

Meeting Minutes: NEC 2023 Adoption Review Committee (Board of Electricity)

Date: Sept. 22, 2022

Time: 9:00 a.m.

Location: Minnesota Room, DLI, 443 Lafayette Road No., St. Paul, MN 55155

Committee Members Present

1. Alfreda Daniels – via phone
2. Steve Haiby
3. Mike Hanson
4. Dean Hunter – Cmt. Chair / CO's Designee
5. Desiree Weigel – Secretary

Committee Members Absent

Jeff Heimerl

DLI Staff & Visitors

Jeff Lebowski (Board Counsel, DLI)
Brittany Wysokinski (Board Co, DLI) – via phone
Lyndy Logan (DLI)
Scott Higgins (DLI)
Marty Kumm (DLI)
Amanda Spuckler (DLI)
Sarah Gudmunson (BOE member)
Don Iverson (Schneider Electric)
Pete Lindahl (BOE member) – via phone
Barbara Conti (Commerce) – via phone
Clara Albert (Electrical Assn.) – via phone
Nick Erickson (Housing First)
Tim McClintock (NEMA)
Gerald O'Connor (Eaton)
Andy Snope (IBEW 292)
Shawn Weyer (St. Paul Electrical JATC)
John Williamson (former BOE member) – via phone

1. Call to Order – Committee Chair Hunter

- A. **Roll call:** Committee Chair Hunter called the meeting to order at 9:02 a.m. Roll call was taken by Secretary Weigel and a quorum was declared with 5 of 6 voting committee members present in person or via phone.
- B. **Announcements/Introductions** – Committee Chair Hunter
 - Committee members:
 1. Alfreda Daniels – Public member
 2. Steve Haiby – Representative of Electrical Suppliers in rural areas
 3. Michael Hanson – Master Electrician – Contractor
 4. Jeff Heimerl – Journeyworker Electrician
 5. Dean Hunter (Chair) – Commissioner's Designee
 6. Desiree Weigel – Electrical Inspector
 - All handouts discussed and meeting information are posted on the Committee's website.
 - Everyone present in person and via phone can hear all discussions.
 - Public participation is welcome and encouraged.
 - All votes will be taken by roll call if any Committee member is attending via phone.

2. Approval of Meeting Agenda

A motion was made by Haiby, seconded by Hanson, to approve the agenda as presented. The roll call vote was unanimous with 5 votes in favor of the motion; the motion carried.

3. Regular Business

A. **Expense Approval** – Daniel’s expense report will be sent to Financial Services.

4. Special Business

A. Introduction to the 2023 NEC – Dean Hunter

- Hunter provided a presentation (see summary below) regarding the NFPA 70® and said information is based on the requirements of the 2023 edition of the *National Electrical Code (NEC)* and is for informational purposes, only meant to address significant 2023 NEC changes. Informational Handout Book (Analysis of Changes, 2023 NEC) can be viewed here: <https://www.iaei.org/store/>
- Free access to the 2023 NEC maybe found at: <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70>
- Questions and comments will be accepted until Oct. 14, 2022 – please send to: DLI.Electricity@State.MN.US. Questions/comments will be compiled and addressed at the next Committee meeting on Oct. 20, 2022, at 9 a.m. Additional Committee meetings will be scheduled until Committee members are prepared to make a recommendation to the full Board of Electricity.
- The model code development process was discussed – steps 1 through 4, with the final outcome – the issuance of the Standard NFPA 70: the National Electrical Code.
- NFPA NEC first and second draft meetings were conducted virtually instead of in person. Code Making Panel Task Group meetings were also conducted virtually. Several IAEI members served on NFPA Correlating Committee Task Groups to work on issues. The following were submitted to NFPA for the edition of the Code
 - 4006 Public Inputs
 - 1805 First Revisions
 - 1956 Public Comments
 - 900 Second Revisions
 - 441 Correlating Notes
 - 55 Certified Amending Motions
- Code Wide Changes: *NEC* Style Manual Changes, Definition Location, Reconditioned Equipment, Medium Voltage Requirements, New Articles for 2023 *NEC*
- **New Articles for the 2023 NEC**
Ten (11) new articles have been added to the 2023 NEC:
 - **Article 235** Branch Circuits, Feeders and Services Over 1000 Volts ac, 1500 Volts dc, Nominal
 - **Article 245** Overcurrent Protection for Systems Rated Over 1000 Volts AC, 1500 Volts DC
 - **Article 305** Wiring Methods and Materials for Systems Rated Over 1000 Volts ac, 1500 Volts dc, Nominal
 - **Article 315** Medium Voltage Conductors, Cable, Cable Joints, and Cable Terminations

- **Article 369** Insulated Bus Pipe/Tubular Covered Conductors
- **Article 371** Flexible Bus Systems
- **Article 495** Equipment Over 1000 Volts AC, 1500 Volts DC, Nominal
- **Article 512** Cannabis Oil Equipment
- **Article 722** Cables for Power-Limited Circuits, Fault-Managed Power (*Class 4*) Circuits, and Optical Fiber
- **Article 724** Class 1 Power-Limited Circuits and Class 1 Power-Limited Remote-Control and Signaling Circuits
- **Article 726** Class 4 (*CL4*) Power Systems
- **Deleted Articles for the 2023 NEC**
Three (3) articles have been deleted for the 2023 *NEC*:
 - **Article 231** Electric Power Sources Interconnected with an Electric Utility
 - **Article 490** (*contents moved to new Article 495*) Equipment Over 1000 Volts, Nominal
 - **Article 712** Direct Current Microgrids

