Agenda

- Members Open Forum
- Main Presentation
- Q&A
- Next Meeting Announcement
Members Open Forum

*In an Orderly Fashion, Please Unmute Yourself or Request the Microphone*

1. Related Announcements
2. Job Openings
3. Outreach Opportunities
4. Recommended Topics
5. Asks
2023 NEC Changes and Updates

Presenter: Don Iverson - Manager, Industry Codes & External Relations - Schneider Electric

- Master Electrician/Contractor - State of Michigan
- 26 years’ experience in the Electrical Industry
- Electrical Inspector – City of Lansing, MI.
- Midwest Field Representative for the National Electrical Manufactures Association (NEMA)

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National Electrical Code: 2023 Code Changes

Highlights

For more information, visit

2023 NEC Overview

- There were 4006 Public Inputs (PI) and 1956 Public Comments (PC) that were submitted by the electrical industry and interested public seeking to changes to the 2023 NEC.

- **Definitions. Article 100** has been restructured by removing all “Parts” and relocates definitions previously found in XXX.2 Sections to Article 100 and organized alphabetically. Reconditioned equipment requirements were moved to XXX.2.

- (New) Article 369 Insulated Bus Pipe

- (New) Article 371 Flexible Bus Systems
2023 NEC Overview

New Articles for Medium Voltage

Over 1000 volts AC, 1500 volts DC Installations – Correlating Committee Long-Range Task Group developed several Public Inputs to create separate Articles to address requirements associated with Medium or High Voltage Installations.

- Article 235 – Branch Circuits, Feeders, and Services
- Article 245 – Overcurrent Protection
- Article 305 – Wiring Methods and Materials
- Article 315 – Conductors, Cable, Cable Joints, and Cable Terminations
- Article 395 – Outdoor Overhead Conductors
- Article 495 – MV Equipment

New Articles for Control and Communication Wiring Methods

Changes made to create one article for wiring methods, separate Class 1 Power-Limited Circuits, and a new article for Class 4 FMPS.

- Article 722 – Cables for Power-Limited Circuits and Fault-Managed Power Circuits
- Article 724 – Class 1 Power-Limited Circuits and Class 1 Power-Limited Remote-Control and Signaling Circuits
- Article 726 - Class 4 Fault-Managed Power Systems
- Article 727 - Moved to new Article 335
NEC 110.3(A)(8) Cybersecurity (New)

Cybersecurity Network Connected Life Safety Equipment

Industry Impact:
- Protection from cyber attacks to promote reliability, sustainability and, safety issues.
- Key requirement based on Life Safety Equipment definition.
- Standards that can be used are ANSI/ISA/IEC 62443 for automation and control; UL 2900 for Life Safety Equipment, and UL 5500 for over air firmware upgrades.

Industry Impact:
- ANSI/ISA/IEC 62443-4-1 Product Development Life Cycle evaluated.
- UL 2900-2-3 Listed
- Product Standard that requires UL 5500
Section 110.3(B) Installation and Use

Installation Instructions

Change Summary:
Two new Informational Notes specify installation and use instructions can be printed, a QR code or on the internet. Installation and use instructions cannot lessen code requirements.

Industry Impact:
- Flexible options for delivering installation and use instructions allow ready access to the most up to date information available for products.
- On-line documentation, videos, and product options will assist users to quickly find what they need, when they need it.

Section 110.16(B) Arc-Flash Hazard Warning

Labeling Requirements

Change Summary:
Builds on the general label requirement in 110.16(A). Expansion to feeder supplied equipment, reduced threshold.

Industry Impact:
- Revision expands beyond service equipment to include feeder equipment.
- Threshold reduced from 1200A to 1000A
- Applies to other than dwelling units
- Specific label information removed and now must meet industry practice – (NFPA 70E and ANSI Z535)
Section 110.17 Servicing and Maintenance of Equipment (New)

**Equipment Safety**

The addition of service and maintenance requirements address installation safety and align with the arc flash hazard labeling in 110.16.

**Industry Impact:**

- Follow manufacturer’s instructions
- Use identified replacement parts meeting applicable standards
  - By the OEM
  - Experienced engineering design
  - AHJ approved
- New Informational Note highlighting 70B Recommended Practice for Electrical Equipment Maintenance. This would provide information to help the end-user determine proper preventive maintenance of electrical equipment.

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Section 110.20 Reconditioned Equipment (New)

**Installation Safety**

**Change Summary:**

Addresses the industry concerns with the use of reconditioned equipment and the actions taken in the restoration.

**Industry Impact:**

- Use of identified replacement parts similar to 110.17
- Listing or field labeled as reconditioned
- If not required to be listed by the code, reconditioning can follow manufacturer’s instructions
- AHJ can approved alternate method
Section 110.21 Equipment Marking

Reconditioned Equipment

Provides specific information on the reconditioning performed and when it was performed.

Industry Impact:

- Must include “reconditioned” or other approved term
- Original listing mark removed or made permanently illegible
- Industrial exception where conditions of supervision and maintenance are provided and a regular equipment maintenance program is followed

Non-compliant example:

- Marking appears to be from the manufacturer at first glance
- No information on the entity which performed the reconditioning
- Original UL Listing mark still on the product
**Section 110.26 Spaces About Electrical Equipment**

**Working Space**

Guidance on the minimum working space where open equipment doors may restrict the access and egress.

