immediately adjacent to or attached to a pool or spa that are specifically constructed or installed for sitting, standing, or walking. Generally made of concrete, wood, or masonry.

Deep Area: Water depth areas exceeding five feet (5') (1.52 meters).

Design Rate of Flow: The rate of flow used for design calculations in a system.

Diatomaceous Earth (DE): A white powder used as a filtering medium composed of microscopic fossil skeletons of diatoms.

Diatomaceous Earth Filter: A filter that utilizes a coating of diatomaceous earth (DE) or other filter media over a porous fabric as its filter medium.

Diatomite Filter Element: Device used in a filter tank called a filter grid or element coated with a fabric that traps diatomite on its surface.

Dichlor: See Sodium Dichlor.

Diethylphenylene Diamine (DPD): A chemical testing reagent that measures bromine or free available and total chlorine; produces a series of colors from pale pink to dark red.

Diffuser: A component of a pump whose function is to reduce velocity and increase static pressure of a fluid passing through a system.

Digital Multimeter: This meter is read by means of an LED or LCD display.

Discharge Head: The resistance, caused by friction and/or changes in elevation, of the water flow encountered on the discharge side of the pump back to the swimming pool or spa.

Dive: A free-fall entry into water from a planned acrobatic maneuver into a designated diving area of a pool.

Diving Area: The area of a swimming pool that is designed for diving.

Diving Board: A flexible board secured at one end that is used for diving.

Diving Platform: Stationary platform designed for diving.

Diving Stand: Any supporting device for a spring-board or diving board.

Draft Hood: Part of a heater venting system used to prevent a downdraft.

Dry Acid (NaHSO₄): See Sodium Bisulfate.

Dynamic Head: The sum of the total resistance, caused by friction and/or changes in elevation, of the water flow through the entire circulation system that the pump has to overcome to achieve the necessary flow rate.

Edge Guards: Shields designed to cover sharp edges in aboveground pools.

Effective Filter Area: Total surface area through which designed flow rate will be maintained during filtration.

Cartridge Type: The total effective filter area is the cartridge fabric area that is exposed to the direct flow of water, figured in square footage of fabric. This excludes cartridge ends, seals, supports, and other areas where flow is impaired.

Diatomaceous Earth (DE) Type: The actual area of the element is the total effective area of the porous fabric septum, less any area of a septum support member greater than one-fourth inch (1/4") (6.35 millimeters) wide contacting the septum during filtration.

Permanent Medium Type: The effective filter area is the filter surface that is perpendicular to the flow direction.

Sand Filtration Type: The top surface area of the filter medium within the filter, calculated in square inches or square feet. One square inch is equivalent to 6.45 square centimeters. One square foot is equivalent to 0.09 square meters.

Effluent: The outflow of water from a filter, pump, or pool.

Egress: Means of exit.

Electrical Induction: The process by which an object having electrical or magnetic properties produces similar properties in a nearby object, usually without direct contact. See Air Induction System.

Electrolysis: The decomposition of material by an outside electrical current.

Electrolytic Chlorinator: See Electrolytic Chlorine/Bromine Generator.

Electrolytic Chlorine/Bromine Generator: An electrolytic device used to generate free available chlorine or total bromine from either chloride or bromide salts.

Electron: A minute particle of negatively charged electricity.

Entry Pool: Pool at a water theme park that is provided at the entrance of a water slide or inner tube ride.

EPA-Registered Product: A product bearing the EPA stamp indicating that it meets EPA standards for efficacy, human health and safety, environmental impact, use instructions, and product labeling. All products that claim to kill or control bacteria, algae, etc., are required to be registered.

Equalizer Line: 1. A line below the pool surface to the body of a skimmer that prevents air from being drawn into the pump. 2. A pipe between two pools/spas to equalize water levels.

Equipment Area: Area used to house recirculation and disinfecting equipment and related appurtenances.

Erosion: 1. Act of destroying or dissolving by slow disintegration or wearing away. 2. In an erosion feeder, it is the way water dissolves the chemical being fed.

Erosion Feeder: A device that dispenses a sanitizer by directing a flow of water past tablets, briquettes, or pellets.

Etching: Corrosion on the surface; the pitting or eating away of a material such as the surface of plaster.

Evaporation: Conversion of liquid molecules into vapor.

Exercise Bar: A tubular device installed in the wall as a handhold.

Expansive Soil: Clay soil that absorbs moisture and swells, creating the potential for structure damage.

Fecal Streptococci: The fecal streptococcus group of microorganisms includes, but is not limited to, the organisms *S. faecalis*, and *S. faecium*, which inhabit the gastrointestinal tract of warm blooded animals. These organisms are indicators of contamination in water. The ingestion of the fecal streptococci can cause illness.

Feet of Head: The resistance in a hydraulic system based on the equivalent to the height of a column of water that causes the same resistance (100 feet of head equals 43 pounds per square inch). The total dynamic head is the sum of all resistances in a complete operating system. One pound per square inch is equivalent to 6.89 KiloPascal (kPa). One pound per square inch is also equivalent to 70.3 grams per square centimeter. 100 feet of head is equivalent to 296.47 KiloPascal (kPa). 100 feet of head is equivalent to 3.02 kilograms per square centimeter.

Ferric Iron (Fe+3 or Iron III): Generally insoluble in water, commonly precipitating as rust.

Ferrous Iron (Fe+2 or Iron II): Found in groundwater. It is soluble in water and will generally impart a pale green color. In the presence of oxidizers, it will convert to Iron III.

Fiberglass: Fine-spun filaments of glass that are available in a rope or mat form. When used in a process with polyester resins and hardeners, can be formed and molded into pools, spas, and related equipment.

Filter: A vessel that removes undissolved particles from water by recirculating the water through a porous substance (a filter medium or elements).

Cartridge Filter: A filter that utilizes a porous element that acts as a filter medium.

Diatomaceous Earth Filter: A filter that utilizes a thin coating of diatomaceous earth (DE) or other filter aid over a porous fabric as its filter medium.

Permanent Medium Filter: A filter that utilizes a filter medium (sand).

Filter Agitation: The mechanical or manual movement to dislodge the filter aid and dirt from the filter element.

Filter Aid: Usually refers to powder-like substances such as diatomaceous earth or volcanic ash used to coat a septum type filter. Also used as an aid to sand filters. Finely divided medium (diatomaceous earth, processed perlite, etc.) used to coat a septum of a diatomite-type filter.

Filter Cartridge: A filtering element, usually of fibrous material.

Filter Cycle: The operating time between cleaning or backwash cycles.

Filter Element: A device within a filter tank designed to entrap solids and conduct water to a manifold, collection header, pipe, or similar conduit and return it to the pool, spa, or hot tub. A filter element usually consists of a septum and septum support, or a cartridge.

Filter Medium: A finely graded material (such as sand, diatomaceous earth, polyester fabric, anthracite, etc.) that removes solid particles from the water.

Filter Sand: A hard silica-like material free of carbonates or other foreign material used in sand filters as the media.

Filtration: The process of removing undissolved particles from water by recirculating the water through a porous substance (a filter medium or elements).

Filtration Flow: The design rate of flow, in volume per time (GPM, GPH), through the filter system installed per manufacturer's instructions with a new, clean filter medium. One U.S. gallon per minute is equivalent to 3.79 liters per minute. One U.S. gallon per hour is equivalent to 3.79 liters per hour.

Filtration Rate: The rate of water flowing through a filter during a given period of time, expressed in U.S. gallons per minute per square foot of effective filter area. One U.S. gallon per minute per square foot is equivalent to 40.75 liters per minute per square meter. FILTRATION FLOW RATE.

