

Guidelines for Residential Pools



Prepared by:
City of Naperville
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U.S. Consumer Product Safety Commission





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For further information:

U.S. Consumer Product Safety Commission
Office of Communications
4330 East West Highway
Bethesda, Md. 20814
WWW.cpsc.gov

Twitter: @poolsafely
www.PoolSafely.gov
Email: poolsafely@cpsc.gov



Each year, thousands of American families suffer swimming pool tragedies—drownings and near-drownings of young children. The majority of deaths and injuries in pools and spas involve young children ages 1 to 3 and occur in residential settings. These tragedies are preventable.

***Pool and Spa Submersions:
Estimated Injuries and Reported Fatalities****

CPSC publishes an annual report on submersion incidents.

Key findings from the 2015 report include:

- ✚ 290 children younger than 5 drown in swimming pools and spas each year representing 76 percent of the 382 fatalities reported for children younger than 15.
- ✚ Children aged 1 to 3 years (12 months through 47 months) represented 65 percent of the reported fatalities and 64 percent of reported injuries in pools and spas.
- ✚ Over 4,100 children younger than 5 suffer submersion injuries and require emergency room treatment; about half are seriously injured and are admitted to the hospital for further treatment.
- ✚ The majority of drownings and submersion injuries involving victims younger than 5 occur in pools owned by the family, friends or relatives.
- ✚ Portable pools accounted for 7 percent of the total fatalities (annual average of 25) for children younger than 15.

Swimming Pool Barrier Guidelines

Many of the nearly 300 children under 5 who drown each year in backyard pools could be saved if homeowners completely fenced in pools and installed self-closing and self-latching devices on gates.

Anyone who has cared for a toddler knows how fast young children can move. Toddlers are inquisitive and impulsive and lack a realistic sense of danger. These behaviors make swimming pools particularly hazardous for households with young children.



Barriers

Barriers are not child proof, but they provide layers of protection for a child when there is a lapse in adult supervision. Barriers give parents additional time to find a child before the unexpected can occur.



Barriers include a fence or wall, door alarms for the house, and a power safety cover over the pool.

Use the following recommendations as a guide.

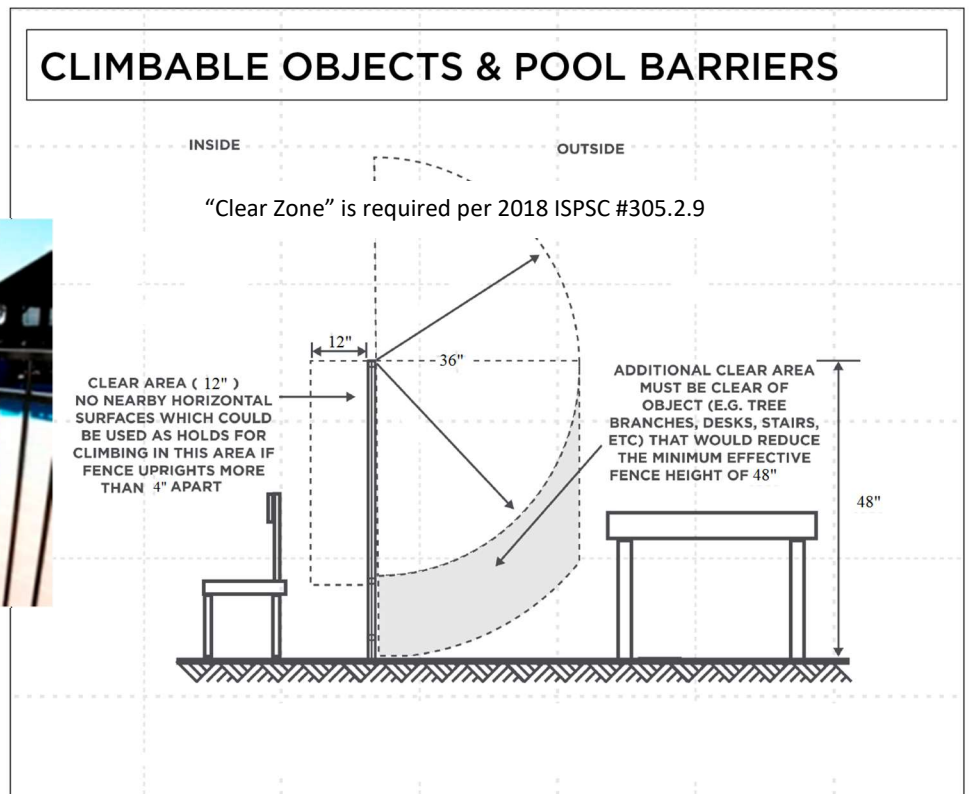
Fences

A fence completely surrounding the pool is better than one with the house serving as the fourth side. Fences shall be a minimum of 4 feet high, although fences 5 feet or higher are preferable. Per 2018 ISPSC #305.2.1



