



**CHAPTER3**  
**GENERAL COMPLIANCE**    
**SECTION301**  
**GENERAL**

**301.1 Scope.**

The provisions of this chapter shall govern the [general design and construction of public and residential pools and spas and related piping, equipment, and materials](#). Provisions that are unique to a specific type of pool or spa are located in Chapters 4 through 10.

**301.1.1 Application of Chapters 4 through 10.**

Where differences occur between the provisions of this chapter and the provisions of Chapters 4 through 10, the provisions of Chapters 4 through 10 shall apply.

**SECTION302**  
**ELECTRICAL, PLUMBING, MECHANICAL AND**  
**FUEL GAS REQUIREMENTS**

**302.1 Electrical.**

Electrical requirements for aquatic facilities shall be in accordance with NFPA 70 or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

**Exception:** Internal wiring for portable *residential* spas and portable *residential* exercise spas.

**302.2 Water service and drainage.**

Piping and fittings used [for water service, makeup and drainage piping for pools and spas](#) shall comply with the *International Plumbing Code*. Fittings shall be *approved* for installation with the piping installed.

**302.3 Pipe, fittings and components.**

Pipe, fittings and components shall be *listed* and *labeled* in accordance with NSF 50 or NSF 14. Plastic jets, fittings, and outlets used in public spas shall be *listed* and *labeled* in accordance with NSF 50.

**Exceptions:**

1. 1.Portable *residential* spas and portable *residential* exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.
2. 2.[Onground storable pools](#) supplied by the pool manufacturer as a kit that includes all pipe, fittings and components.

**302.4 Concealed piping inspection.**

Piping, including process piping, that is installed in trenches, shall be inspected prior to backfilling.

**302.5 Backflow protection.**

[Water supplies for pools and spas](#) shall be protected against backflow in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

**302.6 Waste-water discharge.**

[Where waste water from pools and spas, backwash from filters and water from deck drains discharge to the building drainage system, such installation](#) shall be in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

**302.7 Tests.**

[Tests on water piping systems constructed of plastic piping](#) shall not use compressed air for the test.

**302.8 Maintenance.**

[Pools and spas](#) shall be maintained in a clean and sanitary condition, and in good repair.

**302.8.1 Manuals.**

An operating and maintenance manual in accordance with industry-accepted standards shall be provided for each piece of equipment requiring maintenance.

**SECTION303**  
**ENERGY**

**303.1 Energy consumption of pools and permanent spas.**

The energy consumption of pools and permanent spas shall be controlled by the requirements in Sections 303.1.1 through 303.1.3.

**303.1.1 Heaters.**

The electric power to heaters shall be controlled by a readily accessible on-off switch that is an integral part of the heater, mounted on the exterior of the heater or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

**303.1.2 Time switches.**

Time switches or other control methods that can automatically turn off and on heaters and [pump motors according to a preset schedule](#) shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

**Exceptions:**

1. 1.Where public health standards require 24-hour pump operation.
2. 2.[Pumps that operate solar- or waste-heat recovery pool heating systems](#).

**303.1.3 Covers.**

[Outdoor heated pools and outdoor permanent spas](#) shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means in accordance with Section 104.11.

**Exception:** Where more than 70 percent of the energy for heating, computed over an operating season, is from site-recovered energy such as from a heat pump or solar [energy source, covers or other vapor-retardant means](#) shall not be required.

**303.2 Portable spas.**

The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP 14.

**303.3 Residential pools and permanent residential spas.**

The energy consumption of *residential* swimming pools and permanent *residential* spas shall be controlled in accordance with the requirements of APSP 15.

**SECTION304**  
**FLOOD HAZARD AREAS**

**304.1 General.**

The provisions of Section 304 shall control [the design and construction of pools and spas installed in flood hazard areas](#).

**[BS]304.2 Determination of impacts based on location.**

[Pools and spas located in flood hazard areas](#) indicated within the *International Building Code* or the *International Residential Code* shall comply with Section 304.2.1 or 304.2.2.

**Exception:** Pools and spas located in riverine [flood hazard areas](#) that are outside of designated floodways and pools and spas located in [flood hazard areas](#) where the source of flooding is tides, storm surges or coastal storms.

**[BS]304.2.1 Pools and spas located in designated floodways.**

Where pools and spas are located in designated floodways, documentation shall be submitted to the code official that demonstrates that the construction of the pools and spas will not increase the design flood elevation at any point within the jurisdiction.

**[BS]304.2.2 Pools and spas located where floodways have not been designated.**

Where pools and spas are located where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates that the proposed pool or spa and any associated grading and filling, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the jurisdiction.

**[BS]304.3 Pools and spas in coastal high-hazard areas.**

Pools and spas installed in coastal high-hazard areas shall be designed and constructed in accordance with ASCE 24.

**[BS]304.4 Protection of equipment.**

Equipment shall be elevated to or above the design flood elevation or be anchored to prevent flotation and protected to prevent water from entering or accumulating within the components during conditions of flooding.

**304.5 GFCI protection.**

Electrical equipment installed below the design flood elevation shall be supplied by branch circuits that have ground-fault circuit interrupter protection for personnel.

## **SECTION 305 BARRIER REQUIREMENTS**

**305.1 General.**

The provisions of this section shall apply to the design of barriers for pools and spas. These design controls are intended to provide protection against the potential drowning and near drowning by restricting access to such pools or spas. These requirements provide an integrated level of protection against potential drowning through the use of physical barriers and warning devices.

**Exceptions:**

1. 1. Spas and hot tubs with a lockable safety cover that complies with ASTM F 1346.
2. 2. Swimming pools with a powered safety cover that complies with ASTM F 1346.

**305.2 Outdoor swimming pools and spas.**

Outdoor pools and spas and indoor swimming pools shall be surrounded by a barrier that complies with Sections 305.2.1 through 305.7.

