

2020 NEC Changes

Schneider Electric Codes and Standards
Presented by: Chad Kennedy



© 2020 Schneider Electric

NEC® in Effect 1/1/2020

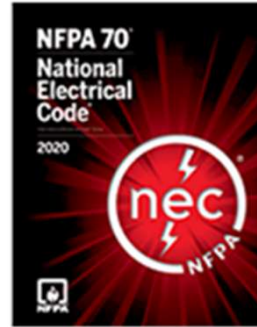


- 2020 NEC® - 1
- 2017 NEC® - 31
- 2014 NEC® - 11
- 2011 NEC® - 1
- 2008 NEC® - 3
- County/Municipality NEC® regulation only - 3

Source: dynapact (s)

2020 NEC Facts

- 3730 Public Inputs
- 1930 Public Comments
- 4 New Articles, 4 Deleted Articles
- 18 Code Making Panels
- NFPA Annual Meeting, June 2019
- Issuance by Standards Council, Effective Date, and Available for Adoption in August 2020



2020 NEC Facts

New Articles

- Article 242 SPDs (All)
- Article 311 MV Conductors & Cable
- Article 337 Type P Cable
- Article 800 General Requirements for Communications Systems

Deleted Articles

- Article 280 SPDs over 1000 V
- Article 285 SPDs 1000 V or less
- Article 328 MV Cable Type MV
- Article 553 Floating Buildings

Article 242 (New)

Overvoltage Protection

Articles 280 and 285 combined into one article

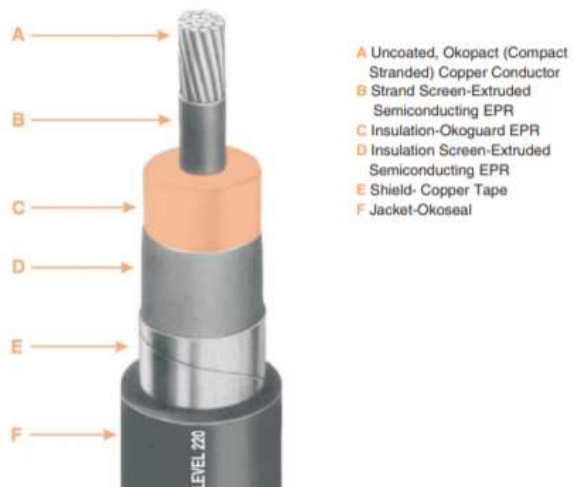
- Part II SPD's 1000V or less
- Part III Surge Arrestors, Over 1000V



Article 311 (New)

Medium Voltage Conductors and Cable

- Construction specifications
- Installations
- Ampacities
- Listing of Type MV



Article 337 (New)

Type P Cable

- 2000 V and less, with and without armor
- A factory assembly of one or more insulated flexible tinned CU conductors and associated equipment grounding conductors with a non-metallic jacket
- Industrial applications under engineering supervision
- Hazardous locations by reference within those articles

© 2020 Schneider Electric | Page 7

Article 800 (New)

General Requirements for Communications Systems

- Common location to set the common rules for Chapter 8 wiring methods

© 2020 Schneider Electric | Page 8

Chapter 1

General

90.2 (A) Scope

Introduction

New areas covered

(5) Installations supplying shore power to ships and watercraft in marinas and boatyards, including monitoring for leakage current.

(6) Installations used to export electric power from vehicles to premises wiring or for bidirectional current flow.



90.2 (B) Scope

Introduction

Updated what is **not covered** by the code by adding another subsection to what is under utility control.

(5) d. Are located by other written agreements either designated by or recognized by public service commissions, utility commissions, or other regulatory agencies having jurisdiction for such installations. These written agreements shall be limited to installations for the purpose of communications, metering, generation, control, transformation, transmission, energy storage, or distribution of electric energy where legally established easements or rights-of-way cannot be obtained. These installations shall be limited to federal lands, Native American reservations through the U.S. Department of the Interior Bureau of Indian Affairs, military bases, lands controlled by port authorities and state agencies and departments, and lands owned by railroads.

100 Island Mode

Definitions

Stand-Alone (Islanded) Island Mode

The operational mode for stand-alone power production equipment or an isolated microgrid, or for a multimode inverter or an interconnected microgrid that is disconnected from an electric power production and distribution network or other primary power source. (CMP-4)

Informational Note: Isolated microgrids are distinguished from interconnected microgrids, which are addressed in Article 705.



100 Power Production Equipment

Definitions

Power Production Equipment.

Electrical generating equipment supplied by any source other than a utility service, up to the source system disconnecting means.

Informational Note: Examples of power production equipment include such items as generators, solar photovoltaic systems, and fuel cell systems



© 2020 Schneider Electric | Page 13

100 Reconditioned

Definitions

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. (CMP-10)

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

© 2020 Schneider Electric | Page 14

110.14 (D) Electrical Connections

Requirements for Electrical Installations

(D) Terminal Connection Torque.

Tightening torque values for terminal connections shall be as indicated on equipment or in installation instructions provided by the manufacturer. An approved means shall be used to achieve the indicated torque value.



Visi-Tite™
Nut



Examples:

- Torque tools
- Shear bolts
- Breakaway devices

LUG TORQUE DATA
SEE CIRCUIT BREAKERS AND FIELD INSTALLED UNITS FOR WIRE RANGE AND TORQUE

Lug Type	Wire Range (AWG/kcmil)	Torque lb-in
Main & Neutral Lugs	4-250 CU / 4-300 AL	250
Service Ground Lug	6-2/0 CU/AL	50
Always Main Breaker	See Main Breaker	See Main Breaker

BRANCH NEUTRAL AND EQUIPMENT GROUND BAR

Wire Range (AWG)	TORQUE LB-IN	
	BAR WITH 2 SCREW SIZES	BAR WITH 1 SCREW SIZE
1/0 - 3 CU / AL	LARGE 50 SMALL ---	---
4 CU / AL	45	35
6 CU / AL	45	35
8 CU / AL	40	25
10-14 CU / 10-12 AL	35	20

EQUIPMENT GROUND COMBINATIONS (QTY WIRES)

14 CU	(2 or 3) 35	(2) 10	(2 or 3) 25
12 CU/AL	(2 or 3) 35	(2) 10	(2 or 3) 25
10 CU/AL	(2 or 3) 35	---	(2 or 3) 25

110.21 (A)(2) Equipment Markings

Requirements for Electrical Installations

(2) Reconditioned Equipment.

Reconditioned equipment shall be marked with the name, trademark, or other descriptive marking by which the organization responsible for reconditioning the electrical equipment can be identified, along with the date of the reconditioning.

- Identified as **“reconditioned”**
- Original listing mark **removed**
- Exception for industrial occupancies under conditions of maintenance and supervision.

110.22 Identification of Disconnecting Means

Requirements for Electrical Installations

(A) General.

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.



© 2020 Schneider Electric | Page 17



© 2020 Schneider Electric | Page 18

110.26 (C)(2) Spaces About Electrical Equipment

Requirements for Electrical Installations

Large equipment that contains overcurrent devices, switching devices, or control devices is required to have one entrance/egress from the required working space at each end of the working space for the following conditions.

- For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide
- Multiple service disconnecting means where the combined ampere rating is 1200 A or more and over 1.8 m (6 ft) wide



© 2020 Schneider Electric | Page 19

110.26 (C)(2) Spaces About Electrical Equipment

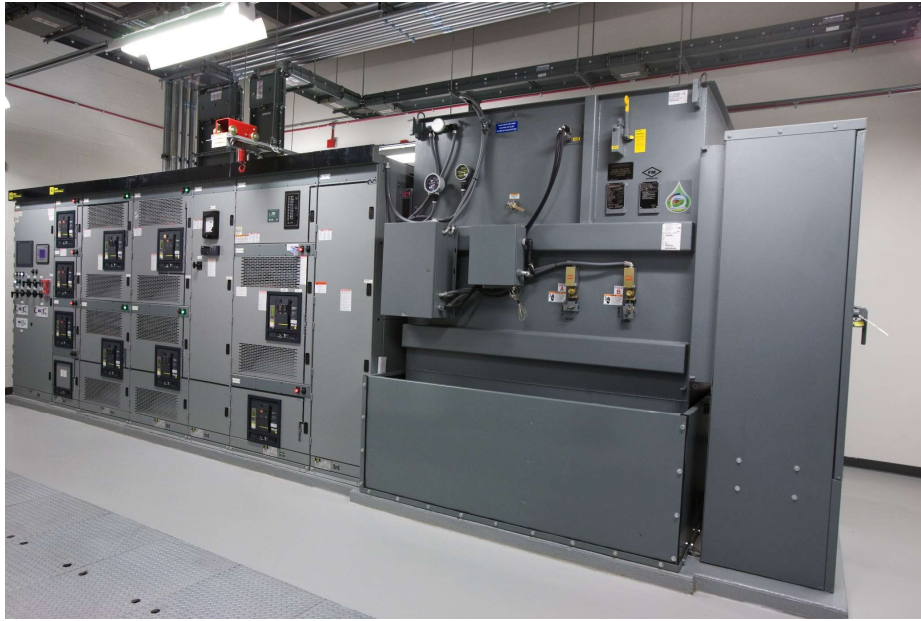
Requirements for Electrical Installations

Large equipment (continued)

- For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide
- Open equipment doors shall not impede the entry to or egress from the working space.



© 2020 Schneider Electric | Page 20



© 2020 Schneider Electric | Page 21

Life Is On | Schneider Electric

Chapter 2

Wiring and Protection

© 2020 Schneider Electric | Page 22

Life Is On | Schneider Electric

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Dwellings

All 125-**250 volt** receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(A)(5) Basements** – Expanded from unfinished areas to further include **finished** areas.



© 2020 Schneider Electric | Page 23

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Dwellings

All 125-**250 volt** receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(A)(7) Sinks** – Now includes Range receptacles within 6ft of the sink.



