Section 68 — Pools, tubs, and spas

Scope

Rule 68-000 Scope

Section 68 includes additional and specific requirements for electrical installations near or in pools, tubs, and spas. People standing, sitting, or swimming in water can receive a severe electric shock by touching the energized casing of a faulty appliance or by coming into contact with a voltage gradient in the water itself. Section 68 sets out requirements for electric wiring and equipment in or adjacent to pools, tubs, and spas and specifies bonding and grounding requirements for metal accessories that can become energized.

General

Rule 68-052 Electrical wiring or equipment in pool walls or water

A breakdown in electrical equipment near or in a pool can pose a hazard to a person immersed in the pool. Even small amounts of current in the water can be fatal, rendering a person immobile and susceptible to drowning. The intent of Rule 68-052 is to ensure that the electrical equipment used in and around pools is properly controlled and that electrical installations are safe.

Rule 68-054 Overhead wiring

The intent of Rule 68-054 is to minimize, or even eliminate, the possibility that overhead wiring might fall into a pool, or that a person in or near the pool might come into contact with an overhead conductor. Ideally, there should be no wiring above a pool or the deck around a pool. However, some types of overhead conductors are allowed, provided that certain clearances are maintained. See Figure 68-1.

Rule 68-054 takes into account the circumstances of an installation. Subrule (1) states that where overhead wiring is already in place, a pool must not be placed underneath it. If a pool already exists, and the need arises to install overhead wiring, the installation must conform to the requirements of Rule 68-054.

Rule 68-054 applies not only to outdoor pools but also to indoor pools. Subrule (2) prohibits any overhead wiring except as allowed in Subrules (3) and (4).

For outdoor pools, Subrule (3) allows insulated communication conductors, communication antenna distribution conductors, and neutral supported cables (see definition of neutral supported cable in Section 0 of this Handbook) not exceeding 750 V to be installed over a pool, provided that there is a vertical clearance of at least 5 m from any elevated platform, such as a slide, diving board, or lifeguard tower, and a 4.5 m vertical clearance horizontal setback 5 m from the edge of the pool (see Figure 68-1). These clearances are intended to ensure that no one standing around a pool, jumping off a diving board, or sitting or standing on a slide or lifeguard platform can come into contact with any overhead conductors, even while holding a rod or pipe, such as a vacuum pole or shepherd’s hook.

Subrule (4) recognizes that a supply authority might have the right to run high-voltage distribution lines (up to 50 kV phase-to-phase) over private property. If so, a vertical clearance of 7.5 m must be provided from any elevated platform, such as a slide, diving board, or lifeguard tower. The requirement for a 5 m horizontal setback from the edge of a pool also applies.

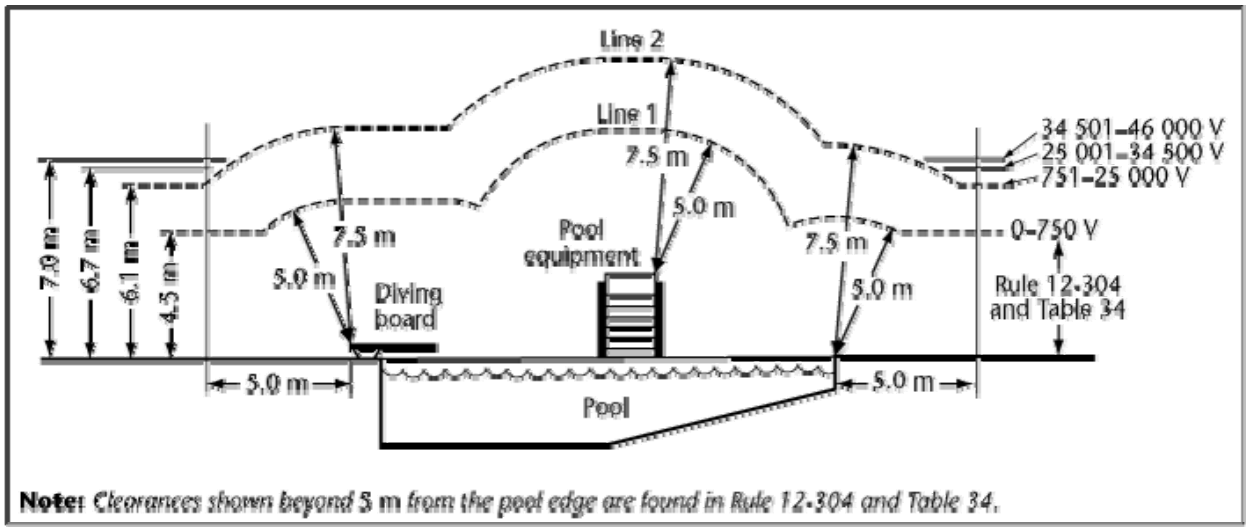

Figure 68-1
Overhead clearance from outdoor pool and accessories

Rule 68-056 Underground wiring

Underground wiring not directly associated with a pool can present a potential hazard to the users of the pool. This underground wiring includes conductors supplying services to a residence (e.g., for power, telephone, cable TV), as well as underground circuits supplying detached garages, equipment sheds, yard lighting, and other similar applications. Each of these circuits is protected against possible overloads and short-circuits by a fuse or a circuit breaker. However, it is possible for leakage current, while not high enough to cause the overcurrent devices to function, to create a hazard if the current finds a conductive path through the pool if the conductors are installed closer than the Table 61 distances. Underground wiring associated with the pool and installed within 3 m of the inside walls of the pool generally require GFCI protection (the specific requirements are covered by other Rules of this Section) which controls the shock hazard.

