



Revisions for the 2020 National Electrical Code - Part 2

An Online Continuing Education Course for Engineers

Course Number: E-4065

Credit: 4 Hours / 4 PDH / 4 CPD

Revisions for the 2020 National Electrical Code - Part 2

Patrick Ouillette, P.E.

This course is intended to familiarize the reader with the major changes contained in the 2020 National Electrical Code®. These are the “need to know” changes. The document is heavily illustrated to enable effective and efficient visual learning. The course addresses Code revisions that apply to all types of occupancies: residential, commercial, and industrial.

The course series is divided into 3 parts. This course covers Part 2.

- Part 1: Code-wide changes through Article 220
- **Part 2: Article 230 through Article 406**
- Part 3: Article 408 through Article 800

The layout and method of this presentation will enable new Code users to easily navigate through the changes. Those well experienced in the Code will find depth in the coverage. Through the heading(s) at the beginning of each Code change addressed in the document, the reader will readily identify the section affected by the change and the specific subject being discussed.

The Introduction sets the stage. An Analysis of the Code change follows, with explanations where necessary to help the student understand the revision, its background, and the logic of the change. Graphics, photographs, examples, or calculations are used to illustrate the change and to enhance learning. The Summary is a brief re-statement of the highlights of the Code change.

An Application Question with an answer is included at the end of most Code sections studied for exercise in applying the change. The “Top Ten” most significant Code changes, in the author’s opinion, are identified. Less significant changes are addressed in less detail. Some of the sections analyzed contain a Code Refresher that addresses existing Code requirements related to the change. General Code information and rules are weaved into the writing throughout the document. The author’s writing method attempts to provide general Code study and a Code refresher through discussion of the Code changes. NFPA 70E®, Electrical Safety in the Workplace, is briefly discussed and referenced several times within the course.

Although there are many references to the 2020 NEC® throughout this document, the course and quiz can be completed without the need to refer to the NEC® itself. However, the learning experience will be enhanced by referring to the NEC® as the course is completed. For further study on any Code section within this course, the full text of the 2020 NEC® should be consulted.

You can read the 2020 NEC® online at the following site, courtesy of NFPA:

<https://www.nfpa.org/NEC/electrical-codes-and-standards/NFPA-70?code=70>

230.67

Part V. Service Equipment — General – Surge Protection

Introduction

Top 10 among significant Code changes

The purpose of the *NEC* is the practical safeguarding of persons and property from hazards arising from the use of electricity (90.1). A major change in the 2020 *NEC* requires whole-house surge protection for dwelling units. This requirement will enhance personal safety by mitigating surge damage to GFCIs, AFCIs, and smoke alarms. Surge-protective devices (SPDs) are capable of protecting costly *smart* appliances and other equipment from damage caused by surges. However, there is debate on whether mandated protection of this equipment is consistent with the *NEC*'s purpose of safeguarding property from hazards arising from the use of electricity.

Analysis

The 2020 *NEC* requires that all services supplying dwelling units be provided with a surge-protective device. The SPD shall be a Type 1 or Type 2 device. The surge-protective device shall be an integral part of the service equipment or be located immediately adjacent to the service equipment. By exception, the device is not required to be located at the service equipment if surge protection is applied at each next level distribution equipment downstream toward the load. The requirement applies to new work and when service equipment is replaced.

Computers, televisions, and audio systems are not the only sensitive electronic equipment that can benefit from protection against surges. Modern homes contain numerous *smart* appliances and devices that contain sensitive electronic circuitry. It is estimated that the average new home contains \$10,000 to \$15,000 worth of electrical and electronic equipment that is susceptible to damage from surges.

Surges can enter a building's electrical system as a result of external sources such as indirect lighting strikes and utility switching. The expanding use of distributed energy resources (DER) can result in greater exposure/opportunity for the introduction of surges into electrical systems. The majority of surges are internal, originating within a home or facility electrical system as a result of certain common electric loads switching on and off. The damage from these surges will not usually be immediate or obvious but may cause eventual premature failure of equipment, particularly sensitive electronic equipment. A Type 1 or 2 SPD wired on the load side of the electrical service (or Type 1 on the line side) can be beneficial. Even if point-of-utilization surge protection is installed (Type 3 SPD) to protect computers and similar equipment, the upstream protection from the Type 1 or 2 device will provide additional cascading protection. Connection of a surge-protective device at the service equipment will provide protection from both external and internal surges.