**305.2.1 Barrier height and clearances.**

Barrier heights and clearances shall be in accordance with all of the following:

1. 1. The top of the barrier shall be not less than 48 inches (1219 mm) above grade where measured on the side of the barrier that faces away from the pool or spa. Such height shall exist around the entire perimeter of the barrier and for a distance of 3 feet (914 mm) measured horizontally from the outside of the required barrier.
2. 2. The vertical clearance between grade and the bottom of the barrier shall not exceed 2 inches (51 mm) for grade surfaces that are not solid, such as grass or gravel, where measured on the side of the barrier that faces away from the pool or spa.
3. 3. The vertical clearance between a surface below the barrier to a solid surface, such as concrete, and the bottom of the required barrier shall not exceed 4 inches (102 mm) where measured on the side of the required barrier that faces away from the pool or spa.
4. 4. Where the top of the pool or spa structure is above grade, the barrier shall be installed on grade or shall be mounted on top of the pool or spa structure. Where the barrier is mounted on the top of the pool or spa, the vertical clearance between the top of the pool or spa and the bottom of the barrier shall not exceed 4 inches (102 mm).

**305.2.2 Openings.**

Openings in the barrier shall not allow passage of a 4-inch-diameter (102 mm) sphere.

**305.2.3 Solid barrier surfaces.**

Solid barriers that do not have openings shall not contain indentations or protrusions that form handholds and footholds, except for normal construction tolerances and tooled masonry joints.

**305.2.4 Mesh fence as a barrier.**

Mesh fences, other than chain link fences in accordance with Section 305.2.7, shall be installed in accordance with the manufacturer's instructions and shall comply with the following:

1. 1. The bottom of the mesh fence shall be not more than 1 inch (25 mm) above the deck or installed surface or grade.
2. 2. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not permit the fence to be lifted more than 4 inches (102 mm) from grade or decking.
3. 3. The fence shall be designed and constructed so that it does not allow passage of a 4-inch (102 mm) sphere under any mesh panel. The maximum vertical clearance from the bottom of the mesh fence and the solid surface shall not be more than 4 inches (102 mm) from grade or decking.
4. 4. An attachment device shall attach each barrier section at a height not lower than 45 inches (1143 mm) above grade. Common attachment devices include, but are not limited to, devices that provide the security equal to or greater than that of a hook-and-eye-type latch incorporating a spring-actuated retaining lever such as a safety gate hook.
5. 5. Where a hinged gate is used with a mesh fence, the gate shall comply with Section 305.3.
6. 6. Patio deck sleeves such as vertical post receptacles that are placed inside the patio surface shall be of a nonconductive material.
7. 7. Mesh fences shall not be installed on top of onground residential pools.

**305.2.5 Closely spaced horizontal members.**

Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is less than 45 inches (1143 mm), the horizontal members shall be located on the pool or spa side of the fence. Spacing between vertical members shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width. Where there are decorative cutouts within vertical members, spacing within the cutouts shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm) in width.

**305.2.6 Widely spaced horizontal members.**

Where the barrier is composed of horizontal and vertical members and the distance between the tops of the horizontal members is 45 inches (1143 mm) or more, spacing between vertical members shall not exceed 4 inches (102 mm). Where there are decorative cutouts within vertical members, the interior width of the cutouts shall not exceed 1<sup>3</sup>/<sub>4</sub> inches (44 mm).

**305.2.7 Chain link dimensions.**

The maximum opening formed by a chain link fence shall be not more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm). Where the fence is provided with slats fastened at the top and bottom which reduce the openings, such openings shall be not more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm).

**305.2.8 Diagonal members.**

Where the barrier is composed of diagonal members, the maximum opening formed by the diagonal members shall be not more than 1<sup>3</sup>/<sub>4</sub> inches (44 mm). The angle of diagonal members shall be not greater than 45 degrees (0.79 rad) from vertical.

**305.2.9 Clear zone.**

There shall be a clear zone of not less than 36 inches (914 mm) between the exterior of the barrier and any permanent structures or equipment such as pumps, filters and heaters that can be used to climb the barrier.

**305.2.10 Poolside barrier setbacks.**

The pool or spa side of the required barrier shall be not less than 20 inches (508 mm) from the water's edge.

**305.3 Gates.**

Access gates shall comply with the requirements of Sections 305.3.1 through 305.3.3 and shall be equipped to accommodate a locking device. Pedestrian access gates shall open outward away from the pool or spa, shall be self-closing and shall have a self-latching device.

**305.3.1 Utility or service gates.**

Gates not intended for pedestrian use, such as utility or service gates, shall remain locked when not in use.

### 305.3.2 Double or multiple gates.

Double gates or multiple gates shall have at least one leaf secured in place and the adjacent leaf shall be secured with a self-latching device. The gate and barrier shall not have openings larger than  $\frac{1}{2}$  inch (12.7 mm) within 18 inches (457 mm) of the latch release mechanism. The self-latching device shall comply with the requirements of Section 305.3.3.

### 305.3.3 Latches.

Where the release mechanism of the self-latching device is located less than 54 inches (1372 mm) from grade, the release mechanism shall be located on the pool or spa side of the gate not less than 3 inches (76 mm) below the top of the gate, and the gate and barrier shall not have openings greater than  $\frac{1}{2}$  inch (12.7 mm) within 18 inches (457 mm) of the release mechanism.

### 305.4 Structure wall as a barrier.

Where a wall of a dwelling or structure serves as part of the barrier and where doors or windows provide direct access to the pool or spa through that wall, one of the following shall be required:

1. Operable windows having a sill height of less than 48 inches (1219 mm) above the indoor finished floor and doors shall have an alarm that produces an audible warning when the window, door or their screens are opened. The alarm shall be *listed* and *labeled* as a water hazard entrance alarm in accordance with UL 2017. In dwellings or structures not required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located 54 inches (1372 mm) or more above the finished floor. In dwellings or structures required to be Accessible units, Type A units or Type B units, the operable parts of the alarm deactivation switches shall be located not greater than 54 inches (1372 mm) and not less than 48 inches (1219 mm) above the finished floor.
2. A safety cover that is *listed* and *labeled* in accordance with ASTM F 1346 is installed for the pools and spas.
3. An approved means of protection, such as self-closing doors with self-latching devices, is provided. Such means of protection shall provide a degree of protection that is not less than the protection afforded by Item 1 or 2.

