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Basic Electrical Safety for Pool and Spa Professionals

Presented By
Hamilton & Associates
Architecture - Engineering - Technical Services
Why should I care about electricity - I don’t do electrical work?

- Safety is paramount for everybody
- The why and how of pool electrical systems are not generally well-understood
- **You are working around electrical equipment and components that can kill or injure you or someone else if proper safety measures are not taken**
- Poor and/or incorrect installation or maintenance of a pool installation, or damage to electrical components or wiring can create hazards
- Other third parties can still expose the manufacturer, builder, contractor, 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 should I care about electricity - I don’t do electrical work?

• The nature of your work is around and with older pools

• The older the pool, the greater the electrical hazards (usually)
  • Pools and equipment rooms, pads and pool chemicals are wet and can be corrosive
  • Wiring and equipment deteriorate over time and hazards can be hidden
  • Compliance requirements change – the pool may never have been permitted or inspected
  • The Electrical Code changes – modern Code requirements were not in place even a few years ago

• Know what you are getting into!

NEC 680 Timeline Highlights

• Q: Why is understanding the timeline important?

• 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 Highlights

• Pre-1962 pools
  – No direct regulation-NEC 680 nonexistent!

• Pre-1965 pools
  – Open electrical connections in lights.
  – Equipotential bonding not directly addressed.

• Pre-1971 pools
  – Flush deck boxes at line voltage (120V).

• Pre-1975 pools
  – GFCl not mandatory under NEC

NEC 680 Timeline Highlights

• Post-1999 Pools
  – Code allows use of PVC-jacketed (i.e., insulated) rebar in concrete pools - *this defeats the pool bonding!*

• Post-2005 Pools
  – Confusion over bonding for fiberglass and vinyl liner pools

• Post-2008 Pools
  – Bonding of conductive vs. nonconductive (fiberglass and vinyl liner) pool shells clarified
  – Bond to Water Introduced
NEC 680 Timeline Highlights

• Post-2011 Pools
  – Redefined acceptable low voltage limits as a Low Voltage Contact Limit 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.
  – Allowed listed low voltage underwater lights not requiring grounding to be installed without grounding.

• Post-2014 Pools
  – Requires ALL 120-240 V single phase pumps to be GFCl-protected.
  – Regarding underwater lights:
    • Allows listed low voltage luminaires not requiring grounding, not exceeding the NEC Low Voltage Contact Limits defined in 2011, 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).

Basic pool wiring - what equipment and wiring you are likely to see in and around the pool, even if you don’t do electrical work

Electrical Flow Is Like Water Flow
Know the Wire Color Codes (NEC)

- Under the NEC, certain wire colors are reserved for specific functions so you can identify their electrical function:
- Equipment Ground - Safety device only; does not normally carry current.
  - **Wire is green or bare only! No other color!**
  - **Screw connectors green!**
- Neutral - Return conductor in the circuit; normally carries current; grounded at the electrical service panel (ONLY).
  - **Wire is white or natural gray only! No other color!**
  - **Screw connectors generally silver or light colored.**

Wire Color Codes (Continued)

- Hot Wire - The energized conductor in the circuit; normally carries current.
  - **Wires can be any other color!**
  - **Screw connectors generally gold or dark colored.**
- Hot wires must not be green or white!
- Do not mix up the neutrals and grounds!
- Connect **green to green** and **white to white** ONLY!
120 Volt Grounding-Type (Polarized) Receptacle

(Neutral)  (Hot)  (Ground)

Electrical Equipment and Wiring You Are Likely To See In and Around the Pool

- Gas heater with 120V controls
- Blower and switch
- Lighting J-box
- Pool controller with circuit breakers
- GFCI receptacle
- Pumps
- Electrical conduits
Types of electrical hazards around pools and what to do about them

• Know when to call a licensed electrician:
  – DON’T DO A JOB YOU’RE NOT SURE ABOUT OR ARE NOT QUALIFIED FOR!
• These hazards generally require a licensed, trained electrician to correct.
• Don’t try to repair equipment if you have doubts about its safety or integrity - it should be replaced.
• Don’t try to fix a motor that has no legible nameplate - it should be replaced.
Wiring Hazards Include:

- Open wiring and boxes (especially in wet locations)
- Improper or damaged wiring and equipment
- Use of the earth as a grounding conductor
- Ungrounded systems
- Mixing neutrals with grounds
- Mixing hots with neutrals or grounds
- 120V deck boxes
- “Innovative” electrical installations

J-box “Poster Child”
The ultimate pool light switch! Even with the frayed wires fixed this is **unsafe** - plug is not allowed, ground is NOT continuous. Here's how this cord gets to the light......

