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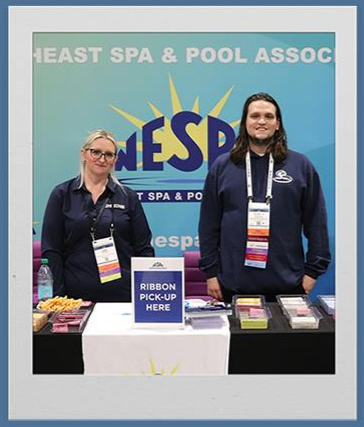

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Changes in Article 680 2020, 2023 and 2026 National Electrical Code (NEC)

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Pflugerville (Austin) TX

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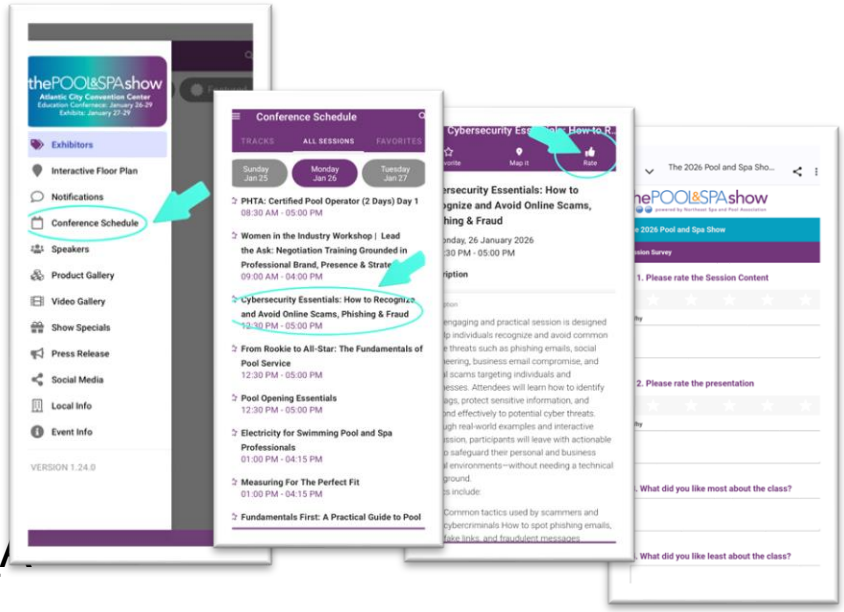

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Changes in Article 680 2020, 2023 and 2026 National Electrical Code (NEC)

Presented By

Hamilton & Associates

Engineering - Technical Services

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After completing this lesson, students should be able to:

- Understand how the National Electrical Code (NEC) is developed
- Understand changes to Article 680 in the 2020 NEC, 2023 NEC and the 2026 NEC

The NEC is a Safety Document Governing Construction of Electrical Installations on the Customer's Side of the Meter- "practical safeguarding"

The NEC is published by the National Fire Protection Association (NFPA) and is revised on a 3-year cycle

The NEC has no force of law unless it is adopted by an Authority Having Jurisdiction (AHJ). The AHJ is usually a government entity (state, city, county, etc.)

20 states including ME, NH, MA, MI, OH, KY and GA currently adopt the 2023 Edition

19 states including VT, RI, CT, NJ, DE, MD, VA, WV, NC, SC, AL, and FL adopt the 2020 Edition

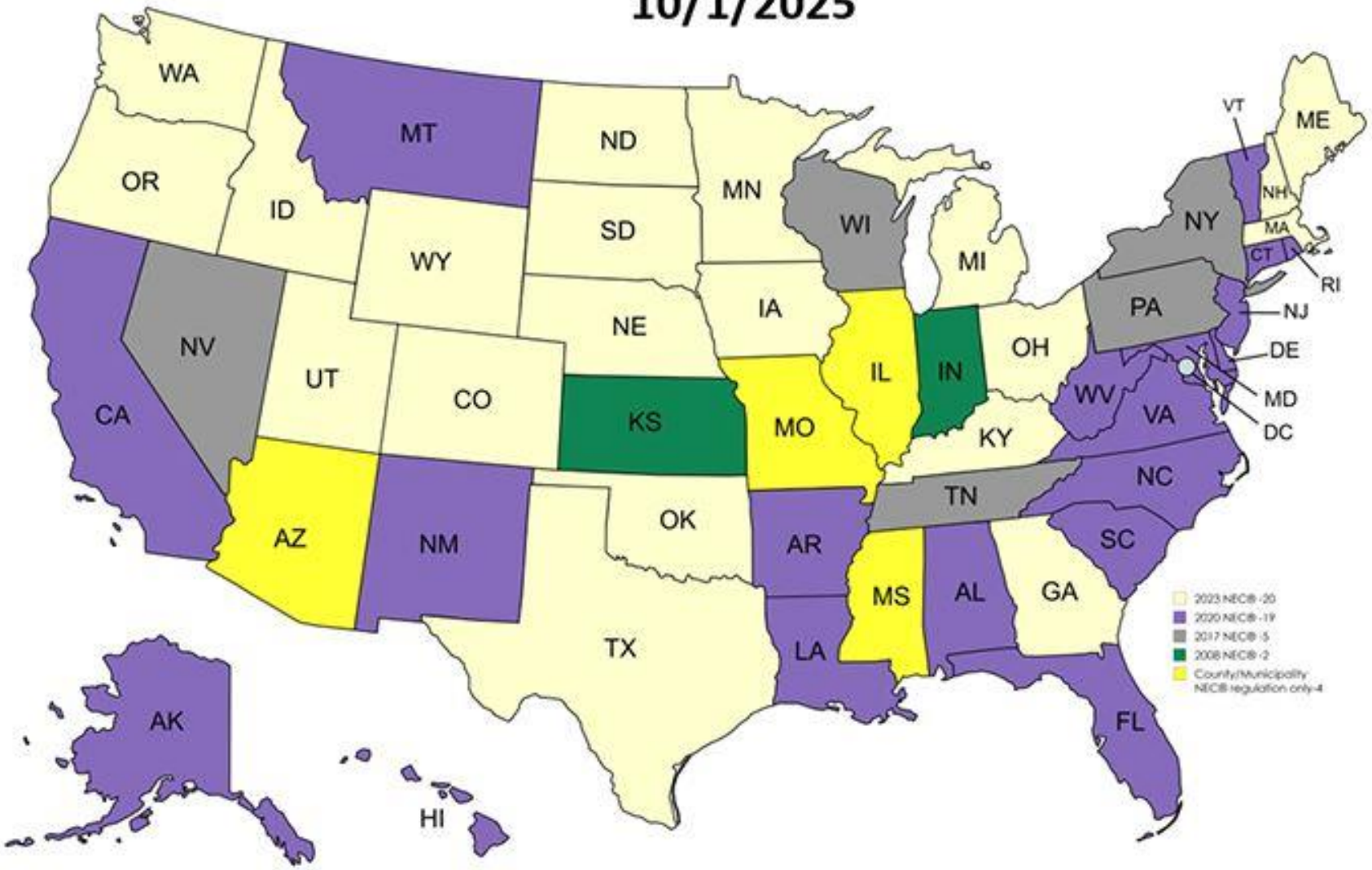
PA, NY, TN, WI, and NV currently adopt the 2017 Edition

IN and KS currently adopt the 2008 Edition

AZ, MO, IL and MS have local adoption only (no statewide adoption)

The 2011 New York City Electrical Code is based on the 2008 NEC Edition

NEC® In Effect
10/1/2025



NEC Article 680 Addresses Construction of Electrical Installations for Pools, Spas, Fountains, Pools and Tubs for Therapeutic Use, and Hydromassage Bathtubs

Why is this important to the pool and spa professional?

