

HOW TO INSPECT POOLS AND SPAS

Welcome to Module 3

In this module the focus will be on the following topics:

- Pumps and motors
- Inspection tips
- Electricity and electrical safety
- Filtration



PUMPS & MOTORS: HOW PARTS WORK

- The volute, sometimes called the diffuser gives a self-priming pump the ability to handle the air and re-prime itself.
- Impellers move water by spinning
- Strainer pots filters out and traps small debris, and must be routinely cleaned.
- The strainer pot attached to the pump likely has an O-ring in between. Check for water leaks. If the O-ring fails, the pump will suck air into the system through the deteriorated ring.
- Cavitation is a symptom of a problem. It can occur when the impeller doesn't have enough water. Cavitation occurs if the pump is oversized, there's debris in the skimmer, a dirty filter, restriction in the suction line or a vacuum-side leak.
- The shaft is the cylinder coming out of the motor. It is the part that turns the impeller.

MOTOR INSPECTION TIPS

- Keeping the pump in good, functional shape involves keeping it dry and cool.
- The motor should be clean and free of debris.
- There should be no leaks.
- The strainer pot should be clean.
- The pump should not vibrate.
- There should be no unusual or unexpected noises.



ELECTRICAL SYSTEMS

It's common knowledge that mixing water and electricity can cause injuries and even fatalities. The next few slides will focus on safety for the pool with its electrical systems.

Dry-Niche Luminaire

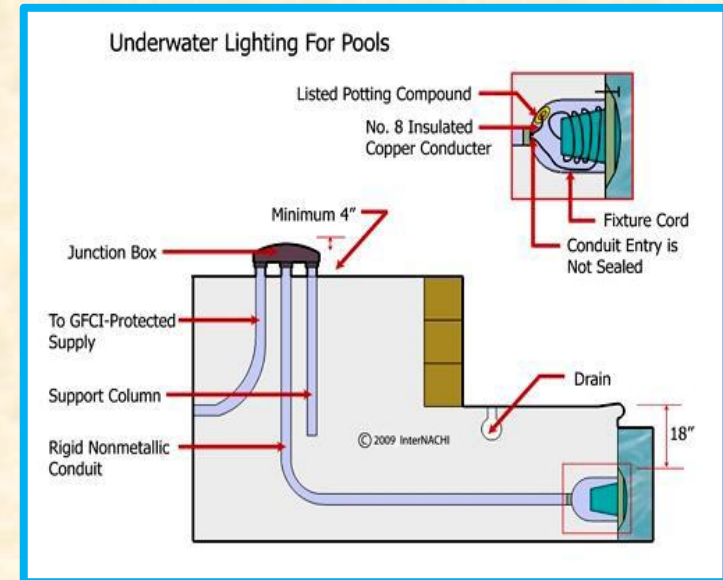
A dry-niche luminaire is installed behind a window below the water level and does not allow any water penetration. Typical residential installations have access through the deck box. The glass window is sealed and waterproof.

Forming Shells

The forming shell for the luminaire is built into the pool wall and supports the wet-niche luminaire.

No-Niche Luminaires

This is an underwater luminaire that is attached to the pool's wall surface. A mounting bracket is used. Typically, no-niche luminaires are installed in above-ground pools.



UNDERWATER LUMINAIRES

An underwater luminaire must be designed to assure freedom from electrical shock without a GFCI device in its circuit. Any light fixture operating at more than 15 volts must have GFCI protection. Portable luminaires must not have any exposed metal parts.

WET-NICHE LUMINAIRES

A wet-niche luminaire is intended for installation in a forming shell mounted in a pool wall. The forming shell is installed before the concrete is placed. The forming shell is not sealed from the pool water.

LOCATION

The top of the fixture lens of a luminaire must be at least 18 inches below the normal water level of a permanent pool, except where the luminaire is listed for use at other depths. For a portable pool, the luminaire can be between 8 to 10 inches below the top of the pool wall.

CORDS

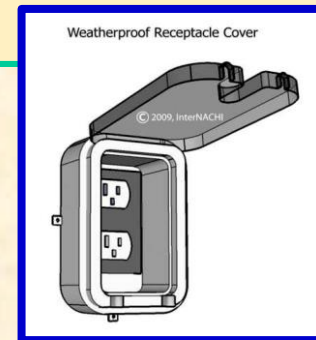
A listed spa- or hot tub-assembly packaged unit installed outside can have a long cord-and-plug connection, but it has to have GFCI protection, and the cord cannot be longer than 15 feet.

