SIEMENS
Ingenuity for life

NEC 2020®
Code Changes

Highlighting some of the significant code changes.

www.usa.siemens.com/ce

Disclaimer

SIEMENS
Ingenuity for life

Subject to changes and errors. The information given in this document only contains general descriptions and/or performance features which may not always specifically reflect those described, or which may undergo modification in the course of further development of the products. The requested performance features are binding only when they are expressly agreed upon in the concluded contract.

All product designations may be trademarks or other rights of Siemens AG, its affiliated companies or other companies whose use by third parties for their own purposes could violate the rights of the respective owner.

Table of Contents

- Adjustable-Trip Breakers 4
- Arc Energy Reduction 7
- Connections 13
- Coordination 19
- Critical Operations Power Systems (COPS) 26
- Disconnects 29
- GFCI/GFPE 45
- Overvoltage (Surge) Protection 65
- Power Monitoring 70
- Reconditioning 76

SIEMENS
Ingenuity for life

Adjustable-Trip Circuit Breakers

Restricted Access
Adjustable-Trip Circuit Breakers

Adjustable-Trip Circuit Breakers – NEC 240.6(C)

SIEMENS
Ingenuity for life

Code Change Details

2020 NEC

Restricted Access Adjustable-Trip Circuit Breakers. A circuit breaker(s) that has restricted access to the adjusting means shall be permitted to have an ampere rating(s) that is equal to the adjusted current setting (long-time pickup setting). Restricted access shall be achieved by one of the following methods:

(1) Located behind removable and sealable covers over the adjusting means

(2) Located behind bolted equipment enclosure doors

(3) Located behind locked doors accessible only to qualified personnel

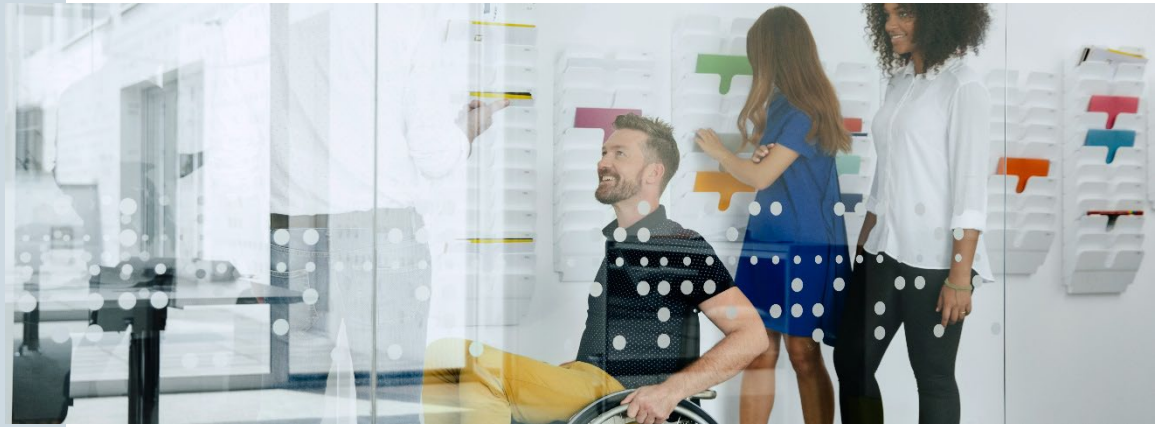
(4) Password protected, with password accessible only to qualified personnel

Adjustable-Trip Circuit Breakers – NEC 240.6(C)

SIEMENS
Ingenuity for life

Discussion

Section 240.6(C) has been revised for clarity and a new parenthesis (4) has been added to address new technology. Access to the adjusting means associated with adjustable-trip circuit breakers shall be achieved by one of the methods listed. The new parenthesis (4) adds a password protected option when the password is accessible only to qualified persons. Modern electronic trip units provide the ability to set a password in order to keep unauthorized and/or non-qualified people from changing the settings.



SIEMENS
Ingenuity for life

Arc Energy Reduction

NEC240.67 and 240.87

Arc Energy Reduction - NEC 240.67

SIEMENS
Ingenuity for life

Code Change Details

Arc Energy Reduction. Where fuses rated 1200A or higher are installed, 240.67(A) and (B) shall apply. This requirement shall become effective January 1, 2020.

Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the fuses. Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

Method to Reduce Clearing Time. A fuse shall have a clearing time of 0.07 seconds or less at the available arcing current, or one of the following means shall be provided and shall be set to operate at less than the available arcing current:

1) Differential relaying
2) Energy-reducing maintenance switching with local status indicator
3) Energy-reducing active arc-flash mitigation system
4) Current-limiting, electronically actuated fuses
5) An approved equivalent means

Arc Energy Reduction - NEC 240.67

SIEMENS
Ingenuity for life

Discussion

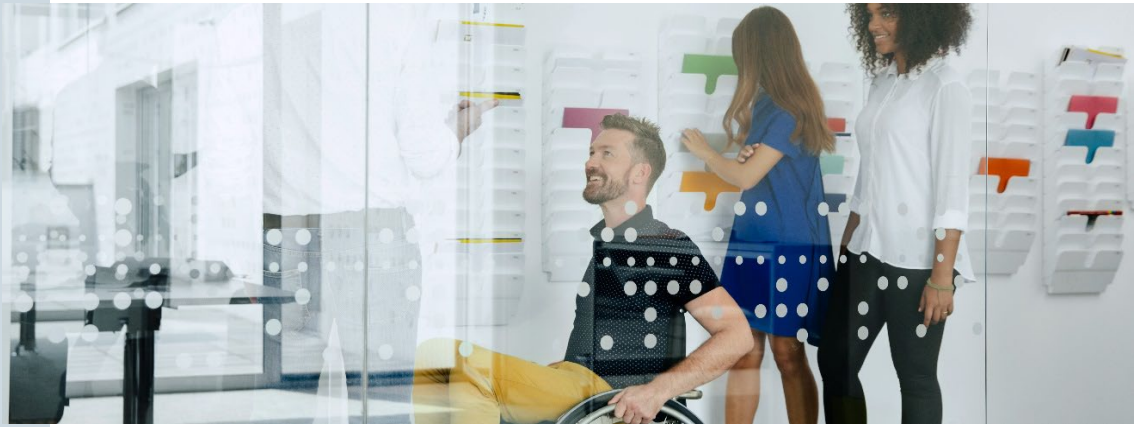
A few additions have been made to 240.67 with the intent of improving protection for workers that may be exposed to the dangers of arc flash. There is now a requirement that the method to reduce clearing time is set to operate at less than the arcing current. Previously, there was no rule to specify a current level at which the system must engage. A documentation requirement was added so that the calculations used to design the method to reduce clearing time are recorded and made available to authorized persons. Finally, a performance testing section was added to require performance of on-site testing to show that the method to reduce clearing time functions properly at each installation. A Tentative Interim Amendment (TIA) was created to clarify the extent of the testing required. See TIA 20-4 Log #1451 issued by the NFPA Standards Council on August 6, 2019.

Arc Energy Reduction - NEC 240.67

SIEMENS
Ingenuity for life

Discussion

For testing information calls should be routed through Siemens Customer Service Center which is available 24/7/365 at 1-877-784-9322 and emails can be sent to our portal at siespowerstudies.industry@siemens.com



Arc Energy Reduction - NEC 240.87

SIEMENS
Ingenuity for life

Code Change Details

Where the highest continuous current trip setting for which the actual overcurrent device installed in a circuit breaker is rated or can be adjusted ins 1200A or higher, 240.87(A) and (B) shall apply.

(A) Documentation. Documentation shall be available to those authorized to design, install, operate, or inspect the installation as to the location of the circuit breaker(s). Documentation shall also be provided to demonstrate that the method chosen to reduce clearing time is set to operate at a value below the available arcing current.