Firebox: A chamber in the pool/spa heater where combustion takes place.

Firebrick: A refractory brick capable of sustaining high temperatures.

Fireman's Switch: A mechanism adapted to the time clock that will turn the heater off long enough for it to cool down before the time clock turns the pump off.

Float Valve: A valve controlled by the level of a fluid.

Flocculant (floc): A chemical that causes fine suspended solids in water to combine into large clusters that settle out.

Floor: The interior bottom surface of a pool or spa.

Flow: The rate of the movement of water, typically in gallons per minute. One U.S. gallon per minute is equivalent to 3.79 liters per minute.

Flow Balance Valve: Device that regulates the flow from skimmers, drains, or other outlets.

Flow Meter: A device that measures the rate of flow of water or other liquid through piping.

Flow Rate: The volume of liquid flowing past a given point in a specified time period. Usually expressed as U.S. gallons per minute (GPM) or gallons per hour (GPH). One U.S. gallon per minute is equivalent to 3.79 liters per minute. One U.S. gallon per hour is equivalent to 3.79 liters per hour.

Flow Rider: Pool at a waterpark that uses wave sheet technology for body boarding or body surfing activity.

Flow Switch: A safety device that prevents the equipment from firing if there isn't adequate water flow through the system.

Flume: A trough-like or tubular structure, generally recognized as a water slide, that directs the path of travel and the rate of descent by the rider.

Flume Slide: Slides of various configurations that are characterized by having deep riding channels, vertical and lateral curves, high water flows, and accommodate riders using or not using mats, tubes, rafts, and other transport vehicles. Included but not limited to family raft rides, inner-tube rides, body slides, and speed slides.

Fly Ash: 1. A fine particulate, essentially non-combustible refuse, carried in the gas stream from a furnace. 2. A product used in concrete mixtures. 3. Admixture.

Frame: The structure that defines and/or supports the outline or shape of the aboveground pool wall.

Free Available Chlorine: That portion of the total chlorine that is not combined chlorine and is available as a sanitizer.

Freeboard: The clear vertical distance between the top of the filter medium and the lowest outlet of the upper distribution system in a permanent medium filter.

Freeze-Thaw Cycle: Seasonal weather and temperature changes that can cause stress to a surface.

Friction Head: Head specifically caused by friction or drag.

Friction Water: Resistance created by the liquid passing the inner surface of the conductor pipe and fittings.

Fusible Link (Gas Heater): A thermal safety cut-off device in the control circuitry that melts if temperature parameters are exceeded.

Gallonage: A specific quantity of fluid in terms of gallons. One U.S. gallon is equivalent to 3.79 liters.

Galvanic Action: The creation of electrical current by the process of electro-chemical action of dissimilar metals in a liquid.

Galvanic Corrosion: The deterioration of metal produced when two dissimilar metals are exposed to the electrical current produced by electro-chemical action.

Gate Valve: A device in a pipe that can partially or totally obstruct the flow of water, using an internal "gate" that moves in and out as the valve is operated.

Gelcoat: A colored polyester-resin material applied in liquid form that hardens to a smooth, durable form when applied over a mold.

GFCI: See Ground Fault Circuit Interrupter.

GPD: Gallons per day. One U.S. gallon per day is equivalent to 3.79 liters per day.

GPH: Gallons per hour. One U.S. gallon per hour is equivalent to 3.79 liters per hour.

GPM: Gallons per minute. One U.S. gallon per minute is equivalent to 3.79 liters per minute.

Grab Bar/Rail: Rails used to enter or leave a pool or spa.

Groover: See Jointer.

Ground Clearance: Distance between the surface of the ground and the bottom of the fence. The distance should be small enough to prevent entrapment or entry.

Ground Fault Circuit Interrupter (GFCI): A device intended for the protection of people and/or equipment that functions to de-energize an electrical circuit within an established period of time when current to ground exceeds some pre-determined value (5/1000th of an ampere (0.005)).

Grounding: Connecting to or providing a conducting path to earth or to some conducting body that serves in place of earth.

Gunite: A pneumatically applied (sprayed) concrete that is a dry mixture of cement, aggregate, and/or sand. Water is applied to the mix at the hose nozzle.

Gutter: Overflow trough in the perimeter wall of a pool that is a component of the circulation system or flows to waste.

Hair and Lint Strainer: A device attached on or in front of a pump to which the influent line (suction line) is connected for the purpose of entrapping lint, hair, or other debris that could damage the pump.

Halogen: Any of the family of chemical elements including fluorine, chlorine, bromine, and iodine. Chlorine and bromine are commonly used as sanitizers or oxidizers in recreational water.

Handhold/Handrail: A support device that is intended to be gripped by a user for the purpose of resting or steadying. It is typically located within or at exits to the pool or spa or as part of a set of steps.

Hardness: The amount of calcium and magnesium dissolved in water; measured by a test kit and expressed as parts per million (ppm) of equivalent calcium carbonate.

Hazard: A condition or set of circumstances that has the potential of causing or contributing to injury or death.

Head: A measure of the amount of pressure or resistance in a hydraulic system expressed in "feet." 100 feet of head is equivalent to 296.47 KiloPascal (kPa). 100 feet of head is also equivalent to 3.02 kilograms per square centimeter.

Head Loss: The amount the flow would reduce as the head increases.

Header: A manifold in a heater that directs the flow of water into and out of the heat exchanger.

Heater: Fossil-fueled, electric, or solar device to heat the water of pools or spas.

Direct Electric: Uses resistive heating element placed in line with the circulation system.

Fossil-Fueled: Natural gas, propane gas, or fuel oil. They utilize an open flame to heat a heat exchanger.

Heat Pump: Uses a compressor with a closed freon loop to exchange heat between either the ambient air or external water source with the pool or spa water.

Solar: Uses energy from the sun to heat the collector or through the blanket to heat the water.

Other ways to categorize heaters include:

Direct Heaters that heat the tubes in which water circulates.

Indirect Heaters that circulate steam or hot water inside a heat exchanger through which water flows.

Heat Exchanger: A device with coils, tubes, and plates that takes heat from any liquid, or air, and transfers that heat to another fluid without intermixing the fluids.

Heat Loss: The natural drop in water temperature as heat is transferred to the surrounding air.

Heat Pump: A refrigeration compressor, usually electrically driven, that is operated in reverse. To obtain heat, the evaporator side (cooling coil) is exposed to water, air, or ground. The coil takes the heat from this source and transfers it to the condenser coil where it discharges the heat to the pool/spa to be heated.

Heat Sink: A type of device capable of absorbing and dissipating heat.

High Limit Switch: A temperature control switch that can deactivate a control circuit at a preset temperature. They are normally preset at the factory and are non-adjustable. Some must be manually reset.

High Permeability Element: Mechanically inter-locked, non-woven filter material designed to remove suspended solids.

Hoop: 1. A circular constraint that provides the structural bonding of staves of a hot tub to prevent separating. 2. A device used to secure sections of a filter together.

Hoop Connector: A tightening and connection device.

Horsepower: A unit for expressing the power of motors or engines, equal to a rate of 33,000 foot-pounds per minute. One horsepower is equivalent to 42.41 BTU per minute. One horsepower is also equivalent to 745.7 watts.

Hose Bib: A valve with a threaded connection and specifically used as a hose connection.

Hot Tub/Spa: A warm water reservoir with hydro-massage jets that are manufactured from prefabricated materials at a factory. Hot tubs/spas may be "self-contained," or "non-self-contained." (Refer to ANSI/NSPI-6, Standard for portable spas, latest edition.)

