2023 NEC® Code Changes

BUSSMANN SERIES

Code changes based on the 2023 *NEC*

Powering Business Worldwide

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Save space

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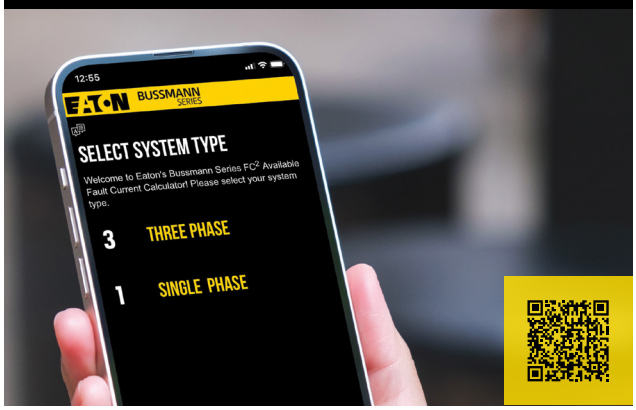

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National Electrical Code style manual

The NEC® style manual was revised in 2020 and was used for the 2023 *NEC*. The objective of the Style Manual is to ensure that the code is easily understandable and concise, and to establish guidelines for formatting. This resulted in formatting changes in the 2023 *NEC* reorganizing numerous rules that were previously presented as lengthy paragraphs into list formats. When feasible, lengthy terms were substituted with acronyms, and redundant language was removed from the Code. There were changes to the structure of informational notes throughout the Code. Informational notes that reference a requirement or another standard shall be structured with the referenced requirement or standard identified first followed by the explanatory text.

Two significant global modifications were implemented - comprehensive relocation of definitions to Art. 100 and the relocation of medium voltage requirements to their own Articles. These modifications align the *NEC*'s current text with the requirements of the *NEC* Style Manual, resulting in a more user-friendly document.

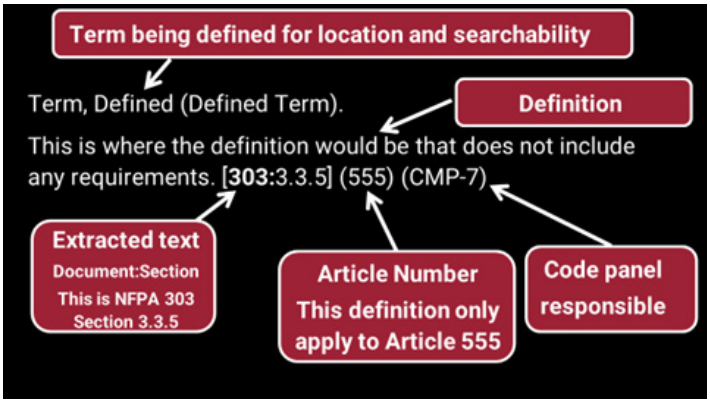
Definitions

All definitions within the *NEC* have been moved to Article 100. The move is a result of changes in the NFPA style manual to help standardize across all NFPA documents. It also helps improve usability of the code by having all definitions located in one place. Many definitions were already located in Article 100, but there were additional definitions typically found in Section xxx.2 of subsequent Articles if the defined term was only found in that Article, or if it only applied to the terminology in that Article.

Previous editions of The Code had the definitions in Article 100 separated into three parts:
Part I. General
Part II. Over 1000 Volts, Nominal
Part III. Hazardous (Classified) Locations.

The three parts have been removed so definitions are listed in alphabetical order and no longer separated for over 1000V or hazardous locations. Article 100 now contains close to 800 definitions.

The code making panel that has responsibility for the definition is listed at the end of each definition. If a defined term only appears in one Article within the *NEC* that Article is also listed at the end of the definition. For example:



Medium voltage

Several new Articles were created to address the growing number of medium voltage applications under the purview of the *NEC* and to improve usability by making them easier to find in more "standardized" locations.

- Article 235 — Branch Circuits, Feeders, and Services Over 1,000VAC, 1,500VDC, Nominal. This Article consolidates requirements that were previously located in Articles 210, 215, 225 and 230. Most of the requirements have not changed but have simply been moved to one centralized location.
- Article 245 — Overcurrent Protection for Systems Rated Over 1,000VAC, 1,500VDC. This information was moved from Article 240 Part IX. The requirements and other information for the different types of circuit-interrupting devices was relocated from Section 490.21 to 245.21.
- Article 305 — General Requirements for Wiring Methods and Materials for Systems Rated Over 1,000VAC, 1,500VDC, Nominal. This Article replaces Article 399, realigning the existing language and moves it closer to Article 300 which covers general requirements for wiring methods and materials.
- Article 315 — Medium Voltage Conductors, Cable, Cable Joints, and Cable Terminations. This Article replaces Article 311 and adds additional information and requirements for joints and terminations. The voltage range has been specified to be 2001 volts to 35,000 volts ac, nominal and 2001 volts to 2500 volts dc, nominal.
- Article 495 — Equipment Over 1,000VAC, 1,500VDC, Nominal. This Article replaces Article 490. The requirements and other information for the different types of circuit-interrupting devices was relocated from Section 490.21 to 245.21.

Short-circuit current and interrupting ratings

As a result of numerous public inputs and comments concerning the safety of equipment with inadequate ratings, the *NEC* has revised and clarified many requirements surrounding short-circuit current ratings

and interrupting ratings. In past *NEC* editions, significant revisions have been made to improve terminology and add more prescriptive requirements for establishing processes to verify overcurrent protective device interrupting ratings and equipment short-circuit current ratings are adequate at the point of installation.

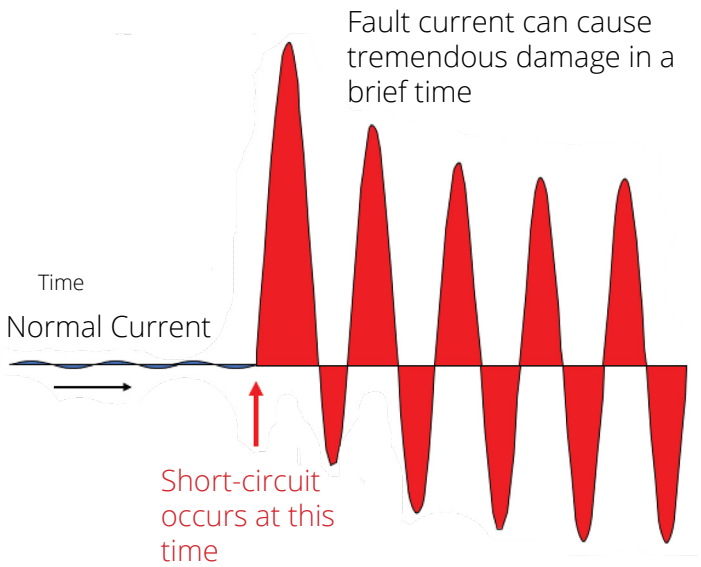
For the 2020 edition, the Fault Current Working Group was formed to support the Correlating Committee's Usability Task Group and analyzed the usage of "fault current", "short-circuit current", "available short-circuit current", "available fault current", "maximum available short-circuit current", "maximum available fault current" and other terms. During the 2020 *NEC* process, this Working Group submitted many public inputs (PIs) throughout the *NEC* to achieve consistency of terms as an objective. Individual Technical Committees considered these PIs.

Though there were not as many significant changes in the 2023 *NEC*, there were still some key revisions that help to further clarify the differences between some terms and to use the newer nomenclature. In the 2023 *NEC* there is now a definition for short circuit, which is a term used in several other related definitions. Also, Article 110.9 has been revised to include the term "available fault current" to add clarity and match the defined term that was added in the 2020 edition.

Fault Current

Overcurrent and overload have been defined in the *NEC* for some time. However, the definition for "fault current" was only added in 2020. Prior to the 2020 *NEC*, fault current and short-circuit current were used interchangeably but neither were defined. With the 2020 *NEC* changes the proper term is fault current.

Fault current flows when a short-circuit condition occurs on an energized circuit. A practical understanding when a short-circuit condition occurs is that fault current leaves the normal circuit conduction path. In contrast, during an overload condition, the current stays within the normal conduction path.



Available fault current

Another significant change in the 2020 *NEC* was the addition of a definition for "available fault current," also prompted by a public input by the Fault Current Working Group. The intent was for "available fault current" to be used throughout the *NEC* rather than such terms as "available short-circuit current", "maximum available short-circuit current", and "maximum available fault current". As a result, there are many 2020 *NEC* changes incorporating this newly defined term.

There are many requirements in the *NEC* in which the available fault current must be determined to ensure circuit breakers and fuses have sufficient interrupting ratings (110.9), devices and assemblies have sufficient short-circuit current ratings (110.10 plus many other sections), overcurrent protective devices provide selective coordination (700.32 and many more sections). Now the terms available fault current, short-circuit current rating, interrupting rating and selective coordination are all defined in the *NEC*. This should help in the proper interpretation and compliance of the many requirements for these items in the *NEC*.

Interrupting rating

The available fault current must be determined because each circuit breaker or fuse is required to have an interrupting rating that is adequate for the fault current at the point of application. The previous wording stated that the interrupting rating must be "at least equal to the current that is available at the line terminals of the equipment." This has been revised for clarity to now state, "at least equal to the available fault current at the line terminals of the equipment." The requirement hasn't changed but adds clarity and better aligns with the defined terminology that was updated in the 2020 *NEC*.

Failure to install overcurrent protective devices having an interrupting rating adequate for the available fault current can result in catastrophic, violent explosions which are a serious fire and shock hazard. In addition, if a person is near equipment in which an overcurrent protective device fails while trying to interrupt a fault current beyond its interrupting rating, the person may be subject to arc flash and arc blast hazards including high speed projectiles from the exploding equipment.

Reconditioned equipment

For many years the *NEC* had not directly addressed the reconditioning of electrical equipment. The electrical equipment installed must perform its duties safely, and to do that the quality of that equipment is critical. In recent code cycles the *NEC* has made numerous revisions regarding reconditioned and refurbished equipment with the intent to increase safety.

NEC 2017 made the first significant revision by adding a new second level sub-division (2) titled "Reconditioned Equipment" to Section 110.21(A), "Equipment Markings". This new section provided specific marking requirements for reconditioned equipment. It stated that reconditioned equipment must be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of reconditioning. This 2017 *NEC* section also requires that reconditioned equipment be identified as "reconditioned" and there is a brief mention of the listing requirements for this equipment. These marking requirements add transparency for all involved.

Introduction

NEC 2017 took the initial step forward on the topic of reconditioned equipment, but as usual changes of this magnitude generated industry dialog that drove more public inputs and comments for the development of *NEC* 2020.

The NEMA policy on refurbished equipment was a key reference for each of the *NEC* code making panels as they deliberated on their changes for *NEC* 2020. A total of 18 sections of the *NEC* spanning 15 Articles were added and/or modified to include new requirements. These sections can be separated into three key areas:

1. General requirements
2. That equipment which is NOT permitted to be reconditioned
3. That equipment which IS permitted to be reconditioned

The changes to reconditioned equipment requirements continued and in the *NEC* 2023 there is a new section 110.20 addressing reconditioned equipment. The new section permits reconditioning of electrical equipment except where specifically prohibited elsewhere in the Code and has requirements addressing replacement parts and listing and labeling of reconditioned equipment. The marking requirements in 110.21(A)(2) were also revised and most of the requirements regarding reconditioning have been moved to section xxx.2 of the Article if reconditioning is addressed in that Article.

General requirements

Terminology is important when interpreting and trying to understand any new requirements in the *NEC*. The *NEC* addressed this in 2017 by establishing a definition of "Reconditioned" in Article 100. Subsequent versions of the *NEC*, including the 2023 *NEC*, have been revised and clarified marking requirements for reconditioned equipment.

Not permitted to be reconditioned

Here is the list of equipment that cannot be reconditioned per the *NEC* 2023.

1. Equipment that provides ground-fault circuit-interrupter protection for personnel – 210.2
2. Equipment that provides arc-fault circuit-interrupter protection – 210.2
3. Equipment that provides ground-fault protection of equipment - 240.2(A)
4. Ground-fault circuit interrupters – 240.2(A)
5. Low-voltage fuse holders – 240.2(A)
6. Low-voltage nonrenewable fuses – 240.2(A)
7. Molded-case circuit breakers – 240.2(A)
8. Low-voltage power circuit breaker electronic trip units – 240.2(A)
9. SPDs and surge arresters – 242.2
10. Medium-voltage fuse holders – 245.2(B)
11. Medium-voltage nonrenewable fuses – 245.2(B)
12. Flexible metal conduit (FMC) – 348.2
13. Liquidtight flexible metal conduit (LFMC) – 350.2
14. Electrical nonmetallic tubing (ENT) – 362.2
15. Insulated bus pipe (IBP) and IBP systems – 369.2
16. Lighting, dimmer, and electronic control switches – 404.16(A)
17. Snap switches of any type – 404.16(B)
18. Molded-case switches – 404.16(D)
19. Receptacles, attachment plugs, cord connectors, and flanged surface devices – 406.2
20. Panel boards – 408.2(A)
21. Luminaires, lamp holders, ballasts, LED drivers, lamps, and retrofit kits – 410.2
22. Listed low-voltage lighting systems or a lighting system assembled from listed parts - 411.2
23. Resistors – 470.2(A)
24. Equipment over 1000 volts ac, 1500 volts dc within the scope of Article 495 (except as modified) – 495.2
25. Fire pump controllers and transfer switches - 695.2
26. Transfer switches – 700.2, 701.2, 702.2, 708.2

Permitted to be reconditioned

When there is no code requirement that prohibits reconditioning, reconditioning is permitted. In some areas equipment was identified as being able to be reconditioned and a little more information was provided. The following sections have language permitting reconditioning:

1. Low-voltage power circuit breakers - 240.2(A)
2. Electromechanical protective relays and current transformers – 240.2(A)
3. Medium- and high-voltage circuit breakers – 245.2(A)
4. Electromechanical protective relays and current transformers – 245.2(A)
5. Knife switches, switches with butt contacts, and bolted pressure contact switches – 404.16(C)
6. Switchboards and switchgear, or sections of switchboards or switchgear – 408.2(B)
7. Motors – 430.2
8. Reactors – 470.2(B)
9. Switchgear, or sections of switchgear, within the scope of Article 495 – 495.49

Selective coordination

NEC selective coordination requirements

Selective coordination of overcurrent protective devices is important to avoid unnecessary power outage to loads. See the Article 100 of the *NEC* definition:

> *"Coordination, Selective. (Selective Coordination)*
> *Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents. (CMP-10)."*

There are several *NEC* sections in which selective coordination is required, including:

- 620.62 Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts (revised exception)
- 620.65 Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts
- 645.27 Information Technology Equipment, Critical Operations Data Systems
- 695.3(C)(3) Fire Pumps, Multi-building Campus-Style Complexes
- 700.10(B)(6)(b)(ii) Emergency Systems
- 700.32 Emergency Systems (revised)
- 701.32 Legally Required Systems (revised)
- 708.54 Critical Operations Power Systems (revised)

The 2023 *NEC* also has a significant addition in Article 240. The newly created section 240.11 states:

> *"If one or more feeder overcurrent protective devices are required to be selectively coordinated with a service overcurrent protective device by other requirements in this Code, all feeder overcurrent protective devices supplied directly by the service overcurrent protective device shall be selectively coordinated with the service overcurrent protective device."*

Installations where selective coordination is mandatory per the *NEC* must provide selectively coordinated overcurrent protective devices adhering to the definition. This means the selective coordination analysis must be for the full range of opening times and over-currents from overloads to the available fault current. Therefore, designations such as "selective coordination greater than 0.01 seconds" or "selective coordination greater than 0.1 seconds" are inherently contradictory and are not to be used when selective coordination is the objective.