Threaded under the concrete......
......And into a piece of flexible plastic pipe. And, of course, no #8 green wire! Notice the misused bonding nipple and strap on the water pipe.

THIS IS ALL EXTREMELY DANGEROUS!

Improper dry niche light installation
flexible cord & plug not allowed
This is not an effective ground and is not bonded!
Splice in ground electrode conductor
This is an unreliable ground!

Corroded main service ground electrode connection in commercial equipment room
This is an unreliable ground!
Exposed wiring – conduit nipple destroyed

Open connections/exposed wiring
Open connections/exposed wiring and 1” water on floor!

Wet 120V deck box
Wet 120V deck box & broken deck

Mowed-down, Improper Pool Light J-box
Damaged buried galvanized steel conduit

Open spaces in panel exposing energized parts – electrocution hazard
Note the exposed wiring behind the cut panel cover
Or Worse – No Cover at All – Would You Put Your Hand in This?

Corrosion – Aluminum Box Unsuitable for Location
Baptistries and Mikvahs are Pools Too (Immersion Pools)
This One Electrocuted and Killed a Pastor During a Service
Right in Front of the Church’s Congregation (and his family)
Another Baptistry
In addition to needing a plaster job, note the portable commercial baptistry heater with a 240 V plug and cord, which is WITHIN EASY REACH OF A PERSON IN THE WATER
THIS IS UNSAFE!

 Bonding Hazards Include:

• Open or nonexistent bonds
• Damaged bonding conductors or connections
• Improper connections
• Use of the earth as a bonding conductor
• Use of coated rebar
Pump is not bonded

Neither is this one...
But then, who reads the directions anyway??

These two pumps aren’t bonded, either.
Neither are these two.

Are you beginning to get the idea that maybe this is COMMON??

Do you want to work on or around these?

Improper, unreliable bond - needs lug

This is NOT a good connection!
Bond wire cut between pumps

This niche is not connected by metal conduit to the j-box and is not bonded
This is a pool window in contact with the water, with somebody’s idea of a bonding connection.

Bonding Conductor for Pool is Loose and Unattached to Equipment.
What's wrong with this bond???

Improper bond to lifeguard stand
Putting a baseplate on doesn’t make it a good bond

Disconnected bond wire
Improper, dangerous bond to filler pipe

Improper bond to water pipe
Check connections at ladder pockets

One of the best reasons to inspect during construction… THIS IS A “BOND” WIRE!!
This is **NOT** a ladder pocket bond, even if the bolt were tight! **DO NOT** USE A GROUND ROD IN PLACE OF A BOND. **DO NOT** USE A BATTERY CLAMP!

Thanks to Bob Huss, P-J NSPI

Here’s the other pocket. Well, at least the guy was consistent.....

**THIS IS UNSAFE!**
Green Epoxy-Coated Rebar Eliminates the Pool Shell Bonding

**THIS IS UNSAFE!**

Corrosion Damage Includes:

- Water and humidity damage
- Damage from corrosive pool chemicals
- Damage from corrosive soils
- All or several of the above, simultaneously
Corroded EMT Conduit in Equipment Room Open to the Air

Corrosion –Damaged Panel
Corrosion–Damaged Panel Busbars from Major Chlorine Spill in Equipment Room

Thanks to Randy Hunter, Las Vegas NV

Corrosion–Damaged Breaker Lugs from Major Chlorine Spill in Equipment Room

Thanks to Randy Hunter, Las Vegas NV
This Lug Was Completely Destroyed from Major Chlorine Spill in Equipment Room

Thanks to Randy Hunter, Las Vegas NV

Corrosion – Damaged Dry-type Transformer in Commercial Pool Equipment Room

NOTE – this room is open to the air!

Thanks to Randy Hunter, Las Vegas NV
Here’s a closeup of the damage. Note the missing metal. Transformer is 480 Volt primary.

NOTE – this room is open to the air!

