Bulletin 68-8-4
Bonding of swimming pool, hot tub, and spa
Rule 68-058

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Scope

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1) Overview of bonding requirements

When planning to install a pool, considering its entire lifespan during the design phase helps ensure safe, long-term enjoyment. A key part of this is evaluating the environment where the pool will be located. The Ontario Electrical Safety Code (OESC) provides installation guidelines and requirements to protect people using the pool, especially given the growing demand for electricity and the increasing complexity of electrical systems.

With aging infrastructure and rising energy use, it's important to design pools that reduce exposure to external electrical risks. Doing so can help create a safer, more comfortable space while reducing long-term maintenance costs. According to the OESC, a pool is made up of three main elements:
1. The body or shell: the physical structure that holds the water
2. The patio or perimeter decking: the deck or surface area around the pool
3. The water: the conductive medium inside the body

The body or shell is what most people picture when they think of a pool. It’s the structure built to contain the water and can be made from concrete, metal, molded plastic, or other suitable materials. Rule 68-058 4) provides the bonding requirements for this portion of the installation.

The patio or perimeter decking can be made of various materials based on the owner's preference. Materials like concrete, interlock, flagstones, and paving stones are considered conductive when wet. These surfaces are addressed in Rule 68-058 3). Surrounding areas that include conductive parts, such as metal fencing within 1.5 m of the pool are addressed by Rule 68-058 1).

The water inside the pool creates a conductive environment. The goal of the OESC is to ensure that all conductive parts in and around the water are electrically bonded together

to always maintain the same potential, regardless of external influences, thus creating a condition called equipotentiality. This equipotentiality minimizes the chance of shock when people enter, exit, or interact within the pool. Rules 68-058 7) and 8) provide bonding requirements for the pool water bonding.

2) Equipotential bonding connections for pools

Rule 68-058 1) requires metal parts of the pool and other non-electrical equipment associated with the pool (metal piping, pool reinforcing steel, metal ladders, diving board supports, fences, etc.) within 1.5m of the pool water, to be bonded together and to non-current carrying metal parts of electrical equipment associated with the pool (e.g. decorative luminaires and lighting equipment).

Parts of non-electrical and electrical equipment are required to be bonded to each other and to the pool. See Diagrams B1 and B2.

A pool bonding conductor is not required to be connected to a grounding electrode, it is connected to the same bonding conductor(s) as other bonded equipment, typically at the panelboard feeding the equipment or to the pool equipment.

Any exposed metallic gas piping located within 1.5 metres of the inside walls of a pool must be bonded to the pool equipment and surfaces. This bonding requirement helps ensure that all metallic systems near the pool are at the same electrical potential, reducing the risk of electric shock.

Metal covers on pool drains do not require a bonding connection when the drain body is constructed of non-metallic material. These covers are considered minor metal items and are not included in the scope of “non-electrical equipment associated with the pool” as described in the rule (i.e. piping, reinforcing steel, ladders, diving board supports, or fences). Additionally, metal covers typically lack bonding connection provisions, are mounted on non-conductive surfaces, and do not establish a reference to remote earth, making bonding impracticable and unnecessary in this context.

Aluminum split bolts or ground lugs are not permitted for use in pool bonding installations. All bonding components located underground must be approved for earth burial and/or concrete encasement, where applicable. Components installed outdoors must be rated and approved for wet locations. In accordance with Rule 2-034 (Use of approved equipment), all electrical equipment must be of a type and rating that is specifically approved for its intended use, ensuring long-term safety and code compliance.

3) Bonding for pool shells (the body)

The OESC defines a conductive pool shell as “a rigid encasing structure that is made of metal, concrete, or other conductive material and that contains the pool water.” The Appendix B note clarifies that vinyl liners and fibreglass shells are considered non-conductive, but any associated metal components, such as liner backing or coping tracks are still required to be bonded.