In practice, when selective coordination is an objective, focus on the available fault current and whether only the nearest upstream overcurrent protective device open for any level of current from overloads up to the available fault current and removes power only to the load(s) that are affected. This requires analysis by a qualified person having the expertise in overcurrent protective device characteristics and how to analyze and interpret their performance when in series during overcurrent conditions.

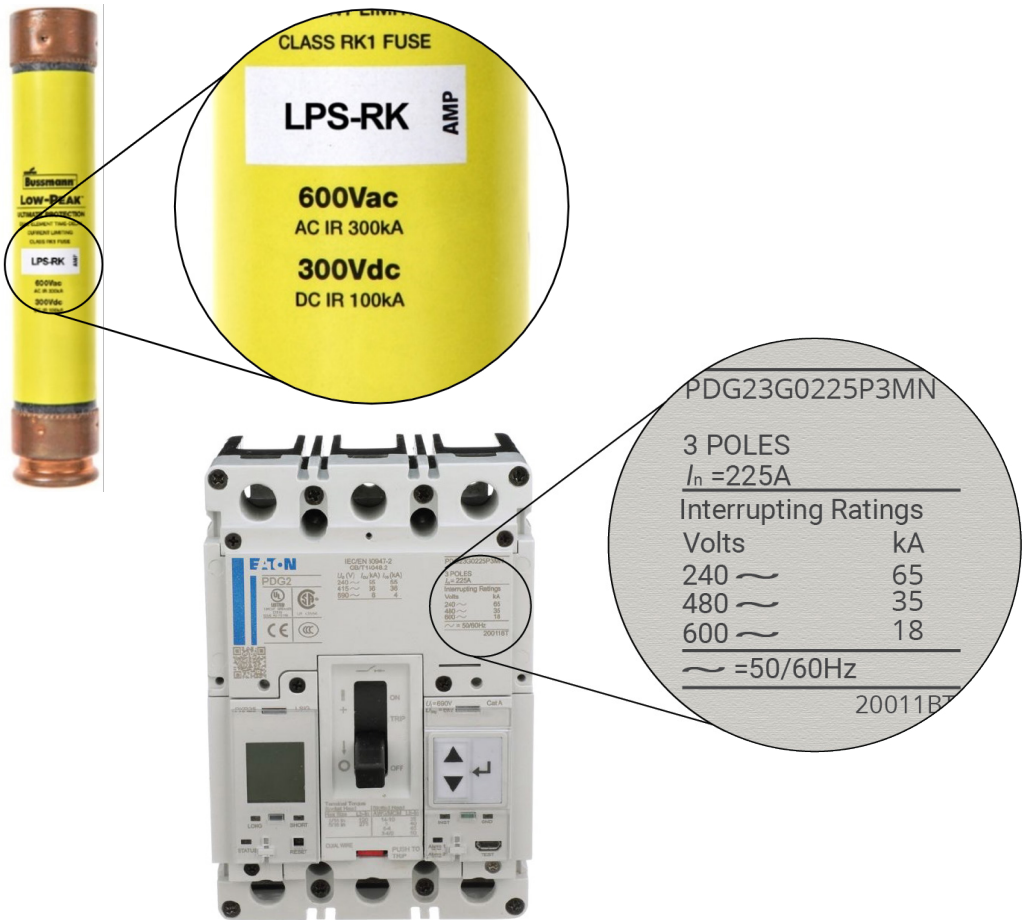
Definitions

Overcurrent Protective Device, Branch-Circuit. (Branch-Circuit Overcurrent Protective Device
Part I. General
Article 100 Definitions
Chapter 1 General

Revised text

Overcurrent Protective Device, Branch-Circuit. (Branch-Circuit Overcurrent Protective Device)

A device capable of providing protection for service, feeder, and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. ~~Such devices are provided with interrupting ratings appropriate for the intended use but no less than 5000 amperes.~~ (CMP-10)



Related *NEC* Sections

- Article 100 Definitions, Fault Current, Available
- Article 100 Definitions, Interrupting Rating
- 110.9
- 240.16

Significance of Change

The second sentence was removed because it contained a requirement. Per the *NEC* Style manual 2.2.2.2 definitions are not allowed to contain requirements or recommendations. The requirement was moved to Article 240 in a newly created Section 240.16.

Change Summary

- Remove minimum interrupting rating from the definition

Safety Circuit
Part I. General
Article 100 Definitions
Chapter 1 General

Added text

Safety Circuit.

The part of a control system containing one or more devices that perform a safety-related function. [79:3.3.95] (CMP-12)

Related *NEC* Sections

- 409.70
- 670.6

Informational Note: See NFPA 79-2021, *Electrical Standard for Industrial Machinery*. *Safety-related control system* and *safety interlock circuit* are common terms that can be used to refer to the safety circuit in other standards. The safety circuit can include hard-wired, communication, and software-related components.

Significance of Change

Added definition for safety circuits taken from NFPA 79 Electrical Standard for Industrial Machinery. Safety circuits are typically used in situations where there is a risk of injury from electrical or mechanical energy. They are designed to detect and respond to hazardous conditions and to take appropriate action to prevent harm such as stopping the mechanical motions of a machine if a worker gets too close to the moving parts. The term safety circuits is used in section 409.70 and 670.6 for industrial control panels and industrial machinery which require surge protective devices be installed when safety circuits are included.

Change Summary

- Added definition for safety circuits

Added text

Short Circuit.

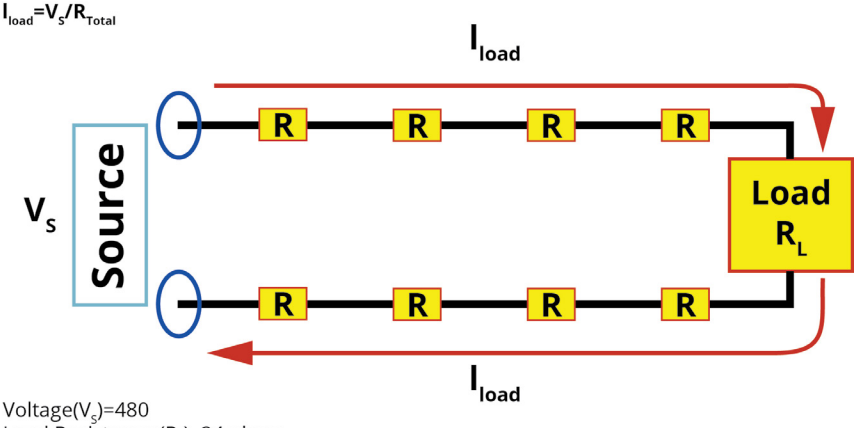
An abnormal connection (including an arc) of relatively low impedance, whether made accidentally or intentionally, between two or more points of different potential. (CMP-10)

Related *NEC* Sections

- Article 100 Definitions, Fault Current
- Article 100 Definitions, Available Fault Current
- Article 100 Definitions, Overcurrent
- Article 100 Definitions, Overload

Normal load current on a circuit

$I_{load}=V_S/R_{Total}$

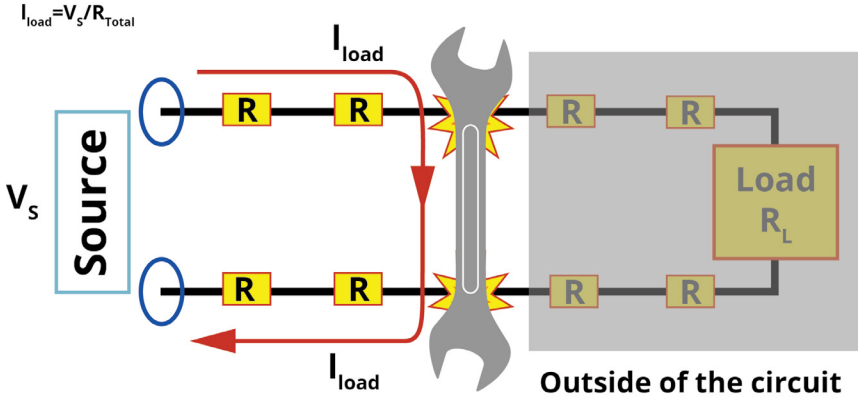


Voltage(V_S)=480
Load Resistance (R_L)=24 ohms
Wire Resistance (R)=0.01 ohms = 8*0.01=0.080 ohms
I_{load}=(480)/(0.08+24)=19.93 Amps

Normal condition: Current flows through the intended circuit path.

Short circuit current

$I_{load}=V_S/R_{Total}$



Current flows outside the normal path

Voltage(V_S)=480
Load Resistance (R_L)=~~24 ohms~~
Wire Resistance (R)=0.01 ohms = 4*0.01=0.04 ohms
I_{load}=(480)/(0.04)=12,000 Amps

Short Circuit: Abnormal condition where current flows outside the normal path. The resulting fault current could be many times the normal current due to decrease in resistance.

Significance of Change

The phrase short circuit is used throughout the *NEC* and is included in other definitions like fault current, available fault current and overload; however it was not defined. The new definition was added to improve clarity and to recognize that a short circuit can occur between two points, such as a line-to-line or line-to-ground short circuit, or more than two points, such as a three-phase, line-to-line-to-line short circuit.

Change Summary

- Add new definition for short circuit

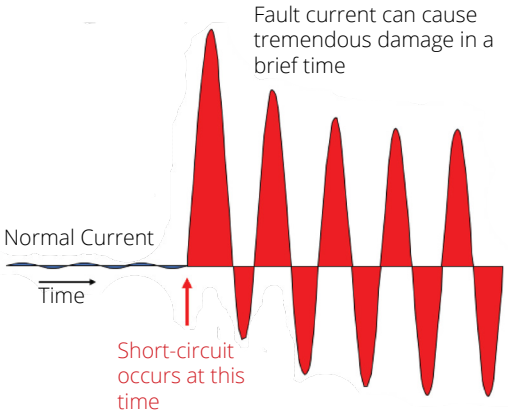
110.9 Interrupting Rating
Part I. General
Article 110 General Requirements for Electrical Installations
Chapter 1 General

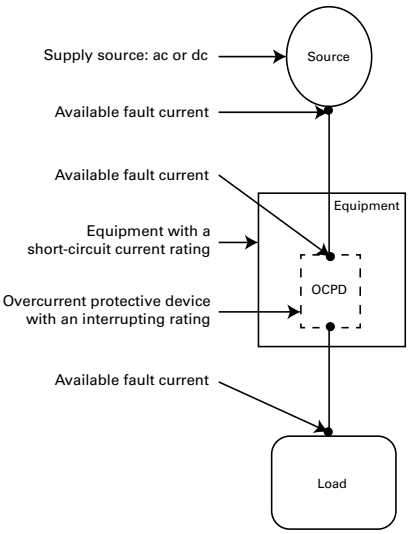
Revised text

Interrupting Rating.

Equipment intended to interrupt current at fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the ~~current that is~~ available fault current at the line terminals of the equipment.

Equipment intended to interrupt current at other than fault levels shall have an interrupting rating at nominal circuit voltage at least equal to the current that must be interrupted.





Related *NEC* Sections

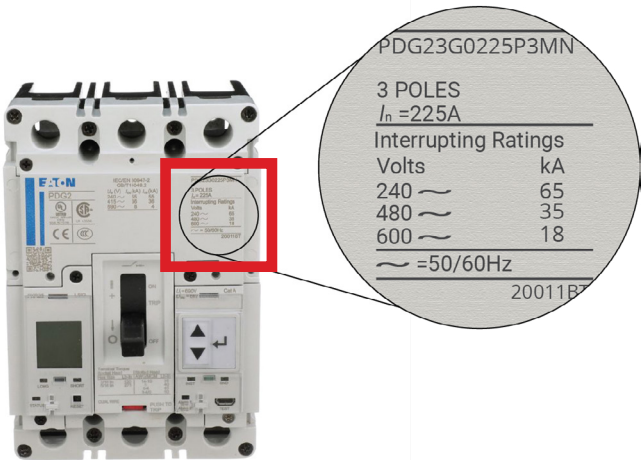
- Article 100 Definitions, Fault Current
- Article 100 Definitions, Available Fault Current
- Article 100 Definitions, Interrupting Rating
- Article 240.16

Significance of Change

In the 2020 *NEC* a new definition of available fault current was added. The new language in 110.9 provides clarity that the interrupting rating needs to be at least equal to the available fault current which is defined as the maximum amount of current that can be delivered to equipment during a short circuit condition. The interrupting rating should not be confused with the equipment short-circuit current ratings which may be different.

Change Summary

- Wording was revised to clarify that the interrupting rating must be compared to the "available fault current" which is a defined term and used consistently throughout the *NEC*.



Interrupting Rating

Added text

240.16 Interrupting Ratings.

Branch-circuit overcurrent protective devices shall have an interrupting rating no less than 5000 amperes.

Related *NEC* Sections

- Article 100 Definitions, Fault Current, Available
- Article 100 Definitions, Interrupting Rating
- Article 100 Definitions, Overcurrent Protective Device, Branch-Circuit
- 110.9
- 240.7

Significance of Change

In previous editions of the Code the branch-circuit overcurrent protective device had a minimum interrupting rating of 5000 per the definition. However, definitions are not allowed to have requirements per the *NEC* Style Manual, so the definition was revised in 2023 to remove the reference to a minimum interrupting rating. Section 240.16 was added to include the 5000 A minimum interrupting rating.

Change Summary

- The requirement for a minimum interrupting rating of 5000 amperes was moved from the definition of branch-circuit overcurrent protective device to a new section, 240.16

240.11 Selective Coordination
Part I. General
Article 240 Overcurrent Protection
Chapter 2 Wiring and Protection

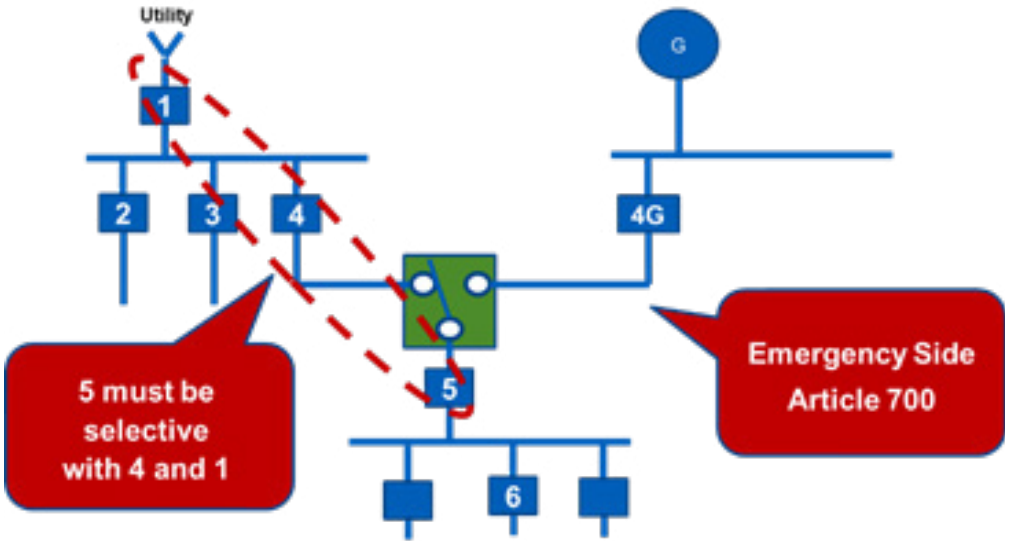
Added text

240.11 Selective Coordination.

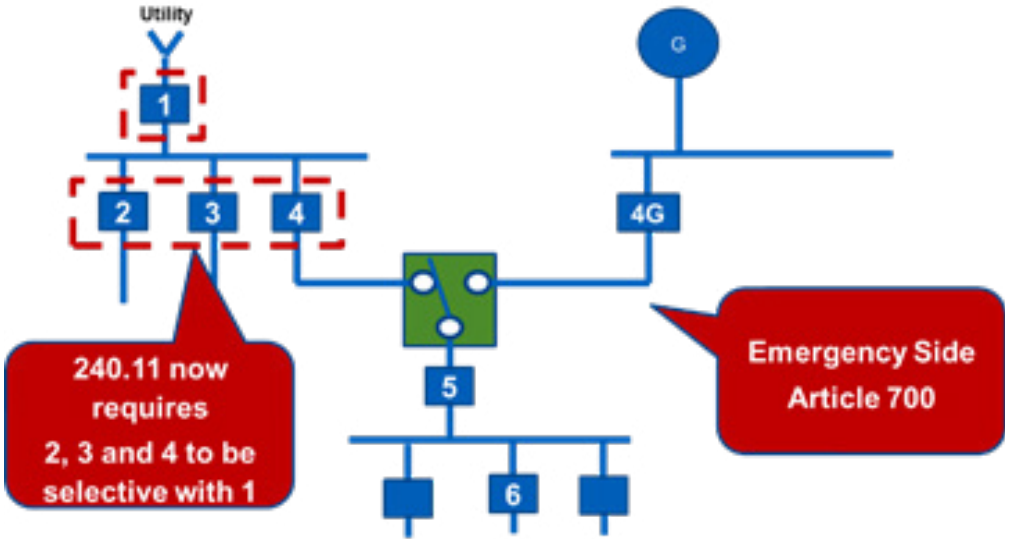
If one or more feeder overcurrent protective devices are required to be selectively coordinated with a service overcurrent protective device by other requirements in this Code, all feeder overcurrent protective devices supplied directly by the service overcurrent protective device shall be selectively coordinated with the service overcurrent protective device.