Corrosion – Installations Must Use Copper, Copper Alloy, Stainless Steel
Corrosion – Installations Must Use Copper, Copper Alloy, Stainless Steel

This is a direct burial clamp which came with plated steel bolts. **This will not last.**

This is the same clamp with stainless steel bolts. **This will usually last a lot longer.**

Corrosion – Installations Must Use Copper, Copper Alloy, Stainless Steel

This is a direct burial clamp with stainless steel bolts. **Notice it is LISTED AND Labeled for direct burial.**
Corrosion – Cadwelding also allowed

Cadwelding is an exothermic welding process which solidly welds metals together. It will also work on copper connections to steel rebars. If done per instructions, this will also usually last a very long time.

If You Find ANY of These Hazards, They MUST be Repaired or Replaced by a Licensed Electrician
Automatic Startup of Equipment

• Much of the electrical equipment at a pool is usually controlled by timers or control panels incorporating automatic timing functions.
  • This equipment includes pumps, boosters, blowers, heaters, and lights
  • The timer controls may not be obvious – they may be part of a programmed controller using a remote
  • The issues are not exclusive to personnel safety

Automatic Startup of Equipment

• DO NOT assume that if there is a switch or disconnect, the device is not on an automatic timer
• NEVER rely on an automatic timer in lieu of Lockout/Tagout when working on a pool light
• ALWAYS turn off and Lock Out/Tag Out all pumps, heaters and other circulation system electrical equipment before draining the pool, or equipment damage (and possibly a fire) can result
• ALWAYS turn off and Lock Out/Tag Out all underwater lights before removing them from the pool structure
Control The Source of Power While You Are Working

- Turn off electrical power to the device you are working on
- Then use Lockout/Tagout
- The idea of Lockout/Tagout is to keep someone or something from turning the power ON to an electrical device while you are working on it

Basic lockout-tagout - when, how and where to cut and lock out the power so you can work safely and not damage equipment

- There are restrictions on work involving equipment with energized, exposed electrical parts:
  - Unless you are a licensed, trained electrician, you are considered UNQUALIFIED with regard to electrical work
  - OSHA requires that equipment electrical sources that can become energized be turned off and Locked Out/Tagged Out prior to work
Basic Lockout-Tagout

• Lockout of electrical sources:
  – Safest location is to turn off the breaker at the panel and lock it out
  – Each entity doing work applies their own lock and keeps the key
  – Economically-priced lockout kits are available from multiple sources (distributors, retail and internet)
  – Hasps to allow multiple locks are readily available and must be used if more than one entity is working on the equipment

Lightning hazards - when and where not to work

• Don’t do outdoor work in a thunderstorm.
  – If you see lightning or hear thunder, it’s too close! STOP AND SEEK SHELTER!
  – DO NOT restart working until 30 minutes after you saw the last flash or heard the last thunder.
Power line hazards - when and where not to work:

• Do not do any work in proximity to an overhead power line.
  – Unless you are a trained utility lineman, you are considered UNQUALIFIED regarding power lines
  – Most overhead wires are BARE (NOT INSULATED) and are high voltage (>1000V)
  – If you or an object you are holding contacts the line, serious injury or death can result.
  – Power lines are usually along property boundaries, BUT NOT ALWAYS
  – LOOK UP AND LIVE!

Power line hazards - when and where not to work:

• Some lines can be hidden in trees:
  – Never climb a tree where there is a nearby power line
  – Don’t stick any long tools or pipes up into a tree
  – Never attempt to trim any limbs near a power line – call the utility
  – If you see sparking in a tree near a power line, stay away – call the utility
  – TREE WOOD CONDUCTS ELECTRICITY!
Power line hazards - when and where not to work:

- There are restrictions on work near power lines:
  - OSHA requires that you keep yourself and all tools, equipment, etc. at least 10’ away from overhead power lines
  - This includes cranes, forklifts, backhoes, personnel lifts, etc.
  - Be especially careful moving metal pipes or skimmer nets and shepherds’ crooks that are on long poles
  - Texas requires a 6’ limit for you and any tool, etc.
  - Texas also has outlawed portable pool equipment with metallic poles on commercial pools. Don’t leave this equipment on-site at the commercial pool if you see any - inform the owner

Power line hazards:

- If there is a contact accident involving a power line at your work site:
  - A potentially deadly voltage and current in the earth itself usually results
  - Do not touch any cranes, forklifts, backhoes, personnel lifts, etc. which are involved in the line contact
  - Get away from the scene by keeping both feet on the ground and shuffling them (do not walk, run, or jump); if you feel a shock, shuffle with smaller steps
  - As terrible and uncaring as it sounds, DO NOT ATTEMPT RESCUE; you can become part of the accident
  - CALL 911 IMMEDIATELY AND TELL THEM A POWER LINE IS INVOLVED
**How do I know it is safe to remove an underwater light for pool shell prep?**