Rule 68-056 requires ground fault circuit interrupter (GFCI) protection on any underground circuit located closer than the minimum separation distances listed in Table 61, in order to minimize the possibility that stray leakage current might pass through the pool water. Bonding conductors and conductors supplying pool equipment are exempt from this requirement but might be required by other Rules in Section 68 to have GFCI protection.

It is also advisable to separate underground power, telephone, and coaxial cable installations from a pool. When excavating for a pool, the soil underneath these wiring installations can be undermined, often resulting in a break or failure of the conductors after the pool has been completed. This can require costly repairs to the areas adjacent to the pool, such as decks, platforms, and patios.

Rule 68-058 Bonding to ground

Bonding offers a low-resistance (low-impedance) conductive path; all non-current-carrying metal parts are permanently joined to ensure electrical continuity between all parts and to provide a path that can safely conduct any current imposed on it to ground. The grounding and bonding requirements of Rule 68-058 apply to all pools, even pools where the electrical equipment associated with the pools is

- located beyond 3 m from the inside walls of the pool;
- separated from the pool by a fence, wall, or other barrier; or
- approved without a bonding conductor.

Proper bonding is important where pool installers have used epoxy-coated reinforcing steel to reduce corrosion of the rebar. Epoxy reduces the conductivity of the steel and restricts its ability to reduce voltage differences in the pool area. In such installations, Subrule (3) requires that alternative methods be used to eliminate voltage differences. The Note to Rule 68-058(3) in Appendix B suggests a loop of No. 6 AWG copper conductor installed around the pool as an option.

Subrule (5) prohibits the use of metal sheaths and metal raceways as bonding conductors and requires the use of a separate copper bonding conductor. The quantity and the chemical treatment of pool water are likely to lead to corrosion of metal sheaths and raceways.

Rule 68-060 Junction and deck boxes

Rule 68-060 provides requirements for installing junction boxes (commonly known as deck boxes) for electrical equipment in or near a pool. Common electrical equipment includes underwater lighting and, in some decorative pools, an underwater pump for a fountain. A deck box must be provided to enclose the connection between the branch circuit wiring and the equipment in question.

Subrule (1) allows a deck box to be submerged in a decorative pool only when it is marked (and therefore approved) for that purpose.

The typical installation covered by Rule 68-060 involves a deck box installed on the supply side of the conduit extending from a forming shell for a wet-niche underwater lighting fixture. In such an installation, the bonding path between the forming shell and the deck box (provided by the metal conduit) is not reliable. Provision must be made inside the deck box for terminating the copper bonding conductors.

Deck boxes must be located and sealed in a way that prevents water from getting into the boxes, which contain electrical joints. If chemically treated pool water leaks into a box, electrical joints can break down over time, allowing a small current flow that might not trip the overcurrent device but still ranks as a shock hazard. To supplement the mechanical protection, Subrule (4) requires that the deck box contain only circuits feeding underwater equipment.

To prevent water from getting into the deck box through the conduit from the forming shell, Subrule (7) requires a watertight seal around the cord. To prevent undue water pressure on this seal, the bottom of the deck box must be above the normal water level of the pool. If this is achieved by elevating the box above the pool deck, it can be an obstacle for a person walking or running around the pool; therefore, an elevated deck box must be guarded or placed out of the way (e.g., under a diving board). In many cases, the top of the deck box can be installed flush with the surface of the deck and, as the Note to Rule 68-060(6) in Appendix B suggests, the deck in the vicinity of the deck box can be sloped up to the top of the deck box from the normal deck level to prevent water from collecting on the top of the deck box (see Figure 68-2).

