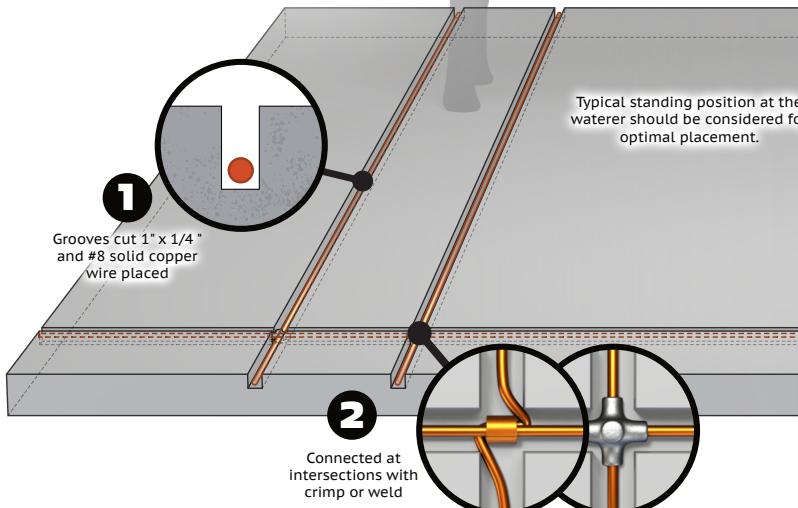




Retrofitting

There are methods of retrofitting an EQP that don't require pouring a new floor. Any method you choose requires grounding, bonding, and transition rods.



Groove existing concrete: (shown above)

- 1) Cut 1-inch-deep grooves at approximately 12 inches spacing and install a #8 AWG or larger bare solid copper wire in the groove.

Copper wires can be installed as either a single continuous length or as multiple segments joined using welded or crimped connections that are direct-bury rated to create an equipotential plane.

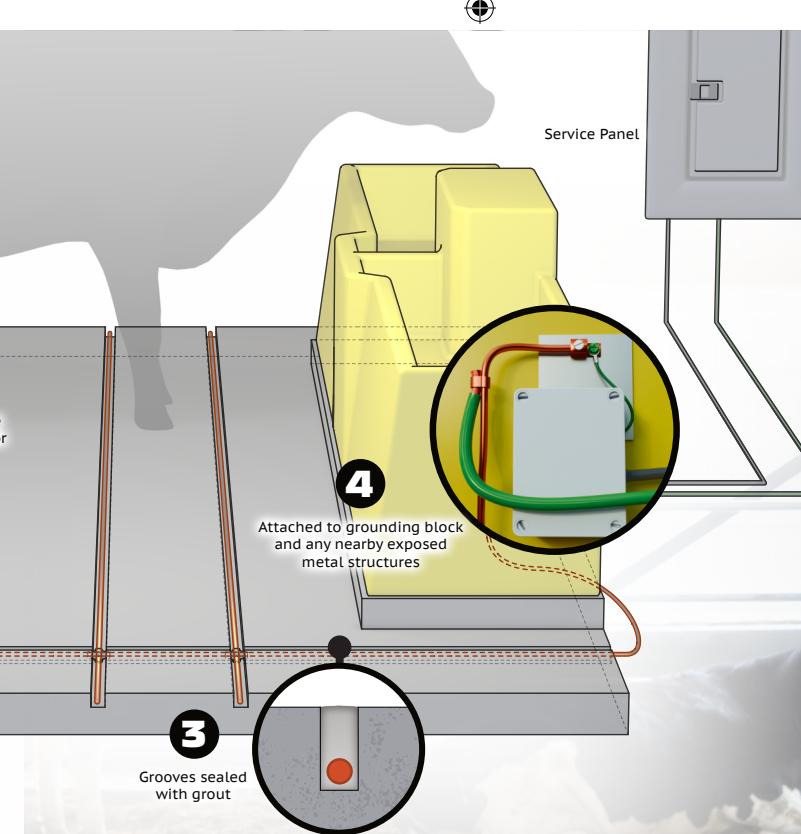
Install bonding wires in the concrete floor around the waterer at the typical standing positions of the animal to ensure effective grounding: two conductors under the front hoof zone and two conductors under the rear hoof zone.

- 2) Establish the conductive network with direct-bury rated connections at intersections.
- 3) Seal the grooves with grout (follow manufacturer's directions for installation).
- 4) Bond the retrofitted plane and the metallic waterer components (ex. metal pan) to the farm's grounding electrode system using a wire no smaller than a #8 AWG solid copper.

