

## Livestock Waterers and Equipotential Planes

The National Electrical Code (NEC) requires that you must install an equipotential bonding plane where livestock can stand while accessing metallic equipment. An equipotential plane (EP) is an area where a wire mesh or other conductive elements are embedded in or placed under concrete, bonded to all metal structures and fixed nonelectrical equipment that may become energized, and connected to the electrical grounding system to minimize voltage differences within the plane and between the plane, the grounded equipment and the earth.

In the case of a livestock waterer, if the equipment grounding conductor becomes damaged or disconnected, and the metallic enclosure becomes energized, it's likely there could be some level of voltage present. By installing an EP in the surrounding concrete slab on which the livestock stand while drinking, the voltage potential between the livestock waterer and the concrete slab would be greatly reduced, thus minimizing or eliminating any discomfort to the livestock. The concept behind the EP installed according to NEC 547.10 is that the entire area should be at the same voltage potential, creating a "bird on a wire" effect. In addition, there is an Informational Note that provides further direction.

Partial extract from the NEC. Emphasis added. See the 2020 NEC for more information:

547.10 Equipotential Planes and Bonding of Equipotential Planes. The installation and bonding of equipotential planes shall comply with 547.10(A) and (B). For the purposes of this section, the term livestock shall not include poultry.

(A) Where Required. Equipotential planes shall be installed where required in (A)(1) and (A)(2).

(2) Outdoors. Equipotential planes shall be installed in concrete slabs where metallic equipment is located that may become energized and is accessible to livestock. The equipotential plane shall encompass the area where the livestock stands while accessing metallic equipment that may become energized.

*Informational Note No. 2: Methods for safe installation of livestock waterers are described in American Society of Agricultural and Biological Engineers (ASABE) EP342.3-2010, Safety for Electrically Heated Livestock Waterers.*

Summary: In all instances, whether a waterer is located indoors or outdoors, when the NEC makes reference to the EP, the common denominator is a concrete floor or slab. If there is a concrete floor or slab that encompasses the area where livestock stand while accessing fixed metallic nonelectrical equipment that is likely to become energized, then the EP would be required.

The use of non-conductive waterers would not require an EP. However, if the non-conductive waterer utilizes an electric heating element that is placed in the water, the EP should be considered when livestock are standing on a concrete floor or slab.