Chapter 1 – General: Article 90, Article 100, Article 100

- **Article 100 – Class 4 Circuit**
A new definition for a Class 4 Circuit has been added as it applies to equipment and installations located in Article 726. This was the result of the **Packet Energy Transfer (PET) Systems** Task Group tasked to provide guidance towards this new technology. This emerging technology has been referred to in the past as Packet Energy Transfer (*PET*), Digital Electricity (*DE*), Pulsed Power, Smart Transfer Systems and Fault Managed Power (*FMP*). Involves a **fault-managed system** that verifies the powered device is present and operating correctly prior to a greater than Class 2 power being applied (*a fault would cause a termination of the output power*). Must ensure safety in design, implementation, installation, and use of this technology. There are now a total of seven (6) definitions associated with this Class 4 technology.
- **Article 100 Definitions – Energy Management System**
A new definition for Energy Management System has been created and added to the 2023 *NEC*. The Energy Management Task group was asked to review all current and proposed definitions and requirements. Items reviewed were load management, load management system, power control system, energy management system, and related terms. Need to promote a coordinated approach and understanding throughout the *Code*. An energy management system will contain a **monitor, a form of communication equipment, some type of controller and timer**, and other devices responsible for monitoring or controlling an electrical load, form of power production, or a type of storage source.
- **Article 100 Definitions – Feeder Assembly**
This new definition will provide consistency when referencing the factory cord or cable assembly between the electrical equipment and the mobile home, recreational vehicle, or park trailer panelboard. In previous editions of the *Code*, there were different definitions in the *NEC* articles under CMP-7 purview that basically covered the power cord assembly. Adding the term “feeder assembly” consistently throughout Articles 550, 551, and 552, clarifies these conductors, although connected to a receptacle, are considered feeders in order to forgo the GFCI protection. This alleviates concerns about

“unwanted tripping” that could be caused by the accumulation (*multiple portable appliances*) of leakage current at the source.

- **Article 100 - Load Management**

Substantiation was submitted for a new definition for Load Management. This was the result of the Energy Management Task Group asked to review current as well as proposed definitions and requirements. Review topics included load management, load management system, power control system, energy management system and related terms. This will result in a coordinated approach and understanding throughout the *NEC*. The Task Group proposed several public comments for energy management items located throughout the *NEC*. Load management is considered a function of a listed energy management system. The definition will now correlate with Article 750 *Energy Management Systems*.

- **Article 100 Definitions – Normal High-Water Level**

This new definition will help the authority having jurisdiction (*AHJ*) determine the elevation for the electrical datum plane distances used in Articles 551, 555, and 682. Previously there was not a consistent way to determine the elevation next to a body of water to validate or confirm where electrical equipment could be placed and where the electrical datum plane is located. This will provide an easier and more consistent way to determine the elevation for the electrical datum planes. See this definition for further definitions of the following: Natural or Artificially Made Shorelines, Rivers and Streams, Flood Control Bodies of Water, and Non-flood Control Bodies of Water.

- **What is an Electrical Datum Plane?** The electrical datum plane is a horizontal plane, a specified distance above the normal high-water level. It governs, by applicable Code rules, the lowest level that specified electrical equipment can be installed and the electrical connections can be made. The electrical datum plane for floating piers and landing stages is installed to permit located to accommodate the rise and fall of the pier or stage in response to water level, without lateral movement. In these cases, the datum plane above the floating pier or landing stage is specified as being 30 inches above the water level at the floating pier or landing stage and a minimum of 12 inches above the level of the deck.

- **Article 100 Definitions – Servicing**

A new definition for servicing of electrical equipment to assist in maintenance and repair activities. There has been confusion between what is considered reconditioning versus normal servicing, maintenance, and repair of electrical equipment. This definition distinguishes the act of servicing and maintenance of electrical equipment from reconditioning of electrical equipment. It will help assure the operational performance of the electrical equipment during the life of the equipment. See *NEMA CS 100-2020, NEMA Technical Position on Reconditioned Electrical Equipment* for additional information for the proper application of rules related to reconditioning.

- **110.16(B) Service Equipment/Feeder Supplied Equipment**

This adds “Feeder Supplied Equipment” to the title, adds the phrase “arc flash” for the type of permanent label required, and reduces 1200 to 1000 amperes for equipment rating amperes. Clarifies that the requirements apply to both service equipment and feeder-supplied equipment. It was necessary to add the phrase “arc flash” to clarify the type of permanent label required for this equipment. The revision from 1200 to 1000

amperes will protect worker safety. The four previous list items and exception deleted and now references label to meet applicable industry practice.

- **110.26 Spaces About Electrical Equipment**
This change concerns equipment doors and their interference with egress and access from working space. Many instances of electrical equipment installations violate the previous *Code* language involving this working space (*entrapment when doors are open*). Worker entrapment by equipment doors can cause serious injury or death. This change recognizes open equipment doors can impede egress from electrical equipment when dangerous situations arise (*arc blast, etc.*). Access and egress **is impeded** if an equipment door(s) is opened and **restricts** the working space access to less than 610 mm (**24 in.**) wide and 2.0 m (**6 ½ ft**) high. This rule also applies to the space between two simultaneously opened doors on opposite sides of the aisleway.

Chapter 2, Wiring and Protection – Article 210, 215, 220, 225, 230, 235, 240, 242, 245, and 250

- **210.8(A)(6) Dwelling Units – Kitchens**
Ground-fault circuit-interrupter (*GFCI*) protection has been expanded to include any cord-and plug equipment in the kitchen, regardless of whether the outlet serves the countertop. There have been 104 electrocutions that have taken place from 2011 to 2022 based on the consumer products safety commission (*CPSC*) database. Eighty-one percent of these accidents were from working on an appliance or other equipment. GFCI protection required within a kitchen for receptacles that are 125-volt through 250-volt and supplied by single-phase branch circuits rated 150 volts or less.
- **210.8(A) Dwelling Unit Bathroom**
A new exception number 4 will help the electrical professional understand ground-fault circuit-interrupter (*GFCI*) protection requirements for factory-installed exhaust fans and their receptacles. There was confusion as to if a receptacle found within an exhaust fan installed in the bathroom required GFCI protection. This receptacle is typically installed within a fan unit and is not accessible or interactable with people. This will help reduce arguments and misunderstandings in the field. Language specifies that exhaust fans are not readily accessible and that the receptacles be installed integral to the fan assembly.
- **210.8(A) Ex. 3 and 210.8(B) Ex. 6 (*GFCI Protection*)**
Two new terms and acronyms have been introduced for “**Weight Supporting Ceiling Receptacle (WSCR)**” and “**Weight Supporting Attachment Fitting (WSAF)**” for consistency throughout the code. These two exceptions were relocated to the end of 210.8(A) and 210.8(B) as part of the reorganization of 210.8. The exception text was revised to apply the new defined terms “**Weight Supporting Ceiling Receptacle (WSCR)**” and “**Weight Supporting Attachment Fitting (WSAF)**”, including the acronyms. WSCR has a new definition in Article 100 and the WSAF had its term and definition modified with the acronym added. Similar nomenclature changes were made in 314.27 for *Outlet Boxes* and 422.18 for *Ceiling-Suspended (Paddle) Fans*.
- **210.8(B) Other Than Dwelling Locations**
A new list item (4) has been added for the addition of buffet serving areas to the list of locations requiring ground-fault circuit-interrupter (*GFCI*) protection. All receptacles are to be GFCI protected if they are single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, 125-volt through 250-volt and three-phase branch circuits

rated 150 volts or less to ground, 100 amperes or less; the buffet serving area typically contains various food wells which hold hot water; customers or staff members touching the stainless steel are subject to electric shock in the event of an accident. It was demonstrated that these locations are similar in safety concerns to those surfaces which are in kitchens.

