

Electricity & Water Do Not Mix

A Review of Article 682 of the National Electrical Code

Failure to follow the National Electric Code could have serious or fatal consequences. Article 682 was added to the National Electrical Code in 2005 and contains many provisions that are applicable to aeration ponds.

Scope of National Electrical Code Article 682

This article applies to the installation of electrical wiring for, and equipment in and adjacent to, natural or artificially made bodies of water not covered by other articles in the NEC, such as, but not limited to aeration ponds, fish farm ponds, storm retention basins, treatment ponds and irrigation (channels) facilities.

The article is not applicable to industrial applications where there is an alarm indication of equipment faults and where conditions of maintenance and supervision ensure only qualified persons service and operate the installed equipment and continued circuit operation is necessary for safe operation of equipment or processes.

Electrical Datum Plane

According to the NEC Handbook, the electrical datum plane provides a “horizontal benchmark” to which the location of electrical equipment on or near the water is referenced. All locations addressed in the article—inside, outside, over and under—are with respect to the surface and boundary of the electrical datum plane. Consequently, the electrical datum plane for facilities addressed in 682 is defined by:

- Land areas subject to tidal fluctuation
- Land areas not subject to tidal fluctuation
- Land areas subject to flooding
- Floating structures and landing stages

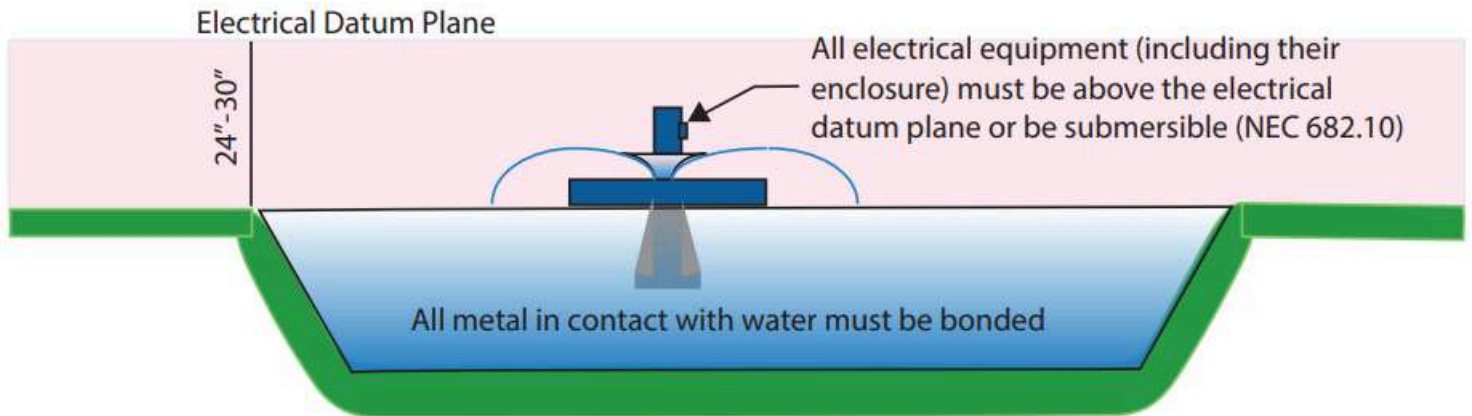
Definition of the Electrical Datum Plane for Facilities

- 1 Land Areas Subject to Tidal Fluctuation:**
The electrical datum plane shall be a horizontal plane 600 mm (2 ft) above the highest tide level for the area occurring under normal circumstances, that is, highest high tide.
- 2 Land Areas Not Subject to Tidal Fluctuation:**
The electrical datum plane shall be a horizontal plane 600 mm (2 ft) above the highest water level for the area occurring under normal circumstances.
- 3 Land Areas Subject to Flooding:**
The electrical datum plane based on (1) or (2) above shall be a horizontal plane 600 mm (2 ft) above the point identified as the prevailing high water mark or an equivalent benchmark based on seasonal or storm-driven flooding from the authority having jurisdiction.
- 4 Floating Structures & Landing Stages:**
The electrical datum plane for floating structures and landing stages that are (a) installed to permit rise and fall response to water level, without lateral movement, and (b) that are so equipped that they can rise to the datum plane established for (1) or (2) above, shall be a horizontal plane 750 mm (30 in.) above the water level at the floating structure or landing stage and a minimum of 300 mm (12 in.) above the level of the deck.