**Industry Impact:**
- Layout of electrical equipment spaces must ensure an access and egress of at least 24 in wide and 6-1/2 ft high with equipment doors opened
- Multiple equipment installations are evaluated with doors simultaneously opened

**NEC 110.26(C)(2) Applied**

In the case where an equipment door can swing beyond 90 degrees in the direction of egress, the entry/egress area should be measured from the maximum door swing point.

**Table 110.26(A)(1) Working Space**

<table>
<thead>
<tr>
<th>Nominal Voltage to Ground</th>
<th>Condition 1</th>
<th>Condition 2</th>
<th>Condition 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 150</td>
<td>0.9 m (3 ft)</td>
<td>0.9 m (3 ft)</td>
<td>0.9 m (3 ft)</td>
</tr>
<tr>
<td>151 - 600</td>
<td>1.0 m (3 ft)</td>
<td>1.2 m (4 ft)</td>
<td>1.5 m (5 ft)</td>
</tr>
<tr>
<td>601 - 1000</td>
<td>1.2 m (4 ft)</td>
<td>1.5 m (5 ft)</td>
<td>1.8 m (6 ft)</td>
</tr>
</tbody>
</table>

*Note: Where the conditions are as follows:
Condition 1 — Exposed live parts on one side of the working space and live or grounded parts on the other side of the working space; or exposed live parts on one side of the working space and either exposed live parts or live or grounded parts on the other side of the working space.
Condition 2 — Exposed live parts on one side of the working space and grounded parts on the other side of the working space, or live parts on the other side of the working space.*
Section 110.26 Spaces About Electrical Equipment

Working Space

Equipment A

Door 1

Working Space per Table 110.26(A)(1)

Entry/Egress Area (min 610 mm/24”)

Door 2

Egress

Equipment B

Industry Impact:

Grade, Floor, or Working Platform

Electrical work performed on equipment where the working space has a steep grade or uneven surfaces creates safety challenges for workers.

Industry Impact:

- Design of the electrical equipment space must include practical steps to provide a level working space
- Applies to both the working space width and depth
Section 210.8(A)(6) GFCI (Dwelling Units)

**Kitchen Area Expansion**

GFCI protection has been extended to the entire kitchen not just where receptacles were installed to serve countertops.

**Industry Impact:**
- All kitchen receptacle outlets
- Removes distance limitation
- 125v – 250v receptacles connected to single phase branch circuits, 150v to ground or less.

Section 210.8(A)(7) GFCI (Dwelling Units) *(New)*

**Beverage Preparation Areas**

**Change Summary:**
GFCI protection has been extended to include areas with sinks and permanent provisions for food preparation, beverage preparation or cooking.

**Industry Impact:**
125v – 250v receptacles connected to single phase branch circuits, 150v to ground or less.
Section 210.8(B) GFCI (Other than dwellings)

Beverage Preparation Areas

GFCI protection has been extended to include areas with sinks and permanent provisions for food preparation, beverage preparation or cooking.

Industry Impact:
- 125v – 250v receptacles connected to single phase branch circuits, 150v to ground or less and 50A or less
- All receptacles supplied by three phase branch circuits, 150v to ground or less and 100A or less

Section 210.8(D) GFCI Specific Appliances

Additional Appliances

GFCI protection has been extended to include:
- Electric ranges
- Wall-mounted ovens
- Counter-mounted cooking units
- Clothes Dryers
- Microwave Ovens

Industry Impact:
Protection must be provided for the branch circuit or outlet where...
- Circuit is 150 volts to ground or less
- 60A or less
- Single or three phase
Section 210.8(F) Outdoor Outlets (New)

Effectivity date extension

GFCI protection for listed HVAC equipment must comply starting September 1st, 2026.

Industry Impact:
- Dwelling units only
- Exception limited to HVAC equipment
- Recognizes GFCI protection is needed for safety
- Provides industry time to address required product adjustments

Section 210.12(A) AFCI (Means of Protection)

AFCI Requirements Clarifications

The AFCI section was re-written to improve clarity. 210.12 (A) now contains the means of AFCI protection that can be used.

Industry Impact:
- Section restructured
- Improve readability and clarity in understanding what protection options are available.
Section 210.12(B) AFCI (Dwelling Units)

AFCI Requirements Clarifications

The AFCI section was re-written to improve clarity. 210.12 (B) now contains the locations requiring AFCI protection for dwelling units. Also, a requirement for 10A branch circuits to also be protected.

Industry Impact:
- Improve readability and clarity in understanding the AFCI required locations.
- 10A requirement for branch circuits not permitted to feed receptacles.

Section 210.12(D) AFCI Other Occupancies (New)

AFCI Requirements Clarifications

Added areas that have sleeping quarters that shall have AFCI protection.

Industry Impact:
- Recognizes that similar locations should have AFCI protection
- Improve readability and clarity in understanding the AFCI required locations for other occupancies such as Police, Fire & Ranger Stations.
Section 210.23(A) 10 A Branch Circuits (New)

Circuit Loads

Allows the installation of a 10 A branch circuit to supply lighting outlets, exhaust fans and a gas fireplace unit supplied by an individual branch circuit.

Industry Impact:
- Energy efficiency improvements and new technology have reduced the load for these applications
- Circuits that supply receptacle outlets, fixed appliances, garage door openers and laundry equipment are not permitted
- Expands residential wiring design options in dwelling units

Section 210.52(C)(2) (Dwelling Units)

Island Receptacles - Installed

Industry Impact:
Based on data submitted by CPSC, the installation of receptacles serving the countertop or work surface of an island or peninsula is now optional.

If installed, the receptacle shall be in accordance with 210.52(C)(3) for receptacle placement.