Barrier Locations

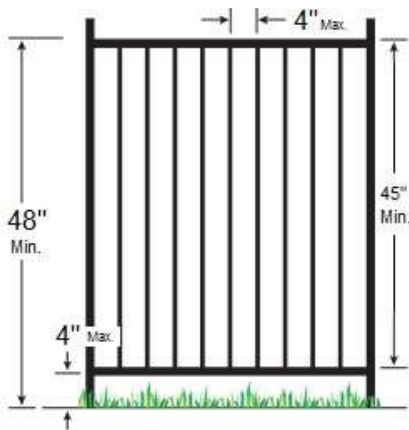
Barriers shall be located so as to prohibit permanent structures, equipment or similar objects from being used to climb the barriers. A 36" "Clear Zone" is required per 2018 ISPSC #305.2.9



A successful pool barrier prevents a child from getting **OVER, UNDER, or THROUGH** and keeps the child from gaining access to the pool except when supervising adults are present.

How To Prevent a Child from Getting OVER a Pool Barrier

A young child can get over a pool barrier if the barrier is too low or if the barrier has handholds or footholds to use when climbing. The top of a pool barrier shall be at least 48 inches above grade, measured on the side of the barrier which faces away from the swimming pool.



Eliminate handholds and footholds and minimize the size of openings in a barrier's construction.

For a Solid Barrier

No indentations or protrusions shall be present, other than normal construction tolerances and masonry joints.

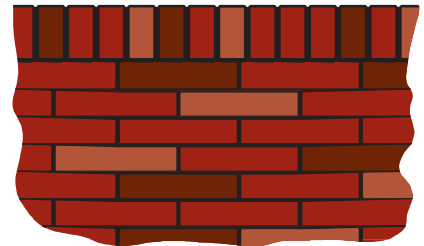
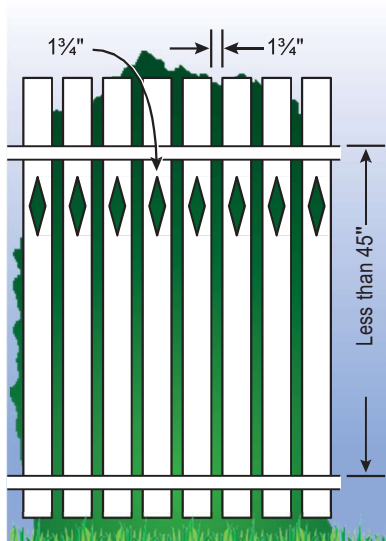


Figure 1

Figure 2

For a Barrier (Fence) Made Up of Horizontal and Vertical Members

If the distance between the top side of the horizontal members is less than 45 inches (figure 3), the horizontal members shall be on the swimming pool side of the fence. Per 2018 ISPSC #305.2.5.



The spacing between vertical members and within decorative cutouts shall not exceed 1 3/4 inches. This size is based on the foot width of a young child and is intended to reduce the potential for a child to gain a foothold and attempt to climb the fence.

Figure 3

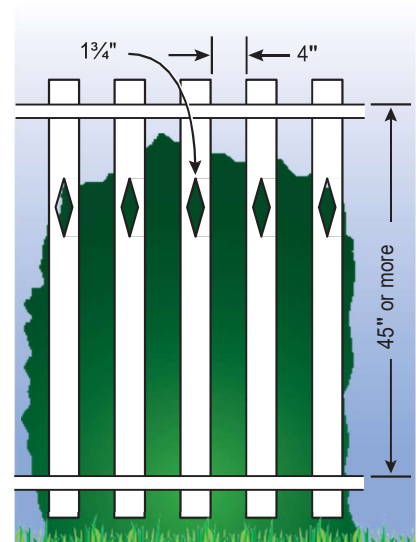


Figure 4

If the distance between the tops of the horizontal members is more than 45 inches (figure 4), the horizontal members can be on the side of the fence facing away from the pool. The spacing between vertical members shall not exceed 4 inches. This size is based on the head breadth and chest depth of a young child and is intended to prevent a child from passing through an opening. If there are any decorative cutouts in the fence, the space within the cutouts shall not exceed 1 3/4 inches.

For a Chain Link Fence

The mesh size shall not exceed $1\frac{1}{4}$ inches (fig.5) square unless slats (fig.6), fastened at the top or bottom of the fence, are used to reduce mesh openings to no more than $1\frac{3}{4}$ inches. Per 2018 ISPC #305.2.7.