(B) Method to Reduce Clearing Time. One of the following means shall be provided and shall be set to operate at less than the available arcing current:

(1) Zone-selective interlocking
(2) Differential relaying
(3) Energy-reducing maintenance switching with local status indicator
(4) Energy-reducing active arc-flash mitigation system
(5) An instantaneous trip setting that is less than the available arcing current. Temporary adjustment of the instantaneous trip setting to achieve arc-energy reduction shall not be permitted.
(6) An instantaneous override that is less than the available arcing current
(7) An approved equivalent means

Arc Energy Reduction - NEC 240.87

SIEMENS
Ingenuity for life

Discussion

This section was updated with the intent of improving protection for workers that may be exposed to the dangers of arc flash. It is now required that all methods to reduce clearing time are set to operate at less than the arcing current. Previously, a current level for engagement of the system only applied when an instantaneous trip level was used to reduce clearing time. When an instantaneous trip setting is used to satisfy this requirement, it cannot consist of a temporary setting. Next, a documentation requirement was added so that the calculations used to design the method to reduce clearing time are recorded and made available to authorized persons. Finally, a performance testing section was added to require performance of on-site testing to show that the method to reduce clearing time functions properly at each installation. A Tentative Interim Amendment (TIA) was created to clarify the extent of the testing required. See TIA 20-5 Log #1452 issued by the NFPA Standards Council on August 6, 2019. For testing information calls should be routed through Siemens Customer Service Center which is available 24/7/365 at 1-877-784-9322 and emails can be sent to our portal at siespowerstudies.industry@siemens.com

SIEMENS
Ingenuity for life

Connections

NEC408.3(D) and NEC 408.18(C)

Connections – NEC 408.3(D)

SIEMENS
Ingenuity for life

Code Change Details

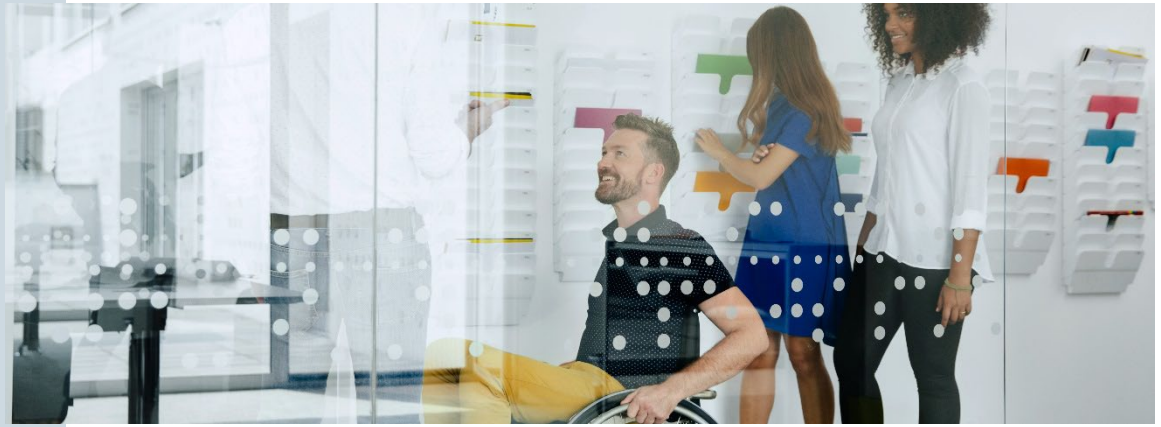
Terminals. In switchboards and switchgear, load terminals for field wiring shall comply with 408.18(C).

Connections – NEC 408.3(D)

SIEMENS
Ingenuity for life

Discussion

This revision addresses terminating conductors in switchboards and switchgear. These must be marked on the front of the gear. Panelboards have been removed as rear and side access for terminations is unnecessary due to their design. The revision correlates with new requirements located in Part II Switchboards and Switchgear, Section 408.18(C) Clearances-Connections



Connections – NEC 408.18(C)

SIEMENS
Ingenuity for life

Code Change Details – 1 of 2

Connections. Each section of equipment that requires rear or side access to make field connections shall be so marked by the manufacturer on the front. Section openings requiring rear or side access shall comply with 110.26. Load terminals for field wiring shall comply with 408.18(C)(1), (C)(2), or (C)(3) as applicable.

Equipment Grounding Conductors. Load terminals for field wiring shall be so located that it is not necessary to reach across uninsulated ungrounded bus in order to make connections.

Grounded Circuit Conductors. Where multiple branch or feeder grounded circuit conductor load terminals for field wiring are grouped together in one location, they shall be so located that it is not necessary to reach across uninsulated ungrounded bus, whether energized, in order to make connections.

Connections – NEC 408.18(C)

SIEMENS
Ingenuity for life

Code Change Details – 2 of 2

Where only one branch or feeder set of load terminals for field wiring are grouped with its associated ungrounded load terminals, they shall be so located that it is not necessary to reach across energized uninsulated bus including other branch or feeder bus in order to make connections. Bus on the line side of service, branch, or feeder disconnects is considered energized with respect to its associated load side circuits.

Ungrounded Conductors. Load terminals for ungrounded conductors shall be so located that it is not necessary to reach across energized uninsulated bus in order to make connections. Bus on the line side of service, branch, or feeder disconnects is considered energized with respect to its associated load side circuits.

Connections – NEC 408.18(C)

SIEMENS
Ingenuity for life

Discussion

This new requirement provides specific guidance on the location of load terminals in equipment that require rear or side access for field connections of conductors. Each section of equipment that requires this access must be marked on the front by the manufacturer. Terminals for equipment grounding conductors and grounded circuit conductors must be located so that it is not necessary for installers to reach across uninsulated, ungrounded bus in order to terminate conductors. Terminals for ungrounded conductors must be located so that it is not necessary for installers to reach across energized uninsulated bus in order to terminate conductors. This addition provides improved protection for those tasked with installing and maintaining this type of equipment. Keep in mind that the purpose of the NEC is practical safeguarding of persons and property from hazards arising from the use of electricity. This change correlates with a revision to 408.3(D) Terminals.

SIEMENS
Ingenuity for life

Coordination

Selective Coordination NEC 620.62 & 695.3(C)

Coordination – NEC 620.62 – Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts

SIEMENS
Ingenuity for life

Code Change Details

Selective Coordination. Where more than one driving machine disconnecting means is supplied by the same source, 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 and device settings shall be documented and made available to those authorized to design, install, inspect, maintain, and operate the system.

Exception No. 1: Selective coordination shall not be required between transformer primary and secondary overcurrent protective devices where only one overcurrent device or set of overcurrent devices exists on the transformer secondary.

Exception No. 2: Selective coordination shall not be required between overcurrent protective devices of the same rating located in series where no loads are connected in parallel with the downstream device.

Coordination – NEC 620.62 – Elevators, Dumbwaiters, Escalators, Moving Walks, Platform Lifts, and Stairway Chairlifts

SIEMENS
Ingenuity for life

Discussion

This section has been updated with a new requirement and two new exceptions. The new requirement specifies that the documentation must now include device settings. The first exception allows for no coordination between OCPDs located on the primary and secondary sides of transformers.

The second exception allows for no coordination between OCPDs of the same rating if there are no OCPDs in parallel with the downstream device.

Coordination – NEC 695.3(C) – Fire Pumps – Multibuilding Campus-Style Complexes

SIEMENS
Ingenuity for life

Code Change Details

Selective Coordination. Overcurrent protective device(s) shall be selectively coordinated with all supply-side overcurrent protective device(s).

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, maintain, and operate the system.

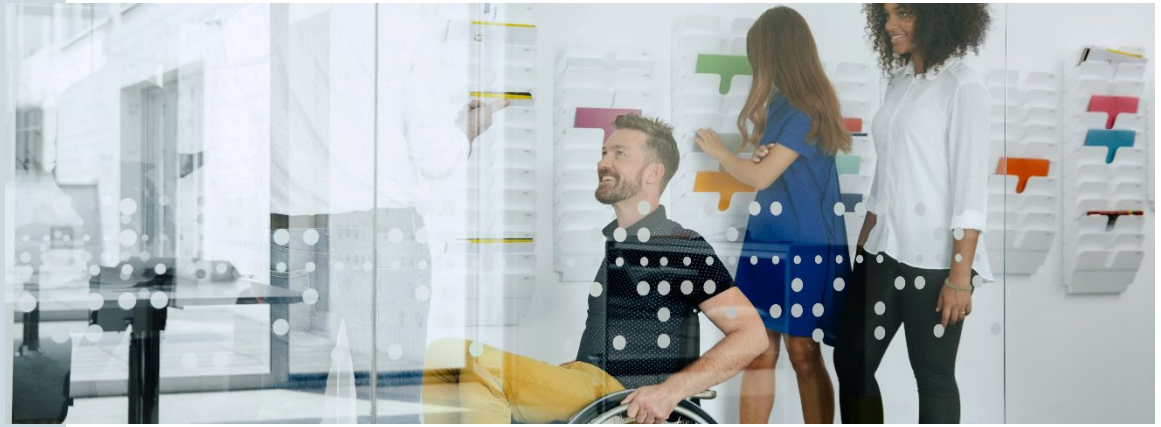
Exception: Selective coordination shall not be required between two overcurrent devices located in series if no loads are connected in parallel with the downstream device.

Coordination – NEC 695.3(C) – Fire Pumps – Multibuilding Campus-Style Complexes

SIEMENS
Ingenuity for life

Discussion

New requirements have been added to this section requiring that the selective coordination be designed by a qualified person and that the design must be documented. Additionally, a new exception has been added to exclude the requirement of selective coordination in cases where there is no paralleling on the load side of an upstream OCPD.