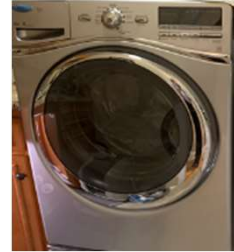
© 2020 Schneider Electric | Page 24

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Dwellings

All 125-**250 volt** receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(A)(10) Laundry** – Expanded to now include the protection of Electric Dryers.



Watch for neutral to ground connections!



210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Non Dwellings

All 125-250 volt receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(B)(2) Kitchens** – Expanded to include areas with a sink and permanent provisions for either food preparation or cooking



210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Non Dwellings

All 125-250 volt receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(B)(6) Indoor damp and wet locations**



© 2020 Schneider Electric | Page 27

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Non Dwellings

All 125-250 volt receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(B)(8) Accessory buildings**



© 2020 Schneider Electric | Page 28

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits - Non Dwellings

All 125-250 volt receptacles require Ground Fault Circuit Interrupter protection in the following locations:

- **210.8(B)(11) Laundry**

- **210.8(B)(12) Bathtubs and shower stalls –**
Where installed within 6 ft of the outside edge



© 2020 Schneider Electric | Page 29

210.8 – Ground-Fault Circuit Interrupter Protection

Specific Appliance Outlets

210.8(D) Specific Appliances – Correlates with 422.5 and requires GFCI protection for the outlets supplying the specific appliances listed in 422.4(A) unless it is provided per 422.5(B)(3) through (B)(5). Vending machines require GFCI protection for the branch circuit unless it is provided per 422.5(B)(3) or (B)(4).



© 2020 Schneider Electric | Page 30

210.8 – Ground-Fault Circuit Interrupter Protection

Equipment Service Receptacles – Both Dwellings and Non-dwellings

210.8(E) Equipment Requiring Servicing – GFCI protection is now required for the HVAC and refrigeration equipment outlet required in 210.63 for servicing these systems.



© 2020 Schneider Electric | Page 31

210.8 – Ground-Fault Circuit Interrupter Protection

Branch Circuits – Dwelling Unit Outdoor Outlets

210.8(F) Outdoor Outlets – Now includes outlets 150V to ground or less and up to 50amps

- Outdoor AC/Heat Pump Unit
- Outdoor 15-50 amp receptacles
- Exception: Excludes dedicated branch circuit for deicing and snow melting equipment and outdoor lighting outlets other than crawl spaces 210.8(C)



© 2020 Schneider Electric | Page 32

210.12 (C) – Nursing Homes & Limited-Care Facilities

Branch Circuits - Arc-Fault Circuit Interrupter Protection

Nursing homes and limited care facilities

All 120-volt single phase, 15-20 amp branch circuits supplying outlets and devices installed in **patient sleeping rooms** shall have AFCI protection



© 2020 Schneider Electric | Page 33

210.12(D) Guest Rooms and Guest Suites

Branch Circuit Extensions or Modifications - Arc-Fault Circuit Interrupter Protection

- Added branch circuit extensions or modifications locations requiring AFCI
- Dormitory Units, Guest Rooms and Guest Suites.



© 2020 Schneider Electric | Page 34

210.15 Reconditioned Equipment

Branch Circuits

- **The following shall not be reconditioned.**
 - **GFCI**
 - **AFCI**
 - **GFPE**

© 2020 Schneider Electric | Page 35

210.52(C) Countertop and Work Surface Receptacle Outlets

Branch Circuits

(2) Receptacles at Island and Peninsular Countertops

- Number of receptacles based on square foot calculation
- One receptacle for first 9 ft² and additional receptacle for every additional 18 ft² or fraction thereof
- At least one receptacle must be within 2 ft of the end
- Peninsular measurement begins at the connected perpendicular wall



Island shown is 12 ft² so **2 receptacle outlets are required**

One outlet

© 2020 Schneider Electric | Page 36

210.70 Lighting Outlets Required

Branch Circuits

210.70 (A) (1) Habitable Rooms.

- Revision allows a control device to meet the wall-mounted lighting control requirements
- Located near an entrance to the room
- Exceptions to permit one or more controlled receptacles in lieu of lighting outlets were extended to wall mounted control devices



© 2020 Schneider Electric | Page 37

215.9 GFCI Protection

Feeders

Permits feeder GFCI protection in lieu of the requirements in 210.8 for dwellings and non-dwellings and temporary wiring installations in 590.6(A)

Limitation to 15 A and 20 A branch circuits was removed



© 2020 Schneider Electric | Page 38

220.12 Lighting Load for Non-Dwelling Occupancies

Load Calculations

A unit load of not less than that specified in Table 220.12 for non-dwelling occupancies and the floor area determined in 220.11 shall be used to calculate the minimum lighting load. Motors rated less than 1/8 HP and connected to a lighting circuit shall be considered general lighting load.

220.12 Lighting Load for Non-Dwelling Occupancies

Load Calculations

Table 220.12 General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/m ²	Volt-amperes/ft ²
Automotive facility	16	1.5
Convention center	15	1.4
Courthouse	15	1.4
Dormitory	16	1.5
Exercise center	15	1.4
Fire station	14	1.3
Gymnasium ^a	18	1.7
Health care clinic	17	1.6
Hospital	17	1.6
Hotels and motels, including apartment houses without provisions for cooking by tenants ^b	18	1.7
Library	16	1.5

220.12 Lighting Load for Non-Dwelling Occupancies

Load Calculations

Table 220.12 General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/m ²	Volt-amperes/ft ²
Manufacturing facility ^c	<u>24</u>	<u>2.2</u>
Motion picture theater	<u>17</u>	<u>1.6</u>
Museum	<u>17</u>	<u>1.6</u>
Office ^d	<u>14</u>	<u>1.3</u>
Parking garage ^e	<u>3</u>	<u>0.3</u>
Penitentiary	<u>13</u>	<u>1.2</u>
Performing arts theater	<u>16</u>	<u>1.5</u>
Police station	<u>14</u>	<u>1.3</u>
Post office	<u>17</u>	<u>1.6</u>
Religious facility	<u>24</u>	<u>2.2</u>
Restaurant ^f	<u>16</u>	<u>1.5</u>

220.12 Lighting Load for Non-Dwelling Occupancies

Load Calculations

Table 220.12 General Lighting Loads by Non-Dwelling Occupancy

Type of Occupancy	Unit Load	
	Volt-amperes/m ²	Volt-amperes/ft ²
Retail ^{g,h}	<u>20</u>	<u>1.9</u>
School/university	<u>33</u>	<u>3</u>
Sports arena	<u>33</u>	<u>3</u>
Town hall	<u>15</u>	<u>1.4</u>
Transportation	<u>13</u>	<u>1.2</u>
Warehouse	<u>13</u>	<u>1.2</u>
Workshop	<u>18</u>	<u>1.7</u>

220.12 Lighting Load for Non-Dwellings

Load Calculations

(K) ~~Banks and~~ Office Buildings.

In ~~banks or~~ office buildings, the receptacle loads shall be calculated to be the larger of (1) or (2):

1. The calculated load from 220.14(I) after all demand factors have been applied
2. 11 volt-amperes/m² or 1 volt-ampere/ft²

© 2020 Schneider Electric | Page 43

225.30 Number of Supplies

Outside Branch Circuits and Feeders

A building or other structure that is served by a branch circuit or feeder on the load side of a service disconnecting means shall be supplied by only one feeder or branch circuit unless permitted in 225.30(A) through (E). For the purpose of this section, a multiwire branch circuit shall be considered a single circuit.

Where a branch circuit or feeder originates in these additional buildings or other structures, only one feeder or branch circuit shall be permitted to supply power back to the original building or structure, unless permitted in 225.30(A) through (E).

© 2020 Schneider Electric | Page 44

225.30 Number of Supplies

Outside Branch Circuits and Feeders

(A) Special Conditions - Additional feeders or branch circuits permitted to supply:

1. Fire pumps
2. Emergency systems
3. Legally required standby systems
4. Optional standby systems
5. Parallel power production systems
6. Systems designed for connection to multiple sources of supply for the purpose of enhanced reliability
7. Electric vehicle charging systems listed, labeled, and identified for more than a single branch circuit or feeder
8. Docking facilities and piers



© 2020 Schneider Electric | Page 45

225.30 Number of Supplies

Outside Branch Circuits and Feeders

(B) Common Supply Equipment.

Where feeder conductors originate in the same panelboard, switchboard, or other distribution equipment, and each feeder terminates in a single disconnecting means, not more than six feeders shall be permitted. Where more than one feeder is installed in accordance with this section, all feeder disconnects supplying the building or structure supplied shall be grouped in the same location, and the requirements of 225.33 shall not apply. Each disconnect shall be marked to indicate the load served.

© 2020 Schneider Electric | Page 46

230.46 Spliced and Tapped Conductors

Services

- Power distribution blocks, pressure connectors, and devices for service conductor splices and taps shall be **listed**.
- Power distribution blocks installed on service conductors must be marked “suitable for use on the line side of the service equipment” or equivalent.



Effective January 1, 2023, all devices in this application will require this marking

230.46 Spliced and Tapped Conductors

Services

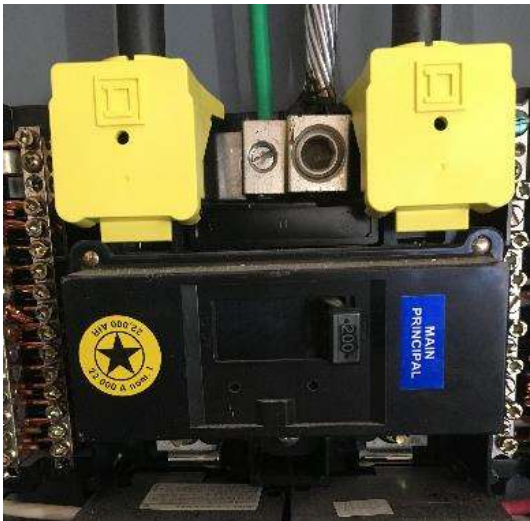


230.62 Service Equipment – Enclosed or Guarded

Services

(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.





