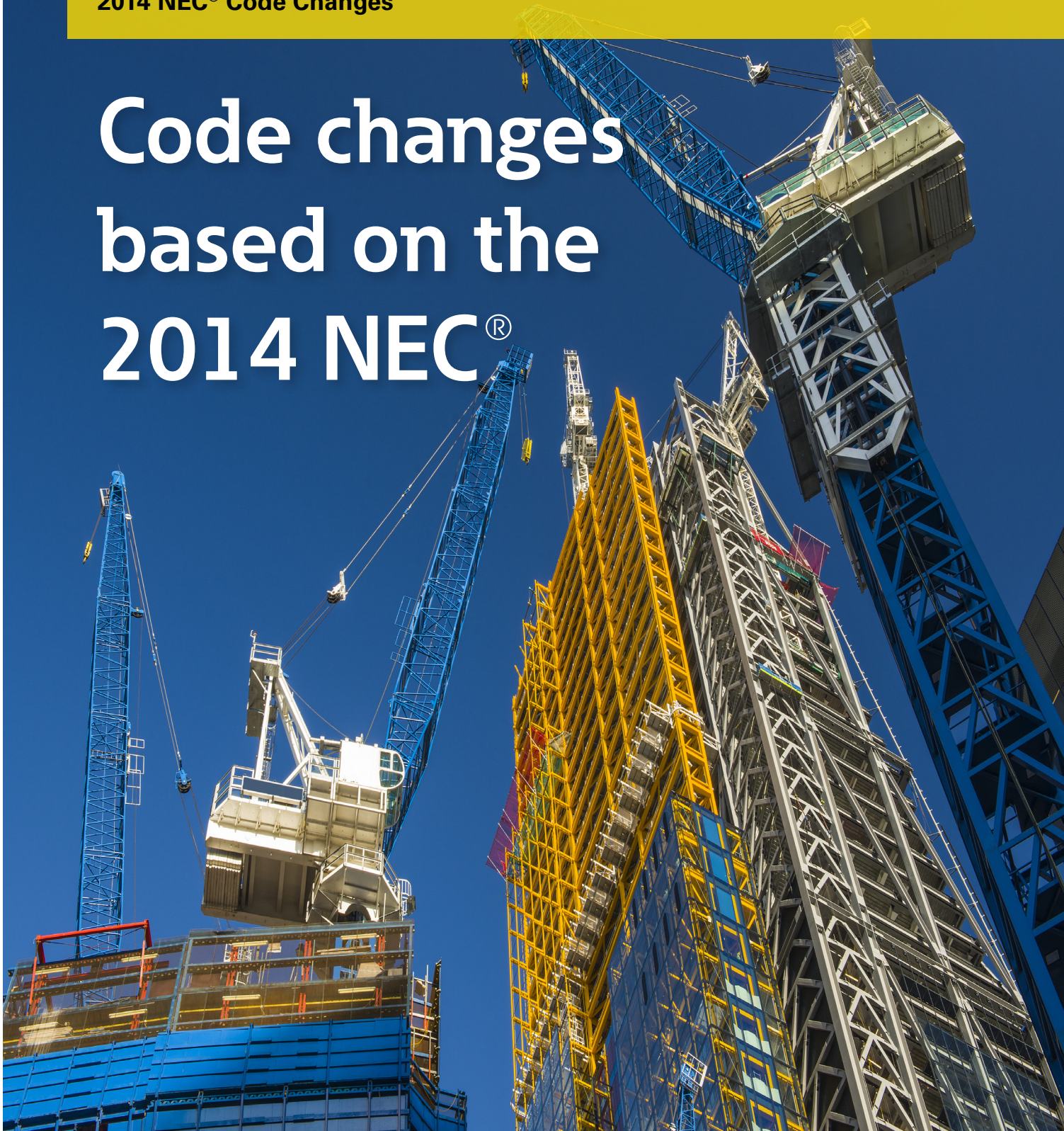


2014 NEC® Code Changes

Code changes based on the 2014 NEC®



Powering Business Worldwide

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What you'll find in this handbook

This brochure highlights the 2014 NEC® changes pertaining to circuit protection. Please refer to the Selecting Protective Devices (SPD) handbook No. 3002, based on the 2014 NEC® for more detail and further explanations.

110.9 Interrupting Rating

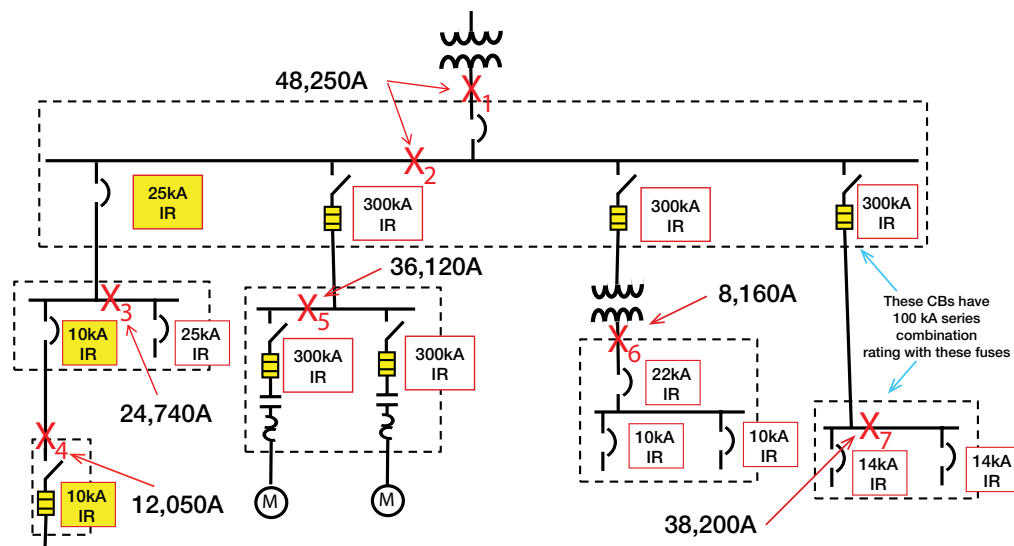
Article 110 Requirements for Electrical Installations
Part I General

REVISION

110.9 Interrupting Rating.

Equipment intended to interrupt current at fault levels shall have an interrupting rating not less than the at nominal circuit voltage and sufficient for the current that is available 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 not less than sufficient for the current that must be interrupted.



Which circuit breakers or fuses have an inadequate interrupting rating?

Significance of the change

110.9 is located in Article 110, Chapter 1 General Requirements, which applies generally to all electrical installations. This is a safety requirement that if not met, can result in catastrophic, explosive failure to an overcurrent protective device, switch, or controller. The remainder of this discussion will focus on fault current interrupting requirements.

Whenever a fuse or circuit breaker voltage rating and ampere rating are selected, based upon the application and requirements in other Articles of the NEC®, the selection process is not complete. The first sentence of 110.9 requires that a fuse or circuit breaker must additionally have an interrupting rating at the system voltage sufficient for the available fault current at the line terminals of the fuse or circuit breaker.

There are two means for compliance with 110.9. The first is fully rated fuses and circuit breakers which means that each fuse or circuit breaker has an individual interrupting rating at the applied voltage which is equal to or greater than the available fault current at the line terminals of the fuse or circuit breaker (110.9). The second method is to comply with 240.86 series ratings. In this case, a circuit breaker can be applied where the available fault current exceeds the circuit breaker's interrupting rating for the applied voltage, if an upstream fuse or circuit breaker provides the level of protection for the downstream circuit breaker in compliance with 240.86 and equipment labeling is per 240.86 and 110.22.

In order to comply with the fault current interrupting rating requirement, it typically is necessary to calculate the available fault current at each location where a fuse or circuit breaker is to be applied. Then a fuse or circuit breaker must be selected where the interrupting rating is sufficient at the applied voltage.

Change summary

- Editorial change for clarity and consistency between first sentence which pertains to fault current interrupting rating for overcurrent protective devices and the second

sentence which pertains to devices that interrupt other than fault current, such as switches and motor controllers.