- Safety is paramount for everybody
- The why and how of pool electrical systems are not generally well-understood
- Poor and/or incorrect installation or maintenance of a pool installation by third parties can still expose the manufacturer, builder or maintainer to significant liability issues
- The issues don’t stop with owner acceptance of the initial installation of the product or the end of the maintenance or service call

Why is this important to the pool and spa professional?

HOUSTON CHRONICLE, November 8, 2013 (excerpts)

Two electricians charged in electrocution of man at Houston hotel pool.

Charged with criminally negligent homicide (felony – 2 yrs + $10,000 fine). One pleaded No Contest to slightly lesser charge. One pleaded Guilty to criminally negligent homicide. Both on probation and no longer have electrician licenses.

An investigation by police, the city's Public Works and Engineering Department and the Texas Department of Licensing and Regulation also determined the wiring to the pool light **lacked a ground fault circuit interrupter** that would have immediately cut off the current in the event of a shock, officials said. The pool also **lacked proper bonding**, police said. Both are violations of the NEC.

Did not get a permit for the work with the City of Houston, police said.

Lawyers for the victim's family also filed several civil lawsuits seeking more than $2 million in 2013, which settled in 2015.

The Deadliest People Around the Pool

- Homeowner - generally clueless but thrifty
  - Tries to save a buck and gets it wrong. "WHAT CODE??"
- The property maintenance person
  - Generally just like the homeowner, but has an equally clueless boss with a budget. "I GOT AN OLD COPY YESTERDAY;" "They won't let me do it because it costs too much"
- The mass merchandiser's "expert"
  - Credentials and experience??? "HUH??"
- The pool tech who overdoes it
  - Most electrical work requires a license.
- The inexperienced electrician
  - May be good, but what do they know about pools??
- The "know it all" inspector
  - Did you look at it?? The Code "requires" ***WHAT***??

National Electrical Code

The NEC is revised on a 3-year cycle.

The NEC is a MINIMUM standard.

The NEC has no stand-alone legal authority. Various editions of the NEC are adopted by Authorities Having Jurisdiction (AHJs).

ALWAYS verify the proper edition of the NEC and any local amendments with the permitting/inspecting authority prior to doing work!

A Reminder …

Older Editions of the NEC Do **NOT** Require That Older Pools Be Routinely Upgraded To Current Standards

BUT…

Starting with the 2020 Edition, Reconstructed Pool Shells Must Be Bonded to Meet Current NEC Requirements, AND When Pool Pump Motors Are Replaced, They Must Be GFCI-Protected

The NEC Revision Process for Pools and Spas

Typical NEC Revision Schedule

- Meetings are public
- Anyone can propose changes in the Code (First Draft – FD) or comment on proposed changes (Second Draft– SD) – do it on-line during the allotted time period and it WILL be considered - go to www.nfpa.org
- The FD used to be called the Report on Proposals (ROP) and the SD used to be called the Report on Comments (ROC)

Typical NEC Revision Schedule (cont'd)

- Code-Making Panel CMP-17 covers 680 and other sections dealing with appliances
- 27 current members:
  - 15 Principals (1 is Chairman)
  - 1 Voting Alternate
  - 9 Alternates
  - 2 Non-voting members (CPSC – 1 principal, 1 alt.)
- All principals of CMP-17 vote on 680
- NEC code-making process results are published on the NFPA website www.nfpa.org

Example: 2020 CMP-17 First Draft Summary

- About 400 Public Inputs (Proposals) total – CMP-17
- FD: About 175 Public Inputs (Proposals) involving Articles 680 and 682 (bodies of water):
  - First Draft Ballot – 54 FRs (680), 6 FRs (682) (these may include multiple PIs)
  - Held for future action- 0

- Well over half of the FD proposals for 680 & 682 were primarily wording and terminology changes. Some of these were incorporated into the First Draft by the Panel. There were several other similar proposals which were also incorporated into the First Draft by the Panel.

2020 CMP-17 Second Draft Summary

- About 140 Public comments total – CMP-17
- 4 Global comments (entire NEC)
- About 85 Public Comments involving Articles 680 and 682 (bodies of water):
  - Second Draft Ballot – 26 SRs (680), 3 SRs (682) (these may include multiple PCs)
  - Held for future action- 0

National Electrical Code Recap

The NEC is revised on a 3-year cycle

Various editions of the NEC are adopted by authorities having jurisdiction.

ALWAYS verify the proper edition of the NEC and any local amendments with the permitting/inspecting authority prior to doing work!

The final second revision phase for the 2026 Edition is currently underway

NEC 680 Timeline

Q. Why is a timeline important in the first place?

A. Because the requirements for pools and spas have changed over the years. When you are looking at an older pool it is important to know what kind of an installation to expect.

NEC 680 Timeline

- Pre-1962 pools
  - No direct regulation-NEC 680 nonexistent!
- Pre-1965 pools
  - Open electrical connections in lights.
  - Bonding not directly addressed.
- Pre-1971 pools
  - Flush deck boxes at line voltage (120V).
- Pre-1975 pools
  - GFCI not mandatory under NEC **(Several states now require GFCIs on all public pools)**

NEC 680 Timeline (Cont'd)

- Pre-1993 pools
  - Uninsulated / uncovered pool motor grounds inside 1 family dwellings.
  - No regulation of rebar ties or location of nearby ceiling fans.
  - No non-metallic wet niche light fixtures / niches allowed.

NEC 680 Timeline (Cont'd)

- Post-1999 Pools
  - Bonding clamps must be listed for purpose; cadwelding of bonds is allowed, BUT
  - Code allows use of PVC-jacketed (i.e., insulated) rebar in concrete pools - *this defeats the pool bonding!* **(Some states are still considering outlawing this for safety reasons)**
    - **THE SAME HAZARD EXISTS FOR FIBERGLASS REBAR**
- Post-2005 Pools
  - Confusion over bonding for fiberglass and vinyl liner pools

NEC 680 Timeline (Cont'd)

- Post-2008 Pools
  - Clarified definition of a pool: facilities for immersion such as baptistries and mikvahs are pools
  - Bonding of conductive vs. nonconductive (fiberglass and vinyl liner) pool shells clarified
  - Perimeter bonding - Grid vs. Single Conductor Ring
  - **Bond to Water** Introduced
  - Bonding of Portable Spas

NEC 680 Timeline (Cont'd)

- Post-2011 Pools
  - Eliminated perimeter bonding of listed portable spas and hot tubs installed outdoors above grade per manufacturer's instructions (TIA70-11-1)

  - Expansion of voltage ranges and addition of power supplies. Creates a "**Low Voltage Contact Limit" (LVCL)** which is as follows:
    - 15 V RMS for sinusoidal ac
    - 21.2 V peak for nonsinusoidal ac
    - 30 V for continuous dc
    - 12.4 V peak for dc that is interrupted at a rate of 10-200 Hz

    This change is to accommodate different voltage ranges necessary for new technologies in lighting and controls. All references to 15V now reference this limit. There is effectively no change for ac equipment rated 15 V or less, including 12 V lights.