230.67 Surge Protection

Services

- Required for all services supplying dwelling units
- Located integral to the service equipment or immediately adjacent
- Exception permits locating at each level of downstream distribution
- Type 1 (line side) or Type 2 (load side)
- Replacements or service upgrades must comply

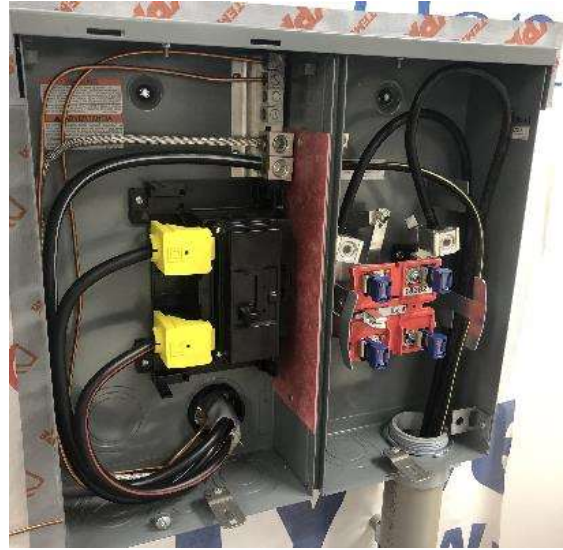


230.71 Maximum Number of Disconnects

Services

230.71 Maximum Number of Disconnects.

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



© 2020 Schneider Electric | Page 53

230.71 Maximum Number of Disconnects

Services

230.71 Maximum Number of Disconnects.

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



© 2020 Schneider Electric | Page 54

230.71 Maximum Number of Disconnects

Services

230.71(B) Two to Six Service Disconnecting Means.

Service disconnects 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



© 2020 Schneider Electric | Page 55

230.71 Maximum Number of Disconnects

Services

230.71(B) Two to Six Service Disconnecting Means.

Service disconnects 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



© 2020 Schneider Electric | Page 56

ANSI LV Switchgear

Compartmentalized
construction



Life Is On | Schneider Electric

© 2020 Schneider Electric | Page 57

230.82 Equipment Connected to the Supply Side

Services

Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means: ...

(6) Solar photovoltaic systems, fuel cell systems, wind electric systems, energy storage systems, or interconnected electric power production sources., if provided with a disconnecting means listed as suitable for use as service equipment, and overcurrent protection as specified in Part VII of Article 230.



© 2020 Schneider Electric | Page 58

230.85 Emergency Disconnects

Services



© 2020 Schneider Electric | Page 59

- Applies to service conductors in one- and two-family dwelling units
- Requires outside disconnecting means with a short-circuit current rating equal to or greater than the available fault current
- Located in a readily accessible outdoor location
- Multiple disconnects must be grouped

230.85 Emergency Disconnects

Services

Disconnect(s) must be marked with one of the following:

(1) 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



© 2020 Schneider Electric | Page 60

240.6(C) Standard Ampere Ratings

Overcurrent Protection

(C) Restricted Access Adjustable-Trip Circuit Breakers.

- Permits circuit breaker ampere rating(s) that is equal to the adjusted current setting (long-time pickup setting).
- Restricted access must be one of the following:
 - Located behind removable and sealable covers over the adjusting means
 - Located behind bolted equipment enclosure doors
 - Located behind locked doors accessible only to qualified personnel
 - Password protected, with password accessible only to qualified personnel



© 2020 Schneider Electric | Page 61

Article 240 – Mounting & Reconditioning

Overcurrent Protection

- **240.33 Vertical Position**
 - Enclosures shall be mounted in the vertical position
- **240.62 Reconditioned Equipment**
 - **LV fuseholders and LV nonrenewable fuses shall not be reconditioned**

© 2020 Schneider Electric | Page 62

240.67 Arc Energy Reduction (Fuses 1200 A and Greater)

Overcurrent Protection

- **2017 NEC requirements are effective January 1, 2020**
- **240.67(A) Documentation**
 - Shall provide proof that reduction method chosen operates below the arcing current
- **240.67(B) Method to Reduce Clearing Time**
 - Means selected shall operate below the available arcing current
- **240.67(C) Performance Testing**
 - **On site testing shall be provided after installation to verify reduction method functions properly**
 - **Primary current injection or another approved method conducted by qualified person based on manufacturer’s instructions.**

240.87 Arc Energy Reduction (CB 1200 A and Greater)

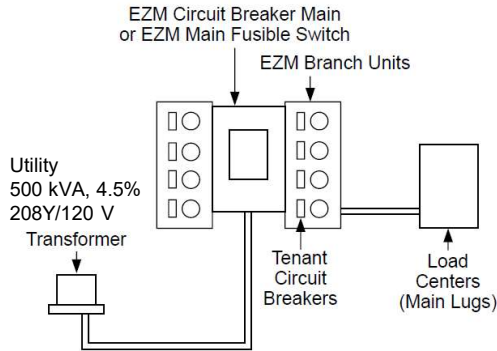
Overcurrent Protection

- **240.87(A) Documentation**
 - Shall provide proof that reduction method chosen operates below the arcing current
- **240.87(B) Method to Reduce Clearing Time**
 - **Temporary adjustment of the instantaneous trip setting does not satisfy this requirement**
- **240.87(C) Performance Testing**
 - **On site testing shall be provided after installation**
 - **Primary current injection or another approved method conducted by qualified person based on manufacturer’s instructions.**



240.87 Arc Energy Reduction (CB 1200 A and Greater)

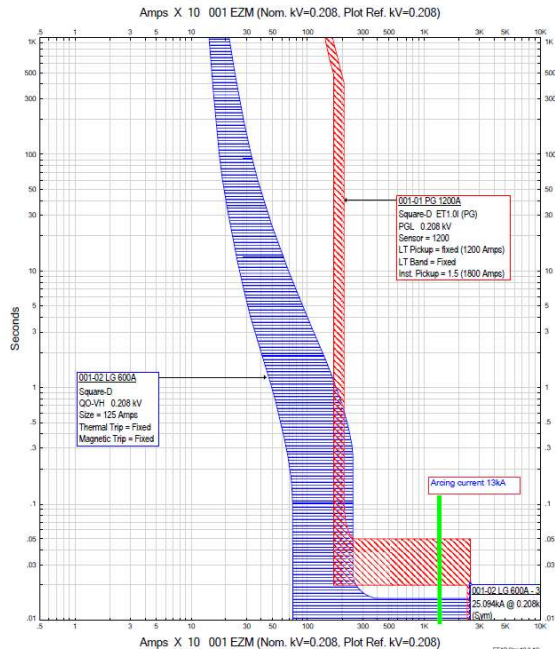
Overcurrent Protection



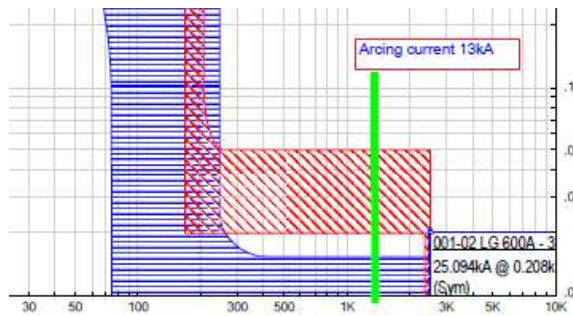
Input Data

- ☑ Service Transformer
 - 500kVA
 - 12.47 Delta primary / 208/120V Grounded Wye Secondary
 - 4.50 nominal percent impedance ; X/R ratio of 5.0 (typical values)
- ☑ Utility Data
 - 12.47kV service
 - Fault current of 5,500 Amps with X/R of 8
- ☑ Secondary Conductor Data
 - 50ft ; four (4) sets ; 600kcmil ; PVC conduit
- ☑ Service Entrance Equipment
 - Metering Center Construction (18" working distance)
 - Main Breaker – 1200A PGL
 - Largest Branch – 125A QO-VH Thermal/Magnetic
 - Main OCPD settings – 1,800A INST pickup

Can instantaneous trip meet the code requirement?



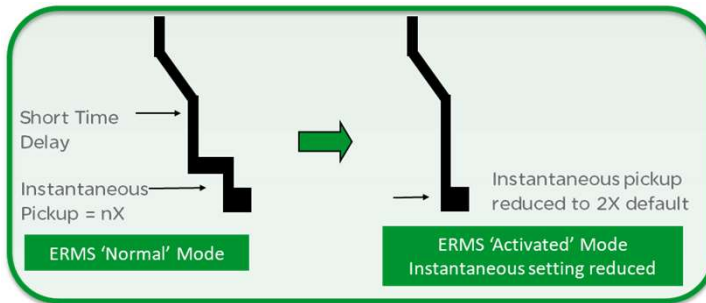
Instantaneous trip settings below 13 kA meet the requirements



240.87 Arc Energy Reduction (CB 1200 A and Greater)

Overcurrent Protection

- **240.87(A) Documentation**
 - Shall provide proof that reduction method chosen operates below the arcing current
- **240.87(B) Method to Reduce Clearing Time**
 - Temporary adjustment of the instantaneous trip setting does not satisfy this requirement

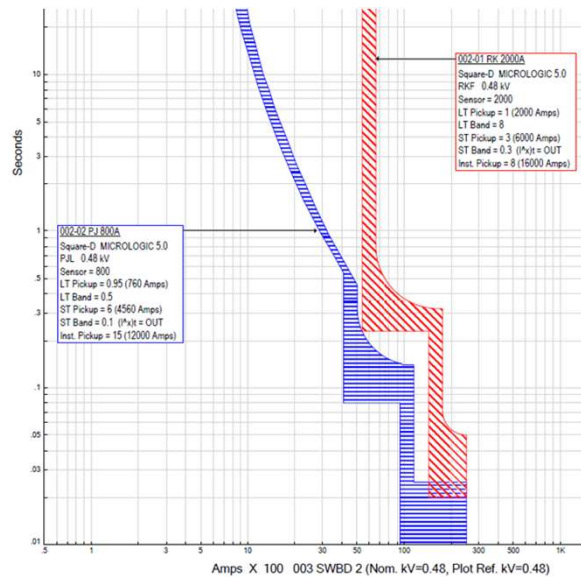
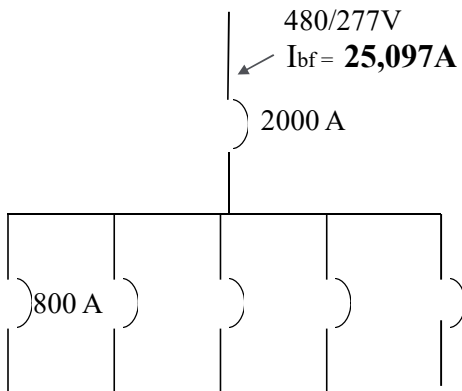