Related NEC® Sections

Article 100 Definitions:
Interrupting Rating
110.22

110.24 see page 6
240.60(C)
240.83(C)
240.85
240.86

110.9 Interrupting Rating

Article 110 Requirements for Electrical Installations
Part I General

REVISION

Following are key considerations for overcurrent protective device interrupting rating:

- Most current-limiting fuses used in electrical distribution systems and utilization equipment have 200kA or 300kA interrupting rating. It is the “no worry” solutions for 110.9 compliance for the vast majority of applications. See table.
- Interrupting ratings of circuit breakers vary by voltage.
- From design to start-up, the available fault currents are not certain. The parameters affecting the available fault current are subject to change during the entire process of design, value engineering, system install, and transformer install. Specifying and installing high interrupting rated fuses and circuit breakers with a wide margin for increases in the available fault currents can help accommodate potential changes without jeopardizing safety or increasing liability.
- After a construction project is completed, the available fault current in a system can increase. One of the common causes, which may go unnoticed, is the utility changing the service transformer due to transformer failure or need to increase kVA capacity. If the replacement transformer has a larger kVA rating and/or lower percentage impedance, the available fault currents can significantly increase.
- OSHA §1930.303(b)(4) requires the proper interrupting rating for all overcurrent protective devices (similar to 110.9). OSHA §1910.302(b) requires compliance to §1930.303(b)(4) irrespective of the age or installation date of the system.
- NFPA 70E Standard for Electrical Safe Work Practices in the Workplace 210.5 requires protective devices to be adequately maintained to interrupt available fault current.

More resources

- FC² Available Fault Current Calculator: downloadable App and on-line www.cooperbusssmann.com/FC2
- Selecting Protective Devices publication www.cooperbusssmann.com/spd
- Consulting ApplicationGuide <http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT260923>
- Selective Coordination Guide www.eaton.com/selectivecoordination

Fuses for mains, feeders, and branch circuits

Tier of Protection	Line	UL Fuse Class	Symbol	AC volt rating	Amp rating	Interrupting rating (AC)
Ultimate protection	Low-Peak™	CF	TCF,TCF-RN	600	1 to 100	300,000
		J	LPJ_SP, LPJ_SPI	600	1 to 600	300,000
		RK1	LPS-RK_SP, LPN-RK_SP	600 250	1/10 to 600	300,000
		CC	LP-CC	600	1/2 to 30	200,000
		L	KRP-C_SP	600	601 to 6000	300,000
Advanced protection	Fusetron™	RK5	FRS-R FRN-R	600 250	1/10 to 600	200,000
		CUBEFuse	CF	600	1 to 100	300,000
	Limitron™	J	JKS	600	1 to 600	200,000
		RK1	KTS-R KTN-R	600 250	1 to 600	200,000
		T	JJS JJN	600 300	1 to 800 1 to 1200	200,000
		CC	KTK-R	600	1/10 to 30	200,000
		CC	FNQ-R	600	1/4 to 30	200,000
		L	KTU and KLU	600	601 to 6000	200,000
Basic protection	One-Time	G	SC	600 480	1/2 to 20 25 to 60	100,000
		K5	NOS NON	600 250	1 to 60 1/8 to 60	50,000
		H	NOS NON	600 250	70 to 600 70 to 600	10,000

110.24 Available Fault Current

(A) Field Marking

Article 110 Requirements for Electrical Installations

Part I General

CHANGE

110.24 Available Fault Current.

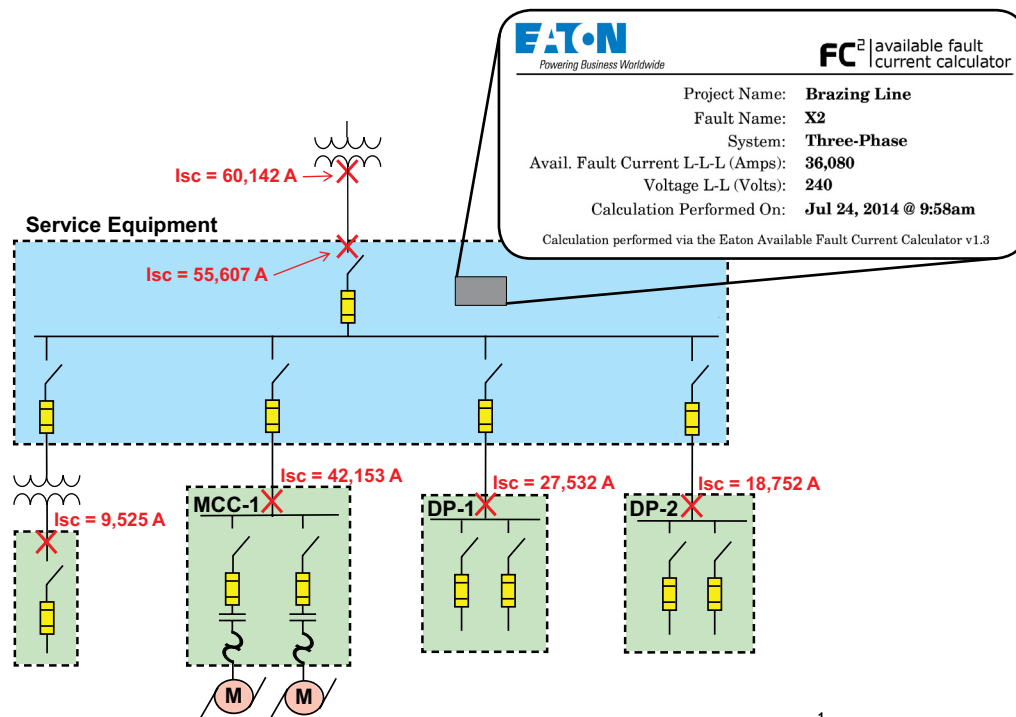
(A) Field Marking.

Service equipment in other than dwelling units shall be legibly marked in the field with the maximum available fault current. The field marking(s) shall include the date the fault-current calculation was performed and be of sufficient durability to withstand the environment involved.

Informational Note: The available fault-current marking(s) addressed in 110.24 is related to required short-circuit current ratings of equipment. NFPA 70E-2012, Standard for Electrical Safety in the Workplace, provides assistance in determining the severity of potential exposure, planning safe work practices, and selecting personal protective equipment.

(B) Modifications.

(Unchanged).



Significance of the change

Section 110.24 requires that service equipment, in other than dwelling units and some industrial installations, be field marked with the maximum available fault current and the date that the calculation was performed. In addition, it is required that updates be made to the marking whenever modifications are made to the system that result in changes to the maximum available short-circuit current.

A new informational note was added to advise that the intent of the marking is compliance with overcurrent protective device interrupting ratings (110.9) and electrical equipment fault current ratings (110.10).

The informational note also advises that, for arc flash incident energy analysis and other safe work practices, NFPA 70E provides assistance. However, since the maximum available fault current that is required to be marked on the service equipment may be a conservative calculation, it may not be appropriate to use in the calculation of the arc flash incident energy. However, the marked maximum fault current could be used to verify that the 2015 NFPA 70E Table 130.7(C)(15)(A)(b) parameter maximum fault current available is not exceeded (Table Method).

Change summary

- A new informational note to 110.24(A).
- This note advises that the 110.24 maximum available fault current marking on service equipment pertains to equipment short-circuit current ratings and overcurrent protective device interrupting ratings.
- The 110.24 maximum available fault current marking is not intended for determining the arc flash incident energy.

Related NEC® Sections

110.9 see page 4

110.10

240.86

110.24 Available Fault Current

(A) Field Marketing

Article 110 Requirements for Electrical Installations

Part I General

CHANGE

For compliance with 110.9 and 110.10, the maximum available fault current can be calculated conservatively by using infinite available for the primary of the service transformer or omitting the service conductor impedance. As long as the overcurrent protective devices and service equipment have sufficient interrupting ratings and short-circuit current ratings, a conservative calculation is permitted.

For service equipment, one intent of 110.24 is to ensure that the overcurrent protective devices have interrupting ratings which are equal to or greater than the maximum available short-circuit current and that the equipment short-circuit current rating is equal to or greater than the maximum available short-circuit current.

When using the 2015 NFPA 70E 130.5 Arc Flash PPE Category Method (formerly HRC Method or commonly called the table method), the 110.24 maximum available fault current could be used for verifying that the Table 130.7(C)(15)(A)(b) parameter maximum short-circuit current available is not exceeded.

Modifications or expansion of a system can change the available short-circuit current. A common occurrence is the utility changing the service transformer due to transformer failure or need to increase kVA capacity. If the transformer has a larger kVA rating and/or lower percentage impedance, the available short-circuit currents can greatly increase.

For safety, when changes to the system occur that may increase the available fault current at the service equipment, adherence to 110.24(B) is necessary. Verify that the maximum available fault current marked on the service equipment is still valid; if not, a new label marked with the new value of maximum available fault current and date of calculation is required.

More resources

- FC² Available Fault Current Calculator: downloadable App and on-line; this app includes ability to create 110.24 label image for printing.
www.cooperbussmann.com/FC2.
- Point-to-Point Fault Current Calculation Method in Selecting Protective Devices handbook
www.cooperbussmann.com/spd.
- Consulting Application Guide for circuit breaker interrupting ratings http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT_260923

Selecting Protective Devices handbook
www.cooperbussmann.com/spd.

