

service equipment, this terminal is bonded to the neutral terminal bar. Any other connection between the equipment grounding terminal bar and the neutral bar (other than that allowed in 250.30, 250.32, and 250.142) is not permitted. If the grounding terminal bar and neutral terminal bar are connected downstream from the service equipment, current in the neutral or grounded conductor would take parallel paths through the EGCs (e.g., the raceway, the building structure, or earth) back to the service equipment. Normal load currents on the EGCs could create a shock hazard. Exposed metal parts of equipment could have a potential difference of several volts created by the load current on the grounding conductors. Another safety hazard of making this connection is arcing from loose connections at connectors and raceway fittings, which could be a potential fire hazard.

Exception: Where an isolated equipment grounding conductor for a branch circuit or a feeder is provided as permitted by 250.146(D), the insulated equipment grounding conductor that is run with the circuit conductors shall be permitted to pass through the panelboard without being connected to the panelboard's equipment grounding terminal bar.

Equipment grounding conductors shall not be connected to a terminal bar provided for grounded conductors or neutral conductors unless the bar is identified for the purpose and is located where interconnection between equipment grounding conductors and grounded circuit conductors is permitted or required by Part II and Part VII of Article 250.

The exception permits an isolated equipment grounding terminal if it is necessary for the reduction of electrical noise on the grounding circuit. The equipment grounding terminal must be grounded by an insulated EGC that is run with the circuit conductors. The isolated EGC is also permitted to pass through one or more panelboards without connection to the panelboard grounding terminal. However, it is important that the EGC terminate to the applicable separately derived system or service grounding terminal. It is not necessary to run this conductor as an isolated conductor all the way back to the service or source of the separately derived system. It should be terminated at a point in the system where the noise is mitigated. If the isolated EGC is run in a separate building, however, 250.146(D) requires the isolated EGC to terminate at a panelboard within the same building.

An isolated grounding electrode would not provide a safe path for ground-fault current. It would depend on the earth to be part of the fault return path, which might prevent a sufficient level of ground-fault current necessary to open the OCPD if a ground fault occurs.

See also

250.146(D) and **250.54** commentary for more information on isolated ground receptacles and auxiliary grounding electrodes

408.41 Grounded Conductor Terminations. Each grounded conductor shall terminate within the panelboard in an individual terminal that is not also used for another conductor.

Exception: Grounded conductors of circuits with parallel conductors shall be permitted to terminate in a single terminal if the terminal is identified for connection of more than one conductor.

In accordance with 110.14(A), conductor terminations are suitable only for a single conductor unless the terminal is marked or otherwise identified as suitable for more than one conductor. The use of a single termination point within a panelboard to connect more than one grounded conductor or to connect a grounded conductor and an EGC can be problematic if it is necessary to isolate a particular grounded conductor for testing purposes. For example, if the grounded conductors of two branch circuits were terminated at a single connection point, and it was necessary to isolate one branch circuit for the purposes of troubleshooting, the fact that the circuit not being tested remained energized could create an unsafe working condition for service personnel disconnecting the grounded conductor of the circuit being tested. In some cases, panelboard instructions are provided that permit the use of a single-conductor termination for more than one EGC.

See also

408.40 for the requirements on panelboard terminations for EGCs

408.43 Panelboard Orientation. Panelboards shall not be installed in the face-up or face-down position.

Part IV. Construction Specifications

408.50 Panels. The panels of switchboards and switchgear shall be made of moisture-resistant, noncombustible material.

408.51 Busbars. Insulated or bare busbars shall be rigidly mounted.

408.52 Protection of Instrument Circuits. Instruments, pilot lights, voltage (potential) transformers, and other switchboard or switchgear devices with potential coils shall be supplied by a circuit that is protected by standard overcurrent devices rated 15 amperes or less.

Exception No. 1: Overcurrent devices rated more than 15 amperes shall be permitted where the interruption of the circuit could create a hazard. Short-circuit protection shall be provided.

Exception No. 2: For ratings of 2 amperes or less, special types of enclosed fuses shall be permitted.

408.54 Maximum Number of Overcurrent Devices. A panelboard shall be provided with physical means to prevent the installation of more overcurrent devices than that number for which the panelboard was designed, rated, and listed.

For the purposes of this section, a 2-pole circuit breaker or fusible switch shall be considered two overcurrent devices; a