### 305.5 Onground residential pool structure as a barrier.

An onground residential pool wall structure or a barrier mounted on top of an onground residential pool wall structure shall serve as a barrier where all of the following conditions are present:

1. Where only the pool wall serves as the barrier, the bottom of the wall is on grade, the top of the wall is not less than 48 inches (1219 mm) above grade for the entire perimeter of the pool, the wall complies with the requirements of Section 305.2 and the pool manufacturer allows the wall to serve as a barrier.
2. Where a barrier is mounted on top of the pool wall, the top of the barrier is not less than 48 inches (1219 mm) above grade for the entire perimeter of the pool, and the wall and the barrier on top of the wall comply with the requirements of Section 305.2.
3. Ladders or steps used as means of access to the pool are capable of being secured, locked or removed to prevent access except where the ladder or steps are surrounded by a barrier that meets the requirements of Section 305.
4. Openings created by the securing, locking or removal of ladders and steps do not allow the passage of a 4-inch (102 mm) diameter sphere.
5. Barriers that are mounted on top of onground residential pool walls are installed in accordance with the pool manufacturer's instructions.

### 305.6 Natural barriers.

In the case where the pool or spa area abuts the edge of a lake or other natural body of water, public access is not permitted or allowed along the shoreline, and required barriers extend to and beyond the water's edge not less than 18 inches (457 mm), a barrier is not required between the natural body of water shoreline and the pool or spa.

### 305.7 Natural topography.

Natural topography that prevents direct access to the pool or spa area shall include but not be limited to mountains and natural rock formations. A natural barrier approved by the governing body shall be acceptable provided that the degree of protection is not less than the protection afforded by the requirements of Sections 305.2 through 305.5.

## SECTION 306 DECKS

### 306.1 General.

Decks shall be designed and installed in accordance with the *International Residential Code* or the *International Building Code*, as applicable in accordance with Section 102.7.1, except as provided in this section.

### 306.2 Slip resistant.

Decks, ramps, coping, and similar step surfaces shall be slip resistant and cleanable. Special features in or on decks such as markers, brand insignias, and similar materials shall be slip resistant.

### 306.3 Step risers and treads.

Step risers for decks of public pools and spas shall be uniform and have a height not less than  $3\frac{3}{4}$  inches (95 mm) and not greater than  $7\frac{1}{2}$  inches (191 mm). The tread distance from front to back shall be not less than 11 inches (279 mm). Step risers for decks of residential pools and spas shall be uniform and shall have a height not exceeding  $7\frac{1}{2}$  inches (191 mm). The tread distance from front to back shall be not less than 10 inches (254 mm).

### 306.4 Deck steps handrail required.

Public pool and spa deck steps having three or more risers shall be provided with a handrail.

### 306.5 Slope.

The minimum slope of decks shall be in accordance with Table 306.5 except where an alternative drainage method is provided that prevents the accumulation or pooling of water. The slope for decks, other than wood decks, shall be not greater than  $\frac{1}{2}$  inch per foot (1 mm per 24 mm) except for ramps. The slope for wood and wood/plastic composite decks shall be not greater than  $\frac{1}{4}$  inch per 1 foot (1 mm per 48 mm). Decks shall be sloped so that standing water will not be deeper than  $\frac{1}{8}$  inch (3.2 mm), 20 minutes after the cessation of the addition of water to the deck.

### MINIMUM DRAINAGE SLOPES FOR DECK SURFACES

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

### 306.6 Gaps.

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

### 306.6.1 Maximum gap.

The open gap between pool decks and adjoining decks or walkways, including joint material, shall be not greater than  $\frac{3}{4}$  inch (19.1 mm). The difference in vertical elevation between the pool deck and the adjoining sidewalk shall be not greater than  $\frac{1}{4}$  inch (6.4 mm).

### 306.7 Concrete joints.

Isolation joints that occur where the pool coping meets the concrete deck shall be water tight.

### 306.7.1 Joints at coping.

Joints that occur where the pool coping meets the concrete deck shall be installed to protect the coping and its mortar bed from damage as a result of the anticipated movement of adjoining deck.

### 306.7.2 Crack control.

Joints in a deck shall be provided to minimize visible cracks outside of the control joints caused by imposed stresses or movement of the slab.

### 306.7.3 Movement control.

Areas where decks join existing concrete work shall be provided with a joint to protect the pool from damage caused by relative movement.

### 306.8 Deck edges.

TABLE 306.5  
MINIMUM DRAINAGE SLOPES FOR DECK SURFACES

SURFACE	MINIMUM DRAINAGE SLOPE (INCH PER FOOT)
Carpet	1/2
Exposed aggregate	1/4
Textured, hand-finished concrete	1/8
Travertine/brick-set pavers, public pools or spas	3/8
Travertine/brick-set pavers, residential pools or spas	1/8
Wood	1/8
Wood/plastic composite	1/8

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

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

### 306.9 Valves under decks.

Valves installed in or under decks shall be accessible for operation, service, and maintenance. Where access through the deck walking surface is required, an access cover shall be provided for the opening in the deck. Such access covers shall be slip resistant and secured.

#### 306.9.1 Hose bibbs.

Hose bibbs shall be provided for rinsing down the entire deck and shall be installed in accordance with the *International Plumbing Code* or *International Residential Code*, as applicable in accordance with Section 102.7.1, and shall be located not more than 150 feet (45 720 mm) apart. Water-powered devices, such as water-powered lifts, shall have a dedicated hose bibb water source.

**Exception:** *Residential* pools and spas shall not be required to have hose bibbs located at 150-foot (45 720 mm) intervals, or have a dedicated hose bibb for water-powered devices.