- Section on Bussmann fuse interrupting ratings
- Section on interrupting rating including links to QRs to videos of test demonstrations.
- Section on series ratings and tables of fuse to circuit breaker series ratings.
- Section on 110.24
- Section of short-circuit current ratings
- Section on electrical safety and arc flash risk assessment

Tools

FC² available fault current calculator

Designed for three-phase and single-phase systems. Quick, easy method to calculate available fault current at one or multiple points in an electrical distribution system. Scan QR Code to download app for Apple and Android mobile devices. Web-based version via www.cooperbussmann.com/fc2. Product profile No. 10106



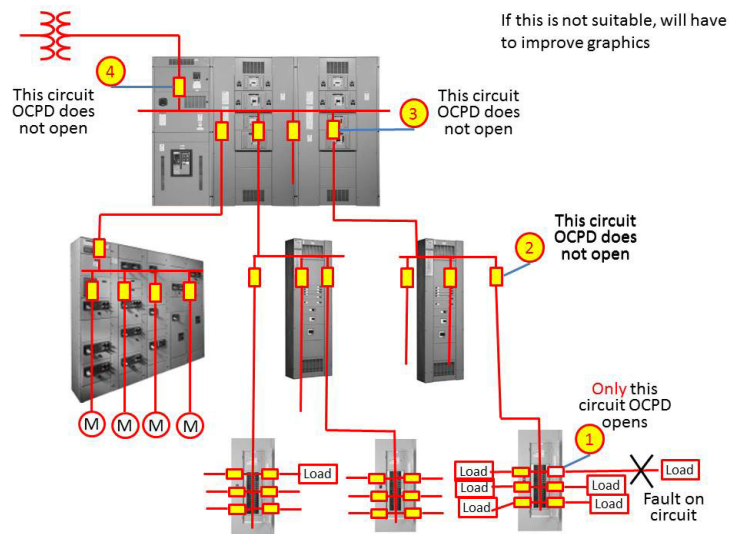
Definition of Coordination, Selective

Article 100 Definitions, Part I General

CHANGE

Coordination (Selective).

Localization of an overcurrent condition to restrict outages to the circuit or equipment affected, accomplished by the choice selection and installation of overcurrent protective devices and their ratings or settings for the full range of available overcurrents, from overload to the maximum available fault current, and for the full range of overcurrent protective device opening times associated with those overcurrents.



Selective coordination exists when an overcurrent on a circuit, such as shown by the X, opens only the nearest upstream overcurrent protective device. The larger upstream ampere rated OCPDs on the circuit do not open, such as 2 (subfeeder), 3 (feeder), and 4 (main). This maximizes continuity of service for the remaining circuits.

Significance of the change

This revised definition clarifies the meaning of selective coordination. Selective coordination as used within the NEC® is the interruption of only the nearest upstream overcurrent protective device during all possible overcurrent conditions on the system. No other upstream, larger ampere rated overcurrent protective device is to open. By this action, the remainder of the electrical system is unaffected and can continue delivering power to the other circuits and loads. Selective coordination improves the reliability of an electrical system to deliver power to the loads.

The phrase “selection and installation” replacing the word “choice” clarifies that it is not a choice that achieves selective coordination but rather it is the proper selection by analysis of overcurrent protective device types, ampere ratings, characteristics and, settings and then the installation of the overcurrent protective devices that adhere to these selections.

The new verbiage at the end of the sentence clarifies that selective coordination is for the “full range of available overcurrents” and “for the full range of overcurrent protective device opening times associated with those overcurrents.” This means selective coordination is not limited to a specified subset of available overcurrents, such as fault currents less than 10,000 amperes, or limited to a specified subset of overcurrent protective device opening times, such as for times greater than 0.1 seconds or times greater than 0.01 seconds.

The NEC® is the principal document where the term selective coordination was originally defined and related requirements were initially developed.

Related NEC® sections

620.62 see page 12

645.27 see page 14

695.3

700.10(B)(5)(b)

700.28 see page 10

701.27 see page 10

708.54 see page 10

517.30(G) see page 18

Change summary

- The phrase “selection and installation” replaces “choice.”
- Clarifies that selective coordination is for the full range of overcurrents and includes all overcurrent protective device clearing times associated with those overcurrents.

Definition of Coordination, Selective

Article 100 Definitions, Part I General

CHANGE

See the change in this document for 517.30(G) which permits a less restrictive “coordination” requirement applicable to healthcare essential electrical systems: “coordinated for the period of time that a fault’s duration extends beyond 0.1 seconds.” Providing a selection that only meets “coordination” does not meet the definition of selective coordination since it is not for the full range of available overcurrents and for the full range of overcurrent protective device opening times associated with those overcurrents. There can be a clear difference in system reliability if the selection is to “selective coordination” versus to “coordination.” “Coordination” is less restrictive and may not result in a system with the same reliability as “selectively coordinated” system. However, providing a selection that provides selective coordination will in addition comply with the 517.30(G) “coordination” requirement. All systems that are selectively coordinated will meet the requirements for a coordinated system, but systems that are simply coordinated will not necessarily be selectively coordinated.

More resources

- Fuse-to-Fuse Selectivity Ratio Guide table
- Circuit Breaker-to-Fuse Selective Coordination tables
- Circuit Breaker-to-Circuit Breaker Selective Coordination tables

Products

Fusible panelboards:



Quik-Spec
Coordination Panelboard



Pow-R-Line 3FQS

30, 60, 100, 200, 400A panelboards
Utilize Compact Circuit Protector
(CCP Switch) with CUBEfuses, 600V or
less, 1 to 100A for branch circuits

Bussmann Low-Peak™ fuses

Selecting and installing fuses for a selectively coordinated electrical system is easy using Bussmann Low-Peak fuses. Simply adhere to the published ampere rating ratios of 2:1. These ratios are applicable up to 200kA available fault current for the Low-Peak fuses shown below. In addition, if the available fault currents on a system increase during the design to construction cycle or any time after energization, selective coordination is retained, (unless the available fault current exceeds 200kA).



LP-CC,
1/2 to 30A,
(600V),
Class CC



CUBEFuse,
1 to 100A,
(600V),
Class CF



LPJ (amp)SP,
1 to 600A,
(600V),
Class J



LPS-RK (amp)SP,
1/10 to 600A,
(600V),
Class RK1



LPN-RK (amp)SP
1/10 to 600A,
(250V),
Class RK1



KRP-C (amp) SP
601 to 6000A,
(600V),
Class L

700.28, 701.27, and 708.54 Selective Coordination

CHANGE

Article 700 Emergency Systems, Part VI Overcurrent Protection; Article 701 Legally Required Standby Systems, Part IV Overcurrent Protection; and 708.54 Critical Operations Power Systems, Part IV Overcurrent Protection

Emergency system(s) 700.28 Selective Coordination.

Emergency system(s) overcurrent devices shall be selectively coordinated with all supply-side overcurrent protective devices. 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.

Exception: (remains unchanged) ...

(Note: 701.27 and 708.54 have the same new paragraph inserted.)

The image displays three tables from the National Electrical Code (NEC) related to selective coordination:

- Fuse to fuse table:** Table 8, Selectivity ratio guide (upstream/downstream to downstream/upstream).
- Circuit breaker to circuit breaker table:** Table 9, MCCB Selective Coordination Combinations. It includes columns for Breaker Frame (J, K, H, D), Trip Unit Type (TMA, TMB, TMC, TMD), Minimum Amp Rating (70A, 100A, 150A, 200A, 250A, 300A, 400A, 500A), and Power Line (Main, Branch, Sub-Feed).
- Circuit breaker to fuse table:** Table 10, Molded Case Circuit Breaker (MCCB) Selective Coordination Combinations. It includes columns for Breaker Frame (J, K, H, D), Trip Unit Type (TMA, TMB, TMC, TMD), Minimum Amp Rating (70A, 100A, 150A, 200A, 250A, 300A, 400A, 500A), and Power Line (Main, Branch, Sub-Feed).

Circuit breaker to fuse table

Significance of the change

These articles cover requirements for systems in which reliability of power to supply loads is essential for life safety, first responders, public safety or national security. Selective coordination of overcurrent protective devices was added as a requirement to Articles 700 and 701 in the 2005 NEC® and then to the new Article 708 in the 2008 NEC®. In accepting the selective coordination requirement in the 2005 NEC® Article 700, Code Panel 13's panel statement provides their reasoning: "The panel agrees that selective coordination of emergency system overcurrent devices with the supply side overcurrent devices will provide for a more reliable emergency system..."

The selection of the overcurrent protective devices (types, ampere ratings, characteristics, and settings) to achieve selective coordination must be completed by a professional engineer or a person qualified for this endeavor. Providing selective coordination for overcurrent protective devices requires knowledge of manufacturers' overcurrent protective device characteristics, such as time-current curves, as well as expertise to select overcurrent protective devices that achieve selective coordination.