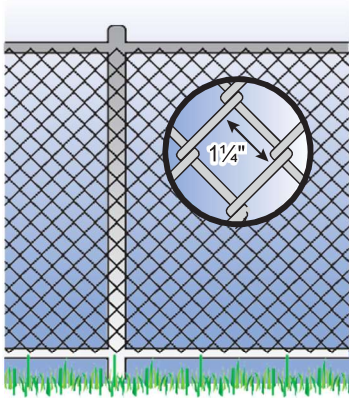


Figure 5

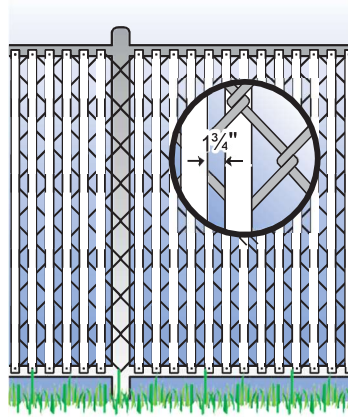


Figure 6

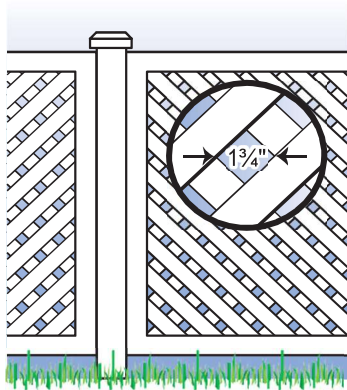


Figure 7

For a Fence Made Up of Diagonal Members or Latticework

The maximum opening in the lattice shall not exceed $1\frac{3}{4}$ inches. Per 2018 ISPC #305.2.8 (figure 7)

For Above Ground Pools

Above ground pools should have barriers. The pool structure itself serves as a barrier or a barrier is mounted on top of the pool structure.

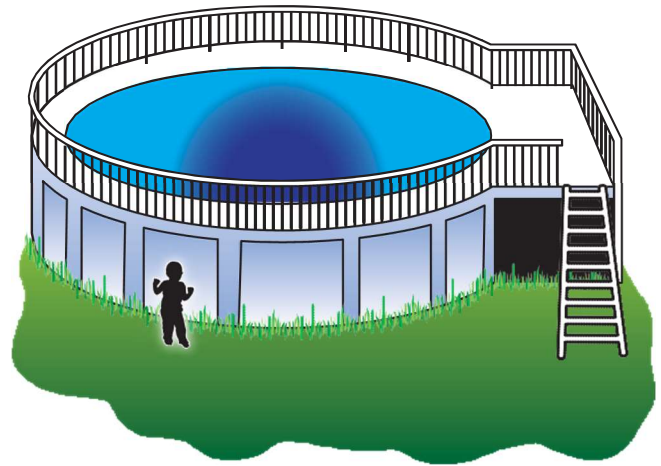


Figure 8a

There are two possible ways to prevent young children from climbing up into an above ground pool. The steps or ladder can be designed to be secured, locked or removed to prevent access, or the steps or ladder can be surrounded by a barrier such as those described in these guidelines. 2018 ISPSC #305.5

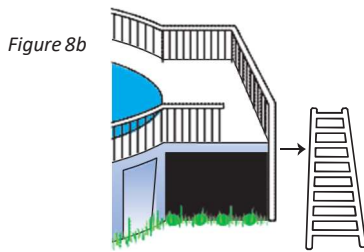


Figure 8b



Figure 8c

Above Ground Pool with Barrier on Top of Pool

If an above ground pool has a barrier on the top of the pool, the maximum vertical clearance between the top of the pool and the bottom of the barrier should not exceed 4 inches.

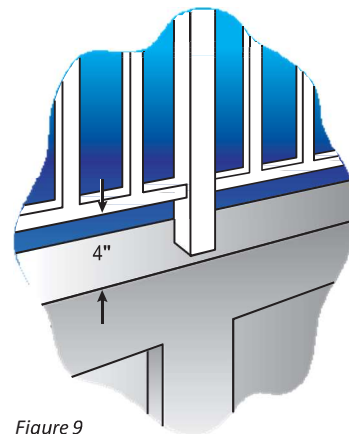


Figure 9

How to Prevent a Child from Getting UNDER a Pool Barrier

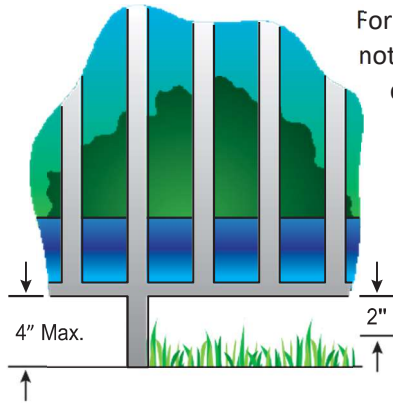


Figure 10

For any pool barrier, the maximum clearance at the bottom of the barrier shall not exceed 4 inches above the surface or ground when the measurement is done on the side of the barrier facing away from the pool.

Industry recommends that if the bottom of the gate or fence rests on a non-solid surface like grass or gravel, that measurement shall not exceed 2 inches. 2018 ISpsc #305.2.1

How to Prevent a Child from Getting THROUGH a Pool Barrier

Preventing a child from getting through a pool barrier can be done by restricting the sizes of openings in a barrier and by using self-closing and self-latching gates.