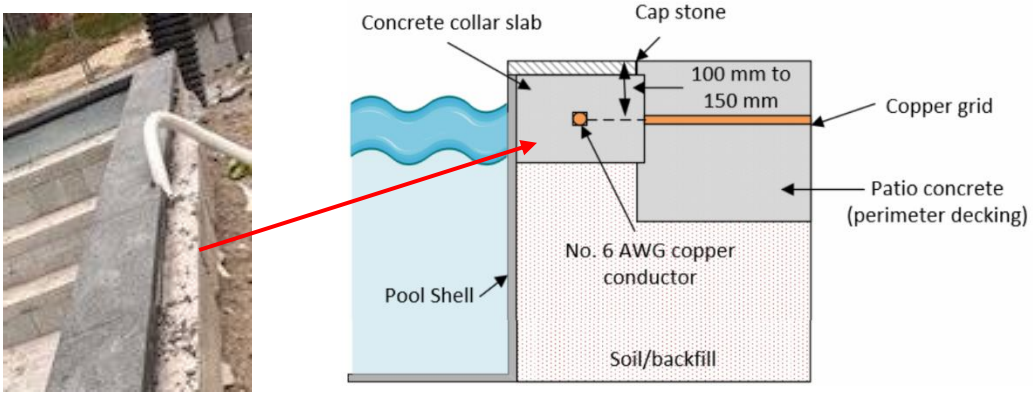
It is common practice for pool installers to reinforce pool shells (the body) with poured concrete below grade to provide structural support (concrete collar) for the body. When this is the case, the concrete below grade is not required to be bonded for this portion of the installation since it is not accessible by the pool user when not incorporated to the perimeter decking or sub-surface (see photo B1).

Photo B1 – Poured concrete collar for structural support

Bonding requirements are applicable to the concrete collar when it is placed at a height where it may be in contact with, or coupled to, the perimeter decking (the patio) (see image B1). This can be achieved by one of the following methods:

1. *Use of copper grid as per Rule 68-058 3) b) (and as per this Bulletin);*
2. *By embedding a No. 6 copper conductor in the concrete collar creating a "loop" to the extent of the collar around the pool and connected in four equally spaced points to the final perimeter surface or grid; or*
3. *Connected at four equally spaced points to the final perimeter surface when the collar has unencapsulated reinforcing steel embedded in it, as per Rule 68-058 3) a).*

Image B1 – Example of concrete collar in contact with the patio (perimeter decking)



a) Conductive pool shells

Rule 68-058 4) a) requires unencapsulated *interconnected (i.e. steel mesh connected with each other)* conductive structural reinforcement steel to be bonded with a minimum of four equally spaced connections around the pool. See Diagram B1.

Rule 68-058 4) b) requires a continuous metal pool shell made up of individual panels securely bolted together, to be bonded in at least one location to equipment specified in Subrule 1) and as shown in Diagram B2.

Diagram B1 – Bonding a pool and pool deck with unencapsulated structural reinforcing steel