CORDS

A listed spa- or hot tub-assembly packaged unit installed indoors can have a long cord-and-plug connection, but it has to be rated 20 amps or less.

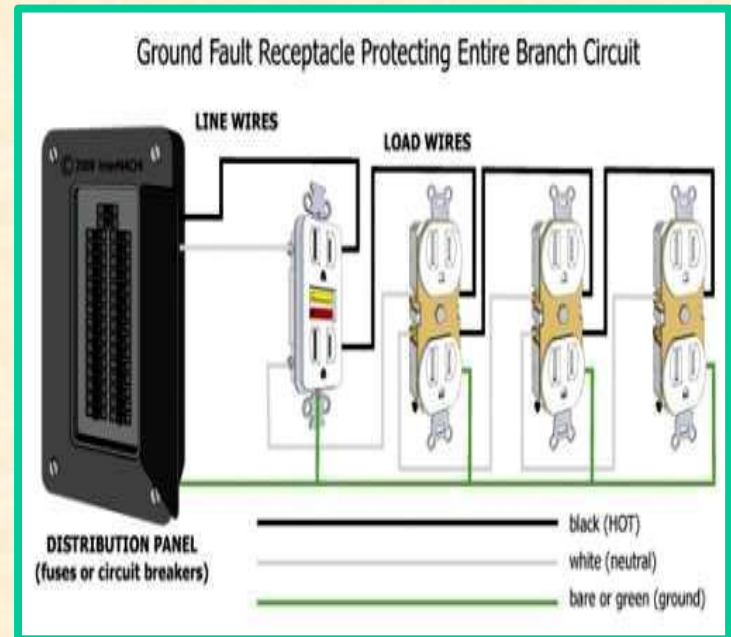
RECEPTACLES

- When measuring clearances between a pool or spa and a receptacle, measure the shortest path that an appliance supply cord connected to the receptacle would follow without penetrating a floor, wall, ceiling, doorway, window, or other effective, permanent barrier.
- Only receptacles for specific equipment are permitted between 5 and 10 ft. from the inside wall of the pool. They must be a single receptacle of the locking and grounding type, so that a typical radio, could not be plugged into it. The receptacle must also be GFCI-protected. There must not be any receptacles that supply power to appliances within 10 feet of the inside wall of the pool or spa.
- At least one 125-volt, 15- or 20-ampere receptacle is required to be installed. Place within 10-20' no longer from the inside wall of a pool or spa. It mustn't exceed 6 ft. and 6 in. from the floor, platform or ground at the pool or indoor spa.



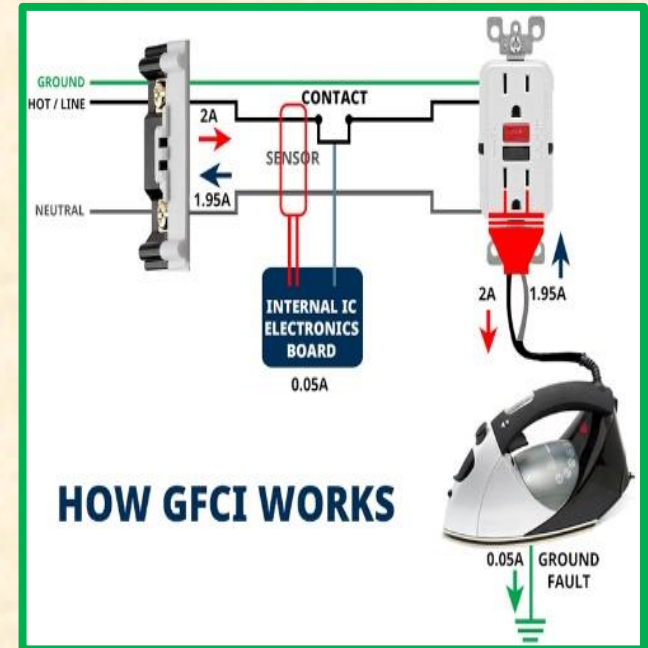
GFCI PROTECTION

- All 15- and 20-Ampere, single-phase, 125-volt receptacles located within 20 ft. of the inside walls of the pool or spa shall be protected by a GFCI.
- This is for portable and permanent pools and spas, indoor or outdoor. Receptacles that supply electricity to pumps rated at 15- or 20-Ampere shall provide GFCI protection, regardless of their location.
- Study the detailed image in this slide to learn more.