This change also requires that documentation of the overcurrent protective device selections be made available to those authorized in the various phases of the system life cycle, including design, installation, inspection, maintenance and operation. This documentation, provided by the PE or qualified person, is their verification that their selections are selectively coordinated.

This IAEI-submitted proposed wording change improves the process for the authority having jurisdiction and contractor. It identifies who is responsible for the selections and that person must provide verification documentation of the selections to the AHJ, which can become part of the construction documents. This requirement, in conjunction with the new clarified selective coordination definition, helps ensure that the completed project will be selectively coordinated.

Change summary

- This change improves the process for the authority having jurisdiction and contractor.
- The selection that achieves selective coordination must be completed by a professional engineer or a person qualified for this endeavor.
- This responsible person must make available the documentation verifying selective coordination of the overcurrent protective devices to those authorized in the various phases of the system life cycle, including AHJ (authority having jurisdiction), design, installation, maintenance, and operation.

Related NEC® sections

Article 100 see page 8
620.62 see page 12
645.27 see page 14
695.3
700.10(B)(5)(b)

700.28, 701.27, and 708.54 Selective Coordination

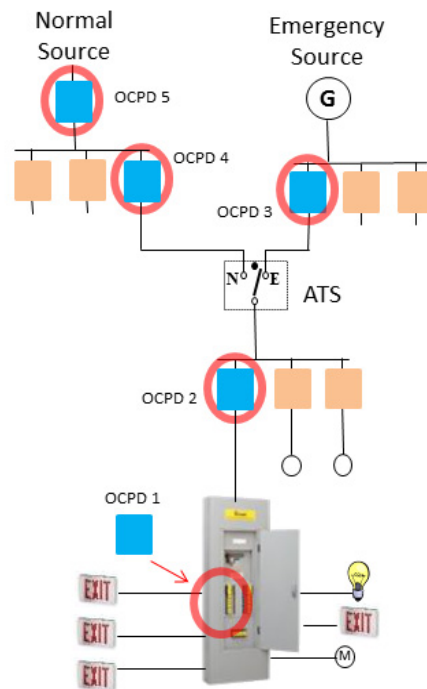
Article 700 Emergency Systems, Part VI Overcurrent Protection; Article 701 Legally Required Standby Systems, Part IV Overcurrent Protection; and 708.54 Critical Operations Power Systems, Part IV Overcurrent Protection

CHANGE

The term coordination study is commonly used in the industry. It does not ensure selective coordination is achieved. Normally it points out where the overcurrent protective devices are selectively coordinated and where they are not selectively coordinated. It may include recommendations of how to achieve a higher degree of coordination or even how to obtain selective coordination. It may also include cable and transformer protection analysis. For compliance with the selective coordination requirements in the NEC®, AHJs require documentation from the responsible party that verifies the overcurrent protective devices are selectively coordinated per the definition in the 2014 NEC® and to the specific requirement, such as 700.28. The documentation provides the specific overcurrent protective device types, ampere ratings, characteristics, and settings. Selective coordination requirements in the 2014 NEC®: 620.62, 645.27, 695.3, 700.10(B)(5)(b), 700.28, 701.27, and 708.54.

More resources

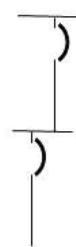
- Fuse-to-Fuse Selectivity Ratio Guide table
- Circuit Breaker-to-Fuse Selective Coordination Tables
- Circuit Breaker-to-Circuit Breaker Selective Coordination tables
- Consulting Application Guide http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT_260923
- Selective Coordination Guide www.eaton.com/selectivecoordination



Three applications

Depending on system parameters, considerations, and preferences there are three Eaton alternatives for selective coordination.

Circuit Breaker to Circuit Breaker



Utilize circuit breaker to circuit breaker selective coordination tables

Circuit Breaker to Fuse



Utilize circuit breaker to fuse selective coordination tables

Fuse to Fuse



Utilize fuse to fuse selectivity ratio guide

620.62 Selective Coordination

Article 620 Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts Part VII Overcurrent Protection

CHANGE

620.62 Selective Coordination.

Where more than one driving machine disconnecting means is supplied by a single feeder, the overcurrent protective devices in each disconnecting means shall be selectively coordinated with any other supply side overcurrent protective devices.

Selective coordination shall be selected by a licensed professional engineer or other qualified person 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.



Significance of the change

For more than 20 years, (since 1993 NEC®), this selective coordination requirement has increased the reliability for elevator service and safety for persons by ensuring an overcurrent on one elevator branch circuit does not disrupt service for another elevator or bank of elevators supplied by the same feeder.

The selection of the overcurrent protective devices (types, ampere ratings, characteristics, and settings) to achieve selective coordination must be completed by a professional engineer or a person qualified for this endeavor. Providing selective coordination for overcurrent protective devices requires knowledge of manufacturers' overcurrent protective device characteristics, such as time-current curves, as well as expertise to select overcurrent protective devices that achieve selective coordination.

This change also requires that documentation of the overcurrent protective device selections be made available to those authorized in the various phases of the system life cycle, including design, installation, inspection, maintenance and operation. This documentation, provided by the PE or qualified person, is their verification that their selections are selectively coordinated.

This IAEI-submitted proposed wording change improves the process for the authority having jurisdiction and contractor. It identifies who is responsible for the selections and that person must provide documentation of the selections to the AHJ, which can become part of the construction documents. This requirement, in conjunction with the new clarified selective coordination definition, helps ensure that the completed project will be selectively coordinated. This same wording was added to 700.28, 701.27, and 708.54.

Change summary

- This change improves the process for the authority having jurisdiction and contractor.
- The selection that achieves selective coordination must be completed by a professional engineer or a person qualified for this endeavor.
- This responsible person must make available the documentation verifying selective coordination of the overcurrent protective devices to those authorized in the various phases of the system life cycle including AHJ (authority having jurisdiction), design, installation, maintenance, and operation.

Related NEC® sections

Article 100 see page 8

645.27 see page 14

695.3

700.10(B)(5)(b)

700.28 see page 10

701.27 see page 10

708.54 see page 10

620.62 Selective Coordination

Article 620 Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts Part VII Overcurrent Protection

CHANGE

The Bussmann Power Module™ elevator disconnect and Eaton's Elevator Disconnect are simple and consistent installation solutions for complying with numerous NEC®, ASME, and NFPA 72 requirements. In one enclosure, engineering consultants and contractors can comply with the 620.62 NEC® requirement for selective coordination, ASME 17.1 shunt-trip requirement, and NFPA 72 fire safety interface and monitoring requirements. When sprinklers are installed in elevator hoistways, machine rooms, or machinery spaces, ANSI/ASME A17.1 requires that the power be removed to the affected elevator upon or prior to the activation of these sprinklers. This is most commonly accomplished through the use of a shunt-trip disconnect with its own control power. In addition, interface with the fire alarm system along with the monitoring of components required by NFPA 72 must be accomplished in order to activate the shunt-trip action when appropriate as well as helping to make sure that the system is functional during normal operation. This requires the use of interposing relays that are supplied in other equipment.

More resources

- Fuse-to-Fuse Selectivity Ratio Guide table
- Circuit Breaker-to-Fuse Selective Coordination table
- Consulting Application Guide http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT_260923
- Selective Coordination Guide www.eaton.com/selectivecoordination

Products

Power Module Switch fusible elevator disconnect:



Bussmann Quik-Spec™ Power Module Switch (PS) for single elevator applications.
Product profile No. 10268

Power Module Panel fusible elevator panelboard:



Bussmann Quik-Spec™ Power Module Panel (PMP) for multiple elevator applications
Product profile No. 10269 - 400A - 800A
Product profile No. 3187 - 600A - 1200A



Elevator disconnect for single elevator applications.
Consulting Application Guide No. 22.6-11



Elevator control panelboard for multiple elevator applications.
Consulting Application Guide No. 28.0-7

645.27 Selective Coordination

Article 645 Information Technology Equipment

NEW

645.27 Selective Coordination.

Critical operations data system(s) overcurrent protective devices shall be selectively coordinated with all supply-side overcurrent protective devices.



Significance of the new requirement

This new section requires overcurrent protective devices in critical operations data systems to selectively coordinate with all upstream overcurrent protective devices. “Critical operation data system,” defined in 645.2, includes information technology equipment systems requiring continuous operation for public safety, emergency management, national security, or business continuity. Information technology equipment is also defined in 645.2 and pertains to 600V or less.

All overcurrent protective devices for these critical electrical systems, starting with the rack Power Distribution Unit (PDU) overcurrent protective devices, must be selectively coordinated with all upstream overcurrent protective devices.

It is important to note that the power distribution system for the non-information technology equipment room, such as systems supplying HVAC equipment, which are classified as critical operation power systems, must have overcurrent protective devices that are selectively coordinated with all upstream overcurrent protective devices per 708.54.