To prevent a young child from getting through a fence or other barrier, all openings shall be small enough so that a 4-inch diameter sphere cannot pass through. This size is based on the head breadth and chest depth of a young child.

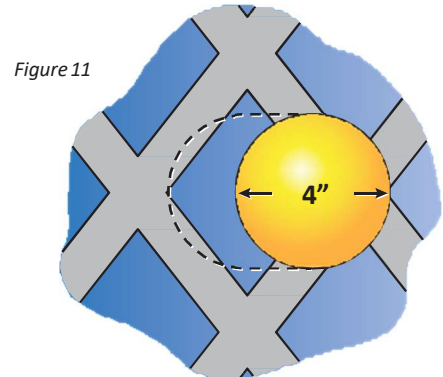


Figure 11

Portable Pools



Portable pools are becoming more popular. They vary in size and height, from tiny blow-up pools to larger thousands-of-gallons designs. Portable pools present a real danger to young children.



Never leave children unsupervised around portable pools. Portable pools deeper than 23" are required to have a permit and need to meet the barrier requirements with the manufacturers installation requirements, electrical bonding and grounding per NEC2017. Instruct neighbors, friends and caregivers about their presence and the potential dangers of a portable pool in your yard.

Gates

There are two kinds of gates which might be found on a residential property: pedestrian gates and vehicle or other types of gates. Both can play a part in the design of a swimming pool barrier. All gates shall be designed with a locking device.

Pedestrian Gates

These are the gates people walk through. Swimming pool barriers shall be equipped with a gate or gates which restrict access to the pool.

Gates shall open out from the pool and self-closing and self-latching. If a gate is properly designed and not completely latched, a young child pushing on the gate in order to enter the pool area will at least close the gate, and may actually engage the latch. 2018 ISPC #305.3



Figure 12

When the release mechanism of the self-latching device on the gate is less than 54 inches from the bottom of the gate, the release mechanism for the gate shall be at least 3 inches below the top of the gate on the side facing the pool. Placing the release mechanism at this height prevents a young child from reaching over the top of a gate and releasing the latch.

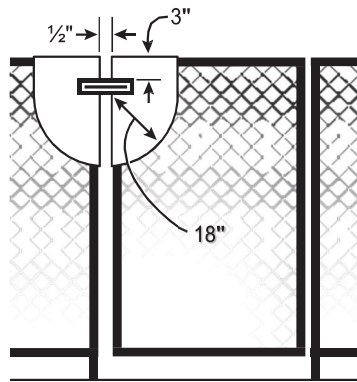


Figure 13

Also, the gate and barrier shall have no opening greater than 1/2 inch within 18 inches of the latch release mechanism. This prevents a young child from reaching through the gate and releasing the latch.

All Other Gates (Vehicle Entrances, Etc.)

Other gates (where part of a pool barrier) shall be equipped with self-latching devices. The self-latching devices shall be installed as described for pedestrian gates.

Self-Closing hinges and locking devices (Latches)



Pet or Doggy Doors

Never have a pet or doggy door if the door leads directly to a pool or other backyard water.

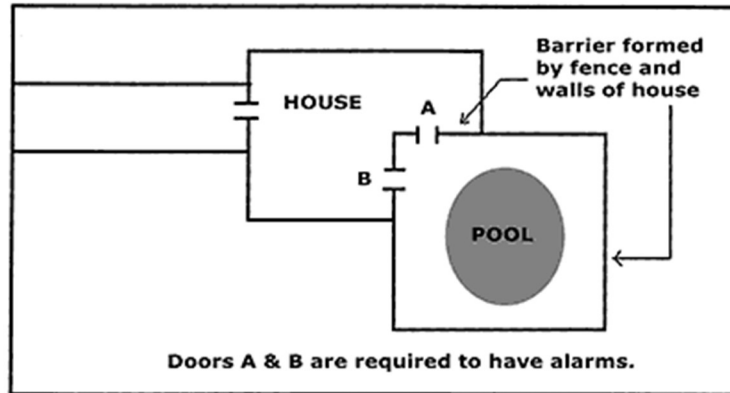
An isolation barrier or fence is the best defense when pet doors are installed.

Remember, pet door openings, often overlooked by adults, provide curious children with an outlet to backyard adventure.

Children regularly drown in backyard pools, which they were able to access through pet doors.

When the House Forms Part of the Pool Barrier

In many homes, doors open directly from the house onto the pool area or onto a patio leading to the pool. In such cases, the side of the house leading to the pool is an important part of the pool barrier. Passage through any door from the house to the pool shall be controlled by security measures.



The importance of controlling a young child's movement from the house to pool is demonstrated by the statistics obtained in CPSC's submersion reports. Residential locations dominate in incidents involving children younger than 5 accounting for 85 percent of fatalities and 54 percent of injuries.