MORE ON GFCI PROTECTION

- For portable pools, all electrical equipment, including power cords, shall be protected by GFCIs.
- GFCI breakers have trip and reset buttons to test that they are working properly. An inspector should test (or trip) the breaker using the test button to ensure that the GFCI is functioning and the circuit has been turned off.
- You may encounter 3 types: a standard circuit breaker, a GFCI receptacle and a portable device. If a GFCI will not reset, then further investigation is necessary because an electrical safety hazard may exist.



FOR SPAS

- The outlet that supplies a self-contained spa or hot tub with a heater load of 50 amperes or less should be protected by a GFCI.
- There should be no receptacles within 5 ft. from the inside walls of indoor spas and hot tubs. At least one receptacle should be located between 5-10 ft. from the inside walls of the indoor spa or hot tub.
- All receptacles of 30 amperes or less located within 10 ft. of the inside walls of indoor spas and hot tubs shall have GFCI protection.
- There should be no switches (including timers or panelboards) within 5 ft. horizontally from the inside walls of pools, spas or hot tubs, except where separated by a barrier.



SWITCHES AND FANS

Switches

There should be no switches (including timers or panelboards) within 5 ft. horizontally from the inside walls of pools, spas or hot tubs, except where separated by a barrier. This standard prevents bathers from reaching a device.

Paddle Fans and Luminaires Overhead

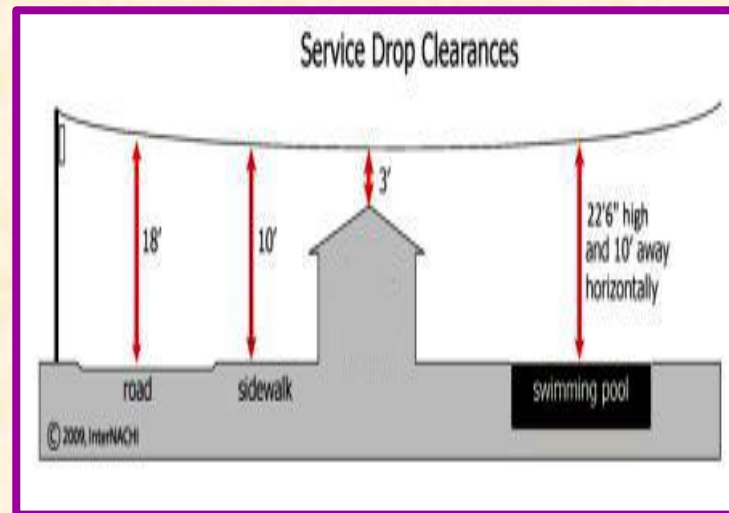
- For outdoor pools and spas, luminaires and paddle fans are not permitted in the area over the water, and extending 5 ft. horizontally from the inside edge of the pool to a distance of 12 ft. above the water level.
- For indoor pools and spas, there are some exceptions to not having luminaires and paddle fans installed overhead.
- Luminaires and paddle fans can be installed at least 12 ft. above the water level without GFCI protection. However, if GFCI protection is provided, enclosed luminaires and fans are permitted as close as 7.5 ft. above the water.

OVERHEAD CONDUCTOR CLEARANCES

There should be at least 22.5 ft. of clearance in any direction to the water level, the edge of the water surface, and the base of a diving platform.

