

Question of the Month — You are installing (or inspecting) a 480 volt three-phase service rated at 1600 amperes. The ungrounded supply conductors consist of seven parallel 300 kcmil aluminum XHHW conductors. What is the minimum size copper main bonding jumper required? — *See correct answer on page 2.*

Inspection Results via Email are on the Horizon

In preparation to report inspection results to you quicker, we started collecting email addresses for each online permit at the time of purchase. Providing a valid email address will make electronic notifications possible. We are working on this capability, but do not have an exact date when email notifications of inspection results will commence. Updates will be provided in future editions of this newsletter.

When is Existing Wiring Required to Comply With Current Codes?

Remodeled and repaired structures often involve changing only a portion of the wiring. All previously inspected wiring left untouched and in good condition will be considered acceptable when installed in accordance with the code in force at the time of its initial installation subject to the following considerations:

- The original use and occupancy class of the building or structure remains unchanged.
- Structures damaged by fire may require closer examination to determine suitability of the existing wiring. Testing may be required to judge the fitness of the wiring.
 - Over-heated insulation will be brittle and will flake off when slightly bent.
 - A megger test will indicate a lower than acceptable megohm level of resistance.
 - Close examination may reveal physical damage by falling debris.
- Modifications to knob-and-tube wiring must be in accordance with [WAC 296-46B-394](#).
- Load centers will be inspected for overheating, grounding and bonding, and proper overcurrent protection.
- The grounding electrode system must be intact, and for altered services, must meet current requirements.
- There are some specific NEC® requirements for upgrading existing wiring (e.g., 210.12(B) AFCI protection, 406.4(D) receptacle replacements).

As always, inspectors and electricians must use their training and judgment when determining whether or not wiring must be updated.

Delayed 2014 NEC® Photovoltaic Requirements to be Effective July 1, 2016

The delay in implementing NEC® 690.11 Arc-Fault Circuit Protection (Direct Current) and NEC® 690.12 Rapid Shutdown of PV Systems on Buildings was put in place to allow manufacturers additional time to develop and produce listed equipment. As discussed in the [February 2016](#) newsletter, all solar photovoltaic (PV) installations made with electrical work permits obtained on or after July 1, 2016 must comply with NEC® 690.11 and NEC® 690.12.

Implementation of a third requirement for Wire Harness and Exposed Cable Arc-Fault Protection in NEC® 705.12(D)(6) is delayed until further notice. This requirement will likely be removed from the NEC® in the [2017 edition](#).

Rapid Shutdown Requirements for Additions to Existing PV Systems

Many solar photovoltaic (PV) systems have been installed before the rapid shutdown requirements of NEC® 690.12 became effective. The purpose of this article is to establish requirements that apply when part of building's PV system has rapid shutdown capability and part of it does not. The following requirements will be in effect until adoption of the 2017 NEC® as amended by [WAC 296-46B](#).

Safety Tip of the Month

When installing or using listed electrical equipment, always read and follow the manufacturer's installation instructions. Also, leave a copy of the instructions for the inspector and the owner.

When new PV equipment with rapid shutdown capability is installed on a building that has PV equipment without rapid shutdown capability, the new portion must comply with the rapid shutdown requirements of 690.12. If a building has an existing PV system inspected and approved without rapid shutdown capability, the department will not require the existing portion of the system to be retrofitted with equipment to perform rapid shutdown function. Local building and fire officials may require by ordinance, all PV equipment and conductors on a building to be upgraded with rapid shutdown capability if new PV equipment is added to an existing system that does not have rapid shutdown. In this case, the department will enforce the local jurisdiction's requirements in accordance with WAC [296-46B-902](#)(1).

To reduce confusion and provide greater safety for firefighters and property owners, the "PHOTOVOLTAIC SYSTEM EQUIPPED WITH RAPID SHUTDOWN" [identification plate](#) required in 2014 NEC® 690.56(C) is only permitted when all PV equipment and conductors installed on a building comply with 690.12. Such an identification plate is not permitted to be installed if a building has one or more existing PV systems not capable of rapid shutdown. When required, this identification plate must be located on or within 3 ft. of the service disconnecting means and, where the service disconnect and meter are not grouped in the same location, an additional plate must be installed on or within 3 ft. of the utility metering equipment. Rapid shutdown can be initiated either by loss of utility power, or by installation of one or more initiation switches. The identification plate must also identify if loss of utility power initiates rapid shutdown, and the location of all rapid shutdown initiation switches if not at the same location. For one- and two-family dwellings, rapid shutdown initiation switches, when installed, must be in a readily accessible location outside the building. Identification plates for rapid shutdown initiation switches must be reflective, with all letters capitalized and having a minimum height of 3/8 inch, in white on red background. For switches on buildings in which all of the PV equipment has rapid shutdown capability, each switch must be labeled: "RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM. TURN SWITCH TO "OFF" POSITION TO SHUT DOWN CONDUCTORS LEAVING THE ARRAY". When all PV equipment and conductors on a building do not have rapid shutdown capability, all switches must have an identification plate within 3 ft. of the switch location stating: "RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM. DANGER: PARTIAL SHUTDOWN ONLY! SOME PV WIRING AND EQUIPMENT WILL REMAIN ENERGIZED WITH SWITCH IN "OFF" POSITION". The words "DANGER: PARTIAL SHUTDOWN ONLY!" must be on a separate line using letters having a minimum height of ½ inch.

Fees for After-Hours Inspections

Occasionally, a customer requires an inspection outside the normal business hours of 7:30 a.m. to 4:00 p.m., Monday through Friday. Such inspections must be pre-arranged with the local inspection field supervisor. For inspections outside of normal business hours, fees apply in addition to regular permit fees. If an after-hours inspection is pre-arranged 24 or more hours (before noon of the previous working day) in advance, the fee for the inspection will be the portal-to-portal hourly rate specified in [WAC 296-46B-906](#)(11) in addition to the regular permit fee. For inspections where the department has not been given at least 24 hours' notice, the fee will be the portal-to-portal fee plus the after-hours surcharge of WAC 296-46B-906(5)(f) (currently \$113.70), plus the regular permit fee. These fees are not available online and must be paid at a service location, or as a fee due issued by an inspector.

The exception to this rule is for temporary stage or concert inspections only, which will be the greater of the permit fee from WAC 296-46B-906(3), or the portal-to-portal hourly fee; in addition to the short-notice surcharge if applicable.

Ugly Picture: *If viewing this document online, click on the picture to open a larger image.*

This disconnect switch is attached to a fixed pier. NEC 555.9 requires all electrical connections to be located at least 12 inches above the deck of a fixed pier but not below the electrical datum plane as defined in 555.2.

Answer to Question of the Month: 4/0 Copper. NEC® Table 250.102(C)(1) including Notes 1 and 2; Table 310.15(B)(16); Chapter 9, Table 8. 7 X 300 kcmil aluminum = 2100 kcmil total aluminum supply conductor area. Ampacity of 300 kcmil aluminum 75° supply conductors = ampacity of 4/0 copper 75° supply conductors (both are 230 amperes). 4/0 copper = 211.6 kcmil (Chapter 9, Table 8). 7 X 211.6 kcmil = 1481.2 kcmil total copper supply conductor area. Per notes 1 and 2, 1481.2 kcmil X 12.5% = 185.15 kcmil. Next higher conductor size = 4/0 copper main bonding jumper.



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