If the home serves as one side of the barrier, install **door alarms** on all doors and windows (with a sill height less than 48 inches), leading to the pool area, **or a Safety Cover listed and labeled**. Make sure the doors have self-closing and self-latching devices or locks beyond the reach of children to prevent them from opening the door and gaining access to the pool. In many homes, doors open directly onto the pool area or onto a patio which leads to the pool.

Door Alarms:

Alarms shall meet the requirements of *UL 2017 General-Purpose Signaling Devices and Systems, Section 77* with the following features:

- ✚ Sound lasting for 30 seconds or more within 7 seconds after the door is opened.
- ✚ The alarm shall be loud: at least 85 dBA (decibels) when measured 10 feet away from the alarm mechanism.
- ✚ The alarm sound shall be distinct from other sounds in the house, such as the telephone, doorbell and smoke alarm.
- ✚ The alarm shall have an automatic reset feature to temporarily deactivate the alarm for up to 15 seconds to allow adults to pass through house doors without setting off the alarm. The deactivation switch could be a touchpad (keypad) or a manual switch, and shall be located at least 54 inches above the threshold and out of the reach of children. This height was selected based on the reaching ability of young children.

Figure 14



Pool Safety covers are another level of protection when the home serves as a barrier. Keep pool covers well-maintained and make sure the control devices are kept out of the reach of children.
Per 2018 ISPSC #305.4.



Power safety covers can be installed on pools to serve as security barriers. Power safety covers shall conform to the specifications in ASTM F 1346. This standard specifies safety performance requirements for pool covers to protect young children from drowning.



If you wish further information on this standard, contact ASTM, Inc., Philadelphia, Pa. (formerly the American Society for Testing & Materials), directly.

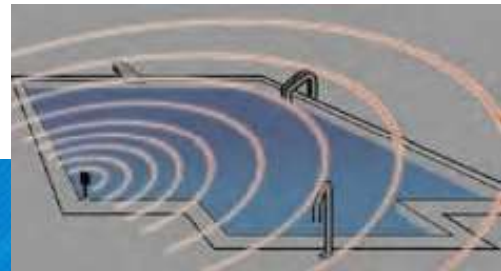


Indoor Pools



Figure 15

When a pool is located completely within a house, the walls that surround the pool shall be equipped to serve as pool safety barriers. Measures recommended for using door alarms, pool alarms and covers where a house wall serves as part of a safety barrier also apply for all the walls surrounding an indoor pool.



Outdoor Swimming Pools - CHECK LIST

Barriers for Residential Swimming Pool, Spas, and Hot Tubs

All outdoor swimming pools, including in-ground, above ground, or on-ground pools, hot tubs, or spas, shall have a barrier which complies with the following:

- The top of the barrier shall be at least 48 inches above the surface measured on the side of the barrier which faces away from the swimming pool (figure 1).
- The maximum vertical clearance between the surface and the bottom of the barrier shall be 4 inches measured on the side of the barrier which faces away from the swimming pool. In the case of a non-solid surface, grass or pebbles, the distance shall be reduced to 2 inches. (figures 1 and 10).
- Where the top of the pool structure is above grade or surface, such as an aboveground pool, the barrier may be at ground level, such as the pool structure, or mounted on top of the pool structure. Where the barrier is mounted on top of the pool structure, the maximum vertical clearance between the top of the pool structure and the bottom of the barrier shall be 4 inches (figure 9).
- Openings in the barrier shall not allow passage of a 4-inch diameter sphere. (figure 11).
- Solid barriers, which do not have openings, such as a masonry or stone wall, shall not contain indentations or protrusions except for normal construction tolerances and tooled masonry joints (figure 2).
- Where the barrier is composed of horizontal and vertical members and the distance between the bottom and top horizontal members is less than 45 inches, the horizontal members shall be located on the swimming pool side of the fence (figure 3).
- Spacing between vertical members shall not exceed 1¾ inches in width. Where there are decorative cutouts, spacing within the cutouts shall not exceed 1¾ inches in width (figure 4).
- Maximum mesh size for chain link fences shall not exceed 1¼ inch square unless the fence is provided with slats fastened at the top or the bottom which reduce the openings to no more than 1¼ inches (figures 5 and 6).
- Where the barrier is composed of diagonal members, such as a lattice fence, the maximum opening formed by the diagonal members shall be no more than 1¼ inches (figure 7).
- Access gates to the pool shall be equipped with a locking device. Pedestrian access gates shall open outward, away from the pool, and shall be self-closing and have a self-latching device (figure 12).
- Gates other than pedestrian access gates shall have a self-latching device.
- Where the release mechanism of the self-latching device is located less than 54 inches from the bottom of the gate, the release mechanism shall be located on the pool side of the gate at least 3 inches below the top of the gate and the gate and barrier shall have no opening greater than ½ inch within 18 inches of the release mechanism (figure 13).
- Where a wall of a dwelling serves as part of the barrier, one of the following shall apply:
 - All doors with direct access to the pool through that wall shall be equipped with an alarm which produces an audible warning when the door and its screen, if present, are opened. Alarms shall meet the requirements of *UL 2017 General-Purpose Signaling Devices and Systems, Section 77*.
For more details on alarms, see page 10.
- The pool shall be equipped with a *power safety cover* which complies with ASTM F1346-91, see page 11.
- Where an above ground pool structure is used as a barrier or where the barrier is mounted on top of the pool structure, and the means of access is a ladder or steps (figure 8a), **then**
 - The ladder to the pool or steps shall be capable of being secured, locked or removed to prevent access (figure 8b),
or
 - The ladder or steps shall be surrounded by a barrier (figure 8c). When the ladder or steps are secured, locked, or removed, any opening created shall not allow the passage of a 4 inch diameter sphere.