New section 230.67 addresses the need to protect sensitive electronic circuitry in GFCIs, AFCIs, and smoke alarms. Failures of these personal safety devices due to surges are well documented. There is no specific level of protection mandated. The amount of protection (kA) should consider such factors

as the robustness of the serving utility infrastructure, the proximity of heavy industry, and the prevalence of lightning strikes in the location of the home.

The Code mandates the installation of a Type 1 or 2 device at the service. The SPD can be mounted to the outside of a panel, connected to a 2-pole circuit breaker. Optionally, a Type 2 SPD is available that will plug directly into a panel in the position of a 2-pole circuit breaker. Some manufacturers offer a factory-installed SPD in the panelboard.

Follow the manufacturer's instructions for connecting the SPD. Wired-in devices usually connect to a 30-A, 2-pole circuit breaker using #10 copper leads kept as short as possible. Many devices are equipped with monitoring that will provide an audible alarm if the SPD loses its ability to provide protection. Surge-protective devices are also available for the protection of low-voltage circuits, either combined in a single enclosure with the power SPD or as discrete devices.

Summary

All services supplying dwelling units shall be provided with a surge-protective device. The SPD shall be a Type 1 or Type 2 device. The surge-protective device shall be an integral part of the service equipment or be located immediately adjacent to the service equipment. The device is not required to be located at the service equipment if surge protection is applied at each next level distribution equipment downstream toward the load. The requirement applies to new work and when service equipment is replaced.



Type 1 or Type 2 SPD
Courtesy of Schneider Electric



Type 2 SPD (Plug-in surge protector)



Type 2 SPD, FirstSurge™
Courtesy of Siemens

Application Question

The 2020 NEC requires a Type ____ SPD to be installed at dwelling unit service equipment.

- a. 1
- b. 2
- c. 1 or 2
- d. 3

230.71 and 230.62(C)

Part VI. Service Equipment — Disconnecting Means – Maximum Number of Disconnects

230.62(C) Part V. Service Equipment — General — Enclosed or Guarded – Barriers

Introduction

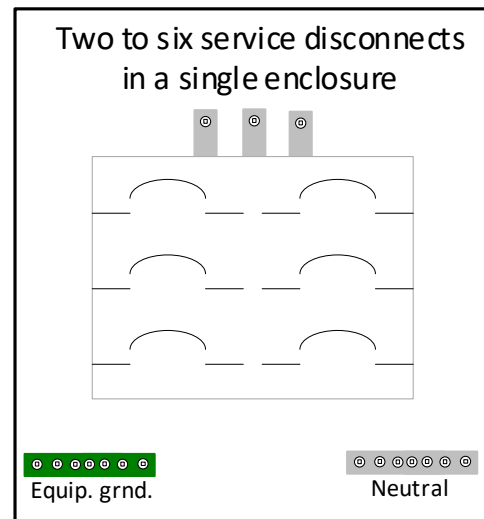
Top 10 among significant Code changes

Revised section 230.71 is a major change for 2020. It will prohibit the long-standing practice of installing two to six service disconnecting means in a single enclosure. Also, the provision for barriers now applies to *all* service equipment in new 230.62(C).

Analysis

Despite its benefits, the *NEC* permission to install multiple service disconnects in a single enclosure presents challenges and has had unintended consequences:

1. The permission has sometimes been used to avoid compliance with 230.95, which requires ground-fault protection of equipment (GFPE) for certain service disconnects rated 1000 A or more.
2. With multiple service disconnects in an enclosure, it is difficult to establish an electrically safe work condition per *70E*. Incident energy calculations are difficult, as is the placement of barriers on line-side terminals.
3. Without a single main service disconnect, adding a disconnect for new loads may require the service to be re-configured.
4. In contrast with multiple service disconnects in the same enclosure, a single disconnecting means in an enclosure facilitates building disconnection by first responders and constitutes an overall safer installation.