NEC 680 Timeline (Cont'd)

- Post-2011 Pools (cont'd)
  - Clarified bonding requirements
  - Required perimeter bonding only on the pool side of a perimeter surface separated by a permanent wall or building 5' or more in height and located less than 3' from the wall of the pool. Eliminated confusion and misinterpretations wherein some AHJs were requiring bonding to building foundations, etc.
  - Exempted indoor portable spas installed above a finished floor from perimeter bonding grid requirements

NEC 680 Timeline (Cont'd)

- Post-2014 Pools
  - Deletes the word "adequately" throughout the Code to conform to NFPA style requirements. The term as utilized is vague and unenforceable. (Part of a revision involving the entire NEC)
  - Clarifies definitions of fixed, portable & stationary (as applied to equipment)
  - Adds storable spas and hot tubs to the definition of storable swimming, wading or immersion pool in the Definitions section 680.2.
  - Clarifies overhead conductor clearances to include overhead service conductors. Includes "overhead service conductors" with service drop conductors and open overhead conductors in 680.8(8) to correlate with other earlier changes in the 2011 NEC regarding service technologies.

NEC 680 Timeline (Cont'd)

- Post-2014 Pools (cont'd)
  - Requires ALL 120-240 V single phase pumps to be GFCI-protected (680.21(C)).
  - Eliminates requirement in 680.22 that pump motor receptacles employ a locking configuration.
  - Now requires a general purpose GFCI-protected receptacle outlet on all permanent pool installations, not just at dwelling units (680.22(A)(3).

NEC 680 Timeline (Cont'd)

- Post-2014 Pools (cont'd)
  - Regarding underwater lights,
    - Allows listed low voltage luminaires not requiring grounding, not exceeding the LVCL, and supplied by listed transformers or power supplies to be located <5' from pool edge
    - Requires bottom-mounted luminaires to be either guarded or listed for use without a guard (pools, spas, and fountains)
    - Clarifies water levels to mean maximum water levels instead of the vague term "normal water levels"
  - Eliminates exception for "existing" feeders in 680.25(A)(1); an insulated equipment grounding conductor is required on all installations in 1- and 2-family dwelling units between service panels and panels serving pool equipment (*basically bans NM, UF, and SE cables, etc., from this application due to complaints of widespread abuse of previous "existing feeder" rule*)

NEC 680 Timeline (Cont'd)

- Post-2014 Pools (cont'd)
  - Requires underwater audio equipment to be identified (i.e., recognizable as suitable for the specific purpose, function, use, environment, application, etc., e.g., listed and labeled)
  - Clarifies that motorized pool covers be connected to a branch circuit protected by a GFCI
  - Incorporates storable spas and hot tubs into the requirements for storable pools

NEC 680 Timeline (Cont'd)

- Post-2014 Pools (cont'd)
  - Minor rewording for clarity in bond to water requirements in 680.26(C). Actual requirements do not change.
  - Minor rewording for clarity in 680.74 regarding hydromassage bathtubs.. Actual requirements do not change. For hydromassage bathtubs, requires that both metal piping systems and grounded metal parts in contact with the circulating water be bonded together
  - Requires a maintenance disconnecting means for fountains (same as for pool or spa - at least 5' from inside walls unless separated by barrier)

NEC 680 Timeline (Cont'd)

Post-2014 Spas and Hot Tubs:

- Eliminates 6' length limit in 680.42(A)(1) for LFMC and LFNC conduit installations on spas and hot tubs
- Adopts TIA70-11-1 for portable spas and hot tubs installed outdoors; perimeter surface equipotential bonding is not required if (all must apply):
  - Listed as a self-contained spa for aboveground use
  - Spa is not identified as suitable only for indoor use
  - Installations in accordance with the manufacturer's instructions and located on or above grade
  - Top rim at least 28" above all perimeter surfaces that are within 30" of the spa, excluding non-conducting steps.

  (Adds an informational note referencing ANSI/UL 1563-2010 for information on listing requirements for self-contained spas and hot tubs.)

NEC 680 Timeline (Cont'd)

- Post-2014 Spas and Hot Tubs (cont'd):
  - Adds a new Exception No. 3 to 680.43 (indoor spa and hot tub installations) to clarify the type of feeder used for a listed spa or hot tub installed indoors in a 1- and 2-family dwelling unit. The interior wiring method requirements for outdoor spas in 680.42(C) also apply to listed spas or hot tubs installed indoors in dwelling units. These requirements include:
    - Insulated or enclosed copper grounding conductor not smaller than #12 AWG
    - Wiring to an underwater luminaire must comply with 680.23 or 680.33

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - Added a definition for Electrically Operated Pool Lift
  - Modified definition of storable swimming, wading or immersion pools; or storable/portable spas and hot tubs to clarify that they are swimming, wading or immersion pools that are intended to be stored when not in use, or a pool, spa or hot tub constructed on or above the ground
  - Added a new 680.7 to require grounding and bonding terminals to be identified for use in wet and corrosive environments, and listed and labeled for direct burial use
    - labeled "DIRECT BURIAL" or "DB"
    - composed of copper, copper alloy, or stainless steel
  - Reworded 680.22(A)(2) regarding receptacles associated with the sanitation system - you can use a grounding type duplex receptacle if GFCI-protected or a grounding type duplex GFCI receptacle located at least 6' from the inside pool wall for a plug-and-cord connected pump and associated sanitation system equipment

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - Reworded 680.23(A)(3) regarding GFCI protection of underwater luminaires – lamping, relamping, and servicing
    - The revisions clarify that the GFCI protection shall be protection for personnel. The addition of "servicing" will close the loophole around replacement of luminaires not technically "lamping" or "relamping", or other types of lighting service. The intent is to get GFCI protection for personnel for all lights operating above the LVCL.
  - Reworded 680.23(F)(3)(2) as a correlation item related to the changes in the 2011 NEC regarding the term "equipment grounding conductors," **however a unique requirement for pool luminaires still requires a bonding jumper to be installed in non-metallic conduit between the j-box and a wet niche incorporating metal parts and was not changed**

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - Clarified what the perimeter surface required to be bonded in 680.26(B)(2) is. This revision is intended to clarify that the perimeter surface is considered an area rather than a physical object.
    - Perimeter surface to be bonded is considered to extend 3' (1 m) horizontally beyond the inside walls of the pool
    - Includes unpaved surfaces as well as other types of paving
    - Perimeter surfaces separated from the pool by a permanent wall or building 5' (1.5 m) in height or more requires equipotential bonding only on the pool side of the permanent wall or building
  - Expanded specific conduit types for Underwater Audio Equipment to incorporate all 3 LFNC types. This was brought on by a change in UL listing requirements.

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - Added exceptions to 680.27(B) Electrically Operated Pool Covers – Motors and Controllers to address new low voltage technology on some pool cover motors.
    - Motors that are part of listed systems with ratings not exceeding the LVCL that are supplied by pool transformers or power supplies complying with 680.23(A)(2):
      - are allowed to be located within 5' (1.5 m) from the inside wall of the pool (all others are not).
      - are not required to be connected to a branch circuit with GFCI protection (all others require GFCI).
  - New 680.28 - GFCI protection is now required for circuits serving gas-fired swimming pool and spa water heaters operating at voltages above the LVCL. Not required for electric water heaters because they incorporate internal ground fault current mitigation.