Related NEC® sections

Article 100 see page 8

620.62 see page 12

645.27 see page 14

695.3

700.10(B)(5)(b)

700.28 see page 10

701.27 see page 10

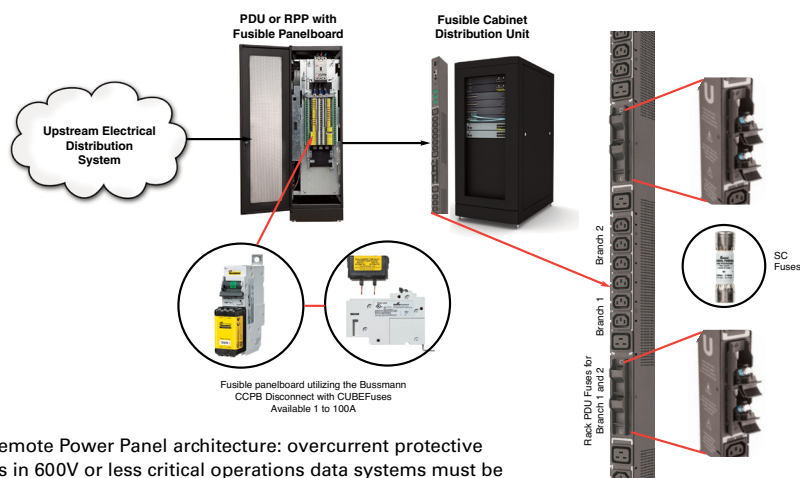
708.54 see page 10

Change summary

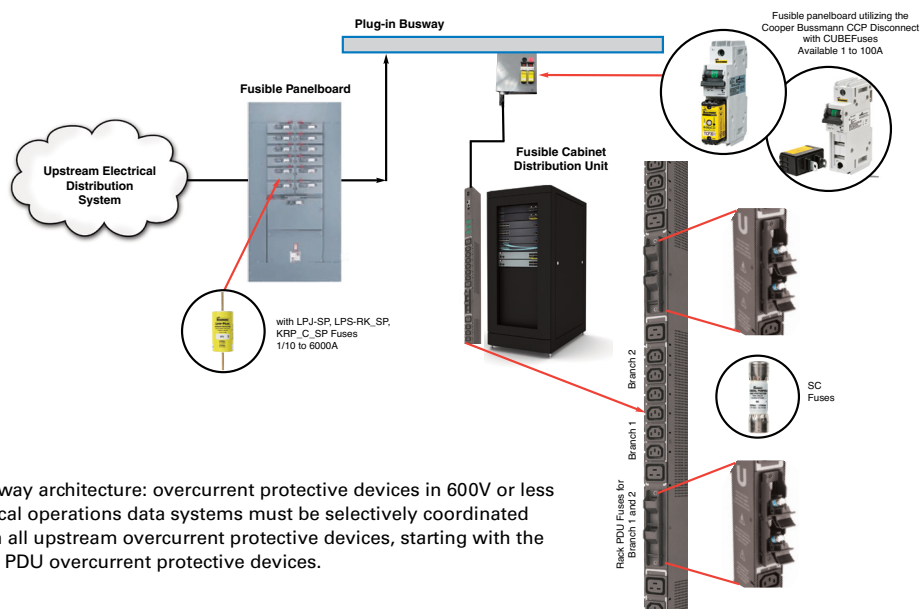
- Overcurrent protective devices in critical operation data systems must selectively coordinate with all supply-side overcurrent protective devices.
- Per NEC® definition, selective coordination is for the full range of overcurrents and for all overcurrent protective device opening times associated with interrupting those overcurrents.

More resources

- Fuse-to-Fuse Selectivity Ratio Guide table
- Circuit Breaker-to-Fuse Selective Coordination tables
- Circuit Breaker-to-Circuit Breaker Selective Coordination tables
- Electrical Protection handbook, Selecting Protective Devices, section on data centers
- Consulting Application Guide <http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT260923>
- Selective Coordination Guide www.eaton.com/selectivecoordination



PDU/Remote Power Panel architecture: overcurrent protective devices in 600V or less critical operations data systems must be selectively coordinated with all upstream overcurrent protective devices, starting with the rack PDU overcurrent protective devices.



Busway architecture: overcurrent protective devices in 600V or less critical operations data systems must be selectively coordinated with all upstream overcurrent protective devices, starting with the rack PDU overcurrent protective devices.

Molded Case Circuit Breakers

Circuit Breaker Authentication (CBA)

What is Circuit Breaker Authentication (CBA)?

Eaton's online Circuit Breaker Authentication (CBA) tool is intended to provide customers with the ability to authenticate Eaton molded case circuit breakers (MCCB) through 400 amp.

The tool is accessible via any web or mobile browser at www.eaton.com/counterfeit.

1 QPC Code (Bar Code)

The QPC code is a quality mark applied by Eaton to uniquely identify each molded case circuit breaker during the manufacturing process. Applied at the beginning of the manufacturing process, much like a serial number, the QPC code is used to store manufacturing and quality information up to the date and time manufacturing is complete.

2 Style Number

The Style Number is a manufacturing reference number for the product. In some instances the Style Number and Catalog Number are the same.

3 Date Code

The Date Code is applied at the time of final manufacture. The date code is in the format YYMMDD and may include a suffix which identifies the plant or point of manufacture.

The screenshot shows the 'MCCB Verify' web application. At the top, the Eaton logo and tagline 'Powering Business Worldwide' are on the left, and the 'MCCB Verify' title with a magnifying glass icon is on the right. Below the title, a message states: 'Authenticate molded case circuit breakers through 400A. Responses based on the quality marks applied to the product at the time of manufacturing.' The interface is divided into two main sections. The first section, 'QPC Code (Bar Code)', features an image of a circuit breaker with a QPC code label '1220020311181408'. To the right of the image are two input fields: the first is labeled '1 * QPC Code' and the second is labeled '2 Missing?' with a link. The second section, 'Nameplate', features an image of a nameplate with details like '70 AMPS 3 POLES', '600VAC - 250VDC', 'CAT. UMCP070M2C', 'STYLE 6601C87G09', 'CU/AL (UL)', 'CU ONLY (CSA)', and '090928DT'. To the right of the nameplate image are three input fields: '2 * Style Number', '3 * Date Code', and a checkbox for 'No Date Code'. At the bottom of the form are three buttons: 'Submit', 'Reset', and 'Close'. Below the buttons, a footer contains the text: 'For additional information or inquiries please Email: Report_fakes@eaton.com', followed by links for 'Privacy Policy', 'Terms & Conditions', and 'Copyright© Eaton® Corporation 2012. All rights reserved.' A blue callout box on the right side of the form states: 'If the QPC code is missing from the circuit breaker, or the nameplate has been visibly altered, the breaker should be considered suspect and rejected immediately.'

Responses

No additional action necessary
Authentic ✓
A suspect response will initiate an email form for manual Eaton authentication
Suspect ✗

Circuit Breakers are designed to provide circuit protection for low voltage power distribution systems. They safeguard connected electrical devices against current overloads and short-circuits. In this manner, they protect equipment and personnel.

Scan below to view Eaton's online Circuit Breaker Authentication tool.



517.30(G) Coordination

Article 517 Healthcare Facilities
Part III Essential Electrical Systems

NEW

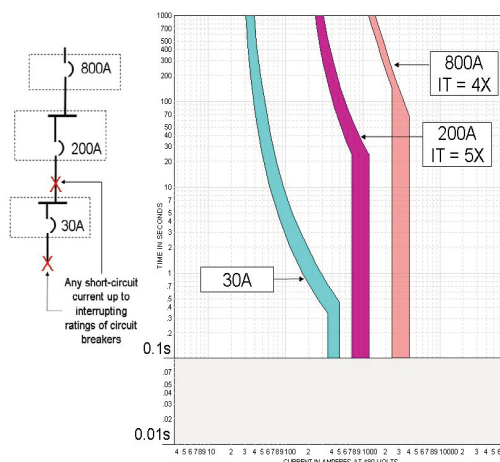
517.30 (G) Coordination.

Overcurrent protective devices serving the essential electrical system shall be coordinated for the period of time that a fault's duration extends beyond 0.1 second.

Exception No. 1: Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary.

Exception No. 2: Between overcurrent protective devices of the same size (ampere rating) in series.
Informational

Note: The terms coordination and coordinated as used in this section do not cover the full range of overcurrent conditions.



Significance of the change

This is a new requirement for the overcurrent protective devices in healthcare essential electrical systems. It requires overcurrent protective devices to be “coordinated for the period of time that a fault’s duration extends beyond 0.1 seconds.” This new requirement correlates with NFPA 99 which was given purview in NFPA documents for healthcare facilities’ electrical performance requirements.

