POOLS

TOWNSHIP OF DENVILLE
CONSTRUCTION DEPARTMENT
973-625-8300 X251 OR X253
SPECIFICATIONS FOR POOLS

1. ZONING APPLICATION AND SURVEY WITH $75.00 PAYMENT
2. PERMIT APPLICATION (BUILDING, PLUMBING, ELECTRICAL TECHNICAL SECTIONS WITH UCC FOLDER)
3. 3 SETS OF PLANS WITH POOL SPECIFICATIONS

INGROUND POOLS
Electric permit is required for G.F.I., lights, and bonding
Building permit is required for installation of pool and fence
Plumbing permit is required for gas piping, heater, backflow preventer
Pool or yard must be enclosed by at least a 4’ high fence with a
Self-closing & self-latching gate (see barrier requirements)

Definition: Any pool capable of holding a depth of 24 inches or more of water. (Revised 6/2013)

ABOVE GROUND POOLS
Electric permits is required for G.F.I., lights and bonding
Building permit is required for installation of pool
Plumbing permit is required if pool is to be heated.

A 4 foot (or higher) pool only requires a barrier around the stairs as long as the pool is not sunken into the ground. The pool wall must measure at least 4 feet above grade around entire perimeter to a point 36 inches from pool wall.

INSPECTIONS

Building
1. Rough (before backfilling)
   a. Liner Pool- for concrete collar tie
   b. Steel Pool- for re-bar before gunite
2. Final (when pool is complete)

Plumbing
1. Rough (underground piping)
   2. Gas Line Test (a 15 lb. gauge with 5 lbs of pressure)
   3. Final – Heater inspection
   4. Backflow Preventer Inspection

Electric
1. Bonding
2. Equipotential Bonding
3. Trench
4. Final

Revised 5-5-20
BARRIER REQUIREMENTS
(International Residential Code 2006)

ABOVE GROUND POOLS AND INGROUND POOLS

1. A 48 inch barrier is required and it must withstand a 200 pound weight. For above ground pools, the pool wall is considered the barrier if it is at least 48 inches high

2. Top of pool barriers
   Openings in barriers shall not allow passage of a 4 inch diameter sphere

3. Solid Barriers
   Such as a stone wall or masonry must be normal construction tolerances and tooled masonry joints

4. Chain Link Fence
   1 ¾ or 2 ¾ with slats

5. Lattice Fence
   Diagonal members may have maximum openings of 1 ¾ inches.

6. Access Gates
   Shall open away from pool area and have self-closing and self-latching devices 54” high

7. Above Ground Pool Ladders
   Ladder or steps shall be surrounded by a barrier of 48 inches with a self closing and self latching gate. Note: Retractable or removable ladders are not acceptable unless enclosed by the above barrier.

HOT TUBS AND SPAS

Must have a safety cover and comply with ASTM F1346-91 – see Electrical Inspector

Any unique situations should be referred to your Building Official.
ABOVE GROUND POOL-BARRIER ALTERNATIVE

Many times, above ground pools are installed on a sloped site so that the top of the pool wall, which acts as a barrier, is below the 48 inch minimum required. Usually when this occurs, an additional barrier is mounted on the top of the pool.

Where the above-ground pool is to be installed on a sloped site that will render a portion of the top of the pool structure to be less than 48 inches to grade, a minimum of a 4 foot level surface around the portion of the pool structure that is less than 48 inches to grade should be provided. The level surface should be measured away from the pool at a minimum 45 degree angle for a distance of one-half the provided level surface.

Please refer to the sketch below for clarification.
Township of Denville
Electrical Inspection Department

INGROUND POOLS & HOT TUBS

The following is a list of some rules that I have to enforce when doing pool wiring inspections, due to the complexity of pool wiring it is advisable to get the help of a licensed electrical contractor. These rules are taken from the National Electric Code (N.E.C.) book. For a complete list of rules please look in article 680 of the latest edition of the N.E.C. The initials U.L. mean that the equipment is listed and/or labeled by the Underwriters Laboratories.