See Figure 1, Page 2.

AERATION POND

Figure 1



Location of Electrical Equipment

Per article 682.10, electrical equipment including their enclosures shall be specifically approved for the intended location. No portion of an enclosure for electrical equipment not identified for operation while submerged shall be located below the electrical datum plane.

Electrical Connections

Per article 682.12, all electrical connections not intended for operation while submerged shall be located at least 300 mm (12 in.) above the deck of a floating or fixed structure, but not below the electrical datum plane on fixed structures. Conductor splices (within junction boxes identified for wet locations) using sealed wire connection systems listed and identified for submersion, shall be required for floating structures where located above the waterline, but below the electrical datum plane.

Grounding Requirements

Grounding shall be according to article 682.20 and shall have the following minimum requirements:

- The grounding wire shall be minimum of 12 AWG insulated copper conductor.
- As a minimum, metal boxes, metal cabinets, other metal enclosures, metal frames of utilization equipment and grounding terminals of grounding-type receptacle shall be connected to the equipment grounding contactor.

Bonding Requirements for Non-Current-Carrying Metal Parts

Per 682.32, all metal parts in contact with water, all metal piping, tanks, and all non-current-carrying metal parts that are likely to become energized shall be bonded to the grounding terminal in the distribution equipment. See Figure 2. Page 3.

Other Requirements

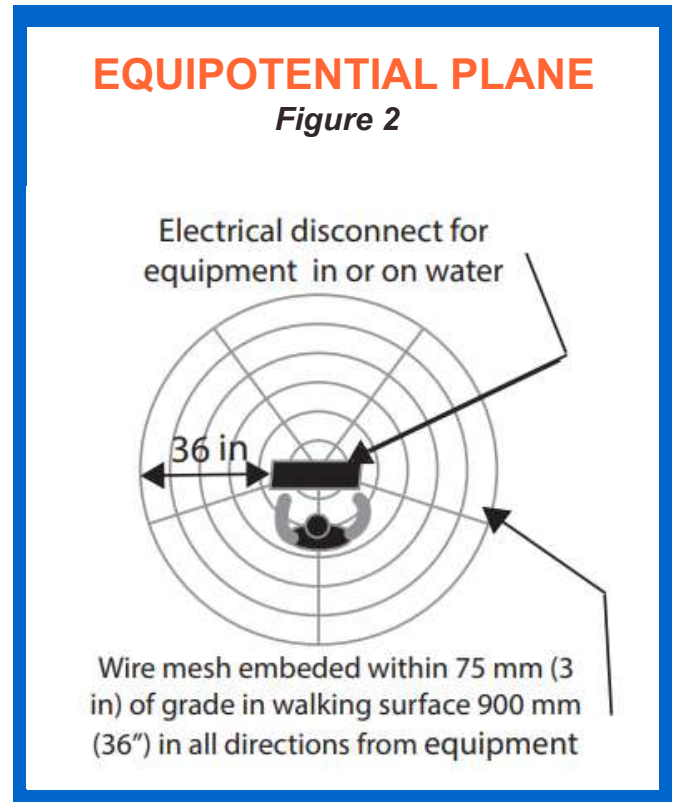
Additional requirements exist for disconnects and for equipotential planes. This specifically includes requirements for bonding the outdoor service equipment, disconnects and walking surfaces not less than 36 inches in any direction from the specified equipment to be bonded to the equipotential plane.

The National Electrical Code exists to keep people and equipment safe. Knowing the requirements is the first step in protection. See Figure 2.

Disclaimer



This Technical Brief is not meant to replace a thorough reading of NEC 682, but is intended merely as an educational introduction to some relevant provisions and definitions with the article.

A qualified electrical engineer or qualified electrician should review the requirements of NEC 682 to ensure equipment is designed and installed in order to keep your aeration basin in compliance.



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