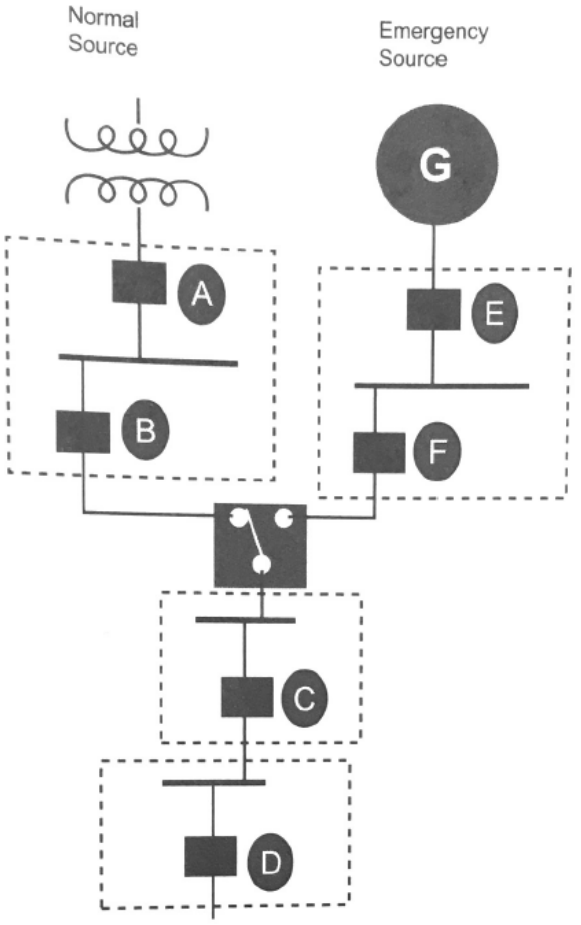
Coordination – NEC 700.32 & 701.32 – Selective Coordination

SIEMENS
Ingenuity for life

Code Change Details

Selective Coordination. Overcurrent protective device(s) shall be selectively coordinated with all supply-side overcurrent protective device(s).

Exception: 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 OCPDs E.
OCPD B is not required to selectively coordinates with OCPDs A because OCPD B is not an emergency system OCPD.



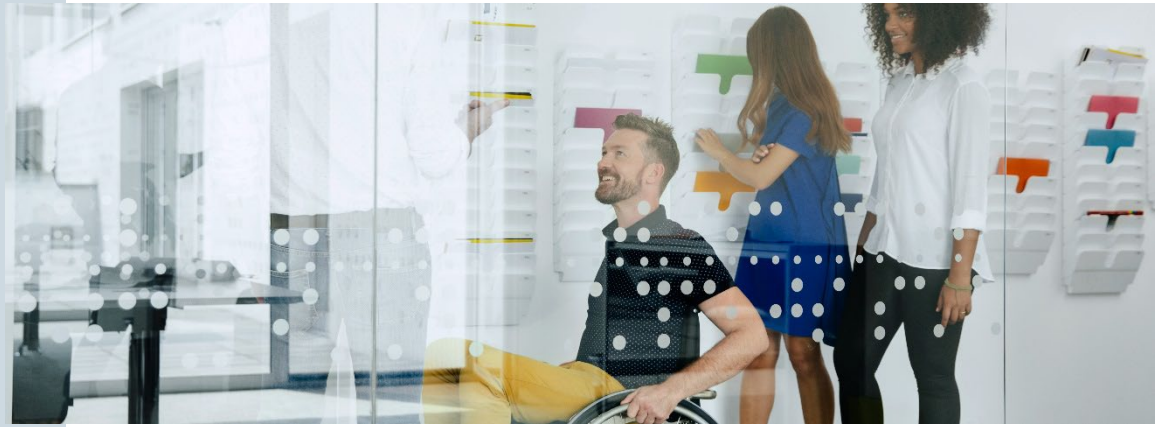
N Informational Note Figure 700.32 Emergency System Selective Coordination.

Coordination – NEC 700.32 & 701.32 – Selective Coordination

SIEMENS
Ingenuity for life

Discussion

New requirements have been added to this section requiring that the selective coordination be from the load to the emergency source and from the load to the normal source. This clarifies an area of debate amongst electricians, engineers and other professionals.



SIEMENS
Ingenuity for life

Critical Operations Power Systems (COPS)

Bypass Isolation Automatic Transfer Switches

Critical Operations Power Systems (COPS) - NEC 708.24(D)

SIEMENS
Ingenuity for life

Code Change Details

Bypass Isolation Automatic Transfer Switches.

Where loads are supplied by only one automatic transfer switch, the automatic transfer switch shall include a bypass isolation switch to facilitate maintenance as required in 708.6(C) without jeopardizing continuity of power. When the bypass isolation transfer switch is in the bypass mode, either it shall automatically initiate transfer between power sources upon loss of the connected power source or it shall remain actively supervised by a qualified person who can manually initiate transfer between power sources.

Transfer switches cannot be reconditioned.

Critical Operations Power Systems (COPS) - NEC 708.24(D)

SIEMENS
Ingenuity for life

Discussion

New language has been added to require a bypass isolation switch where COPS loads are supplied by a single ATS. The intent of the new requirement is to allow for the COPS load to maintain uninterrupted supply redundancy while concurrently allowing for the main ATS to be safely serviced while it is in a de-energized state. With this change, deferring maintenance on the ATS or performing maintenance on an energized ATS should be less likely as it would not compromise the supply integrity of the COPS.

SIEMENS
Ingenuity for life

Disconnects

Barriers, Maximum Quantity, Emergency, Means, Emergency Shutdown and DC

Disconnects – NEC 230.62.C – Service Equipment

SIEMENS
Ingenuity for life

Code Change Details

(A) Enclosed. Energized parts shall be enclosed so that they will not be exposed to accidental contact or shall be guarded as in 230.62(B).

(B) Guarded. Energized parts that are not Enclosed shall be installed on a switchboard, panelboard, or control board and guarded in accordance with 110.18 and 110.27.

(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.

Disconnects – NEC 230.62 – Service Equipment

SIEMENS
Ingenuity for life

Discussion

This new requirement addresses barriers having to be placed in service equipment. These barriers are required at the uninsulated, ungrounded service busbar and service terminations. This includes terminations at locations such as enclosed circuit breakers, transfer switches, enclosed switches, motor control centers, and industrial control panels.

Manufacturers of equipment will be required to provide solutions for compliance with this new Code requirement. The purpose of the barrier is to provide workers an added level of protection from inadvertent contact with energized parts.

These barriers are not designed to provide workers protection from an arc blast.

This addition to the Code correlates with requirements that were in 408.3(A)(2) of the 2017 NEC which addressed barriers at all service panelboards, switchboards, and switchgear load terminations. The same hazards that exist in these location also exist at other service equipment load termination locations.

Disconnects – NEC 230.71 - Maximum Number of Disconnects

SIEMENS
Ingenuity for life

Code Change Details

Each service shall have only one disconnecting means unless the requirements of 230.71(B) are met.

(A) General. For the purpose of this section, disconnecting means installed as part of listed equipment and used solely for the following shall not be considered a service disconnecting means:

(1) Power monitoring equipment
(2) Surge-protective device(s)
(3) Control circuit of the ground-fault protection system
(4) Power-operable service disconnecting means

(B) Two to Six Disconnecting Means. Two to six service disconnects shall be permitted for each service permitted by 230.2 (Number of Services) 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
(4) Service disconnects in switchgear or metering centers where each disconnect is located in a separate compartment

So…what does 230.2 say?

Disconnects – NEC 230.71 - Maximum Number of Disconnects

SIEMENS
Ingenuity for life

Code Change Details

230.2(A) through (D) – Services – Number of Services

(A) Special Conditions. Additional services shall be permitted to supply the following:

1) Fire pumps
2) Emergency systems
3) Legally required standby systems
4) Optional standby systems
5) Parallel power production systems

(B) Special Occupancies. By special permission, additional services shall be permitted for either of the following:

1) Multi-occupancy buildings where there is no available space for service equipment accessible to all occupants.
2) A single building or other structure sufficiently large to make two or more services necessary.

Disconnects – NEC 230.71 - Maximum Number of Disconnects

SIEMENS
Ingenuity for life

Code Change Details

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

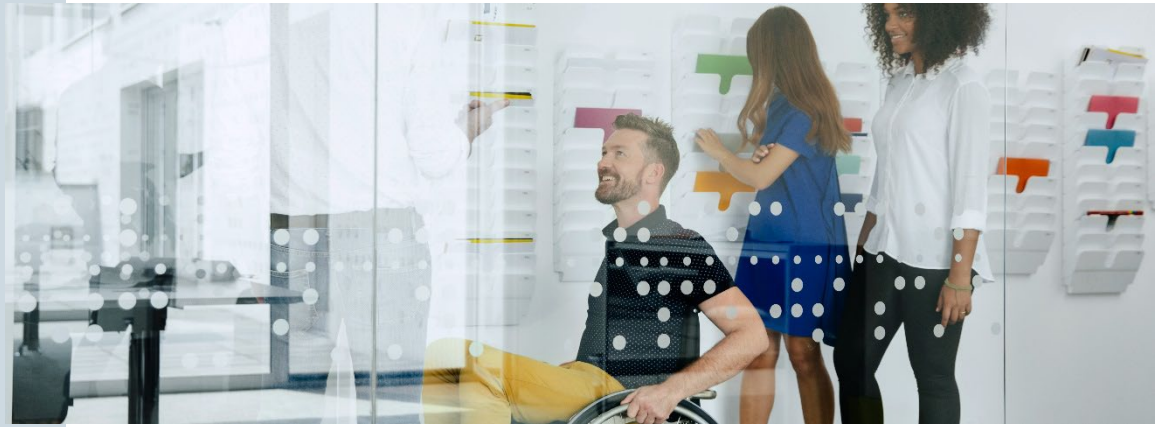
Informational Note No. 2: Examples of separate enclosures with a main service disconnecting means in each enclosure include, but are not limited to motor control centers, fused disconnects, circuit breaker enclosures, and transfer switches that are suitable for use as service equipment.