Self-Contained Hot Tub/Spa: A hot tub/spa that has a cabinet that houses the controls, the pump, heater, and filter. Most "portable hot tubs/spas" are made of an acrylic thermoplastic

shell and are surrounded by a cabinet made of wood, alternative wood, or thermoplastic. A "self-contained hot tub/spa" can be moved to another location and reinstalled. A "self-contained hot tub/spa" has all control, water heating and water circulating equipment as an integral part of the product. A "self-contained hot tub/spa" may be permanently wired or cord connected. Also known as a "portable hot tub/spa."

Non-Self-Contained Hot Tub/Spa: A hot tub/spa that is made of an acrylic or thermo-plastic shell molded at the factory to comfortably fit the body's contours. A "non-self-contained hot tub/spa" does not have water heating and circulating equipment as an integral part of the product. "Non-self-contained hot tubs/spas" may employ separate components such as an individual filter, pump, heater and controls, or they may employ assembled combinations of various components.

Hydraulics: Deals with the physical movement of water through the entire circulation system and is concerned with such matters as friction and turbulence generated in the pipes and other components of the system by the moving water.

Hydrochloric Acid (HCl): Also called muriatic acid when diluted. A very strong acid used in pools or spas for pH control and for certain specific cleaning needs. A by-product of the addition of chlorine gas to water. Use extreme caution in handling.

Hypochlorous Acid (HOCl): Formed when any chlorinating product is dissolved in water. This is the most active sanitizing form of chlorine. Its dissociation in water into H⁺ and OCl⁻ is pH dependent.

Hydrogen Peroxide (H₂O₂): Compound consisting of hydrogen and oxygen supplied in an aqueous solution, used as an oxidizer. Will neutralize halogen sanitizer in water.

Hydrostatic Pressure: The pressure created by a depth of water, such as the upward pressure that high ground water may exert on the bottom.

Hydrostatic Relief Valve: A fitting installed in the bottom of the pool that is designed to open automatically or manually to relieve upward ground water pressure by allowing water to flow into the pool or spa.

Hydrotherapy Jet: A fitting that blends air and water, creating a high-velocity turbulent stream of air-enriched water.

Hypobromous Acid (HOBr): A chemical compound that acts as a sanitizer and algicide in water.

Hypochlorinator: A chemical feeder through which liquid solutions of chlorine-bearing chemicals are fed into the pool water at a controlled rate. See Chlorinator.

Hypochlorite: A family of chemical compounds including calcium hypochlorite, lithium hypochlorite, sodium hypochlorite, etc., found in various forms for use as a chlorine carrier in pool/spa water.

Hypochlorite Ion (OCl⁻): The anion from ionization of hypochlorous acid.

Hypochlorous Acid (HOCl): A chemical compound that acts as an algicide. The most powerful sanitizer of chlorine in water.

Impeller: The rotating part of a centrifugal pump that creates the flow of water.

Inertia: The tendency of all matter to persist in its state of rest or uniform motion until acted upon by some external force.

Influent: The water entering a filter or other device.

Ingress: Means of entry.

Inlet Fitting: A pipe that allows water to enter a pool, spa, or hot tub.

Insulator: In electricity, any device that serves as a nonconductor.

Intermediate Pool: Any section of a quiescent water flow between the entry and landing pools in attractions at a waterpark that utilize a series of pools.

Intermittent Ignition Device: An electrical spark device used to ignite a gas heater.

Iodine (I₂): A chemical element that exists as a grayish-black granule in its normal state or as a part of a chemical compound that is a biocidal agent.

Ionization: The process whereby a compound in solution separates into positive ions (cations) and negative ions (anions).

Ionizer: A device that electro-chemically generates metal ions such as silver and/or copper ions from anodes of these metals.

Iron: See Ferric Iron and Ferrous Iron. Isocyanurates: See Chlorinated Isocyanurates. Jets: See Hydrotherapy Jet.

Jointer: Tool used to prepare, make, or simulate joints in concrete flat work. Tool used to smooth out coping joints or brick joints. GROOVER.

Joist: See Chine Joist.

Jump Board: A premanufactured diving board that has a coil spring, leaf spring, or comparable device located beneath the board that is activated by the force exerted by jumping on the board's end.

Jumping Jet: A hydraulic device used in fountains to fluctuate the stream of water by blowing through the stream of water with another stream of water to deflect its flow. Can also be accomplished with air.

Kicker: A block of wood attached to formwork to take the thrust from other formwork. To stabilize forms commonly placed at the bottom of forms to prevent spreading during concrete placement.

Kilowatt: A unit of power equal to 1000 watts. One kilowatt is equivalent to 56.89 BTU per minute. One kilowatt is also equivalent to 1.341 horsepower.

Kilowatt Hour: A unit of work or energy equal to that expended by one kilowatt in an hour. One kilowatt hour is equivalent to 3413 BTU. One kilowatt hour is also equivalent to 3.6 million joules.

Ladder: A structure for ingress/egress that usually consists of two long parallel side pieces joined at intervals by crosspieces (treads).

Ladders for aboveground/onground pools consist of the following; also see the latest edition of NSPI-4 Aboveground/Onground Residential Swimming Pools:

"A-Frame" Ladder: An entry ladder that straddles an aboveground/onground pool wall and is either removable or has a built-in entry limiting feature.

Double Access Ladder (Type A): An "A-Frame" ladder that straddles the pool wall of an aboveground pool and provides ingress and egress and is intended to be removed when not in use.

Limited Access Ladder (Type B): An "A-Frame" ladder that straddles the pool wall of an aboveground/onground pool. Type B ladders are removable and have a built-in feature that prevents entry to the pool when the pool is not in use.

Staircase Ladder (Type C): A "ground to deck" staircase ladder that allows access to an aboveground pool deck and has a built-in entry-limiting feature.

"In-pool" Staircase Ladder (Type E): Located in the pool to provide a means of ingress and egress from the pool to the deck.

Landing Pool: Pool at a waterpark that is located at the end of a flume that is designed to safely receive the rider of an attraction.

Langelier Index: A numerical calculation, based on the Langelier water balance equation, that indicates whether the water may be corrosive or scale forming. See Saturation Index.

Leaching: The extracting of a soluble substance from some material, commonly tannic acid from redwood or cedar in hot tubs or a mineral extracted from plaster.

Lifeguard: A qualified person who is responsible for supervision and lifesaving at a pool.

Lifeline: An anchored line thrown to aid in rescue.

Line Level: A small spirit level that can be suspended from a stringline.

Liner: See Vinyl Liner.

Liquid Acid (HCl): Chemical used to lower pH and total alkalinity, most commonly muriatic acid.

Liquid Chlorine: See Sodium Hypochlorite.

Liquid Propane Gas: The liquid form of propane gas, a heavy hydrocarbon occurring naturally in petroleum.

Lithium Hypochlorite (LiOCl): A white solid used as a sanitizer and oxidizer in pools and spas that has a pH of approximately 9 and that typically contains 35% available chlorine.

Lower Distribution System: A device used in the bottom of a permanent medium filter to collect water during filtering and distribute it during backwashing (underdrain).

Magnesium Hardness: A measure of the amount of magnesium dissolved in water and expressed in parts per million (ppm) or milligrams per liter (mg/L) as calcium carbonate.

Main Drain: An outlet located at the bottom of a pool or spa to conduct water to the recirculating pump.

Make-Up Water: Water used to fill or refill a pool/spa. SOURCE WATER.