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - 680.42(C) regarding indoor wiring to outdoor spa or hot tub installations eliminates requirement that a copper grounding conductor be insulated or enclosed within the outer sheath and not smaller than 12 AWG. Effectively allows the use of NM cable between the disconnecting means and service equipment for residential spas and hot tubs. The addition of the informational note makes it clear this section applies to branch circuits, not feeders.
  - Added New 680.22(B)(7) – Allows Low Voltage Gas-Fired Luminaires, Decorative Fireplaces, Fire Pits and Similar Equipment within 5' of the inside wall of the pool under certain conditions
  - Clarified that the wiring methods underground near pools must be installed in a manner to withstand the conditions unique to the pool environment
  - Allows only wiring serving pool equipment to be run under pools
    - Only in RMC, IMC, rigid PVC, reinforced thermosetting resin conduit, or MC cable, suitable for the conditions at that location

NEC 680 Timeline (Cont'd)

- Post-2017 Spas and Hot Tubs:
  - 680.12 Equipment Rooms and Pits clarified that the equipment installed in equipment rooms and pits be suitable for the environment in accordance with 300.6 (300.6 addresses protection from corrosion)
    - Added an informational note to clarify the intentions of the Panel
      - Chemicals can cause severe corrosion to electrical equipment in the same vicinity
      - Adequate ventilation of indoor spaces is addressed in ANSI/APSP-11 and can reduce the likelihood of the accumulation of corrosive vapors
  - New 680.14 Corrosive Environment - specifically addresses wiring methods suitable for pool and spa environments
    - Created to detail the corrosion resistance necessary for wiring methods utilized in these installations
    - Corrosive environments (air and liquids/condensation) include:
      - Areas where sanitation chemicals are stored
      - Areas with pumps, automatic chlorinators and filters
      - Open areas under decks adjacent to or abutting the pool structure

      This has caused problems – no UL listing

NEC 680 Timeline
2020 Edition Significant Changes

2020: Changes – 680

- Sections were renumbered as necessary to accommodate additions and deletions
- Clarified that definitions in Art. 680 apply ONLY to that Article.
- Added immersion pools and splash pads to scope.
- Clarified definition of fountain and included splash pads in definition.
- Clarified definition of Corrosive Environment and clarified which areas are to be considered corrosive. **NOTE: This was further clarified in 2023 Edition to state that equipment listed for pool and spa use is considered suitable for use in these environments.**
- Clarified equipment ground conductor sizing requirements for low voltage pool lighting circuits between the secondary (low voltage) winding of a transformer and a junction box

2020: Changes – 680

- Eliminated the 3 remaining references to “bonding grid” as this terminology is no longer used in the NEC.
- Added reference to “bonding” in discussion of grounding in 680.7, referring to Art. 250 definition rather than to equipotential bonding. PHTA opposed this change because it is confusing in the context of pools and spas, but it passed.
- Adds a section stating that AHJs “are permitted to require” periodic inspection and testing of pools and spas. The 2023 NFPA Standard 70B Standard for Electrical Equipment Maintenance addresses periodic testing and inspection of public pools, fountains, etc.

2020: Changes – 680

- Clarified listing requirements for equipment.
- Clarified that definitions in Art. 680 apply ONLY to that Article.
- Clarified electrical equipment required to be connected to an equipment grounding conductor.
- Clarified specifics for distance measurements for consistency throughout 680.
- Clarified measurement requirements for overhead conductors, including communications cables, installed above pools.
- Addressed nomenclature regarding equipment grounding conductors to conform to other NEC references and clarified grounding requirements.

2020: Changes – 680

- Clarified identification requirements for underwater audio equipment.
- Clarified requirements for underwater enclosures.
- Modifications and clarifications to 680.14 regarding corrosive environments.
- Clarified that the only metallic conduit allowed to be installed from a wet niche (forming shell) is either red brass or stainless steel. Does not affect nonmetallic conduit requirements.
- Clarified which parts of a spa are to be bonded together.
- Clarified which metal parts of a hydromassage bathtub are to be bonded together.

2020: Changes – 680

- Added requirement that all reconstructed conductive pool shells meet the bonding requirements of 680.26(B)(1).
- Clarified that acceptable perimeter bonding methods in 680.26(B)(2) included structural steel, #8 AWG copper bond ring, and copper wire mesh (all are currently accepted)
- Added requirement that a GFCI be installed where a pool motor on a single phase, 120V through 240 V branch circuit is replaced for maintenance or repair.
- Added requirement that all motors rated 250 V or less and 60 A or less used in pool applications to be protected by a GFCI, including both single-phase and three phase motors.
- Added requirement that all outlets supplying all permanently installed nonsubmersible pump motors rated 250 volts or less and 60 amperes or less, single- or 3-phase, be provided with GFCI protection.

2020: Changes – 680

- Immersion pool requirements added.

- Applies to installations used for ceremonial or ritual immersion of persons, which is designed to have its contents drained or discharged (e.g., baptistries and mikvahs).

- General: An immersion pool is a spa or pool, but has unique characteristics which must be addressed

- Storable/portable and permanently installed immersion pools are addressed.

2020: Changes – 680

- Storable and portable immersion pools

- Considerable variety
  - Cord connection for self-contained units must utilize cord 6'-15' long and must be protected by a GFCI (may be integral GFCI within 12" of plug)
  - Cord-connected storable and portable pumps not built-in must be identified for swimming pool and spa use, and must be (680.31):
    - Double insulated with grounding conductor connected to internal parts and grounding-type plug
    - Integral GFCI in the plug or within 12" of the plug
  - Storable and portable heaters not built-in must be identified for swimming pool and spa use, and must meet the following additional requirements:
    - Rated 120 V 20 A or less, or 240 V 30 A or less, single phase
    - If plug-and-cord connected, cord must be 6'-15' long and at rated for at least "hard usage"
    - Heaters supplied by branch circuits 150 V or less to ground must be protected by a Class A GFCI
    - If integral GFCI, must be in the plug or within 12" of the plug

2020: Changes – 680

- Storable and portable immersion pools (cont'd)
  - No audio equipment installed in or on pool
  - All audio equipment located within 6' from the inside wall of the pool and operating at >LVCL must be grounded and GFCI-protected
  - At least 10' (straight line measurement) between nearest point on top rim and luminaires, lighting outlets, and ceiling-suspended paddle fans
  - Located at least 5' (horizontal measurement) from switches >LVCL not part of the pool
  - All receptacles rated 250 V 50 A or less within 20' of the inside walls and supplying power to heaters or other electrical equipment serving the pool must meet the requirements of 680.32 and 680.34:

    Protected by GFCI

    Not located within 6' of the inside walls of the pool

    Distance is shortest path a cord connected to receptacle would follow without piercing a floor, wall, ceiling, or other effective permanent barrier

Immersion Pools

- Storable and portable immersion pools (cont'd)

2020: Changes – 680

- Permanently Installed Immersion Pools
- Must meet requirements of Parts I, II and IV and use the Chapter 3 wiring methods
- Considered a spa or hot tub with regard to Part IV requirements
  - Any cord connection on a permanently installed portable packaged immersion pool must utilize cord 6'-15' long and must be protected by a GFCI (may be integral GFCI within 12" of plug)
  - Cord-connected storable and portable pumps not built-in or permanently attached, rated 120 V and 20 A or less must be identified for swimming pool and spa use, and must be:
    - Double insulated with grounding conductor connected to internal parts and grounding-type plug
    - Integral GFCI in the plug or within 12" of the plug
- All references to heaters include immersion heaters, circulation heaters and combination pump-heater units