## SECTION 307 GENERAL DESIGN

### 307.1 General.

The provisions of this section apply to all [pools and spas](#).

**Exception:** The provisions of Sections 307.3 through 307.6 do not apply to *listed and labeled* portable *residential* spas and *listed and labeled* portable *residential* exercise spas.

### 307.2 Glazing in hazardous locations.

Hazardous locations for glazing shall be as defined in the *International Building Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1 of this code. Where glazing is determined to be in a hazardous location, the requirements for the glazing shall be in accordance with those codes, as applicable.

### 307.3 Materials.

[Pools and spas and appurtenances thereto](#) shall be 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 cleanable surface without cracks or joints, excluding structural joints, or that will provide a watertight structure to which a smooth, easily cleaned surface/finish is applied or attached. Material surfaces that come in contact with the user shall be finished, so that they do not constitute a cutting, pinching, puncturing or abrasion hazard under casual contact and intended use.

#### 307.3.1 Beach pools.

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

#### 307.3.2 Compatibility.

Assemblies of different materials shall be chemically and mechanically compatible for their intended use and environment.

### 307.4 Materials and structural design.

[Pools and spas](#) shall conform to one or more of the standards indicated in Table 307.4. The structural design of [pools and spas](#) shall be in accordance with the *International Building Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1 of this code.

TABLE 307.4  
RESERVOIRS AND SHELLS

MATERIAL	STANDARD
Fiberglass reinforced plastic	IAPMO Z124.7
Plastic	IAPMO Z124.7
Stainless steel (Types 316, 316L, 304, 304L)	ASTM A 240
Tile	ANSI A108/A118/A136.1
Vinyl	ASTM D 1593

#### 307.4.1 Installation.

[Equipment for pools and spas](#) shall be supported to prevent damage from misalignment and settling and located so as to allow access for inspection, servicing, removal and repair of component parts.

### 307.5 Freeze protection.

In climates subject to freezing [temperatures, outdoor pool and spa shells and appurtenances](#), piping, filter systems, pumps and motors, and other components shall be designed and constructed to provide protection from damage from freezing.

### 307.6 Surface condition.

The surfaces within [public pools and spas](#) intended to provide footing for users shall be slip resistant and shall not cause injury during normal use.

### 307.7 Colors and finishes.

The colors, patterns, or finishes [of the pool or spa interior](#) shall not obscure objects or surfaces within the pool or spa.

**Exception:** *Residential* pools and spas.

### 307.8 Roofs or canopies.

Roofs or canopies over pools and spas shall be in accordance with the *International Building Code* or *International Residential Code*, as applicable in accordance with Section 102.7.1 and shall be constructed so as to prevent water runoff into the pool or spa.

### 307.9 Accessibility.

An accessible route to [public pools and spas](#) shall be provided in accordance with the *International Building Code*. Accessibility within [public pools and spas](#) shall be provided as required by the accessible recreational facilities provisions of the *International Building Code*. Accessibility for [pools and spas accessory to detached one-](#) and two-family dwellings and townhouses not more than three stories in height shall be provided where required by the *International Residential Code*.

## SECTION 308 DIMENSIONAL DESIGN

### 308.1 Floor slope.

The slope of the floor from the point of the first slope change to the deep area shall not exceed one unit vertical in three units horizontal (33-percent slope).

**Exception:** Portable *residential* spas and portable *residential* exercise spas.

### 308.2 Walls.

Walls shall intersect with the floor at an angle or a transition profile. Where a transitional profile is provided at water depths of 3 feet (914 mm) or less, a transitional radius shall not exceed 6 inches (152 mm) and shall be tangent to the wall and is permitted to be tangent to or intersect the floor.

#### Exceptions:

1. 1. Portable *residential* spas and portable *residential* exercise spas.
2. 2. *Onground storable pools*.

### 308.3 Shape.

This code is not intended to regulate the shape of a pool or spa other than to take into account the effect that a given shape will have on the safety of the occupants and to maintain the minimum required level of circulation to ensure sanitation.

### 308.4 Waterline.

The *design waterline* shall have a maximum construction tolerance at the time of completion of the work of plus or minus 1/4 inch (6.4 mm) for pools and spas with adjustable weir surface skimming systems, and plus or minus 1/8 inch (3.2 mm) for pools and spas with nonadjustable surface skimming systems.

## SECTION 309 EQUIPMENT

### 309.1 Electrically operated equipment.

Electrically operated equipment shall be *listed* and *labeled* in accordance with applicable product standards.

**Exception:** Portable *residential* spas and portable *residential* exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.

### 309.2 Treatment and circulation system equipment.

Treatment and circulation system equipment for public pools and spas shall be *listed* and *labeled* in accordance with NSF 50 and other applicable standards.

## SECTION 310 SUCTION ENTRAPMENT AVOIDANCE

### 310.1 General.

Suction entrapment avoidance for pools and spas shall be provided in accordance with APSP 7.

#### Exceptions:

1. 1. Portable spas and portable exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.
2. 2. Suction entrapment avoidance for wading pools shall be provided in accordance with Section 405.

## SECTION 311 CIRCULATION SYSTEMS

### 311.1 General.

The provisions of this section shall apply to circulation systems for pools and spas.

#### Exceptions:

1. 1. Portable *residential* spas and portable *residential* exercise spas.
2. 2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes circulation system equipment that is in accordance with Section 704.

### 311.2 System design.

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

**Exception:** Separate filtering systems are not required for *residential pools and spas*.

#### 311.2.1 Turnover rate.

The equipment shall be sized to turn over the volume of water that the pool or spa is capable of containing as specified in this code for the specific installation.

#### 311.2.2 Servicing.

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

#### 311.2.3 Equipment anchorage.

Pool and spa equipment and related piping shall be designed and installed in accordance with the manufacturer's instructions.

### 311.3 Water velocity.

The water velocity in return lines shall not exceed 8 feet (2.4 m) per second. The water velocity in suction piping shall be as required by Section 310.