Manifold: A pipe with several openings for making multiple connections.

Manometer: An instrument that measures vacuum or pressure differential.

Manufactured Diving Equipment: Manufactured diving equipment shall include diving boards, jump boards, springboards, and starting platforms. Architectural features such as decorative rocks and elevated bond beams are not considered to be manufactured diving equipment.

Marcite®: Marcite® is a registered trademark of Paddock of California, Inc. See Plaster.

Maximum Pool User Load: The maximum number of people allowed in a pool/spa at any one time.

Mechanical Seal: A device to prevent the passage of water in or out of a centrifugal pump at the motor shaft.

Medical Facility Pool: Special purpose pool used by a medical institution.

Mesh Restraining Barrier/Fence: A combination of materials, including fabric, posts, and other hardware to form a barrier around a swimming pool (or other areas).

Micron: One millionth of a meter. Used to describe the size of particles that filters are capable of trapping.

Microorganism: A microscopic plant or animal life. Usually refers to bacteria, protozoa, and algae in the water.

Millivolt: A measure of electrical potential equal to one thousandth of a volt.

Millivolt Ignition (Flame): Heat from a continuous pilot is used to generate electrical energy that opens the main gas valve.

Moment: A point at which load or stress can cause bending in a structural member.

Motor: A machine for converting electrical energy into mechanical energy. When electrical current is supplied to a series of wires (windings), a magnetic field is created that spins the rotor and shaft to drive a pump impeller.

Mottling: A different coloration of plaster similar to the shading difference of cumulus clouds with no apparent pattern. A blotch, spot, or streak of different shades of color, usually in a variegated pattern.

Multiple Function Filter: CONTROL VALVE. See Multiport Valve.

Multiport Valve: A device that allows for the multidirectional control of the passage or flow of water through a system.

Muriatic Acid (HCl): A commercial name for hydrochloric acid.

National Sanitation Foundation (NSF International): An independent, nonprofit organization of scientists, engineers, educators, and others engaged in research and testing and in the development of standards in selected public health and environmental areas.

National Swimming Pool Foundation (NSPF): A nonprofit organization dedicated to research and education in aquatic safety.

Natural Gas: Admixture of gaseous hydrocarbons, chiefly methane, occurring naturally underground, often in association with petroleum products.

Negative Edge: See Vanishing Edge.

Nitrogen (N₂): An element present in ammonia, sweat, urine, fertilizers, and a variety of personal care products and environmental sources. When inadvertently introduced into pools or spas it readily reacts with chlorine to form chloramines.

Non-Swimming Area: Any portion of a pool where water depth, off-set ledges, or other irregularities prevent normal swimming activities.

Non-Toxic: Generally having no adverse physiological effect on human beings or other living organisms.

Ohm: A unit of measure of electrical resistance.

Ohm's Law: An electrical relation between volts, amperes, and ohms that can be expressed as follows: $\text{amps} = \text{volts}/\text{ohms}$, or $\text{current} = \text{voltage}/\text{resistance}$, or $I=E/R$.

Organic Matter: Carbon-based substances, generally originating from living organisms, often introduced to pools or spas by bathers and the environment. For example, perspiration, urine, saliva, suntan oil, cosmetics, lotions, and dead skin.

Organisms: Plant or animal life. Usually refers to algae or bacteria-like growth in pool water.

Orifice: An opening in a device, usually calibrated in size, through which water, air, or gas flows.

Orifice Plate: A disk, placed in a water flow line, with a concentric, sharp-edged circular opening in the center that creates a differential pressure to measure flow and to operate feeders and instruments or other hydraulic equipment.

ORP: See Oxidation Reduction Potential.

Orthotolidine (OTO): A colorless reagent that reacts with chlorine or bromine to produce yellow-to-orange colors that indicate the amount of total chlorine or bromine in water. OTO measures total

chlorine. Because OTO is a suspected carcinogen and very acidic, use caution when handling this chemical.

Outdoor Stack: A type of equipment to be used on outdoor heaters in areas of extreme, constant winds.

Outlet: The aperture or fitting through which the water flows from the pool, spa, or hot tub.

Outlet, Suction: See Suction Outlet.

Overflow Gutter: The gutter around the top perimeter of the pool/spa, which is used to skim the surface of the water and carry off the waste or collect it for return to the filters.

Overflow System: Refers to removal of pool/spa surface water through the use of overflows and surface water collection systems of various design and manufacture.

Oxidation-Reduction Potential (ORP): A measure of the oxidation-reduction potential of chemicals in water. It is generally measured in millivolts by means of an electronic meter and depends upon the types and concentrations of oxidizing and reducing chemicals in the water.

Oxidizers: Products used to destroy organic and inorganic contaminants in water.

Ozone (O₃): A gaseous molecule composed of three (3) atoms of oxygen that is generated on site and used for oxidation of water contaminants. It can also be used to regenerate bromine from bromide ions and as a supplemental contact sanitizer in conjunction with an EPA-registered sanitizer that provides a constant residual.

Ozone Contact Concentration: The amount of ozone that is dissolved in pool/spa water.

Ozone Generator: A device that produces ozone, generally exposing oxygen or air to corona discharge or ultraviolet light.

Ozone, Low Output Generating Equipment (Ozonator): Refers to units that will produce ozone in air at a concentration less than 500 ppm. Usually this term will refer to ultraviolet (UV) generators.

Parts Per Million (PPM): The unit of measurement used in chemical testing that indicates the parts by weight in relation to one million parts by weight of water. It is essentially identical to the term milligrams per liter (mg/L) in pool water.

Pass Through: Openings between vertical pickets of a fence.

Pathogens: Disease-causing microorganisms.

Pathological Agents: Toxins, microbes, etc. capable of causing diseases.

Permanently Installed Swimming Pool: A pool that is constructed in the ground or in a building in such a manner that it cannot be readily disassembled for storage.

pH: A value used to express acidity of a substance. Expressed as a number on a scale of 0 to 14, with 7.0 being neutral; values less than 7.0 are acidic and values greater than 7.0 are basic.

Phenol Red: A pH indicator used in water analysis in the range between 6.8 and 8.4 The color changes from yellow to red to purple as pH increases.

pH Meter: An electronic device that measures pH by means of a pH electrode immersed in the water to be tested.

Pilot Flame Generator: The component in a milli-volt system that transforms heat from the pilot into electrical energy. THERMAL COUPLING, THERMOCOUPLE.

Pilot Light: A small permanent flame used to ignite gas at the burner.

Pinching Hazard: Any configuration of component that may pinch the user.

Pitting: A form of etching or the deterioration of the integrity of the surface.

Plaster: Mixture of portland cement, water and sand; used as an interior and exterior wall finish material. Variety of finishes and ornamental designs may be formed with plaster.

Polyvinyl Chloride (PVC): Thermoplastic resin commonly used for pool piping and plumbing components and pool liners.

Pool: A body of water contained in a reservoir used for recreational purposes. See Residential Pool. See Commercial/Public Pool.

Pool Slide: An attraction having a configuration as defined in The Code of Federal Regulations (CFR) Ch. II, Part 1207, or is similar in construction to a playground slide used to allow users to slide from an elevated height to a pool.

Pool User: Any person using a pool and adjoining deck area for the purpose of water activities or other related activities.

Potable Water: Water that is safe and satisfactory for drinking.

Potassium Monopersulfate (KHSO₅): A solid oxidizer used to prevent the build-up of contaminants in pool and spa water. POTASSIUM PEROXYMONOSULFATE.