Related *NEC* Sections

- Article 100 Definitions, Coordination, Selective
- 620.62
- 645.27
- 695.3(C)(3)
- 700.32
- 701.32
- 708.54



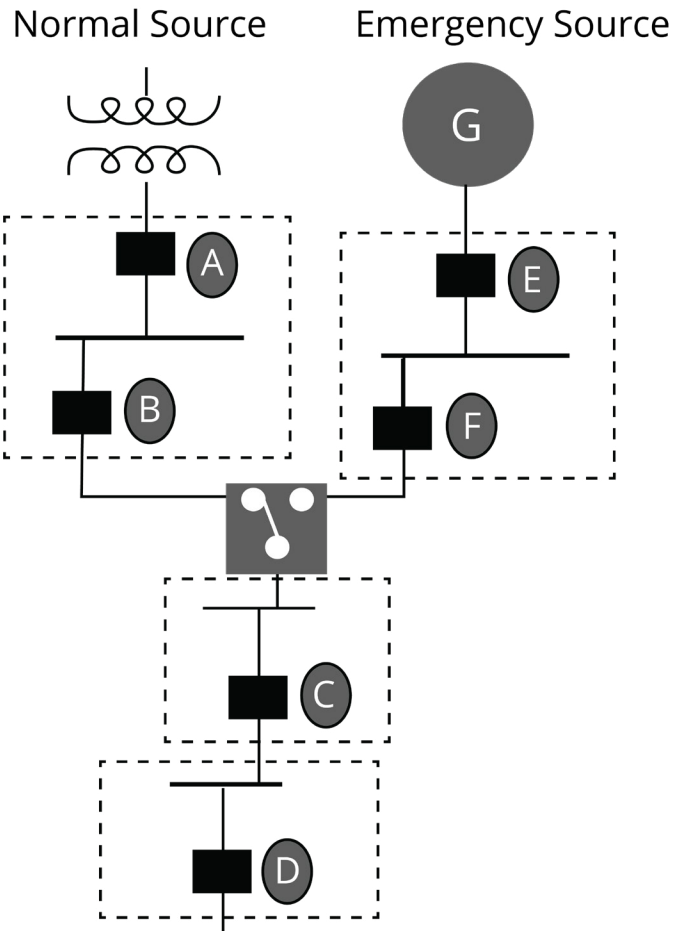
OCPD 5 is a feeder that is required to be selectively coordinated with the service OCPD 1



Because a feeder OCPD 5 is required to be selectively coordinated with the service OCPD 1, now all feeder OCPDs 2, 3 & 4 are required to be selectively coordinated with the service OCPD 1.

Selective Coordination

240.11 Selective Coordination
Part I. General
Article 240 Overcurrent Protection
Chapter 2 Wiring and Protection



Informational Note: Figure 700.32 Emergency System selective coordination.

OCPD C selectively coordinates with OCPDs F, E, B, and A.

Significance of Change

There are selective coordination requirements in several Articles of the Code typically involving systems that impact life safety. Those include:

- 620.62 Multiple elevators supplied by the same source,
- 645.27 Critical operations data systems,
- 695.3(C)(3) Fire pumps on multi-building campus-style complexes,
- 700.32 Emergency systems
- 701.32 Legally required standby systems
- 708.54 Critical operations power systems

Many of these requirements will require a feeder overcurrent protective device (OCPD) to be selectively coordinated with the service OCPD. For instance, in emergency systems the feeder OCPDs must selectively coordinate with the service OCPD as illustrated in informational note figure 700.32. The new requirement in 240.11 now requires that all feeder OCPDs fed directly from the service OCPD must also coordinate with the service OCPD.

Change Summary

- All feeder OCPDs fed directly from the service OCPD must now selectively coordinate with the service OCPD if any feeder OCPD in the system is required to selectively coordinate with the service OCPD by other requirements in the Code, eg. emergency systems, legally required standby systems and systems with multiple elevators fed by the same source. It is part of the design features of emergency systems and the reliability to be selectively coordinated to avoid the inadvertent transfer to the emergency source simply because an upstream overcurrent protective device tripped. The requirement to have these selectively coordinated will prevent the unnecessary tripping of the OCPD on the normal side.

The Quik-Spec Coordination Panelboard (QSCP) (left) simplifies selective coordination and eliminates the need to plot time-current curves or perform expensive studies. The user only needs to follow the published selective coordination ratios.

700.32 Selective Coordination (Same as 701.32 and 708.54)
Part VI. Overcurrent Protection
Article 700 Emergency Systems
Chapter 7 Special Conditions

Revised text

700.32 Selective Coordination for services and feeders

(A) General.

Emergency System(s) overcurrent protective devices (OCPDs) shall be selectively coordinated with all supply-side ~~overcurrent protective devices~~ and load-side OCPDs. overcurrent protective devices (OCPDs) shall be selectively coordinated with all supply-side ~~overcurrent protective devices~~ and load-side OCPDs.

Selective coordination shall be selected by a licensed professional engineer or other qualified persons engaged primarily in the design, installation, or maintenance of electrical systems. The selection shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

(B) Replacements.

Where emergency system(s) OCPDs are replaced, they shall be reevaluated to ensure selective coordination is maintained with all supply-side and load-side OCPDs.

(C) Modifications.

If modifications, additions, or deletions to the emergency system(s) occur, selective coordination of the emergency system(s) OCPDs with all supply-side and load-side OCPDs shall be reevaluated.

Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Informational Note: See Informational Note Figure 700.32(C) for an example of how emergency system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

- OCPD D selectively coordinates with OCPDs C, F, E, B, and A.
- OCPD C selectively coordinates with OCPDs F, E, B, and A.
- OCPD F selectively coordinates with OCPD E.
- OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not an emergency system OCPD.

Note: 701.32 and 708.54 have the same language and revisions.

Related *NEC* Sections

- Article 100 Definitions, Coordination, Selective
- 701.32
- 701.10(B)(1)(b)
- 708.54

Significance of Change

Additional language has been added to the selective coordination requirements for emergency systems, legally required standby systems, and critical operations power systems to clarify that when specifying OCPDs, particularly feeders, you need to verify selective coordination with both the supply-side OCPD and the load-side OCPD.

Most panelboards and switchboards will accept multiple varieties of OCPDs. For instance, a fusible panelboard with Class R switches will accept both Class RK1 and Class RK5 fuses, or a circuit breaker panelboard will accept a variety of circuit breakers. When OCPDs in the system are replaced, special care should be taken to replace the OCPDs with the same type and manufacturer if possible and if not, the system must be reevaluated to make sure that selective coordination is maintained per subdivision 700.32(B).

It is important to maintain selective coordination for the life of the system which is addressed by the addition of subdivision 700.32(C). Any time there are modifications, additions, or deletions the selective coordination of the system must be reevaluated to make sure it still complies with 700.32(A).

When the new subdivisions (B) and (C) were added to the section, the informational note was correctly moved to the end of the section. The intent was to have this informational note and figure apply to the entire section. However, the (C) was mistakenly added to the informational note and figure after the first draft report and was not noticed by the CMP during the second draft stage of the process. The informational note and figure currently only reference subdivision (C) of the section. TIA 1692 has been submitted and is expected to correct this error.

Change Summary

- Selective coordination must be reevaluated when OCPDs are replaced
- Selective coordination must be reevaluated when modifications, additions or deletions occur

Revised text

701.10 Wiring Legally Required Standby Systems.

(A) General.

The legally required standby system wiring shall be permitted to occupy the same raceways, cables, boxes, and cabinets with other general wiring.

(B) Wiring.

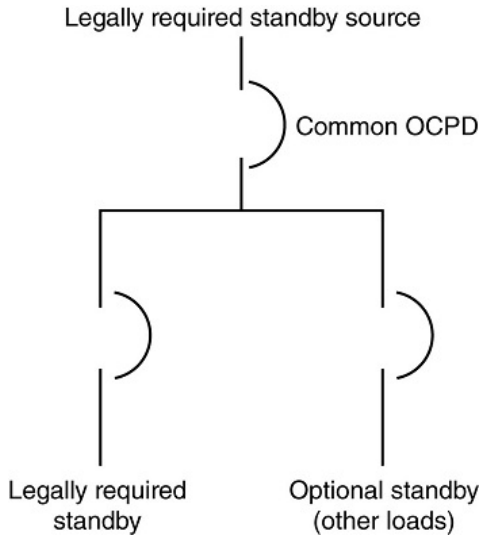
Wiring from a legally required source to supply legally required and other (non-legally required) loads shall be in accordance with the following:

1. The common bus of switchgear, sections of a switchboard, or individual enclosures shall be either of the following:
   a. Supplied by single or multiple feeders without overcurrent protection at the source
   b. Supplied by single or multiple feeders with overcurrent protection, provided that the overcurrent protection that is common to a legally required system and any non-legally required system(s) is selectively coordinated with the next downstream overcurrent protective device in the non-legally required system(s)

Informational Note: See Informational Note Figure 701.10(B)(1) and Informational Note Figure 701.10(B)(2) for further information.

Related *NEC* Sections

- Article 100 Definitions, Coordination, Selective
- 700.10 (B)
- 700.32
- 701.32
- 708.54



Informational Note Figure 701.10(B)(2) Single or Multiple Feeders with Overcurrent Protection.

Significance of Change

Unlike emergency system wiring which is required to be separated from all other wiring unless permitted in 700.10(B), wiring of legally required standby and optional standby systems are not required to be separated. Wiring from the legally required standby source is permitted to supply both the legally required standby system and the optional standby system. Single or multiple feeders are permitted with or without overcurrent protection that is common to both systems. If overcurrent protection is provided that is common to the legally required standby system and a non-legally required system, selective coordination with the next downstream overcurrent protective device in the non-legally required system is required. Selective coordination of the downstream overcurrent protective device in the legally required standby system per 701.32.

Change Summary

- Selective coordination with the downstream overcurrent protective devices is required if a common overcurrent protective device supplies both legally required standby systems and non-legally required standby systems.

110.16(B) Service Equipment and Feeder Supplied Equipment
110.16 Arc-Flash Hazard Warning
Part I. General
Article 110 General Requirements for Electrical Installations
Chapter 1 General

Revised text

110.16 Arc-Flash Hazard Warning.

(A) General.
Electrical equipment, such as switchboards, switchgear, enclosed panelboards, industrial control panels, meter socket enclosures, and motor control centers, that is in other than dwelling units, and is likely to require examination, adjustment, servicing, or maintenance while energized, shall be field or factory marked to warn qualified persons of potential electric arc flash hazards. The marking shall meet the requirements in 110.21(B) and shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment.

(B) Service Equipment and Feeder Supplied Equipment.
In other than dwelling units, in addition to the requirements in 110.16(A), a permanent arc flash label shall be field, or factory applied to service equipment and feeder supplied equipment rated ~~1200~~ 1000 amperes or more. The label shall be in accordance with applicable industry practice and include the date the label was applied. The label shall meet the requirements of 110.21(B). ~~and contain the following information:~~

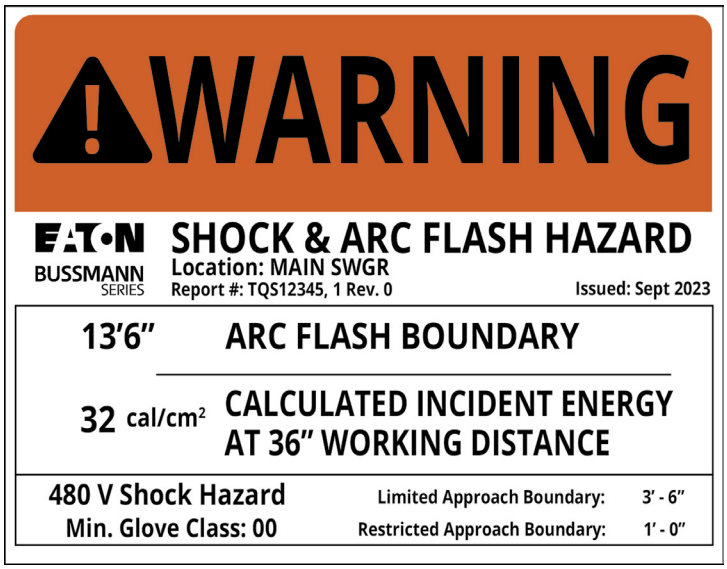
1. ~~Nominal system voltage~~
2. ~~Available fault current at the service overcurrent protective devices~~
3. ~~The clearing time of service overcurrent protective devices based on the available fault current at the service equipment~~
4. ~~The date the label was applied~~

~~Exception: Service equipment labeling shall not be required if an arc flash label is applied in accordance with acceptable industry practice.~~

~~Informational Note No. 1: NFPA 70E® -2018, Standard for Electrical Safety in the Workplace, provides guidance, such as determining severity of potential exposure, planning safe work practices, arc flash labeling, and selecting personal protective equipment.~~

Informational Note No. 12: See ANSI Z535.4-2011 (R2017), Product Safety Signs and Labels, ~~provides~~ for guidelines for the design of safety signs and labels for application to products.

Informational Note No. 23: ~~Acceptable industry practices for equipment labeling are described in~~ See *NFPA 70E*-2021, ~~2018~~, Standard for Electrical Safety in the Workplace, for applicable industry practices for equipment labeling. This standard provides specific criteria for developing arc-flash labels for equipment that provides nominal system voltage, incident energy levels, arc-flash boundaries, minimum required levels of personal protective equipment, and so forth.



Significance of Change

The previous language only included service equipment rated 1200A and higher. The language reduces the threshold from 1200A down to 1000A and includes both service and also feeder supplied equipment, effectively expanding the requirement to all equipment rated 1000A or larger.

The detailed requirements of the arc-flash hazard warning have been removed from the Code in lieu of stating that the label must be in accordance with applicable industry practice and Informational Note No. 2 directs users to *NFPA 70E*.