- **210.8(B) Other Than Dwelling Locations**

Language at list item (7) has been modified addressing cord-and-plug-connected fixed and stationary appliances at **sinks** locations in other than dwelling units. The electrical hazard is typically not with the 125-volt through 250-volt receptacle supplying a fixed or stationary piece of equipment but from the equipment itself. Equipment such as a refrigerator or range is typically constructed of metal and located within 6 feet of a sink. A person at the sink making contact with these metal appliances has been injured or killed as a result. This action was necessary to prevent needless electrocutions or shocks to people from occurring.

- **210.8(B) Other Than Dwelling Locations**

A new list item (13) has been added for **aquariums and bait wells** in locations other than dwelling units. **Receptacles installed within 1.8 m (6 ft.)** of aquariums, bait wells, and similar open aquatic vessels or containers need to be provided with ground-fault circuit-interrupter (*GFCI*) protection – single-phase branch circuits rated 150 volts or less to ground, 50 amperes or less, 125-volt through 250-volt – supplied by three-phase branch circuits rated 150 volts or less to ground, 100 amperes or less. The areas around bait wells, aquariums, and the like tend to be wet conductive locations where various types of electrical equipment are used. Examples are aerators, luminaires, and pump motors. GFCI protection of the receptacle provides a level of protection from accidental electrical shock.

- **210.8(D) Specific Appliances**

The appliances (cord-and-plug and hard-wired) requiring ground-fault circuit-interrupter (GFCI) protection were placed into a list format for easier use. GFCI protection will apply to outlets supplied by a branch circuit of 150 volts or less to ground and 60 amperes or less in a single-phase system. Appliances now appear in a list format for enhanced useability and also correlate with 422.5. The new list items include: electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and microwave ovens.

- **210.8(F) Outdoor Outlets**

Ground-fault circuit-interrupter (*GFCI*) protection to be installed when the equipment supplied by an outlet covered under the requirements of this section is **replaced**. This addresses issues of **older existing outlets** that are **not GFCI protected**. Will require GFCI protection for dwelling outdoor outlets when the electrical equipment is replaced that receives power from that older existing outlet. This change will increase the overall level of safety by providing the same level of protection. In addition, now HVAC equipment will be exempt from GFCI protection until September 1, 2026.

- **210.11(C)(4) Dwelling Unit Garage Branch Circuits**

The text was clarified so that 15-ampere branch circuits are permitted to serve receptacle outlets installed in a dwelling unit garage. If a 15-ampere branch circuit(s) is installed, it would be in addition to the 20-ampere circuit supplying the required garage receptacles. This would not diminish the required 20-ampere circuit requirement found

at 210.52(G)(1). Applies to garages of any size (1,2,3,4, etc. vehicle bays). Equipment such as a central vacuum unit or garage door opener is allowed to be supplied by a branch circuit that limits ampacity to 15 amperes. This change will alleviate any confusion about garage branch circuit requirements

- **210.11(C)(4) Dwelling Unit Garage Branch Circuits**

A new exception (4) was added permitting the 20-ampere circuit supplying a single vehicle bay garage to supply other equipment in accordance with requirements in 210.23(A)(1) and (A)(2). A single bay garage is only mandated to be provided with one receptacle outlet on the 20-ampere branch circuit. The branch circuit will provide adequate circuit capacity to supply other loads. These loads are likely to be limited in number due to the reduced space availability in the garage.

- **210.12 Arc-Fault Circuit-Interrupter Protection (AFCI)**

This section was reformatted making it easier to reference and utilize the requirements. The 10-ampere branch circuit was added to the branch circuit sizes allowed for these locations and subdivisions were renamed:

- **Subdivision (A), Means of Protection**, now lists the protection methods available
- **Subdivision (B), Dwelling Units, Subdivision (C), Dormitory Units, and Subdivision (D), Other Occupancies**, contains a list format of locations requiring the 120-volt, single-phase, 10, 15, and 20-ampere branch circuit outlets or devices to have AFCI protection for first responder living facilities
- **Subdivision (E)** is entitled **Branch Circuit Wiring Extensions, Modifications, or Replacements**

- **210.17 Guest Rooms and Guest Suites**

Substantiation was presented to add **assisted living** facilities to the existing list of locations requiring their branch circuits to be installed per the requirements for dwelling units if a permanent means for cooking exists. Assisted living facilities were seen as having the same characteristics as a guest room and guest suite which were addressed in the 2020 *NEC*. It was felt that they should observe the same branch circuit requirements as dwelling units. The previous locations in this section were placed into a list format for added clarity. Informational notes were also included for guidance with laundry branch circuits and direction towards the *Life Safety Code* for the definition of an assisted living facility.

- **225.41 Emergency Disconnects**

Requires an emergency disconnect at a readily accessible outdoor location for one-and two-family dwelling units that are served by feeders. One-and two-family dwelling unit are not always fed by a service but instead by an outdoor feeder. This ensures that all new one-and two-family dwelling units are provided with an emergency disconnect located at a readily accessible outdoor location. This disconnect to be marked as **“EMERGENCY DISCONNECT.”** Plaque or directory must also be provided adjacent to the emergency disconnect identifying the location(s) of any other energy source disconnect on the premises. The disconnect must be on or within sight of the dwelling unit.

- **215.18 Surge Protection (Feeders)**

Language requires **Type 1 or 2 SPDs** when a service or feeder supplies a dwelling unit, dormitory unit, guest rooms of hotels and motels, and sleeping rooms/areas of nursing homes and limited-care facilities. Voltage surges can damage important sensitive

equipment, such as smoke alarms, AFCIs, and GFCIs. These devices are very important in areas where people sleep. Rules have been expanded to ensure that SPDs are also required for feeders supplying other occupancies or areas used for sleeping purposes. Requirements specify SPD's must have a nominal discharge rating not less than 10kA. Note new requirements located for SPDs at 225.42 and 230.67.