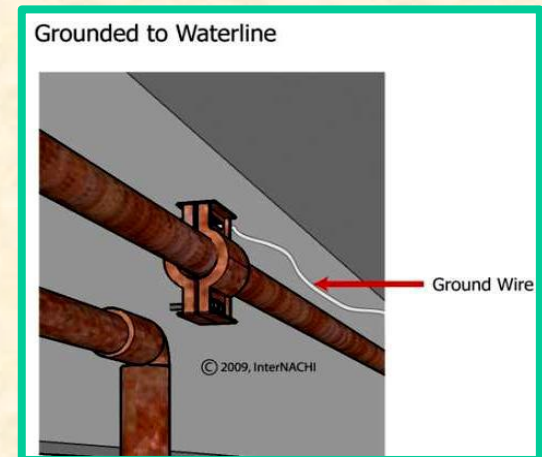
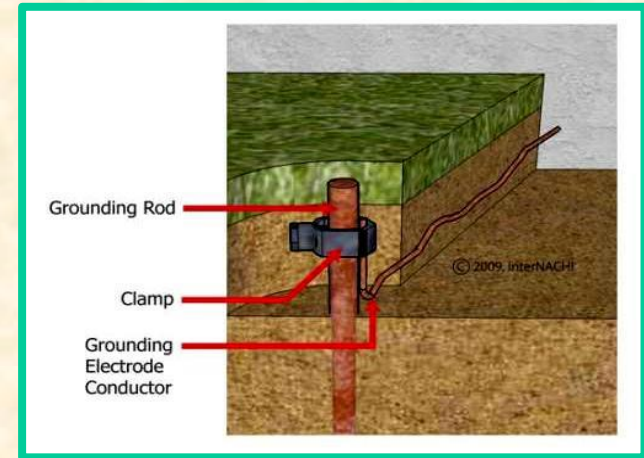
Underground Wiring

Underground wiring should not be installed within 5 ft. from the inside walls of pools or spas, unless installed inside a corrosion-resistant conduit or raceway.



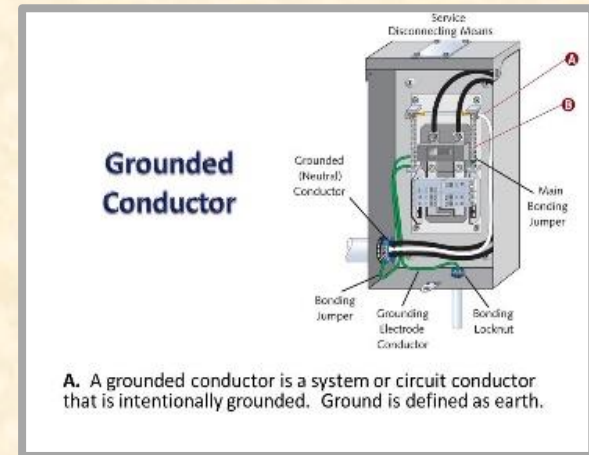
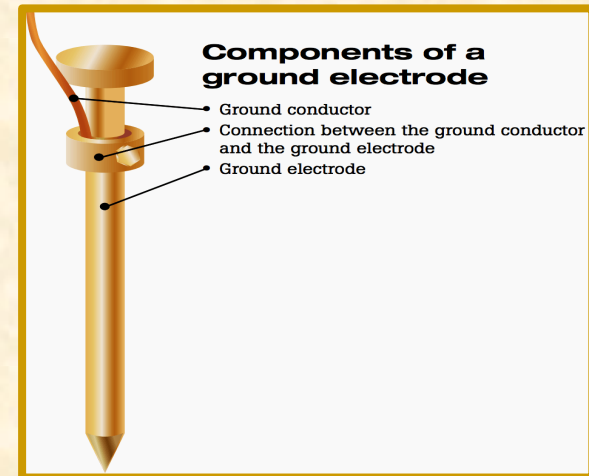
GROUNDING AND BONDING

- Grounding and bonding are required for different reasons. Bonding is required to get all metal parts of the electrical equipment and the non-electrical metal parts of the pool/spa structure to attain equal electrical potential.
- Bonding of metal parts of the electrical equipment makes a low-impedance path for fault current back to the source circuit to trip the over-current device.
- For equipment grounding, a separate, insulated copper grounding conductor should be run to the equipment-grounding terminal in the main service panel.