1. A receptacle for the pool motor can be between 6 ft. and 20 ft. from the pool, it shall be a 20 amp twist lock receptacle with an “In Use” cover (That is a cover where the receptacle can stay plugged and the cover can be closed). This receptacle has to be Ground Fault protected. Motor can also be hardwired using approved flexible liquid tight conduit. (Seal tight) For pool motor disconnects, not less than 5 ft. from inside walls of pool.

2. The underground wiring from the house to the receptacle shall be in an approved electrical pipe (like PVC) and buried down at 18” below the grade. The wire in the pipe must be #12 gauge THHN wire of the proper colors (black, white, green, etc.).

3. A bonding inspection is required and the bonding wire is required to be (#8 gauge) solid copper wire shall be attached from the pool frame to the motor at the grounding lug provided on the motor. (All bonding lugs are to be copper and approved for direct burial). All metal within 5 feet of the pool must be bonded (for example: ladders, dive boards, fences, siding of house, etc.).

3a. Equipotential Bonding Grid (see attached)

4. The cord from the motor to the twist lock receptacle shall be a #12 gauge cord approved for outside/wet usage (the cord length shall not exceed 3 feet).

5. There shall be a convenience receptacle between 6 feet and 20 feet from the side of the pool and it shall be a ground fault protected receptacle.

6. Inside the house regular house wiring is allowed. (For example: non metallic sheath cable, romex)

7. Use the correct breaker for the correct panel and label it. (For example: Square D breaker in a Square D panel)

8. There shall be proper support for the box with the receptacle on it for the pool motor, or deck box. (For example: a 4 x 4 post, angle iron, etc.)

9. A trench inspection is required to inspect the pipe from the house to the pool motor or panel wiring, and a bonding inspection of the pool and a final inspection once the pool is completely installed, filled with water, and the pump is working.

10. If there is a pool heater, the lug on the pool heater must be copper, not aluminum.

11. No other wiring allowed in the pipe that has the ground fault wiring from the GFCI to the pool deck box. Switch for the pool light shall also be in pipe and nothing else except that pool light wiring inside of the pipe.

12. Wire from a transformer to the low voltage pool light might have to be #10 THHN in order to meet the ampacity required for the pool light.

13. Low voltage thermostat wire shall not be inside of the same enclosure as line voltage wire. (The low voltage wire must have the same ampacity rating as the line voltage.)
Township of Denville
Electrical Inspection Department

ABOVE GROUND POOLS

The following is a list of some rules that I have to enforce when making inspections on above ground swimming pools. These rules come right out of the National Electric Code (N.E.C.) book. For complete rules please look up article 680 in the latest edition of the N.E.C. The initials U.L. mean that the equipment is listed and/or labeled by the Underwriters Laboratories.

1. Make sure before you start that you have all of your prior approvals. Such as for Zoning. (For example: make sure that you don’t need a variance, for the distance from a side yard or rear yard setback.)

2. A receptacle for the pool motor should be not less than 6’ from the edge of the pool and be GFI protected with cord not more than 3’ long and twist lock single receptacle and in use cover. One general purpose receptacle is required between 6’ and 20’ from the pool. (See attached examples)

3. The underground wiring from the house to the receptacle shall be in an approved electrical pipe (like PVC) and buried down at 18” below the grade. The wire in the pipe shall be #12 gauge THHN wire of the proper colors. (Black, white, green, etc.)

4. A bonding wire is required (#8 solid bear copper) from the motor lug to pool frame in 4 different locations and in one continuous loop around the pool about 18” away from pool wall and back to motor.

4a. Equipotential bonding (see attachment)

5. The cord from the motor to the twist lock receptacle shall be a #12 gauge cord approved for outside/wet usage. (The cord length shall not exceed 3 feet.)

6. There shall be a convenience receptacle between 6 feet and 20 feet from the side of the pool and it shall be a ground fault protected receptacle.

7. Inside the house regular house wiring is allowed. (For example: non-metallic sheath cable, romex.)

8. Use the correct breaker for the correct panel and label it. (For example: a Square D breaker in a Square D panel)

9. There shall be proper support for the box with the receptacle on it for the pool motor. (For example: a 4x4 post, angle iron, etc.)

10. A trench inspection is required to inspect the pipe underground from the house to the pool motor receptacle, and a final inspection once the pool is completely installed, filled with water, and the pump is working.

