Handout E.07

Electrical Installation of Residential Pools, Spas and Hot Tubs

Permitting and Inspections Requirements

All electrical wiring require inspections and, therefore, a permit, with the exception of some types of low voltage. The inspector will need access to all portions of the new wiring installation. If it is fed from a panel in the house and out through the crawl space, then the inspector will need access in the house and the crawl space.

Specific Requirements

Electrical installations for pools, spas and hot tubs are found in Article 680 of the National Electrical Code (NEC) and in the local amendments to the NEC. The comments and requirements relayed in this handout are intended to answer frequently asked questions and address common problems. For all requirements, consult the NEC and the local amendments to the NEC. The NEC is available at the municipal library; the local amendments are available at the Building Safety counter and on the Municipality of Anchorage, Development Services website www.muni.org/building.

Third Party Certification

Package spas and hot tubs must be third party certified that the final product complies with specific standards for safety. Certified equipment bears a label from a testing laboratory such as the Underwriters Laboratory (UL), Canadian Standards Association (CSA), or Electrical Testing Laboratory (ETL). A unit that does not bear a label must be field evaluated for conformance to the manufacturing standard. Field evaluations must be arranged by the owner and the agency must be a Nationally Recognized Testing Laboratory (NRTL).

Location

Carefully choosing the location can minimize the challenge of meeting code requirements. The NEC restricts where lights and receptacles may be in relation to the pool, spa or hot tub.

The NEC also has requirements for bonding which apply to metal parts 4 inches or larger located within 5 feet horizontally and 12 feet vertically, even if they are not part of the pool, spa or hot tub itself. Metal parts such as covers; door or window frames; ventilation openings; the metal grid of suspended ceilings; metal gutters; metal fences; and conductive perimeter surfaces are a few of the things that can be a challenge to properly bond per NEC requirements.

Wiring Methods in General

The NEC has specific requirements for the type of raceways that are allowable and for the type of equipment grounding conductor acceptable. The requirements depend on whether the installation is indoor or outdoor, whether it supplies the disconnection means, or the pool, spa or hot tub itself. In general, the 5 feet surrounding the area is considered to be a wet, damp or corrosive location. In these locations, the wiring method must include a copper equipment grounding conductor. For outdoor installations the location must consider existing overhead and underground wiring.

Disconnecting Means (NEC 680.13)

A disconnecting means shall be provided and be accessible, located within sight from all equipment, and shall be located at least 5 feet (1.5 meters) from the inside walls of the pool, spa, or hot tub.

Switching Devices [NEC 680.22(C)]

Switching devices on the property shall be located at least 5 feet (1.5 meters) horizontally from the inside walls of a pool, spa or hot tub unless it is a listed device that is approved for use in that area or separated by a solid fence, wall, or other permanent barrier.

Other Outlets [680.22 (D)]

Other outlets may include, but are not limited to, remote control; signaling; fire alarm; and communications circuits must be at least 10 feet from the inside walls of the pool, spa or hot tub.

INDOOR POOLS, SPAS AND HOT TUBS

Wiring methods (680.43)

The types of wiring approved for interior residential use are suitable 5 feet outside the area of the equipment; inside of 5 feet is considered to be wet, damp or corrosive. Listed package units rated 20 amps or less shall be permitted to be cord and plug connected.
Within any area considered to be wet, damp or corrosive, the wiring method used must include a copper equipment grounding conductor no smaller than #12 AWG size, with terminations suitable for the environment [NEC 680.21(A)(1)].

Receptacles [680.43(A)]

- At least one 125-volt, 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 6 feet (1.83 meters) from and not more than 10 feet (3 meters) from the inside walls of the pool, spa or hot tub.
- No receptacle may be within 6 feet of the water.
- Ground-fault circuit interrupter (GFCI) protection is required for all receptacles within 10 feet from the water.
- Any receptacle that provides power shall be GFCI protected.

Mounting Height of Lighting Fixtures, Lighting Outlets, and Ceiling-Suspended (Paddle) Fans [NEC 680.43(B)]

Lighting fixtures, lighting outlets, and ceiling-suspended (paddle) fans located over or within 5 feet horizontally of the inside walls of the pool, spa or hot tub:

- Shall not be less than 12 feet above the highest water level without restriction;
- Shall not be less than 7 ½ feet above the highest water level with GFCI protection;
- May be less than 7 ½ feet above the highest water level with GFCI protection and meeting the additional requirements of NEC 680.43(B)(1)(c)(1) or (2).