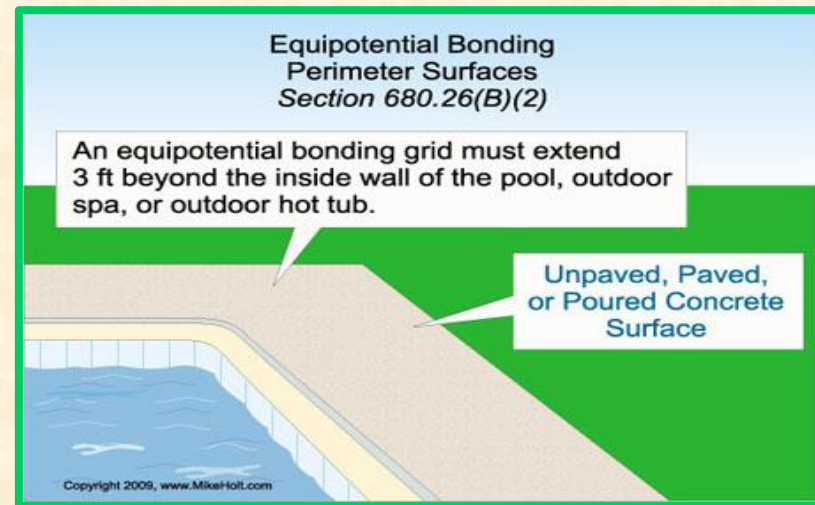
COMPONENTS THAT MUST BE GROUNDED

- Through-wall light assemblies and underwater luminaires, except for low-voltage
- All electrical equipment within 5 ft. of the inside wall of the pool, spa or hot tub
- All electrical equipment associated with the filtering, heating and circulation
- Junction boxes
- Transformer enclosures
- GFCI's
- Panelboards that supply any electrical equipment of the pool, spa or hot tub



EQUIPOTENTIAL BONDING

- All metallic parts of the pool and spa
- Reinforcement metal of the pool, spa, coping, shell, framing, etc.
- Shells and mounting brackets of no-niche luminaires
- All metal fittings
- Metal parts of the equipment
- Electrical devices and controls
- Metal cables and raceways, metal piping, and all metal parts
- Water heaters rated at more than 50 Ampere
- The bonding conductor should be at least 8 AWG or larger solid copper



PANELBOARDS AND HEATERS

Panelboards

If there is a separate panelboard supplying the swimming pool equipment and it is fed from the service equipment, it must have an insulated equipment grounding conductor of at least 12 AWG run with the feeders from the service equipment.

Permanently Installed Radiant Heaters

Electric radiant heaters should not be installed over a pool or within 5 ft. horizontally from the inside walls of the pool, and should be at least 12 vertical ft. away from the pool deck.

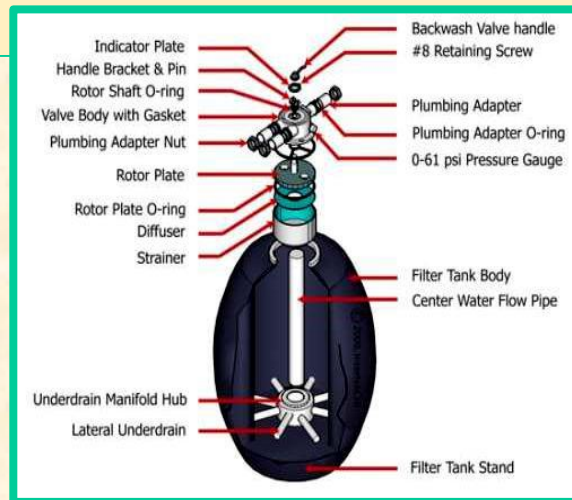


FILTRATION

There are three general types of filters you might find at a pool or spa:

- Sand and gravel
- Diatomaceous Earth (DE) Filters
- Cartridge

The image below is a sand and gravel filter. Sand filters are the oldest type of pool filtration systems. The impurities are filtered by the microscopic shapes of the sand and gravel. Some contractors add aluminum sulfate to the sand in order to improve efficiency.