Receptacles are permitted in the countertop, on the surface, or above if not more than 20 in above the surface.
Section 210.52(C)(2) (Dwelling Units)

Island Receptacles - Provisions

Industry Impact:

- Provisions at the island or peninsular for future receptacle outlet
- Requires the installation of cable or raceway to a box within the island, see 300.12

Section 210.70 Lighting Outlets Required

Switch or Wall Mounted Control Device – Battery Operated

Industry Impact:

- Required switch or wall-mounted control device that relies exclusively on a battery must automatically energize the lighting outlets when the battery fails.
- Does not impact non-required controllers such as a second or third controller in a hall or multiple entrances to a room.
Section 215.15 Barriers (New)

Feeder Equipment

New revision to include inadvertent contact barriers for equipment connected by feeder tap or transformer secondary tap conductors.

Industry Impact:
- Requirements are similar to 230.62(C) for service equipment
- Applies to panelboards, switchboards, switchgear, and motor control centers
- Additional protection from electric shock only – No protection from arc flash or arc blast

Section 215.18 Surge Protection (New)

Feeder Supply

Dwelling units, dormitory units, guest rooms and guest suites of hotels and motels, and patient sleeping rooms in nursing homes and limited care facilities require the installation of a surge protective device.

Industry Impact:
- SPD must be located within or adjacent to the equipment that contains branch circuit overcurrent protection
- Type 1 or Type 2 only
- Replacement of existing equipment will also need to comply
- SPD nominal discharge current not less than 10kA
Section 215.18 Surge Protection (New)

Feeder Supply

SPD located within or adjacent to the equipment that contains branch circuit overcurrent protection.

Section 220.53(5) EV Supply Equipment

Appliance Load Calculation

EVSEs are excluded from the demand factor permitted for dwelling installations with four or more appliances.

Industry Impact:
- **Excludes** EVSE from the 75% appliance demand factor permitted for most dwellings
- Appliances must be fastened in place
- One-family, two-family, or multi-family installations
- See 220.57 for minimum load
Section 220.57 EV Supply Equipment (New)

Load Calculation

New requirements set the minimum load for individual electric vehicle supply equipment.

Industry Impact:
- Individual load of 7200W
- Equipment rating if over 7200W

Section 625.40 EV Branch Circuit

EV Supply Equipment

This section was revised to require an individual branch circuit for each outlet supplying EVSE exceeding 16A or 120V. Exception permits multiple EVSEs if an energy management system or the EVSE has adjustable settings.

Industry Impact:
- Individual branch circuit is required for each EVSE level 2 and above
- Using energy management or adjustable settings may impact the charge rate
- See 625.42 for detailed requirements
Section 625.42 EV Supply Equipment Rating

(A) Energy Management System

Allows the EMS to set the maximum equipment load on a service or feeder.

Industry Impact:
- Integral to the EVSE or
- Listed system
- Must comply with 750.30 and 220.70

(B) Adjustable Ratings

Permits the EVSE to include a restricted access ampere adjusting means which sets the equipment rating.

Industry Impact:
- Adjustments must follow manufacturers instructions
- The adjustment may require a new rating label
- Must comply with 750.30(C) and 220.70
Section 220.70 Energy Management Systems (New)

**Load Calculation**

New requirements permit energy management systems (EMS) to limit the load on a feeder or service. The system setpoint can be used in the feeder or service load calculation under certain conditions.

**Industry Impact:**
- Ability to manage system loads and align the infrastructure sizing
- EMS requirements for the setpoint, access to settings, marking and required actions upon system malfunction are in 750.30
- EMS setpoint is considered a continuous load for calculation purposes

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Section 220.110 Receptacle Loads (New)

**Health Care Facilities**

New Part VI for health care facilities. Revision includes demand factor tables for receptacle loads in specific patient care spaces.

**Industry Impact:**
- Category 1 & 2 Patient Care Spaces are permitted to apply factors which provide more reduction to the calculated receptacle load than 220.47
- Equipment or system failure will impact patients and staff in these spaces
- Patient Care Space Categories are defined in Article 100

<table>
<thead>
<tr>
<th>Category 1 &amp; Category 2 Patient Care Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Factor</td>
</tr>
<tr>
<td>First 5,000 VA or less</td>
</tr>
<tr>
<td>From 5001 VA to 10,000 VA</td>
</tr>
<tr>
<td>Remainder over 10,000 VA</td>
</tr>
</tbody>
</table>
Section 220.110 Receptacle Loads (New)

Health Care Facilities

Tables were added to 220.110 to provide demand factors for receptacle loads in health care specific spaces.

<table>
<thead>
<tr>
<th>Category 3 &amp; Category 4 Patient Care Spaces</th>
<th>Demand Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 10,000 VA or less</td>
<td>100%</td>
</tr>
<tr>
<td>Remainder over 10,000 VA</td>
<td>50%</td>
</tr>
</tbody>
</table>

Industry Impact:
- Category 3 & 4 Patient Care Spaces align with the receptacle load demand factors in 220.47
- Equipment or system failure will normally not impact patients, visitors and staff in these spaces

Section 225.41 Emergency Disconnects (New)

One and Two Family Dwellings Supplied by an Outside Feeder

Similar to service supplied buildings and structures, an outdoor disconnect for a feeder supply will facilitate fire service operations and safety of personnel.

Industry Impact:
- Provides general requirements regardless of the feeder source type
- Other code sections for sources have similar requirements but this would be an additional disconnect
- Requires a directory identifying the location of all other isolation disconnects unless they are adjacent
Section 225.42 Surge Protection (New)

Outside Feeder Supply

Dwelling units, dormitory units, guest rooms and guest suites of hotels and motels, and patient sleeping rooms in nursing homes and limited care facilities require the installation of a surge protective device.