- **230.62(C) Barriers**

Clarifies the requirements for barrier installation in service equipment. Installed in such a way that no uninsulated, ungrounded busbars or terminals are exposed to inadvertent contact while load terminations are being serviced **when the service disconnect is in the open position**. Main point of the barrier requirement is to provide insulation to busbars or terminals while load terminations are being serviced. Barriers have proven to increase safety for electrical professionals working on service equipment. This clarifies that an open service disconnect does not excuse the need for barriers; if there is an energized bus, etc. with the disconnect open, then it must be barriered.

- **230.67(A) Surge-Protective Devices**

Revised the subsection by changing the existing term “dwelling units” to “the following occupancies” and added a list of additional locations that now require protection by a surge-protective device (SPD). Service equipment can at times be subjected to surges that inflict damage on systems designed to provide life safety. Recognized industry authorities such as NEMA, IEEE, and UL, have collected data showing surges cause significant damage. Electronic life-saving equipment such as fire alarm systems, GFCIs, AFCIs, and smoke alarms, could be rendered inoperable when a surge occurs (*Many times, this damage is undetected by the owner*). Additional occupancies have now been added that include: **dormitory units, guest rooms and guest suites of hotels and motels, and areas of nursing homes and limited-care facilities used exclusively as patient sleeping rooms.**

- **230.71(B) Two to Six Service Disconnecting Means**

Transfer switches were added to clarify that they must be listed for and used as service equipment. 230.71(B)(4) and (6) increase the ease of usability for the Code by adding these requirements to the existing list items. Motor control centers used as service equipment were also added with requirements limiting a maximum of two service disconnects per single motor control center and barriers required between each unit or compartment containing a service disconnect. Barrier provisions were added for additional types of service equipment to improve safety by reducing the likelihood of a person or maintenance equipment coming in contact with energized parts while servicing load terminations. Each service disconnect is to be provided in a separate compartment.

- **230.71(B) Ex. Two to Six Service Disconnecting Means**

An exception was added to clarify that existing service equipment is not required to comply with the provisions of 230.71(B) when existing equipment was installed in compliance with previous editions of the NEC allowing for up to six service disconnects in a single enclosure or compartment. Will aid in the enforcement of service equipment disconnecting means installed before this edition of the Code. Concern expressed when an installer wanted to add a disconnect to existing service equipment that allowed for more than one disconnect means. Could be interpreted that the entire service

equipment was required to be replaced. New exception clarifies that existing service equipment in compliance with previous editions of the *NEC* is not required to be upgraded

- **230.85 Emergency Disconnects**

Section 230.85 was reorganized into sub-sections with titles to better align with the formatting requirements of the *NEC Style Manual*. Clarifies that meter disconnects integral to meter mounting equipment or other listed disconnects used as the emergency disconnect cannot be marked as “suitable ONLY for use as service equipment.” This requirement does not apply to the regular service disconnect(s) for the one- and two-family dwelling [see 230.85(B)]. Section 230.85(C) was added to clarify that all of 230.85 applies to new (*or replaced*) service equipment. An exception was added to clarify that when only meter sockets, service conductors, service raceways, and/or fittings are replaced, 230.85 does not apply. Section 230.85(D) specifies that a plaque or directory be provided adjacent to the emergency disconnect identifying the location(s) of any other energy source disconnect on the premises.

- **Article 235 Branch Circuits, Feeders and Services Over 1000 Volts ac, 1500 Volts dc, Nominal**

New Article 235 entitled *Branch Circuits, Feeders and Services Over 1000 Volts ac, 1500 Volts dc, Nominal* has been created to govern **medium voltage branch circuits**. This new article will become the **placeholder** for information pertaining to medium voltage branch circuits, feeders and services. Previously, information for medium voltage branch circuits was located throughout the *NEC*. Requirements from Article 210 were reviewed for applicability to medium voltage branch circuits. Information from Article 210 that was applicable to these circuits have been copied and moved to this article. Some requirements were modified as necessary without making technical changes or modifying the existing requirement. **Note:** This was originally under the purview of CMP-2 but may be assigned to CMP-10 at the August 2022 Correlating Committee meeting.

- **240.4(B) Overcurrent Devices Rated 800 Amperes or Less**

Adjustable trip overcurrent protective devices are permitted to have an ampacity value set that does not exceed the next higher standard overcurrent protection device ampacity value [per Table 240.6(A)] above the ampacity of the conductors being protected. Adjustable trip overcurrent devices are being used increasingly throughout the country. Recognizes such devices and permit them to be adjusted according to 240.4(B). Requirements of 240.4(B)(1), 240.4(B)(2), and 240.4(B)(3) still apply. Adjustable trip overcurrent protective device must be provided with restricted access per 240.6(C). Adds flexibility for designers and electrical professionals when choosing overcurrent protection devices for electrical systems.

- **240.4(D)(3) 14 AWG Copper-Clad Aluminum**

14 AWG copper-clad aluminum was added to the list of permitted small conductors. Has been added to align with other small conductors permitted per 240.4(D). **Overcurrent protection** device rating for the conductors **cannot exceed 10 amperes**, and the **maximum continuous load** on the circuit **cannot exceed 8 amperes**. Branch-circuit-rated breakers or fuses that the conductors connect to **must be listed and marked for use** with such conductors. Offers the electrical industry more flexibility when choosing types of conductors to install for certain circuits.