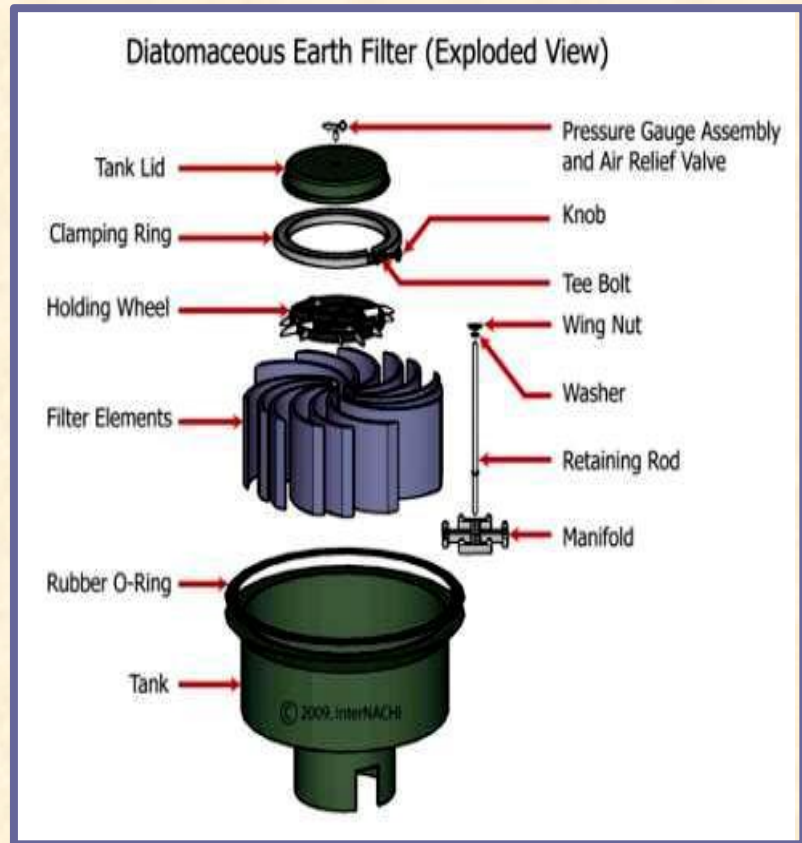
FILTRATION EFFICIENCY

- There are sand and gravel filters that are free-flow, meaning that the water inside the filter tank is not under pressure. Free-flow sand and gravel filters are used mostly for decorative pools, such as fish ponds.
- Sand filters are the least efficient, filtering particles down to about 60 microns.
- Cartridge filters go down to about 20 microns, making them better. There are DE filters that can filter particles down to about 8 microns, making these the best.
- During your inspection, check the lids or covers of the filter tanks.



DIATOMACEOUS EARTH

- DE is actually finely crushed skeletons of microscopic organisms that lived on the earth millions of years ago. The DE is the medium that filters the water by absorbing impure particles, just like a sponge.
- The grids to which the DE is attached help keep the material from slumping into one large blob of material that would be ineffective for filtering.



CARTRIDGES

- Cartridge filtration is a newer type of filtering system used for pools, but mostly for spas. Cartridge filters are ones in which pool water passes through cartridges of fine-mesh, pleated fabric.
- The fabric is the medium that filters the impurities from the water. A filter cartridge can be of a cylindrical, pleated arrangement.
- Cartridge filters are relatively small in size. They are replaceable. Cartridge filters are classified by square footage of filter surface (just as DE and sand filters are). Since the cartridge filter is pleated, a lot of square footage can be contained in a small area.
- Cartridge filters are not backwashed but are removed from the filter, hosed off and cleaned.



PRESSURE GAUGES AND MORE

Most filter tanks have pressure gauges installed on the tank, typically, on the top of the tank. Sometimes, the gauge is installed on the multi-port valve. The gauge will read from 0 to 60 psi.

Air Relief

On top of the tank, you may find an air-release valve. The purpose of the valve is to release air that has been trapped inside the tank.

T-Fitting

On top of the tank, you might find a T-fitting, which is a device shaped like a T. It holds an air-relief valve and a pressure gauge and secures those devices on top of the filter tank lid.



BACKWASH VALVES, WATER & SIGHT GLASS

- Backwashing is the way to clean the pool filter. Backwashing works on sand and DE filters, but not on cartridge filters.
- Cartridge filters do not require backwashing.
- The backwash water is dirty and needs to be handled properly. The water can be hard-plumbed into the sewer line, or directed to a drain using a simple garden hose.
- A sight glass comes in handy in order to keep an eye on the progress of the backwash. The sight glass can be installed on the discharge line.



A Sight Glass

END OF MODULE 3

This concludes Module 3. Please proceed to the 10-question quiz. Once you have completed that, you may proceed to Module 4.