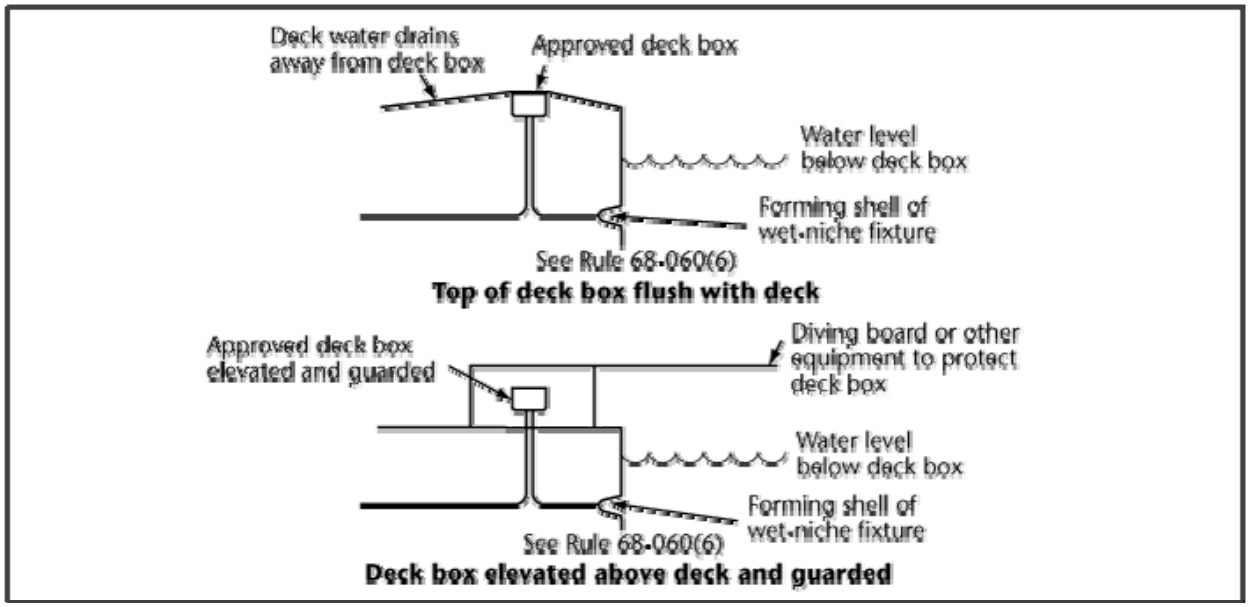

Figure 68-2
Deck box installation requirements

Rule 68-062 Transformers and transformer enclosures

Power transformers and audio transformers can be used with the electrical equipment installed in a pool. Where a power transformer is used to supply an underwater lighting fixture that operates on extra-low voltage (less than 30 V), voltage drop should be considered because the installer might find it preferable to mount the transformer close to the fixture. However, a transformer that is too close can present a shock hazard to people using the pool area. Subrule (1) requires that transformers and special enclosures for transformers not be located within 3 m of a pool wall unless they are on the other side of a permanent barrier, such as a fence, and are inaccessible to people using the pool area.

Subrule (2) requires that, where a metal shield is provided between the primary and secondary windings of a transformer, it is bonded to ground to prevent any leakage and shock hazard between the primary and secondary windings and to ensure that the correct voltage is supplied to the equipment connected to the secondary winding, which is important when the equipment is rated extra-low voltage.

Audio transformers can be installed to supply underwater speakers or regular loudspeakers installed within 3 m of a pool wall. Isolating the audio transformer circuits from ground under a fault condition prevents any current from flowing to the grounded metal parts of the pool. Subrule (3) requires audio transformers to

- be connected between the audio output terminals and any loudspeakers that are installed within 3 m of the pool wall;
- be installed in or located adjacent to the amplifier with which they are used; and
- have a maximum output voltage of 75 V rms.

Rule 68-064 Receptacles

The intent of Rule 68-064 is to discourage and restrict the use of appliances near a pool's edge, so that people using the pool are unlikely to come into direct contact with an appliance. Direct or even indirect contact with the energized casing of a faulty appliance, such as a radio or portable tool, can result in a severe electric shock.

Subrule (1) prohibits receptacles from being installed within 1.5 m of the inside wall of a pool. Subrule (2) allows receptacles to be located between 1.5 m and 3 m from the inside wall of a pool, provided that they are protected by a Class A GFCI (see Rule 68-068). Receptacles may be installed without Class A GFCIs, provided that they are more than 3 m from the pool (see Figure 68-3). However, Rule 26-710(n) requires that all receptacles installed outside of residential occupancies and located within 2.5 m of finished grade be protected by a Class A GFCI.

Rule 2-134 specifies that GFCIs are permitted as extra protection from shock hazard. It should be noted, however, that a GFCI is an electromechanical device that requires regular testing, at intervals specified by the manufacturer, to ensure proper operation.