If using a donut-style immersion heater, coil a bare #8 AWG copper wire, place in direct contact with immersed donut heater, and bond coil to the equipotential plane system.

Cap existing concrete:

Lay wire mesh on the old concrete and bond it to all metallic components before "capping" it by pouring a new 2 inch layer of concrete.



This pamphlet assists farmers, contractors, electricians, concrete installers, and others better understand the proper installation of livestock waterers.

Proper waterer installation methods help ensure human and animal safety and minimize stray voltage.

**Grounding and Bonding
Electrically Heated
Livestock Waterers
to Reduce
STRAY
VOLTAGE**



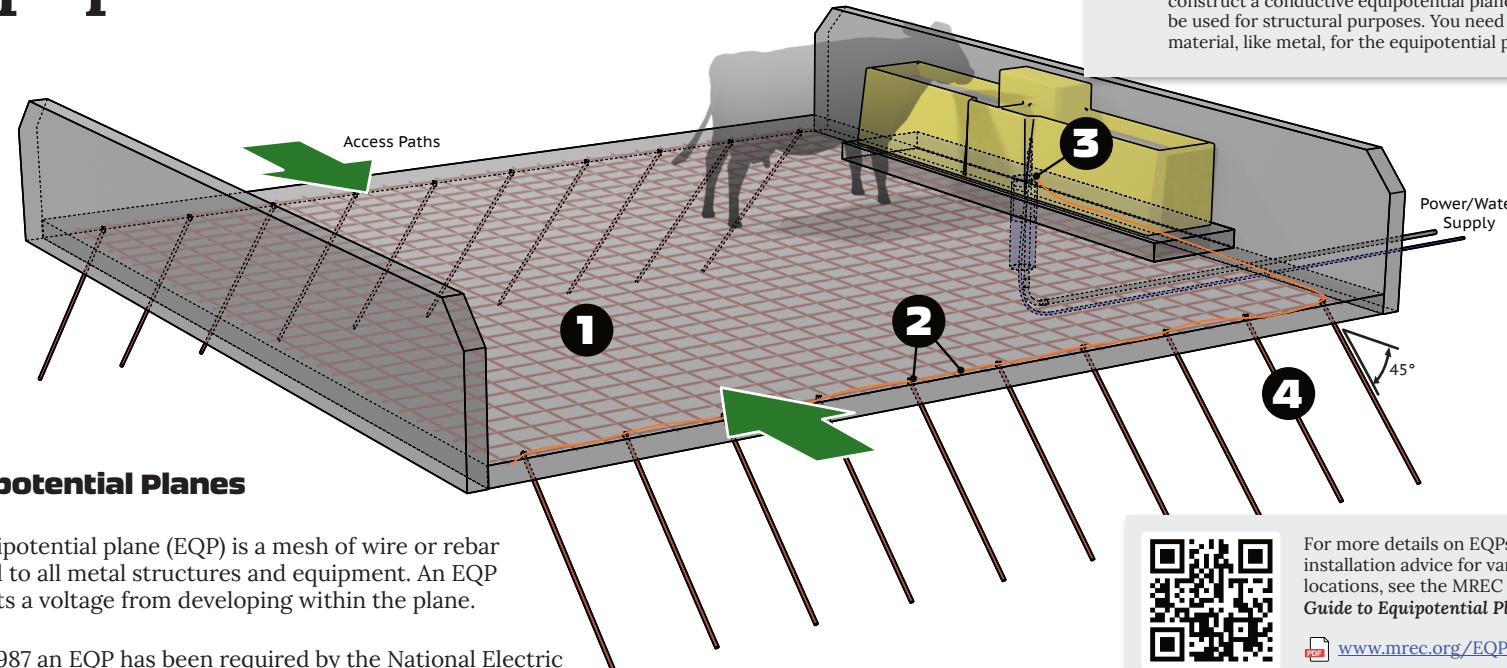
More Info

MREC website topic: Stray Voltage

Visit the MREC website for additional information on stray voltage and equipotential planes. www.mrec.org

For a safe and compliant installation, refer to the current edition of the National Electrical Code (NEC) and all applicable local regulations. www.necanet.org/topics/codesandstandards/the-nec