Disconnects – NEC 230.71 - Maximum Number of Disconnects

SIEMENS
Ingenuity for life

Discussion

This change still allows for up to six disconnects, but requires each disconnect to be in its own enclosure in separate vertical sections of switchboards, or in separate compartments of switchgear and metering centers. The intent of this change, when combined with changes in 230.62, is to improve safety by limiting exposure to live parts on the line side of the service disconnect. The impact of this change limits the use of existing designs of devices that have multiple service disconnects.



Disconnects – NEC 230.85 – Emergency Disconnects

SIEMENS
Ingenuity for life

Code Change Details

Emergency Disconnects. For one- and two-family dwelling units, all service conductors shall terminate in disconnecting means having a short-circuit current rating equal to or greater than the available fault current, installed in a readily accessible outdoor location. If more than one disconnect is provided, they shall be grouped. Each disconnect shall be one of the following:

(1) Service disconnects marked as follows: EMERGENCY DISCONNECT, SERVICE DISCONNECT

(2) Meter disconnects installed per 230.82(3) and marked as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) Other listed disconnect switches or circuit breakers on the supply side of each service disconnect that are suitable for use as service equipment and marked as follows:

EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT

Markings shall comply with 110.21(B).

Disconnects – NEC 230.85 – Emergency Disconnects

SIEMENS
Ingenuity for life

Discussion

This new addition addresses the need for disconnecting means where service conductors terminate at one- and two-family dwellings units. This disconnecting means is required to be installed in a readily accessible outdoor location. The purpose of this disconnecting means is for first responders to have the ability to safely disconnect the service from a structure in the event of an emergency.

Installers and designers may use either of the three methods described to fulfill this requirement:

(1) If the service disconnecting means is located outdoors in a readily accessible location, utilize it for the dual purpose of the emergency disconnecting means. This must be indicated by marking it as follows: EMERGENCY DISCONNECT, SERVICE DISCONNECT

(2) Install a meter disconnect fulfilling the requirements of 230.82(3) and label it as follows: EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT

(3) Install a disconnecting means that is listed as "suitable for use as service equipment" on the supply side of the service disconnect and label it as follows: EMERGENCY DISCONNECT, NOT SERVICE EQUIPMENT

Labels with the statements EMERGENCY DISCONNECT, METER DISCONNECT, NOT SERVICE EQUIPMENT, and/or SERVICE DISCONNECT should be applied by the installer where appropriate.

Disconnects – NEC 445.18 – Generators – Disconnecting Means and Emergency Shutdown

SIEMENS
Ingenuity for life

Code Change Details

Disconnecting Means and Emergency Shutdown.

(A) Disconnecting Means. Generators other than cord-and-plug-connected portable generators shall have one or more disconnecting means. Each disconnecting means shall simultaneously open all associated ungrounded conductors. Each disconnecting means shall be lockable open in accordance with 110.25.

(B) Emergency Shutdown of Prime Mover. Generators shall have provisions to shut down the prime mover. The means of shutdown shall comply with all of the following:

(1) Be equipped with provisions to disable all prime mover start control circuits to render the prime mover incapable of starting

(2) Initiate a shutdown mechanism that requires a mechanical reset

The provisions to shut down the prime mover shall be permitted to satisfy the requirements of 445.18(A) where it is capable of being locked in the open position in accordance with 110.25.

Disconnects – NEC 445.18 – Generators – Disconnecting Means and Emergency Shutdown

SIEMENS
Ingenuity for life

Code Change Details

Disconnecting Means and Emergency Shutdown.

(C) Remote Emergency Shutdown. Generators with greater than 15kW rating shall be provided with a remote emergency stop switch to shut down the prime mover. The remote emergency stop switch shall be located outside the equipment room or generator enclosure and shall also meet the requirements of 445.18(B)(1) and (B)(2).

(D) Emergency Shutdown in One- and Two-Family Dwelling Units. For other than cord-and-plug-connected portable generators, an emergency shutdown device shall be located outside the dwelling unit at a readily accessible location.

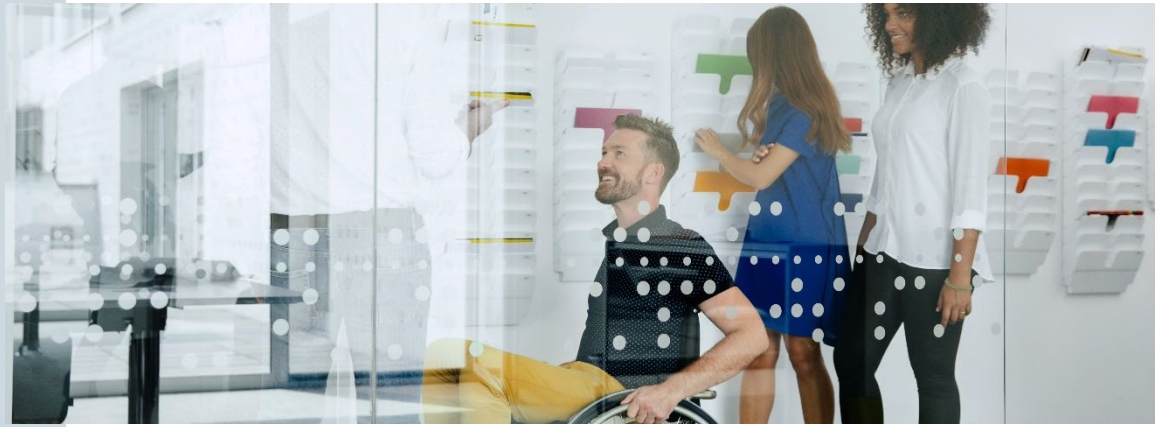
(E) Generators Installed in Parallel. Where a generator is installed in parallel with other generators, the provisions of 445.18(A) shall be capable of isolating the generator output terminals from the paralleling equipment. The disconnecting means shall not be required to be located at the generator.

Disconnects – NEC 445.18 – Generators – Disconnecting Means and Emergency Shutdown

SIEMENS
Ingenuity for life

Discussion

This updated article revises wording and arrangement. There is also a substantial change that requires an emergency shutdown switch to be located on the exterior of one- and two-family dwellings where a non-cord-and-plug-connected generator is installed. This revision was made in order to allow first responders, in the case of an emergency, to easily disconnect the power provided by the generator from the structure's wiring. Unlike 230.85, there are no specific labeling requirements.



Disconnects – NEC 480.7 – Storage Batteries

SIEMENS
Ingenuity for life

Code Change Details – DC Disconnecting Methods

(B) Emergency Disconnect. For one-family and two-family dwellings, a disconnecting means or its remote control for a stationary battery system shall be located at a readily accessible location outside the building for emergency use. The disconnect shall be labeled "EMERGENCY DISCONNECT".

(C) Disconnection of Series Battery Circuits. Battery circuits exceeding 240 volts dc nominal between conductors or to ground and subject to field servicing shall have provisions to disconnect the series-connected strings into segments not exceeding 240 volts dc nominal for maintenance by qualified persons. Non-load-break bolted or plug-in disconnects shall be permitted.

(F) Notification. The disconnecting means shall be legibly marked in the field. A label with the marking shall be placed in a conspicuous location near the battery if a disconnecting means is not provided. The marking shall be of sufficient durability to withstand the environment involved and shall include the following:

(1) Nominal battery voltage
(2) Available fault current derived from the stationary battery system
(3) An arc flash label in accordance with acceptable industry practice
(4) Date the calculation was performed

Disconnects – NEC 480.7 – Storage Batteries

SIEMENS
Ingenuity for life

Code Change Details – DC Disconnecting Methods

(G) Identification of Power Sources. Battery systems shall be indicated by 480.7(G)(1) and (G)(2).

(1) Facilities with Utility Services and Battery Systems. Plaques or directories shall be installed in accordance with 705.10 and 712.10.

Exception: This requirement does not apply where a disconnect in 480.7(A) is not required.

(2) Facilities with Stand-Alone Systems. A permanent plaque or directory shall be installed in accordance with 710.10.