- Table 240.6(A) Standard Ampere Ratings**
 10 ampere was added to the list of standard ratings of overcurrent protection devices. 10 ampere rated fuses and circuit breakers are available and being used in the field. Clarifies that such devices are permitted to be used. Table listing of ampere ratings is more user friendly than the lines of text that appeared in previous editions of the *NEC*. Offers more flexibility to the electrical industry when choosing overcurrent protection devices for certain circuits.
- 240.6(D) Remotely Accessible Adjustable-Trip Circuit Breakers**
 Allows for remote access to adjustable-trip circuit breakers through a direct local nonnetworked interface or a networked interface connection. Due to SMART devices, provisions were needed to address cybersecurity. Were added in relation to safety and not concerns about privacy or data protection. When the connection is through a networked interface: the circuit breaker and associated software must be evaluated for cybersecurity **OR** a cybersecurity assessment of the network is required to be completed, and documentation of such assessment must be provided to those authorized to inspect, operate, and maintain the system. Increases the protection of remotely accessible adjustable-trip circuit breakers from cyberattacks.
- 240.11 Selective Coordination**
 Clarifies that whenever the *NEC* requires a feeder overcurrent protective device to be selectively coordinated with a service overcurrent protective device, then ALL feeder overcurrent devices connected to such service must be selectively coordinated with the service overcurrent device. Closes any loopholes or gaps in the code. Previously it could be interpreted that only certain feeder overcurrent protective devices needed to be included in the coordination study. All feeder overcurrent protective devices need to be included when such devices are fed by the same service overcurrent protective device in order to obtain proper selectivity. Ensures the service overcurrent protective device is less likely to open since all feeder overcurrent protective devices are included in the coordination study.
- 250.130 Equipment Grounding Conductor Connections**
 Snap switches were added to the item (*receptacle*) that must conform with requirements found at 250.130(C) for their equipment grounding conductor (EGC) connection. Replacement of snap switches without an equipment grounding terminal with snap switches with an equipment grounding terminal has been added at 250.130. The installer now has an opportunity to choose to install an EGC for snap switches as well as receptacles. See 250.130(C) for the 6 locations for a snap switch or receptacle to be connected to for their EGC requirements. An added informational note provides a link to the 404.9(B) requirements.
- 250.140 Frames of Ranges and Clothes Dryers**
 Clarification was needed to make Section 250.140 more understandable and has been revised by changing the main requirement and the former exception into two titled subdivisions. Cases exist where an existing load center was the service equipment but is now being supplied by a feeder. In these situations, the grounded conductor is not permitted to be used as part of the effective ground-fault current pathway. The grounded conductor is to be insulated or field covered within the supply enclosure with a listed insulating material to prevent contact of an uninsulated conductor with any

normally non-current carrying metal part of the equipment. New revision provides a safe alternative from having to replace the existing 3-wire nonmetallic sheathed cables.

Chapter 3 – Wiring Methods and Material: Article 300, 305, 310, 312, 314, 315, 320, 322, 330, 337, 342, 344, 352, 353, 358, 369, 371, and 398

- **300.4(E) Raceways/Metal-Corrugated Decking**
A new **Exception No. 2** has been added which **recognizes poured concrete** on top of the metal roof decking as a means of physical protection for cables, raceways, or boxes installed in or under metal-corrugated roof decking. Concrete limits screws from penetrating into the raceway system causing damage to the raceway and wiring. When the metal-corrugated sheet roof decking is covered with a **minimum thickness 50 mm (2 in.) concrete slab**, the 38 mm (*1 ½ in.*) spacing is not necessary. The concrete slab is measured from the top portion of the corrugated roofing. This also recognizes the addition of **“listed steel or malleable iron fittings and boxes”** for Exception No. 1 which are used with rigid metal conduit (*RMC*) and intermediate metal conduit (*IMC*)
- **Table 300.5 Minimum Cover Requirements**
Electrical Metallic Tubing (*EMT*) has been added to Column 3 of the table to clearly indicate that it can be installed in an underground location. EMT is permitted to be used in underground locations. Supplementary corrosion protection is generally required for EMT in direct contact with earth, but not required in all cases (*Example: Stainless tubing*). *UL 797, Standard for Safety Electrical Metallic Tubing-Steel*, also indicates that EMT is permitted in underground installations. A new note #6 was added to the bottom of the table to direct the *Code* user to 358.10 for additional information requirements for directly buried EMT.
- **300.25 Exit Enclosures (Stair Towers)**
An exception was added addressing egress lighting on outside exterior doorways. Eliminated the term “be separated from the building” and added the words “have a fire resistance rating.” “Fire resistance rating” is a defined term in the building code and, therefore, will clarify this requirement. Outside exterior doorways are part of the means of egress and frequently require egress lighting to extend to the public way. Without the addition of the exception, it was a code violation to provide power to the required exterior egress lighting from the lighting circuit inside the exit enclosure.
- **Article 305 General Requirements for Wiring Methods and Materials**
A new Article 305 was created for general wiring methods and installations applying to Wiring Methods and Materials for Systems Rated Over 1000 Volts ac, 1500 Volts dc, Nominal. This content was formerly located as Part II of Art. 300. Increased level of safety by including more information on medium voltage (*MV*) installations. Greater likelihood for the electrical professional to apply all the wiring methods and installations requirements correctly if located in this new article. This will be a long-term task to complete but a start in that direction. Medium voltage (*MV*) information will provide the electrical industry, including installers and inspectors, with more guidance toward installation requirements.
- **312.10 Screws and Other Fasteners**
New section added to address **field installed screws or other fasteners** entering a cabinet, cutout box, or meter socket. Damage to the conductors has been an issue for some time creating a shock or fire hazard. Injuries to electrical professionals have been

reported due to accidental insulation or conductor damage as the result of inappropriate screw use. Greater attention will be required by the installer as to the type of fastener they use and how far it protrudes into the wiring space. The AHJ will need to be mindful and examine these enclosures to make sure this new requirement is being adhered to by the installer. New section added to address **field installed screws or other fasteners** entering a cabinet, cutout box, or meter socket. Screws are to be of a machine type with blunt ends. Other fasteners being installed are to be of the type with blunt ends. Screws or other fasteners **cannot extend** into the enclosure further than **6 mm (1/4 in.) unless the end** is protected with an approved means: **Exception to above requirement:** Screws or other fasteners are permitted to extend into the enclosure not more than **11 mm (7/16 in.)** if located within 10 mm (3/8 in.) of an enclosure wall. **Note:** The 7/16-in. dimension accounts for the customary 1/2-in. screw passing through a 1/16-in. thick enclosure wall along the edges and at the corners of enclosures (*The natural curves in conductors at these locations allow for greater screw lengths*)

- **314.16(B)(6) Terminal Block Fill**

A new section was added to address volume allowance concerns when terminal blocks are installed in boxes. The volume of cubic inches which terminal blocks utilize within boxes needs to be addressed. A single volume allowance based on the largest conductor size terminated on the assembly will be required based on Table 314.16(B)(1). This **does not apply** to every conductor terminated to a pole of a terminal block assembly. Care must be taken by the electrical professional in choosing the size of the box, failure to do so could result in box volume issues when terminal block(s) are installed.