NFPA 70E section 130.5(H) requires the label to include, 1) nominal system voltage, 2) arc flash boundary and 3) at least one of the following: a) available incident energy and the corresponding working distance, or the arc flash PPE category, but not both, b) minimum arc rating of clothing, or c) site-specific level of PPE

Change Summary

- Feeder supplied equipment is now included in addition to service equipment
- Lowered the equipment rating from 1200 amperes or more to 1000 amperes or more
- Removed specific requirements for nominal system voltage, available fault current and clearing and refers instead to "applicable industry practice"

Equipment Marking and Labeling

Revised text

110.21(A)(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the following:

1. Name, trademark, or other descriptive marking of the organization ~~responsible for~~ that performed the reconditioning the electrical equipment can be identified, along with
2. The date of the reconditioning
3. The term reconditioned or other approved wording or symbol indicating that the equipment has been reconditioned

~~Reconditioned equipment shall be identified as "reconditioned" and~~ The original listing mark shall be removed or made permanently illegible. The equipment nameplate shall not be required to be removed or made permanently illegible, only the part of the nameplate that includes the listing mark, if applicable. Approval of the reconditioned equipment shall not be based solely on the equipment's original listing.

> *Exception: In industrial occupancies, where conditions of maintenance and supervision ensure that only qualified persons service the equipment, the markings indicated in 110.21(A)(2) shall not be required for equipment that is reconditioned by the owner or operator as part of a regular equipment maintenance program.*

Informational Note No. 1: ~~Industry~~ ANSI-approved standards are available for application of reconditioned and refurbished equipment.

Informational Note No. 2: The term reconditioned may be interchangeable with the terms rebuilt, refurbished, or remanufactured even though these are sometimes different processes.

~~Informational Note No. 3: The original listing mark may include the mark of the certifying body and not the entire equipment label.~~

Related *NEC* Sections

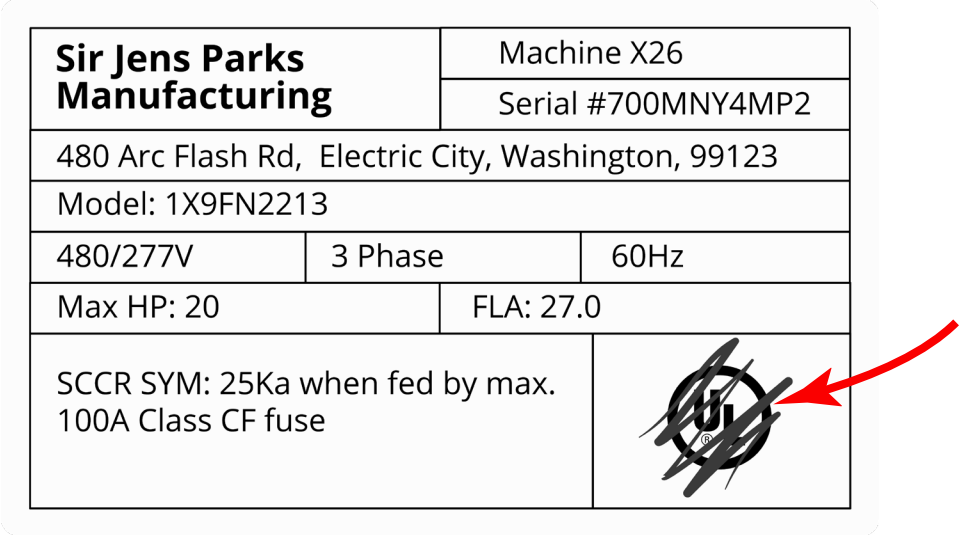
- Article 100 Definitions, Reconditioned
- 110.20
- See section 2 of each article for additional reconditioned equipment requirements

Significance of Change

The modifications clarify the marking requirements of reconditioned equipment. These changes involve specifying the organization responsible for performing the reconditioning, identifying the equipment as reconditioned and clarifying the procedures for removing the original listing mark without removing the nameplate.

Change Summary

- The requirements have been reorganized from a paragraph to a list format for clarity in accordance with the *NEC* style manual
- Informational Note No. 3 has been eliminated as it is deemed unnecessary.



Equipment Marking and Labeling

409.110 Marking
Part III. Construction Specifications
Article 409 Industrial Control Panels
Chapter 4 Equipment for General Use

Revised text

409.110 Marking.

An industrial control panel shall ~~be marked with the following information~~ have permanent markings that ~~is~~ are visible after installation. The markings in 409.110(2) and (3) shall be attached to the outside of the enclosure. The markings in 409.110(1), (4), (5), (6), and (7) shall be attached to either the inside or outside of the enclosure. The following markings shall be included:

1. Manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product can be identified.
2. Supply voltage, number of phases, frequency, and full-load current for each incoming supply circuit.
3. ~~Industrial~~ Where the industrial control ~~panels~~ panel is supplied by more than one electrical source and where more than one disconnecting means is required to disconnect all circuits 50-volts or more within the control panel, ~~shall be~~ marked to indicate that more than one disconnecting means is required to de-energize the equipment. The location of the means necessary to disconnect all circuits 50-volts or more shall be documented and available.
4. Short-circuit current rating of the industrial control panel based on one of the following:
   a. Short-circuit current rating of a listed and labeled assembly
   b. Short-circuit current rating established utilizing an approved method

   Informational Note: See ANSI/UL 508A, Standard for Industrial Control Panels, Supplement SB, ~~is~~ for an example of an approved method.

   Exception to (4): Short-circuit current rating markings are not required for industrial control panels containing only control circuit components.

5. If the industrial control panel is intended as service equipment, marked to identify it as being suitable for use as service equipment.
6. Electrical wiring diagram, the identification number of a separate electrical wiring diagram, or a designation referenced in a separate wiring diagram.
7. An enclosure type number ~~shall be marked on the industrial control panel enclosure~~.

Related *NEC* Sections

- 409.22
- 670.3

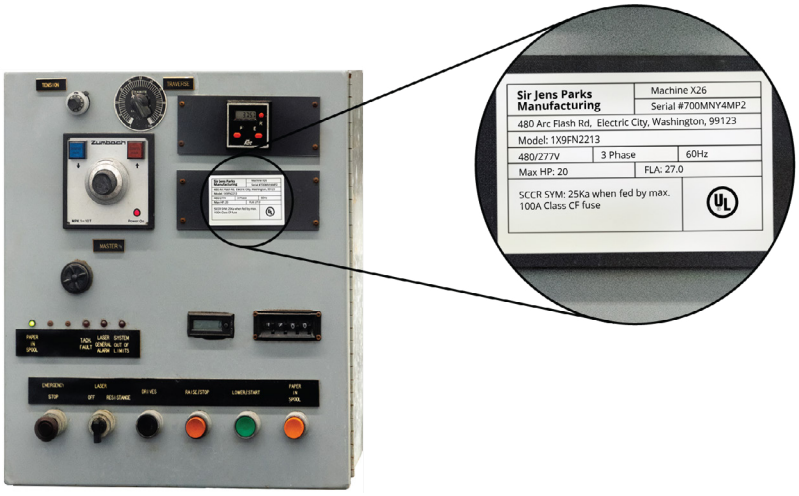
Significance of Change

Previous editions of the Code required markings to be "plainly visible after installation," but there was confusion as to whether markings located inside the enclosure met this requirement, or if the markings had to be on the outside of the enclosure. The revised wording clarifies that the voltage, number of phases, frequency, and full load current, as well as markings required for multiple disconnecting means must be located on the outside of the enclosure. All other markings can be either inside or outside of the enclosure. Users should strongly consider marking the short-circuit current rating (SCCR) on the outside of the panel for ease of verification and inspection for compliance with 409.22 even though it is allowable to mark the SCCR on the inside.

It is important to note that this differs from the requirements in Article 670 for Industrial Machinery which requires additional information like maximum ampere rating of the short-circuit and ground-fault protective device, ampere rating of largest motor, from the motor nameplate, or load, SCCR and electrical diagram numbers or index to be marked "outside of the control equipment enclosure."

Change Summary

- The voltage and the marking to indicate more than one disconnecting means shall be visible on the outside of the industrial control panel
- The manufacturers name, SCCR, suitability for use as service equipment, wiring diagram and enclosure type can be marked inside or outside of the enclosure.



Equipment Marking and Labeling

Revised text

620.51(D)
(21) Available Fault Current Field Marking.

~~Where an elevator control panel is used, it~~ The disconnecting means shall be legibly marked in the field with the available fault current at its line terminals. The field marking(s) shall include the date the available fault current calculation was performed and be of sufficient durability to withstand the environment involved.

When modifications to the electrical installation occur that affect the available fault current at the ~~elevator control panel~~ disconnecting means, the available fault current shall be verified or recalculated as necessary to ensure the elevator ~~control panel's~~ equipment's short-circuit current rating is sufficient for the available fault current at the line terminals of the equipment. The required field marking(s) shall be adjusted to reflect the new level of available fault current.

Related *NEC* Sections

- Article 100 Definitions, Fault Current, Available
- Article 100 Definitions, Short-Circuit Current Rating
- 620.16

EATON BUSSMANN SERIES — FC² available fault current calculator

Project Name: **Commercial Office Building**
Vault Name: **Elevator 2**
System: **Three-Phase**
Avail. Fault Current $_{\text{L-L (Amps)}}$: **15,871**
Voltage $_{\text{L-L (Volts)}}$: **480**
Calculation Performed On: **May 15, 2023 @ 3:08pm**

Calculation performed via Eaton's Bussmann Series Available Fault Current Calculator v1.5

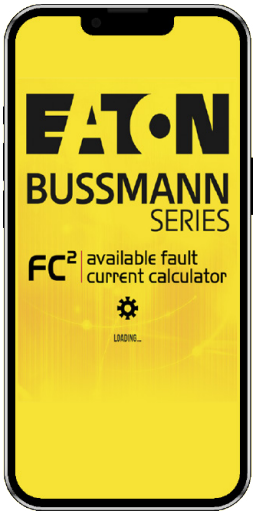
Significance of Change

The requirement for the available fault current field marking was moved from the elevator control panel to the disconnecting means. However, it is the elevator control panel that typically has a lower short-circuit current rating (SCCR) and is more susceptible to damage when the available fault current is even moderately high.

The available fault at the line terminals of the elevator control panel must still be calculated to verify that the SCCR of the elevator control panel complies with 620.16(B). The intent when this marking requirement was added to the 2017 *NEC* was to have the available fault current marked on the elevator control panel to make it easy to verify the SCCR was adequate during installation and inspection.

Change Summary

- Available fault current field marking moved from elevator control panel to the elevator disconnecting means.



More Resources

Calculating available fault current

FC² Available Fault Current Calculator (no cost): available from the Apple App Store, Google Play Store, or on-line at https://faultcurrentcalculator.bussmann.com/web/index.html

FC² offers the following features:

- The option to use English, Spanish or French.
- Calculations for three-phase and single-phase systems.
- Documentation for the available short-circuit current at one or multiple points in an electrical system.
- An easy way to comply with field marking requirements by creating and emailing 110.24 labels, in jpeg or PDF formats.
- A system printout that documents the calculation along with the date it was performed.
- The option to generate labels and documentation in English, Spanish or French.

Equipment Marking and Labeling

670.3(A) Permanent Nameplate
670.3 Machine Nameplate Data
Article 670 Industrial Machinery
Chapter 6 Special Equipment

Revised text

670.3(A) Permanent Nameplate.

A permanent nameplate shall be attached to the outside of the control equipment enclosure or ~~machine and shall be plainly~~ on the machine immediately adjacent to the main control equipment enclosure that is visible after installation. The nameplate shall include the following information:

1. Supply voltage, number of phases, frequency, and full-load current
2. Maximum ampere rating of the short-circuit and ground-fault protective device
3. Ampere rating of largest motor, from the motor nameplate, or load
4. Short-circuit current rating of the machine industrial control panel based on one of the following:
   a. Short-circuit current rating of a listed and labeled machine control enclosure or assembly
   b. Short-circuit current rating established ~~utilizing~~ using an approved method

Informational Note: See UL 508A-2017, ~~Standard for~~ Industrial Control Panels, Supplement SB, ~~is~~ for an example of an approved method.

5. Electrical diagram number(s) or the number of the index to the electrical drawings

The full-load current shown on the nameplate shall not be less than the sum of the full-load currents required for all motors and other equipment that may be in operation at the same time under normal conditions of use. Where unusual type loads, duty cycles, and so forth require oversized conductors or permit reduced-size conductors, the required capacity shall be included in the marked "full-load current." Where more than one incoming supply circuit is to be provided, the nameplate shall state the preceding information for each circuit.

Related *NEC* Sections

- Article 100 Definitions, Short-Circuit Current Rating
- 409.110

Significance of Change

The requirements in 670.3(A) were revised to clarify the location of the machine nameplate and align with the requirement for nameplate marking per NFPA 79 16.4.1. The term "plainly visible" introduced confusion as to whether the nameplate was permitted to be inside the enclosure, or if it had to be outside of the enclosure. This change removes ambiguity by stating that the nameplate must be on the outside of the enclosure. The information required to be included on the nameplate has not changed.

Change Summary

- A permanent nameplate must be attached to the outside of the control equipment enclosure or on the machine immediately adjacent to the main control equipment enclosure and it must be visible after installation.

Surge Protection

215.18 Surge Protection.

215.18(A) Surge-Protective Device.
Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

1. Dwelling units
2. Dormitory units
3. Guest rooms and guest suites of hotels and motels
4. Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

215.18(B) Location.
The SPD shall be installed in or adjacent to distribution equipment, connected to the load side of the feeder, that contains branch circuit overcurrent protective device(s) that supply the locations specified in 215.18(A).

Informational Note: Surge protection is most effective when closest to the branch circuit. Surges can be generated from multiple sources including, but not limited to, lightning, the electric utility, or utilization equipment.

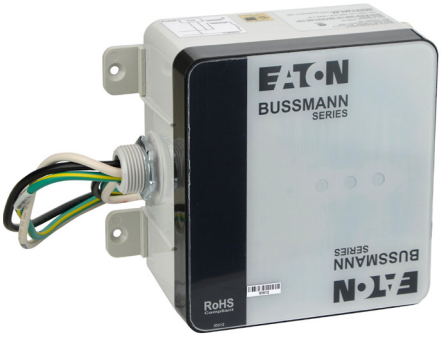
215.18(C) Type.
The SPD shall be a Type 1 or Type 2 SPD.

215.18(D) Replacement.
Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

215.18(E) Ratings.
SPDs shall have a nominal discharge current rating (In) of not less than 10kA.

Related *NEC* Sections

- 225.42
- 230.67
- Article 242



Significance of Change

Electronics in appliances and electronic equipment such as GFCI's and AFCI's could be damaged when surges occur due to lightning, internal local switching as well as external utility switching. In many cases, electronic devices and equipment can be damaged and rendered inoperable by a surge.

The 2020 *NEC* introduced the need for surge protection on services of dwelling units. This new section adds surge protection to feeders for the following occupancies: dwelling units, dormitory units, guest rooms and guest suites of hotels and motels, and areas in nursing homes and limited-care facilities used exclusively as patient sleeping rooms. These occupancies are very similar to dwelling units and have equipment and appliances with sensitive electronics that may be susceptible to damage from surges. The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD. The SPD must be a Type 1 or Type 2 SPD and have a nominal discharge current rating (In) of 10kA. If the distribution equipment is replaced, the replacement equipment needs to comply with all of the requirements of this section.

Change Summary

- Surge protection is required for feeders supplying dwelling units, dormitory units, guest rooms and suites of hotels and motels, and areas of nursing homes and limited-care facilities used as patient sleeping rooms
- The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD
- The SPD must be a Type 1 or Type 2 SPD and have a nominal discharge current rating (In) of 10kA

225.42 Surge Protection
Part II. Buildings or Other Structures Supplied by a Feeder(s) or Branch Circuit(s)
Article 225 Outside Branch Circuits and Feeders
Chapter 2 Wiring and Protection

225.42 Surge Protection.

225.42(A) Surge-Protective Device.

Where a feeder supplies any of the following, a surge-protective device (SPD) shall be installed:

1. Dwelling units
2. Dormitory units
3. Guest rooms and guest suites of hotels and motels
4. Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms

225.42(B) Location.

The SPD shall be installed in or adjacent to the distribution equipment that is connected to the load side of the feeder and contains branch circuit overcurrent protective device(s) that supply the location specified in 225.42(A).