Pozzolan: Siliceous and/or aluminous material in cement that reacts with calcium hydroxide when finely divided to improve cementitious value. May be mixed with portland cement. Also is an admixture.

Precipitate: A substance separating out in the form of solid particles from a liquid. A result of a chemical or physical change that settles out or remains as a haze in suspension (turbidity).

Pre-Coat: The coating of filter aid on the septum of a diatomaceous earth type filter at the beginning of each filter cycle.

Pre-Coat Feeder: A chemical feeder designed to inject filter agents such as diatomaceous earth into a filter in sufficient quantity to coat the filter septum at the start of a filter run.

Pressure: A type of force that is exerted uniformly in all directions. It is expressed as pounds per square inch, feet of liquid, or feet of head.

Pressure Differential: The difference in pressure between two parts of a hydraulic system, such as the influent and effluent of a filter.

Pressure Gauge: Instrument for measuring pressure in a closed system.

Pressure Switch (Heater): A device that will not allow the equipment to operate unless there is adequate water pressure in the system.

Pressure Test: A test for leaks in a closed system.

Primary Structural Members: Any part of the aboveground/onground pool structure that carries or retains any static load or stress caused by water pressure, surge, and/or natural forces, and for the reasonable foreseeable use.

Priming: A term used to define re-establishing the water flow by the recirculating pump.

PSI: Pounds per square inch. One pound per square inch is equivalent to 6.89 KiloPascal (kPa). One pound per square inch is also equivalent to 70.3 grams per square centimeter.

Public Pool: See Commercial/Public Pool.

Pump: A mechanical device, usually powered by an electric motor, that causes hydraulic flow and pressure for the purpose of filtration, heating, and circulation of the pool or spa water. Typically, a centrifugal pump design is used for pools, spas, or hot tubs.

Pump Capacity: The volume of liquid a pump is capable of moving during a specified period of time against a given total head.

Pump Curve: A graph of performance characteristics of a given pump under varying horsepower, flow, and resistance factors. Used in checking and sizing a pump.

Pump Strainer: A device, placed on the suction side of a pump, that contains a removable strainer basket designed to trap debris in the water flow with a minimum of flow restriction. Sometimes referred to as a hair/lint pot or trap.

Puncture Hazard: Any protrusion that is capable of causing injury to skin.

Push-pull Valve: A device that allows for the dual directional control or flow of water through a system.

Quaternary Ammonium (QUAT): Organic compound of ammonia used as an algistat and an algicide.

Radius of Curvature: The curved surface from the springline (vertical sidewall) to the pool bottom.
WALL COVE.

Rated Pressure: The pressure rating specified for a piece of equipment.

Rate of Flow: The quantity of water flowing past a point within a specified time, such as the number of gallons flowing in one minute (GPM). One gallon per minute is equivalent to 3.79 liters per minute.

Reagents: The chemical used to test various aspects of water quality.

Rebar: See Reinforcing Bar.

Recessed Treads: A series of vertically spaced cavities in a pool/spa wall creating tread areas for step holes.

Recirculation System: See Circulation System.

Reinforcing Bar: Steel rod with deformed surface. Used to reinforce concrete construction. The deformations of the steel rods interlock with the concrete mix to give a structure the required tensile strength. REBARS.

Relay: A device that responds to a current or voltage change by activating switches or other devices in an electric circuit.

Remodel: To install cosmetic changes, accessory add-ons, or modernizations. Includes both residential and commercial installations.

Remote Switch: Any device used to activate/deactivate an apparatus from a distance.

Removable: Capable of being easily disassembled or removed.

Renovate: Material alteration. The activity of restoring all or part of a pool or spa structure and its component parts including the rebuilding and/or replacing of worn and broken components. See Remodel.

Residential Pool: Any pool that is intended for non-commercial use as a swimming pool by three (3) families or less and their guests and that is over twenty-four inches (24") (60.96 centimeters) in water depth and has a volume greater than 3250 gallons (12,301.25 liters). (Refer to ANSI/NSPI-5, Standard for residential inground swimming pools, latest edition.)

Residential Aboveground Swimming Pool — Type O: A pool of any shape that has a minimum water depth of thirty-six inches (36") (0.91 meters) and a maximum water depth of forty-eight inches (48") (1.22 meters) at the wall. The wall is located on the surrounding ground and is capable of being disassembled or stored and reassembled to its original integrity. Diving and the use of a water slide are prohibited (Refer to ANSI/NSPI-4, Standard for aboveground/onground residential swimming pools, latest edition). See Residential On-ground Swimming Pool.

Residential Onground Swimming Pool — Type O: A pool package whose walls rest fully on the surrounding ground and has an excavated area below the ground level where diving and the use of a water slide are prohibited. (Refer to ANSI/NSPI-4, Standard for aboveground/onground residential swimming pools, latest edition). The slope adjacent to the shallow area shall have a maximum slope of 3:1, and the slope adjacent to the sidewalls shall have a maximum slope of 1:1. See Residential Aboveground Swimming Pool.

Type I-V: Residential pools suitable for the installation of diving equipment by type.

Type O: Residential pools where the installation of diving equipment is prohibited.

Residual: The measurable sanitizer present in water.

Response Time: The time between recognition of pool user distress and rescue by a lifeguard.

Return Inlet: The aperture or fitting through which the water under positive pressure returns into a pool or spa.

Return Piping: The piping that is referred to as effluent, returning water to the pool or spa.

Reverse Circulation: The name given to a water circulation system in which water is taken from the surface and returned through inlets at the bottom of the pool or spa.

Rimflow Overflow System: Perimeter overflow system in which the overflow rim is at the same elevation as the deck.

Ring Buoy: A ring-shaped floating buoy capable of supporting a user. Usually attached to a throwing line.

Risk: The possibility of suffering harm or loss.

Rope and Float Line: A continuous line not less than one-fourth inch (1/4") (6.35 millimeters) in diameter that is supported by buoys and attached to opposite sides of a pool to separate the deep and shallow ends.

Runout: That part of a waterslide where riders are intended to decelerate and/or come to a stop. The runout is a continuation of the waterslide flume surface.

Salinity: The salt content of water.

Sand Filter: A filter using sand or sand and gravel as a filter medium.

Saturation Index: A number that indicates whether water will have a tendency to deposit calcium carbonate from a solution, or whether it will be potentially corrosive. Five factors are used in the computation: pH, total alkalinity, calcium hardness, temperature, and TDS. When correctly balanced, the water will be neither scale-forming nor corrosive.

Scale: The precipitate that forms on surfaces in contact with water when the calcium hardness, pH, or total alkalinity levels are too high.

Screed: In cement masonry flatwork, the wood or metal straightedge used to strike off or level newly placed concrete.

Sealant: A substance that is applied on a surface or between surfaces to prevent the entry of moisture.

Seat (Underwater): An underwater ledge that is placed completely inside the perimeter shape of the pool; generally located in the shallow end of the pool. BENCH (UNDERWATER).

Secondary Structural Members: Any part of the aboveground/onground pool structure that is not subject to load caused by water pressure.

Sediment Trap: A device used on gas piping and other systems to collect sediment and moisture.

Self Priming: A rating given to centrifugal pumps indicating that the pump is capable of operating above pool water level, after initial filling with water.

Septum: Part of a diatomite-type filter element consisting of cloth, wire screen, or other porous material on which filter aid is deposited.

Sequestering Agent: A chemical that combines with metals keeping them in solution and preventing them from depositing on and staining pool surfaces. Some sequestering agents are chelating agents.

Service Factor: The degree to which an electric motor can be operated above its rated horsepower without danger of overload failure.