© 2020 Schneider Electric | Page 67

240.87 Arc Energy Reduction (CB 1200 A and Greater)

Overcurrent Protection

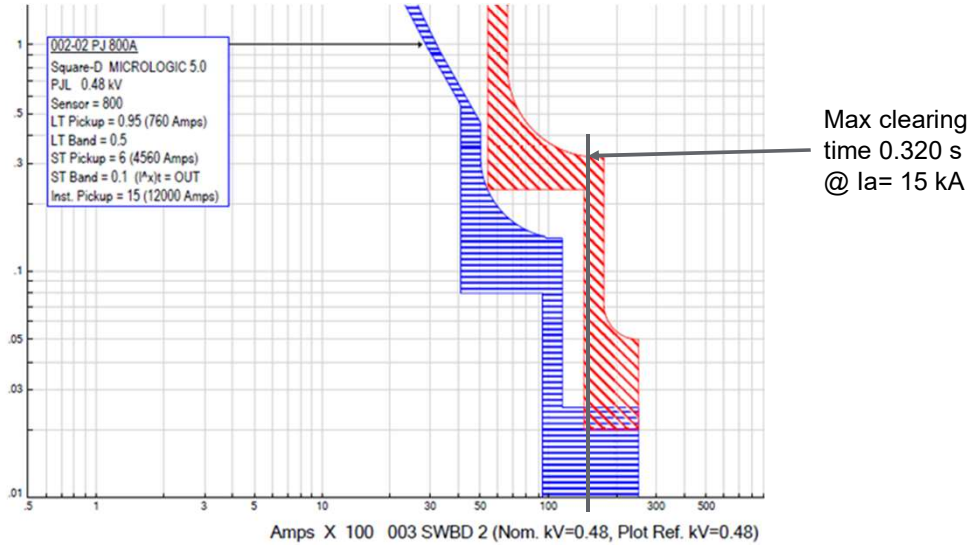
Switchboard Example



© 2020 Schneider Electric | Page 68

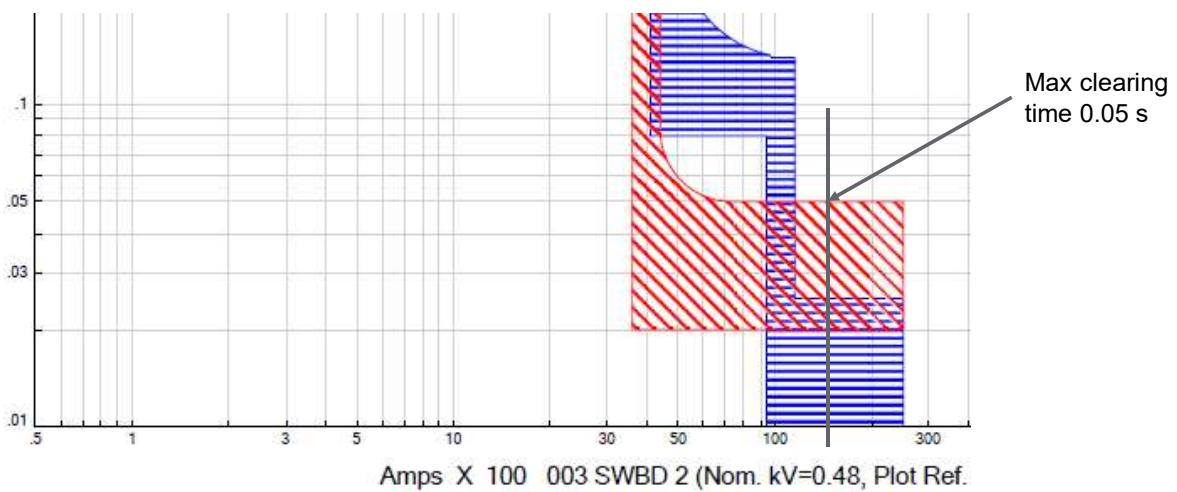
240.87 Arc Energy Reduction (CB 1200 A and Greater)

ERMS Off



240.87 Arc Energy Reduction (CB 1200 A and Greater)

ERMS On



240.87 Arc Energy Reduction (CB 1200 A and Greater)

Overcurrent Protection

240.87(C) Performance Testing

On site testing shall be provided after installation

Primary current injection or another approved method conducted by qualified person based on manufacturer's instructions.



© 2020 Schneider Electric | Page 71

240.88 Reconditioned Equipment – Shall be listed as such

Overcurrent Protection

– 240.88(A) Circuit Breakers

- Use of reconditioned CB must meet 1-3
 - MCCB's cannot be reconditioned
 - LV & MV power CB shall be permitted to be reconditioned
 - HV CB shall be permitted to be reconditioned

– 240.88(B) Components

- Use of reconditioned trip units, protective relays, and CT's shall comply 1-2
 - LV power CB trip units shall not be reconditioned
 - Electromechanical protective relays and CT's shall be permitted to be reconditioned

© 2020 Schneider Electric | Page 72

240.102 Reconditioned Equipment

Overcurrent Protection

MV fuseholders and MV nonrenewable fuses shall not be reconditioned



© 2020 Schneider Electric | Page 73

Chapter 3

Wiring Methods and Materials

© 2020 Schneider Electric | Page 74

Article 310

Conductors for General Wiring

- Article 310 was reorganized to increase usability of the article
- The ampacity requirements over past *Code* cycles become difficult for electrical industry to use.
- Reorganization includes moving the Type MV Cable requirements from Article 310 & 328 (Medium Voltage Cable) into a new Article 311 (*Medium Voltage Cable*).
- The ampacity tables will simply be titled as Table 310.16 through Table 310.21-
- **Example:** Table 310.15(B)(16) will now just be Table 310.16

Article 310

Conductors for General Wiring

- Single Phase Dwelling Services and Feeders was moved from 310.15(B)(7) to new **310.12**
- New **Table 310.12** was added.
 - *Was previously in Annex D and Table 310,15(B)(7)*
- There was a new note added at bottom of **Table 310.12** allowing the table to be used if there are no temperature correction or adjustment factors required

Table 310.12 Single-Phase Dwelling Services and Feeders

Service or Feeder Rating (Amperes)	Conductor (AWG or kcmil)	
	Copper	Aluminum or Copper-Clad Aluminum
100	4	2
110	3	1
125	2	1/0
150	1	2/0
175	1/0	3/0
200	2/0	4/0
225	3/0	250
250	4/0	300
300	250	350
350	350	500
400	400	600

Note: If no adjustment or correction factors are required, this table shall be permitted to be applied.

312.8(B) Switch and Overcurrent Device Enclosures

Cabinets, Cutout Boxes, and Meter Socket Enclosures

(B) Power Monitoring or Energy Management Equipment.

Allows the wiring space of enclosures to contain power monitoring or energy management equipment where the following are met:

- Must be identified as a field installable accessory as part of the listed equipment or is a listed kit evaluated for field installation
- 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



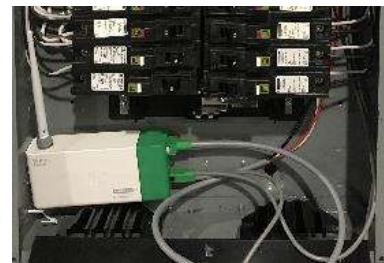
312.8(B) Switch and Overcurrent Device Enclosures

Cabinets, Cutout Boxes, and Meter Socket Enclosures

(B) Power Monitoring or Energy Management Equipment.

Conductors - must comply with 725.49 (18 AWG and 16 AWG) or not less than 22 AWG for a single conductor and 26 AWG for a multiconductor cable where all of the following conditions are satisfied:

- 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.)
- Are secured within 250 mm (10 in.) of terminations
- Are secured to prevent contact with current carrying components within the enclosure
- Are rated for the system voltage and not less than 600 volts
- Have a minimum insulation temperature rating of 90°C



314.16(B)(5) Equipment Grounding Conductor Fill

Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; ...

- Box allowance for EGCs and equipment bonding jumpers revised to add an additional $\frac{1}{4}$ volume allowance to the existing box allowance.
- New $\frac{1}{4}$ volume allowance to be counted in installations with more than four EGCs or equipment bonding conductors.
- It also eliminates the need to address the EGCs for isolated ground receptacles in 250.146(D).

© 2020 Schneider Electric | Page 79

314.27(C) Boxes at Ceiling-Suspended (Paddle) Fans

Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; ...

- Outlet boxes or systems used to support a fan must be listed, marked suitable for this use, and not support fans exceeding 70lb
- Outlet boxes or systems designed to support fans that weigh more than 35 lb. must be marked with the maximum weight to be supported



© 2020 Schneider Electric | Page 80

314.27(C) Boxes at Ceiling-Suspended (Paddle) Fans

Outlet, Device, Pull, and Junction Boxes; Conduit Bodies; Fittings; ...

Outlet boxes mounted in the ceilings of habitable rooms of dwelling occupancies **in a location acceptable for the installation of a fan** must meet one of the following:

- Listed for the sole support of ceiling-supported (Paddle) fans.
- An outlet box complying with the applicable requirements of 314.27 and providing access to structural framing capable of supporting of a ceiling-suspended (Paddle) fan bracket or equivalent.