Informational Note: Surge protection is most effective when closest to the branch circuit. Surges can be generated from multiple sources including, but not limited to, lightning, the electric utility, or utilization equipment.

225.42(C) Type.

The SPD shall be a Type 1 or Type 2 SPD.

225.42(D) Replacement.

Where the distribution equipment supplied by the feeder is replaced, all of the requirements of this section shall apply.

225.42(E) Ratings.

SPDs shall have a nominal discharge current rating (In) of not less than 10kA.

Informational Note: Lead lengths of conductors to the SPD should be kept as short as possible to reduce let-through voltages.

Related *NEC* Sections

- 215.18
- 230.67
- Article 242

Significance of Change

Electronics in appliances and electronic equipment such as GFCI's and AFCI's could be damaged when surges occur due to lightning, internal local switching as well as external utility switching. In many cases, electronic devices and equipment can be damaged and rendered inoperable by a surge.

The 2020 *NEC* introduced the need for surge protection on services of dwelling units. This new section adds surge protection to feeders for the following occupancies: dwelling units, dormitory units, guest rooms and guest suites of hotels and motels, and areas in nursing homes and limited-care facilities used exclusively as patient sleeping rooms. These occupancies are very similar to dwelling units and have equipment and appliances with sensitive electronics that may be susceptible to damage from surges.
The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD. The SPD must be a Type 1 or Type 2 SPD and have a nominal discharge current rating (In) of 10kA. If the distribution equipment is replaced, the replacement equipment needs to comply with all of the requirements of this section. As noted in the informational note, to optimize protection of the SPD, the lead length should be kept as short and also as straight as possible to provide the best performance.

Change Summary

- Surge protection is required for feeders supplying dwelling units, dormitory units, guest rooms and suites of hotels and motels, and areas of nursing homes and limited-care facilities used as patient sleeping rooms
- The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD
- The SPD must be a Type 1 or Type 2 SPD and have a nominal discharge current rating (In) of 10kA

Added text

230.67 Surge Protection.

(A) Surge-Protective Device.

1. All services supplying ~~dwelling units~~ the following occupancies shall be provided with a surge-protective device (SPD).:
2. Dwelling units
3. Dormitory units
4. Guest rooms and guest suites of hotels and motels
5. Areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms
6. Informational Note: See 517.10(B)(2).

(B) Location.
The SPD shall be an integral part of the service equipment or shall be located immediately adjacent thereto.

Exception: The SPD shall not be required to be located in at the service equipment as required in 230.67(B) if located at each next level distribution equipment downstream toward the load.

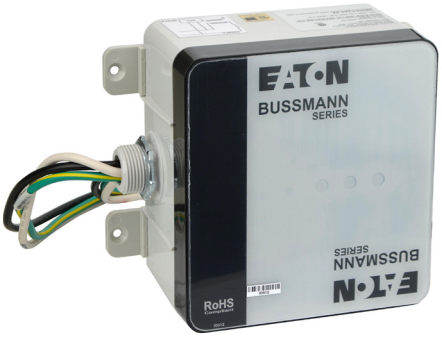
(C) Type.
The SPD shall be a Type 1 or Type 2 SPD.

(D) Replacement.
Where service equipment is replaced, all of the requirements of this section shall apply.

(E) Ratings.
SPDs shall have a nominal discharge current rating (In) of not less than 10kA.

Related *NEC* Sections

- 215.18
- 225.42
- Article 242



Significance of Change

Electronics in appliances and electronic equipment such as GFCI's and AFCI's could be damaged when surges occur due to lightning, internal local switching as well as external utility switching. In many cases, electronic devices and equipment can be damaged and rendered inoperable by a surge.

The 2020 *NEC* introduced the need for surge protection on services of dwelling units. Subdivision 230.67(A) has been expanded and adds surge protection to the following occupancies: dormitory units, guest rooms and guest suites of hotels and motels, and areas in nursing homes and limited-care facilities used exclusively as patient sleeping rooms. These occupancies are very similar to dwelling units and have equipment and appliances with sensitive electronics that may be susceptible to damage from surges.

The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD. The SPD must be a Type 1 or Type 2 SPD and a new requirement to have a nominal discharge rating (In) of not less than 10kA nominal current discharge rating, In, requirement was added in 2023. The nominal discharge rating of an SPD has a current impulse with a virtual front time (rise time) of 8 µs and a time to half-value (decay time) of 20 µs as defined by UL 1449 4th Edition. It is the peak value of the current through the SPD having a current wave shape of 8/20 µs where the SPD remains functional after 15 surges. For Type 2 SPDs, In ratings can be 3kA, 5kA, 10kA or 20kA. The 10kA In rating requirement was put in place to help ensure that the SPD would be active since it is a passive device and doesn't interrupt the circuit like an OCPD. If the distribution equipment is replaced, the replacement equipment needs to comply with all of the requirements of this section.

Change Summary

- Surge protection is required for services supplying dwelling units, dormitory units, guest rooms and suites of hotels and motels, and areas of nursing homes and limited-care facilities used as patient sleeping rooms
- The SPD must be installed in or adjacent to the distribution equipment on the load side of the feeder OCPD
- The SPD must be a Type 1 or Type 2 SPD and have a nominal discharge current rating (In) of 10kA

242.9 Indicating
Part II. Surge-Protective Devices (SPDs), 1000 Volts or Less
Article 242 Overvoltage Protection
Chapter 2 Wiring and Protection

Added text

242.9 Indicating.

An SPD shall provide indication that is functioning properly.

Related *NEC* Sections

- 215.18
- 225.42
- 230.67
- 620.51(E)
- 700.8

LED protection status indicators showing full protection and phase faults.

Significance of Change

SPDs are mandatory in several sections of the *NEC*. However, SPDs may degrade over time as they divert surge current during transient overvoltage events or could be damaged by sustained overvoltage conditions. Consequently, occupants and owners could be left unprotected without realizing it as they are typically parallel connected and will allow normal operation even if they are no longer functioning. This requirement helps to ensure that the desired level of protection remains in effect and the owner or occupant can identify and replace an SPD that is not working properly.

Change Summary

- Surge-Protective Devices rated 1000V or less that are permanently installed on premises wiring systems now must indicate if they are functioning properly

Surge Protection

Added text

409.70 Surge Protection.

Safety circuits for personnel protection that are subject to damage from surge events shall have surge protection installed within or immediately adjacent to the control panel.

Related *NEC* Sections

- Article 100 Definitions, Safety Circuit
- 670.6

Significance of Change

Recent studies revealed that numerous facilities reported that safety circuits installed on machinery had sustained damage from transient overvoltage or surge events. These safety circuits are in place to safeguard workers from potential harm and damage to the safety circuit could result in unsafe working conditions or prevent the machinery from operating.

The addition of surge protection devices (SPDs) will help protect safety circuits from damage due to surge events. Some examples of safety circuits that may be susceptible to surges include, but are not limited to, light curtains, proximity switches, optic actuators and microprocessor controls. This new section requires the SPD to installed within or immediately adjacent to an industrial control panel if it has a safety circuit.

Change Summary

- Industrial control panels that include safety circuits subject to damage from surges must have surge protection

670.6 Surge Protection
Article 670 Industrial Machinery
Chapter 6 Special Equipment

Revised text

670.6 ~~Surge~~ Overvoltage Protection.

Industrial machinery with safety ~~interlock control devices not effectively protected from voltage surges on the incoming supply~~ circuit**s** shall have ~~surge~~ overvoltage protection.

Related *NEC* Sections

- Article 100 Definitions, Safety Circuit
- 409.70

Significance of Change

Recent studies revealed that numerous facilities reported that safety circuits installed on machinery had sustained damage from transient overvoltage or surge events. These safety circuits are in place to safeguard workers from potential harm and damage to the safety circuit could result in unsafe working conditions or prevent the machinery from operating.

The requirement for overvoltage protection has been substantially simplified and now simply states that when an industrial machine has any type of safety circuit, it must have overvoltage protection. The surge protection devices (SPDs) will help protect safety circuits from damage due to surge events.

Some examples of safety circuits that may be susceptible to surges include, but are not limited to, light curtains, proximity switches, optic actuators and microprocessor controls.

Change Summary

- Industrial machinery with safety circuits shall have overvoltage protection

Barriers in Services and Feeders

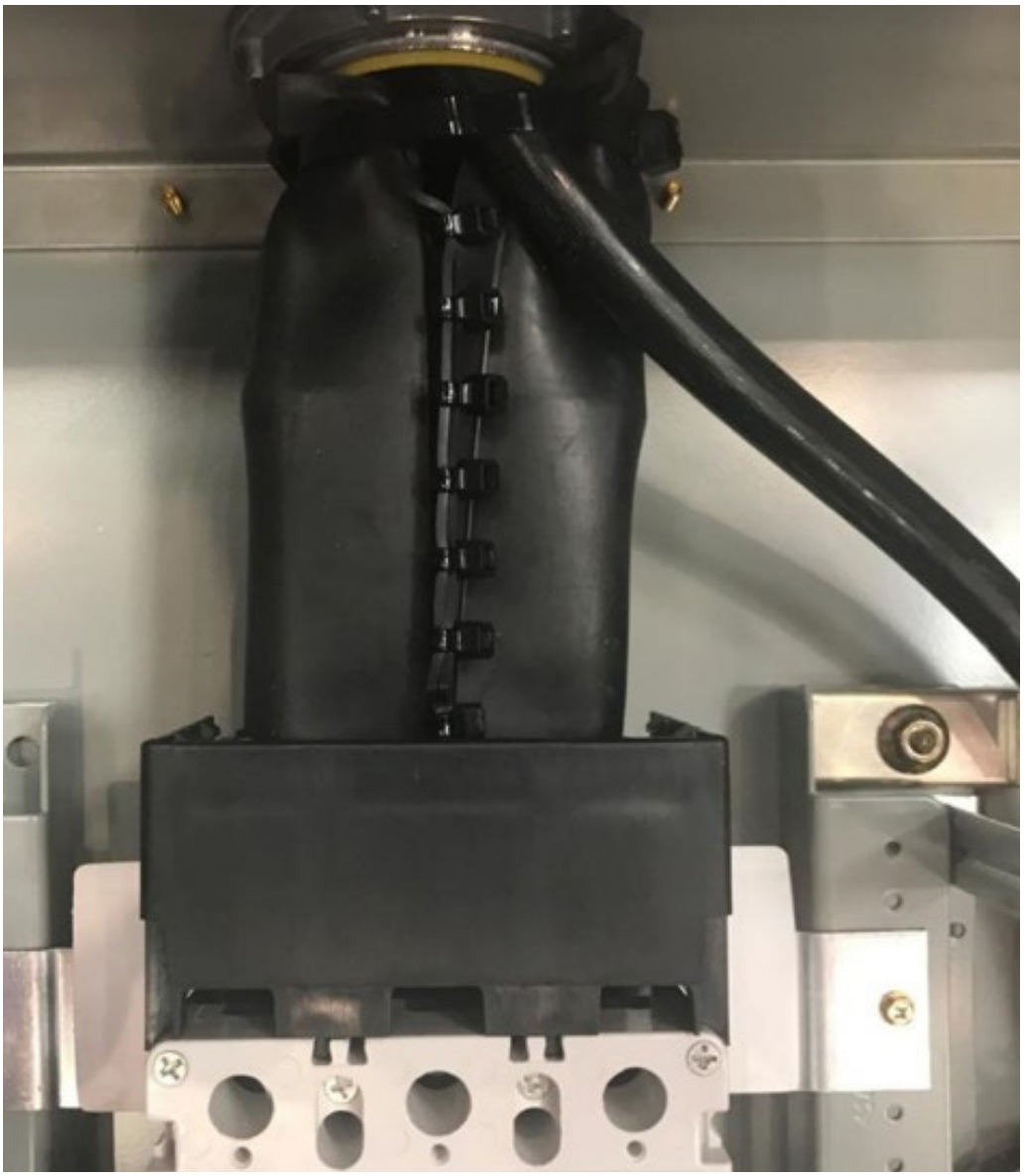
Added text

215.15 Barriers.

Barriers shall be placed such that no energized, uninsulated, ungrounded busbar or terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations in panelboards, switchboards, switchgear, or motor control centers supplied by feeder taps in 240.21(B) or transformer secondary conductors in 240.21(C) when the disconnecting device, to which the tap conductors are terminated, is in the open position.

Related *NEC* Sections

- 230.62(C)
- 230.71(B)



Significance of Change

This change improves safety when work is required to be done on the load side of the feeder disconnecting means. Barriers must be placed to prevent contact with terminals on the line side of the disconnecting means in switchboards, switchgear, motor control centers or transformer secondaries. When the feeder disconnecting means is in the open position an electrical worker performing work on the load side of the disconnecting means will have a reduced risk of contacting energized parts on the line side of the disconnecting means.

Change Summary

Barriers are required to prevent inadvertent contact to any energized parts when the feeder disconnecting means is open.

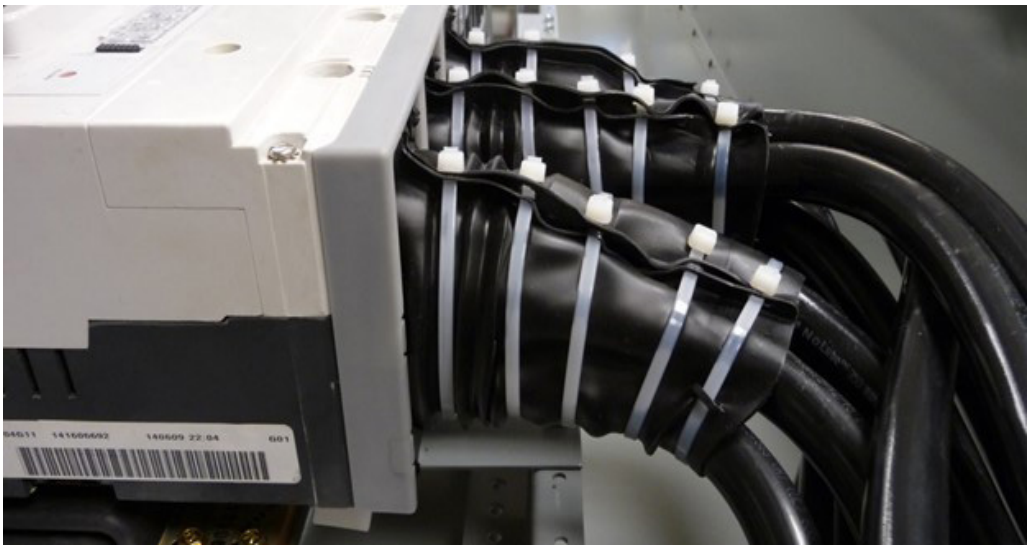
Barriers in Services and Feeders

230.62(C) Barriers
230.62 Service Equipment — Enclosed or Guarded
Part V. Service Equipment — General
Article 230 Services
Chapter 2 Wiring and Protection

Revised text

230.62(C) Barriers.

Barriers shall be placed in service equipment such that no uninsulated, ungrounded service busbar or service terminal is exposed to inadvertent contact by persons or maintenance equipment while servicing load terminations with the service disconnect in the open position.



Related *NEC* Sections

- 215.15
- 230.71(B)

Significance of Change

The additional wording makes it clear that any terminals that are de-energized by opening the service disconnect are not required to be insulated or protected by barriers. Only exposed, energized components on the line side of the service disconnect need to be protected from inadvertent contact.

The incident energy available at the line terminals of the service disconnect may be considerably higher than the incident energy on the load side of the service disconnect. It may also be difficult to de-energize the line side of the service disconnect to do work inside the equipment. For these reasons, it is important prevent any inadvertent contact and provide protection against shock hazard and reduce the likelihood of initiating an arcing fault.