Shallow Areas: Portions of a pool or spa with water depths less than five feet (5') (1.52 meters).

Shock Treatment: The practice of adding significant amounts of an oxidizing chemical to water to destroy inorganic and organic contaminants in water.

Shotcrete: 1. Shotcrete wet is a pneumatically applied mixture of sand, cement, aggregate and water and pumped wet through a nozzle where air is added.

2. Shotcrete dry is a mixture of sand and cement, blown through a nozzle where water is added. Both methods are used as a method of building the concrete floors and walls of swimming pools or water features.

Shut-Off Head: The pressure developed in a centrifugal or axial flow pump when there is zero flow through the system; the amount of head against which the pump can no longer circulate water. CUT OFF HEAD.

Sight Barrier: A fence system that prevents entry but allows visual observation. See Barrier.

Signal Word: A visual alerting device in the form of a decal or label placard or other marking such as an embossing, stamping, etching, or other process that advises the observer of the nature and degree of the potential hazard(s) that can cause property damage, injury, or death. It can also provide safety precautions or evasive actions to take, or provide other directions to eliminate or reduce the hazard. Aquatic safety signage shall conform to specifications as described in the ANSI Z-535 series of standards on product safety signs and labels.

Signal word: to convey the gravity of the risk

Consequences: what are likely to happen if the warning is not heeded

Instructions: appropriate behavior to reduce or eliminate the hazard

CAUTION: Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

DANGER: Danger indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING: Warning indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

Silica Fume: A fine particulate that is used as an additive to improve the strength and abrasion resistance in concrete products. Silica fume is a byproduct of the reduction of high-purity quartz with coal in electric furnaces in the production of silicon and ferrosilicon alloys.

Single-Phase Current: Electrical alternating current flow that reaches one peak in each direction per cycle.

Skimmer: A device installed in the pool or spa that permits the removal of floating debris and surface water to the filter.

Skimmer Cover: A removable lid to close deck opening to the skimmer housing.

Skimmer Equalizer Pipe: Connection from skimmer housing to the pool, spa, or hot tub below the weir and sized to satisfy pump demand and prevent air lock or pump loss of prime.

Skimmer Equalizer Valve: A device on the equalizer line that operates to draw water from the equalizer line when water level inside the skimmer body drops below operating level.

Skimmer Housing: Structure that attaches to or contains skimmer weir, strainer basket, float valve, and other devices used in the skimming operation.

Skimmer Weir: Part of a skimmer that adjusts automatically to small changes in water level to ensure a continuous flow of water to the skimmer.

Slip Resisting: A surface that has been so treated or constructed to significantly reduce the chance of a user slipping. The surface shall not be an abrasion hazard.

Slope: An inclined surface.

Slump: A measurement of water in concrete. A low-slump concrete has a stiff consistency.

Slurry: A free-flowing, pumpable suspension of fine, solid material in liquid.

Smooth: Having a surface free from irregularities, roughness, or projections. EVEN.

Soda Ash: See Sodium Carbonate.

Sodium Bicarbonate (NaHCO₃): Also baking soda or sodium hydrogen carbonate. A white powder (pH= 8.3) used to raise total alkalinity in water.

Sodium Bisulfate (NaHSO₄): Also known as dry acid. A granule used to lower pH and/or total alkalinity in water.

Sodium Carbonate (Na₂CO₃): A white powder used to raise pH of the water.

Sodium Dichlor (Sodium Dichloro-Isocyanurate) (C₃N₃O₃Cl₂Na): Contains between 56% and 64% available chlorine. Sanitizer product that is self-stabilizing due to release of free available chlorine and cyanuric acid when they dissolve. SODIUM DICHLORO-S-TRIAZINETRIONE.

Sodium Hypochlorite (NaCl): A clear liquid form of an inorganic chlorine compound obtainable in concentrations of 5% to 16% available chlorine. LIQUID CHLORINE, BLEACH.

Sodium Thiosulfate (Na₂S₂O₃): A chemical used to neutralize chlorine.

Soft Water: Water that has a low calcium and magnesium content.

Solar Panel: See Collector.

Soot: A black, powdery, carbonaceous substance created by improper air-fuel mixture in combustion of fossil fuels. Soot is a by-product of incomplete combustion.

Spa: A warm water reservoir permanently installed with hydromassage jets that are constructed out of concrete (gunite, shotcrete, etc.). Spas may or may not be attached to a pool.

Permanent Residential Spa: A spa in which the water heating and water circulating equipment is not an integral part of the product. The spa shall be intended as a permanent plumbing fixture and shall not be intended to be moved. (Refer to ANSI/NSPI -3, Standard for permanently installed residential spas, latest edition.)

Public Spa: Any spa other than a permanent residential spa or hot tub that is intended to be used for bathing and is operated by an owner, licensee, concessionaire, regardless of whether a fee is charged for use. (Refer to ANSI/NSPI-2, Standard for public spas, latest edition.)

Hydrotherapy Spa: A unit having a therapeutic use, but that is not drained, cleaned, or refilled for each individual. It includes, but is not limited to hydrotherapy jet circulation, hot water, cold water mineral baths, air induction bubbles, or any combination thereof. Industry terminology for a spa includes, but is not limited to (1) a therapeutic pool, (2) a hydrotherapy pool, (3) a whirlpool, (4) a hot spa, etc. NSPI standards exclude facilities used by or under direct supervision and control of licensed medical personnel.

Spalling (Concrete or Plaster): The separation of the top layer of cement-rich material, exposing the underlying aggregate layer.

Spa User: Any person using a spa and adjoining deck area for the purpose of water activity or other related activity.

Special Purpose Pool: A pool intended to be used exclusively for a specific activity, such as instruction diving, competition, or medical treatment.

Splash Pool: A pool having a water depth not exceeding 18 inches (18") (0.46 meters) that has as its intended primary use random play by small children. The pool could include constructed play devices including small flume type water slides and other play devices. CHILDREN'S ACTIVITY POOL. See Catch Pool.

Splasher (Wader) Pools: A splasher pool shall have a maximum water depth of thirty-six inches (36") (0.91 meters). These pools are not intended to be covered within the scope of NSPI standards.

Spray Pool: A pool or basin occupied by constructed features that spray water in various arrays for the purpose of wetting the persons playing in the spray streams. Maximum depth of accumulated water in the pool or basin area is six inches (6") (15.24 centimeters).

Springline: A line from which the pool wall breaks from vertical and begins its radius arc of the curvature.

Stabilizer: See Cyanuric Acid.

Stairs: A series of steps, each consisting of a riser and a tread.

Static Head: Head resistant caused by the weight of a standing water column to be moved. It is encountered on both the suction and discharge side.

Static Suction Head: The vertical distance in feet (meters) between the pump centerline and the level of the liquid being pumped when the liquid is below the impeller centerline, expressed in feet of head.

Static Suction Lift: Vertical distance in feet (meters) from center line of the pump impeller to pool water level.

Steps: See Stairs.

Story Pole: A pole marked to measure vertical heights during construction and to set elevations.

Strainer Basket: Readily removable, perforated, or otherwise porous container used in the pump lint strainer to catch coarse material.

Structural Crack: A break or split that weakens the structural integrity of the pool.

Suction Head: The head, in feet, that a pump must provide on the inlet side to raise the liquid from the pool/spa supply well to the level of the pump.

Suction Outlet: The aperture or fitting, other than a skimmer, on the side wall of a swimming pool or spa through which the water under negative pressure (vacuum) is drawn from the pool or spa to the pump or circulation system.

