

GROUNDING CONDUCTOR TERMINATIONS

Question

What are the requirements of Section 408.21 of the 2002 NEC^{®1}?

Requirement

Section 408.21 is a new Section in the 2002 NEC and reads as follows:

408.21 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.

To understand the requirements it is first necessary to understand what a grounded conductor is. The following two definitions are from Article 100 of the 2002 NEC.

Grounded Conductor. A system or circuit conductor that is intentionally grounded.

Grounding Conductor, Equipment. The conductor used to connect the non-current-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor, the grounding electrode conductor, or both, at the service equipment or at the source of a separately derived system.

As noted in the definition the grounded conductor is the conductor that is intentionally grounded. This is the conductor that is intentionally connected to ground at the service equipment and is commonly referred to as the neutral conductor. This should not be confused with equipment grounding conductor (ground).

This Section is only applicable to the grounded conductors (neutrals) and is not applicable to equipment grounding conductors (grounds). The proposal for this change was 9-113 (Log 3297) in the 2002 ROP. As noted in the substantiation the change was not a change in practice but a clarification of the existing requirement to align the requirements in the product standard (UL 67 – Panelboards) with the installation requirements.

There are very specific reasons for not having multiple grounded conductors (neutrals) under a single screw and these are explained well in the substantiation for the proposal. The following is a brief summary of the substantiation. To help with the explanation “neutral” is used in place of “grounded conductor” since this seems to be clearer.

Clause 12.3.10 of UL 67 states “An individual terminal shall be provided for the connection of each branch-circuit neutral conductor.” The substantiation noted that the requirement has been enforced in the past by a close review of the manufacturers markings and by NEC 110-3(b) but since it is a rule that specifically effects how the installer can make connections, it is important that it be in the NEC. The substantiation also notes “This addition to the NEC does not

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change any product or permitted wiring arrangement from what it is today. It will however, it will help installers to avoid wiring the panel in violation of 110-3(b) and then have to contend with a red-tag from the inspector.” It was pointed out that even with the manufacturers markings, inspectors still indicate that they see a number of panelboards installed with two (or more) branch circuit neutrals under one terminal or they see an equipment grounding conductor and neutral under the same terminal.

Multiple grounded conductors (neutrals) under a single screw becomes a significant problem when it is necessary to isolate a circuit. To isolate a circuit the neutral must be disconnected by removing the neutral from the connector. If more than one neutral conductor were under the same screw it would not be possible to disconnect a single circuit without disturbing the other circuit.

It is also not acceptable to have the neutral connection and the ground connection under the same screw since disconnecting the neutral would also disconnect the ground. The intent is that the ground, including the grounding electrode connection, always remains solidly connected.

On the other hand while it is not acceptable to have neutrals under a single screw this is not the case with equipment grounds. These are not intended to be disconnected therefore multiple conductors under a single screw is acceptable. The product standard (UL 67 – Clause 17.2.6) allows multiple equipment grounding conductors – but not more than three No. 10 AWG or smaller – in a single opening in a wiring terminal. Many manufacturers, including Siemens Energy & Automation, have included this as part of the UL Listing for many years. If this is part of the Listing the acceptable combinations of conductors is included on the marking of the product as part of the UL Listing.