2020: Changes – 680

- Permanently Installed Immersion Pools (cont'd)
  - Permanently installed heaters must be identified for swimming pool and spa use, and must meet the following additional requirements:
    - Includes built-in or permanently attached heaters
    - Rated 120 V or 250 V, single phase
    - Heaters supplied by branch circuits 150 V or less to ground must be protected by a Class A GFCI
    - Permanently installed immersion heaters rated 120 V 20 A or less, or 240 V 30 A or less, single phase may be plug-and-cord connected, cord must be (1) 6'-15' long, (2) must be grounded and must contain an integral means for grounding all non-current-carrying parts of the heater, and (3) must be GFCI protected. If integral GFCI, must be in the plug or within 12" of the plug
  - Storable and portable heaters not built-in must be identified for swimming pool and spa use, and must meet the following additional requirements:
    - Includes any heaters not built-in or permanently attached
    - If plug-and-cord connected, cord must be 6'-15' long and at rated for at least "hard usage"
    - Heaters supplied by branch circuits 150 V or less to ground must be protected by a Class A GFCI
    - If integral GFCI, must be in the plug or within 12" of the plug
  - No audio equipment installed in or on pool
  - All audio equipment located within 6' from the inside wall of the pool and operating at >LVCL must be grounded and GFCI-protected

Immersion Pools

- Permanently Installed Immersion Pools (cont'd)

2020: Changes – 680

- Splash pads added to requirements for fountains:

- Defined as a fountain with a pool depth 25 mm (1 in.) or less, intended for recreational use by pedestrians. This definition does not include showers intended for hygienic rinsing prior to use of a pool, spa, or other water feature.

- Treat a splash pad as a fountain.

2020: Changes – 680

- Added requirement that (1) all receptacles in a pool equipment room be GFCI-protected, and that (2) at least one single phase 125V, 15A or 20A general purpose branch circuit in a pool equipment room.

- Expanded 680.22 to specify how close to the pool other equipment not traditionally associated with a pool can be installed:
  - Must be located at least 1.5 m (5 ft) horizontally from the inside walls of a pool unless separated from the pool by a solid fence, wall, or other permanent barrier
  - Intended to address other equipment such as energy management and photovoltaic generation which may be located near the pool or in pump rooms

- Requirements for lifts were clarified to eliminate possibility of an electrical outlet for a lift being within 5ft. of the inside walls of a pool or spa.

2020: Changes – 680

- Allowed spa lights installed low in the foot well to have cords only long enough to reach the bench location, where the spa can be drained to make the bench location dry.

- Exempted small metallic pool cover anchors intended for insertion in concrete, masonry, wood, or composite deck surfaces from bonding requirements in 680.26(B)(5):
  - Intended for insertion in a concrete or masonry deck surface:
    - 25 mm (1 in.) or less in any dimension, and
    - 51 mm (2 in.) or less in length
  - Intended for insertion in a wood or composite deck surface:
    - 51 mm (2 in.) or less in any flange dimension, and
    - 51 mm (2 in.) or less in length

- Permits AHJs to require inspection of the complete system for permanently installed equipment periodically after installation to ensure systems are maintained in proper operating order.

NEC 680 Timeline
2023 Edition Significant Changes

2023: Changes – 680

ALL DEFINITIONS MOVE TO ARTICLE 100

- Definitions applicable to only Article 680 or other specific article are identified in parentheses after the definition

Luminaire, No-Niche. (No-Niche Luminaire)

A luminaire intended for installation above or below the water without a niche. (680) (CMP-17)

2023: Changes – 680

MAJOR CHANGES TO GFCI REQUIREMENTS FOR ALL ITEMS COVERED BY 680

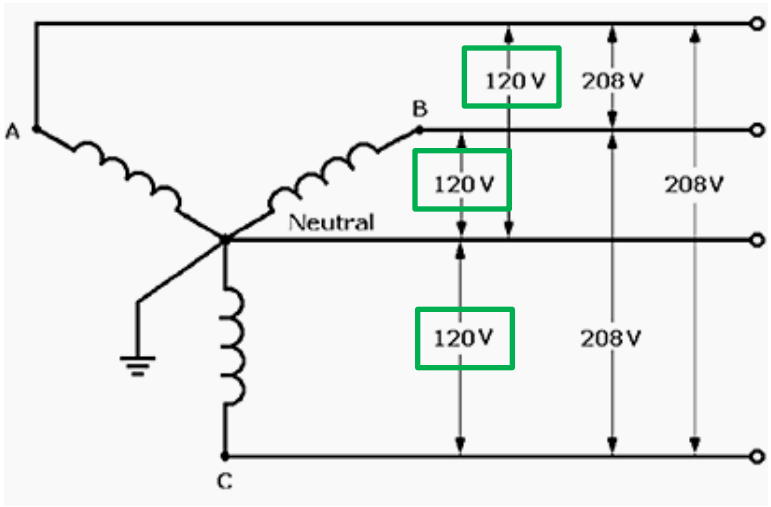
- Receptacles and outlets not exceeding the Low Voltage Contact Limit (LVCL) supplied by listed transformers & power supplies meeting 680.23(A)(2) do not require ground-fault protection
- Circuits serving gas-fired spa and hot tub water heaters operating separately from the spa or hot tum must have GFCI protection
- **GFCIs are rated for a maximum 150 V to ground – systems with voltages to ground from over 150 up to 480 V requiring ground-fault protection must utilize Special Purpose Ground Fault Circuit Interrupters (SPGFCI) all have 20mA max ground-fault trip current – Class C (up to 480V), D, E (>480V) – examples: 240 three phase delta, 480/277V in commercial installations and water parks**

New UL Classes of SPGFCIs

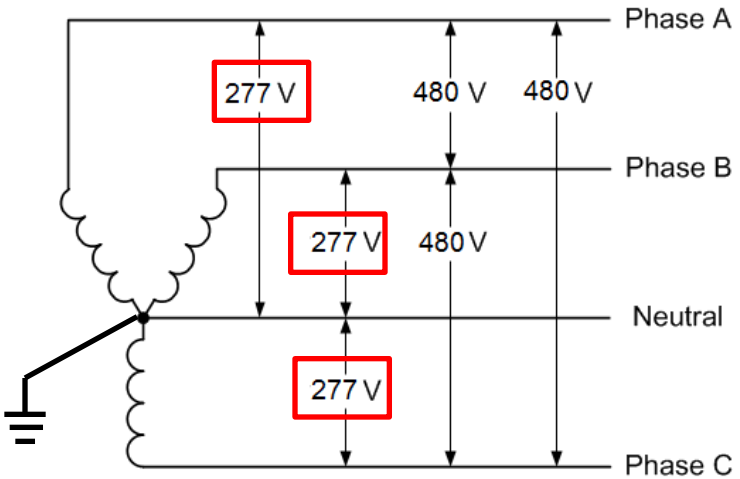
- A “normal” Class A GFCI is only rated for 150 Volts to ground – This creates a hazard for certain other systems which can exist (mostly on commercial installations):
  - 3-phase wye systems above 120/208 V (e.g., 480/277)
  - 3-phase 120/240 V 4-wire (open delta) systems
    - The “hot leg”/”high leg”/”freak leg”/”wild leg” (orange wire) voltage to ground is 208 V, while the voltage to ground of the other two conductors is 120 V
  - 3-phase corner grounded systems (voltage to ground is the phase-phase voltage)

New UL Classes of SPGFCIs

3-phase wye systems above 120/208 V (e.g., 480/277)