Disconnects – NEC 480.7 – Storage Batteries

SIEMENS
Ingenuity for life

Discussion

This updated section adds requirements for one- and two-family dwellings. Similar to 230.85, an emergency disconnect must be provided in an accessible location on the exterior of the building.

SIEMENS
Ingenuity for life

GFCI / GFPE

Dwelling Units, Other than Dwelling Units,
Outdoor Outlets, Personnel Protection & Testing

GFCI – Dwelling Unit vs. Non-Dwelling Unit

What is a dwelling unit?

Dwelling Unit is “a single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking and sanitation.”

Dwelling, One Family – Building with One Dwelling Unit
Dwelling, Two Family – Building with Two Dwelling Units
Dwelling, Multifamily - Building with Three or more Dwelling Units

In Philadelphia, Dwelling Unit Multifamily is deemed commercial space and falls under NEC 2017.

GFCI / GFPE – NEC 210.8 (A) – Dwelling Units

SIEMENS
Ingenuity for life

Code Change Details (1 of 2)

Dwelling Units. All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Garages and accessory buildings that have a floor located at or below grade level not intended as habitable rooms and limited to storage areas, work areas, and areas of similar use

(3) Outdoors

Exception to (3): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, de-icing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

(4) Crawl spaces — at or below grade level

(5) Basements

Exception to (5): A receptacle supplying only a permanently installed fire alarm or burglar alarm system shall not be required to have ground-fault circuit-interrupter protection.

Informational Note: See 760.41(B) and 760.121(B) for power supply requirements for fire alarm systems.

GFCI / GFPE – NEC 210.8 (A) – Dwelling Units

SIEMENS
Ingenuity for life

Code Change Details (2 of 2)

(6) Kitchens — where the receptacles are installed to serve the countertop surfaces
(7) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink
(8) Boathouses
(9) Bathtubs or shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall
(10) Laundry areas
Exception to (1) through (3), (5) through (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.
(11) Indoor damp and wet locations

GFCI / GFPE – NEC 210.8 (A)

SIEMENS
Ingenuity for life

Discussion

Three revisions took place to enhance the ground-fault circuit-interrupter (GFCI) requirements in dwelling units. First, the parent text was changed and now requires all 125V through 250V receptacles, regardless of amperage, to have GFCI protection for personnel where supplied by single-phase branch circuits rated 150V or less to ground. The previous 20A threshold has been removed. The same shock hazards that exist at 125V receptacles exist at 250V receptacles.

Second, parenthesis (5) has been revised to include finished and unfinished areas of basements. The previous requirement limited GFCI protection to only unfinished portions of basements, not intended to be habitable rooms. This revision takes into account the concern that conductive floor surfaces may exist in finished and unfinished basements. Basements, whether finished or unfinished, are prone to moisture and in some cases flooding.

Third, a new parenthesis (11) has been added that includes indoor damp and wet locations. These locations were added to address areas such as mudrooms or changing rooms where there may be an increased shock risk due to moisture or saturation.

GFCI / GFPE – NEC 210.8 (B) – Other Than Dwelling Units

SIEMENS
Ingenuity for life

Code Change Details (1 of 3)

Other Than Dwelling Units. All 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, and all receptacles supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

(1) Bathrooms

(2) Kitchens or areas with a sink and permanent provisions for either food preparation or cooking

(3) Rooftops

Exception: Receptacles on rooftops shall not be required to be readily accessible other than from the rooftop.

(4) Outdoors

Exception No. 1 to (3) and (4): Receptacles that are not readily accessible and are supplied by a branch circuit dedicated to electric snow-melting, de-icing, or pipeline and vessel heating equipment shall be permitted to be installed in accordance with 426.28 or 427.22, as applicable.

Exception No. 2 to (4): In industrial establishments only, where the conditions of maintenance and supervision ensure that only qualified personnel are involved, an assured equipment grounding conductor program as specified in 590.6(B)(2) shall be permitted for only those receptacle outlets used to supply equipment that would create a greater hazard if power is interrupted or having a design that is not compatible with GFCI protection.

GFCI / GFPE – NEC 210.8 (B) – Other Than Dwelling Units

SIEMENS
Ingenuity for life

Code Change Details (2 of 3)

(5) Sinks — where receptacles are installed within 1.8 m (6 ft) from the top inside edge of the bowl of the sink

Exception No. 1 to (5): In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard shall be permitted to be installed without GFCI protection.

Exception No. 2 to (5): Receptacles located in patient bed locations of Category 2 (general care) or Category 1 (critical care) spaces of health care facilities shall be permitted to comply with 517.21.

(6) Indoor damp and wet locations

(7) Locker rooms with associated showering facilities

(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms

(9) Crawl spaces — at or below grade level

(10) Unfinished areas of basements

Exception to (1) through (5), (8), and (10): Listed locking support and mounting receptacles utilized in combination with compatible attachment fittings installed for the purpose of serving a ceiling luminaire or ceiling fan shall not be required to be ground-fault circuit-interrupter protected. If a general-purpose convenience receptacle is integral to the ceiling luminaire or ceiling fan, GFCI protection shall be provided.

GFCI / GFPE – NEC 210.8 (B) – Other Than Dwelling Units

SIEMENS
Ingenuity for life

Code Change Details (3 of 3)

(11) Laundry areas
(12) Bathtubs and shower stalls — where receptacles are installed within 1.8 m (6 ft) of the outside edge of the bathtub or shower stall

GFCI / GFPE – NEC 210.8 (B) – Other Than Dwelling Units

SIEMENS
Ingenuity for life

Discussion

Seven revisions took place to enhance the ground-fault circuit-interrupter (GFCI) requirements in other than dwelling units.

First, all 250V receptacles to have GFCI protection for personnel based on ampacity.

Second, a sink and permanent provisions food preparation or cooking required GFCI protection.

Third, receptacles in certain areas of health care facilities are not required to have GFCI protection.

Fourth, damp locations such as mudrooms and wash down areas

Fifth, added accessory buildings

Sixth, included unfinished areas of basements and the previous reference to habitable rooms has been deleted for clarity

Seventh, added for laundry rooms and new parenthesis (12) has been added for receptacles installed within 6’ of a bathtub or shower stall. These additions correlate with the existing requirements in 210.8(A) for dwelling units.

GFCI / GFPE – NEC 210.8 (F) - Outdoor Outlets

SIEMENS
Ingenuity for life

Code Change Details

Outdoor Outlets. All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), *(not readily accessible)* Exception to (3), that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel.

Exception: Ground-fault circuit-interrupter protection shall not be required on lighting outlets other than those covered in 210.8(D).

GFCI's are everywhere!

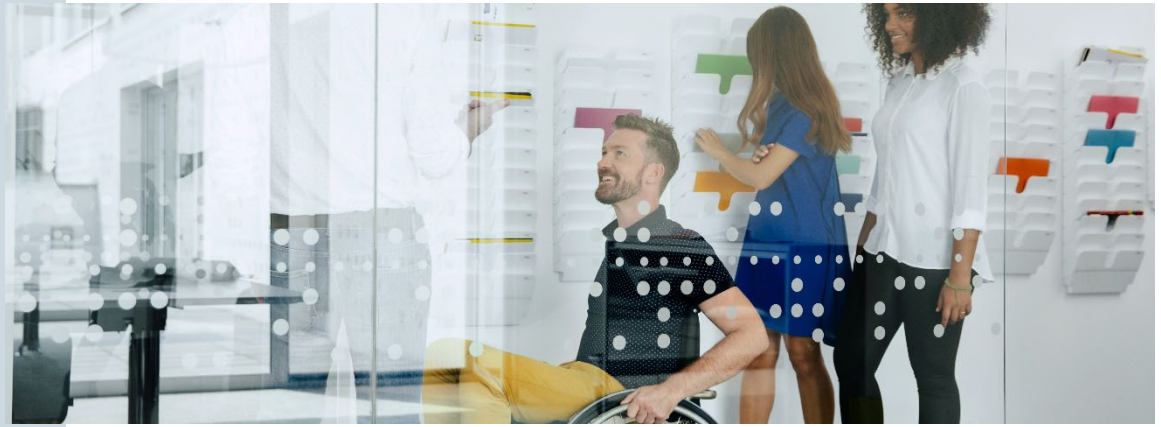
GFCI / GFPE – NEC 210.8 (F) - Outdoor Outlets

SIEMENS
Ingenuity for life

Discussion

This new section was added to address outdoor outlets that are supplied by single-phase branch circuits rated 50A or less, and 150V or less to ground. Outdoor receptacles are already covered by 210.8(A)(3).

This update adds hardwired installations such as HVAC condensers that were not previously covered.



GFCI / GFPE – NEC 625.54 – Electric Vehicle Charging

SIEMENS
Ingenuity for life

Code Change Details

Ground-Fault Circuit-Interrupter Protection for Personnel.

In addition to the requirements in 210.8, all receptacles installed for the connection of electric vehicle charging shall have ground-fault circuit-interrupter protection for personnel.