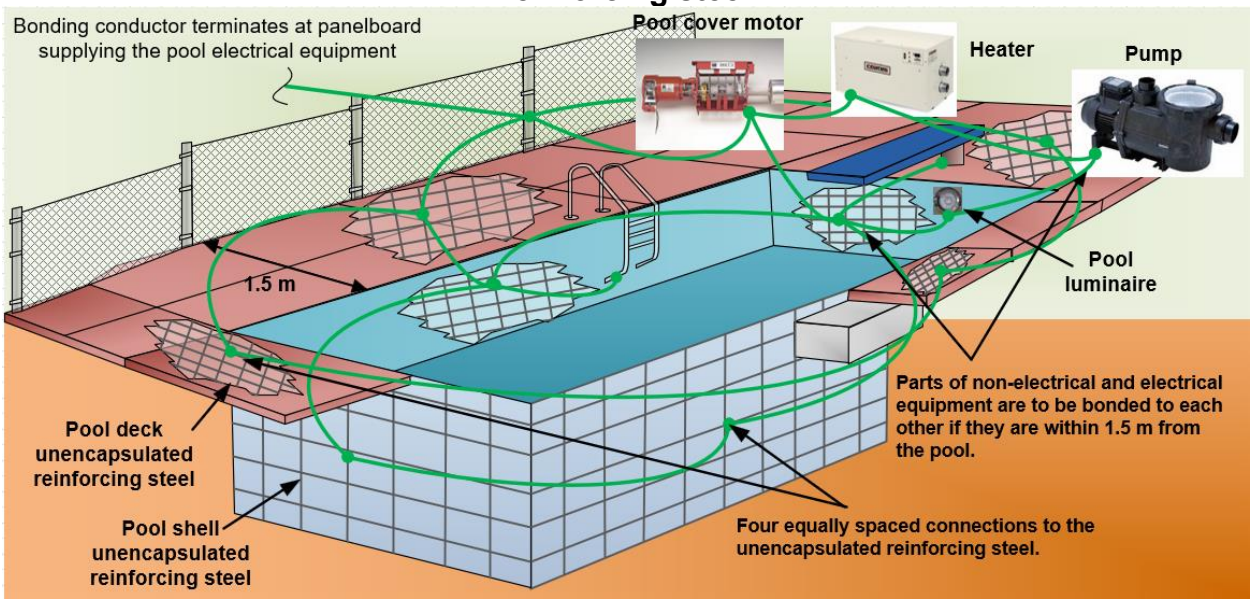
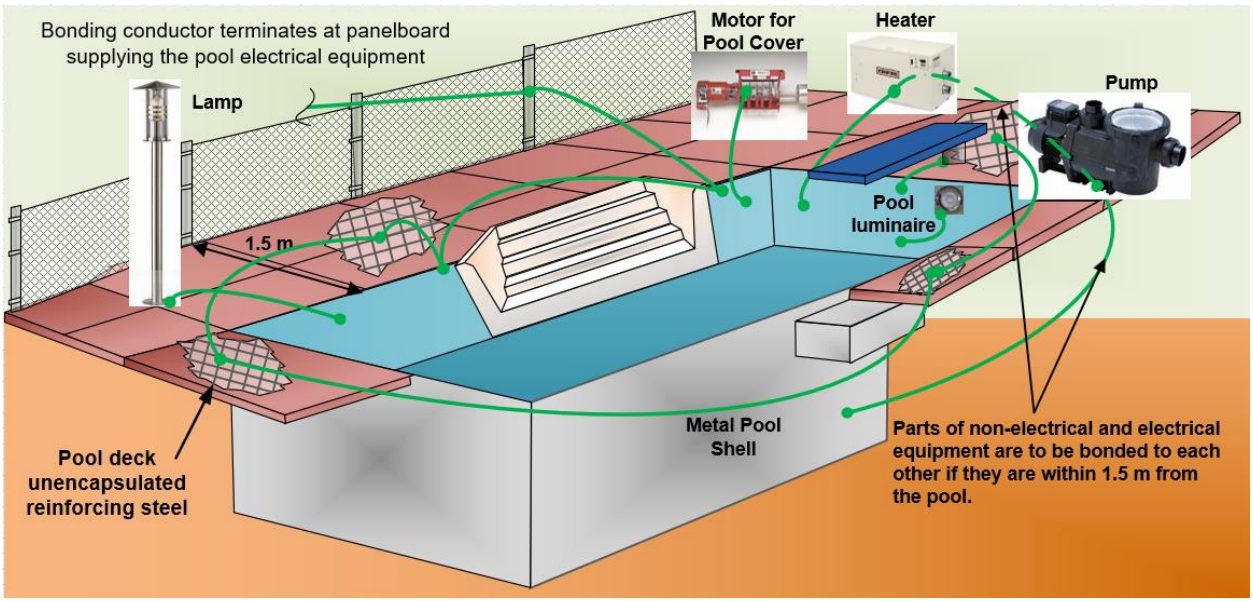


Diagram B2 – Bonding a metal pool shell



In cases where a metal pool shell includes non-conductive components such as fibreglass stairs that interrupt the continuity of the shell, such as the configuration shown in Photo B2, the pool shell is still considered compliant with Subrule 4) b) if it is bonded at only one point, provided that a bonding jumper is installed across the break in the metallic path, as illustrated in Diagram B1. This ensures electrical continuity across all conductive sections of the shell. Alternatively, each isolated metallic section may be bonded individually if a jumper is not used.