Industry Impact:
- SPD must be located within the equipment that contains branch circuit overcurrent protection
- Type 1 or Type 2 only
- Replacement of existing equipment will also need to comply
- SPD nominal discharge current not less than 10kA

Section 230.67 Surge Protection

Services

Dwelling units, dormitory units, guest rooms and guest suites of hotels and motels, and patient sleeping rooms in nursing homes and limited care facilities require the installation of a surge protective device.

Industry Impact:
- Expansion beyond dwelling units
- SPD nominal discharge current not less than 10kA
Section 230.67 & 225.42 Surge Protection

Outside Feeder Supply

SPD Required for the service

Utility Power

To Normal Power Loads

Outdoor source

Alternate Power Source (OCPD)

SPD Required for the subpanel

To Standby loads

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### Section 230.71(B) Maximum Number of Service Disconnects

#### Two to Six Service Disconnects

Clarifications were added for Motor Control Centers and Switchboards.

**Industry Impact:**
- MCCs are permitted to have one service disconnect in a unit and not more than two total in the line-up.
- Switchboards and MCCs containing a service disconnect will have inadvertent contact evaluation based on access from adjacent units, compartments, or sections.

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#### Two to Six Service Disconnects

Existing service equipment shall be permitted to have up to six service disconnects.

**Industry Impact:**
- New exception for existing installations under earlier editions of the code.
- Provides relief from equipment replacement when adding a service disconnect.
Section 230.85 Emergency Disconnects

Services for one and two family dwelling units

The requirements for emergency disconnects were revised to provide additional clarity and align with similar code requirements.

Industry Impact:
- New exclusion of meter disconnects with suitable only for use as service equipment rating
- Replacement of service equipment will force compliance
- A plaque or directory is required where additional isolation disconnects are part of the installation but not adjacent

Article 235 Medium Voltage Services, Feeders, and Branch Circuits (New)

Requirements for installations over 1000 Vac & 1500 Vdc

The requirements for medium voltage circuits were put into their own article to provide additional clarity and ease of use on these installations.

Industry Impact:
- Specific requirements for MV Circuits
- Provides requirements for DC branch circuits to assist in PV or other renewable energy circuits
- Utilization equipment requirements
Section 240.2 Reconditioning Requirements (New)

Overcurrent Protection

Updated and relocated reconditioning requirements for overcurrent protection devices.

Industry Impact:
- Specifically indicates devices not permitted to be reconditioned:
  - GFPE
  - GFCI
  - Fuses/Fuse holders
  - MCCB
  - LV PCB Trip Units
- Specifically indicates devices that can be reconditioned:
  - LV Power Circuit Breakers
  - Electromechanical protective relays and CT’s.

Section 240.6 Remotely Accessible Adjustable-Trip CB’s (New)

Overcurrent Protection

New requirements for cybersecurity when circuit breakers are connected through a network interface.

Industry Impact:
- CB & Software evaluated for cybersecurity
  or
  - Cybersecurity assessment of the network including documentation and system certification. (SE can self-certify and industrial services can perform assessment)
Section 240.7 Listing Requirements  (New)

Overcurrent Protection

New listing requirements are required for branch circuit overcurrent protective devices, relays and circuit breakers providing ground fault protection, and GFCI devices.

Industry Impact:
- Overcurrent protective devices have traditionally been listed even without a requirement
- The incorporation of overcurrent protection functions within other products or devices will need to comply with the product standard requirements for OCPDs.
- Aligns with new 240.16 which sets the minimum interrupting rating to not less than 5 kA
- Replacement trip units also required to be listed, see 240.89

Overcurrent Protection – Not Branch Circuit Protection

Recognizing the difference between an overcurrent protective device versus a supplementary protector or other device requires examination of the marking.

GF Circuit Protector
Molded Case Switch
Instantaneous Trip Circuit Breaker
Supplemental Protectors
Section 240.11 Selective Coordination (New)

Overcurrent Protection

Selective coordination requirements are expanded to include all normal feeder OCPDs supplied directly by the service OCPD. Emergency, legally required standby, and critical operations power systems do not require selective coordination between OCPDs on the normal supply.

Industry Impact:
- Analysis and selection of OCPDs and associated settings must now include all first level (normal) feeder devices supplied by the service disconnect.
- Ensures the service disconnect can supply the normal feeder to the critical system without interruption for a normal system fault.

- 700.32, 701.32, 708.54 do not require selective coordination between B and A.
- This revision expands selective coordination such that all B devices must selectively coordinate with A.
Section 240.16 Interrupting Rating Requirements (New)

Overcurrent Protection

New interrupting rating requirements of 5kA minimum for branch-circuit overcurrent protective devices.

Industry Impact:
- This requirement was existing as part of the definition of branch-circuit overcurrent protective devices
- No change in requirement but does coordinate with new listing section

Article 245 Overcurrent Protection for MV Systems (New)

Overcurrent Protection

The requirements for medium voltage circuits were put into their own article to provide additional clarity and ease of use on these installations.

Industry Impact:
- Circuit-Interrupting Devices
  - Circuit Breakers
  - Fuses
  - Cutouts
  - Load Interrupters
Section 250.140 Frames of Ranges and Clothes Dryers

Grounded Conductor Connections

The allowances for existing branch circuits without an equipment grounding conductor and wired with the appliance frame connected to the grounded conductor were expanded to include those that originate outside the service equipment.