OK to connect a GFCI to this system

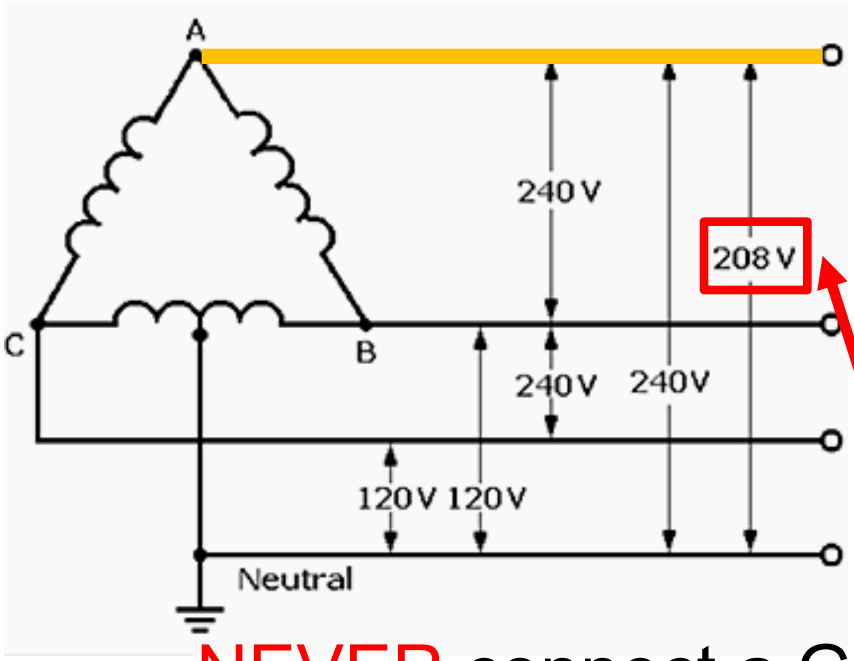


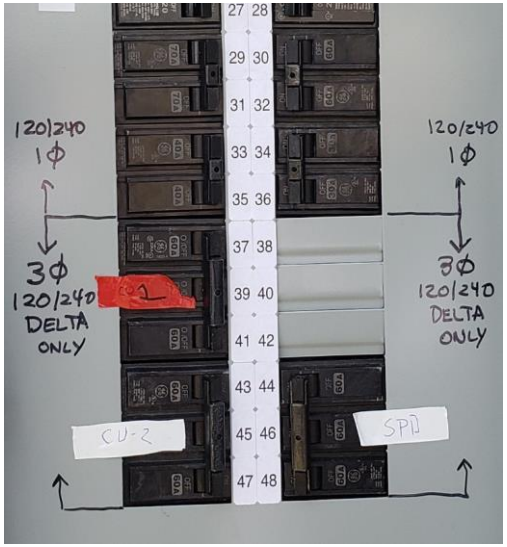
NEVER connect a GFCI to this system

New UL Classes of SPGFCIs

3-phase 120/240 V 4-wire (open delta) systems

The “hot leg”/”high leg”/”freak leg”/”wild leg” (orange conductor) voltage to ground is 208 V, while the voltage to ground of the other two conductors is 120V



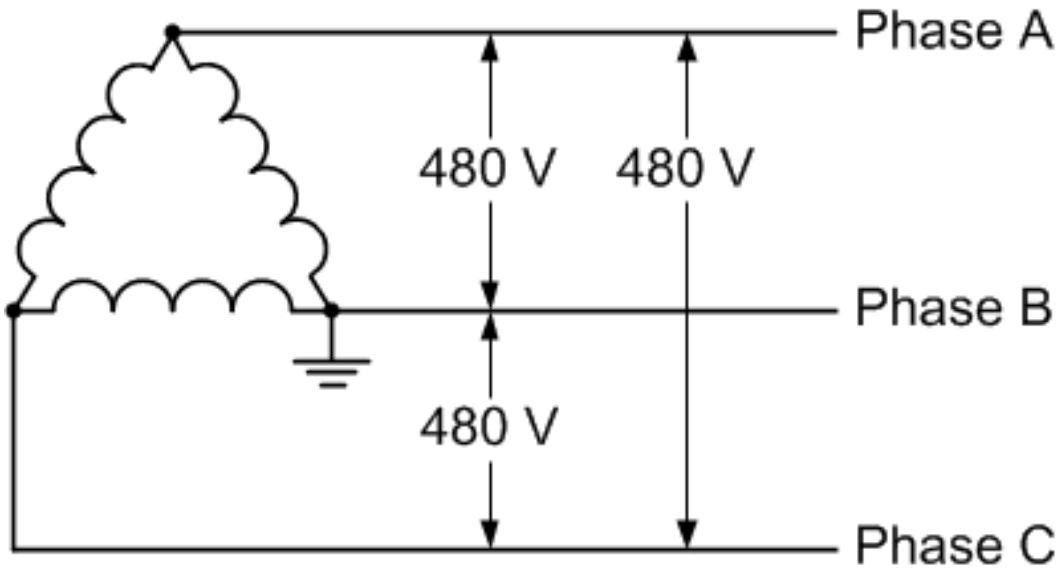


NEVER connect a GFCI to the orange wire

New UL Classes of SPGFCIs

3-phase corner grounded systems

voltage to ground is the phase-phase voltage



NEVER connect a GFCI to this system

New UL Classes of SPGFCIs

- A new Special Purpose GFCI (SPGFCI) is rated for over 150 Volts to ground:
  - Class C, D, E SPGFCI
  - Class C can be used up to 480 V
  - Class D and E are for over 480 V
    - Class D requires an oversize ground wire
  - All trip at 20 mA

The 2023 NEC requires an SPGFCI where ground-fault protection is necessary on pools etc. served by circuits with > 150V to ground - even with the higher trip current

2023: Changes – 680

CORROSIVE ENVIRONMENTS

- Clarified that **equipment listed for pool and spa use is considered suitable for use in these environments**.

EQUIPMENT GROUNDING

- All requirements were consolidated and relocated to 680.7:
  - **All** flexible cords must contain a properly sized insulated copper EGC no smaller than #12, and they must terminate in a grounding-type plug with a fixed grounding contact member.
  - **All** feeders and branch circuits installed in a corrosive environment or wet location must have properly sized insulated copper EGC no smaller than #12.

STORABLE POOLS

- Eliminated the 42” maximum wall height requirement.

FOUNTAINS

- Clarified that fountains having water common to a pool must comply with requirements for pools in 680 Part II

2023: Changes – 680

EQUIPOTENTIAL BONDING REQUIREMENTS

- Clarified that pools with or without associated electrical equipment must be bonded
- For bond to water, clarified that concrete pool shells are conductive bonded parts by referring back to 680.26(B)(1)-(B)(7)
- Clarified that metal parts of pool water circulation, treatment, heating, cooling, and dehumidification equipment must be bonded unless double-insulated, and (unless separated by a permanent barrier) all other electrical equipment within 5’ of the inside wall of the pool horizontally or 12’ vertically above max. water level or any observation stands, towers, platforms or diving structures, must be bonded.

2023: Changes – 680

EQUIPOTENTIAL BONDING REQUIREMENTS (cont'd)

- For splash pads, the shell is defined as comprising the area traversed by pedestrians bounded by the extent of the footing of the splash pad and rising to its exposed surface(s) and its collection basin area. The boundary of this area is considered to be the outside wall for the purpose of perimeter bonding.