Simple Steps Saves Lives:

Installing barriers is just one of the *Pool Safe* Simple Steps for keeping children safe around all pools and spas. Here are others:

Rule # 1: Never leave a child unattended around a pool, spa, bath tub, or any body of water.

At pools, spas, and other recreational waters:

- ✦ Teach children basic water safety skills.
- ✦ Learn how to swim and ensure your children know how to swim as well.
- ✦ Avoid entrapment by keeping children away from pool drains, pipes, and other openings.
- ✦ Have a phone close by at all times when visiting a pool or spa.
- ✦ If a child is missing, look for them in the pool or spa first, including neighbors' pools or spas.
- ✦ Share safety instructions with family, friends, babysitters, and neighbors.

If you have a pool:

- ✦ Maintain Safety Barrier fence around the perimeter of the pool and spa, including portable pools.
- ✦ Use self-closing and self-latching gates; ask neighbors to do the same if they have pools or spas.
- ✦ If your house serves as the fourth side of a fence around a pool, install and use a door or pool alarm and/or a pool or spa cover.
- ✦ Maintain pool and spa covers in good working order.
- ✦ Ensure any pool or spa you use has anti-entrapment safety drain covers; ask your pool service representative if you do not know.*
- ✦ Have life-saving equipment such as life rings, floats or a reaching pole available and easily accessible.

**The Virginia Graeme Baker Pool & Spa Safety Act, a federal law, requires all public pools and spas to have anti-entrapment drain covers and other devices, where needed. Residential pools are not required to install these but it is recommended that they do so.*

For more information:

Fencing: ASTM F 1908-08 Standard Guide for Fences for Residential Outdoor Swimming

Pools, Hot Tubs, and Spas: <http://www.astm.org/Standards/F1908.htm>



Covers: ASTM F 1346-91 Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs: <http://www.astm.org/Standards/F1346.htm>

ASTM Standards, contact ASTM online at: <http://www.astm.org/CONTACT/index.html> *Note: ASTM Standards are available for a fee. You may want to contact a pool contractor.*



Underwriters Laboratories Inc.®

UL (Underwriters Laboratories) Relevant Pool and Spa Standards <http://www.ul.com/global/eng/pages/>, look for Life Safety and Security Product



**Know what's below.
Call before you dig.**

680.26 Equipotential Bonding.



(A) Performance. The equipotential bonding required by this section shall be installed to reduce voltage gradients in the pool area.

(B) Bonded Parts. The parts specified in 680.26(B)(1) through (B)(7) shall be bonded together using solid copper conductors, insulated covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with 250.8. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to remote panel boards, service equipment, or electrodes.



(1) Conductive Pool Shells. Bonding to conductive pool shells shall be provided as specified in 680.26(B)(1)(a) or (B)(1)(b). Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings shall all be considered conductive materials due to water permeability and porosity. Vinyl liners and fiberglass composite shells shall be considered to be nonconductive materials.

(a) *Structural Reinforcing Steel.* Un-encapsulated structural reinforcing steel shall be bonded together by steel tie wires or the equivalent. Where structural reinforcing steel is encapsulated in a nonconductive compound, a copper conductor grid shall be installed in accordance with 680.26(B)(1)(b).

(b) *Copper Conductor Grid.* A copper conductor grid shall be provided and shall comply with (b)(1) through (b)(4).

- (1) Be constructed of minimum 8 AWG bare solid copper conductors bonded to each other at all points of crossing. The bonding shall be in accordance with 250.8 or other approved means.
- (2) Conform to the contour of the pool
- (3) Be arranged in a 300-mm (12-in.) by 300-mm (12-in.) network of conductors in a uniformly spaced perpendicular grid pattern with a tolerance of 100 mm (4 in.)
- (4) Be secured within or under the pool no more than 150 mm (6 in.) from the outer contour of the pool shell



(2) Perimeter Surfaces. The perimeter surface shall extend for 1 m (3ft) horizontally beyond the inside walls of the pool and shall include unpaved surfaces, as well as poured concrete surfaces and other types of paving. Perimeter surfaces less than 1 m (3ft) separated by a permanent wall or building 1.5 m (5ft) in height or more shall require equipotential bonding on the pool side of the permanent wall or building. Bonding to perimeter surfaces shall be provided as specified in 680.26(B)(2)(a) or (2)(b) and shall be attached to the pool reinforcing steel or copper conductor grid at a minimum of four (4) points uniformly spaced around the perimeter of the pool. For nonconductive pool shells, bonding at four points shall not be required.