Industry Impact:
- The addition of new equipment to serve as service equipment will not trigger re-wiring of existing branch circuits for ranges and dryers located in the old service panel
- Feeder to the old service panel will need an equipment grounding conductor
- Facilitates the addition of whole home transfer equipment for existing dwellings

Grounded Conductor Connections – New Service Equipment

- Supply must be 120/240 V single phase, 3 wire or 208Y/120 V from 3 phase, 4 wire system
- Grounded conductor not smaller than 10 AWG CU or 8 AWG AL
- Any receptacles that are part of the equipment must have grounding contacts bonded to the frame
Section 250.140 Frames of Ranges and Clothes Dryers

Grounded Conductor Connections – New Service Equipment

- Grounded conductor must be insulated or part of Type SE cable originating at the service equipment.
- Otherwise, the grounded conductor must be part of Type SE cable and insulated or field covered within the supply enclosure such that contact with normally non-current-carrying metal parts is prevented.

Article 335 Instrumentation Tray Cable: Type ITC (New)

Cable Requirement Relocation

Instrumentation Tray Cable requirements from Article 727 were relocated to a new article. Article 727 was deleted.

Industry Impact:
- Wiring method and use better aligns with Chapter 3.
- Part of overall restructuring of the code for clarity and usability.
- Installation doesn’t fall under Chapter 7 Special Conditions.
**Article 369 Insulated Bus Pipe (New)**

**Wiring Methods**

New Article 369 covering Insulated Bus Pipe (IBP), also known as Tubular Covered Conductor (TCC).

A circular copper or aluminum conductor with a resin impregnated fiber insulation.

UL Outline of Investigation UL 1366 is posted.

**Industry Impact:**
- Primarily a Medium Voltage (MV) product
- Product must be listed and is suitable for exposed installations in indoor and outdoor areas; not in hazardous (classified) locations
- Existing applications in Europe have generally been at Utilities and aboard ships

![Image provided to CMP-8 by UL LLC](image-url)

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**Article 371 Flexible Bus Systems (New)**

**Wiring Methods**

New Article 371 covering Flexible Bus Systems

Flexible, rectangular insulated conductors.

UL Outline of Investigations being developed

- UL Ool 1386 Flexible Bus Systems
- UL Ool 1387 Flexible Insulated Bus

**Industry Impact:**
- Low voltage product (600V Max)
- NEC requires Listing; Two UL Outlines of Investigation in process
- Flexible bus systems are engineered for a specific site location. Layout and all fittings, supports and components are furnished by the manufacturer
- Equipment terminations subject to 110.14(C) temperature limitations

![Images courtesy of nVent](image-url)

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Section 404.30 Switch Enclosures (New)

Interior Access

Enclosures with doors that expose workers to uninsulated, live parts when opened must restrict interior access so that a tool or other means must be used to open the doors when the switch is in the closed position.

Industry Impact:
- Switch mechanism must restrict access to the interior
- Provides protection in addition to the enclosure padlock provision to restrict interior access by unqualified persons
- Heavy Duty Safety Switches are required to have door interlocking per the safety standard (NEMA KS1)

Section 409.70 Surge Protection (New)

Industrial Control Panels

New Section on Surge Protection

Safety circuits shall have surge protection within or immediately adjacent to the control panel.

Industry Impact:
- Expand safety and protection of safety circuits to all industrial control panels
- This change will protect electronic safety devices that may be in use from damaging surges.
Section 409.110 Marking

Industrial Control Panels

The requirements for industrial control panel marking were revised to clarify which items must be on the outside of the enclosure and those permitted inside.

Industry Impact:
- Single nameplate outside the enclosure was revised to allow multiple labels
- Only supply voltage, number of phases, incoming supply full load current, and multiple source markings are required outside
- All other items including the short circuit current rating are permitted inside. This change needs to be monitored if the panel is moved into a new area where the short circuit current may be higher.

Section 430.2 Reconditioned Motors (New)

Motors, Motor Circuits, and Controllers

New section adding requirements for the use of reconditioned motors in both standard use and hazardous locations.

Industry Impact:
- Reconditioning must follow the manufacturer’s instructions or nationally recognized standards (ANSI/EASA AR100)
- Listing is required for use in hazardous locations
Section 430.110 Current Rating

Motors, Motor Circuits, and Controllers

New section adding expanding sizing options for Design A Motors.

Provides for marked motor LRA and calculations if motor is not marked so proper protection can be selected.

Industry Impact:

- Improves safety for disconnects and overload protection for Design A motors

\[
\frac{\sqrt[3]{\text{motor's marked value of rated horsepower}}}{\text{motor's marked value of rated volts}} \times \frac{\text{motor's marked value of rated volts}}{1000} \times \frac{\text{motor's locked-rotor amperes}}{\text{motor's locked-rotor amperes}}
\]

Section 430.208 Disconnecting Means

Motors, Motor Circuits, and Controllers

Revised Medium Voltage Motor Controller Disconnect sizing to align with standard industry practice and product ratings.

Industry Impact:

- Changes sizing from not less than 115% to 100% of the full load current
- Applies for both across the line controllers and MV adjustable-speed drives
Section 445.18 Disconnecting Means

Generators

The requirements for a generator disconnecting means and the prime mover shutdown means were separated into different sections. Both provisions provide safety functions necessary for service and maintenance activities.