Compliance only requires analysis of the overcurrent protective device time-current characteristics for times greater than 0.1 seconds (6 cycles). For the available fault currents applicable on the system, if the overcurrent protective devices’ time-current characteristics do not cross for times greater than 0.1 seconds, this requirement is satisfied; see time-current curves above.

It is important to distinguish the difference between “coordination” and “selective coordination.” The Informational Note for 517.30(G) is intended to clarify this distinction. A system in which the overcurrent protective devices are only coordinated for fault’s of time durations greater than 0.1 seconds (6 cycles) does not have the same performance as a system in which the overcurrent protective devices are selectively coordinated. Coordination greater than 0.1 second does not consider the time-current characteristics for fault currents that may open circuit breakers or fuses in less than 0.1 seconds. It ignores the instantaneous trip characteristics of circuit breakers and the current limiting region of fuses. In other words, it is possible to comply with a 0.1 second coordination requirement and have a fault current that causes multiple levels of circuit breakers or fuses to cascade open if the circuit breakers or fuses open in less than 0.1 seconds. A system with overcurrent protective devices that are “coordinated” may not be “selectively coordinated.” If the overcurrent protective devices of a system are “selectively coordinated” then they will also comply with the less restrictive 0.1 second coordination requirement.

Related NEC® Sections

Article 100 see page 8
620.62 see page 12
645.27 see page 14
695.3
700.10(B)(5)(b)
700.28 see page 10
701.27 see page 10
708.54 see page 10

Change summary

- New 517.30(G) requirement for “coordination” which correlates with NFPA 99 has been added with exceptions and an Informational Note.
- The informational note associated with this requirement clarifies that the term “coordination” as used in this requirement is not the same as “selective coordination” which is defined in Article 100 Coordination, Selective.

517.30(G) Coordination

Article 517 Healthcare Facilities
Part III Essential Electrical Systems

NEW

More resources

- Electrical Protection handbook, Selecting Protective Devices, sections on selective coordination and how to achieve selective coordination with fuses and circuit breakers
- New application guide on selective coordination for fuse to fuse selective coordination ratios and fuse to circuit breaker coordination tables
- Consulting Application Guide for circuit breaker to circuit breaker coordination tables
- Consulting Application Guide <http://www.eaton.com/Eaton/ProductsServices/Electrical/YourBusiness/ConsultantsandEngineers/DesignResources/ConsultingApplicationGuide/PCT260923>
- Selective Coordination Guide www.eaton.com/selectivecoordination

Figure 1 represents an analysis for “coordination” only for times greater than 0.1 second. If considering only times greater than 0.1 second, this system would be “acceptable”. However, this system may not be selectively coordinated.

It should be noted that in addition to the analysis using time-current curves, combinations of downstream Eaton circuit breakers that coordinate with upstream (lineside) Eaton circuit breakers are available in a table format.

Figure 2 illustrates that a coordinated system may not achieve selective coordination for the full range of overcurrents and for the full range of OCPD opening times associated

with those overcurrents. It shows the time-current curves for times less than 0.1 second and the lack of selective coordination in the area of the circuit breaker instantaneous trip settings. Interpreting the curves (without using circuit breaker-to-circuit breaker selective coordination tables), this system is selectively coordinated for overcurrents on the branch circuits up to 750A and for overcurrents on the feeder up to 2400A. However, this system is not selectively coordinated if the fault current at the branch circuit level is greater than 750A or at the feeder level the fault current is greater than 2400A. As a result, multiple levels of overcurrent protective devices may unnecessarily open resulting in unnecessary power outages to loads. The same situation may occur with

fusible systems. Figure 3 shows fuse time-current characteristics where the curves are coordinated for faults with time durations greater than 0.1 second. These two fuses meet the 0.1 second coordination criteria. However, Figure 4 shows the same fuse curves, but below 0.1 second. There is a lack of coordination for fault currents greater than where the fuse curves cross, at approximately 700 amperes and greater.

These examples illustrate that meeting a coordination requirement does not assure that the system will selectively coordinate. “Coordination” is not equivalent to “selective coordination.”

517.30(G) Coordination

Article 517 Healthcare Facilities
Part III Essential Electrical Systems

NEW

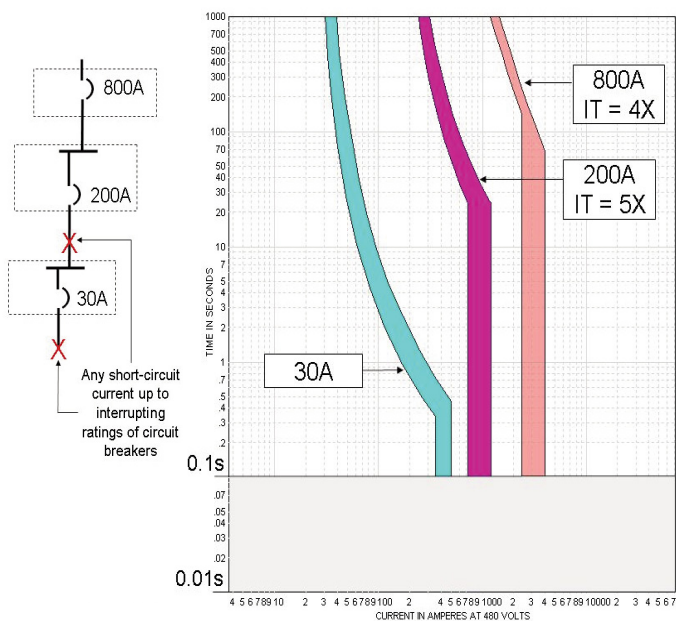


Figure 1

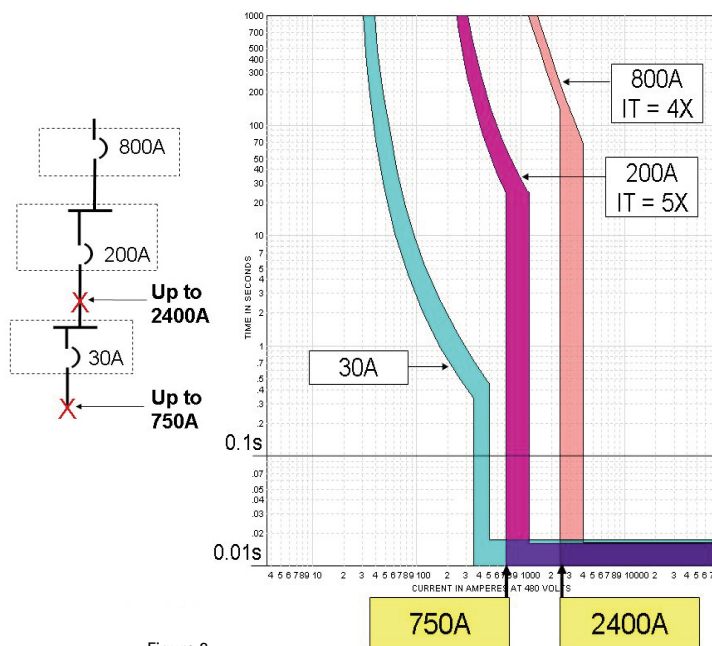


Figure 2

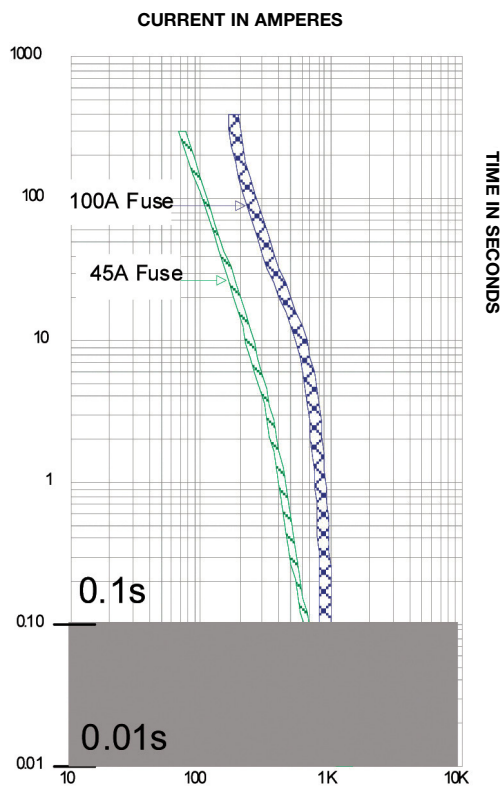


Figure 3

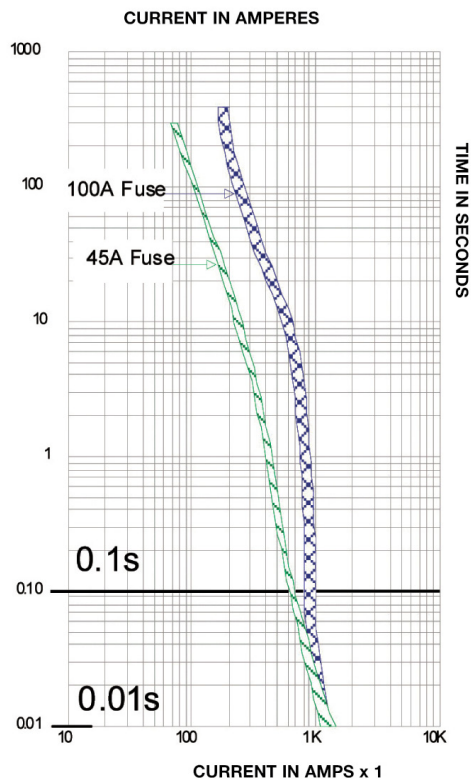


Figure 4

240.21(B)(1)(1) Exception and 240.21(C)(2)(1) Exception

NEW

Concerning 10 foot tap rules

Article 240 Overcurrent Protection

Part II Location

240.21(B) Feeder Taps ...