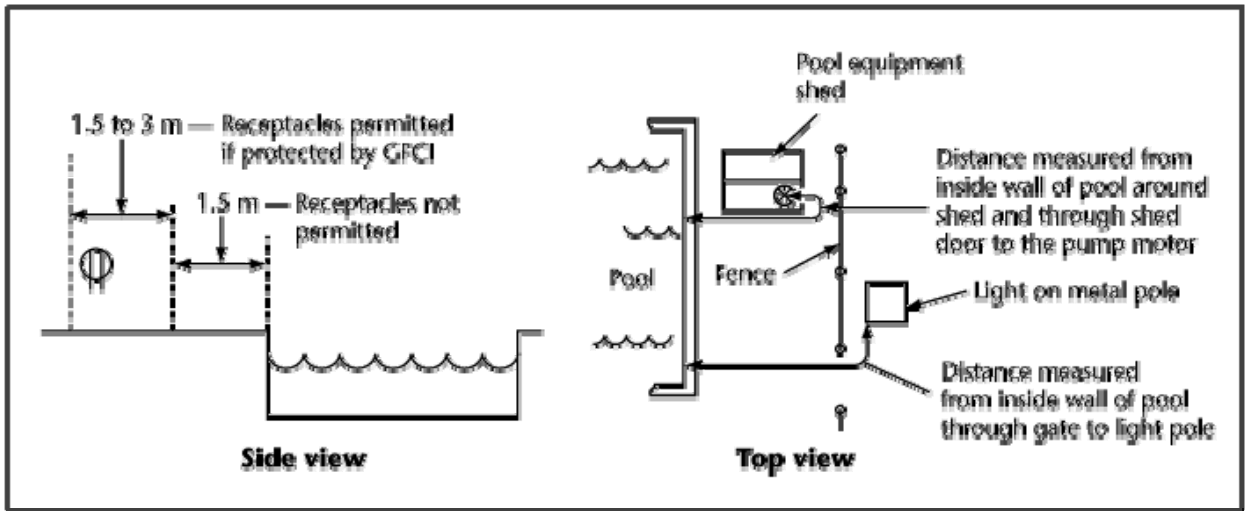

Figure 68-3
Typical receptacle and light installations near pools

The minimum distances between receptacles and the inside walls of pools are based on the length of cord normally provided with appliances. Subrule (3) stipulates that the distances specified in Subrules (1) and (2) be measured as the shortest path the supply cord of an appliance would follow without going through a building floor, wall, or ceiling. Using extension cords to supply electrical devices and appliances in pool areas defeats the distance safety requirements of Rule 68-064, as shock protection is provided only by the GFCIs, which are designed to be used only as supplementary protection (see Rule 2-134).

Rule 68-066 Luminaires and lighting equipment

The Code gives no requirements for illumination in or around a pool. Given the possibility that stray electrical currents from lighting equipment can get into pool water, it seems logical to simply prohibit lighting in the water or in the immediate vicinity of a pool. However, a pool presents hazards other than severe electric shock, and if it is used after dark, adequate illumination is necessary to ensure the safety of the people using it. Despite the apparent risks, underwater lighting is preferable because above-ground lighting can reflect off the surface of the water and make it difficult to see a swimmer who is having problems.

Rule 68-066 covers three types of lighting:

- underwater lighting provided by submersible luminaires (wet-niche luminaires in contact with the pool water);
- underwater lighting provided by dry-niche luminaires (not in contact with the pool water); and
- above-water area lighting.

Wet-niche luminaires are the type most commonly provided in private swimming pools. When installed in any kind of pool other than a decorative pool, Subrule (1)(a) requires that submersible luminaires be mounted in a forming shell. Subrule (2) exempts decorative pools from this requirement because people are unlikely to swim in them.

The metal forming shell of a wet-niche luminaire must be grounded so that it is capable of draining off stray currents imposed by a fault in the luminaire. This grounding can be considered a second line of defence if the GFCI required by Rule 68-068 fails to operate correctly. Subrule (1)(c) states that the maximum voltage for the operation of any submersible luminaire is 150 V.

Wet-niche luminaires are provided with an extra length of cord so that the luminaire can be removed from the forming shell and placed on the pool deck for servicing.

Dry-niche luminaires are usually found in larger pools, where the supply voltage can be as high as 300 V. These luminaires are not in direct contact with the pool water, as they illuminate the pool through a transparent barrier. All lighting equipment must be accessible for servicing and maintenance. Subrule (4) permits access to dry-niche luminaires from a tunnel or walkway around the outside walls of the pool or through a handhole in the deck of the pool.

Subrule (6) requires that luminaires in pool water or within 3 m of the pool surface or walls be protected by a GFCI, unless the luminaires are separated from the pool area by a fence, wall, or other permanent barrier (e.g., in the case of area lighting) (see Figure 68-4).

Lighting equipment, including standards or supports, can present a shock hazard to anyone in the pool area who contacts it directly or even indirectly (e.g., through a metal tool used for pool servicing). Subrule (7) requires that standards and supports for luminaires not be installed within 3 m of the inside walls of a pool, except when the luminaires are protected by GFCIs.

Rule 68-068 Ground fault circuit interrupters

The prime function of a GFCI is to provide protection against hazardous electric shocks caused by leakage current flowing to ground from defective circuits or electrical equipment. Subrule (1) requires that GFCIs in pool installations be of the Class A type, which limits the acceptable amount of leakage current to less than 6 mA. If the leakage current is 6 mA or more, the circuit is interrupted (see the Note to Section 0 in Appendix B).