Change Summary

Additional language “with the service disconnect in the open position” was added to clarify that the intent of this section is to provide protection for exposed service conductors and circuit parts on the line side of the service OCPD or disconnect, not those that are downstream from the service disconnect.

Other Significant Changes

110.3(B) Installation and Use
110.3 Examination, Identification, Installation, Use, and Listing (Product Certification) of Equipment
Part I. General
Article 110 General Requirements for Electrical Installations
Chapter 1 General

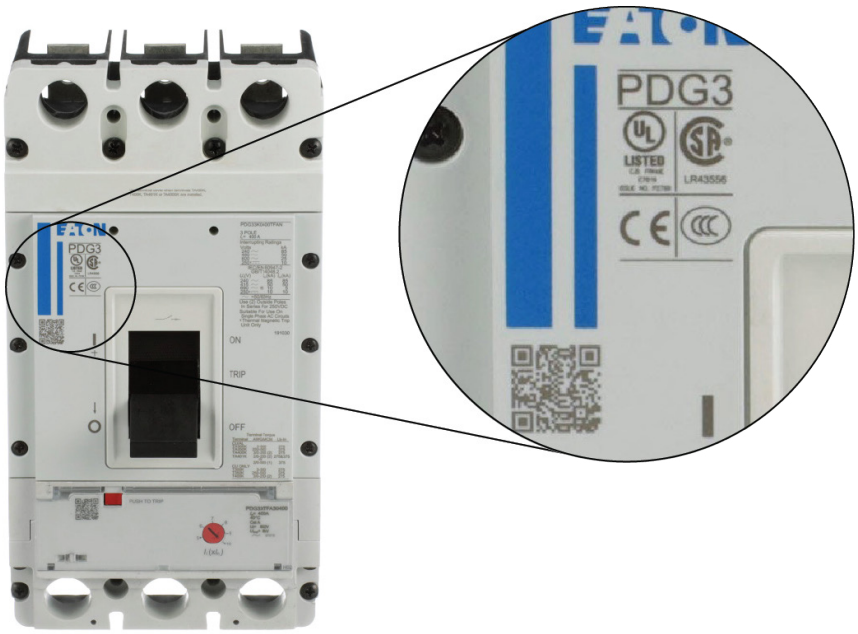
Added text

110.3(B) Installation and Use.

Equipment that is listed, labeled, or both, or identified for a use shall be installed and used in accordance with any instructions included in the listing, labeling, or identification.

Informational Note:

The installation and use instructions may be provided in the form of printed material, quick response (QR) code, or the address on the internet where users can download the required instructions.



Significance of Change

Text has been added to include equipment or components that have been identified for a use in addition to those that are listed and labeled. An informational note has been added to give users guidance that the installation and use instructions may be printed and included in the packaging or it can be referenced by a QR code or internet address. This can be beneficial if printed instructions are lost or otherwise unavailable.

Change Summary

- Added identified along with listed and labeled
- Addition of informational note to describe how installation and use instructions for the equipment can be accessed

110.20 Reconditioned Equipment.

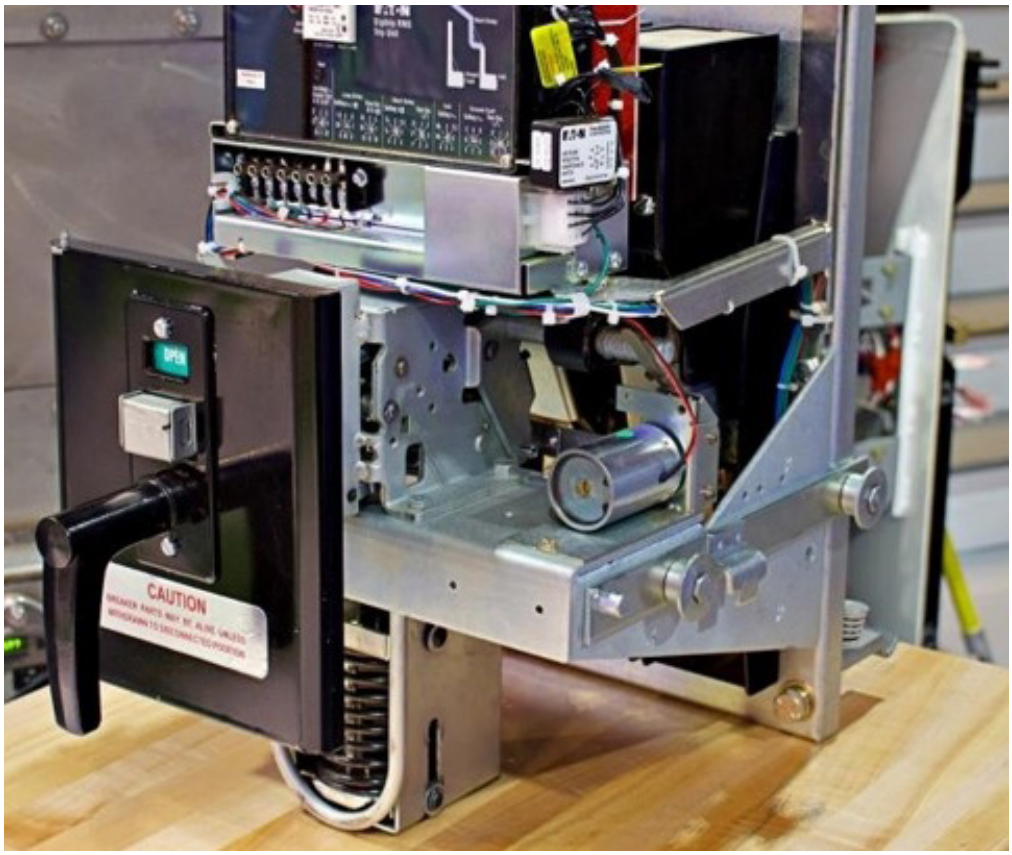
Reconditioned equipment shall be permitted except where prohibited elsewhere in this Code. Equipment that is restored to operating condition shall be reconditioned with identified replacement parts, verified under applicable standards, that are either provided by the original equipment manufacturer or that are designed by an engineer experienced in the design of replacement parts for the type of equipment being reconditioned.

110.20(A) Equipment Required to Be Listed.
Equipment that is reconditioned and required by this Code to be listed shall be listed or field labeled as reconditioned using available instructions from the original equipment manufacturer.

110.20(B) Equipment Not Required to Be Listed.
Equipment that is reconditioned and not required by this Code to be listed shall comply with one of the following:

1. Be listed or field labeled as reconditioned
2. Have the reconditioning performed in accordance with the original equipment manufacturer instructions

110.20(C) Approved Equipment.
If the options specified in 110.20(A) or (B) are not available, the authority having jurisdiction shall be permitted to approve reconditioned equipment, and the reconditioner shall provide the authority having jurisdiction with documentation of the changes to the product.



Significance of Change

A new Section, 110.20, has been established to outline general prerequisites that will be applicable to all reconditioned equipment. Since the notion of "reconditioned equipment" was initially introduced as a fundamental concept in the 2017 *NEC*, and subsequently expanded upon to incorporate additional requirements and specific equipment in the 2020 *NEC*, Code users have inquired about the permissibility of reconditioning certain types of equipment.

The first sentence of the new Section clarifies that reconditioned equipment is allowed under the Code when the Code does not explicitly prohibit or otherwise address the equipment in question. The equipment must be reconditioned using identified replacement parts either provided by the original manufacturer or that are designed by an engineer with experience for the type of equipment being reconditioned.

Additionally, if the equipment is required by the Code to be listed, it then must be listed or field labeled as reconditioned. If the equipment is not required to be listed, it can be listed or field labeled as reconditioned, or the reconditioning must be in accordance with the original manufacturer's instructions. If those options are not available, the AHJ is permitted to approve the equipment.

Change Summary

- New language was added to provide clarity on the specific types of equipment allowed to be reconditioned as well as providing requirements for listing or labeling, replacement parts and the approval process by an AHJ.

Related *NEC* Sections

- Article 100 Definitions, Reconditioned
- 110.21(A)(2)
- See section 2 of each article for additional reconditioned equipment requirements

Revised text

230.71(B) Two to Six Service Disconnecting Means.

Two to six service disconnects shall be permitted for each service 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 shall be permitted to consist of a combination of any of the following:

1. Separate enclosures with a main service disconnecting means in each enclosure
2. Panelboards with a main service disconnecting means in each panelboard enclosure
3. Switchboard(s) where there is only one service disconnect in each separate vertical section ~~where there are barriers separating each vertical section~~. with barriers provided between each vertical section to maintain the inadvertent contact protection required in 230.62 based on access from the adjacent section(s)
4. Service disconnects in switchgear, transfer switches, or metering centers where each disconnect is located in a separate compartment
5. Metering centers with a main service disconnecting means in each metering center
6. Motor control center(s) where there is only one service disconnect in a motor control center unit and a maximum of two service disconnects provided in a single motor control center with barriers provided between each motor control center unit or compartment containing a service disconnect to maintain the inadvertent contact protection required in 230.62 based on access from adjacent motor control center unit(s) or compartment(s)

   Exception to (2), (3), (4), (5), and (6): Existing service equipment, installed in compliance with previous editions of this Code that permitted multiple service disconnecting means in a single enclosure, section, or compartment, shall be permitted to contain a maximum of six service disconnecting means.

Informational Note No. 1: ~~Metering centers are addressed in~~ See UL 67, Standard for Panelboards, for information on metering centers.

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

Informational Note No. 3: Transfer switches may have one service disconnect or multiple service disconnects in separate compartments.

Related *NEC* Sections

- 230.62(C)

Significance of Change

In 2020 there were significant revisions made to the "six disconnect rule" for service equipment. The Code still permits two to six disconnects, but the 2020 revision required separation by having the disconnecting means in their own enclosure, vertical section or compartment. These requirements were added to provide additional safety for electrical workers to reduce any chance of contact with live parts.

The revisions made for the 2023 *NEC* add transfer switches, metering centers and motor control centers increasing the number of options for the types of equipment that can have service disconnecting means. The service disconnects still need to be in either their own enclosure, compartment, or have barriers that provide protection from inadvertent contact with live parts required in 230.62.

The flexibility to be able to use two to six service disconnects may be advantageous for several reasons. For further discussion of design considerations see the following page.

Change Summary

- Added references for inadvertent contact protection required in 230.62
- Added transfer switches, metering centers and motor control centers as equipment that can contain service disconnecting means if they meet specific requirements

230.71(B) Two to Six Service Disconnecting Means
230.71 Maximum Number of Disconnects
Part VI Service Equipment - Disconnecting Means
Article 230 Services
Chapter 2 Wiring and Protection

Benefits of Two to Six Disconnects

Two to six service disconnecting means is still a design option if the installation complies with 230.71(B).

- Two to six service disconnects may avoid the cost of one large ampere rated service disconnect.
- Two to six lower ampere rated service disconnects may help reduce arc flash incident energy verses one large ampere rated service disconnect. Using multiple, lower ampere rated service disconnects may also avoid requirements for arc energy reduction technologies required for fuses and circuit breakers rated 1200A or higher in articles 240.67 and 240.87.
- Two to six service disconnects may avoid using ground fault protection of equipment (GFPE) as required per 230.95.
- Two to six service disconnects may avoid using ground fault protection of equipment (GFPE) on the normal supply path for emergency systems, legally required standby systems, or other portions of the system. 700.31 and 701.31 allow not using GFPE, if otherwise required in the *NEC*, for the alternate source of emergency systems and legally required standby systems, respectively. For larger normal systems, the two to six service disconnect rule may be used for normal source supply to emergency systems and legally required standby systems, if the service disconnect can be kept less than 1000A. See Figure 1, 2 and 3.

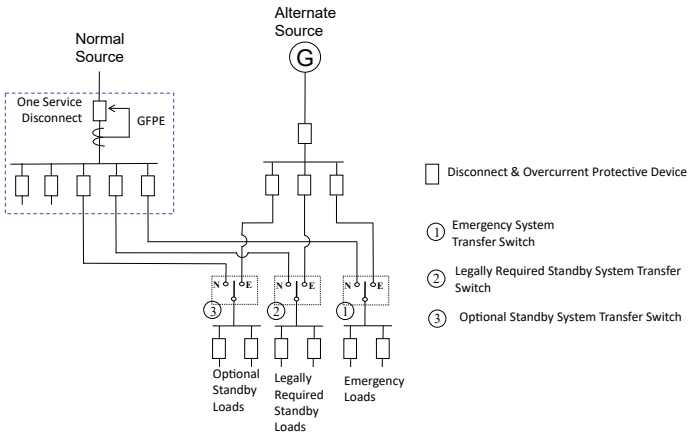


Figure 1 Normal source service at 480/277 V and service disconnect 1000 A or greater having GFPE per 230.95.

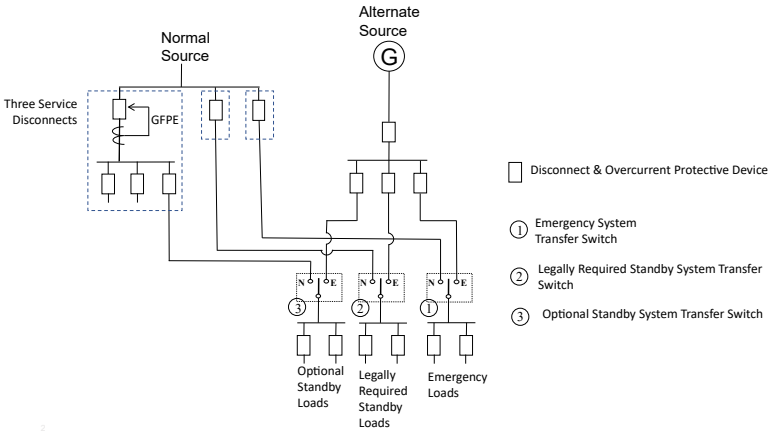


Figure 2 If the normal source disconnects to the emergency system and legally required standby system are less than 1000 A, the 230.71(B) two to six service disconnect rule permits this configuration with GFPE. (480/277 V system)

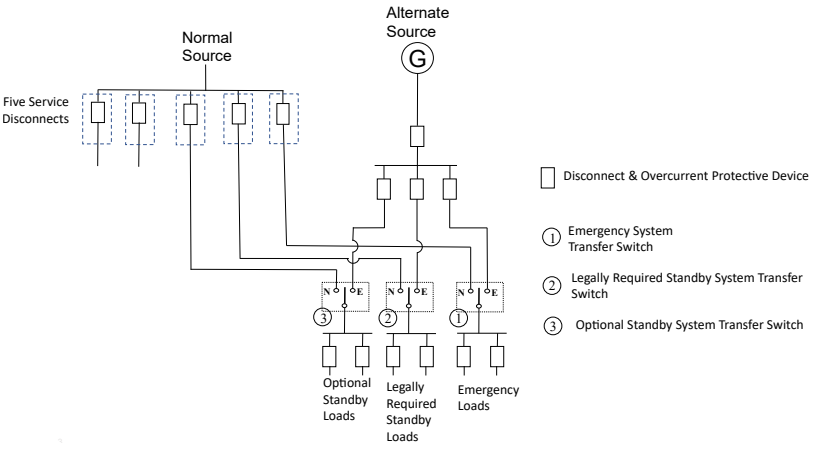


Figure 3 If the normal source disconnects to the emergency system and legally required standby system are less than 1000 A, as well as the other normal source disconnects, the 230.71(B) two to six service disconnect rule permits this configuration without GFPE (480/277 V system).

Other Significant Changes

Added text

240.4(D) Small Conductors.

Unless specifically permitted in 240.4(E) or (G), the overcurrent protection shall not exceed that required by 240.4(D)(1) through (D)(8) after any correction factors for ambient temperature and number of conductors have been applied.

240.4(D)(1) 18 AWG Copper.