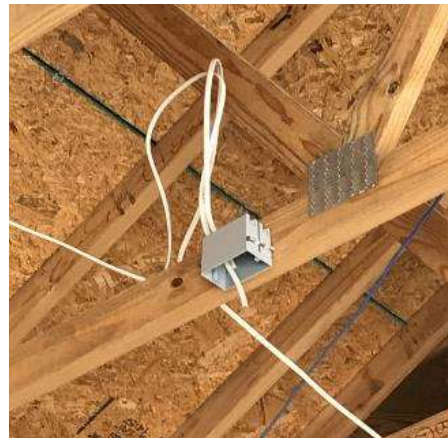


© 2020 Schneider Electric | Page 81

334.30 Securing and Supporting

Nonmetallic Sheathed Cable (NM-B)

- Code change clarifies how NM-B cable should be measured from the outlet box or enclosure to the means of securement
- Present code language would permit securing Type NM cable with a staple within 300 mm (12 in.) of a box with no length restrictions for a loop of cable (NM-B) between the staple and the box.
- **New language** gives direction of a maximum length of **18 inches** between the staple and the box.



© 2020 Schneider Electric | Page 82

New Article 337

Type P Cable

- **337.1 Scope.** This article covers the use, installation, and construction specifications for up through 2000 volt Type P cable (armored and unarmored).
- **337.2 Definition: Type P Cable** - A factory assembly of one or more insulated flexible tinned copper conductors, with associated equipment grounding conductor(s), with or without abraded metallic armor and with an overall nonmetallic jacket.
- **337.10 Uses Permitted:** Under engineering supervision in industrial installations where conditions of maintenance and supervision ensure that only qualified persons monitor and service the system.
 - In hazardous (classified) locations where specifically permitted by other articles in this Code

Chapter 4


Equipment for General Use


408.6 Short-Circuit Current Rating

Switchboards, Switchgear, and Panelboards

408.6 Short-Circuit Current Rating.

Switchboards, switchgear, and panelboards shall have a short-circuit current rating not less than the available fault current. In other than one- and two-family dwelling units, the available fault current and the date the calculation was performed shall be field marked on the enclosure at the point of supply. The marking shall comply with 110.21(B)(3).



System Summary											
	Unknown Primary Fault Current Selected Primary Voltage: 480 V										
	<table border="1"> <thead> <tr> <th>Transformer - T1</th> </tr> </thead> <tbody> <tr> <td>Transformer kVA: 150</td> </tr> <tr> <td>Secondary Voltage: 208</td> </tr> <tr> <td>Transformer Impedance: 3.5</td> </tr> </tbody> </table>	Transformer - T1	Transformer kVA: 150	Secondary Voltage: 208	Transformer Impedance: 3.5						
Transformer - T1											
Transformer kVA: 150											
Secondary Voltage: 208											
Transformer Impedance: 3.5											
	<table border="1"> <thead> <tr> <th>Fault</th> </tr> </thead> <tbody> <tr> <td>I_{s.c.}: 11312 AMPS</td> </tr> <tr> <td>Bolted Fault Current: 11312 A @ 208 V</td> </tr> </tbody> </table>	Fault	I _{s.c.} : 11312 AMPS	Bolted Fault Current: 11312 A @ 208 V							
Fault											
I _{s.c.} : 11312 AMPS											
Bolted Fault Current: 11312 A @ 208 V											
<table border="1"> <thead> <tr> <th colspan="2">WARNING</th> </tr> </thead> <tbody> <tr> <td colspan="2">Maximum available fault current:</td> </tr> <tr> <td>11312</td> <td>amps</td> </tr> <tr> <td>@</td> <td>208 volts</td> </tr> <tr> <td colspan="2">Date Generated: 3/17/2019</td> </tr> </tbody> </table>		WARNING		Maximum available fault current:		11312	amps	@	208 volts	Date Generated: 3/17/2019	
WARNING											
Maximum available fault current:											
11312	amps										
@	208 volts										
Date Generated: 3/17/2019											

408.8 Reconditioning of Equipment

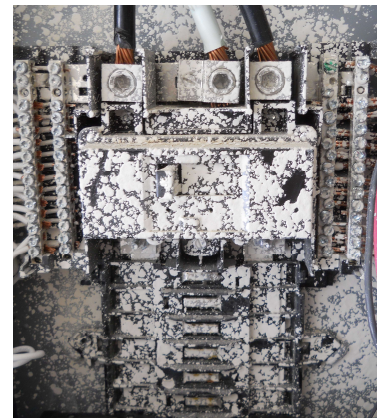
Switchboards, Switchgear, and Panelboards

General

- Requires the use of design qualified parts verified under applicable standards
- Actions must be performed in accordance with manufacturer's instructions
- Equipment damaged by fire, products of combustion, or water shall be specifically evaluated the manufacturer or a qualified testing laboratory prior to being returned to service

(A) Panelboards

- Panelboards are not permitted to be reconditioned
- Replacement of the panelboard interior is allowed
- Where the replacement panelboard is not listed for the specific enclosure and the available fault current is greater than 10,000 amperes, the completed work shall be field labeled, and any previously applied listing marks that pertain to the panelboard shall be removed.



408.8 Reconditioning of Equipment

Switchboards, Switchgear, and Panelboards

(B) Switchboards and Switchgear

- Permitted to be reconditioned
- Reconditioned switchgear shall be listed or field labeled as “reconditioned”
- Previously applied listing marks within the portions reconditioned shall be removed

© 2020 Schneider Electric | Page 87

408.18(C) Connections

Switchboards, Switchgear, and Panelboards

Switchboards or switchgear sections requiring rear or side access to make field connections shall be marked on the front.

ACCESS FIELD CONNECTIONS FROM REAR OF SECTION
ACCESAR LAS CONEXIONES DE CAMPO POR ATRAS DE LA SECCION
ACCESSER LES RACCORDEMENTS DU SITE PAR L'ARRIERE DE LA SECTION
80259-021-01 REV



© 2020 Schneider Electric | Page 88

408.18(C) Connections

Switchboards, Switchgear, and Panelboards

Equipment grounding terminals must be located so that it is not necessary to reach across uninsulated ungrounded bus in order to make connections



408.18(C) Connections

Switchboards, Switchgear, and Panelboards

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 or not energized, in order to make connections.



408.18(C) Connections

Switchboards, Switchgear, and Panelboards

Grounded Circuit Conductors.

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.



© 2020 Schneider Electric | Page 91

408.18(C) Connections

Switchboards, Switchgear, and Panelboards

(3) 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.

© 2020 Schneider Electric | Page 92

408.23 Power Monitoring and Energy Management Equipment

Switchboards, Switchgear, and Panelboards

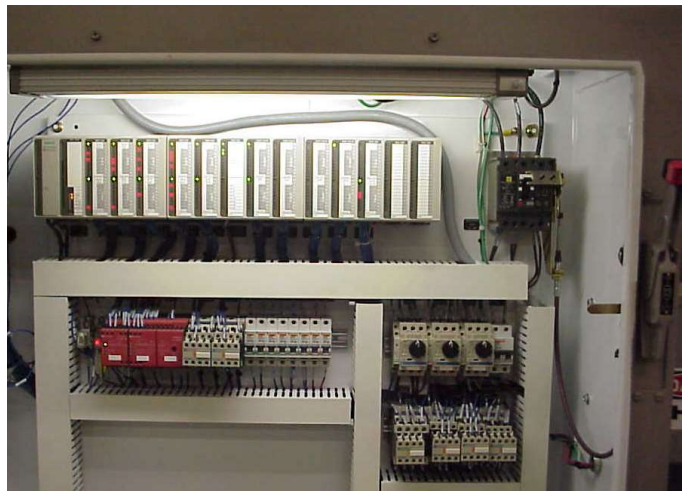
The requirements of 312.8(B) shall apply.



409.22 (B) Short-Circuit Current Rating Documentation

Industrial Control Panels

Documentation requirements changed to include those authorized to install or maintain the installation not just inspect.

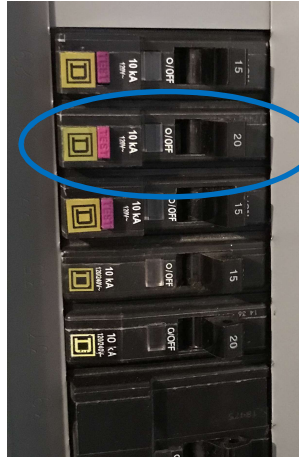


422.5 GFCI Protection for Personnel

Appliances

Appliances identified in 422.5(A)(1) through (A)(7) rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection

422.5(A)(6) Sump Pumps



422.5 GFCI Protection for Personnel

Appliances

Appliances identified in 422.5(A)(1) through (A)(7) rated 150 volts or less to ground and 60 amperes or less, single- or 3-phase, shall be provided with Class A GFCI protection

422.5(A)(7) Dishwashers (All Occupancies)

IN that references back to 210.8



422.16(B) Specific Appliances – Flexible Cords

Appliances

Certain appliances are allowed to be cord and plug connected by flexible cords where the receptacle is accessible

- **Electrically Operated In-Sink Waste Disposers**
- **Built-in Dishwashers**
- **Range Hoods and Microwave Oven/Range Hood Combinations.**



© 2020 Schneider Electric | Page 97

425.22 (B) Resistance Elements

Fixed Resistance and Electrode Industrial Process Heating Equipment

- Industrial process heating equipment shall be protected by not more than 60A. Equipment rated 48A or higher that has more than one load shall be subdivided such that no single load exceeds 48A.
- Industrial process heating equipment shall be subdivided into circuits not exceeding 120A and protected by not more than 150A where 1 of the following conditions are met:
 - Elements are integral and enclosed within the heating surface.
 - Elements are completely contained within an enclosure and identified as suitable for this use.
 - Elements are contained within ASME-rated and stamped vessel

© 2020 Schneider Electric | Page 98

425.82 Branch Circuit Requirements

Fixed Resistance and Electrode Industrial Process Heating Equipment

- Contactor, Relay, or other device, listed for continuous operation at 100% shall be permitted to supply its full-rated load.
- 50KW or higher rated electrode boilers – Conductors supplying the boiler electrodes shall be permitted to be sized at not less than 100% of the nameplate rating providing all of the following are met:
 - The electrode boiler is marked with a min. conductor size
 - The conductors are not smaller than the marked minimum size.
 - A Temperature or pressure actuated switch controls the cyclic operation of the equipment.