(1) Taps Not over 3 m (10 ft) Long.

If the length of the tap conductors does not exceed 3 m (10 ft) and the tap conductors comply with all of the following:

(1) The ampacity of the tap conductors is

- Not less than the combined calculated loads on the circuits supplied by the tap conductors, and
- Not less than the rating of the equipment containing an overcurrent device(s) supplied by the tap conductors or not less than the rating of the overcurrent protective device at the termination of the tap conductors.

Exception to b: Where listed equipment, such as a surge protective device(s) [SPD(s)], is provided with specific instructions on minimum conductor sizing, the ampacity of the tap conductors supplying that equipment shall be permitted to be determined based on the manufacturer's instructions.

(Note: 240.21(C)(2)(1) Exception has same wording)



Significance of the change

The 240.21 tap rules permit tap conductors without overcurrent protective devices at the point of the tap if certain requirements are met. New exceptions were added to 240.21(B)(1)(1), which concerns the minimum ampacity of tap conductor for feeder taps not exceeding 10 feet, and 240.21(C)(2)(1), which concerns the minimum ampacity of tap conductors for transformer secondary conductors not exceeding 10 feet.

Before this change, 10 foot feeder tap conductors could terminate in devices, but not necessarily overcurrent protective devices. Now, these same tap conductors must terminate in equipment containing overcurrent protective devices.

Surge Protective Devices (SPDs) are non-energy consuming devices and therefore it is not possible to determine a SPD's minimum conductor ampacity based on its calculated load or OCPD ampere ratings in the SPD. Therefore, these exceptions were necessary. The SPD manufacturer specifies the minimum conductor size that must be used with the SPD or the conductor leads are supplied as an integral part of the SPD.

Change summary

- For the 10 foot feeder tap rule, 240.21(B)(1), determination of the minimum conductor size for a SPD is per the SPD manufacturer's instructions. In many cases, the conductors are supplied as part of the SPD.
- For the transformer secondary 10 foot tap rule, 240.21(C)(2), determination of the minimum conductor size for a SPD is per the SPD manufacturer's instructions. In many cases, the conductors are supplied as part of the SPD.

Related NEC® sections

Article 285

285.13 see page 24

694.10(D)

700.8 see page 22

240.21(B)(1)(1) Exception and 240. 21(C)(2)(1) Exception

NEW

Concerning 10 foot tap rules

Article 240 Overcurrent Protection

Part II Location

SPDs provide the best voltage transient protection when the conductors are the largest gauge practical and the shortest length practical. Refer to product installation instructions.

More resources

- Surge Application Guide: No. 3193
- SPD product profile No. 3190
- Type 1 Surge data sheets
SurgePOD HEAVY DUTY No. 2163
BSPD No. 10209
- SPD data sheets No. 2149, No. 2150, No. 2151, No. 2152
- For surge protective devices see www.cooperbussmann.com/surge

Products

Type 1: SurgePOD HEAVY DUTY



50kA surge current capacity
Product profile No. 3213

BSPD



120-400kA surge current capacity
Product profile No. 10208

These listed surge protective devices, are field installable, and prewired with specific conductors that are shown in the device's instructions.

DIN-Rail Recognized Type 2 component assembly high SCCR SPDs:



Conductors and Busbars for Use in UL Systems

60/75°C Cu	1/2" 12mm	1/2" 12mm	1/2" 12mm
Conductors			
min. □ L, G, ⚬	1.5 mm ² /14AWG		
max. □ L, G, ⚬	25mm ² /4AWG	35mm ² /2AWG	
Busbar	16mm ² Cu	≥15.5mm	

This Type 2 component assembly is UL Recognized and has minimum and maximum conductor specifications in the installation instructions (see above). For this SPD the minimum is 14 AWG and the maximum is 2 AWG.

Product profile No. 3190

240.21(B)(1)(1), 240. 21(C)(2)(1)

700.8 Surge Protection

Article 700 Emergency Systems
Part I General

NEW

700.8 Surge Protection.

A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.



Significance of the change

This new section requires every emergency system panelboard and switchboard to have a voltage Surge Protective Device (SPD). In addition, 700.8 is a requirement for all panelboards and switchboards in the life safety branch of essential electrical systems for healthcare facilities per 517.26.

The SPD must be listed which means that either the SPD itself must be listed (can be installed by panelboard manufacturer or field installed by qualified person) or the SPD can be Type 4 (recognized) if the SPD is part of the panelboard or switchboard manufacturer's assembly listing (see 285.13).

Voltage transients on low-voltage power systems may be due to nearby lightning strikes, switching or other causes. Damage to load equipment or electrical distribution equipment, such as panelboards, can result from a single voltage transient event or the accumulation of multiple lower magnitude voltage transients.

This requirement will help ensure more reliable power systems for the vital loads served by emergency systems and healthcare life safety branches. The trend for emergency system and healthcare life safety branch loads is an increase of electronic utilization equipment that is more susceptible to damage by transient voltages. These loads are vital for life safety and the SPDs increase reliability that the loads will be able to perform their task when needed during an emergency situation. It is recommended an additional level of transient voltage protection be utilized by providing SPDs on or in sensitive utilization equipment. Similarly, it is recommended SPDs be provided in or on the panelboards/switchboards of 701 legally required electrical systems, 708* critical operation power systems, and healthcare critical and equipment branches.

Article 285 has requirements for voltage surge devices for systems 1000V or less. Standards to reference include UL 1449, the Standard for Surge Protective Devices 3rd Edition, and IEEE C62.41 the IEEE Recommended Practice for Surge Voltages in Low Voltage AC Power Circuit.

*708.20(D) requires surge protection devices at all facility distribution voltage levels.

Change summary

- New section requires voltage surge protective devices to be installed in or on every emergency switchboard or panelboard.
- This requirement is also applicable to all healthcare panelboards and switchboards that are part of the life safety branch of healthcare essential electrical systems.
- The SPD may be listed or may be a recognized product that is part of the panelboard or switchboard manufacturer's assembly listing

Related NEC® sections

Article 285
285.13 see page 24
517.26
694.10(D)

700.8 Surge Protection

Article 700 Emergency Systems

Part I General

NEW

More resources

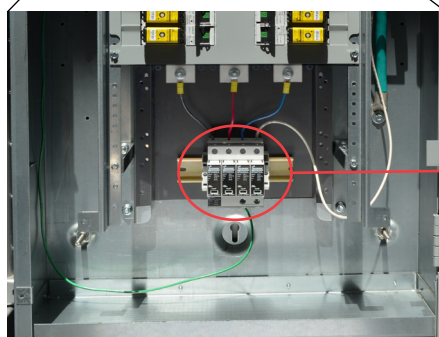
- Surge Application Guide: No. 3193
- SPD product profiles
 - SurgePOD HEAVY DUTY No. 3213
 - BSPD No. 10208
 - Black label DIN-Rail No. 3190
- SPD data sheets
 - SurgePOD HEAVY DUTY No. 2163
 - BSPD No. 10209
 - Black label DIN-Rail No. 2149, No. 2150, No. 2151, No. 2152
- SPD master spec No. 10204



Type 1 SPD Listed to UL 1449 can be installed in the field.



Type 1 Listed SPD.



SPD which is recognized to UL 1449 as Type 2 component assembly is part of Bussmann QSCP panelboard listing (as option).



Voltage surge protective devices (SPD) must be installed in or on all emergency panelboards and switchboards. The SPD can be a listed device that is installed in the field such as shown above on left or a recognized SPD, such as above right, which is part of the manufacturer's panelboard or switchboard assembly listing (option).

285.13 Type 4 and Other Component Type SPDs

Article 285 Surge Protective Devices (SPDs), 1000V or less

Part II Installation

NEW

285.13 Type 4 and Other Component Type SPDs.

Type 4 component assemblies and other component type SPDs shall only be installed by the equipment manufacturer.