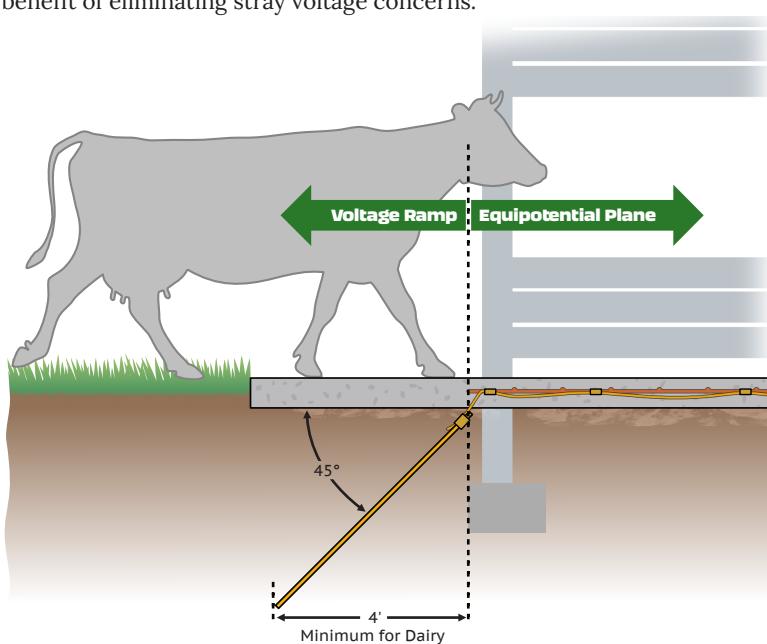
Parts of an Equipotential Plane



Equipotential Planes

An equipotential plane (EQP) is a mesh of wire or rebar bonded to all metal structures and equipment. An EQP prevents a voltage from developing within the plane.

Since 1987 an EQP has been required by the National Electric Code (NEC 574.10) in all animal confinement areas with concrete floors where equipment may become energized, including livestock waterers. The NEC's requirement of an EQP is for human and animal safety in the event of a fault, with the added benefit of eliminating stray voltage concerns.



An EQP has four parts:

- 1) **Conductive network in floor:** A "wire mesh" embedded in the concrete typically consisting of one or more of the following:
 - a. 6-inch x 6-inch welded-steel wire not smaller than #10 gauge.
 - b. Reinforcing steel rebar (3/8 inch) spaced not greater than 18 inches.
 - c. Bare copper wire, not smaller than #8 AWG spaced 12 - 18 inches.
- 2) **Bonding:** All wire mesh, rebar, and all metal objects including livestock waterers shall be electrically bonded together. Multiple or duplicate bonds are strongly recommended.
- 3) **Grounding:** All wire mesh, rebar, and bonded electrical equipment shall be tied to the farm's grounding electrode system with a copper wire not smaller than #8 gauge.
- 4) **Transition area (voltage ramp):** Install copper-clad ground rods at 45-degree angles where livestock step on or off an EQP. Rods should be spaced 12 inches apart and bonded to the EQP.



For more details on EQPs, and installation advice for various locations, see the MREC publication *Guide to Equipotential Planes*.

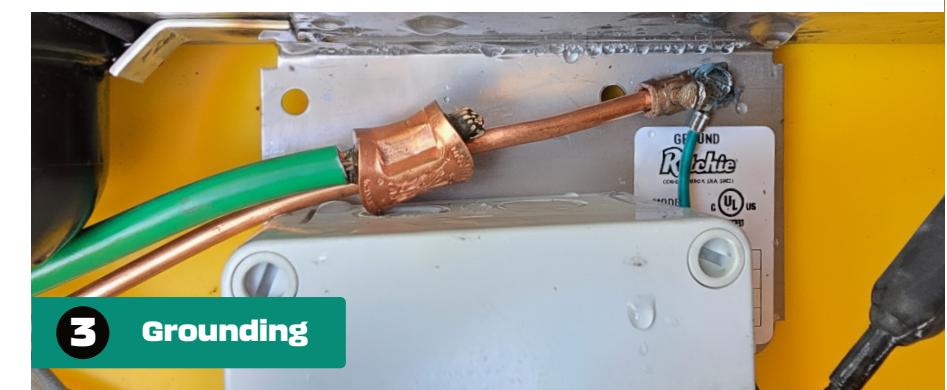
www.mrec.org/EQP



1 Conductive Network



2 Bonding



3 Grounding



4 Transition Area