© 2020 Schneider Electric | Page 99

430.122 (B) Conductors – Min. Sizing & Ampacity

Motors, Motor Circuits, and Controllers

New exceptions were added to address the size of conductors between power conversion equipment and the motor where the equipment is listed and marked as **“Suitable for Output Motor Conductor Protection”**.

Option 1 - requires an ampacity equal to or larger than 125% of the motor full load current determined by 430.6(A) or (B).

or

Option 2 – requires installation of the minimum conductor size marked on the power conversion equipment



© 2020 Schneider Electric | Page 100

440.10 Short-Circuit Current Rating

Air Conditioning and Refrigerating Equipment

- (A) Installation. Motor Controllers or industrial control panels of mutimotor and combination-load equipment shall not be installed where the available fault current exceeds the rating.
- (B) Documentation requirements changed to include those authorized to install or maintain the installation not just inspect.

445.6 Listing

Generators

445.6 Listing.

Stationary generators 600 volts and less shall be listed.

Exception: One of a kind or custom manufactured generators shall be permitted to be field labeled by a field evaluation body.

Informational Note: For additional information, see UL 2200, *Standard for Stationary Engine Generator Assemblies*.



445.18 Disconnecting Means and Emergency Shutdown

Generators

(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.



© 2020 Schneider Electric | Page 103

445.18 Disconnecting Means and Emergency Shutdown

Generators

(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

© 2020 Schneider Electric | Page 104



© 2020 Schneider Electric | Page 105

445.18 Disconnecting Means and Emergency Shutdown

Generators

(C) Remote Emergency Shutdown.

Generators with greater than 15 kW 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).



© 2020 Schneider Electric | Page 106

445.18 Disconnecting Means and Emergency Shutdown

Generators

(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.



© 2020 Schneider Electric | Page 107

445.18 Disconnecting Means and Emergency Shutdown

Generators

(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.



© 2020 Schneider Electric | Page 108

Chapter 5

Special Occupancies

517.21 GFCI Protection

Health Care Facilities

- Added Category 2 (General Care) spaces to this section.
- Clarified that GFCI's are required in Category 2 in patient bathrooms and toilet rooms but not in areas where the patient bed resides.



550.13 (B) GFCI

Mobile Homes, Manufactured Homes, and Mobile Home Parks

- Clarified that any GFCI requirements within this section that conflict w/ 210.8 (A) shall only be enforced.

© 2020 Schneider Electric | Page 111

551.71 (F) GFCI Protection

Recreational Vehicles and Recreational Vehicle Parks

- Removed requirement for 30A & 50A receptacles in RV Power Pedestals to be GFCI protected.

© 2020 Schneider Electric | Page 112

555.5 Maximum Voltage

Marinas, Boatyards, Floating Buildings and Docking Facilities

- Pier power distribution systems shall not exceed 250V phase to phase. Pier power distribution systems, where qualified personnel service the equipment under engineering supervision, shall be permitted to exceed 250 volts, but these systems shall not exceed 600 volts.

© 2020 Schneider Electric | Page 113

555.35 (A) & (B) GFPE and GFCI

Marinas, Boatyards, Floating Buildings and Docking Facilities

- Article 555 was completely re-written with an expanded requirement on where exactly what type of ground fault protection shall be used. Also, a leakage current measurement requirement was added.
- Shore Power Receptacles – not exceeding 30mA GFPE
- Receptacles for other than shore power- GFCI for 125V, single phase, 15 & 20
- Feeder & Branch-Circuit conductors – not exceeding 100mA GFPE
- Where more than 3 receptacles for shore power to boats, a leakage current measurement device shall be available.

© 2020 Schneider Electric | Page 114

Chapter 6

Special Equipment

625.42 Rating

Electric Vehicle Supply Equipment

625.42 Rating.

The power transfer equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Service and feeder shall be sized in accordance with the product ratings. Where an automatic load management system is used, the maximum equipment load on a service and feeder shall be the maximum load permitted by the automatic load management system.

625.42 Rating

Electric Vehicle Supply Equipment

Adjustable settings shall be permitted on fixed-in-place equipment only. If adjustments have an impact on the rating label, those changes shall be in accordance with manufacturer's instructions, and the adjusted rating shall appear with sufficient durability to withstand the environment involved on the rating label. Electric vehicle supply equipment with restricted access to an ampere adjusting means shall be permitted to have ampere ratings that are equal to the adjusted current setting. Sizing the service and feeder to match the adjusting means shall be permitted. Restricted access shall prevent the user from gaining access to the adjusting means. Restricted access shall be accomplished by at least one of the methods below:

1. Cover or door that requires the use of a tool to open
2. Locked doors accessible only to qualified personnel
3. Password protected commissioning software accessible only to qualified personnel

© 2020 Schneider Electric | Page 117

625.48 Interactive Systems

Electric Vehicle Power Transfer System

625.48 Interactive Systems.

EVSE that incorporates a power export function and that is part of an interactive system that serves as an optional standby system, an electric power production source, or a bidirectional power feed shall be listed and marked as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply; when used as an electric power production source, the requirements of Article 705 shall apply. EVPE that consists of a receptacle outlet only shall be in accordance with 625.60.

© 2020 Schneider Electric | Page 118

625.54 GFCI Protection

Electric Vehicle Charging Equipment

625.48 Interactive Systems.

EV charging equipment that is cord and plug connected must have GFCI protection for the receptacle outlet regardless of the location or voltage.

© 2020 Schneider Electric | Page 119

625.60(C) AC Receptacle Outlets Used for EVPE

Electric Vehicle Power Transfer System

(C) Overcurrent Protection.

Electric vehicles provided with receptacle outlets for power export shall be provided with overcurrent protection integral to the power export system. The overcurrent protection shall have a nominal rating sufficient for the receptacle it protects. The overcurrent protection shall also be sufficiently rated for the maximum available fault current at the receptacle and shall be included in the interactive equipment evaluation. See 625.48.

© 2020 Schneider Electric | Page 120

625.60(D) AC Receptacle Outlets Used for EVPE

Electric Vehicle Power Transfer System

(D) GFCI Protection for Personnel.

Ground-fault circuit-interrupter protection for personnel shall be provided for all receptacles. The ground-fault circuit-interrupter indication and reset shall be installed in a readily accessible location.

© 2020 Schneider Electric | Page 121

680.21 (C) GFCI Protection

Swimming Pools, Fountains, and Similar Installations

Pool Motor Outlets

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



© 2020 Schneider Electric | Page 122

680.21 (D) Motors

Swimming Pools, Fountains, and Similar Installations

Pool Pump Motor Replacement.

- Where a pool pump motor in 680.21(C) is replaced for maintenance or repair, the replacement pump motor shall be provided with ground-fault circuit-interrupter protection.



Existing pump motor without GFCI

680.22 (A)(5) Lighting, Receptacles, and Equipment

Swimming Pools, Fountains, and Similar Installations

(5) Pool Equipment Room.

At least one GCFI-protected 125-volt, 15- or 20- ampere receptacle on a general-purpose circuit shall be located within a pool equipment room, and all other receptacles supplied by branch circuits rated 150 volts or less to ground within a pool equipment room shall be GFCI protected.

690.8(A) PV Circuit Sizing and Current

Solar Photovoltaic (PV) Systems

(2) Circuits Connected to the Input of Electronic Power Converters.

Where a circuit is protected with an overcurrent device not exceeding the conductor ampacity, the maximum current shall be permitted to be the rated input current of the electronic power converter input to which it is connected.

© 2020 Schneider Electric | Page 125

690.9(A) PV Circuit Overcurrent Protection

Solar Photovoltaic (PV) Systems

(2) Circuits Where Overcurrent Protection is Required on One End.

A circuit conductor connected at one end to a current-limited supply, where the conductor is rated for the maximum circuit current from that supply, and also connected to sources having an available maximum circuit current greater than the ampacity of the conductor, shall be protected from overcurrent at the point of connection to the higher current source.

© 2020 Schneider Electric | Page 126

695.6 Power Wiring

Fire Pumps

(A) Supply Conductors.

(1) Services and On-Site Power Production Facilities.

Service conductors and conductors supplied by on-site power production facilities shall be physically routed outside a building(s) and shall be installed as service-entrance conductors in accordance with 230.6, 230.9, and Parts III and IV of Article 230. Where supply conductors cannot be physically routed outside of buildings, the conductors shall be permitted to be routed through the building(s) where installed in accordance with 230.6(1) or (2).

Exception: The supply conductors within the fire pump room shall not be required to meet 230.6(1) or (2).

© 2020 Schneider Electric | Page 127

695.14(F) Generator Control Wiring

Fire Pumps

- Revised to align with 700.10(D)(3) and 2017 NEC TIA 1357
- Control wiring integrity must be monitored and start the generator if the wiring is broken, disconnected, or shorted

(F) Generator Control Wiring Methods.

Control conductors installed between the fire pump power transfer switch and the standby generator supplying the fire pump during normal power loss shall be kept entirely independent of all other wiring. The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s).

© 2020 Schneider Electric | Page 128

Chapter 7

Special Condiitons

700.12 General Requirements

Emergency Systems

(H) DC Microgrid Systems

- Permits dc microgrid sources to serve as an emergency source where the system is capable of isolating the emergency sources from all non-emergency sources.
- DC microgrid systems used as a source of power for emergency systems shall be of suitable rating and capacity to supply and maintain the total emergency load for not less than 2 hours of full-demand operation.
- Where a dc microgrid system source serves as the normal supply for the building or group of buildings concerned, it shall not serve as the sole source of power for the emergency standby system.

700.32 and 701.32 Selective Coordination

Emergency and Legally Required Standby Systems

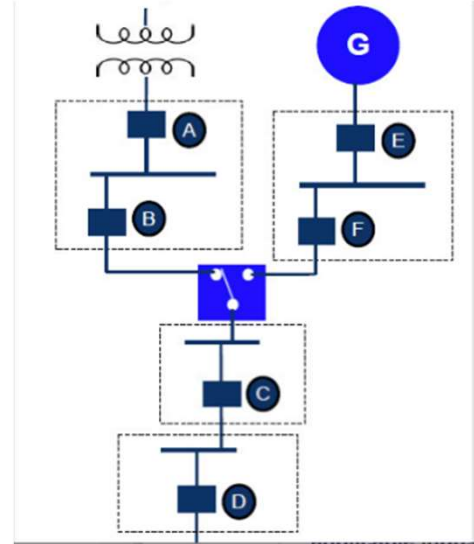
Informational Note: See informational note figure 701.32 for an example of how legally required standby system overcurrent protective devices (OCPDs) selectively coordinate with all supply-side OCPDs.