Significance of the change

This new requirement added provisions for Type 4 SPDs and other component type SPDs. Type 4 SPDs are intended to be only installed in electrical equipment by the original equipment manufacturer (OEM). Type 4 SPDs are not permitted to be installed in the field, except as replacement.

Special Note:

In UL 1449 3rd Edition, there are two overall SPD categories: listed SPDs and recognized SPDs. SPDs listed to UL 1449 for field installable inside or outside a panel (on or as close a practical). SPDs recognized to UL 1449 are intended to be evaluated as suitable for use by an OEM and installed by the OEM in their final assembly. A recognized SPD is generally analogous to a component assembly SPD in Article 285.

285.13 and UL 1449 use different terminology. In UL 1449 3rd Edition, component assembly SPDs are typically referred to as a Type 1, 2, 3 or 4 component assemblies.

- Type 4 component assemblies consist of any SPD protection technology that can pass the limited current testing procedure of UL 1449 3rd Edition. These devices do NOT have an SCCR rating.
- Type 1, 2 and 3 component assemblies consist of a Type 4 component assembly with some means of SCCR protection. This may be an internal short-circuit protector or a paired external overcurrent protective device (fuse or circuit breaker) to meet the SCCR requirements. Type 1, 2, or 3 component assemblies mirror the Type applications detailed in Article 285 except that they are installed by the OEM in their assembly.

Change summary

- Recognized SPDs are only permitted to be installed by an equipment manufacturer (OEM) inside their equipment.
- Replaced the term TVSS (transient voltage surge suppressor) with the term surge protective device or SPD and increased applicable voltage to 1000 volts or less.

Related NEC® sections

Article 285

700.8 see page 22

517.26

285.13 Type 4 and Other Component Type SPDs

Article 285 Surge Protective Devices (SPDs), 1000V or less

Part II Installation

NEW

Eaton offers a range of SPDs both listed and recognized, for many system voltages, system wiring schemes, and applications. See More Resources section on this page for information on the wide range of Eaton SPD products and application guide.

More resources

- Surge Application Guide: No. 3193
- For surge protective devices see www.cooperbusssmann.com/surge

Eaton power, control and data signal SPD product lineup

Type 1 UL Listed



BSPD

- For switchgear and power distribution panels
- Configured product from catalog number system
- NEMA 1 and 4X enclosures
- AC voltages 120 to 600Vac
- Surge current capacity 120kA to 400kA
- Three configuration levels:
 - Basic
 - Standard (Form C contact, EMI/RFI Filter)
 - Standard with Surge Counter (Form C contact, EMI/RFI Filter, counter)



SurgePOD™ HEAVY DUTY (black label)

- For critical commercial and industrial applications
- Defined catalog numbers
- NEMA 4X enclosure
- AC voltages 120 to 600Vac
- Surge current capacity 50kA



SurgePOD™ PRO (grey label)

- For residential and light commercial applications
- Defined catalog numbers
- NEMA 4X enclosure
- AC voltages 120 to 480Vac
- Surge current capacity 40kA

Type 2 and 4 DIN-Rail UL Recognized



Type 2 component assembly, high SCCR (black label)

- 1-, 2-, 3-, and 4-pole Type 2 versions
- 200kA SCCR
- Voltages up to 600Vac



Type 4 component assembly, for use in Type 2 applications, low voltage power (blue label)

- 1-pole Type 4 power versions for Type 2 applications
- Non SCCR rated
- AC and DC voltages from 48 to 600V



Type 4 component assembly, for use in Type 3 applications, low voltage power (blue label)

- 2-pole Type 4 control voltage versions for Type 3 applications
- Non SCCR rated
- AC and DC voltages from 24 to 230V

UL 497B data signal



DIN-Rail 4 wire

- Accomodates two wire pairs



DIN-Rail BNC 50/75Ω coaxial cable

- For nominal voltages up to 5V



Inline BNC 50/75Ω coaxial cable

- For nominal voltages up to 5V



DIN-Rail RJ45/Ethernet cable

- For nominal voltages up to 48V

705.31 Location of Overcurrent Protection

Article 705 Interconnected Electric Power Production Sources Part I General

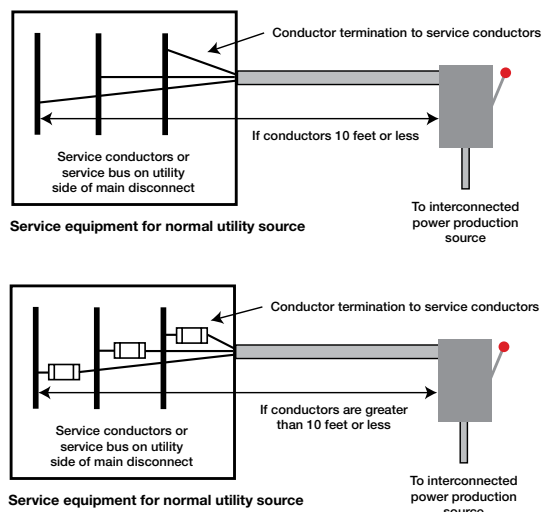
NEW

705.31 Location of Overcurrent Protection.

Overcurrent protection for electric power production source conductors, connected to the supply-side of the service disconnecting means in accordance with 705.12(A), shall be located within 3 m (10 ft) of the point where the electric power production source conductors are connected to the service.

Informational Note: This overcurrent protection protects against short-circuit current supplied from the primary source(s) of electricity.

Exception: Where the overcurrent protection for the power production source is located more than 3 m (10 ft) from the point of connection for the electric power production source to the service, cable limiters or current-limited circuit breakers for each ungrounded conductor shall be installed at the point where the electric power production conductors are connected to the service.



Significance of the change

Article 705 includes requirements for electric power production sources operating in parallel with a primary source of power. Examples of these production sources include generators, solar photovoltaic systems, wind systems, and fuel cell systems.

705.12(A) permits making the connection of an electric power production source ahead of the service disconnect. Per this new requirement, when an interconnected power production source is connected to the supply-side of the service disconnect, the conductors connecting the interconnected electric power production system must have overcurrent protection within 10 feet of their connection to the service conductors/bus. In most cases, a safety switch with fuses can be used to comply.

However, if the overcurrent protection for the electric power production conductors is not within 10 feet of where these conductors are connected to the supply-side of the service disconnect, the exception in this new section permits using cable limiters or a current-limiting circuit breaker at the point where the conductors are connected. The cable limiters provide short-circuit protection for these conductors. Installing cable limiters on the supply-side of the service disconnect is permitted in 230.82.

Change summary

- New requirement
- Overcurrent protection for interconnected electric power production source conductors, connected to the supply-side of the service disconnecting means, must be within 10 feet of the point where these conductors are connected to the service.
- As an exception, the overcurrent protection is permitted to be more than 10 feet from this point of connection to the service, if cable limiters or current-limited circuit breakers are installed at the conductor point of connection ahead of the service disconnect.

Related NEC® Sections

705.12(A)
230.82

705.31 Location of Overcurrent Protection

Article 705 Interconnected Electric Power Production Sources Part I General

NEW

Products

Fusible disconnect switches:

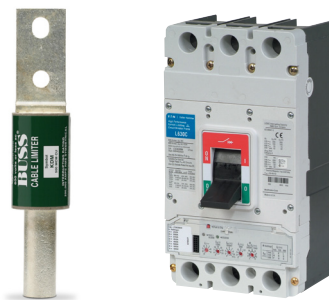


Fusible safety switch can be used within 10 feet of the point of connection to the service.

Product profile No. 3138

Data sheet No. 1156

Cable limiters and current-limiting circuit breakers:



If an overcurrent protective device and disconnect cannot be installed within 10 feet of the connection to the service, then cable limiters or current-limiting circuit breakers can be installed at the point of connection to provide short-circuit current protection to these conductors.

Leadership in circuit protection

When it comes to circuit protection, only Eaton can provide a complete portfolio of solutions for virtually every application. Eaton delivers:

- The most diverse solutions to mitigate arc flash energy for personnel and equipment protection.
- The smallest and most cost effective solutions to meet selective coordination requirements.
- The most experienced, time-tested solutions to meet national and local code requirements.
- The most tested circuit breaker/circuit breaker, circuit breaker/fuse, and fuse/fuse selective coordination combinations.
- The only one-stop shop to solve your design challenges using our expertise and an unmatched portfolio.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority.

At Eaton, that's how we're powering business worldwide.

Eaton
Electrical Sector
1000 Cherrington Pkwy
Moon Township, PA 15108
United States
www.eaton.com/electrical

Eaton's Bussmann Business
114 Old State Road
Ellisville, MO 63021
United States
www.eaton.com/bussmannseries

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