(a) *Structural Reinforcing Steel.* Structural reinforcing steel shall be bonded in accordance with 680.26(B)(1)(a).

(b) *Alternate Means.* Where structural reinforcing steel is not available or is encapsulated in a nonconductive compound, a copper conductor(s) shall be utilized where the following requirements are met:

- (1) At least one minimum 8 AWG bare solid copper conductor shall be provided.
- (2) The conductors shall follow the contour of the perimeter surface.
- (3) Only listed splices shall be permitted.
- (4) The required conductor shall be 450 mm to 600 mm (18 in. to 24 in.) from the inside walls of the pool.
- (5) The required conductor shall be secured within or under the perimeter surface 100 mm to 150 mm (4 in. to 6 in.) below the subgrade.

(3) Metallic Components. All metallic parts of the pool structure, including reinforcing metal not addressed in 680.26(B)(1)(a), shall be bonded. Where reinforcing steel is encapsulated with a nonconductive compound, the reinforcing steel shall not be required to be bonded.

(4) Underwater Lighting. All metal forming shells and mounting brackets of no-niche luminaires shall be bonded.

Exception: Listed low-voltage lighting systems with nonmetallic forming shells shall not require bonding.

(5) Metal Fittings. All metal fittings within or attached to the pool structure shall be bonded. Isolated parts that are not over 100 mm (4 in.) in any dimension and do not penetrate into the pool structure more than 25 mm (1 in.) shall not require bonding.

(6) Electrical Equipment. Metal parts of electrical equipment associated with the pool water circulating system, including pump motors and metal parts of equipment associated with pool covers, including electric motors, shall be bonded.

Exception: Metal parts of listed equipment incorporating an approved system of double insulation shall not be bonded.

(a) Double-Insulated Water Pump Motors.

Where a double-insulated water pump motor is installed under the provisions of this rule, a solid 8 AWG copper conductor of sufficient length to make a bonding connection to a replacement motor shall be extended from the bonding grid to an accessible point in the vicinity of the pool pump motor. Where there is no connection between the swimming pool bonding grid and the equipment grounding system for the premises, this bonding conductor shall be connected to the equipment grounding conductor of the motor circuit.

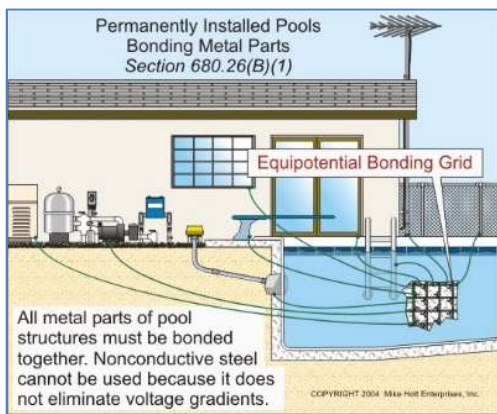
(b) Pool Water Heaters. For pool water heaters rated at more than 50 amperes and having specific instructions regarding bonding and grounding, only those parts designated to be bonded shall be bonded and only those parts designated to be grounded shall be grounded.

(7) Fixed Metal Parts. All fixed metal parts shall be bonded including, but not limited to, metal-sheathed cables and raceways, metal piping, metal awnings, metal fences, and metal door and window frames.

Exception No. 1: Those separated from the pool by a permanent barrier that prevents contact by a person shall not be required to be bonded.

Exception No. 2: Those greater than 1.5 m (5 ft) horizontally of the inside walls of the pool shall not be required to be bonded.

Exception No. 3: Those greater than 3.7 m (12 ft) measured vertically above the maximum water level of the pool, or as measured vertically above any observation stands, towers, or platforms, or any diving structures, shall not be required to be bonded.