Electric Vehicle Power Transfer

GFCI / GFPE – NEC 625.54 – Electric Vehicle Power Transfer

SIEMENS
Ingenuity for life

Code Change Details

Ground-Fault Circuit-Interrupter Protection for Personnel.

In addition to the requirements in 210.8, all receptacles installed for the connection of electric vehicle charging shall have ground-fault circuit-interrupter protection for personnel.

Electric Vehicle Power Transfer

GFCI / GFPE – NEC 625.54

SIEMENS
Ingenuity for life

Discussion

This revision enhances the GFCI requirements for personnel by requiring all receptacles installed for the connection of electric vehicles to be afforded such protection. The previous requirements limiting GFCI protection to only single-phase, 150V or less to ground, and 50A or less have been removed. Portable equipment as well as stationary equipment served by receptacles are now required to be GFCI protected.

This expansion of GFCI protection provides the same level of personnel safety to all receptacles, regardless of voltage.

1 pole GFCI – Available in 15, 20 and 30A up to 65kAIC

	10kAIC	22kAIC	65kAIC
15A	QF115A	QF115AH	QF115AHH
20A	QF120A	QF120AH	QF120AHH
30A	QF130A	QF130AH	QF130AHH

2 pole GFCI – Available in 15 – 60A up to 22kAIC

	10kAIC	22kAIC
15A	QF215A	QF215AH
20A	QF220A	QF220AH
30A	QF230A	QF230AH
40A	QF240A	QF240AH
50A	QF250A	QF250AH
60A	QF260A	QF260AH

GFCI / GFPE – NEC 517.17(D) – Health Care Facilities Testing

SIEMENS
Ingenuity for life

Code Change Details

Testing. When ground-fault protection of equipment is first installed, each level shall be performance tested to ensure compliance with 517.17(C). This testing shall be conducted by a qualified person(s) using a test process in accordance with the instruction provided with the equipment. A written record of this testing shall be made and shall be available to the authority having jurisdiction.

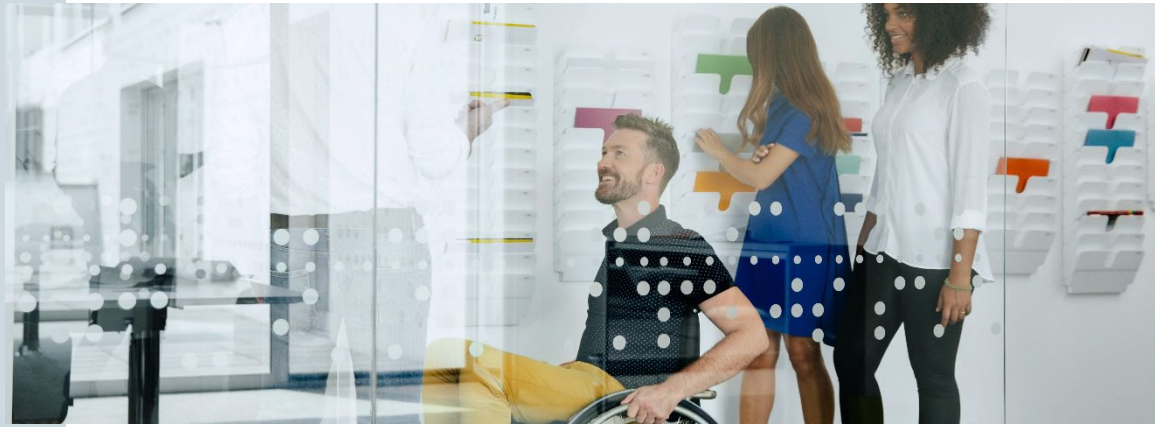
GFCI / GFPE – NEC 517.17(D) – Health Care Facilities Testing

SIEMENS
Ingenuity for life

Discussion

The requirement for on-site testing was in the previous edition of the NEC, but there were no guidelines around the test specifications and who was allowed to perform the testing. For 2020, this section has been updated to require that on-site testing be performed by qualified persons following a procedure provided with the equipment.

Finally, a record of the testing must be created and made available to the Authority Having Jurisdiction.



GFCI / GFPE – NEC 680.21(C) - Swimming Pools, Fountains

SIEMENS
Ingenuity for life

Code Change

GFCI Protection. Outlets supplying all pool motors on branch circuits rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A ground-fault circuit-interrupter protection.

Exception: Listed low-voltage motors not requiring grounding, with ratings not exceeding the low-voltage contact limit that are supplied by listed transformers or power supplies that comply with 680.23(A)(2), shall be permitted to be installed without GFCI protection.

1 pole GFCI – Available in 15, 20 and 30A up to 65kAIC

	10kAIC	22kAIC	65kAIC
15A	QF115A	QF115AH	QF115AHH
20A	QF120A	QF120AH	QF120AHH
30A	QF130A	QF130AH	QF130AHH

2 pole GFCI – Available in 15 – 60A up to 22kAIC

	10kAIC	22kAIC
15A	QF215A	QF215AH
20A	QF220A	QF220AH
30A	QF230A	QF230AH
40A	QF240A	QF240AH
50A	QF250A	QF250AH
60A	QF260A	QF260AH

GFCI / GFPE – NEC 680.21(C) - Swimming Pools, Fountains

SIEMENS
Ingenuity for life

Discussion

This revision enhances the GFCI requirements for outlets supplying pool motors by requiring all outlets rated 250V or less and 60A or less, single- or three-phase to be afforded such protection. The previous requirements limiting GFCI protection to only single phase, 120V through 240V have been expanded. Pool pump motors, whether cord-and-plug-connected or hardwired that meet the revised voltage and amperage thresholds are now required to be GFCI protected. The expanded GFCI requirement recognizes the fact that the same shock hazard exists at pool pump motors, regardless of the voltage and amperage levels.

GFCI / GFPE – NEC 680.59 - Swimming Pools, Fountains – Non-Submersible Pumps

SIEMENS
Ingenuity for life

Code Change Details

GFCI Protection for Permanently Installed Non-Submersible Pumps. Outlets supplying all permanently installed non-submersible pump motors rated 250 volts or less and 60 amperes or less, single- or 3-phase, shall be provided with ground-fault circuit-interrupter protection.

GFCI / GFPE – NEC 680.59 - Swimming Pools, Fountains - Nonsubmersible Pumps

SIEMENS
Ingenuity for life

Discussion

A new section 680.59 has been added that requires GFCI protection for non-submersible fountain pumps. This protection applies to all pumps that are rated 250V or less and 60A or less, single- or three-phase. Pumps in fountain locations expose installers and maintainers to a greater risk of shock hazard and providing GFCI protection mitigates that risk. Note that the requirement references outlets, which means GFCI protection is required if the pumps are hardwired or cord-and-plug-connected.

SIEMENS
Ingenuity for life

Overvoltage (Surge) Protection

Dwelling Units & Overvoltage Protection

Overvoltage (Surge) Protection – NEC 230.67 - Services

SIEMENS
Ingenuity for life

Code Change Details

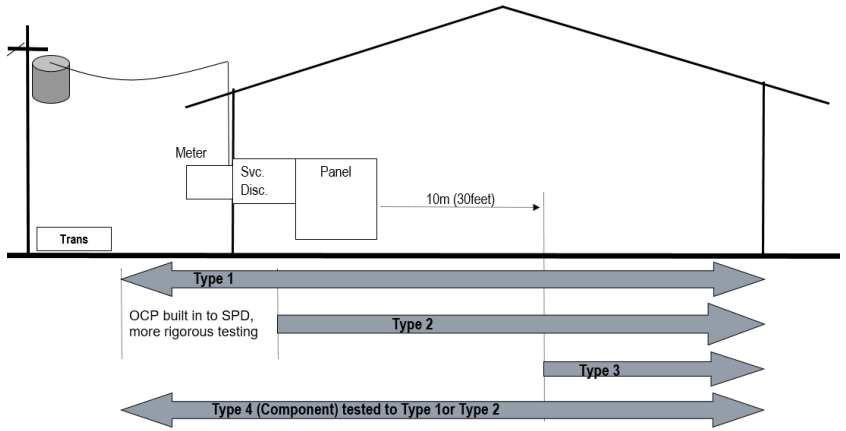
(A) Surge-Protective Device. All services supplying dwelling units shall be provided with a surge-protective device (SPD).

(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 the service equipment as required in (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.



Overvoltage (Surge) Protection – NEC 230.67 - Services

SIEMENS
Ingenuity for life

Discussion

A new requirement has been added at section 230.67 that applies to service equipment surge protection in dwelling units. This requirement is intended to address the need to protect sensitive electronics found in items such as appliances, smoke alarms, arc-fault circuit-interrupters, and ground-fault circuit-interrupters. Additionally, the expanding use of distributed energy resources such as wind and photovoltaics often result in a greater exposure to the introduction of surges into the system.