For one and two family dwellings, see 225.41 Identification of Isolation Disconnects

Industry Impact:

- Clarifies that the disconnect means can be integral and located behind a hinged cover, door, or enclosure panel
- If located within the generator assembly, the disconnect location must be field marked
- For parallel installations, the disconnect must isolate the generator from the paralleling system bus but it is not required to be located at the generator

Section 445.19 Emergency Shutdown

Generators

Revisions were made to clarify that (C) covers the emergency shutdown for one- and two-family dwellings.

Industry Impact:

- Permits the emergency shutdown device to be mounted on the exterior of the generator enclosure
- Shutdown device or switch must be marked Generator Emergency Shutdown
Section 470.2 Reconditioned Equipment

Resistors and Reactors

New section adding requirements for reconditioning.

Industry Impact:
- Provides guidance on reconditioning of resistors and reactors
- Similar to transformers, certain reactors can be rewound
- Requirements do not apply to components within a product

Section 517.30(A) Two Independent Power Sources

Health Care Essential Electrical System

Significant change in terms to convey the power sources necessary for an EES.

Industry Impact:
- EES loads require two independent sources
- Each independent source may consist of a set of sources
- At least one of the independent sources must be on-site and capable of supplying the EES
- Generating units, fuel cell systems, energy storage systems, and health care microgrid are permitted sources
- Utility service can be part of one of the independent sources but generally not both
Section 517.30(A) Two Independent Power Sources

Health Care Essential Electrical System

Traditional System
- Utility Service is an off-site source and serves as the normal source
- Diesel generators are a set of on-site sources which serve as the alternate EES source
- Both sources are independent and capable of supplying the entire EES

Section 517.30(B) Power Sources for the EES

Health Care Essential Electrical System

Permitted Sources
- Energy storage systems
- Fuel cell systems
- Generating units
- Any combination of these

Location requirements of ESS components in 517.30(C) still apply
Section 517.30(B)(5) Health Care Microgrid

Health Care Essential Electrical System

Microgrid System
- Permitted to serve as one of the independent EES sources
- Capacity and reliability consistent with the facility emergency operations plan
- Permitted to serve nonessential loads where failures do not impact ability to serve the EES

Section 517.30(B)(5) Health Care Microgrid

Health Care Essential Electrical System

Microgrid System
- Permitted to include off-site sources where the other independent EES source is on-site
- Allowed to supply nonessential loads or serve as normal supply
Section 555.15 Replacement of Equipment

Marinas, Boatyards, Floating Buildings & Docking Facilities

Updated information on requirement when replacement of equipment is needed and when it can be repaired and to what version of the NEC.

Industry Impact:
- Replaced equipment must meet the current NEC requirements
- Repaired equipment can meet the code in force when the equipment was installed

Section 555.35 GFPE and GFCI

Marinas, Boatyards, Floating Buildings & Docking Facilities

Listed Leakage Current Measurement Device required to determine leakage current from each boat supplied by shore power.

Industry Impact:
- Effectivity date of 1/1/26
- Required in installations of more than 3 receptacles for shore to boat power
- Allow for all devices to be tested to product safety standard
- Certification include suitability for use in marina environment
Section 690.12 Rapid Shutdown of PV Systems

Nonenclosed Detached Structures

Revision adds an exception to the rapid shutdown requirements for nonenclosed detached structures.

Industry Impact:
- Parking shade structures
- Carports
- Solar trellises

Section 690.12(A) Controlled Conductors

PV Rapid Shutdown

New exception removes the controlled conductor requirements for PV system circuits from arrays not attached to buildings.

Industry Impact:
- Circuits must terminate on the exterior of the building
- Includes line side PV connections (service conductors)
Section 690.31(G) PV Systems Over 1000V (New)

Wiring Methods

New requirements for the exterior installation of equipment and wiring methods for PV system dc circuits over 1000 volts.

Industry Impact:
- Excludes one- and two-family dwellings
- Not permitted for buildings containing habitable rooms
- Installation of equipment must be less than 10ft above grade and wiring method length can not exceed 33 ft from the point of attachment to the building to the equipment

Section 700.3(A) Commissioning

Emergency Systems

The critical importance of an emergency systems warrants commissioning of the complete system at installation.

Industry Impact:
- Performance of the system extends beyond the testing of individual parts or subsystems
- AHJ documentation of the system commissioning and/or witness
- System type and complexity determine the schedule for repeating the commissioning steps after installation
- Similar revision in 701.3
Section 700.4(A) Capacity

Emergency Systems

Adequate system capacity should be determined based on system load calculations. Transient power requirements such as HVAC and motor starting must be included to ensure the system will perform.

Industry Impact:
- Generators are typically sized based on the load types and inrush or transient power associated with each
- Renewable and microgrid source systems will require analysis and manufacturer data to determine transient power capabilities
- Similar revision in 701.4(B)

Section 700.4(C) Parallel Operation

Emergency Systems

The emergency system source is permitted to be a set of sources that operate in parallel. Additionally, the emergency source can operate in parallel with the normal source.

Industry Impact:
- DER and microgrid sources used as emergency sources are often a set of sources operating in parallel
- Operation in parallel with the normal source recognizes that DER and microgrid sources don't sit idle waiting on the loss of normal power
- Generating and supplying power to normal loads can satisfy the system testing requirements
- Emergency capacity must be maintained at all times. Similar revision in 701.4(D)
Section 700.5(B) Bypass Isolation Transfer Switches

Emergency Systems

Availability of the emergency system is critical to the life safety of building occupants.