FOUNTAINS AND SPLASH PADS

- Equipment with ratings exceeding the LVCL must be located at least 5' from the inside wall unless separated by a solid fence, wall, or other permanent barrier

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS: TIA 23-9 (2023 Edition)

TIAs and how they work:

- TIA = Temporary Interim Amendment
- A TIA can only address current edition and immediately prior edition (currently 2026 & 2023 ONLY – cannot address 2020 or earlier)
- An adopted TIA must be addressed by Code Panel 17 for the next edition after adoption
- Some states do not recognize TIAs

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS

REMINDER – THE PERIMETER SURFACE EXTENDS OUT ONLY 3’ FROM THE INSIDE EDGE OF THE POOL – NO FURTHER

New 2023 **perimeter bonding language** in 680.26(B)(2) reverted to the existing 2020 language due to an unresolved TIA and associated Standards Council action –

If your state <u>does not</u> recognize TIA’s, this is your Code language under the 2023 Edition:

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS – THE OLD CODE LANGUAGE

If your state does not recognize TIA's, this is your Code language:

- The buried #8 copper ring is allowed for everything
- Burial depths for the copper rings and grids had been clarified in the 2023 text as produced by CMP-17:
  - Can be within or below a paved surface but no more than 6" below finished grade, or below an unpaved surface 4"-6" below finished grade
- This text was not included in the 2023 Edition due to the TIA, and the term "subgrade" remains in the Code language
- Be aware that the intent of the Panel was to clarify its original intent for the burial depth by changing "subgrade" to "finished grade," which is an accepted term in the construction industry.

"Finished grade" is the top of the finished surface, whether paved or not.

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS (cont'd)

REMINDER – THE PERIMETER SURFACE EXTENDS OUT ONLY 3 FEET FROM THE INSIDE EDGE OF THE POOL – NO FURTHER

New 2023 **perimeter bonding language** in TIA 23-9 and associated Standards Council action effective 4/10/23 revamped 680.26(B)(2) and the Definition of a Pool –

If your state recognizes TIA's, this is your Code language under the 2023 Edition:

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS – THE REVISED CODE LANGUAGE

- **If your state recognizes TIA's, this is your language:**

- **Redefines "Pool"** to EXCLUDE bodies of water used as part of industrial processes, lakes, lagoons, surf parks, and other natural or man-made bodies of water
- **Perimeter surface is now limited to 3' above and 2' below maximum water level, extending out 3' from the inside wall of the pool – all other areas are NOT perimeter surfaces**
- **Conductive paved perimeter surfaces** now require a **copper grid, structural steel welded wire reinforcement, or rebar grid**. This is **either embedded within the paved surface or, if pavers with no embedding possible, directly under the paving**. UL listing requirement time has passed – superseded in 2026 and has been extended to 2029.

2023: Changes – 680

PERIMETER BONDING REQUIREMENTS – THE REVISED CODE LANGUAGE (cont'd)

- **Unpaved portions of perimeter surfaces** can use a buried #8 copper conductor 4"-6" below finished grade and 18"-24" from the inside walls of the pool (as in earlier Editions)
- **Nonconductive perimeter surfaces do not require bonding**
  - Includes raised nonconductive surfaces separated from earth or raised on nonconductive supports
  - Includes any perimeter surface that is electrically separated from the pool structure and raised on nonconductive supports above an equipotentially bonded surface
- Minimum grid requirements for copper (12" square #8), steel welded wire reinforcement (ASTM 6x6-W2.0xW2.0) and rebar (12x12 #3) are defined
- Must follow the contour of the perimeter surface
- Only listed splices or exothermic welding
- **Must all be connected together and run back to the equipment pad as before**

NEC 680 Timeline
2026 Edition Significant Changes

2026: Changes – 680

Editorial changes were made to numerous sections including some reordering, moving, and splitting of sections. This includes changing the terms “maintenance and repair” to “servicing,” which is a defined term (no change in meaning).

DEFINITION OF A POOL

- Added Informational notes to clarify that, for the purposes of Article 680, (1) a “leisure river attraction” [ISPSC] is a pool and (2) bodies of water incorporated as part of an industrial process, lakes, lagoons, surf parks, or other natural and artificially made bodies of water that could incorporate swimming and swimming areas, are not pools.

DEFINITION OF A PERMANENTLY INSTALLED POOL

- Clarified that permanently installed pools can be above ground and/or in a building

2026: Changes – 680

GFCIs and SPGFCIs

- Raised the maximum current rating for 3 phase circuits requiring GFCI or SPGFCI protection to 100A as these devices are available (multiple Code sections)

EQUIPMENT GROUNDING

- Removed redundant language in several sections as this has been relocated to 680.7:
  - **All** flexible cords must contain a properly sized insulated copper EGC no smaller than #12, and they must terminate in a grounding-type plug with a fixed grounding contact member.
  - **All** feeders and branch circuits installed in a corrosive environment or wet location must have properly sized insulated copper EGC no smaller than #12.

PORTABLE ELECTRIC SIGNS AT POOLS

- New 680.22(D) requires that **portable electric signs cannot be placed within a pool or within 5 ft. of the inside walls of a pool.**

2026: Changes – 680

STORABLE POOLS

- A storable pool assembled on site that abuts a permanent deck that encloses all or a portion of the pool's perimeter and that is intended to provide access to the pool must also comply with the bonding requirements in 680.26.
- This is intended to clarify that **the requirement does NOT include kiddie wading pools set up on patios or similar**.

FOUNTAINS AND SPLASH PADS

- Revised 680.56 clarified that this section applies to any flexible cord-connected equipment associated with the fountain, not just those that are cord-and-plug-connected
- 680.57(C) regarding portable electric signs and fountains now applies only to fountains; pools are now addressed in 680.22(D)

LIGHTING

- Revised 680.22(B) adds festoon lighting to outdoor clearance requirements

2026: Changes – 680

PUMP MOTORS

- 680.21(D) clarifies that GFCI protection is required on all reconditioned pool pump motors

JUNCTION BOXES, AND SIMILAR ENCLOSURES

- Revised 680.24(E) clarifies that this section applies strain reliefs for enclosures on permanently installed pools

PERMANENTLY INSTALLED IMMERSION POOLS

- Revised 680.45(C)(1)(2) clarifies that heaters for permanently installed immersion pools must be both grounded and bonded

HYDROMASSAGE BATHTUBS

- Revised 680.71clarifies that branch circuits serving hydromassage circuits cannot serve any other loads.
- Editorially revised 680.75 retains the requirement that hydromassage bathtubs and their associated electrical components shall be protected by a readily accessible GFCI

2026: Changes – 680

EQUIPOTENTIAL BONDING REQUIREMENTS - GENERAL

- Adds “Metal Structures” to “Metal Fittings” in the title of 680.26(B)(5), to address items such as moveable bulkheads, clarifying that **conductive bulkheads must be bonded**. Exception 4 was added to provide relief for **conductive components attached to nonconductive bulkheads**. These are often constructed of nonconductive materials, with limited metal fittings and attachments such as handles or starting blocks. **When isolated from the pool structure and other conductive parts, these parts present minimal risk of electric shock and are not required to be bonded**.
- 680.23(b)(2) was revised to eliminate ambiguous language and clarify that the bonding jumper installed in a nonmetallic conduit from an underwater pool light must be connected at both ends.

2026: Changes – 680

CONDUCTIVE POOL SHELL BONDING REQUIREMENTS

- In 680.26(B)(1)(b), a **40% copper clad steel grid** is now allowed in addition to the copper grid currently required in the case of encapsulated (or other non-conducting) pool reinforcing steel or other material.