### 311.4 Piping and fittings.

Plastic pipe and fittings used in circulation systems shall be nontoxic and shall be able to withstand the design operating pressures and conditions of the pool or spa. Plastic pipe shall be *listed* and *labeled* as complying with NSF 14. Circulation system piping shall be *listed* and *labeled* as complying with one of the standards in Table 311.4.

TABLE 311.4  
CIRCULATION SYSTEM PIPE MATERIAL STANDARD

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 1527
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D 2846; CSA B137.6
Copper or copper-alloy tubing	ASTM B 88; ASTM B 447
Polyvinyl chloride (PVC) hose	ASTM D 1785; ASTM D 2241; ASTM D 2672; CSA B137.3
Polyvinyl chloride (PVC) plastic pipe	ASTM D 1785; CSA B137.3
Stainless steel pipe, Types 304, 304L, 316, 316L	ASTM A 312

#### 311.4.1 Fittings.

Fittings used in circulation systems shall be *listed* and *labeled* as complying with one of the standards in Table 311.4.1.

##### Exceptions:

1. Suction outlet fitting assemblies and manufacturer-provided components certified in accordance with APSP 16.
2. Skimmers and manufacturer-provided components.
3. *Gutter* overflow grates and fittings installed above or outside of the overflow point of the pool or spa.

TABLE 311.4.1  
CIRCULATION SYSTEM FITTINGS

MATERIAL	STANDARD
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 1527
Chlorinated polyvinyl chloride (CPVC) plastic pipe and tubing	ASTM D 2846; ASTM F 437; ASTM F 438; ASTM F 439; CSA B137.6
Copper or copper-alloy tubing	ASME B 16.15
Polyvinyl chloride (PVC) plastic pipe	ASTM D 2464; ASTM D 2466; ASTM D 2467; CSA B137.2; CSA B137.3
Stainless steel pipe, Types 304, 304L, 316, 316L	ASTM A 182; ASTM A 403

#### 311.4.2 Joints.

Joints shall be made in accordance with manufacturer's instructions.

#### 311.4.3 Piping subject to freezing.

Piping subject to damage by freezing shall have a uniform slope in one direction and shall be equipped with valves for drainage or shall be capable of being evacuated to remove the water.

#### 311.4.4 Suction outlet fitting assemblies.

Suction outlet fitting assemblies shall be *listed* and *labeled* in compliance with APSP 16.

#### 311.5 System draining.

Equipment shall be designed and fabricated to drain the water from the equipment, together with exposed face piping, by removal of drain plugs, manipulating valves, or by other methods. Drainage shall be in accordance with manufacturer's specifications.

#### 311.6 Pressure or vacuum gauge.

Gauges shall be provided on the circulation system for public pools. Gauges shall be provided with ready access.

1. A pressure gauge shall be located downstream of the pump and between the pump and filter.
2. A vacuum gauge shall be located between the pump and filter and upstream of the pump.

#### 311.7 Flow measurement.

Public swimming pools and wading pools shall be equipped with a flow-measuring device that indicates the rate of flow through the filter system. The flow rate measuring device shall indicate gallons per minute (lpm) and shall be selected and installed to be accurate within plus or minus 10 percent of actual flow.

#### 311.8 Instructions.

Written operation and maintenance instructions shall be provided for the circulation system of public pools.

#### 311.9 Hydrostatic pressure test.

Circulation system piping, other than that integrally included in the manufacture of the [pool or spa](#), shall be subjected to a hydrostatic pressure test of 25 pounds per square inch (psi) (172.4 kPa). This pressure shall be held for not less than 15 minutes.

## SECTION 312 FILTERS

#### 312.1 General.

The provisions of this section apply to filters [for pools and spas](#).

##### Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. [Onground storable pools](#) supplied by the pool manufacturer as a kit that includes a filter that is in accordance with Section 704.

#### 312.2 Design.

Filters shall have a flow rating equal to or greater than the design flow rate of the system. Filters shall be installed in accordance with the manufacturer's instructions. Filters shall be designed so that filtration surfaces can be inspected and serviced.

#### 312.3 Internal pressure.

For pressure-type filters, a means shall be provided to allow the release of internal pressure.

##### 312.3.1 Air release.

Filters incorporating an automatic means of internal air release as the principal means of air release shall have one or more lids that provide a slow and safe release of pressure as a part of the design and shall have a manual air release in addition to an automatic release.

##### 312.3.2 Separation tanks.

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

## SECTION 313 PUMPS AND MOTORS

#### 313.1 General.

The provisions of this section apply to pumps [and motors for pools and spas](#).

##### Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas.
2. [Onground storable pools](#) supplied by the pool manufacturer as a kit that includes a pump and motor that is in accordance with Section 704.

#### 313.2 Performance.

A pump shall be provided for circulation of the pool water. The pump shall be capable of providing the flow required for filtering the pool water and filter cleaning, if applicable, against the total dynamic head developed by the complete system.

#### 313.3 Intake protection.

A cleanable strainer, skimmer [basket, or screen shall be provided for pools and spas, upstream](#) or as an integral part of circulation pumps, to remove solids, debris, hair, and lint on pressure filter systems.

#### 313.4 Location.

Pumps and motors shall be accessible for inspection and service in accordance with the manufacturer's specifications.

#### 313.5 Safety.

The design, construction, and installation of pumps and component parts shall be in accordance with the manufacturer's specifications.

### 313.6 Isolation valves.

Shutoff valves shall be installed on the suction and discharge sides of pumps that are located below the waterline. Such valves shall be provided with access.

### 313.7 Emergency shutoff switch.

An emergency shutoff switch shall be provided to disconnect power to recirculation and jet system pumps and air blowers. Emergency shutoff switches shall be: provided with access; located within sight of the pool or spa; and located not less than 5 feet (1524 mm) horizontally from the inside walls of the pool or spa.