- The most basic test for the presence of voltage:
  - Use a “Voltage Sniffer” (available at most hardware and big box stores)
    - Follow all safety precautions for working around electricity!
    - Follow the product directions!
    - Keep your hands and fingers on the body of the sniffer and away from the tip.
    - When the sniffer goes off, there are usually both a visual and an audible signal
    - Before you test, check that the sniffer is working by testing something you know is energized (usually a live receptacle)

**The Most Basic Test for the Presence of Voltage with Sniffer:**

- Step 1 – Turn the pool light breaker OFF and lock/tag it out
- Step 2 – Look at the light and verify it is visibly off
- Step 3 – Use the sniffer to test the light (and cord, if visible) by slowly moving it around the light (and cord). If it does not go off, the light is deenergized.
- Step 4 – Repeat step 3 on the cord itself after the light is pulled out of the niche.
- Step 5 – Open the J-box and repeat sniffer check near wiring before ever disconnecting anything. If it goes off, it is energized!
The Most Basic Test for the Presence of Voltage with Sniffer:

Light OFF – On this sniffer, the green LED says the sniffer is turned on and working, but no detected voltage.

Light ON – On this sniffer, the red LED (and audible beep) says the sniffer is detecting voltage.

Does the Pool Light Need to Go?

• When you take out an underwater pool light, if it is cracked, broken, modified, or looks like any of these lights, it needs to be replaced. It is a safety hazard.
Damaged Pool Light Cord

Hole in light fixture
Black/green lens = water or damage inside

Black carbon = heat damage
Black carbon and cracked/crazed epoxy = heat damage

Damaged Electrical Parts in Light Fixture
Algae/water plus wrong bulb

Algae = water inside fixture
Unencapsulated or Modified Wet Niche Light

- Open electrical connections in underwater pool lights were allowed by the NEC before 1965. Some of these old lights are still out there.
- These lights present a significant safety hazard.
- If you find one, REMOVE IT and replace.
- If you find a light that appears to have been modified, including a spliced cord, REMOVE IT and replace – it is dangerous!

Guidelines for Unencapsulated Wet Niche Lights:

- Old technology (pre-1965) lights
  - Will not have potted electrical connections and light socket—they will be open and accessible. These belong in museums or the dumpster. **DO NOT REINSTALL.**
- Damaged encapsulated lights
  - If the potting around the socket is cracked or broken and you can see the wiring or parts in the crack, the light belongs in the dumpster. **DO NOT REINSTALL.**
Pre-1965 Pool Lights: Unencapsulated = open electrical connections -- BAD!

Reinstalling Incandescent Bulbs:

• Always reinstall a light with a new gasket if you have opened the fixture:
  ➢ NEVER reuse the old gasket. It can and will leak water into the light fixture! DO NOT REINSTALL.

• Always reinstall a pool light bulb with one that is rated for the same or lower wattage
  ➢ NEVER use a higher wattage bulb. It can and will damage the light fixture and will cause improper low water cutoff operation! DO NOT INSTALL.

• Always use the correct type of bulb
  – NEVER install a light bulb that is not identified as being for pool light use.
Incandescent lamp bulbs designed for pool lights are identified as such on the label. Others (PAR, fluorescent, etc.) should not be used.

Reinstalling Incandescent Lights:

- Always reinstall a light with a new gasket if you have opened the fixture:
  - NEVER reuse the old gasket. It can and will leak water into the light fixture! **DO NOT REINSTALL.**
- NEVER install one brand of light into another brand’s niche **UNLESS** the two companies have been merged or there is a specific UL cross-listing. UL will not list this arrangement unless the bond connection between the light and the niche is retested as part of the UL listing process!
  - In the case of merged companies, ALWAYS use the conversion parts (usually the screw) supplied by the manufacturer when you install it.
Before You Close Up the Wet Niche:

- If there is a conductor terminated on the bonding lug inside the wet niche:
  - The lug and connection **MUST** be entirely coated and encapsulated with a listed potting compound to protect it from water.

Why the Underwater Light’s Mounting Screw Is One of the Most Important Safety Features in a Pool

- Electrical bonding between the light and niche occurs at the attachment screw. **This is the only reliable connection between the light and niche and is tested by UL as part of the listing process (0.0003W max)!**
- While an electrical connection between the hooks on the light fixture and the niche can exist for a while after installation, **it is not reliable!**
Add-on plaster rings can eliminate bonds at the niche when the attachment is bad or if they don’t contact the metal niche, PARTICULARLY IF THE NICHE HAS BEEN PLASTERED OVER!