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

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

OCPD F selectively coordinates with OCPD E.

OCPD B is not required to selectively coordinate with OCPD A because OCPD B is not a legally required standby system OCPD



© 2020 Schneider Electric | Page 131

702.2 Definition

Optional Standby Systems

Optional Standby Systems.

Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. These systems are intended to supply on-site generated or stored power to selected loads either automatically or manually.

© 2020 Schneider Electric | Page 132

702.5 Transfer Equipment

Optional Standby Systems

(E) Parallel Installation.

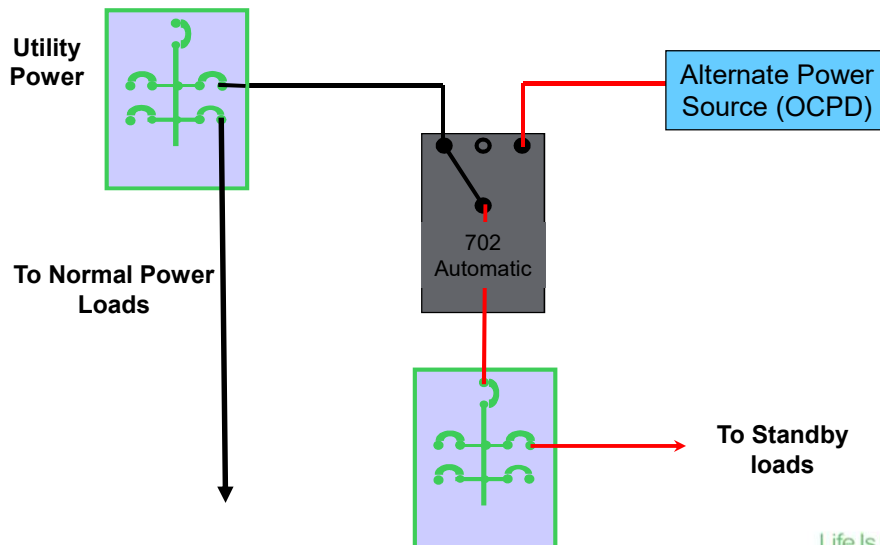
Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall also meet the requirements of Article 705.



© 2020 Schneider Electric | Page 133

702.5 Transfer Equipment

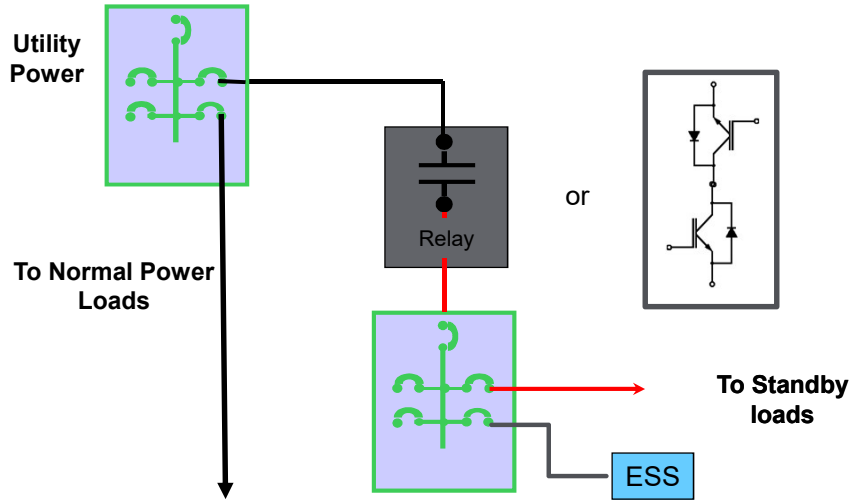
Optional Standby Systems - Traditional



© 2020 Schneider Electric | Page 134

702.5 Transfer Equipment

Optional Standby Systems – Multimodal/Renewable Energy



Life Is On | Schneider Electric

© 2020 Schneider Electric | Page 135

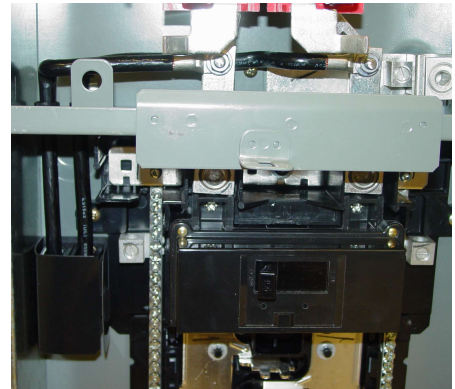
705.11(C) Supply-Side Source Connections

Interconnected Electric Power Production Sources

(C) Overcurrent Protection – Output conductors protected from overcurrent in accordance with 705.30.

Connections inside a building must be protected with one of the following methods:

- Overcurrent device located within 3 m (10 ft) of conductor length in dwelling units and 5 m (16.5 ft) in other than dwelling units
- In other than a dwelling unit, with an overcurrent device located within 20 m (71 ft) of conductor length where cable limiters installed in all ungrounded conductors are located within 5 m (16.5 ft) of conductor length from the point of connection to the service



© 2020 Schneider Electric | Page 136

705.11(C) Supply Side Source Connections

Interconnected Electric Power Production Sources

(C) Overcurrent Protection.

...Where the power source output circuit conductors make their connection to the service inside a building, they shall be protected with one of the following methods:

1. With an overcurrent device located within 3 m (10 ft) of conductor length in dwelling units and 5 m (16.5 ft) in other than dwelling units from the point of connection to the service
2. In other than a dwelling unit, with an overcurrent device located within 20 m (71 ft) of conductor length from the point of connection to the service, provided that cable limiters installed in all ungrounded conductors are located within 5 m (16.5 ft) of conductor length from the point of connection to the service

© 2020 Schneider Electric | Page 137

705.12 Load-Side Connections

Interconnected Electric Power Production Sources

The output of an interconnected electric power source shall be permitted to be connected to the load side of the service disconnecting means of the other source(s) at any distribution equipment on the premises. Where distribution equipment or feeders are fed simultaneously by a primary source of electricity and one or more other power source and are capable of supplying multiple branch circuits or feeders, or both, the interconnecting equipment shall comply with 705.12(A) through (E). Where a PCS is installed in accordance with 705.13, the setting of the PCS controller shall be considered the power-source output circuit current in 705.12(A) through (E).

© 2020 Schneider Electric | Page 138

705.13 Power Control Systems

Interconnected Electric Power Production Sources

705.13 Power Control Systems (PCS)

- PCS listed and evaluated to control the output of the system sources
- Limits the current and loading on the busbars and conductors supplied
- Current based on conductor/busbar rating per 705.13(A) through (E)

© 2020 Schneider Electric | Page 139

705.13 Power Control Systems

Interconnected Electric Power Production Sources

705.13 Power Control Systems....

(A) Monitoring.

The PCS controller shall monitor all currents within the PCS. Any busbar or conductor on the load side of the service disconnecting means that is not monitored by the PCS shall comply with 705.12. Where the PCS is connected in accordance with 705.11, the PCS shall monitor the service conductors and prevent overload of these conductors.

© 2020 Schneider Electric | Page 140

705.13 Power Control Systems

Interconnected Electric Power Production Sources

705.13 Power Control Systems....

(B) Settings.

The sum of all PCS-controlled currents plus all monitored currents from other sources of supply shall not exceed the ampacity of any busbar or conductor supplied by the power production sources. Where the PCS is connected to an overcurrent device protecting any busbar or conductor not monitored by the PCS, the setting of the PCS controller shall be set within the ratings of that overcurrent device.

© 2020 Schneider Electric | Page 141

705.13 Power Control Systems

Interconnected Electric Power Production Sources

705.13 Power Control Systems....

(C) Overcurrent Protection.

The PCS shall provide overcurrent protection either by overcurrent devices or by the PCS including the functionality as an overcurrent device in the product listing.

Informational Note: Some PCS are listed to provide overcurrent protection.

© 2020 Schneider Electric | Page 142

705.13 Power Control Systems

Interconnected Electric Power Production Sources

(D) Single Power Source Rating.

The rating of the overcurrent device for any single power source controlled by the PCS shall not exceed the rating of the busbar or the ampacity of the conductors to which it is connected.

(E) Access to Settings.

The access to settings of the PCS shall be restricted to qualified personnel in accordance with the requirements of 240.6(C).

© 2020 Schneider Electric | Page 143

705.30 Overcurrent Protection

Interconnected Electric Power Production Sources

(C) Power Transformers.

Transformers with sources on each side shall be provided with overcurrent protection in accordance with 450.3. The primary shall be the side connected to the largest source of available fault current. Secondary protection shall not be required for a transformer secondary that has a current rating not less than the sum of the rated continuous output currents of the power sources connected to that secondary.

© 2020 Schneider Electric | Page 144

705 Part II. Microgrid Systems

Interconnected Electric Power Production Sources

New section to facilitate microgrid deployment.

705.50 System Operation

705.60 Primary Source Connection

705.65 Reconnection to Primary Source

705.70 Microgrid Interconnect Devices (MID)

© 2020 Schneider Electric | Page 145



706.1 Scope

Energy Storage Systems

706.1 Scope.

This article applies to all energy storage systems (ESS) having a capacity greater than 3.6 MJ (1 kWh) that may be stand-alone or interactive with other electric power production sources. These systems are primarily intended to store and provide energy during normal operating conditions. Storage batteries not associated with an ESS shall comply with Article 480.

Informational Note No. 2: There can be a subtle distinction between a battery storing energy and an energy storage system. A battery storing energy is not necessarily an ESS. See Article 480. An ESS can be comprised of batteries storing energy. See Article 706.