Industry Impact:
- Revised term to align with Article 100 definition
- Bypass isolation transfer switches provide a means to perform maintenance and servicing on an emergency system transfer switch
- Similar requirements found in 708.24

Section 700.5(B) Bypass Isolation Transfer Switches

Emergency Systems

Bypass-Isolation Transfer Switch

Bypass/Isolation Switch

Transfer Switch
Section 700.5(B) Bypass Isolation Transfer Switches

Emergency Systems

Availability of the emergency system is critical to the life safety of building occupants.

Industry Impact:
- Recognizes the need for transfer equipment servicing and maintenance for single feeder systems
- Bypass isolation transfer switches provide a means to comply
- Exception similar to 700.3(F) for single source systems
- Aligns with 708.24(D) requirements
Section 700.10(D)(4) Source Control Wiring

Emergency Systems

This section was revised to align with the expansion in the types of sources permitted to serve the emergency system.

Industry Impact:

- Monitoring the control wiring between traditional standby generators and transfer equipment is well understood.
- Now microgrid and DER systems will need to verify source readiness and initiate a system malfunction signal if there is any issue. See 700.6(A).
- Daily or frequent operation of the microgrid and DER sources will serve as additional verification of system readiness.

Section 700.11 Class 2 Emergency Lighting

Emergency Systems

Class 2 lighting systems are common for normal lighting within buildings. This new section provides installation requirements for these systems for emergency lighting applications.

Industry Impact:

- Supply must follow general wiring rules in 700.10.
- Identification of boxes, enclosures, cable tray, raceways required.
- Wiring must be listed, jacket cable or follow Chapter 3 wiring method.
- Emergency circuits must be kept separate from other circuits, 725.136.
- Wiring must be installed in raceway, armored or metal-clad cable, or cable tray. *Exceptions for connections to an luminaire or lighting control device and locked rooms or enclosures.*
Section 700.12(C) Supply Duration

Emergency Systems

The capacity requirements for emergency sources of power were revised and reorganized to add clarity. The existing rules contained requirements applying only to traditional generators but which are applicable to other sources.

Industry Impact:
- Minimum duration of 2 hours unless used solely for emergency illumination or unit equipment
- Requirements for on-site fuel supply, fuel transfer pumps, public gas, municipal water supply, and automatic fuel transfer may apply to other source types such as fuel cells and flow battery systems
- Similar revision in 701.12(C)

Section 700.12(E) Stored Energy Sources

Emergency Systems

Stored energy power supply systems were added as acceptable sources for the emergency system.

Industry Impact:
- Stored energy sources including UPS, fuel cell, energy storage system, and storage battery are now included
- General requirements, power source considerations, equipment design and location in 700.12, 700.12(A) and 700.12(B) apply
- Similar revision in 701.12(E)
Section 700.12(G) Microgrids

Emergency Systems

Revisions permit on-site emergency sources to be connected to and operate as part of a microgrid.

Industry Impact:
- Emergency sources are permitted to supply loads within the microgrid
- Capacity for emergency loads must be maintained at all time
- Failures or interruptions within the microgrid must not impact the availability, capacity, and duration of emergency sources
- Nonemergency sources are permitted to recharge stored energy emergency sources
- Similar revision in 701.12(H)

Section 702.4(A) Capacity and Rating

Optional Standby System

Interconnection of on-site generation sources often utilize various switching means rather than traditional transfer equipment. The source capacity requirements apply regardless and are based on if connection is automatic or manual.

Industry Impact:
- Automatic connection of load requires source capacity based on full load or an energy management system. See 220.70 and 750.30
- Requirement applies regardless of the use of transfer switch or transfer equipment
- Supports “Island Mode” operation of on-site sources
Section 702.12(B) Portable Generators 15 kW or Less

Optional Standby System

The misuse of portable generators can create carbon monoxide hazards and potentially a threat to life safety.

Industry Impact:
- Flanged inlet or other cord and plug generator connections must have the connection location outside of the building or structure
- Removes option to install an inlet within a garage or basement since this may imply the generator may also be located in the same space

Section 705.11 Interconnected Electric Power Production Sources

Source Connections to a Service

Revisions clarify that line side source connections are considered service connections and follow the installation rules for service conductors.

Industry Impact:
- Connection options
  - New Service 230.2(A)
  - Supply side of service disconnect 230.82(6)
  - Additional set of service conductors 230.40 Exception 5
- Service conductor minimum sizing and grounding and bonding requirements apply
Section 705.13 Interconnected Electric Power Production Sources

Energy Management Systems (EMS)

The term Power Control System (PCS) is replaced with EMS and the main requirements located in 750.30. An EMS can control sources and loads and relocating to Article 750 will provide clarity and consistency.

Industry Impact:
- EMS can ensure that source connections to busbar within equipment do not result in an overload condition
- Permits the connection of more sources than permitted by the 120% rule

Section 705.76 Interconnected Electric Power Production Sources

Microgrid Control System (MCS)

New requirements for microgrid control systems were added. Multiple power source operation and interaction within the system require coordination to ensure continued production and power quality.

Industry Impact:
- MCS must be evaluated for the application and be listed or field labeled, or designed under engineering supervision
- Must monitor and control production and system power quality
- Perform any transitions or interconnections with external or primary sources
Section 706.15 Energy Storage Systems

ESS Disconnecting Means

The ESS disconnect must separate the ESS from all wiring, equipment, and other power systems. For one and two family dwellings an emergency shutdown function is now permitted which shuts down the export of power from the ESS.