Where a Class A GFCI is not available in the rating required for the electrical equipment, Subrule (2) allows the use of ground fault protection that can clear a ground fault within the time specified for a Class A GFCI. (For the tripping values of GFCIs, see the Note to Section 0 in Appendix B.)

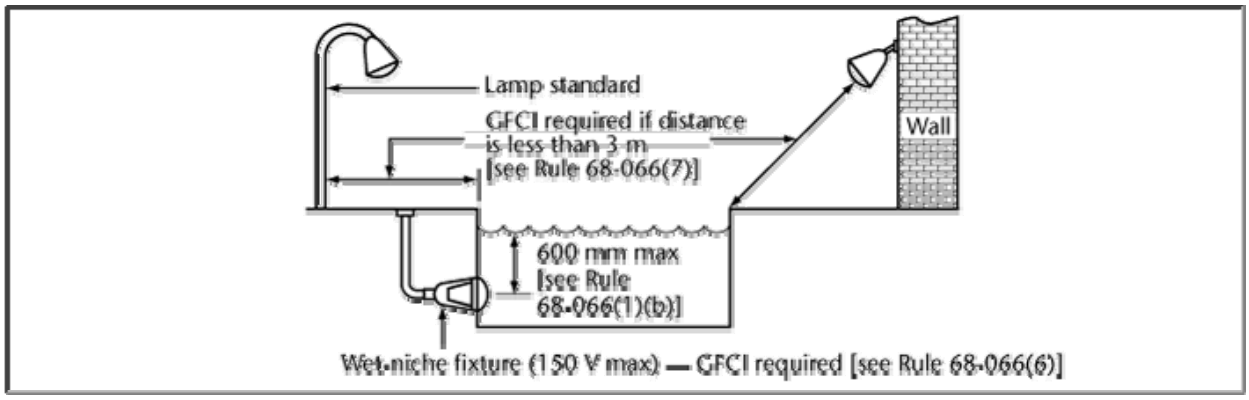

Figure 68-4
Typical luminaire installation

Subrules (3) and (4) require that GFCIs be permanently connected to a feeder, branch circuit, or individual device. Because they perform an important safety function, GFCIs should be tested regularly. To remind pool operators of this requirement, Subrule (5) requires a warning sign, posted beside the switches that control the GFCI-protected circuits, that indicates that GFCI protection is provided and should be tested regularly.

People testing and resetting GFCIs can encounter a shock hazard if they are standing in water or in a wet area near the pool, as an unprotected circuit feeds the interrupter. In addition, moisture, along with the corroding effect of chemically treated pool water, can interfere with the mechanical operation of a GFCI. Subrule (6) requires that GFCIs not be installed within

- 3 m of the water in a pool;
- 3 m of the water in a spa or hot tub; and
- 1.5 m of a hydromassage bathtub.

An exception is allowed if the GFCI is an integral part of an approved factory-built spa, hot tub, or hydromassage bathtub, or is located behind a barrier that prevents the occupant of the pool or tub from contacting the GFCI.

The combination of water and faults in the electrical equipment can create a shock hazard. Thus, Subrule (7) lists equipment and devices that must be protected by a GFCI.

Long runs of conductor can cause the nuisance tripping of a Class A GFCI protecting it. A certain amount of capacitive leakage is always present between the live conductor and the grounded conductor of a grounded electrical system. Nuisance tripping can result when the leakage current to ground is large enough to trip the GFCI. Limiting the length of the protected cable to 75 m can help to reduce this nuisance tripping. This might require locating the GFCI closer to the outlet it protects.

Rule 68-070 Other electrical equipment

When pools are equipped with underwater loudspeakers, Rule 68-070 requires that the output from the associated amplifier be put through an isolation transformer. Subrule (1) prohibits the wiring to such loudspeakers from being grounded, as this defeats the purpose of the isolating transformer. To prevent a swimmer from contacting the speaker itself, Subrule (1) also requires that speakers be mounted in a recess and guarded by a rigid, corrosion-resistant, grounded metal screen.

Communication equipment can present a shock hazard when used near pools. Subrule (2) requires that communication equipment installed within 3 m of the inside walls of a pool be permanently mounted on a wall, with no part of the equipment located within 1.5 m of the inside walls of the pool unless it is made inaccessible by a wall or other permanent barrier. Where it is necessary for a person in a pool to have access to a communicating device (e.g., for safety reasons), an insulated device or link that activates the communication equipment (e.g., a pull string) may be placed in the pool water. However, the communication equipment attached to the insulated link must remain out of reach of a person in the pool.

Subrule (3) prohibits the location or installation of communication jacks within 3 m of the inside walls of a pool. These types of jacks allow the connection of communication equipment (e.g., a telephone) with attachment cords or cord sets that can extend into the pool.