Photo B2 – Metal pool with fibreglass stairs and pool reinforcing brackets

Where the pool shell reinforcing material is encapsulated steel, or fibreglass rebar, Subrule 4) c) requires a bonding grid made of bare No. 6 AWG copper to be installed. This grid must be arranged in a 300 mm by 300 mm mesh pattern and placed around and beneath the pool, no more than 150 mm from the outer contour of the pool shell.

Bonding of an above-ground steel pool shell is not required under the OESC when the shell is constructed from individual metal panels that *are not continuous*, i.e. separated by non-conductive supports, such as insulated resin components (illustrated in Photo B3).

For all construction designs, including above-ground pools with continuous conductive material, the same requirements for in-ground pools apply (i.e.: bonding of body, perimeter, and water).

Photo B3 – Above ground pool with non-conductive supports

Table B1 provides **some** examples of conductive pool shells, their installation methods, and bonding requirements.

Table B1 – Examples of bonding requirements for conductive pool shells

Conductive Pool Shells (bodies)	
Installation Method	**OESC Requirement**
Pool installed with poured concrete and unencapsulated reinforcing steel.	Bonded at 4 equally spaced connections as per Rule 68-058 4) a).
Continuous metal shell made up of individual panels bolted together.	Bonded at one point as per Rule 68-058 4) b).
Pool installed with either fibreglass rebar, or fibre reinforced concrete.	Copper grid is required as per Rule 68-058 4) c).
Pool installed with poured concrete (fibre concrete).	
Pool installed with poured concrete and encapsulated reinforcing steel.	

b) Nonconductive pool shells

The OESC does not have bonding requirements for nonconductive pool shells, such as fibreglass composite (as shown in Photo B4) or resin. If other conductive, non-electrical equipment associated with the pool, such as ladders or fences are installed, they are required to be bonded to the pool conductive non-current carrying infrastructure and the associated electrical equipment; these bonding requirements are also applicable to the perimeter decking around the nonconductive pool shell. *Water bonding requirements are also applicable to nonconductive pool shells (see topic 5 of this Bulletin for water bonding requirements).*

Photo B4 – Fibreglass pool

Table B2 provides **some** examples of nonconductive pool shells, their installation methods, and bonding requirements.

Table B2 – Examples of bonding requirements for nonconductive pool shells

"Nonconductive" Pool Shells (bodies)	
Installation Method	**OESC Requirement**
Non-conductive pool shell (fibreglass composite or resin).	*The shell is not required to be bonded.*
Concrete pool shell with vinyl liner.	Subrules 4) a) or c).
Continuous metal shell made up of individual panels bolted together with vinyl liner.	Subrule 4) b).

4) Bonding for pool perimeter surface/deck (the patio)