**Exception:** *Onground storable pools, permanent inground residential swimming pools, residential spas and residential water features.*

### 313.8 Motor performance.

Motors shall comply with UL 1004-1, UL 1081, CSA C22.2 No. 108 or the relevant motor requirements of UL 1563 or CSA C22.2 No. 218.1, as applicable.

## SECTION 314 RETURN AND SUCTION FITTINGS

### 314.1 General.

The provisions of this section apply to return and suction fittings for pools and spas

**Exception:** Portable residential spas and portable residential exercise spas.

### 314.2 Entrapment avoidance.

Entrapment avoidance means shall be provided in accordance with Section 310.

### 314.3 Flow distribution.

The suction outlet fitting assemblies, where installed, and the skimming systems shall each be designed to accommodate 100 percent of the circulation turnover rate.

#### 314.3.1 Multiple systems.

Where multiple systems are used in a single pool to meet this requirement, each subsystem shall proportionately be designed such that the maximum design flow rates cannot be exceeded during normal operation.

### 314.4 Return inlets.

One return inlet shall be provided for every 300 square feet (27.9 m<sup>2</sup>) of pool surface area, or fraction thereof.

**Exception:** *Onground storable pools.*

#### 314.4.1 Design.

Return and suction fittings for the circulation system shall be designed so as not to constitute a hazard to the bather.

### 314.5 Vacuum fittings.

Where installed, submerged vacuum fittings shall be accessible and shall be located not greater than 12 inches (305 mm) below the water level.

## SECTION 315 SKIMMERS

### 315.1 General.

The provisions of this section apply to skimmers for pools and spas.

#### Exceptions:

1. Portable residential spas and portable residential exercise spas.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes a skimming system that is in accordance with Section 704.

### 315.2 Required.

A surface skimming system shall be provided for public pools and spas. Surface skimming systems shall be listed and labeled in accordance with NSF 50. Either a surface skimming system or perimeter overflow system shall be provided for permanent inground residential pools and permanent residential spas. Where installed, surface skimming systems shall be designed and constructed to create a skimming action on the pool water surface when the water level in the pool is within operational parameters.

#### Exceptions:

1. Class D public pools designed in accordance with Chapter 6.
2. Skimmers that are an integral part of a spa that has been listed and labeled in accordance with UL1563 shall not be required to be listed and labeled in accordance with NSF 50.

#### 315.2.1 Circulation systems.

Public pool circulation systems shall be designed to process not less than 100 percent of the turnover rate through skimmers.

### 315.3 Skimmer sizing.

Where automatic surface skimmers are used as the sole overflow system, not less than one surface skimmer shall be provided for the square foot (square meter) areas, or fractions thereof, indicated in Table 315.3. Skimmers shall be located to maintain effective skimming action.

TABLE 315.3  
SKIMMER SIZING TABLE

POOL OR SPA	AREA PER SKIMMER (SQ. FT)
Public pool	500
Residential pool	800
Spas (all types)	150

For SI: 1 square foot = 0.0929 m<sup>2</sup>.

### 315.4 Perimeter coverage.

Where a perimeter-type surface skimming system is used as the sole surface skimming system, the system shall extend around not less than 50 percent of the pool or spa perimeter.

#### 315.4.1 Surge capacity.

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

### 315.5 Equalizers.

Equalizers on skimmers shall be prohibited.

### 315.6 Hazard.

Skimming devices shall be designed and installed so as not to create a hazard to the user.

**SECTION316**  
**HEATERS**



**316.1 General.**

The provisions of this section apply to [heaters for pools and spas](#).

**Exception:** Portable *residential* spas and portable *residential* exercise spas.

**316.2 Listed and labeled.**

Heaters shall be *listed* and *labeled* in accordance with the applicable standard listed in Table 316.2.

**TABLE 316.2**  
**WATER HEATERS**

DEVICE	STANDARD
Electric water heater	UL 1261, UL 1563 or CSA C22.2 No. 218.1
Gas-fired water heater	ANSI Z21.56/CSA 4.7a
Heat exchanger	NSF 50
Heat pump water heater	UL 1995, AHRI 1160, CSA C22.2 No. 236
Photovoltaic solar water heaters	NSF 50
Thermal radiant solar water heater	NSF 50

**316.3 Sizing.**

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

**316.4 Installation.**

Heaters shall be installed in accordance with the manufacturer's specifications and the *International Fuel Gas Code*, *International Mechanical Code*, *International Energy Conservation Code*, NFPA 70 or *International Residential Code*, as applicable in accordance with Section 102.7.1.

**316.4.1 Temperature.**

A means shall be provided to monitor water temperature.

**316.4.2 Access prohibited.**

For [public pools and spas](#), public access to controls shall be prohibited.

**316.5 Heater circulation system.**

Heater circulation systems shall comply with Sections 316.5.1 and 316.5.2.

**316.5.1 Water flow.**

Water flow through the heater bypass piping, back-siphonage protection, and the use of heat sinks shall be in accordance with the heater manufacturer's specifications.

**316.5.2 Pump delay.**

Where required by the manufacturer, heaters shall be installed with an automatic device that will ensure that the pump continues to run after the heater shuts off for the time period specified by the manufacturer.

**SECTION317**  
**AIR BLOWER AND AIR INDUCTION SYSTEM**

**317.1 General.**

This section applies to devices and systems [that induce or allow air to enter pools and spas either by](#) means of a powered pump or passive design.

**317.2 Backflow prevention.**

Air blower systems shall be equipped with backflow protection as specified in UL 1563 or CSA C22.2 No. 218.1.

**317.3 Air intake source.**

Air intake sources shall not induce water, dirt or contaminants.

**317.4 Sizing.**

Air induction systems shall be sized in accordance with the manufacturer's specifications.

**317.5 Inspection and service.**

Air blowers shall be provided with access for inspection and service.

