

Swimming Pools & Equipotential Bonding

(NEC Section 680.26)



developed by



What is Equipotential Bonding for swimming pools?

Establishing an electrically safe environment in and around permanently installed swimming pools requires the creation of an equipotential grid. The sole purpose of an equipotential grid is to create an area where there is no significant difference in voltage between objects that can be touched simultaneously. Examples of objects at a pool that can be touched simultaneously include the concrete decking, ladders, hand rails, light fixtures, drains, and the pool water. An equipotential grid is created by intentionally connecting all these objects together electrically, otherwise known as bonding them together.

What parts of a swimming pool require bonding?

Section 680.26(B) of the 2005 National Electric Code (NEC) requires bonding of all the metal structures, fittings and parts that are horizontally within five feet of the pool wall and vertically within twelve feet above the maximum water level of the pool.

The following parts require bonding:

- Reinforcing metal of the pool shell, coping stones and deck.
- Metal conduits, metal door frames and metal window frames within five feet of the inside pool wall.
- Metal forming shells and mounting brackets of lighting fixtures.
- Metal fittings such as hand rails, ladders, metal drains and diving board.
- Metal casings of electrical equipment such as pump motors, pool water heaters and equipment associated with pool covers.

Equipotential Bonding Grid

Bonding just the metal parts around the pool to each other may not provide a complete equipotential plane. For this reason, Section 680-26(C) of the 2005 NEC requires connecting the metal parts to a common bonding grid that covers the entire contour of the pool.

Additionally, the equipotential grid is required to extend horizontally under the deck for not less than three feet (Figure 1).

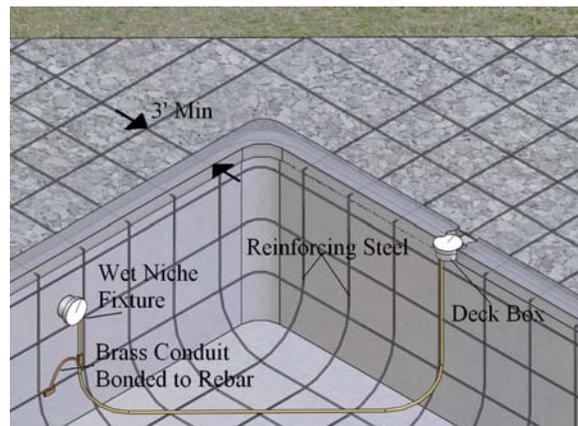


Figure 1: Equipotential grid required for a concrete pool or deck with no rebar

The following pool shells are permitted to be used as an equipotential bonding grid by the code:

- Structural reinforcing steel
- A pool with bolted or welded walls
- Field fabricated grid constructed with a minimum 8 AWG bare solid copper conductors for a concrete pool or deck with no reinforcing metal, as shown in Exhibit 1.

In accordance with the exception in Section 680.26(C), the equipotential bonding grid covering the entire contour of the pool is not required for vinyl lined polymer wall, fiberglass composite or other pools constructed of non-conductive materials.

Bonding Connections

The requirements for connections between the metal parts and the equipotential grid are also specified in the code (Exhibit 2):

- Use an insulated, covered, or bare solid copper conductor not smaller than 8 AWG or use brass or other corrosion resistant metal conduits.
- Use exothermic connectors or pressure type connectors that are labeled as being suitable for the purpose and are of stainless steel, brass, copper or copper alloy.

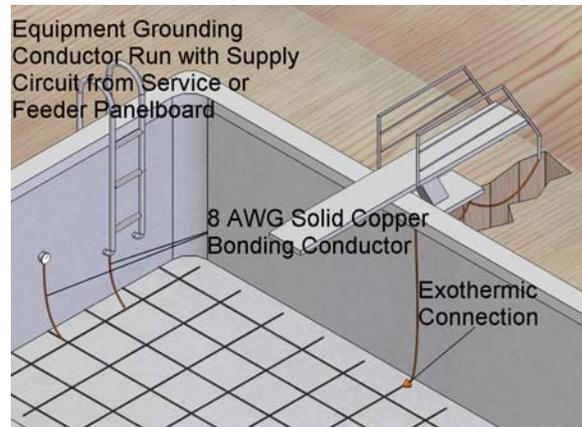


Exhibit 2: An example of equipment bonding in a swimming pool

How do you mitigate Neutral-Earth Voltages (NEV) at an insulated pool?

The 2005 NEC Section 680.26 describes various metal parts and equipment that require bonding with an equipotential bonding grid. In describing these metal parts, it is assumed that one or more of the metal parts are in contact with the pool water. This may not always be the case.

Some pools are lined with insulating materials (vinyl, tiles etc.) and do not have any metal parts such as a ladder or lighting fixture in contact with water. In such a case, intentional bonding of the water is necessary to equalize the water-to-deck voltages.

The 2008 NEC requires the installation of conductive metal fitting(s) or equipment totaling a minimum surface area of 9 square inches (equivalent to metal strip in underwater pool light fixture) in contact with water and bonded with the equipotential grid to mitigate the neutral-earth voltages.

The metal fitting must consist of a corrosion resistant material such as stainless steel or aluminum.

My pool is not bonded properly

It is important to remember that if you can feel the annoying shock from NEV while in your pool, then your pool is not properly bonded. While NEV isn't dangerous, an improperly bonded pool can be dangerous.

Your local "Authority Having Jurisdiction" (AHJ), usually a local electrical inspector or pool inspector, should be able to help you find qualified electricians to test and repair deteriorating pool bonding. However, if you have a pool that was built without complete and proper bonding, significant renovations may be necessary to establish an adequate equipotential grid. It can be especially difficult to bond concrete decking after the initial construction.

Additionally, your local electric utility may be another resource in assisting you in determining if your pool is properly bonded and providing recommendations to improve your pool's bonding.



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