Permanently installed swimming pools

Rule 68-100 Wiring method

The electrical equipment most commonly installed in a pool is underwater lighting. Rule 68-100 requires that a wet-niche luminaire be installed in a forming shell embedded in the pool wall [see Rule 68-066(1)]. Rule 68-060 requires the installation of a deck box (junction box) for the connection of the flexible cord that connects the luminaire to the branch circuit wiring. Rule 68-100(1) requires that the forming shell and the junction box be connected by a rigid conduit made of copper, rigid PVC, or other corrosion-resistant material.

Subrule (4) requires that the conductors for wet-niche luminaires be kept isolated from all other wiring so that the protection provided by GFCIs is not defeated.

Water can collect in conduits installed in the walls and deck of a pool, either from leakage due to the failure of a gasket or seal or (as is most often the case) from condensation. Subrule (5) requires proper drainage for any such moisture, to help reduce shock hazards and leakage currents.

Storable swimming pools

Rule 68-202 Pumps

A pool large enough for swimming contains a substantial quantity of water, and it is not practical to continually change the water. Without proper filtering of the water, it can become a health hazard; therefore, filter pumps are normally supplied as part of the pool. These pumps must be specifically approved for the purpose and are usually mounted close to the side wall of the pool.

Typically, the pumps are provided with a flexible cord and an attachment plug so that they can be plugged into a receptacle. Subrule (1)(a) requires that such a receptacle be permanently installed not less than 1.5 m and not more than 7.5 m from the pool (see Figure 68-5). This distance is intended to discourage the use of extension cords. Subrule (1)(b) requires that, where the pump is within 3 m of the inside walls of the pool and not suitably separated from the pool area (and so can be touched by someone in the pool area), it be protected by a GFCI and be approved for such an installation as required by Subrule (2).

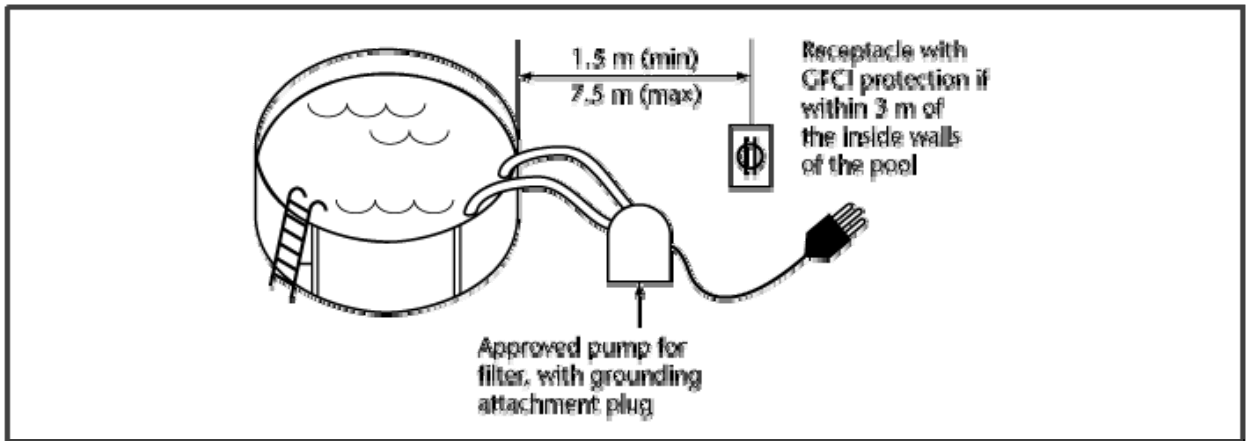

Figure 68-5
Typical pump installation

Hydromassage bathtubs

Rule 68-302 Protection

A person submerged in water is at considerable risk if exposed to even small amounts of electric current (i.e., amounts in excess of 6 mA). For this reason, Rule 68-302 requires that hydromassage bathtubs that are equipped with electrical components be protected by a Class A GFCI.

Rule 68-304 Control

Rule 68-304 specifies the location of controls for a hydromassage bathtub, in order to eliminate the potential for shock hazards. Unless the controls are part of an approved factory-built hydromassage bathtub, they must be installed behind a barrier or be located at least 1 m horizontally from the wall of the hydromassage tub to prevent an occupant from reaching them.

Rule 68-306 Receptacle for a cord-connected hydromassage bathtub

A receptacle for a cord-connected hydromassage bathtub must be located close enough to the equipment so that the tub's supply cord can reach the receptacle but cannot be reached by a person in the tub. Subrule (2) requires that a warning label be affixed to the receptacle for the cord-connected hydromassage bathtub to warn against and prevent the connection of any other equipment to the receptacle. Subrule (3) allows an exemption from the warning label if the receptacle used is a single receptacle.

Rule 68-308 Other electric equipment

Rule 68-308 indicates that a room containing a hydromassage bathtub is classified as a bathroom, and that all the other Rules regarding the installation of electrical equipment in bathrooms apply.