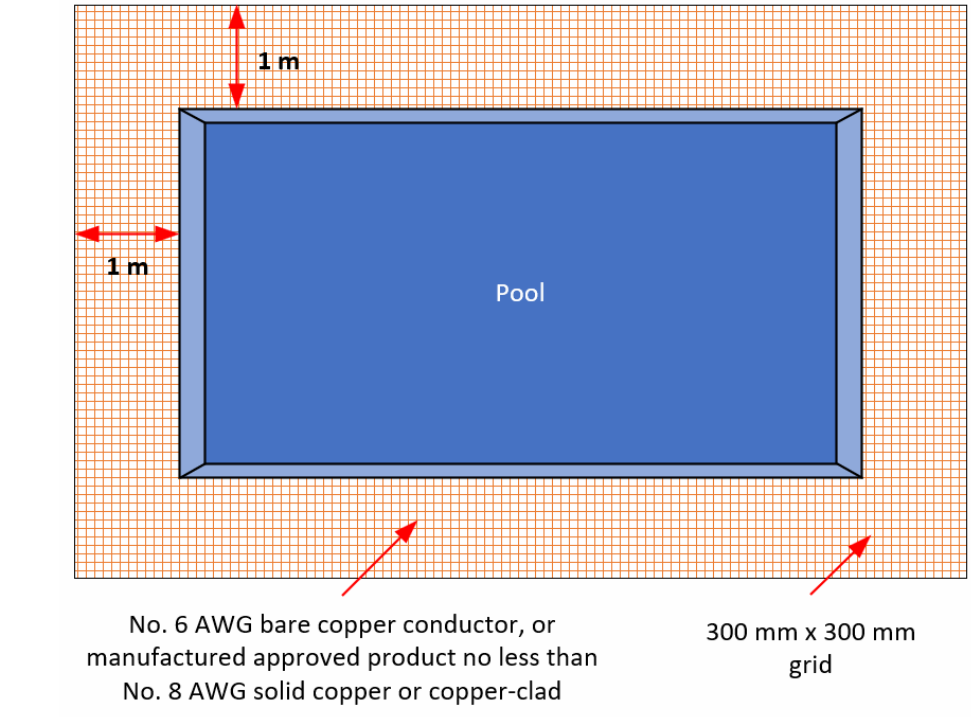
Rule 68-058 3) a) requires the pool deck's unencapsulated *interconnected (i.e. steel mesh connected with each other)* reinforcing steel to be bonded together with a minimum of four connections, equally spaced around the perimeter of the pool, as shown in Diagram B1.

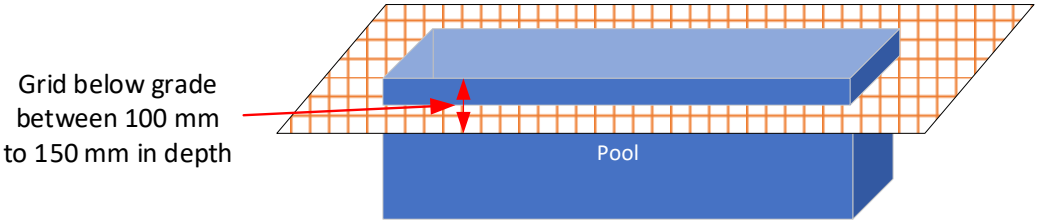
When the pool deck reinforcing material is encapsulated steel, or fibreglass rebar, Subrule 3) b) requires a bonding grid to be installed around the pool deck. Notwithstanding Subrule 3) b), a copper grid conforming to one of the conditions below is acceptable to satisfy the rule requirement to establish equipotentiality for the patio (perimeter decking):

1. *Copper grid construction (in-situ)*
    - *Minimum of No. 6 AWG bare copper conductor bonded to each other using suitable connectors at all points of crossing;*
    - *Arranged network of a 300 mm by 300 mm uniformly spaced grid pattern with a tolerance of 100 mm;*
    - *Grid extends horizontally no less than 1 m from the outside of the pool shell to form a 1 m side shield around the pool circumference; and*
    - *Below grade at a depth between 100 mm to 150 mm*
2. *Manufactured or prefabricated products complying with the grid construction requirements mentioned above, and constructed with copper conductor that is no less than No. 8 AWG solid copper or 40% copper clad.*

Additionally, if non-conductive materials (wooden or composite) are used for the decking, which isolate the pool user from conductive surfaces, with a minimum 13 mm (1/2") thickness or rubber matting of no less than 27 mm (1") (nonconductive), is installed below or around the pool or hot tub, that extends 1 m beyond the outer contour, the bonding requirements for the patio can be omitted. Other products, which can be shown to provide sufficient insulating characteristics under all conditions, can also be considered.

Diagram B3 – Bonding a pool deck with encapsulated structural reinforcing steel





For pools, spas, and hot tub designs which contain features that will impede access to areas around the pool, spas, and hot tubs such as fencing, guard rails, retaining walls, or large landscape structures like hedges or rockery, bonding can be omitted where there is no clear standing space (See table B4).

