



Electrical code issues and answers.

● Equipotential Planes in Agriculture Buildings

The 1999 NEC 547-9 requires that an equipotential plane be created in concrete floors in animal confinement areas of buildings that have electrical wiring. An equipotential plane made of wire mesh or other conductive elements (e.g. reinforcing bar) must be installed in the concrete floor and bonded to all adjacent metal structures, surfaces and fixed non-electrical metal equipment. The equipotential plane must be bonded to the building electrical grounding system to prevent a difference in voltage from developing within the equipotential plane. Minimum #8 copper wire must be used for all equipotential bonding.

Equipotential planes are necessary in “animal confinement areas” where the livestock are exposed to more than one electrical conductive element, including things like watering units, feeders, metal partitions, stalls, or milking equipment. In such areas, the potential for “stray” currents would exist if all the conductive surfaces were not bonded together. Additionally, a “voltage gradient or voltage ramp” may be necessary at entrances and exits to the equipotential plane to reduce the potential for an animal to receive a shock as it steps onto or off the plane. The voltage differential cannot be totally eliminated, but it can be reduced to acceptable levels.

NEC 547-9 FPN No. 2 references the ASAE design criteria noted below as a possible standard of design for equipotential planes. **The designer of the equipotential plane is responsible for designing a plane that will prevent a difference in voltage from developing within the plane.** The NEC does not have specific design requirements for the equipotential plane.

● Additional Information for Scope of Work -- HVAC/Refrigeration

Is a Limited Energy System (06) contractor/electrician permitted to do work included in the scope of the HVAC/R (06A) specialty? Yes. The intent is to allow the (06) to install the same control wiring, HVAC/R equipment, and service and replace line and low voltage components as allowed in the (06A) category. This is consistent with current industry practice. The scope of the (06) specialty encompasses the work in the (06A).

What work is an HVAC/R technician permitted to do? An HVAC/Refrigeration technician may install HVAC/R electrical equipment and the Class 2 HVAC/Refrigeration control cables and devices that control furnaces, heat pumps, HVAC/R equipment in residential occupancies and other buildings that are three stories or less in height. An HVAC/R technician is also permitted to install, service, and replace line and low voltage components and wiring within the equipment. “Within the equipment” is defined as inside the equipment or within close proximity and integral with the operation of the HVAC/Refrigeration equipment. A commercial boiler is an example of equipment that might not be “inside” a single piece of equipment. Control devices, valves, motors, and etc. might be in the boiler room, but not directly attached to the boiler itself. Another example could be an electronic air filter located immediately adjacent to a furnace when the power supply for the air filter is obtained from appropriate power terminals on a furnace.

What work can an HVAC/R technician not perform? An HVAC/Refrigeration technician cannot install branch circuit, feeder, or service conductors that supply a piece of HVAC/R equipment. The scope of work for the HVAC/R technician begins at the power termination point within the equipment. The technician cannot install any wiring in classified (hazardous) locations.

What work is required to be permitted and inspected? WAC 296-46-495 requires an electrical work permit for the “installation, alteration, or other maintenance of electrical systems except for replacement of circuit breakers or fuses, for replacement of lamps, snap switches, receptacle outlets or heating elements, replacement of a lighting fixture ballast with an exact same ballast, replacement of contactors, relays, timers, starters, or similar control components or for plug-in appliances or travel trailers.” For the purposes of HVAC/Refrigeration equipment, “similar control components”, will be interpreted to include manufacturers’ authorized replacement components, motors, and compressors. Most routine service work to HVAC/R equipment will not require an electrical permit. That unpermitted service work would, however, require the technician to possess a valid HVAC/R certificate.

● Temporary Service – GFCI Requirements

The 1999 NEC 305-6 has made significant changes in the GFCI requirements for temporary services. The NEC 305-6(a) now requires “all 125-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets” to have GFCI protection. NEC 305-6(b) requires that all other receptacles have GFCI protection or an assured equipment grounding conductor program must be in place for all contractors and sub-contractors working on the site. If an assured equipment conductor program is to be used, the program must be in place and available to the inspector when the temporary is inspected and until the temporary service is disconnected.

● Wiring to Temporary Portable Construction Office/Storage Structures

Commercial coaches are identified with the Labor and Industries black label insignia. Units equipped with a 120-volt electrical system must have a label that reads “THIS CONNECTION IS FOR 110-125 VOLT AC SERVICE. DO NOT CONNECT TO HIGHER VOLTAGE.” Units equipped with 120/240-volt systems are labeled “THIS CONNECTION IS FOR 120/240 VOLT AC _____ AMPERE SERVICE” and units equipped with 480/277-volt systems must be labeled “THIS CONNECTION IS FOR 480/277 VOLT AC _____ AMPERE SERVICE.” (The correct equipment rating shall be stamped in the blank spaces.) These labels must be installed on an outside wall, adjacent to the point of entrance of the supply assembly or permanently installed feeders.

Black label commercial coaches set up as temporary construction offices and storage structures may be fed with temporary wiring methods in compliance with NEC Article 305. The ampere rating on the label is intended to identify the maximum rating of the electrical equipment and conductors installed within the commercial coach. Feeders to these units need to be of adequate capacity and rating to carry the loads as calculated in NEC Article 220 and must not exceed the rating on the label.

● RV Septic Tank Requirements

A Recreational Vehicle (RV) must be considered as a residential unit when interpreting WAC 296-46-50002. An RV is defined in 1999 NEC 551-2 as a unit that is primarily designed as temporary living quarters (a temporary residence). If there is a Recreational Vehicle Park (two or more RVs), the on-site or STEP system may not have residential loading characteristics. The installation will probably have open floor drains, shower, laundry, or other facilities connected to the sewage system. The residential classification permitted in WAC 296-46-50002 would no longer apply. When multiple RVs are connected to on-site and STEP systems, the entire system must be evaluated to determine the correct classification.

● Conduit to Outdoor Hot Tubs and Spas

Previous editions on the National Electrical Code did not specifically address wiring methods to the disconnect for outdoor hot tubs and spas. The 1999 edition of the codes is specific as to the grounding requirements and wiring methods to the disconnecting means.

NEC 680-40 requires that *“A spa or hot tub installed outdoors shall comply with the provisions of Parts A and B of this article except as permitted in (a) and (b).”* Article 680-25 (d), found in Part B of NEC 680 now is specific about grounding a disconnect. *“A panelboard and, where installed, a disconnecting means, that are not part of the service equipment or source of a separately derived system, shall have an equipment grounding conductor installed between its grounding terminal and the grounding terminal of the applicable service equipment or source of a separately derived system.”*

The 1999 code makes it clear that the equipment grounding conductor must be insulated and must be installed with the feeder conductors in rigid metal conduit, intermediate metal conduit, liquidtight flexible nonmetallic conduit, or rigid non metallic conduit. It is permissible to use EMT where it is installed on or within the building and electrical non-metallic tubing where installed within a building. NEC 680-25(d) no longer allows multi-conductor cable to supply a new panelboard or new disconnect. Existing multi-conductor cable is allowed to feed existing remote panelboards and disconnects.

● Sign Transformer Secondary Circuit Ground-fault Protection per NEC 600-23

NEC 600-23(b) states that “Transformers and electronic power supplies shall have secondary ground-fault protection.” The code requirement preceded the neon transformer and power supply manufacturing industry’s ability to supply a product that complies. In order to cooperate with the electrical distributors and the sign manufacturing and installation industry, the department will not begin active enforcement of NEC 600-23(b) until September 1, 1999. This should give the industry adequate time to distribute the new equipment and clear existing supplies of transformers and power supplies from the distribution pipeline.