- **314.24 Dimensions of Boxes**

Substantiation was presented to CMP-9 to adjust the existing language by broadening the reach of this section to address side entries for outlet and device boxes. These changes will help to ensure that conductor damage is not caused by the installation of devices into outlet and device boxes. Adjusted the wording to assure that the depth of boxes accommodates wiring method entries where those entry points line up with the backs of installed devices or equipment. CMP became aware of damage to conductors from installed devices or other equipment of sufficient size to create a conflict with conductors entering these boxes. A fire investigation concerning a GFCI receptacle installed on the outside of a house was also considered as substantiation for this change. Many devices do not use the full NEMA envelope, such as snap switches.

- **352.44(B) Earth Movement (*Expansion Fittings*)**

Requirements were added for an expansion fitting to be installed for underground runs of direct buried PVC conduit that emerge from the ground. Section 352.44 is entitled Expansion Fittings. Section 352.44(A) contains existing language that addresses the **thermal expansion and contraction** of a PVC conduit system and a new (B) has been added to address **earth movement** events. Substantiation has been provided stating that PVC raceways and associated fitting are sometimes pulled away from the bottom of electrical enclosures due to earth movement. In some cases, the raceway and fitting are pushed into the electrical enclosure or equipment. This typically results from the settling of the soil because it was not compacted properly when the raceway was covered or from frost heave events during cold weather.

Chapter 4 – Equipment for General Use: Article 404, 406, 408, 409, 410, 422, 424, 425, 426, 427, 430, 440, 450, 470, 495

- **404.1 Scope (Switches)**

New informational note to Section 404.1 addressing wall-mounted control devices. Battery-powered wireless lighting wall control devices are a new technology, and guidance was needed as to how they should be installed. Article 404 does not cover equipment such as wireless control switches that do not connect to electrical branch circuit conductors. Informational note directs the user of the *Code* to Section 210.70, *Lighting Outlets Required*, for additional details.

- **406.4(D)(8) Ground-Fault Protection of Equipment**

Requires ground-fault protection of equipment (*GFPE*) to be provided for replacement receptacles that require *GFPE* protection by requirements found elsewhere in the *NEC*. Needed to provide the ground-fault protection of equipment (*GFPE*) protection when modifications are made in areas such as marinas. Will protect the people who use this electrical equipment and provide a safer electrical system. Similar to existing requirements for receptacles being replaced such as tamper-resistant type receptacles, ground-fault circuit-interrupter (GFCI) protected receptacles, AFCI protection, and other similar safety improvements.

- **Paraphrased Code Text for 406.4(G)**

G) Floor Receptacles Protection for floor receptacles must be installed accordance with the following: Floor receptacles must permit floor-cleaning equipment to be operated without damage to the receptacles – all 125-volt, single-phase, 15- and 20-ampere floor receptacles in food courts and waiting spaces of passenger transportation facilities where food or drinks are allowed must be GFCI protected.

- **406.9(C) Bathtub and Shower Space**

This clarifies receptacle restrictions in and around bathtubs and showers. The area below the bathtub rim was not included in the previous *Code* language. Exception No. 4 was added to allow single receptacles within 36 inches of the tub or shower with limitations (for dwelling units). Allows toilets with electronic seats or personal hygiene devices for people with physical limitations which require 120-volt receptacles installed within the 36-inch zone. Receptacle is required to be a single receptacle and not be located in the space between the bathtub or shower and the toilet or bidet. The single receptacle in this location would need to be ground-fault circuit-interrupter (*GFCI*) protected.

- **406.12 Tamper-Resistant Receptacles**

Allows for an easier understanding of where tamper-resistant receptacles are required. Additional areas and occupancies were added where tamper-resistant receptacles will now be required to help protect children. Required for public transportation facilities such as bus stations, airports, and other areas such as gymnasiums, skating rinks, and fitness centers. Required for agricultural buildings **accessible to the general public** such as pumpkin patches, petting farms, Christmas tree farms, and similar venues. Text for **clinics, medical, dental offices, and outpatient facilities** was revised to clarify the areas where these receptacles are to be installed.

- **408.4 Descriptions Required**

Requirements for circuit directories and descriptions were placed into a list format for clarity. There was confusion with the previous text as written in paragraph form. Information in a list format is easier to reference and understand. Location of where power originates is critical information for inspectors, service persons, and other individuals that may need to locate the supply source. It is not always readily apparent where the source is located. Will clarify labeling and description for panelboards and panels for the electrical professional as well as the end user.

- **408.9 Replacement Panelboards**

Clarifies the replacement requirements for panelboards. There are now two list items for the replacement of existing panelboards in an enclosure or cabinet. (A) If a panelboard is listed for the specific enclosure type, the replacement panelboard shall be allowed to retain its short-circuit current rating – this can be determined by the catalog number or other dimensional information. (B)- If the replacement panelboard is not listed for the enclosure and the available fault current is greater than 10,000 amperes, the installation is to be field labeled – the replacement panelboard is to be identified for the application if the available fault current is 10,000 amperes or less – if the cabinet has any previous listing mark pertaining to the previous panelboard, the listing marks is to be removed.

- **408.38 Enclosure (*Panelboards*)**

The panelboard and enclosure combination shall be evaluated for the application when a panelboard is installed in a cabinet, cutout box, or identified enclosure and having an available fault current greater than 10,000 amperes. Cabinets are the common enclosure for panelboards, but they are being installed in other types of enclosures. When an existing panelboard needs to be replaced and the cabinet or other enclosure is installed in a block wall, this can be problematic. The new requirement for the application to be evaluated where the available fault current is greater than 10,000 amperes will provide guidance and a workable solution for these instances. An exception exists for equipment without a deadfront and maintained by a qualified person.

- **408.43 Panelboard Orientation**

Panelboards **cannot be installed** in the **face-down position**. Added due to working space concerns. Even with acceptable working space, it would be very difficult for a qualified worker to safely work due to the installer lying, kneeling, or standing on a floor surface looking up. Movement from an arc blast or arc-fault event might only be to the left or right from the equipment. In some cases, the panelboard overcurrent protective devices would only be accessible utilizing a step ladder. Some *NEC* articles such as Article 518 may allow for face-up applications as it has been deemed necessary to comply with the manufacturer's installation requirements.