11. If there is a pool heater, the lug on the pool heater must be copper, not aluminum.

12. If there is a receptacle needed for a low voltage pool light it shall be installed more than 10 feet away from the pool.
Swimming Pools
Zoning requirements

The above examples are for two typical lots, a rectangle and a corner lot. All pools must be at least 10 feet from their side lines and from other structures. Corner lots need at least 20 feet from the side property line.

Please note: The drawings are for example purposes only. Individual lots may vary and each survey must be reviewed separately for zoning compliance.
## Jones Bond System

Swimming pools / spas, Agricultural buildings and other difficult environments

### Jones Rebar Clamp
Use to connect solid copper bond/ground wire to rebar
Compact for easy coverage in gunite pool wall
For use on copper wire only

<table>
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<tr>
<th>Catalog Number</th>
<th>Wire Range</th>
<th>Rebar Size</th>
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<td>J 29-DB</td>
<td>8 - 6 SOL</td>
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<tr>
<td>J 30-DB</td>
<td>8 SOL- 4 STR</td>
<td>#4</td>
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<tr>
<td>J 31-DB</td>
<td>6 SOL- 2/0 STR</td>
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BEAVER TOOTH LUG™ Lay-in Lug
Use to connect copper/ground wire to equipment
Copper body, stainless steel screw
For use on copper wire only

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<th>Catalog Number</th>
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<td>#4 - 14 AWG</td>
<td>#10</td>
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<tr>
<td>BTL 4-DBP</td>
<td>#4 - 14 AWG</td>
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BUGLUGS™ Lay-in Lug
Use to connect copper/ground wire to equipment
Heavy duty silicon bronze and copper, tin plated
For use on copper wire only

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<td>#2</td>
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MESHE-BUGS™
Use to connect copper bond ground wire to rolled or sectional re-enforcing steel wire mesh
Sizes available for rolled (#10) and heavy (#6) mesh
Copper-alloy bronze. For use on copper wire only

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<td>A2-DB</td>
<td>#10</td>
<td>#12 STR - #8 STR</td>
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<tr>
<td>A5-DB</td>
<td>#8</td>
<td>#8 SOL - #4 STR</td>
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PIPE CLAMPS
Cast bronze body
Silicon bronze screws
For use on copper wire only

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GROUND ROD CLAMPS
Cast bronze body
Silicon bronze bolt
For use with copper wire only
Direct burial in earth and concrete

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U-BOLT CLAMPS
Use to connect wire to pipe, rod, or fence posts parallel or perpendicular to pipe
Cast bronze body
Silicon bronze hardware
For use on copper wire only

GROUNDS ROD CLAMPS
Use to mount BTL-4-DB and BL Series lay-in lugs to equipment
Sets of stainless steel hardware
Available in #10-24 and 1/4-20 sizes

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GREAVES CORPORATION
Guilford, Connecticut 06437
Phone 203-453-4304  Fax 203-453-8343
must be connected together to form an equipotential bonding grid. The equipotential bonding grid is divided into two (2) distinctive parts, the conductive pool shell (belly steel) and the perimeter surfaces (deck steel). For the conductive pool shell, poured concrete, pneumatically applied or sprayed concrete, and concrete block (including painted or plastered coatings) are all considered conductive materials due to water permeability and porosity. Vinyl liners and fiberglass composite shells are not included in these bonding requirements and are considered to be nonconductive materials. For the perimeter surfaces, the equipotential bonding grid shall extend under paved walking surfaces for a distance of 1 m (3 ft) horizontally beyond the inside walls of the pool unless separated from the pool by a permanent wall or building 1.5 m (5 ft) or more in height. The deck or perimeter surface does include unpaved surfaces as well as poured concrete and other types of paving and is required to be attached to the pool reinforcing steel or copper conductor grid of the conductive pool shell at a minimum of four (4) points uniformly spaced around the perimeter of the pool. For non-conductive pool shells, bonding at four points is not a requirement. The components and make-up of the conductive pool shell and the perimeter surfaces will be discussed in greater detail later in this chapter.