Industry Impact:
- If the disconnect is not integral to the ESS it must be within sight and no more than 10 ft away or remote with capability of being locked. See 110.25
- Permits controls to activate the disconnecting means. Control must be within sight or the disconnect lockable and location of controls marked on the disconnect
- Emergency shutdown is no longer required to be a disconnect or a control which opens the ESS disconnect

Section 708.7 Critical Operations Power Systems (New)

Cybersecurity

Critical Operations Power Systems (COPS) that are connected to an external communication network and have the capability to permit control of any portion of the building.

Industry Impact:
- The power system and associated software must be identified as having been evaluated for Cybersecurity or a Cybersecurity risk assessment shall be conducted on the entire system
- Documentation must be provided to AHJ, contractors, and owners.
- Updated based on system changes or every 5 years
- Several standards listed as examples and potential certification options
- Coordinates w/ NFPA 1660 on emergency management risk assessments
Section 708.7 Critical Operations Power Systems (New)

Cybersecurity Assessment Using ANSI/ISA 62443-3-2

1. Initial (High) Recommendations (as soon as possible)

- Identify and assess vulnerabilities in the critical operations power system.
- Develop and document a cybersecurity policy and procedures.
- Conduct a risk assessment to identify potential threats and vulnerabilities.

2. Medium-Term (Moderate) Recommendations (9+ Months)

- Implement and document a cybersecurity management plan.
- Conduct penetration testing and vulnerability assessments.
- Develop and implement a incident response plan.

3. Long-Term (Moderate) Recommendations (1+ Years)

- Develop and implement a continuous monitoring and reporting system.
- Conduct regular employee training on cybersecurity best practices.
- Develop and implement a supply chain security program.

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Section 708.7 Critical Operations Power Systems (New)

Cybersecurity

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Article 710 Stand Alone Systems

Scope

The scope of Article 710 was revised to clarify that the requirements only apply to installations which do not have a connection to an electric utility or other electric power production network.

Industry Impact:

- Removes conflicts within the installation rules where a utility connection is present
- Sites which have a utility connection are required to comply with the source capacity and load management requirements based on the load type (e.g. Optional, Emergency)

Article 712 Direct Current Microgrids

Deleted

The requirements for microgrid installations were consolidated into Article 705.

Industry Impact:

- Eliminates redundancy and provides consistency
- All microgrid specific requirements are now in one place within the code
Article 722 Cables for Power-Limited Circuits, Fault-Managed Power Circuits (New)

Cable Requirement Relocation

Cable requirements from Articles 725, 726, and 770 were relocated to a new article.

Industry Impact:
- Only 1 place to go for cable installation requirements for Low Voltage and Fault-Managed Power circuits
- Eliminates redundancy within the code
- Improves code structure, usability

Article 724 Class 1 Power-Limited Circuits and Class 1 Power-Limited Remote-Control and Signaling Circuits (New)

Class 1 Power-Limited Circuits Relocation

Class 1 circuit requirements were relocated to a new stand-alone article. The title was revised to clarify and improve useability.

Industry Impact:
- Recognizes that Class 1 circuits are power limited, 30 volts, 1000 VA
- Remote-Control and Signaling had been permitted up to 600 volts, unlimited VA.
- Separation from Class 2 and Class 3 which are limited to 100 VA adds clarity
Definitions – Article 100

Class 4 Circuit. The portion of the wiring system between the load side of a Class 4 transmitter and the Class 4 receiver or Class 4 utilization equipment, as appropriate. Due to the active monitoring and control of the voltage and current provided, a Class 4 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock. (726) (CMP-3)

Class 4 Power System. An actively monitored and controlled system consisting of one or more Class 4 transmitters and one or more Class 4 receivers connected by a cabling system. (CMP-3)

Definitions for Class 4 Device, Receiver, Transmitter, and Utilization Equipment were also added.

Fault-Managed Power Systems / Class 4 Power

New Article detailing installation requirements for a new technology, Class 4 Fault-Managed Power Systems.

Key Items
- Shall be listed
- Max 450Vdc Rating
- Transmitter/Receiver shall be listed as a system
- Firmware protection for short-circuit, overload, arc-faults, ground-faults and electric shock

Industry Impact:
- Provide installation instructions on this new technology. The primary application is long distance powering of low power devices, i.e. 5G Telecom Equipment
- Currently designed to feed small dc loads.
- Shall not be permitted in dwelling units
Fault-Managed Power Systems / Class 4 Power

Fault Managed Power Systems have

- Power levels significantly higher than class 2 or POE. (2000W currently)
- Ability to transfer power over 1000’s of feet.
- Transmitter/Receiver are used on most systems.
- Wiring methods are similar to class 2 and telecommunication cables, but do have limitations as listed in Article 722

Section 750.30(C) Energy Management Systems

Definition – Article 100

Energy Management System (EMS). A system consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), or other device(s) that monitors and/or controls an electrical load or a power production or storage source. (CMP-13)
Section 750.30(C) Energy Management Systems

Source & Load Management

Energy management functions throughout the code were consolidated. Functions such as automatic load management, manual load management, peak shaving, load shedding and source power control are now considered part of an EMS.

Industry Impact:
- Consolidated requirements
- Access to settings
- Source setpoint
- System malfunction
- Equipment marking
- Aligns with new 220.70
Section 750.30(C) Energy Management Systems

Source & Load Management

- Square D Energy Center Electrical Panel
- Wiser Energy Home Power Monitor
- Square D Switches, Dimmers, Sensors, and Receptacles
- Wiser Suite of Apps

Questions?
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Open Discussion and Q&A
Next Meeting: Monday, 05/15/23

Topic: TBD
Thank You and Have a Great Day!