Section 230.67 requires that all services supplying dwelling units be provided with a surge protective device. The device is required to be an integral part of the service equipment or it can be located immediately adjacent to the service equipment. When not installed integrally or immediately adjacent to the service equipment, there is an option to provide the protection at each next-level distribution equipment downstream toward the load. The surge protection device can be either a Type 1 or Type 2 device. This new requirement also applies to when existing service equipment is replaced.

Overvoltage (Surge) Protection – NEC 242 – Overvoltage Protection

SIEMENS
Ingenuity for life

Code Change Details

New section combining articles 280 and 285

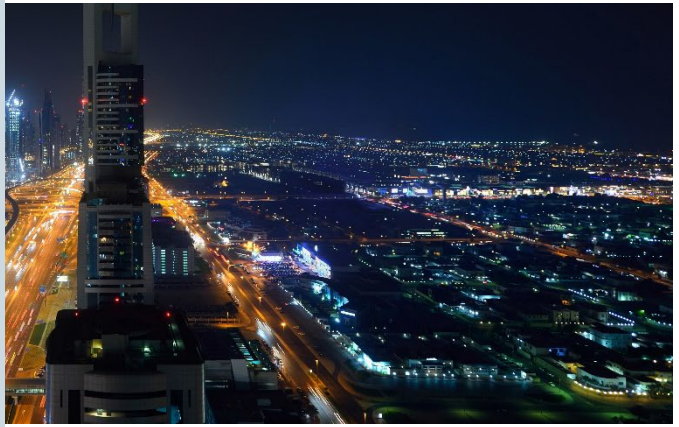
Overvoltage (Surge) Protection – NEC 242 – Overvoltage Protection

SIEMENS
Ingenuity for life

Discussion

New to the 2020 NEC is Article 242 Overvoltage Protection. The new article has combined previous Article 280 Surge Arresters, Over 1000 Volts, and Article 285 Surge Protective Devices, 1000 Volts or Less. One technical change occurred in section 242.49 concerning identifying types of grounding conductors.

The new article was formed at the direction of the NEC Correlating Committee to improve clarity and usability associated with overvoltage protection. A task group, which included stakeholders of electrical industry professionals, reviewed previous Articles 280 and 285 and recommended that they be combined into one new article to assist users of the Code. Overcurrent protection requirements are still found in Article 240 and overvoltage protection requirements can now be found in the following article, which is a logical and convenient location for these types of protection.



SIEMENS
Ingenuity for life

Power Monitoring

Energy Management Equipment

Power Monitoring – NEC 312.8(B)

SIEMENS
Ingenuity for life

Code Change Details (1 of 2)

Power Monitoring or Energy Management Equipment. The wiring space of enclosures for switches or overcurrent devices shall be permitted to contain power monitoring or energy management equipment in accordance with 312.8(B)(1) through (B)(3).

(1) Identification. The power monitoring or energy management equipment shall be identified as a field installable accessory as part of the listed equipment or is a listed kit evaluated for field installation in switch or overcurrent device enclosures.

(2) Area. The total area of all conductors, splices, taps, and equipment at any cross section of the wiring space shall not exceed 75 percent of the cross-sectional area of that space.

Power Monitoring – NEC 312.8(B)

SIEMENS
Ingenuity for life

Code Change Details (2 of 2)

(3) Conductors. Conductors used exclusively for control or instrumentation circuits shall comply with either 312.8(B)(3) (a) or (B)(3)(b).

(a) Conductors shall comply with 725.49.

(b) Conductors smaller than 18AWG, but not smaller than 22AWG for a single conductor and 26AWG for a multiconductor cable shall be permitted to be used where the conductors and cable assemblies meet all of the following conditions:

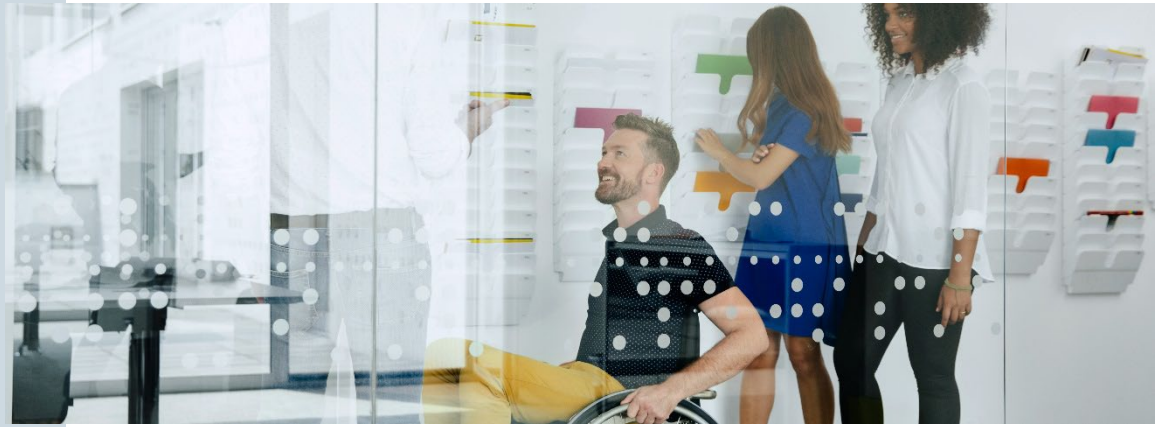
(1) Are enclosed within raceways or routed along one or more walls of the enclosure and secured at intervals that do not exceed 250 mm (10 in.)
(2) Are secured within 250 mm (10 in.) of terminations
(3) Are secured to prevent contact with current carrying components within the enclosure
(4) Are rated for the system voltage and not less than 600 volts
(5) Have a minimum insulation temperature rating of 90°C

Power Monitoring – NEC 312.8(B)

SIEMENS
Ingenuity for life

Discussion

This section has been updated and now allows for a wider range of conductor sizes to be used for power monitoring and energy management equipment. Previously, the lower wire diameter limit was 18AWG, but with this change, 22AWG single conductors and 26AWG multiconductor cables can be used. This change should allow for less bulky wiring harnesses where power monitoring equipment is installed.



Power Monitoring – NEC 408.23 – Switchboards, Switchgear and Panelboards

SIEMENS
Ingenuity for life

Code Change Details

Power Monitoring and Energy Management Equipment.

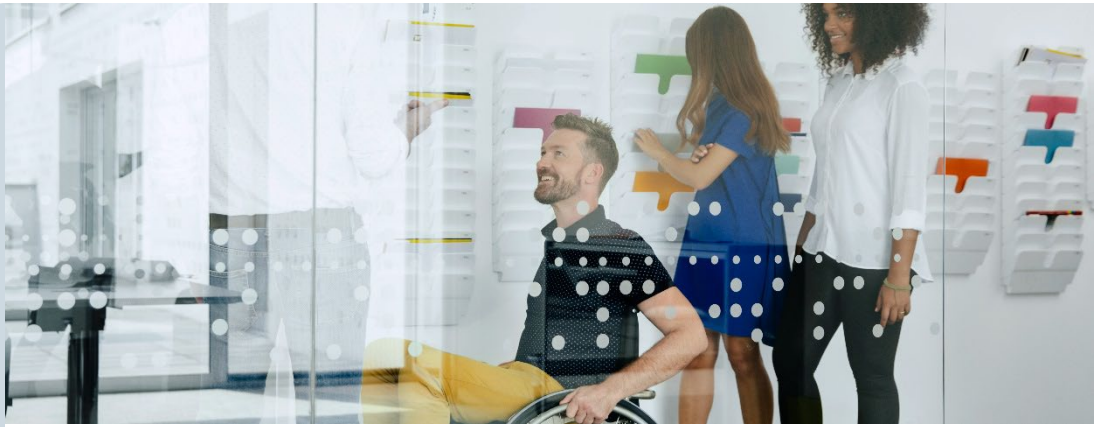
The requirements of 312.8(B) - Switch and Overcurrent Device Enclosures shall apply.

Power Monitoring – NEC 408.23 – Switchboards, Switchgear and Panelboards

SIEMENS
Ingenuity for life

Discussion

This new section extends 312.8(B) (previous topic), Power Monitoring or Energy Management Equipment, to switchboard and switchgear applications. These requirements previously only applied to cabinets, cutout boxes, meter socket enclosure and, by extension, panelboards.



SIEMENS
Ingenuity for life

Reconditioning

Defining what is and is not allowed to be reconditioned

Reconditioning - NEC 100

SIEMENS
Ingenuity for life

Code Change Details

Reconditioned. Electromechanical systems, equipment, apparatus, or components that are restored to operating conditions. This process differs from normal servicing of equipment that remains within a facility or replacement of listed equipment on a one-to-one basis.

Informational Note: The term reconditioned is frequently referred to as rebuilt, refurbished, or remanufactured.