How Not to Circumvent Internal Light-Niche Bonding

• Installing after-market repair parts such as float-in rings without bonding lugs or connections and plastic light fixture clamping devices can destroy the electrical safety bonding connection between the light fixture and the bonded niche!

• Destroying this bonding connection is virtually guaranteed when using such “innovative” fasteners as wallboard screws to replace the proper part.

• Similarly, unless the light is cross-listed and specifically labeled for use in another manufacturer’s niche, do not mix. Under these conditions, the electrical safety bonding connection between the light fixture and the bonded niche has not been shown to be reliable!

• NEVER plaster over the interior of a wet niche. The exposed bare metal is part of the electrical bonding system.
The Most Basic GFCI Test on the Light After It Is Installed

- Types of Permanently Installed GFCIs:
  - Receptacle-type (common in bathrooms; fits in outlet box)
    - With duplex receptacle
    - Faceless (no receptacle)
  - GFCI Breaker (combination GFCI and circuit breaker - fits in panel)
    - Single pole (120V) or two pole (240V)

Types of Permanently Installed GFCIs

<:- Duplex
Faceless - >
Types of Permanently Installed GFCIs

GFCI Breakers in Panel

New UL Classes of GFCIs

- Class C, D, E
- 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
  - NEC is not allowing these around pools because of the higher trip current
The most basic GFCI test on the light after it is installed

• Find the GFCI controlling the light
  – GFCI breaker in the panel
  – GFCI or GFCI breaker in the pool controller
  – GFCI in a box or on the wall
• Turn the light on and verify that it is actually lighting up
• Press the “TEST” button on the GFCI
  – There should be a click
  – Verify that the light actually turned OFF
• Reset the GFCI ("RESET" button or reset handle on GFCI breaker)

Testing GFCI Receptacles with a GFCI Tester

• Plug-in GFCI testers are readily available at hardware and big box stores
• To check GFCI receptacles with plug-in GFCI tester – plug in a GFCI tester into the receptacle and follow instructions on tester.
• Push button on tester and GFCI should trip off
• Push RESET button on GFCI to turn back on
• On many testers, lights will tell you if the GFCI is wired properly
When Is a Bond to Water Required and Why You Need to Know

- A requirement in new 680.26(C) requiring a Bond to Water was added to the NEC beginning in the 2008 Edition:
  - Requires a minimum 9 sq.in. of conductive surface in contact with the pool water and connected to the equipotential bonding system
  - May consist of electrically conductive parts in contact with the water that are required to be bonded

When is a bond to water required and why you need to know

- This requirement has been misinterpreted by some AHJs to require that a Bond to Water is necessary on ALL pools
- **THIS IS NOT THE CASE:**
  - 680.26(B)(1) specifically states that “poured concrete, pneumatically applied or sprayed concrete, or concrete block with painted or plaster coatings shall be considered conductive materials due to water permeability and porosity.”
  - A properly bonded concrete pool with a bare steel rebar structure does **NOT** require a Bond to Water.
When is a bond to water required and why you need to know

NEC Handbook 2017:

A conductive element that is part of the pool bonding system must be in direct contact with the pool water. Where bonded items such as ladders, rails, or underwater luminaires are in direct contact with the pool water and provide the required surface area, it is not necessary to provide another conductive element. A conductive pool shell in contact with the water also satisfies this requirement. However, where the pool does not include any of these items, it is necessary to install a conductive element. Devices have been specifically listed as a means to provide this contact with the pool water.

IF I’M DEALING WITH FLOOD AND STORM SURGE DAMAGE, DO I NEED TO CALL AN ELECTRICIAN?