Bonding [NEC 680.43(D)]

The following parts shall be bonded together:

- All metal fittings within or attached to the equipment/structure;
- Metal parts of electrical equipment associated with the water circulating system, including pump motors, unless part of a listed, labeled and identified self-contained unit;
- Metal conduit, metal piping, and all metal surfaces within 5 feet (1.5 meters) of the inside walls of the pool, spa or hot tub and not separated by a permanent barrier, with the exception of small, isolated, conductive surfaces not likely to become energized; e.g. towel bars, mirror frames, etc.;
- Electrical devices and controls that are not part of a listed packaged unit.

Methods of Bonding [NEC 680.43(E)]

Metal parts that are required to be bonded shall be bonded by any of the following methods:

- The interconnection of threaded metal piping and fittings;
- Metal-to-metal mounting on a common frame or base;
- A copper bonding jumper, insulated, covered, or bare, no smaller than #8 AWG size solid wire.

OUTDOOR POOLS, SPAS AND HOT TUBS

Wiring Methods (NEC 680.21)

The portion of the wiring inside of the residential structure can consist of any of the types of wiring approved for interior residential use [NEC 680.21(A)(1)].
The portion of the wiring outside of the residential structure must include a copper equipment grounding conductor.
An exterior corrosive environment is an area where pool chemicals are stored; areas with circulation pumps, automatic chlorinators, and filters; and open areas under decks adjacent to or abutting the pool structure. Where installed in a corrosive environment, it must contain an insulated copper equipment grounding conductor not smaller than #12 AWG size and be installed in rigid metal conduit; intermediate metal conduit; jacketed metal clad cable (MC cable); or where protected from physical damage, Polyvinyl Chloride (PVC), or reinforced thermosetting resin conduit [NEC 680.14(B), 680.21(A)(1)].
Note: Nonmetallic rigid conduit is not approved for above ground use outdoors if exposed to physical damage due to brittleness in cold weather (NEC 352).

Flexible Connections [NEC 680.42(A)(2)]

Listed packaged units utilizing a factory-installed remote panel-board shall be permitted to be connected with liquid-tight flexible metal, or liquid-tight flexible non-metallic conduit [NEC 680.42(A)(1)] or be cord and plug connected with a cord not longer than 15 feet (4.6 meters) where protected by a GFCI [NEC 680.42(A)(2)]. The receptacle must have a cover that is waterproof while in use.

Receptacles [NEC 680-22(A)(1) thru (A)(5)]

- At least one 125-volt 15- or 20-ampere receptacle on a general-purpose branch circuit shall be located a minimum of 6 feet (1.83 meters) from and not more than 20 feet (6 meters) from the inside walls of the pool, spa or hot tub.
- No receptacle may be within 6 feet of the inside walls.
- GFCI protection is required for all receptacles within 20 feet of the inside walls.

Lighting Outlets [NEC 680.22(B)]

- New outdoor lighting outlets must be at least 12 feet above the maximum water level and at least 5 feet horizontally from the inside walls of the pool, spa or hot tub [NEC 680.22(B)(1)].
- Existing outdoor lighting outlets within 5 feet horizontally of the inside walls must be at least 5 feet above the maximum water level, rigidly attached to the structure and be GFCI protected [680.22(B)(3)].
- Lighting outlets in adjacent areas, between 5 feet and 10 feet horizontally from the inside walls and less than 5 feet above the maximum water level, must be GFCI protected [680.22(B)(4)].
- For cord and plug connected luminaires; low voltage luminaires; low voltage gas fired luminaires; decorative fireplaces; fire pits; and similar equipment requirments, consult NEC 680.22(B)(5),(6), and (7).

Overhead Conductor Clearances (NEC 680.9)

There must be a minimum of 14.5 feet (4.4 meters) in any direction from an observation stand, tower, or diving platform, and 22.5 feet (6.9 meters) in any direction from the water level or edge of water surface.

Underground Wiring (NEC 680.11)

Wiring under a pool is only permitted if the wiring is necessary to supply pool equipment. All wiring within 5 feet must use one of the following wiring methods:

- Rigid metal conduit;
- Intermediate metal conduit;
- Rigid PVC conduit;
- Rigid thermosetting resin conduit;
- MC cable with an overall non-metallic jacket listed for underground use;
- Liquidtight flexible metallic conduit; or
- Liquidtight flexible non-metallic conduit.

Equipotential Bonding (NEC 680.26)

All metallic parts over 4 inches (100 milimeters) in any dimension within 5 feet (1.5 meters) horizontal and within 12 feet (3.7 meters) above the pool, spa or hot tub must be bonded together (NEC 680.26.B.5), with the exception of metal bands or hoops used to secure wooden staves (NEC 680.42.B).

Conductive perimeter surfaces around a pool, spa or hot tub must be bonded [680.42(B)].

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