- **409.70 Surge Protection**

New section has been added requiring surge protection for industrial control panels. Added these safety features for the protection of the personnel and the equipment. Added language because not all industrial control panels are made in a factory setting. Both enforcement and labor are witnessing these types of panels assembled from listed materials in the field. Provides a needed level of protection for personnel servicing these panels.

- 410.10(F) Luminaires Installed in or Under Roof Decking**
 Requires a minimum of 38 mm (1 ½ in.) to luminaires under any roof system where physical damage can occur to the luminaire. Roofers installing screws and other fasteners occasionally miss trusses or rafters and could inadvertently damage luminaires. This previously only applied to metal corrugated style roof systems. An exception was added where installations of 50 mm (2 in.) of concrete covering metal-corrugated sheet roof decking. This exception utilizing concrete does not require 38 mm (1 ½ in.) spacing between the deck and the luminaire.
- 410.71 Disconnecting Means for Fluorescent or LED Luminaires**
 Relocated the requirement for disconnects for luminaires to this location because LED drivers were added to this section. Originally added to the *Code* in response to an accident involving a double-ended lamp fluorescent ballast replacement. Many fluorescent lamps are being discontinued and replaced with LED lamps. Many are being upgraded to incorporate LED lamps to meet energy conservation requirements. Addresses a hazard that would exist with either style of luminaire. Only addresses LED-type luminaires that are the equivalent to fluorescent luminaires that utilize double-ended lamps.
- Article 410 Part XVII- Germicidal Irradiation**
 Part XVII of Article 410 has been added to address the increasing use of germicidal luminaires for disinfecting purposes. Germicidal irradiation has been used to disinfect air, water, and surfaces for many years. There has been an increased interest in the application and installation of these luminaires due to the COVID 19 pandemic. Possible eye and skin damage can occur to personnel if not installed as intended. Germicidal irradiation luminaires are required to be listed. Are typically not permitted for general lighting or to be installed permitted within dwelling units unless specifically listed. Luminaires have minimum mounting heights, among other limitations.
- 422.16(B)(2) Built-in Dishwashers and Trash Compactors**
 Provisions were added for supply cords to trash compactors and dishwashers that pass through a wood cabinet to be provided with protection that incorporates “smoothed edges.” In many installations cords passed through holes in wood cabinet separations. While gromets and bushings are practical solutions in metal cabinet separations, those fittings were not practical with wood cabinets. Eliminates the need for a judgement call in the field between the AHJ and the installer when a solution exists (*install protection with “smoothed edges”*).
- 424.48 Installation of Cables in Walls**
 New section will allow heating cable to be installed in walls with specific protection and limitations. Concerns existed for heating cable installed in walls, and the need for installation with proper protection was evident. Provision includes a January 1, 2026, future effective date. This change allows equipment manufacturers, standards developers, and certification agencies an opportunity to develop products and address interoperability issues before the future effective date.
- 440.8 Single Machine and Location**
 New language has been added indicating that **mini-split unit heating and cooling systems** are not to be installed in a tub or shower zone. This equipment is being installed in bathtub and shower spaces due to a lack of wall space, occurring in older homes with smaller bathrooms, creates a clear danger to the occupants. Now **prohibits**

the installation of these units in the zone around bathtub and shower spaces. The dimensions of the zone are consistent with code requirements for other electrical equipment or devices (*3 feet horizontally and 8 feet vertically from the top of a bathtub rim or shower stall threshold*).

- **440.11 General**

Added additional language requiring disconnects with covers exposing live parts to be locked. Requires air-conditioning and refrigerating equipment disconnects that have hinged covers, and when open, have exposed live parts, be locked to prevent children and unqualified people from accidental contact. CMP generally agreed that knife blade type disconnects pose the biggest hazard even if properly maintained. CMP also made it clear that a lock would be anything that required a tool to open. “Zip-ties” would require the use of a tool to remove the cover. This practice (*zip-ties*) already used by many electrical and mechanical contractors. Talk to the local AHJ and make sure he/she is on board with the use of zip ties for this purpose

- **440.14 Location**

Adds a reference to 110.26(A), which makes it clear that working space clearances are required for air-conditioning and refrigerating equipment. HVAC contractors install their equipment per the manufacturer’s specifications. Some are not aware of the minimum required clearances in 110.26 for disconnects that require servicing. Adds clarity for the inspector and installer that minimum clearances must be maintained at air-conditioning and refrigerating disconnects

- **445.18(A) Disconnecting Means**

New guidance has been added permitting the disconnecting means to be located **within the generator** behind a hinged cover, door, or enclosure panel. When the generator disconnecting means is located in the generator enclosure, **a field-applied label to be provided** indicating the location of the disconnecting means. Field labeling requirements provide clarity for the purpose of the disconnecting means **to aid first responders**. Field-applied labels are to meet requirements found at 110.21(B) (*Field-Applied Hazard Markings*).

- **445.19 Emergency Shutdown of Prime Mover**

A new Section 445.19 will separate the generator emergency shutdown requirements from the generator disconnect requirements. Generators with **greater than 15 kW rating** located at other than one- and two-family dwelling units are to be equipped with a remote emergency stop switch that will shut down the prime mover. Switch is to be located outside the equipment room or generator enclosure at a readily accessible location and meet the requirements found at 445.19(A)(1) and (A)(2). New language at (C) clarifies that the emergency shutdown device located at one- and two-family dwelling units installed on the exterior of the generator enclosure meets the requirements of this section. This emergency shutdown device is to be marked as the **“Generator Emergency Shutdown”** and meet the requirements of 110.21(B) (*Field-Applied Hazard Markings*).

- **445.19 Emergency Shutdown of Prime Mover (Revised)**

This revision creates a new section to separate the generator emergency shutdown and disconnect requirements for clarity. Additional modifications are made to clarify the permitted locations for emergency shutdown devices and marking. Makes it clear that

the emergency disconnect for one-and two-family dwellings is to shut down the prime mover and not allow it to restart.