The bonding connection between the various components of the equipotential bonding grid can be made with a solid copper conductor or with rigid metal conduit of brass or other identified corrosion-resistant metal. If a conductor is used, this conductor may be insulated, covered, or bare, but cannot be smaller than 8 AWG. This bonding conductor is not required to be extended or attached to remote panelboards, service equipment, or any grounding electrodes. This bonding conductor is, again, simply for bonding of metal components together; it is not intended for the purpose of establishing a connection to earth or a ground-fault return path.

The connection(s) must be made in accordance with NEC 250.8 or IRC E3406.13 by such things as listed pressure connectors or clamps that are labeled as suitable for the purpose and are made of stainless steel, brass, copper or copper alloy. Where pressure-type connectors are used, be certain they are sized to accommodate the 8 AWG copper bonding conductor and the steel reinforcing bar or whatever is being bonded. Consult the connector manufacturer's specifications for the proper model connector. Some clamps or connectors are suitable for use with pipe only or with reinforcing rods only. Some of the clamps or connectors are identified for use with a certain size or diameter pipe only, such as ½ in. – 1 in. diameter trade sizes only. This will also ensure a secure connection on what are often widely different sizes of reinforcing bar or rod and the 8 AWG bonding conductor.

If the connection will be covered with concrete or earth, use a wire pressure connector that is identified as being suitable for direct earth burial or concrete encasement, whichever applies.

The process of exothermic welding is an excellent way to bond the required bonding conductor(s) to reinforcing rods or bars. If the exothermic welding process is used, it is critical to use the proper form or mold. A proper
form will be sized for both the reinforcing rod and the bonding conductor to be used. Also, be certain all the manufacturer's instructions are followed. Too "hot" of a load may ruin the connection. Safe work practices and proper personnel protective equipment are required to avoid being seriously burned.

**Equipotential Bonding Grid — Conductive Pool Shell**

The equipotential bonding grid is comprised of two (2) different and distinct parts. The first of these two that we will discuss is the conductive pool shell. This conductive pool shell is sometimes referred to as the belly steel. The conductive pool shell is to be comprised of the following elements:

Unencapsulated structural reinforcing steel of a conductive pool, where the reinforcing steel is bonded together by the usual steel tie wires or the equivalent. If the structural reinforcing steel is encapsulated in a nonconductive compound or if unencapsulated structural reinforcing steel is not available or utilized at a conductive pool shell, a copper conductor grid is required to be installed.

If installed, this copper conductor grid system shall comply with and consist of (1) through (4) below:

1. Be constructed of minimum 8 AWG bare solid copper conductors bonded to each other at all points of crossing (see NEC 250.8 for bonding connection provisions).

2. Conform to the contour of the pool shell.

3. Be arranged in a 300 mm (12 in.) by 300 mm (12 in.) network of conductors in a uniformly spaced perpendicular grid pattern with a tolerance of 100 mm (4 in.).

4. Be secured within or under the pool no more than 150 mm (6 in.) from the outer contour of the pool shell.” [NEC 680.26(B)(1)(a) and (b) or IRC E4204.2(1)].
Figure 14.7. Receptacle outlet location requirements for permanently installed pools

Figure 14.8. Receptacle outlet for permanently installed pool water-pump motor is permitted as close as 1.83 m (6 ft) from water’s edge with specific conditions (GFCI protection required).

Receptacle Locations for Permanently Installed Swimming Pools

Receptacles that provide power for circulation water-pump motors are generally required to be at least 3.0 m (10 ft) away from the inside walls of a pool. A lesser distance is permitted for these water-pump motor receptacles or other loads directly related to the circulation and sanitation system of not less than 1.83 m (6 ft) from the inside walls of the pool if they meet all of the following conditions. This circulation water-pump motor receptacle must be of a grounding type, a single contact device, and protected by a ground-fault circuit interrupter (GFCI) [680.22(A)(2) or IRC E4203.1.1].

Where a flexible cord-and-attachment plug is used to connect a pump motor to this receptacle installed as indicated above, the cord length is not permitted to exceed 900 mm (3 ft) in length; it must include a copper equipment grounding conductor not smaller than 12 AWG; and be provided with a grounding-type attachment plug (NEC 680.7 or IRC E4202.2). This outlet rated 120-volt through 240-volt, single-phase would be required to be GFCI-protected regardless of the ampere rating or if it were cord-and plug-connected or hard-wired [NEC 680.21(C) or IRC E4203.1.3].