7 amperes, provided all the following conditions are met:

1. Continuous loads do not exceed 5.6 amperes.
2. Overcurrent protection is provided by one of the following:
   a. Branch-circuit-rated circuit breakers listed and marked for use with 18 AWG copper ~~wire~~ conductor
   b. Branch-circuit-rated fuses listed and marked for use with 18 AWG copper ~~wire~~ conductor
   c. Class CC, Class CF, Class J, or Class T fuses

240.4(D)(1) 16 AWG Copper.

10 amperes, provided all the following conditions are met:

3. Continuous loads do not exceed 8 amperes.
4. Overcurrent protection is provided by one of the following:
   a. Branch-circuit-rated circuit breakers listed and marked for use with 16 AWG copper ~~wire~~ conductor
   b. Branch-circuit-rated fuses listed and marked for use with 16 AWG copper ~~wire~~ conductor
   c. Class CC, Class CF, Class J, or Class T fuses

Significance of Change

240.4(D)(1)(2)(c) and 240.4(D)(2)(2)(c) now offer the option to include Class CF fuses. These fuses offer the same level of protection as Class J fuses and have equivalent let-through values. The inclusion of Class CF fuses in the *NEC* is also in alignment with product standards, such as UL 508A Standard for Safety for Industrial Control Panels, which permits their use for 16 AWG or 18 AWG copper conductors in industrial control panels for industrial machinery in accordance with NFPA 79, Electrical Standard for Industrial Machinery.

Change Summary

- Class CF fuses were added as an acceptable overcurrent protective device for protection of 18 AWG and 16 AWG conductors

240.6(A) Fuses and Fixed-Trip Circuit Breakers
240.6 Standard Ampere Ratings
Part I. General
Article 240 Overcurrent Protection
Chapter 2 Wiring and Protection

Revised text

240.6(A) Fuses and Fixed-Trip Circuit Breakers.

The standard ampere ratings for fuses and inverse time circuit breakers shall be considered as shown in Table 240.6(A). Additional standard ampere ratings for fuses shall be 1, 3, 6, ~~10~~, and 601. The use of fuses and inverse time circuit breakers with nonstandard ampere ratings shall be permitted.

Related *NEC* Sections

- 210.23(A)
- 210.24

Table 240.6(A) standard ampere ratings for fuses and inverse time circuit breakers

Standard Ampere Ratings				
10	15	20	25	30
35	40	45	50	60
70	80	90	100	110
125	150	175	200	225
250	300	350	400	450
500	600	700	800	1000
1200	1600	2000	2500	3000
4000	5000	6000	—	—

Significance of Change

Prior to the 2023 *NEC* the smallest standard rating for a circuit breaker was 15 amps. A new standard rating of 10 amps was added to table 240.6(A) for inverse time circuit breakers. Now both fuses and circuit breakers have a standard ampere rating of 10A. Fuses have additional standard ampere ratings of 1, 3, 6 and 601 that are not standard rating for circuit breakers.

Change Summary

- Added 10 amp rating as a standard ampere rating for inverse time circuit breakers

Other Significant Changes

Added text

240.7 Listing Requirements.

The following shall be listed:

1. Branch-circuit overcurrent protective devices
2. Relays and circuit breakers providing ground-fault protection of equipment
3. Ground-fault circuit interrupter devices

Related *NEC* Sections

- Article 100 Definitions for Branch-Circuit Overcurrent Protective Device

Significance of Change

Branch-circuit overcurrent protective devices provide protection of service, feeder, and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. This change requires these devices, such as circuit breakers and fuses, to be listed. This revision assures that circuit breakers, such as supplemental protectors, which are UL recognized, are not suitable as a branch circuit overcurrent protective device. For fuses, this revision reinforces that listed plug fuses and Class fuses are suitable as a branch circuit protective device.

Change Summary

- Branch-circuit overcurrent protective devices (typically fuses or circuit-breakers), relays and circuit breakers providing GFPE, and GFCI devices are now required to be listed

240.60(E) Fuse Reducers
240.60 General
Part VI. Cartridge Fuses and Fuse holders
Article 240 Overcurrent Protection
Chapter 2 Wiring and Protection

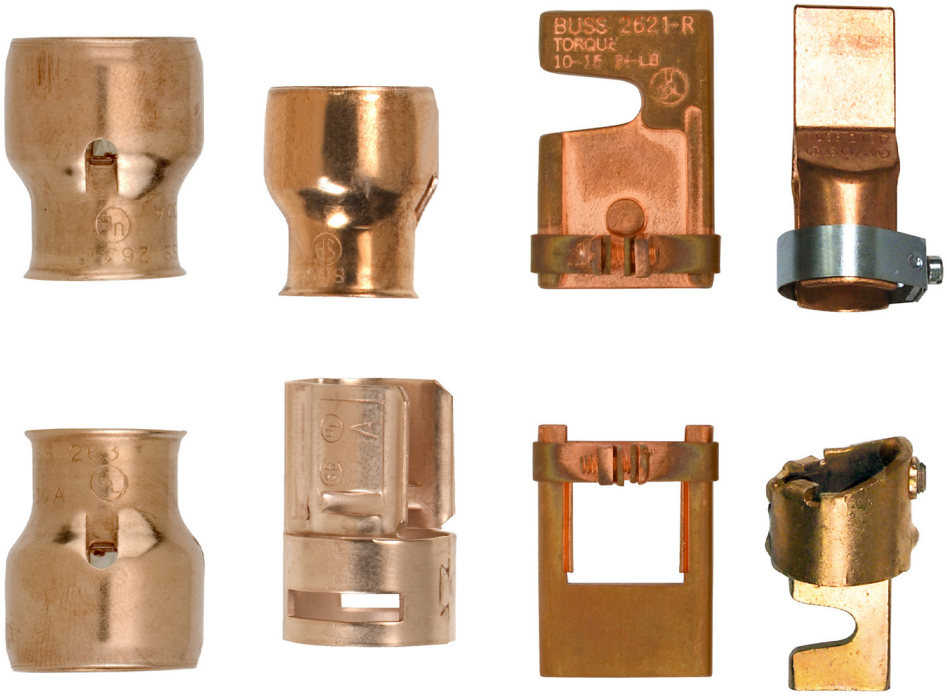
Added text

240.60(E) Fuse Reducers.

Fuse reducers shall be listed.

Related *NEC* Sections

- 240.7



Significance of Change

Fuse reducers are commonly used in temporary and permanent applications. Fuse reducers are used to increase the length of the fuse in order to allow insertion of a lower ampere rated fuse into a higher ampere rated fuse holder or fuse switch. Class fuses and fuse holders come in case sizes such as 30, 60, 100, 200, 400 and 600 amperes. For example, a 30 ampere Class R fuse can be installed in a 60A or higher ampere rated Class R fuse holder by using the proper fuse reducer. By requiring the fuse reducers to be listed, this assures that this application is suitable and will not result in an unsafe installation.

Change Summary

- Fuse reducers are now required to be listed

Revised text

430.6(A) General Motor Applications.
For general motor applications, current ratings shall be determined based on 430.6(A)(1) and (A)(2).

430.6(A)(1) Table Values.
Other than for motors built for low speeds (less than 1200 RPM) or high torques, and for multi-speed motors, the values given in Table 430.247, Table 430.248, Table 430.249, and Table 430.250 shall be used instead of the actual current rating marked on the motor nameplate to determine the following: ~~the ampacity of conductors or ampere ratings of switches, branch-circuit short-circuit and ground-fault protection, instead of the actual current rating marked on the motor nameplate:~~

1. Ampacity of conductors
2. Current ratings of switches
3. Current ratings of branch-circuit short-circuit and ground-fault protection

Where a motor is marked in amperes, but not horsepower, the horsepower rating shall be assumed to be that corresponding to the value given in Table 430.247, Table 430.248, Table 430.249, and Table 430.250, interpolated if necessary. ~~Motors built for low speeds (less than 1200 RPM) or high torques may have higher full-load currents, and multispeed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.~~

Exception No. 1: Multispeed motors shall be in accordance with 430.22(B) and 430.52.

Exception No. 2: For equipment that employs a shaded-pole or permanent-split capacitor-type fan or blower motor that is marked with the motor type and the marking on the equipment nameplate is not less than the current marked on the fan or blower motor nameplate, the full-load current marked on the nameplate of the ~~equipment in which the fan or blower motor is employed~~ appliance shall be used ~~instead of the horsepower rating~~ to determine the ampacity ~~or rating of the disconnecting means, the~~ of branch-circuit conductors, ~~the controller, the branch-circuit short-circuit and ground-fault protection, and the separate overload protection. This marking on the equipment nameplate shall not be less than the current marked on the fan or blower motor nameplate. determine the ampacity of branch-circuit conductors in addition to the current ratings of the following:~~ in addition to the current ratings of the following:

1. Disconnecting means
2. Motor controllers
3. Short-circuit and ground-fault protective devices
4. Separate overload protective devices

Exception No. 3: For a listed motor-operated appliance that is marked with both motor horsepower and full-load current, the motor full-load current marked on the nameplate of the appliance shall be used instead of the horsepower rating on the appliance nameplate to determine the ampacity ~~or rating of the disconnecting means, the~~ of branch-circuit conductors, ~~the controller, the branch-circuit short-circuit and ground-fault protection, and any separate overload protection.~~ in addition to the current ratings of the following:

1. Disconnecting means
2. Motor controllers
3. Short-circuit and ground-fault protective devices
4. Separate overload protective devices

430.6(A)(2) Nameplate Values.

~~Separate motor overload protection shall be based on the~~ The motor nameplate current ratings shall be used to determine the values for the following:

1. Separate motor overload protection
2. For motors built for low speeds (less than 1200 RPM), high torques, canned pumps, or multispeed motors, the following:
   c. Ampacity of conductors
   d. Current ratings of switches
   e. Current ratings of branch-circuit short-circuit and ground-fault protection
3. Large motors exceeding the values in Part XIV shall use the nameplate current rating for conductor sizing.

Related *NEC* Sections

- 430.32
- 430.52

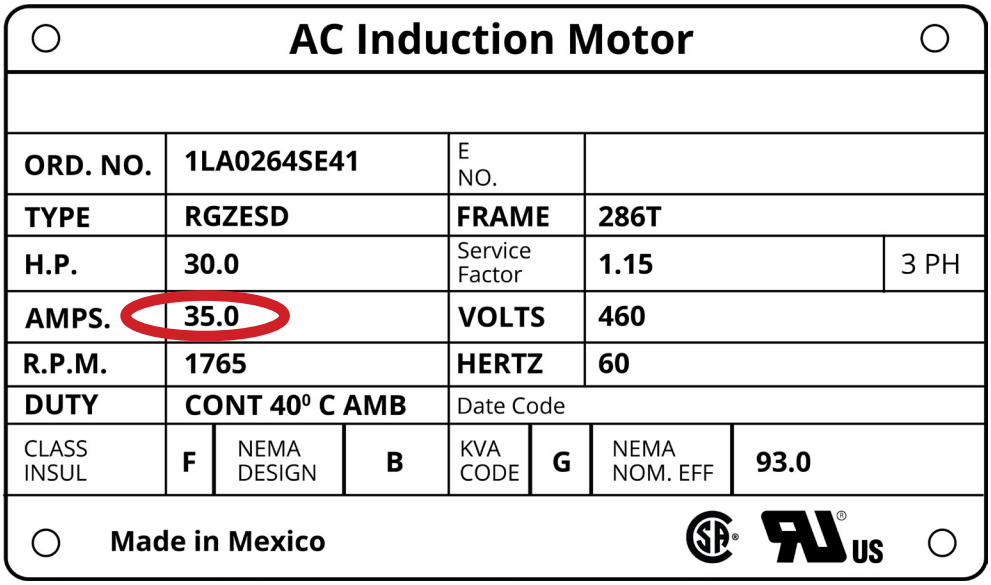
Significance of Change

The requirements in sections 430.6(A)(1) and 430.6(A)(2) have not changed, but the information has been reorganized into a list format. There was often confusion about whether the motor full-load current from the tables should be used to size motor circuit components or if the motor full-load current marked on the nameplate should be used so it was also rearranged for clarity.

For typical motor applications the full-load current from the motor tables is used to size the conductors, switches and branch-circuit short-circuit and ground-fault protective devices and the full-load current from the name plate is used to size the motor overload protection. There are some notable exceptions such as low speed motors, high torque motors, multispeed motors, and large motors exceeding the values in the tables.

Change Summary

- The information is reorganized into a list format and added clarity to when the full-load current from Tables 240.247, 240.248, 240.249, and 248.250 is used versus when the full-load current from the motor nameplate is used when sizing motor circuit components.



AC Induction Motor							
ORD. NO.	1LA0264SE41		E NO.				
TYPE	RGZESD		FRAME	286T			
H.P.	30.0		Service Factor	1.15		3 PH	
AMPS.	35.0		VOLTS	460			
R.P.M.	1765		HERTZ	60			
DUTY	CONT 40⁰ C AMB		Date Code				
CLASS INSUL	F	NEMA DESIGN B	KVA CODE	G	NEMA NOM. EFF	93.0	
Made in Mexico							

AC Induction Motor Nameplate- marked nameplate current ratings used to determine values for separate overload protection. It is also used in place of the tables for motors built for low speeds, high torques, canned pumps or multi-speed motors, and large motors exceeding the table values.

Table 430.250 Full-Load Current, Three-Phase Alternating-Current Motors

The following values of full-load currents are typical for motors running at speeds usual for belted motors with normal torque characteristics. The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120, 220 to 240, 440 to 480, 550 to 600, and 2300 to 2400 volts.

	Percentage of Full-Load Current						
Horsepower	115 Volts	200 Volts	208 Volts	230 Volts	460 Volts	575 Volts	2300 Volts
1/2	4.4	2.5	2.4	2.2	1.1	0.9	—
3/4	6.4	3.7	3.5	3.2	1.6	1.3	—
1	8.4	4.8	4.6	4.2	2.1	1.7	—
1 1/2	12.0	6.9	6.6	6.0	3.0	2.4	—
2	13.6	7.8	7.5	6.8	3.4	2.7	—
3	—	11.0	10.6	9.6	4.8	3.9	—
5	—	17.5	16.7	15.2	7.6	6.1	—
7 1/2	—	25.3	24.2	22	11	9	—
10	—	32.2	30.8	28	14	11	—
15	—	48.3	46.2	42	21	17	—
20	—	62.1	59.4	54	27	22	—
25	—	78.2	74.8	68	34	27	—
30	—	92	88	80	40	32	—
40	—	120	114	104	52	41	—

	Synchronous-Type Unity Power Factor* (Amperes)			
Horsepower	230 Volts	460 Volts	575 Volts	2300 Volts
1/2	—	—	—	—
3/4	—	—	—	—
1	—	—	—	—
1 1/2	—	—	—	—
2	—	—	—	—
3	—	—	—	—
5	—	—	—	—
7 1/2	—	—	—	—
10	—	—	—	—
15	—	—	—	—
20	—	—	—	—
25	53	26	21	—
30	63	32	26	—
40	83	41	33	—

Table values used to determine ampacity of conductors, current rating of switches, and current ratings of branch-circuit short-circuit and ground-fault protection.

* Note the difference between the ampere rating listed in fuse sizing and what is listed on the label.

Other Significant Changes

430.52 Rating or Setting for Individual Motor Circuit
Part IV. Motor Branch-Circuit Short-Circuit and Ground-Fault Protection
Article 430 Motors, Motor Circuits, and Controllers
Chapter 4 Equipment for General Use

Revised text

Table 430.52(C)(1) Maximum Rating or Setting of Motor Branch-Circuit Short-Circuit and Ground-Fault Protective Devices

	Percentage of Full-Load Current			
Type of Motor	**Nontime Delay Fuse[1]**	**Dual Element (Time-Delay) Fuse[1]**	**Instantaneous Trip Breaker**	**Inverse Time Breaker[2]**
Single-phase motors	300	175	800	250
AC polyphase motors other than wound-rotor	300	175	800	250
Squirrel cage — other than Design B energy-efficient and Design B premium efficiency.	300	175	800	250
Design B energy-efficient and Design B premium efficiency.	300	175	1100	250
Synchronous[3]	300	175	800	250
Wound-rotor	150	150	800	150
DC (constant voltage)	150	150	250	150

Note: ~~For~~ See 430.54 for certain exceptions to the values specified, ~~see 430.54.~~

[1]The values in the Nontime Delay Fuse column apply to time-delay Class CC fuses.