© 2020 Schneider Electric | Page 147





706.5 Listing

Energy Storage Systems

Energy storage systems shall be listed.



706.15 Disconnecting Means

Energy Storage Systems

(A) ESS Disconnecting Means.

A disconnecting means shall be provided for all ungrounded conductors derived from an ESS and shall be permitted to be integral to listed ESS equipment. The disconnecting means must meet all of the following:

- Readily accessible
- Located within sight of the ESS or installed as close as practicable, and the location of the disconnecting means shall be field marked on or immediately adjacent to the ESS

© 2020 Schneider Electric | Page 151

706.15 Disconnecting Means

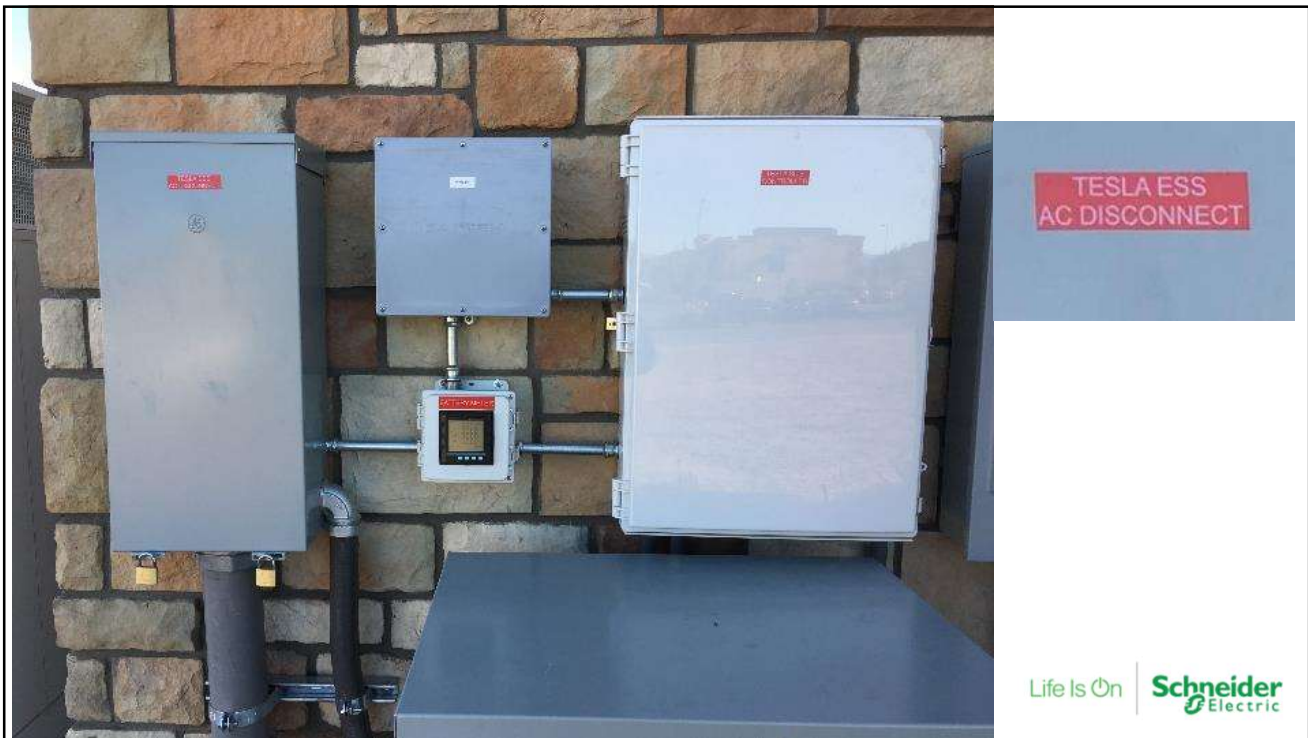
Energy Storage Systems

(A) ESS Disconnecting Means.

3. The disconnecting means shall be lockable open in accordance with 110.25.

For one-family and two-family dwellings, a disconnecting means or its remote control shall be located at a readily accessible location outside the building

© 2020 Schneider Electric | Page 152

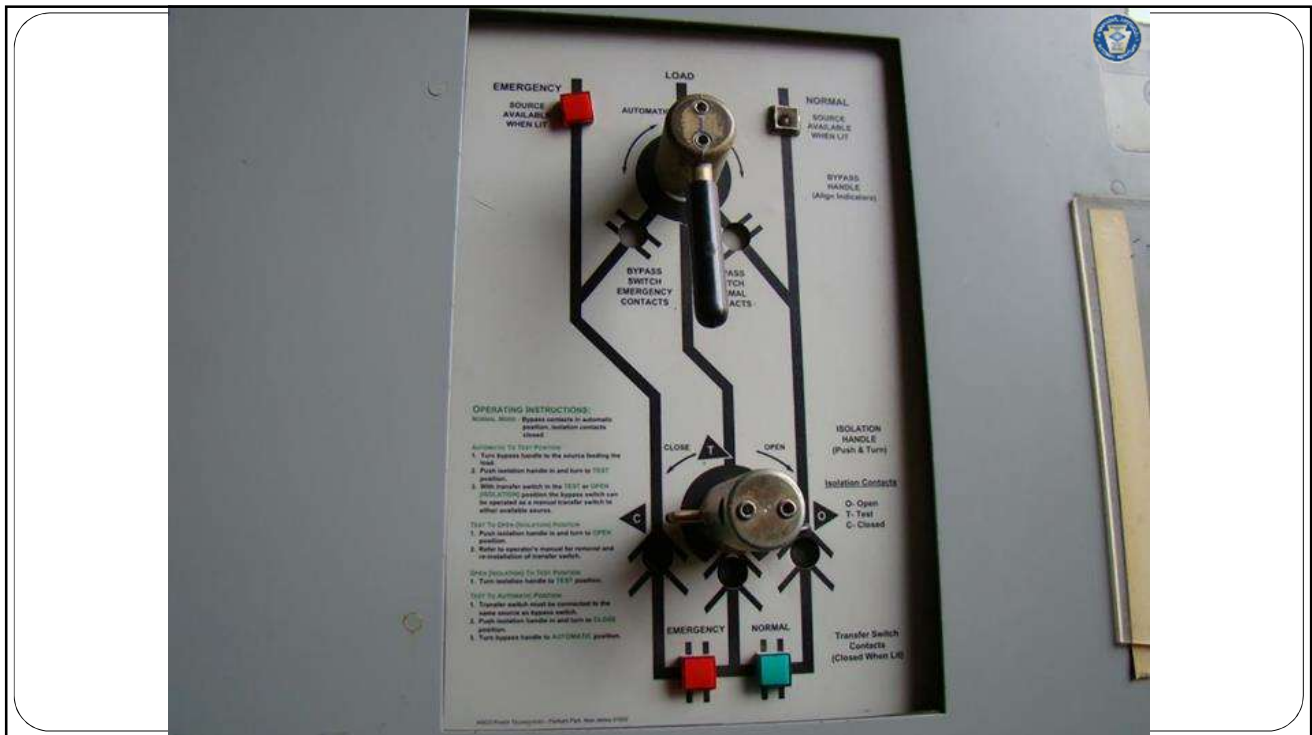


708.24(D) Bypass Isolation Automatic Transfer Switches

Critical Operations Power Systems

- Bypass Isolation ATS required where COPs loads are supplied by only one transfer switch
- Goal is to facilitate system maintenance 708.6(C)
- Bypass mode requires the ability to automatically transfer upon source loss or be actively supervised for manual source transfer

© 2020 Schneider Electric | Page 155



Chapter 8

840.160 SR7751

Powering Circuits

- Removes 60W limitation for POE in communication article. The change to 4 pair allows for use of 90W for POE per new IEEE 4 pair guidelines.

About the Instructor



Alan Manche, P.E.

- VP, External Affairs at Schneider Electric
- Member NEC Correlating Committee & NEC CMP 2 & 10
 - Past Member of NEC CMP 8 and CMP 20
- Member of Technical Committee NFPA 110, 70B, and 73
 - Past Chair of NFPA 70B
- Board of Directors Western Section IAEI
- Board of Directors Electric Safety Foundation International (ESFi)
- Member, Common Wealth of Kentucky Electrical Advisory Committee
- Member, NEMA Codes and Standards
- Chair, NEMA Code Adoption Initiative
- Chair, NEMA Water and Fire Damaged Equipment Committee

About the Instructor



Chad Kennedy, P.E.

- Director, Industry Standards at Schneider Electric
- Member NEC CMP 13
- Member of ELS, NFPA 99
- Member of NFPA 3, 4 Testing and Commissioning
- Member of UL, NEMA, and IEEE Technical Committees for Transformers, Panelboards, Switchboards, Switches, Switchgear , Energy Storage, Distribution Automation (Microgrid)
- Member of NFPA and NFPA Electrical Section
- IAEI Member
- Chair, NEMA Sharp Edges Task Force
- Chair , NEMA LVDE02 Panelboards and Switchboards

About the Instructor



Don Iverson

- Manager of Industry Codes & External Relations
- CMP -1 2014, 2017 & 2020 Revision Cycle
- Past NEMA Midwest Field Representative 2008-2019
- Members NFPA and NFPA Electrical Section
- Member of the International Association of Electrical Inspectors (IAEI).

About the Instructor



Keith Waters, P.E. C.E.M.

- Manager, Industry Standards at Schneider Electric
- 33 Years with Square D / Schneider Electric
- Member NEC CMP -11
- Member Power & Energy Institute of Kentucky Advisory Board
- Member of UL, NEMA, IEC, and IEEE Technical Committees for Circuit Protection, Motor Control, Automation Products, Data Center Power Systems, and Codes/Standards.
- Vice-Chair – NEMA LVDE01 CB Product Group
- Vice-Chair – NEMA GFCI Technical Committee
- Secretary – IEEE I&CPS Power Protection Committee
- Vice-Chair – IEEE I&CPS Data Center Subcommittee.
- Member of AEE, CANENA,IAEI, NFPA and NFPA Electrical and Healthcare Sections

Life Is On | Schneider
Electric