• In a word, **YES**
• The equipment can be water-damaged and, in some cases, fire and heat-damaged. THIS EXPOSURE CAN MAKE THE EQUIPMENT EXTREMELY HAZARDOUS.
• The equipment must be evaluated by a trained professional and, in many cases, the manufacturer.
• There are guidelines and standards on what must be replaced and what can be reconditioned.
• See National Electrical Manufacturers Assn. (NEMA) Publications:
  – NEMA-GD-1-2016 Evaluating Water-Damaged Electrical Equipment
DEALING WITH FLOOD AND STORM SURGE DAMAGE

- Equipment which generally must be replaced includes:
  - Fuses, GFCIs, AFCIs, circuit breakers and surge protective devices
  - Disconnect switches
  - Equipment containing electronics
  - Variable-speed pump drives
  - Transformers
  - Conduit fittings, outlet and junction boxes, switches, dimmers, receptacles, etc.
  - Light fixtures
  - Wire, cable and flexible cord (listed for dry locations, if flooded – otherwise, replace)
  - Batteries

- Equipment which may be reconditioned, if the manufacturer allows (which can be rare), includes:
  - Electrical panels
  - Conduit and tubing
  - Wire and cable suitable for wet locations, if the ends have not been exposed to water and the wire is not damaged
  - Motors

DO I HAVE TO BOND A RECONSTRUCTED POOL SHELL?

WHAT THE NEW 2020 NATIONAL ELECTRICAL CODE BONDING REQUIREMENT IN 680.26(B)(1) HAS TO DO WITH MY PLASTER WORK
• **680.26(B)(1) IN THE NEW 2020 NATIONAL ELECTRICAL CODE SETS OUT EQUIPOTENTIAL BONDING REQUIREMENTS FOR ELECTRICALLY CONDUCTIVE POOL SHELLS**
  
  – A CONCRETE/GUNITE POOL SHELL IS ELECTRICALLY CONDUCTIVE
  
  – EQUIPOTENTIAL BONDING IS A PROVEN SAFETY MEASURE INTENDED TO REDUCE DANGEROUS ELECTRICAL VOLTAGE GRADIENTS IN AND AROUND THE POOL
  
  – EQUIPOTENTIAL BONDING HAS BEEN REQUIRED IN SOME FORM SINCE THE MID-1960s
  
  – THIS MEANS THAT OLD POOLS ARE LIKELY NOT BONDED
  
• UNDER THE 2020 NEC, ALL RECONSTRUCTED CONDUCTIVE POOL SHELLS MUST BE BONDED TO MEET 2020 NEC REQUIREMENTS
  
• The purpose is to address old, unbonded pools, or old pools with failing bonding, and to provide a practical means to get them bonded for safety.
  
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**WHAT IS A RECONSTRUCTED POOL SHELL?**

It is not defined in the NEC, but here is some guidance based on the Code Panel’s discussion when it was adopted (I was there and participated):

  – IT IS GENERALLY NOT A SMALL PLASTER PATCHING REPAIR JOB
  
  – IT IS GENERALLY NOT REFINISHING THE POOL PLASTER
  
  – IT IS GENERALLY NOT REPLACING A FEW DAMAGED TILES
  
  – IT IS GENERALLY NOT PATCHING LIMITED PARTS OF THE DECK OR COPING
  
  – IT IS GENERALLY MAJOR REMOVAL AND/OR REPLACEMENT OF THE PLASTER AND OTHER MAJOR COMPONENTS LIKE THE DECK
  
• **GUIDANCE:** CHECK WITH YOUR AHJ AND SHOW THEM THE PROJECT SCOPE. GENERALLY, IF IT NEEDS A PERMIT, IT WILL LIKELY REQUIRE BONDING AFTER THE 2020 NEC IS ADOPTED.
  
• **THIS WILL BE A CHALLENGE IF THE POOL WAS BUILT WITH COATED REBAR (WHICH CANNOT BE BONDED) AND NO ALTERNATIVE BONDING METHOD (COPPER GRID UNDER THE POOL) WAS INSTALLED AT THE TIME OF CONSTRUCTION.**
• THIS IS A RECONSTRUCTED POOL SHELL

DO I HAVE TO BOND A RECONSTRUCTED POOL SHELL?

• EVEN IF THE RECONSTRUCTION OF THE POOL IS NOT UNDER THE 2020 NEC, IT IS STILL ADVISABLE TO HAVE THE BONDING INSPECTED AND:
  – IF NO BONDING, HAVE IT INSTALLED
  – IF BONDING EXISTS, HAVE IT REPAIRED AND UPDATED TO CURRENT NEC REQUIREMENTS

• PROPER EQUIPOTENTIAL BONDING IS KNOWN TO ENHANCE SAFETY AND REDUCE ELECTROSHOCK DROWNING HAZARDS
Even If You’re Only Plastering, If You Find A Safety Problem:

- **Easy** - Repair or Have it Repaired 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.
Hamilton & Associates
Architecture - Engineering – Technical Services

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