Prohibited in the 2020 NEC

Revisions to 230.71 address these concerns. Operating a single disconnect will de-energize all components within the enclosure, except for the line-side buses or terminals of the disconnect, which require insulating barriers. The provision for barriers had been relocated from 408.3(A)(2) to 230.62(C). Hence, the requirement for barriers is no longer limited to service switchboards, switchgear, and panelboards but applies to all service equipment. Barriers shall be placed in service equipment such that no uninsulated, ungrounded line-side busbar or terminal is exposed to accidental contact by persons or maintenance equipment while servicing load terminations.

Two to six service disconnecting means are still permitted for each service that is permitted by 230.2 or for each set of service-entrance conductors permitted by 230.40, Exception No. 1, 3, 4, or 5. The two to six service disconnecting means are permitted to consist of a combination of any of the following:

- (1) Separate enclosures with a single main service disconnecting means in each enclosure
- (2) Panelboards with a single service disconnecting means in each panelboard enclosure
- (3) Switchboards where there is only one service disconnect in each separate vertical section, where there are barriers separating each vertical section
- (4) Service disconnects in switchgear or metering centers where each disconnect is located in a separate compartment

Two new Informational Notes contain helpful information.

Informational Note No. 1: Metering centers are addressed in U.L. 67, *Standard for Panelboards*.

Informational Note No. 2: Examples of separate enclosures that contain a single main service disconnecting means in each enclosure include but are not limited to motor control centers, fused disconnects, circuit breaker enclosures, and transfer switches that are suitable for use as service equipment (SUSE rated).

Metering centers, such as the “Uni-PAK” shown below, will be affected by this change unless each service disconnect is located in a separate compartment. Also, the popular combination meter/disconnect that contains provisions for more than one service disconnecting means is now prohibited unless each disconnect is located in a separate compartment. Generally, motor control centers will not be affected since service disconnects are located in separate compartments.



This metering equipment contains six service disconnects and continues to be Code-compliant without a main service disconnect, only if each disconnect is located in a separate compartment [230.71(B)(4)].

Uni-PAK 6-Gang, 400 Amp, Ringless Style Multi-Family Metering

Courtesy of Siemens USA

Summary

The long-standing permission for two to six service disconnecting means in a single enclosure is prohibited in the 2020 *NEC*. Where a service is permitted to have more than one service disconnecting means (two to six disconnecting means), each service disconnecting means shall be in a separate enclosure. Metering centers will be affected if each service disconnecting means is not located in a separate compartment. Also, the provision for barriers now applies to all service equipment.

230.85

Part VI. Service Equipment — Disconnecting Means – Emergency Disconnects

Introduction

Top 10 among significant Code changes

The long-debated question about whether to mandate an outdoor disconnecting means for dwellings has been answered in the 2020 *NEC*. New section 230.85 is a major change requiring a readily accessible outdoor emergency disconnect for one- and two-family dwellings. Some jurisdictions already require an outdoor disconnecting means.

Analysis

This is not an *emergency disconnect* in the sense of emergency equipment in Article 700. This disconnect is required in cases of emergency, where first responders are called to residences for fires, gas explosions, floods, etc. The safety of first responders is jeopardized if they resort to removing meter sockets or cutting service conductors in order to disconnect power to a structure. In emergencies, electric utility workers usually cannot respond quickly enough to disconnect power at the meter or street.

The requirement can be met using any of three options:

- (1) Service disconnects marked EMERGENCY DISCONNECT, SERVICE DISCONNECT
- (2) Meter disconnects connected on the supply side of the service disconnect per 230.82(3) and marked EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT
- (3) Other listed disconnect switches or circuit breakers, one for each service disconnect that are suitable for use as emergency disconnects, marked EMERGENCY DISCONNECT,



To view the remainder of the course material and to take the quiz for PDH credit, you must purchase the course.

Close this window and click "Add to cart" on the product page.

disconnect must have a minimum current rating equal to or greater than the available fault current. If more than one disconnect is provided, they must be marked in accordance with 110.21(B). Each disconnecting means will likely begin to be marked in accordance with certain requirements that conform to this section. Option 1 is the most common in new installations. It requires the service disconnect outdoors in the same enclosure as the meter. The enclosure must be marked/labeled as indicated on the adjacent