Suction Piping (Influent): The piping that is connected to the suction side of the pump.

Superchlorination: The practice of adding a sufficient amount of a chlorinating compound to reduce cloudy water, slime formation, musty odors, algae and bacteria counts, and/or improve the ability to maintain sanitizer residuals.

Surface Checks: Spider-webbing pattern in a surface. Not all the way through, not an open crack.

Surface Crack: A repairable break in the surface, not major, not self-curing.

Surface Skimming System: A device or system installed in the pool/spa that permits the removal of floating debris and surface water to the filter.

Surge: Displacement of water in a pool — static and dynamic. WAVE ACTION.

Surge Capacity: The storage volume in a surge chamber, gutter, and plumbing lines. See System Capacity.

Surge Chamber: A storage vessel within the pool recirculating system used to absorb the water displaced by bathers. SURGE PIT.

Swimmer Load: See Bather Load.

Swimming Area: Area of pool in excess of three feet (3') (0.91 meters) in depth that is devoted to swimming.

Swimout: An underwater seat area that is placed completely outside of the perimeter shape of the pool. When located at the deep end, swimouts are permitted to be used as the deep-end means of entry/exit of the pool. LOVE SEAT.

System Surge Capacity: The total storage, including surge chamber, gutter system and piping, within the pool recirculating system used to absorb the water displaced by bathers.

Tamperproof: Requiring tools to alter or remove portions of the equipment. VANDAL-PROOF.

Tangent: Straight line or curve that contacts an arc or curve at one point only.

Temperature Factor (TF): Used when determining the saturation index.

Temperature Rise: The difference between the desired water temperature and the temperature of the body of water.

10/20 Rule: A pool or aquatic facility shall be provided with a qualified lifeguard or a number of lifeguards trained and stationed in a manner that will permit them to identify an incident or trauma within ten (10) seconds of its initiation. Upon identification of the incident or trauma, the guard shall be able to respond to and initiate indicated protocol appropriate to the circumstance within twenty (20) additional seconds.

Test Kit: Equipment used to determine specific chemical residual and physical properties of water.

Texture: The visual or tactile condition of a surface.

Therm: A unit of thermal measurement equal to 100,000 BTUs.

Thermostat: A temperature-controlling device that cycles the heater on and off to maintain the desired temperature.

Three-Phase Current: Current flow that reaches a peak in each direction three times during a cycle.

Time Clock: A device that automatically controls the periods that a pump, filter, heater, blower, and other electrical devices are in operation.

Titration: A method for measuring alkalinity, hardness, available chlorine or other such chemical parameters by measured addition of reagents that yield a foreseeable end point as indicated by a change in color.

Top Coat: See Plaster.

Top Rail: The part of the frame located on top of or adjacent to the outer edges of the above-ground/onground pool wall.

Total Alkalinity: A measure of the pH buffering capacity of water. Alkalinity is generally expressed in terms of the equivalent concentration of calcium carbonate in mg/L (or ppm).

Total Alkalinity (TA) Factor: Used when determining the saturation index.

Total Chlorine: The sum of both the free available and combined chlorines.

Total Dissolved Solids (TDS): The measure of the total amount of dissolved matter in water.

Total Dynamic Head: See Feet Of Head.

Toxic: A substance having an adverse physiological effect on human beings or other living organisms.

Transfer System: A device, or combination of devices, that include a platform, steps, and other structures to facilitate user access to a pool.

Transition: Any point(s) on the floor of a pool where the angle/slope changes.

Tread Contact Surface: Foot contact surfaces of a ladder, step, stair, or ramp.

Trichloro: A form of organic chlorine, most commonly found in compressed form (tablets or sticks).

Trichloro-Iso-Cyanurate (C₃N₃O₃Cl₃): Sanitizer product that is self-stabilizing due to release of free available chlorine and cyanuric acid when it dissolves. A form of organic chlorine that reacts with water to form 90% available chlorine and cyanuric acid. TRICHLORO-S-TRIAZINETRIONE. See *Iso-cyanurates*.

Tsunami Pool: A wave pool designed to generate a single transitional wave in each cycle. These pools are characterized by strong cross currents and counter currents after the passage of each wave. The operating pattern for the Tsunami pool produces a single wave form at frequencies ranging from several seconds to several minutes.

Tube Ride: A gravity flow attraction found at a waterpark designed to convey riders on an inner tube-like device through a series of chutes, channels, flumes, or pools.

Turbidity: Cloudy condition of water due to the presence of extremely fine particulate materials in suspension that interfere with the passage of light.

Turnover Rate: The period of time (usually in hours) required to circulate a volume of water equal to the pool or spa capacity.

Two-Speed Pump: A centrifugal pump that has a motor that operates at two different speeds.

Ultra-Violet Light: A component of sunlight and can be generated artificially. Ultra-violet light stimulates many types of organic molecules to become chemically reactive and can decompose a variety of chemical species. UV light-generating devices may be used as a supplemental sanitizer to inactivate microorganisms. UV light is often characterized as UV- A, UV-B, or UV-C, indicating wave lengths of 315 – 400 nanometers (nm), 290 – 315 nm, and 220 – 290 nm, respectively.

Underwater Ledge: A narrow shelf projecting from the side of a vertical structure whose dimensions are defined in the appropriate standard.

Underwater Light: A fixture designed to illuminate from beneath the water surface.

Wet Niche Light: A watertight and watercooled light unit placed in a submerged niche in a pool, spa, or hot tub wall and accessible only from the interior.

Dry Niche Light: A light unit placed behind a watertight window in the pool, spa, or hot tub wall.

Upper Distribution System: Those devices designed to distribute the water entering a permanent medium filter in a manner to prevent movement or migration of the filter medium. Also collects water during filter backwashing unless other means are provided.

Upright Support: That portion of the frame that is adjacent to the aboveground/onground wall in a vertical position that supports the top rail and braces the wall.

Usable Perimeter: The perimeter of a pool that is available for ingress and egress. Perimeter areas available only to staff or for emergency situations are not included.

User: Any person engaging in water activities or related activities at a pool, spa, or hot tub, including the adjoining deck.

User Load: The total number of persons permitted in the pool/spa complex at any given time. See Bather Load.

Vacuum: The reduction of atmospheric pressure within a pipe, tank, pump, or other vessel. Vacuum is measured in inches of mercury. One inch of mercury is equivalent to 1.13 Feet of Head One inch of mercury is also equivalent to 345.3 kilograms per square meter.

Vacuum Filter: A filter through which water is pulled by a pump mounted on the effluent side of the filter.

Valve: Any device in a pipe that will partially or totally obstruct the flow of water (such as a ball, gate, globe, or butterfly valve) or permit flow in one direction only (as with a check or foot valve).

Vanishing Edge: Water-feature detail in which water flows over the edge of at least one of the pool walls and is collected in a catch basin. NEGATIVE EDGE.

Velocity: The speed at which a liquid flows between two specified points, expressed in feet per second. One foot per second is equivalent to 0.30 meters per second.

Velocity Head: When applied to a hydraulic system, a measurement of resistance or pressure that is equal to the height of a column of water than would cause the same pressure or resistance. Velocity

head = $v^2/(2g)$. The principal factors of “head” are vertical distances and resistance due to friction of the flow of water against the walls of a pipe or vessel.

Venting (Heaters): The system responsible for the introduction of air for combustion and for dispersal of the flue products.

Venturi Jet: See Hydrotherapy Jet.