Table B3 provides **some** examples of different pool perimeter decking installations and their bonding requirements.

Table B3 – Examples of bonding requirements for pool decking installations

Pool Perimeter Decking	
Installation Method	**OESC Requirement**
Installed with poured concrete and unencapsulated reinforcing steel.	Bonded at 4 equally spaced connections as per Rule 68-058 3) a).
Installed with fibreglass rebar or fibre reinforced concrete.	Copper grid is required as per Rule 68-058 3) b) *or as per permission in topic 4) of this Bulletin*.
Installed with fibre concrete.	
Patio stones or pavers around the pool as the decking. (*)	
Installed with poured concrete and encapsulated reinforcing steel.	
Installed with wooden or composite decking (non-conductive).	No bonding required for the deck.

(*) An alternative method could be a non-encapsulated reinforced concrete slab extending at least 1 m from the perimeter of the pool's edge, and not more than 150 mm below the pavers or patio stones that have been bonded as per Rule 68-058 3) a).

5) Pool water bonding

When pools are nonconductive or have a vinyl liner and no other bonded conductive parts are in contact with the pool water (items specified in Subrule 1)), Subrule 7) requires the pool water to be bonded via corrosion-resistant conductive surface that always exposes no less than 58 cm^2 of the surface area to the pool water. Subrule 8) permits a pool water bonding device (see Photo B5) to be located where it is not exposed to damage or dislodgement during normal pool use and be connected to any of the pool infrastructure by a No. 6 AWG copper bonding conductor.

Photo B5 – Examples of pool water bonding devices

"Skimmer" water bonding device

"Spigot" water bonding device

6) Spa and hot tub bonding requirements

Subrule 3) a) (bonding of unencapsulated deck and perimeter reinforcing steel) is applicable to pools and permanently installed spas and hot tubs. When the decking or perimeter surface for spas and hot tubs does not fall within the requirements of Subrule 3) a), a copper ring consisting of a bare copper conductor (minimum No. 6 AWG) *may be constructed instead*, between 450 mm to 600 mm around the spa or hot tub at a depth of 100 mm to 150 mm below grade according to Subrule 3) c) (see Diagram B5).

Constructing a pad, as identified in Subrule 3) a) (explained above), or installing the permitted ring will establish a equipotential gradient around the spa or hot tub for the safety of the users.

Diagram B5 – Deck or perimeter bonding for permanently installed spas and hot tubs

Table B4 provides **some** examples of different spa and hot tub decking and perimeter surface installations and their bonding requirements.

Table B4 – Examples of bonding requirements for spa and hot tub decking

Permanently Installed Spas and Hot Tubs (See notes 1 and 2)	
Installation Method	**OESC Requirement**
Installed on a poured concrete and unencapsulated reinforcing steel (slab).	Bonded at 4 equally spaced connections as per Rule 68-058 3) a).
Installed on poured concrete with encapsulated reinforcing steel.	Copper ring is required as per Rule 68-058 3) c).
Installed on patio stones, pavers.	
Installed on the ground.	
Permanently installed wooden or composite decking (or other nonconductive surface) below or around that extends 1 m beyond the outer contour.	Copper ring is not required.

Note 1: These requirements are only applicable to permanently installed spas and hot tubs; portable spas and hot tubs are to be used according to manufacturer instructions. *The term "permanently connected equipment" is defined in the OESC which aligns with the scope of the product standard for spas and hot tubs (C22.2 No. 218.1) limiting portable products to cord connected equipment with a rating not exceeding 115 V and 15 A.*

- *The OESC defines "permanently connected equipment" as electrically connected equipment to a supply by means of connectors that cannot be accessed, loosened, or tightened unless a tool is used. It also defines "portable" as equipment designed not to be used in a fixed position, receiving current through the medium of a flexible cord or cable attached to an attachment plug.*

Note 2: *The replacement of a hot tub does not require the installation to meet the requirements of Rules 68-058 3) a) or 3) c); however, it is recommended to use one of the methods listed in Table B4 to mitigate any potential issues with stray voltages.*