Spas and hot tubs

Rule 68-402 Bonding to ground

Different voltage gradients between the metal parts of a spa or hot tub can become shock hazards to people in the tub. Subrule (1) requires that the metal parts of spas and hot tubs be bonded together and to ground, in accordance with Rule 68-058.

Subrule (2) notes that metal rings or bands used to secure the staves of a wooden hot tub need not be bonded to ground since it is highly unlikely that they would become energized.

Rule 68-404 Controls and other electrical equipment

Subrule (1) aims to reduce the risk of shock hazard by requiring that the controls be located so that a person in the spa or hot tub cannot reach them.

In emergencies, the circulating pumps for spas or hot tubs might have to be shut down. When spas and hot tubs are installed in locations other than dwelling units (e.g., in health clubs, hotels, or resorts), people trained in emergency procedures might not be readily available. In such locations, Subrule (4) requires that an emergency shut-off switch be installed (see Figure 68-6).

Rule 68-406 Leakage current collectors

Unlike factory-assembled spas and hot tubs, field-assembled units have not been fully tested for continuity and insulation resistance and can present a shock hazard to users if there is leakage current from electrical devices in contact with water. There needs to be a path to ground for the leakage current to flow that would trip the GFCI when the leakage current reaches a specific level (6 mA or more for a Class A type GFCI). For safety reasons, field-assembled spas and hot tubs must meet the same safety standards as factory-assembled units. Rule 68-406 describes the requirements for leakage current collectors, which are intended to ensure a high degree of safety.

Subrule (1) requires that all water flowing through the water inlets and outlets of a field-assembled spa or hot tub flow through a leakage current collector, which conducts to ground any electrical charge imposed on the water by defective electric water heater elements or faulty circulation pumps. Subrule (4) makes an exception to this requirement if the only electrical component in the system is a pump marked as an insulated wet end pump, which by design and construction effectively keeps the water from contacting any metallic part of the pump.

Subrule (2) requires that a leakage current collector be a section of corrosion-resistant metal tubing at least five times as long as its diameter, provided with a corrosion-resistant lug, and inserted in a run of non-metallic pipe (see Figure 68-7). In a spa or hot tub that is factory-built for field assembly, an integral device that provides equivalent protection may also be used; this device can be part of the electric water heater used to heat the spa water.