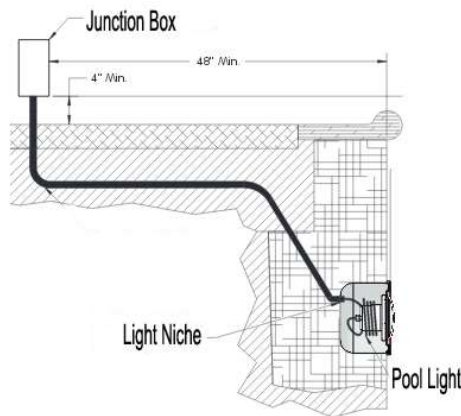
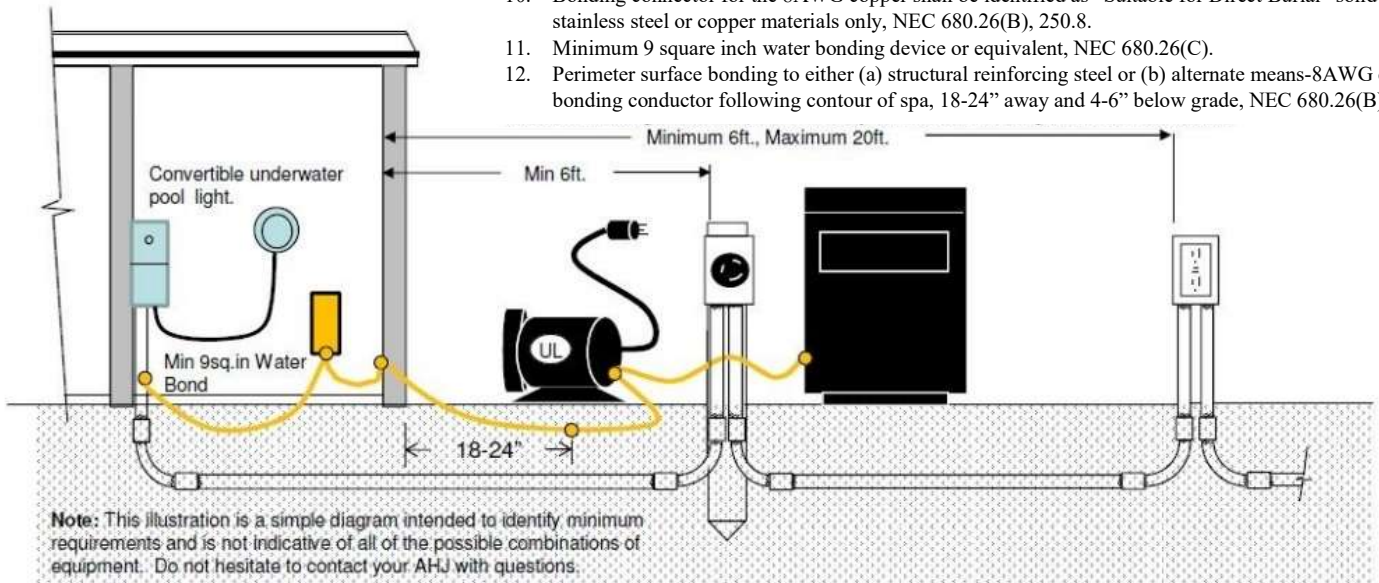
(C) Pool Water. An intentional bond of a minimum conductive surface area of 5800 mm² (9 in.²) shall be installed in contact with the pool water. This bond shall be permitted to consist of parts that are required to be bonded in 680.26(c).



City of Naperville

2017 NEC© Electrical Requirements for Permanent Above Ground Swimming Pools

1. UL™ Listed Swimming Pool Pump with a minimum 12 AWG cord, not longer than 36” in length terminating in a twisting & locking cord plug, NEC 680.8, 680.21(A)(3), 680.22(A)(1)
2. A simplex 15 or 20 amp, 125Volt twisting & locking type receptacle outlet for pump ONLY, protected by a GFCI, and located not less than 6 feet from inside wall of pool, NEC 680.22(A)(1).
3. UL™ Listed, Wet location “In-Use” Covers for receptacle outlets, NEC 406.9(B).
4. Intermediate/Rigid Metal Conduit (6 in) or PVC (18 in) burial depths per NEC 300.5
5. 15 or 20 amp, 125Volt branch circuit with a minimum 12AWG Green equipment grounding conductor but not smaller than required by Table 250.122, NEC 680.21(A)(3).
6. 15 or 20 amp, 125Volt GFCI protected (general purpose). Receptacle located between 6 and 20 feet from wall of pool, NEC 680.22(A)(1).
7. Natural Gas water heater (optional), bonded per NEC 680.26.
8. Convertible underwater luminaries (optional) – PERMANENTLY installed per mfg. instructions.
9. 8AWG SOLID copper equi-potential bonding conductor, connecting all pool equipment, pool structure and all metal surfaces located w/in 5 feet horizontally, NEC 680.26
10. Bonding connector for the 8AWG copper shall be identified as “Suitable for Direct Burial” solid brass, stainless steel or copper materials only, NEC 680.26(B), 250.8.
11. Minimum 9 square inch water bonding device or equivalent, NEC 680.26(C).
12. Perimeter surface bonding to either (a) structural reinforcing steel or (b) alternate means-8AWG copper bonding conductor following contour of spa, 18-24” away and 4-6” below grade, NEC 680.26(B)(2).



NEC680.24(A)2



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