For permanently installed pools, at least one 125-volt, 15- or 20-ampere receptacle must be installed in the vicinity of the pool. This receptacle must be located not less than 1.5 m (5 ft), adjacent to, and within sight from the spa or hot tub, and be readily accessible to users.

provided in NEC 680.41 and IRC E4208.4 and do not apply to single-family dwellings, but would be required for two-family or multi-family dwellings. This emergency shutoff must be located not less than 1.5 m (5 ft), adjacent to, and within sight from the spa or hot tub, and be readily accessible to users.
tacle must be GFCI-protected, on a general purpose branch circuit and must be located not closer than 1.83 m (6 ft) and not farther than 6.0 m (20 ft) from the inside wall of the pool. This receptacle shall be located not more than 2.0 m (6½ ft) above the same floor, platform or grade on which the pool is installed. For residential construction, this requirement applies if the permanently installed pool is constructed at either a new or existing dwelling unit(s). All 15- and 20-ampere, 125-volt receptacles located within 6.0 m (20 ft) of the inside walls of a pool must be protected by a ground-fault circuit interrupter [NEC 680.22(A)(1) through (5) or IRC E4203.1.1, E4203.1.2, and E4203.1.3].

Other outlets such as for remote control, signaling, fire alarm and communications shall be not less than 3.0 mm (10 ft) from the inside walls of the pool. [NEC 680.22(D) or IRC E4203.5].

It is important to clarify that where receptacle locations involve taking measurements, the distances are required to be the shortest path that a supply cord of an appliance that is connected to the receptacle would follow without penetrating any floor, wall, ceiling, doorway with hinged or sliding door, window opening, or other effective permanent barrier [NEC 680.22(A)(5) or IRC E4203.1].

Luminaires, Lighting Outlets and Ceiling Fans

New Outdoor Installations

Generally, luminaires, lighting outlets and ceiling-suspended (paddle) fans cannot be installed over outdoor pools or over any area extending 1.5 m (5 ft) horizontally from the inside walls of a pool unless they are located 3.7 m (12 ft) or more above the maximum water level [NEC 680.22(B)(1) or IRC E4203.4.1].

GFCI Protection in Adjacent Areas

Where luminaires and lighting outlets are installed in the area extending between 1.5 m (5 ft) and 3.0 m (10 ft) horizontally from the inside walls of a pool, they must be protected by a ground-fault circuit interrupter. GFCI protection is not required.
The requirement for bonding perimeter surfaces now applies to paved and unpaved surfaces. An example of an unpaved perimeter surface would be the lawn surrounding a permanently installed aboveground swimming pool. Where the paved portion of the perimeter surface extends less than 3 ft horizontally from the inside walls of the pool, the perimeter bonding grid must be continued under the adjacent unpaved perimeter surface. If physical constraints (such as a wall or other physical barrier) prevent the perimeter from extending 3 ft beyond the inside walls of the pool, the bonding grid is required only to extend under the available perimeter area.

The perimeter bonding grid can be comprised of structural reinforcing metal (re-bar or welded wire mesh) that is conductive to the perimeter surface and installed in or under the perimeter surface. Where structural reinforcing steel is not available, a single, bare, solid 8 AWG or larger copper conductor can be installed around the perimeter of the pool in an area measuring between 18 in. and 24 in. from the inside pool walls. This 8 AWG bonding conductor can be installed in the paving material (i.e., in the concrete), or it can be buried in the material (subgrade) below the paving material. Where buried, the bonding conductor is to be not less than 4 in. and not more than 6 in. below the surface level of the subgrade material.

The perimeter surface bonding medium has to be connected, at four evenly spaced points around the pool perimeter, to either the structural steel of a conductive pool shell or to the copper bonding grid provided for the conductive pool shell that has encapsulated re-bar or no re-bar at all. Connection between the perimeter bonding medium and nonconductive pool shells is not required.
EXAMPLES OF ACCEPTABLE LADDER ENCLOSURES

Deck & Fence with oval pool.

Aluminum Deck & Fence