BONDING CONDUCTOR

- In 680.26(B)(2), the bonding conductor can be pool reinforcing steel, a #8 copper conductor, or a **40% copper clad steel #8 conductor.**

2026: Changes – 680

PERIMETER BONDING REQUIREMENTS

- **Perimeter bonding language** revamped 680.26(B)(2) and definitions in TIA 23-9 and associated Standards Council action effective 4/10/23 – **This has now been incorporated in the 2026 Edition with three important modifications (in red):**
- Perimeter surface is now limited to 3' above and **3' below** maximum water level, extending out 3' from the inside wall of the pool – all other areas are NOT perimeter surfaces
- **Conductive paved perimeter surfaces** now require a copper grid, **40% copper clad steel grid**, structural steel welded wire reinforcement, or rebar grid. This is either embedded within the paved surface or, if pavers with no embedding possible, directly under the paving. **Where not embedded, the copper grid, 40% copper clad steel grid, and structural steel welded wire reinforcement must be listed for corrosion resistance and mechanical performance after January 1, 2029.**

2026: Changes – 680

PERIMETER BONDING REQUIREMENTS (cont'd)

- **Unpaved portions of perimeter surfaces** can use a buried #8 copper or **40% copper clad steel** conductor 4"-6" below finished grade and 18"-24" from the inside walls (as in earlier Editions)
- **Nonconductive perimeter surfaces** do not require bonding
  - Includes raised nonconductive surfaces separated from earth or raised on nonconductive supports
  - Includes any perimeter surface that is electrically separated from the pool structure and raised on nonconductive supports above an equipotentially bonded surface
- Minimum grid requirements for copper and **40% copper-clad steel** (both 12" square #8), steel welded wire reinforcement (ASTM 6x6-W2.0xW2.0) and rebar (12x12 #3) are defined
- Must follow the contour of the perimeter surface
- Only listed splices or exothermic welding
- **Must all be connected together and run back to the equipment pad as before**

2023 & 2026: TIA 70-26-1 680.21(C) GFCIs for Motors on Adjustable-Speed Drives (VFDs)

REMINDER - TIAs and how they work:

- TIA = Temporary Interim Amendment
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- Must be addressed by Code Panel 17 for next edition (2029)
- Some states do not recognize TIAs

2023 & 2026: TIA 70-26-1 680.21(C) GFCIs for Motors on Adjustable-Speed Drives (VFDs)

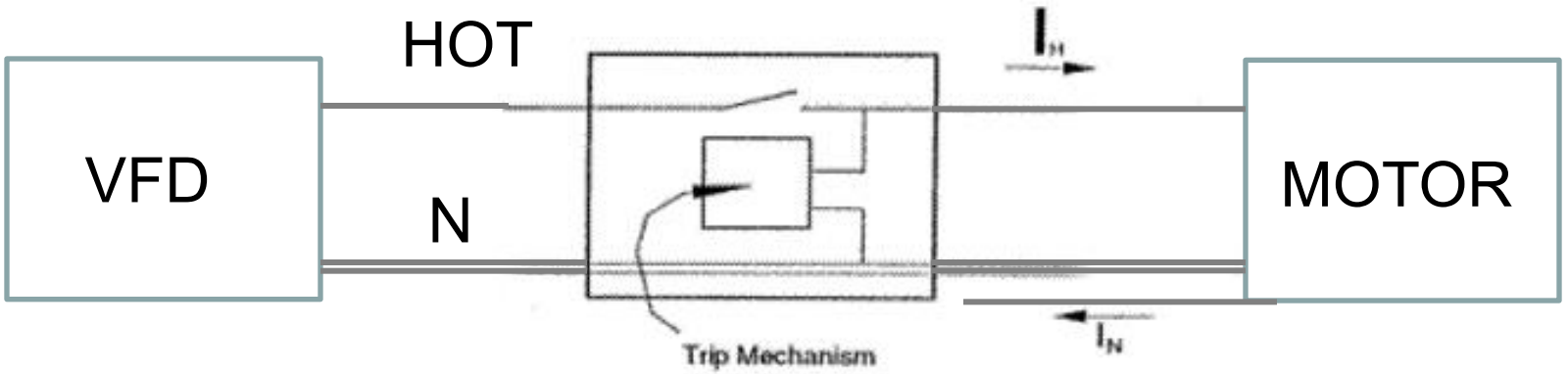
WHAT IT DOES

- 680.21(C) is amended to clarify that GFCI protection is NOT to be installed between the output terminals of a VFD and the input terminals of a motor
- Amends both the 2023 and the 2026 Editions
- Effective April 30, 2025
- This IS NOT the nuisance tripping issue;
  UL has a task force addressing this in UL 943

OTHER RELEVANT TIAs

- TIAs 20-23-20 and 70-26-3 add a new 430.132 (motors Article) that says the same thing

Why an Off-the-Shelf GFCI Installed Between the VFD and a Motor is Dangerous



The GFCI's Electronic Trip Mechanism uses incoming ac line power to operate its sensitive control electronics, which are designed for:

Constant 120V ac

Clean waveform – minimal harmonics

No voltage spikes

BUT, the VFD <u>provides</u>:

AC that varies from 0 to 120V – controls not always on

Dirty waveform – harmonics – affect control function

High voltage spikes – damage the electronics

Ground-Fault Circuit Interrupters (GFCIs) on the Output of a VFD

- **DO NOT connect a GFCI on the output of a variable speed drive (VFD) between the VFD and a variable speed motor (even if the inspector tells you to)**
  - **It won't work**
    - **The electronics get their power from the lines being monitored**
    - **They expect constant voltage – that's not what the VFD gives them**

AND……

Ground-Fault Circuit Interrupters (GFCIs) on the Output of a VFD

- **DO NOT connect a GFCI on the output of a variable speed drive (VFD) between the VFD and a variable speed motor (even if the inspector tells you to)**
  - **If it works, it won't last long**
    - **Operation of the VFD will likely fry the GFCI's electronics due to power quality effects including high voltage spikes**
    - **This can result in catastrophic failure with collateral damage, including a fire**

BOTTOM LINE – THIS CREATES SIGNIFICANT LIFE AND FIRE SAFETY HAZARDS

It is OK to Install Ground-Fault Circuit Interrupters (GFCIs) on the Input of a Motor with an Integral VFD

2023 NFPA 70B

CHANGED FROM PECOMMENDED PRACTICE TO STANDARD FOR EQUIPMENT MAINTENANCE

- In effect end of 2023
- Adds public pools, fountains and similar installations (Ch. 34).
- Includes bonding, grounding, GFCIs, motors, etc.
- Requires conformance to manufacturer's instructions and industry consensus standards for maintenance.
- Requires preparation, implementation and documentation of an overall Electrical Maintenance Program (EMP) that "directs activity appropriate to the safety and operational risk," and includes consideration of current condition as well as the operational safety and risk (Ch. 4).
- Incorporates maintenance intervals for specific types of equipment

A Reminder (again) ...

Older Editions of the NEC Do **NOT** Require That Older Pools Be Routinely Upgraded To Current Standards

BUT…

Starting with the 2020 Edition, Reconstructed Pool Shells Must Be Bonded to Meet Current NEC Requirements, AND When Pool Pump Motors Are Replaced, They Must Be GFCI-Protected

Upgrade To Meet Code

- Major modifications may require entire building to be upgraded.

- **When in doubt, check with the local inspector; a permit and inspection may be required! A licensed electrician may be required to do the repairs!**

If You Find A Safety Problem

- **Easy** - Repair On The Spot.
- **Major** - Notify The Pool Owner In Writing.
- **Life-threatening & Extensive** - Shut Down and Lock Out The Pool. Notify The Owner In Writing.

Remember - Always Err On The Side Of Safety!!!!

If You See A Problem:

Tell The Pool Owner In Writing, AND Let Them Know How It Can Be Repaired.

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