**SECTION318**  
**WATER SUPPLY**

**318.1 Makeup water.**

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

**318.2 Protection of potable water supply.**

Potable water supply systems shall be designed, installed and maintained so as to prevent contamination from nonpotable liquids, solids or gases being introduced into the potable water supply through cross-connections or other piping connections to the system. Means of protection against backflow in the potable water supply shall be provided through an air gap complying with ASME A112.1.2 and the *International Residential Code* or the *International Plumbing Code*, as applicable in accordance with Section 102.7.1.

**318.3 Over-the-rim spouts.**

Over-the-rim spouts shall be located under a diving board, adjacent to a ladder, or otherwise shielded so as not to create a hazard. The open end of such spouts shall not have sharp edges and shall not protrude more than 2 inches (51 mm) beyond the edge of the pool. The open end shall be separated from the water by an air gap of not less than 1.5 pipe diameters measured from the pipe outlet to the rim.

**SECTION319**  
**SANITIZING EQUIPMENT**

**319.1 Equipment standards.**



Sanitizing equipment installed in public pools and spas shall be capable of introducing the quantity of sanitizer necessary to maintain the appropriate levels under all conditions of intended use.

#### 319.2 Chemical feeders.

Where installed, chemical feed systems shall be installed in accordance with the manufacturer's specifications. Chemical feed pumps shall be wired so that they cannot operate unless there is adequate return flow to disburse the chemical throughout the pool or spa as designed.

### SECTION 320 WASTE WATER DISPOSAL

#### 320.1 Backwash water or draining water.

Backwash water and draining water shall be discharged to the sanitary or storm sewer, or into an approved disposal system on the premise, or shall be disposed of by other means approved by the state or local authority. Direct connections shall not be made between the end of the backwash line and the disposal system. Drains shall discharge through an air gap.

#### 320.2 Water salvage.

Filter backwash water shall not be returned to the vessel except where the backwash water has been filtered to remove particulates, treated to eliminate coli form bacteria and waterborne pathogens, and such return has been approved by the state or local authority.

#### 320.3 Waste post treatment.

Where necessary, filter backwash water and drainage water shall be treated chemically or through the use of settling tanks to eliminate or neutralize chemicals, diatomaceous earth, and contaminants in the water that exceed the limits set by the state or local effluent discharge requirements.

### SECTION 321 LIGHTING

#### 321.1 General.

The provisions of Sections 321.2 and 321.3 shall apply to lighting for public pools and spas. The provisions of Section 321.4 shall apply to lighting for residential pools and spas.

#### 321.2 Artificial lighting required.

When a pool is open during periods of low natural illumination, artificial lighting shall be provided so that all areas of the pool, including all suction outlets on the bottom of the pool, will be visible. Illumination shall be sufficient to enable a lifeguard or other persons standing on the deck or sitting on a lifeguard stand adjacent to the pool edge to determine if a pool user is lying on the bottom of the pool and that the pool water is transparent and free from cloudiness.

These two conditions shall be met when all suction outlets are visible from the edge of the deck at all times when artificial lighting is illuminated and when an 8-inch-diameter (152 mm) black disk, placed at the bottom of the pool in the deepest point, is visible from the edge of the pool deck at all times when artificial lighting is illuminated.

#### 321.2.1 Pool and deck illumination.

Overhead lighting, underwater lighting or both shall be provided to illuminate the pool and adjacent deck areas. The lighting shall be listed and labeled. The lighting shall be installed in accordance with NFPA 70.

#### 321.2.2 Illumination intensity.

For outdoor pools, any combination of overhead and underwater lighting shall provide maintained illumination not less than 10 horizontal foot-candles (10 lumens per square foot) [108 lux] at the pool water surface. For indoor pools, any combination of overhead and underwater lighting shall provide maintained illumination of not less than 30 horizontal foot-candles (30 lumens per square foot) [323 lux] at the pool water surface. Deck area lighting for both indoor and outdoor pools shall provide maintained illumination of not less than 10 horizontal foot-candles (10 lumens per square foot) [108 lux] at the walking surface of the deck.

#### 321.2.3 Underwater lighting.

Underwater lighting shall provide not less than 8 horizontal foot-candles (8 lumens per square foot) [86 lux] at the pool water surface area, or not less than a total wattage of  $\frac{1}{2}$  watt/ft<sup>2</sup> (5.4 watts/m<sup>2</sup>) of pool water surface for incandescent underwater lighting where the fixtures and lamps are rated in watts.

**Exception:** The requirement of this section shall not apply where overhead lighting provides not less than 15 foot-candles (15 lumens per square foot) [161 lux] of maintained illumination at the pool water surface, the overhead lighting provides visibility, without glare, of all areas of the pool, and the requirements of Section 321.2.2 are met or exceeded.

#### 321.3 Emergency illumination.

Public pools and public pool areas that operate during periods of low illumination shall be provided with emergency lighting that will automatically turn on to permit evacuation of the pool and securing of the area in the event of power failure. Emergency lighting facilities shall be arranged to provide initial illumination that is not less than 0.1 foot-candle (0.1 lumen per square foot) [1 lux] measured at any point on the water surface and at any point on the walking surface of the deck, and not less than an average of 1 foot-candle (1 lumen per square foot) [11 lux]. At the end of the emergency lighting time duration, the illumination level shall be not less than 0.06 foot-candle (0.06 lumen per square foot) [0.65 lux] measured at any point on the water surface and at any point on the walking surface of the deck, and not less than an average of 0.6 foot-candle (0.6 lumen per square foot) [6.46 lux]. A maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

#### 321.4 Residential pool and deck illumination.

Where lighting is installed for, and in, residential pools and permanent residential spas, such lighting shall be installed in accordance with NFPA 70 or the International Residential Code, as applicable in accordance with Section 102.7.1.