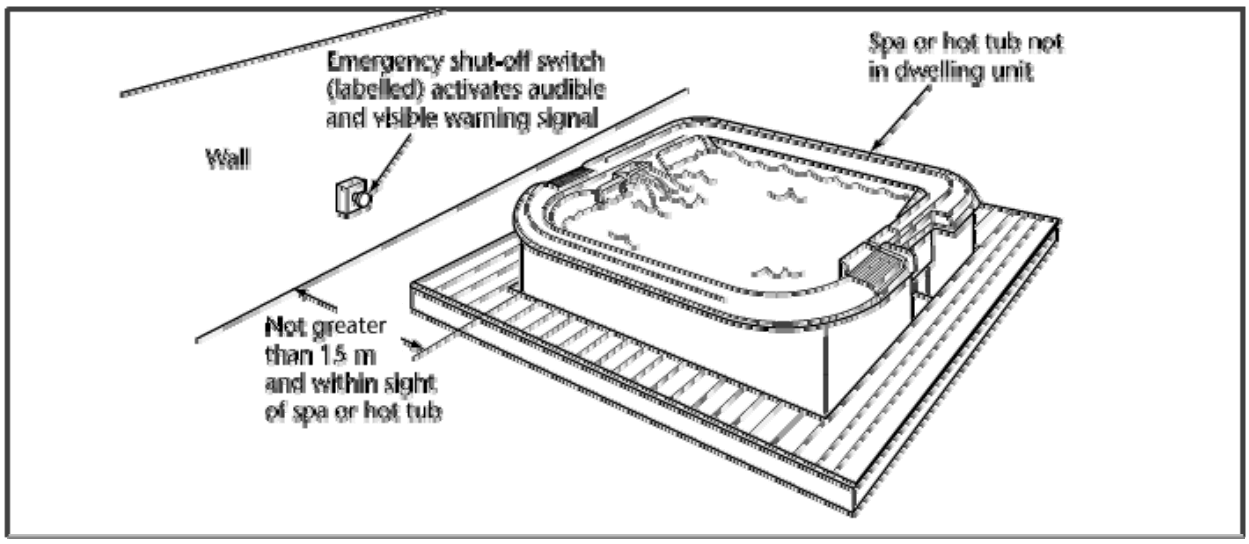

Figure 68-6
Emergency shut-off switch

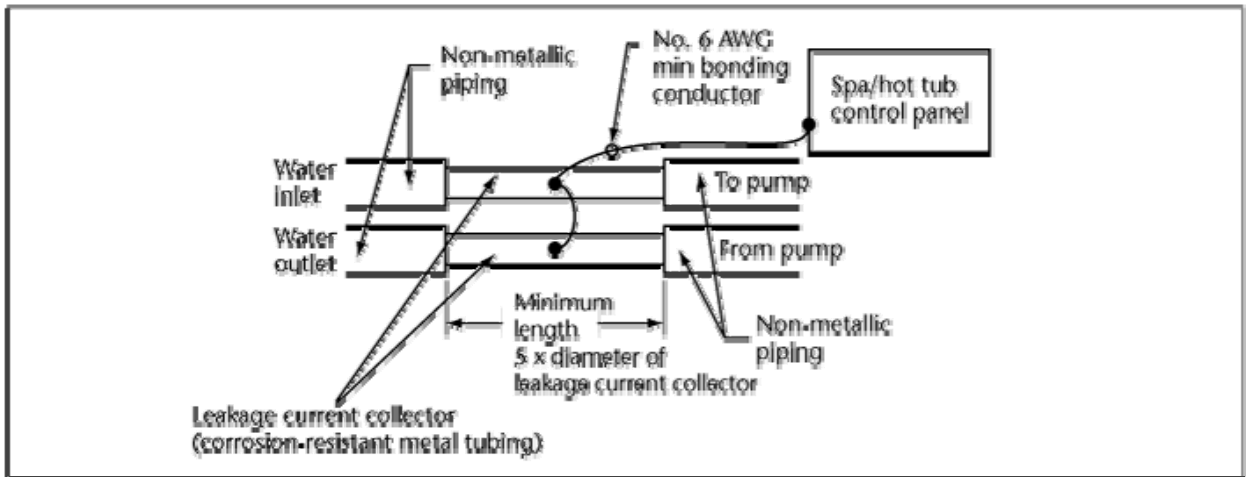

Figure 68-7
Leakage current collector (typical field-assembled installation)

Rule 68-408 Field-assembled units

Because some units are custom designed, Rule 68-408 requires that individual components be specifically approved for their intended purpose and assembled in the proper manner. Since field-assembled units cannot be certified in the same way as factory-assembled units, additional requirements are provided.

Subrule (3) requires that water be prevented from contacting the live parts of air blowers, where they are used. Air blowers (air pumps) are used to introduce air into the spa through a series of injectors in the side of the footwell and seats, or into the water coming out of the jets, to modify the massaging action of the spa. The Note to Rule 68-408(3) in Appendix B suggests that, as a means of preventing water from contacting a blower's live parts, an inverted U-shaped pipe be installed in the air pipe so that the bottom of the top loop of the pipe is not less than 300 mm above the tub rim.

Table 68-1
Summary of requirements for pools, tubs, and spas

	Permanently installed swimming pool	**Storable swimming pool**	**Hydromassage tub**	**Spa or hot tub**
Requirement for GFCI protection	When electrical equipment is installed within the confines of the pool walls within 3 m of the inside walls of the pool [see Rule 68-068(7)(c)]	When the pump or pump receptacle is located within 3 m of the inside walls of the pool [see Rule 68-202(1)(b)]	Always required on electrical equipment associated with the tub (see Rule 68-302)	Always required on factory-assembled units; requirements for field-assembled are the same as for permanently installed swimming pools [see Rule 68-068(7)(c)]
Requirements for the location of GFCIs	Not closer than 3 m from the pool water and in a location that facilitates testing [see Rule 68-068(6)]	Requirements are the same as for permanently installed swimming pools [see Rule 68-068(6)]	Not closer than 1.5 m from the tub, unless it is part of an approved factory-built tub or located behind a barrier that prevents the occupant from contacting it [see Rule 68-068(6)]	Not closer than 3 m from the pool water, unless it is part of an approved factory-built spa or hot tub, or behind a barrier that prevents the occupant from contacting it [see Rule 68-068(6)]
Requirements for the installation of receptacles	• No receptacles are allowed within 1.5 m of the inside walls of a pool • Receptacles installed between 1.5 m and 3 m of the inside walls of a pool require GFCI protection (see Rule 68-064)	• Pump receptacle must be installed between 1.5 m and 7.5 m of the pool • Receptacles installed within 3 m of the inside walls of the pool require GFCI protection (see Rule 68-202)	For cord-connected hydromassage tubs, one receptacle located not less than 300 mm from the floor and inaccessible to the tub occupant (see Rule 68-306)	Same as for permanently installed swimming pools (see Rule 68-064)
Requirements for the installation of luminaires	Luminaires and supports or standards for luminaires installed within 3 m of the pool surface or walls require GFCI protection [see Rule 68-066(6)]	No requirements in Section 68	No requirements in Section 68	Same as for permanently installed swimming pools (see Rule 68-066)
Requirements for the installation of other types of electrical equipment	GFCI protection is required where the electrical equipment is located within 3 m of the inside walls of the pool [see Rule 68-068(7)]	No requirements in Section 68	No requirements in Section 68	Same as for permanently installed swimming pools [see Rule 68-068(7)]