Reconditioning – NEC 100

NEC Reference	NEC Topic	Applicable Products	Added Requirement
110.21(A)(2)	Equipment Markings	All	Original listing mark must be removed
240.88	Overcurrent Protection	LV Power CB MV Power CB HV CB Electromech Prot Relays	Shall be permitted to be reconditioned Must be listed as "reconditioned"
408.8(B)	Switchboards, Switchgear and Panelboards	Switchboards Switchgear	Shall be permitted to be reconditioned
240.88	Overcurrent Protection	MCCB LV Power CB ETU	Reconditioning not allowed
240.62	Overcurrent Protection	LV Fuse holders Non-renewable fuses	
240.102	Overcurrent Protection	MV Fuse holders Non-renewable fuses	
210.15	Branch Circuits	GFCI AFCI GFPE	
406.3(A)	Receptacles	Receptacles AFCI GFCI	
408.8(A)	Switchboards, Switchgear and Panelboards	Panelboards	
700.5	Emergency Systems	ATS	
702.5	Opt. Standby Systems	Transfer Switches	
708.24(A)	Critical Operations Power Systems	Transfer Switches	

Bonus Material

Just when you thought it was safe to go back in the water.

Bonus Material

SIEMENS
Ingenuity for life

Code Change Details

Definition – Dormitory Unit –

A building or a space in a building in which group sleeping accommodations are provided for more than 16 persons who are not members of the same family in one room, or a series of closely associated rooms, under joint occupancy and single management, with or without meals, but without individual cooking facilities.

Bonus Material

SIEMENS
Ingenuity for life

Code Change Details

Definition – Habitable Room –

A room in a building for living, sleeping, eating, or cooking, but excluding bathrooms, toilet rooms, closets, hallways, storage or utility spaces and similar areas

Bonus Material – NEC 680.2

SIEMENS
Ingenuity for life

Code Change Details

Definition – Splash Pads –

A fountain with a pool depth of 1 inch or less intended for recreational use by pedestrians.

Bonus Material – NEC 110.22(A)
Identification of Disconnecting Means

SIEMENS
Ingenuity for life

Code Change Details

Requirements – Identification of Disconnecting Means

Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- or two-family dwellings, the marking shall include the identification of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.

Bonus Material – NEC 110.26(C)(2)
Large Equipment and Egress

SIEMENS
Ingenuity for life

Code Change Details

Large Equipment

For large equipment that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 24 inches wide and 6-1/2 feet high at each end of the working space. This requirement shall apply to either of the following conditions:

(1) Equipment rated 1200 amperes or more and over 6 foot wide.

(2) For service disconnecting means installed in accordance with 230.71 (Maximum Number of Disconnects) where the combined ampere rating is 1200 amperes or more and over 6 feet wide.

Open equipment doors shall not impede the entry to or egress from the working space.

Bonus Material – NEC 620.51(A) & 620.65 Elevators – Disconnecting Means

SIEMENS
Ingenuity for life

Code Change Details

Disconnecting Means. Elevators, Dumbwaiters…

The disconnecting means shall be an enclosed externally operable fused motor circuit switch or circuit breaker that is lockable only in the open position in accordance with 110.25.

Signage. Equipment enclosures containing selectively coordinated overcurrent devices shall be legibly marked in the field to indicate that the overcurrent devices are selectively coordinated. The marking shall meet the requirements of 110.21 (B), shall be readily visible, and shall state the following:

CAUTION: OVERCURRENT DEVICES IN THIS ENCLOSURE ARE SELECTIVELY COORDINATED. EQUIVALENT REPLACEMENTS AND TRIP SETTING ARE REQUIRED.

Bonus Material

SIEMENS
Ingenuity for life

Code Change Details

210.8 (D) – Vending machines get GFCI's

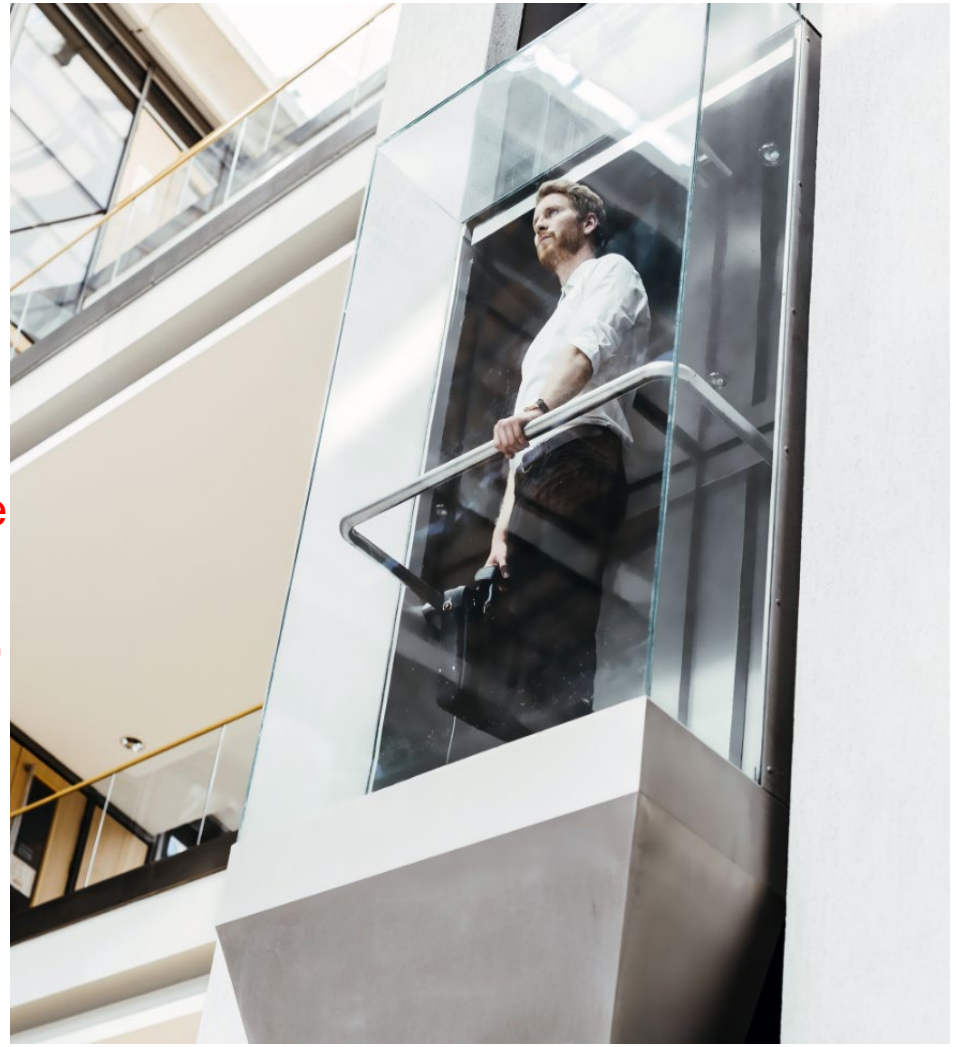
210.8 (E) – GFCI for equipment requiring Servicing like HVAC

210.12 (C) – AFCI for Guest Rooms, Guest Suites, and Patient Sleeping Rooms in Nursing Homes and Limited Care Facilities

210.52 (C)(2)(a) – Island and Peninsular Countertops and Work Surfaces – At least one receptacle outlet shall be provided for the first 9 feet^2, or fraction thereof, of the countertop or work surface. A receptacle outlet shall be provided for every additional 18 feet^2, or fraction thereof, of the countertop or work surface.

680.4 – Swimming Pools, Fountains and Splash Pads are now subject to periodic inspection and testing by the AHJ.

600.5 (A) – Exit signs are NOT required in areas for delivery, service corridors and service hallways.



Bonus Material

SIEMENS
Ingenuity for life

Code Change Details

408.6 – Switchboard, Panelboards, Switchgear – In other than 1 and 2 family dwelling units equipment shall be marked with the calculated fault current and the date it was performed.

406.9.C – No receptacle 3 feet horizontally and 8 feet vertically from the rim of the tub.

408.4 (A) – Rooms shall be described in a non-transient manner. Northeast Bedroom is correct. Fred's room is not.

408.43 – Panelboards shall not be mounted in the face up position.

220.12 – Lighting table for non-dwelling units updated (1971)

110.14 (D) – Torque values shall be indicated on the equipment. An approved means shall be used to achieve the indicated torque values.

What did we learn about today?
NEC Code changes in regards to:

Adjustable Trip Circuit Breakers
Arc Energy Reduction
Connections
Coordination
Critical Operations Power Systems (COPS)
Disconnects
GFCI / GFPE
Overvoltage (Surge) Protection
Power Monitoring
Reconditioning

Thank you for your time, attendance and participation!

SIEMENS
Ingenuity for life

Brad Zilch
Business Development Manager

2060 Detweiler Road
Harleysville, PA 19438
USA

Phone: (610) 662-6791
Mobile: (610) 662-6791

E-mail:
brad.zilch@siemens.com

www.usa.siemens.com/ce

Thank you!

SIEMENS
Ingenuity for life

No really.
That was the end.
I’m done.
Thank you!