[2]The values given in the last column also cover the ratings of nonadjustable inverse time types of circuit breakers that ~~may~~ can be modified as in ~~430.52(C)(1), Exceptions No. 1 and No. 2~~ 430.52(C)(1)(a) and (C)(1)(b).

[3]Synchronous motors of the low-torque, low-speed type (usually 450 rpm or lower), such as ~~are~~ those used to drive reciprocating compressors, pumps, and so forth, that start unloaded, do not require a fuse rating or circuit-breaker setting in excess of 200 percent of full-load current.

Related *NEC* Sections

- 430.6

Significance of Change

The requirements in 430.52(C) have not significantly changed, but they have undergone an extensive reorganization in an effort to improve clarity and usability. In 430.52(C)(1) Exceptions No. 1 and No. 2 have been re-written as rules rather than exceptions in compliance with the *NEC* Style Manual. Section 430.52(C)(3) has been re-organized to part (a) covering application requirement and part (b) covering settings and the two exceptions have been re-written as rules.

Design B premium efficiency motors have largely replaced Design B energy-efficient motors so they have been added to the requirements in Table 430.52(C)(1) and throughout 430.52(C).

Change Summary

- Design B premium efficiency motors were added and treated the same as Design B energy-efficient motors
- Several requirements were re-written as rules rather than exceptions

440.11 General
Part II. Disconnecting Means
Article 440 Air-Conditioning and Refrigerating Equipment
Chapter 4 Equipment for General Use

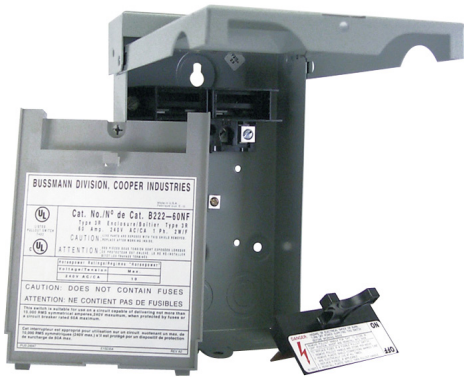
Revised text

440.11 General.

~~Part II is intended to require~~
Disconnecting means shall be capable of disconnecting air-conditioning and refrigerating equipment, including motor-compressors and controllers from the circuit conductors. If the disconnecting means is readily accessible to unqualified persons, any enclosure door or hinged cover of a disconnecting means enclosure that exposes energized parts when open shall require a tool to open or be capable of being locked.

Non-fused disconnect with GFCI receptacle.

Fused disconnect



Non-fused disconnect

Significance of Change

Disconnecting means for residential and some commercial air-conditioning units are often located where they are accessible by unqualified persons. The language was added to ensure that if there are any exposed energized parts when the door or cover is opened, then a tool is required to open the enclosure or the enclosure is capable of being locked.

Change Summary

- Added requirement to require a tool to open the disconnecting means or that the disconnecting means is capable of being locked if there are exposed energized parts when open.

Revised text

440.22 (A) Rating or Setting for Individual Motor-Compressor.

The motor-compressor branch-circuit short-circuit and ground-fault protective device shall be capable of carrying the starting current of the motor. A protective device having a rating or setting not exceeding 175 percent of the motor-compressor rated-load current or branch-circuit selection current, whichever is greater, shall be permitted, ~~provided that, where the protection specified is not sufficient for the starting current of the motor, the rating or setting shall be permitted to be increased but shall not exceed 225 percent of the motor rated-load current or branch-circuit selection current, whichever is greater.~~

Exception No. 1: If the values for branch-circuit short-circuit and ground-fault protection in accordance with 440.22(A) do not correspond to the standard sizes or ratings of fuses, nonadjustable circuit breakers, thermal protective devices, or available settings of adjustable circuit breakers, a higher size, rating, or available setting that does not exceed the next higher standard ampere rating shall be permitted.

Exception No. 2: If the values for branch-circuit short-circuit and ground-fault protection in accordance with 440.22(A) or the rating modified by Exception No. 1 is not sufficient for the starting current of the motor, the rating or setting shall be permitted to be increased but shall not exceed 225 percent of the motor rated-load current or branch-circuit selection current, whichever is greater.

Exception No. 3: The rating of the branch-circuit short-circuit and ground-fault protective device shall not be required to be less than 15 amperes.

Significance of Change

The language of 440.22(A) has been reorganized and two exceptions have been added. Exception No. 1 allows you round up to the next standard size branch-circuit short-circuit and ground-fault protective device if the 175% calculation does not correspond to a standard rating or setting. Exception No. 2 permits that if the branch-circuit short-circuit and ground-fault protective device based on the 175% calculation does not allow the motor to start, you are allowed to increase the rating up to, but not exceeding 225% of the rated-load current or branch-circuit selection current, whichever is greater.

Change Summary

- Reorganized the requirement as a rule with two added exceptions and clarifies that if the 175% calculation does not correspond to a standard rating you are allowed to round up to the next hire standard rating.

Related *NEC* Sections

- 430.52 (C)

700.3(F) Temporary Source of Power for Maintenance or Repair of the Alternate Source of Power
700.3 Test and Maintenance
Part I. General
Article 700 Emergency Systems
Chapter 7 Special Conditions

Revised text

700.3(F) Temporary Source of Power for Maintenance or Repair of the Alternate Source of Power.

If the emergency system relies on a single alternate source of power, which will be disabled for maintenance or repair, the emergency system shall include permanent switching means to connect a portable or temporary alternate source of power, ~~which~~ that shall be available for the duration of the maintenance or repair. The permanent switching means to connect a portable or temporary alternate source of power shall comply with the following:

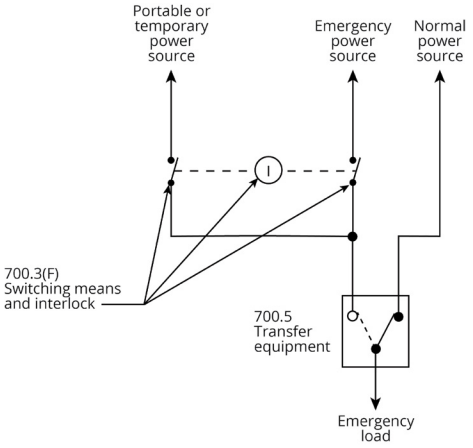
1. Connection to the portable or temporary alternate source of power shall not require modification of the permanent system wiring.
2. Transfer of power between the normal power source and the emergency power source shall be in accordance with 700.12.
3. The connection point for the portable or temporary alternate source shall be marked with the phase rotation and system bonding requirements.
4. ~~Mechanical or electrical interlocking shall~~The switching means, including the interlocks, shall be listed and provided with mechanical or mechanical and electrical interlocking to prevent inadvertent interconnection of power sources.
5. The switching means shall include a contact point that shall annunciate at a location remote from the generator or at another facility monitoring system to indicate that the permanent emergency source is disconnected from the emergency system.
6. The permanent connection point for the temporary generator shall be located outdoors and shall not have cables from the connection point to the temporary generator routed through exterior windows, doors, or similar openings.
7. A permanent label shall be field applied at the permanent connection point to identify the system voltage, maximum amperage, short-circuit current rating of the load side of equipment supplied, and ungrounded conductor identification in accordance with 210.5.

It shall be permissible to ~~utilize~~use manual switching to switch from the permanent source of power to the portable or temporary alternate source of power and to ~~utilize~~ use the switching means for connection of a load bank.

Informational Note: ~~There are~~See Informational Note Figure 700.3(F) for one example of many possible methods to achieve the requirements of 700.3(F). ~~See Informational Note Figure 700.3(F) for one example.~~

Exception: The permanent switching means to connect a portable or temporary alternate source of power, for the duration of the maintenance or repair, shall not be required where any of the following conditions exists:

1. *All processes that rely on the emergency system source are capable of being disabled during maintenance or repair of the emergency source of power.*
2. *The building or structure is unoccupied and fire protection systems are fully functional and do not require an alternate power source.*
3. *Other temporary means can be substituted for the emergency system.*
4. *A permanent alternate emergency source, such as, but not limited to, a second on-site standby generator or separate electric utility service connection, capable of supporting the emergency system, exists.*



Informational Note Figure 700.3(F)

Significance of Change

Maintenance of the alternate source of power supplying the emergency system is a very important consideration and required per manufacturer instructions per 700.3(C). This requirement applies where a single alternate source of power supplies the emergency system. The switching means is permitted to be automatic or manual. The revision now requires the switching means and mechanical or mechanical and electrical interlocks to be listed and prevent inadvertent interconnection of power. A new list item (6) requires a permanent connection point located outdoors without cables from the connection point to the temporary generator. New list item (7) requires a permanent label to be field applied at the permanent connection point which includes the system voltage, maximum amperage, the short-circuit current rating of the load side equipment, and ungrounded conductor identification. The permanent switching means is not required where one or more of the conditions in the exception exist.

Change Summary

- Switching means including the mechanical and electrical interlocks shall be listed.
- A permanent connection point for the temporary generator shall be located outside and shall not have cables routed from the from the connection point to the temporary generator through exterior windows, doors or similar openings.
- A permanent label is required to be field applied at the permanent connection point and identify the system voltage, maximum amperage, short-circuit current ratings of load side equipment, and identification of ungrounded conductors.
- A permanent switching means is not required where one or more of the four conditions in the exception exist.

Related *NEC* Sections

- 700.3 (C)

Other Significant Changes

Revised text

700.5(D) Redundant Transfer Equipment.

If emergency loads are supplied by a single feeder, the emergency power system shall include redundant transfer equipment or a bypass isolation transfer switch to facilitate maintenance as required in 700.3(C) without jeopardizing continuity of power. If the redundant transfer equipment or bypass isolation transfer switch is manual (or non-automatic), then it shall be actively supervised by a qualified person when the primary (automatic) transfer equipment is disabled for maintenance or repair.

Exception: The requirement for redundancy with the transfer equipment shall not apply where any of the following conditions exist:

1. *All processes that rely on the emergency system source are capable of being disabled during maintenance or repair activities without jeopardizing the safety to human life.*
2. *The building or structure is unoccupied and fire protection systems are fully functional and do not require an alternate power source.*
3. *Other temporary means shall be permitted to be substituted for the emergency system.*
4. *A written emergency plan that includes mitigation actions and responsibilities for qualified persons to address the recognized site hazards for the duration of the maintenance or repair activities shall be developed and implemented. The emergency plan shall be made available to the authority having jurisdiction.*

Related *NEC* Sections

- Article 100 Definitions, Bypass Isolation Transfer Switch
- 700.3 (C)

Significance of Change

Maintenance of the automatic transfer switch supplying the emergency system is a very important consideration and required per manufacturer instructions per 700.3(C). The new requirement applies where emergency loads are supplied by a single feeder, which is typical for most emergency systems. Utilizing redundant transfer equipment or a bypass isolation transfer switch can allow the maintenance of the automatic transfer switch while in bypass mode. If the redundant transfer equipment or bypass isolation transfer switch is non-automatic, then it is required to be actively supervised by a qualified person during maintenance.

There are four exceptions where redundancy with the transfer equipment is not required, similar to the exceptions in 700.3(F).

Change Summary

- Redundant transfer equipment or bypass isolation transfer switch is required where emergency loads are supplied from a single feeder.
- If the redundant transfer equipment or bypass isolation transfer switch is non-automatic, it is required to be actively supervised by a qualified person during maintenance.
- Redundant transfer equipment or bypass isolation transfer switch is not required where one or more of the four conditions in the exception exist.

NEC Code Changes video series

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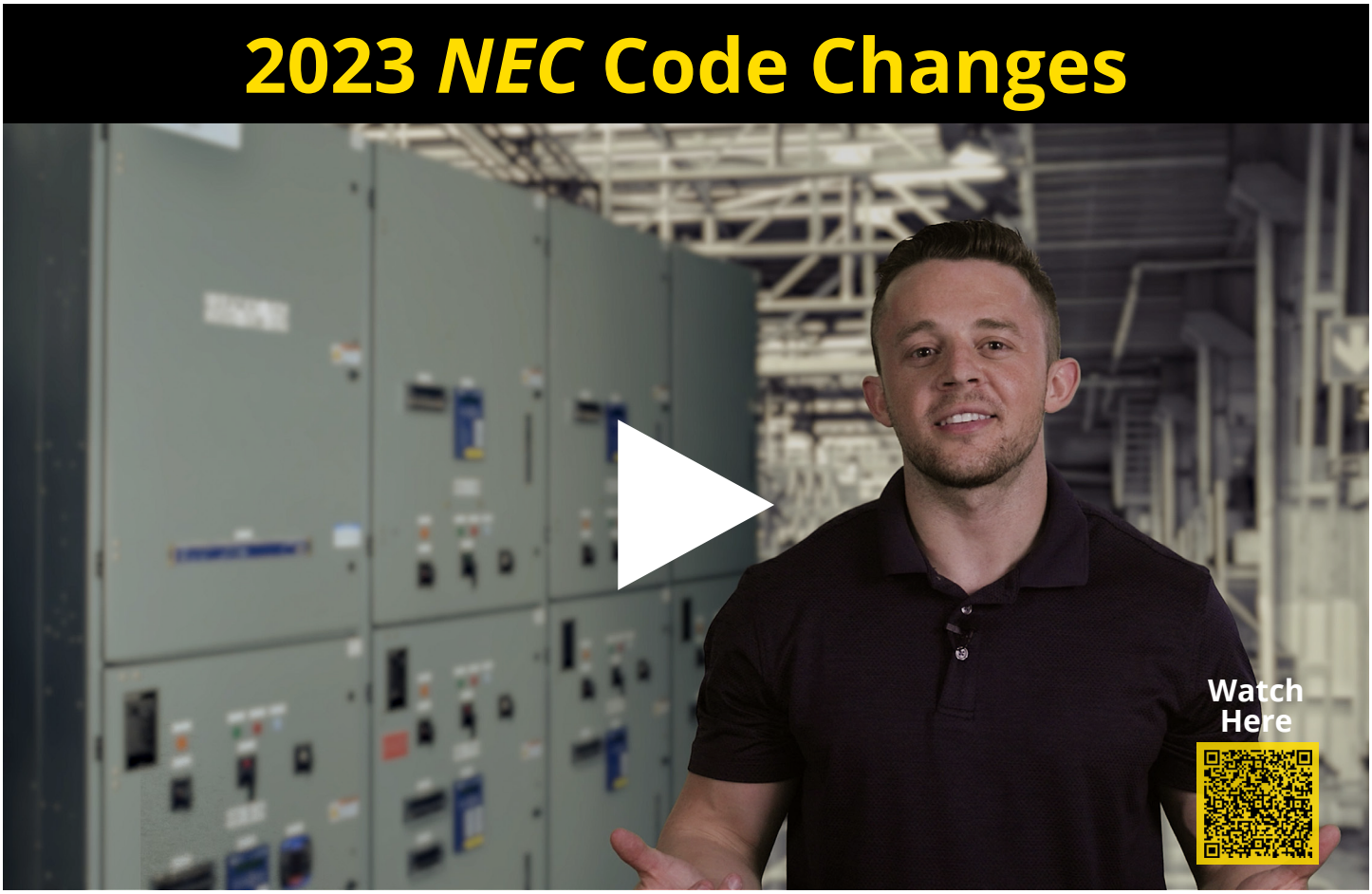

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Printed in USA
Publication No. 11318 — BU-MC20287
January 2024

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