Venturi Tube: A tube mounted in a circulation line so as to cause restrictions of flow. The restriction causes a pressure differential that is used to measure flow rate or to operate hydraulic chemical feeders such as sanitizers, clarifiers, etc.

Vertical Wall: A wall that may slope outward up to 11° (eleven degrees) from plumb.

Vinyl Liner: A suitable material constructed of vinyl or vinyl compounds that acts as a container for water when used in conjunction with a structural support system.

Voltage: The measure of electrical potential or electromotive force in units called volts.

Volume: The capacity of a specified container (e.g., a pool or spa) expressed in gallons or liters. One U.S. gallon is equivalent to 3.79 liters.

Wading Pool: A pool that has a shallow depth used for wading.

Waler: A horizontal bracing member used in form construction. RANGER, WHALER.

Wall: The surface of a vertical barrier.

Wall Closure: The fastening device(s) that connect the aboveground wall ends together.

Warning: See Signal Word.

Waste Water Disposal System: All water disposal systems approved by the authority having jurisdiction, such as a storm sewer, sanitary sewer, open pit, leach field, or irrigation system.

Waterline: The waterline shall be defined in one of the following ways: 1. Skimmer System: The water-line shall be at the midpoint of the operating range of the skimmers when there are no users in the pool or spa. 2. Overflow System: The waterline shall be at the top of the overflow rim.

Water Pressure Switch: See Pressure Switch.

Watt: The measure of electrical power computed by multiplying voltage times current (volts x amperes). Equal to 1/746 of one horsepower unit.

Watt Density: The amount of watts generated in a heating element per inch. The lower the amount of watts per square inch, the lower the density. One square inch is equivalent to 6.45 square centimeters.

Wave Pool Caisson: A large chamber used in wave generation. This chamber houses pulsing water and air surges in the wave generation process and is not meant for human occupancy.

Weir: See Skimmer Weir.

Wet Niche Light: See Underwater Light.

White Coat: See Plaster.

Winterized Liner: A vinyl liner that is manufactured with sufficient plasticizers to withstand exposure to its rated lowest temperature or $-20\text{ }^{\circ}\text{F}$ (-28.89 degrees Celsius) per ASTM standard D-1790-99, Standard test method for brittleness temperature of plastic sheeting by impact, 2001, or latest edition.

Winterizing: Preparation of pools and spas for cold or freezing weather.

Wrinkle: A small ridge or crease in an otherwise smooth vinyl liner.

Zero Entry: See Beach Entry.

USE OF ELEMENTAL CHLORINE

1. GENERAL

Chlorine is one of the chemical elements. The gas has a characteristic odor and greenish yellow color and is about two and one-half (2-1/2) times as heavy as air. Chlorine is shipped in Department of Transportation specification steel containers; standard sizes contain either 100 or 150 pounds (45 or 68 kg) of chlorine. In the cylinder the chlorine has both a liquid and a gas phase. All cylinders are equipped with the Chlorine Institute standard chlorine cylinder valve.

Chlorine is a "hazardous material" subject to Department of Transportation requirements. When used for pool disinfection, chlorine is considered a pesticide and as such is subject to pertinent regulations of the U.S. Environmental Protection Agency, as well as various state agriculture and environmental regulations.

Users of chlorine must be trained as to the proper procedures for handling chlorine and as to appropriate emergency procedures.

2. EQUIPMENT AND INSTALLATION

- 2.1 Chlorination equipment should be located so that equipment failure or malfunction will have minimum effect on evacuation of pool patrons in an emergency.
- 2.2 Elemental chlorine feeders (chlorinators) should be activated by a booster pump using recirculated water supplied via the recirculation system. The booster pump should be interlocked to the filter pump to prevent feeding of chlorine when the recirculation pump is not running.
- 2.3 The chlorinator, cylinders of chlorine and associated equipment should be housed in a reasonably gas-tight and corrosion-resisting housing having a floor area adequate for the purpose. Cylinders should always be stored in an upright position and properly secured.
- 2.4 All enclosures should be located at or above ground level. The enclosure should be provided with: ducts from the bottom of the enclosure to the atmosphere in an unrestricted area, a motor-driven exhaust fan capable of producing at least one air change per minute, and louvers of good design near the top of the enclosure for admitting fresh air. Warning signs should be posted on the doors. It is recommended that the doors to the chlorine room should open away from the pool.
- 2.5 Electrical switches for the control of artificial lighting and ventilation should be on the outside of the enclosure adjacent to the door.
- 2.6 Contents of a chlorine cylinder can be determined only by weight; therefore, facilities should include a scale suitable for weighing the cylinders. Changing cylinder(s) should be accomplished only after weighing proves contents of cylinder to be exhausted. Care must be taken to prevent water suck-back into the cylinder when empty by closing the cylinder valve.
- 2.7 Connections from the cylinders to the system depend on the type of chlorinator to be used and should comply with the chlorinator manufacturer's recommendation.
- 2.8 It is recommended that an automatic chlorine leak detector and alarm be installed in the chlorinator room.

Continued...

- 2.9 Respirators approved by the National Institute for Occupational Safety and Health (NIOSH) should be provided for protection against chlorine. It is recommended that at least one approved self-contained breathing apparatus be provided. Respiratory equipment should be mounted outside the chlorine enclosure. Occupational Safety and Health Administration (OSHA) regulations require training and maintenance programs for respirators.
- 2.10 Containers may be stored indoors or outdoors. Full and empty cylinders should be segregated and appropriately tagged. Storage conditions should: (a) minimize external corrosion, (b) be clean and free of trash, (c) not be near an elevator or ventilation system, (d) be away from elevated temperatures or heat sources.

3. OPERATIONAL PROCEDURES

- 3.1 A specific person should be made responsible for chlorination operations and should be trained in the performance of routine operations including emergency procedures and leak control procedures.
- 3.2 Chlorine cylinders must be handled with care. Valve protection caps and valve outlet caps should be in place at all times except when the cylinder is connected for use. Cylinders must not be dropped and should be protected from falling objects. Cylinders should be used on a first-in, first-out basis. New, approved washers should be used each time a cylinder is connected.
- 3.3 It is recommended that a safety wall chart be posted in or near the chlorine enclosure and a second chart in the pool office near the telephone. Such charts are available from many suppliers and from the Chlorine Institute, 1300 Wilson Blvd., Rosslyn, VA 22209. The telephone number of the chlorine supplier should be shown on this chart.
- 3.4 Although chlorine suppliers make every effort to furnish chlorine in properly conditioned cylinders, chlorine gas leaks may still occur. Pool personnel should be informed about leak control procedures and consideration should be given to providing a Chlorine Institute Emergency Kit A.
- 3.5 Chlorine suppliers are equipped with a Chlorine Institute Emergency Kit A, that contains devices for capping leaks at cylinder valves and some leaks that occur in the cylinder wall. Further information on these kits and training slides demonstrating their use are available from the Chlorine Institute.
- 3.6 As soon as a container is empty, the valve should be closed and the lines disconnected. The outlet cap should be applied promptly and the valve protection hood attached. The open end of the disconnected line should be plugged or capped promptly to keep atmospheric moisture out of the system.
- 3.7 To find a chlorine gas leak, use a plastic bottle containing 26E BE Ammonia capable of releasing only vapors when squeezed. A white cloud will result if there is any chlorine leakage. Never use water on a chlorine leak.

For additional information, contact The Chlorine Institute, Inc., 1300 Wilson Blvd., Rosslyn, VA 22209, (703) 741-5760, and request a copy of the "Chlorine Manual" and the wall chart entitled "Handling Chlorine Cylinders & Ton Containers."