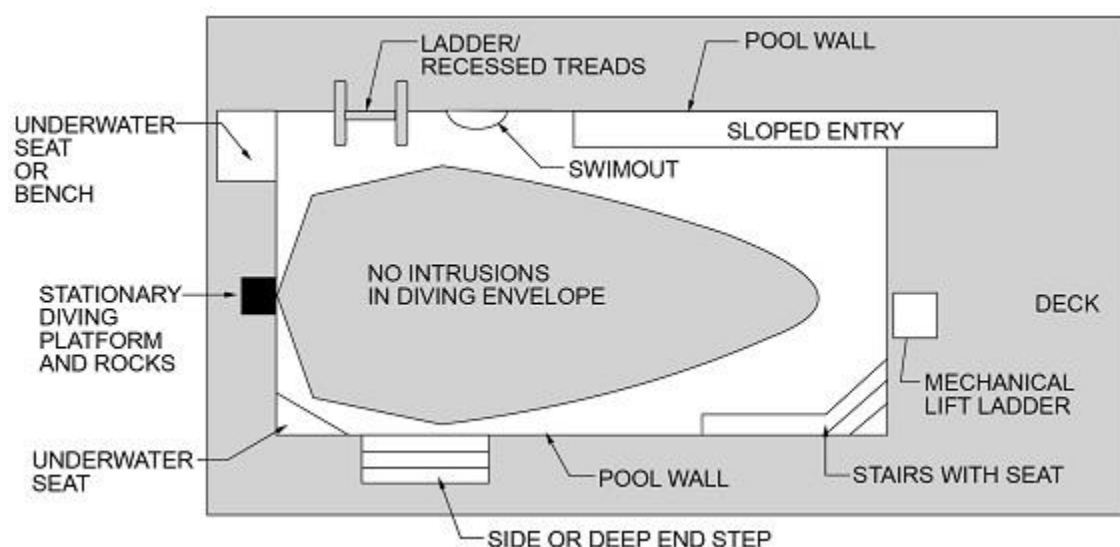
### SECTION 322 LADDERS AND RECESSED TREADS

#### 322.1 General.

Ladders and recessed treads shall comply with the provisions of this section and the applicable provisions of Chapters 4 through 10 based on the type of pool or spa.

#### 322.2 Outside diving envelope.

Where installed, steps and ladders shall be located outside of the minimum diving water envelope as indicated in Figure 322.2.



**FIGURE 322.2**  
**MINIMUM WATER DIVING ENVELOPE**

**322.3 Ladders.**

Ladder treads shall have a uniform horizontal depth of not less than 2 inches (51 mm). There shall be a uniform distance between ladder treads, with a distance of not less than 7 inches (178 mm) and not greater than 12 inches (305 mm). The top tread of a ladder shall be located not greater than 12 inches (305 mm) below the top of the deck or coping. Ladder treads shall have slip-resistant surfaces.

**322.3.1 Wall clearance.**

There shall be a clearance of not less than 3 inches (76 mm) and not greater than 6 inches (152 mm) between the pool wall and the ladder.

**322.3.2 Handrails and handholds.**

Ladders shall be provided with two handholds or two handrails. The clear distance between ladder handrails shall be not less than 17 inches (432 mm) and not greater than 24 inches (610 mm).

**322.4 Recessed treads.**

Recessed treads shall have a minimum depth of not less than 5 inches (127 mm) and a width of not less than 12 inches (305 mm). The vertical distance between the pool coping edge, deck, or step surface and the uppermost recessed tread shall be not greater than 12 inches (305 mm). Recessed treads shall have slip-resistant surfaces.

**322.4.1 Vertical spacing.**

Recessed treads at the centerline shall have a uniform vertical spacing of not less than 7 inches (178 mm) and not greater than 12 inches (305 mm).

**322.4.2 Drainage.**

Recessed treads shall drain into the pool.

**322.4.3 Handrails and grab rails.**

Recessed treads shall be provided with a handrail or grab rail on each side of the treads. The clear distance between handrails and grab rails shall be not less than 17 inches (432 mm) and not greater than 24 inches (610 mm).

**SECTION 323**  
**SAFETY**

**323.1 Handholds required.**

Where the depth below the *design waterline of a pool or spa exceeds 42 inches (1067 mm)*, handholds along the perimeter shall be provided. Handholds shall be located at the top of deck or coping.

**Exceptions:**

1. Handholds shall not be required where an underwater bench, seat or swimout is installed.
2. Handholds shall not be required for wave action pools and action rivers.

**323.1.1 Height above water.**

Handholds shall be located not more than 12 inches (305 mm) above the *design waterline*.

**323.1.2 Handhold type.**

Handholds shall be one or more of the following:

1. Top of pool deck or coping.
2. Secured rope.
3. Rail.
4. Rock.
5. Ledge.
6. Ladder.
7. Stair step.
8. Any design that allows holding on with one hand while at the side of the pool.

**323.1.3 Handhold spacing.**

Handholds shall be horizontally spaced not greater than 4 feet (1219 mm) apart.

**323.2 Handrails.**

Where handrails are installed, they shall conform to this section.

**323.2.1 Height.**

The top of the gripping surface of handrails for public pools and public spas shall be 34 inches (864 mm) to 38 inches (965 mm) above the ramp or step surface as measured at the nosing of the step or finished surface of the slope. The top of the gripping surface of handrails for *residential pools and residential spas* shall be 30 inches (762 mm) to 38 inches (965 mm) above the ramp or step surface as measured at the nosing of the step or finished surface of the slope.

**323.2.2 Material.**

Handrails shall be made of corrosion-resistant materials.

**323.2.3 Nonremovable.**

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

**323.2.4 Leading edge distance.**

The leading edge of handrails for stairs, pool entries and exits shall be located not greater than 18 inches (457 mm) from the vertical face of the bottom riser.

**323.2.5 Diameter.**

The outside diameter or width of *handrails* shall be not less than 1¼ inches (32 mm) and not greater than 2 inches (51 mm).

**323.3 Obstructions and entrapment avoidance.**

There shall not be obstructions that can cause the user to be entrapped or injured. Types of entrapment include, but are not limited to, wedge or pinch-type openings and rigid, nongiving cantilevered protrusions.

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