Chapter 5 – Equipment for General Use: Chapter 500, 505, 515, 517, 530, 547, 550, 551, 555, and 590

- **Article 512 Cannabis Oil Equipment**

Created a new article, which covers cannabis oil extraction equipment, booths, postprocessing equipment, and systems using flammable materials in commercial and industrial facilities. The authorities having jurisdiction (*AHJ*) and other industry members have expressed concerns about safety. Several fire and explosion hazards are associated with equipment used to process and extract plant oils from cannabis. Flammable solvents such as butane, pentane, hexane, propane, and ethanol can be released during the processing and extraction of plant oils. This includes high temperatures and high pressures, which increase the risk of fire and explosion. This information is intended to address the hazards associated with the extraction of cannabis oil.

- **Article 517 Health Care Facilities**

This edition of the *NEC* has completed the phased approach of changing the references from critical, general, basic, and support spaces to Category 1, 2, 3, and 4 Spaces. Starting with the 2014 *NEC*, the migration from the previous terms started. For the 2017 *NEC*, the Category terms as parenthetical references were included and then the order of parenthetical references was reversed in the 2020 *NEC*. This “phased approach” of aligning with NFPA 99 (*Health Care Facilities Code*) was completed this cycle and the parenthetical references were deleted, leaving only the Category space references. This will allow for harmony between the two documents with fewer conflicts between designers and installers/inspectors. Consistent use of the terminology related to patient care and support spaces will bring better useability to the *Code*.

- **518.2 General Classification- (A)Examples**

Casinos and gaming facilities are now included in the list of **assembly occupancy** examples. Substantiation shows that casinos and gaming facilities are more prevalent than some of assembly occupancies already included in the list of current examples. Electrical equipment that is suitable for use in exhibition halls is also installed in casinos and similar gaming facilities. Including these items in the list format will assure that there is no confusion or misapplications of *NEC* requirements for these locations.

- **547.26 Physical Protection (*Agricultural Buildings*)**

Nonmetallic cables will be prohibited from being concealed within walls and above ceilings of buildings that are contiguous with or physically adjoin livestock confinement areas. It has been substantiated that rodents and other pests have caused damage to wiring systems such as nonmetallic sheathed cables. There is also a requirement that protection is to be provided for all types of electrical wiring that is subject to physical damage. Electrical wiring installed in this environment should be protected against physical damage.

- **547.44 Equipotential Planes and Bonding of Equipotential Planes**

Clarifies the indoor and outdoor locations requiring equipotential planes and specifies the bonding locations for these planes at **agricultural buildings**. Text provides

clarification where the equipotential plane can be connected in agricultural environments. Bonding should take place to the following items:

- a circuit equipment grounding conductor (*EGC*)
- any metal part connected to a circuit equipment grounding conductor
- the grounding electrode conductor (*GEC*)
- any grounding electrode of the grounding electrode system (*GEC*) or
- the equipment-grounding terminal in a panelboard

- **550.32(A) Service Equipment**

The electrical service disconnect can now be located “**within sight from**” the mobile home as opposed to the previously required 30 feet. Service equipment cannot be installed in or on mobile home. The service disconnect can also serve as the emergency disconnect (230.85). “Within sight from” is a defined term in Article 100 [*see In Sight From (Within Sight From, Within Sight)(purview of CMP-1)*] – *visible* and not more than 15 m (50 feet). Reference 250.32 in the *NEC* for requirements concerning grounding.

Note: Manufactured homes (*with permanent foundation*) not required to have remote service equipment.

- **551.3 Electrical Datum Plane Distances**

Substantiation was submitted to CMP-7 for the need to address recreational vehicle sites located next to natural bodies of water. This change was necessary to clarify some of the inconsistencies related to all electrical equipment installations around bodies of water. With the changes to the definitions for “Electrical Datum Plane” and “Normal High-Water Level,” the inclusion of these requirements in Article 551 for recreational vehicles and recreational vehicle parks made sense. This will clarify the requirements for the AHJ when applying electrical elevation requirements in an RV park located next to a body of water. The installer and AHJ will need to determine if the area will be subject to tidal fluctuations or not.

- **551.40(D) Loss of Ground Device**

Substantiation was submitted to eliminate the need for a “reverse polarity device” in a recreational vehicle and in its place a “loss of ground device.” The “Loss of Ground” device would notify users of the recreational vehicle (*RV*) if a hazardous condition exists that may result in a condition referred to as “hot skin” (*electrical current on the frame of the RV*). Previously, CMP-7 has not required GFCI protection on the feeder assembly connected to the *RV*; however, panel members agree that this level of protection (*loss of ground device*) is very important to ensure electrical safety. Ultimately, the *RV* manufacturers would be required to create a solution by providing a loss of ground device installed at the factory for the recreational vehicle.

- **555.4 Location of Service Equipment**

Modified to state that services for a marina or docking facility must be located on land and **no closer than 1.5 m (5 ft) horizontally** from the structure served and elevated to a distance of **12 in. above** the electrical datum plane. Current language states that the electrical service for a marina or docking facility must be located on land adjacent to the structure served. This is vague with regards to the minimum distance horizontally and for the height the service should be located above the electrical datum plane. Adding the distance for the service location and height above the electrical datum plane promotes electrical safety and enforceability. This new language will provide a correlation between similar requirements in Articles 682 and 555.

- **555.14 Equipotential Planes and Bonding**
 Substantiations was submitted that enhanced safety could result from requiring an equipotential plane to equalize or eliminate step and touch voltages for electrical equipment located at or on docks. Equipotential planes were added in marina environments to correlate with Article 682 (*Natural and Artificial Bodies of Water*). This will help to mitigate step and touch voltage where electrical equipment is located within **10 feet** of the water’s edge and exceeding **250 volts** to ground. The installer and AHJ will need to verify the presence of the equipotential plane or develop plans for the installation of one.
- **555.15 Replacement of Equipment**
 Equipment at Marinas, Boatyards, Floating Buildings, and Commercial and Noncommercial Docking Facilities. The “**replacement**” of electrical equipment at docking facilities to be installed to the current edition of the *NEC*. The new language will allow the authority having jurisdiction (AHJ) to inspect the existing electrical equipment for any damage. The damage found for existing equipment needs only to be repaired to the *NEC* edition for which it was originally installed. Determining which edition of the *NEC* that damaged electrical equipment was installed could also be problematic.
- **555.35(E) Leakage Current Measurement Device**
 Language was added recognizing that the leakage current device is required to be listed by **January 1, 2026** (*future effective date*). The required leakage current testing device had no specific standard in place to build, test, or construct this metering equipment specific for a marina environment. Requiring a “listed” Leakage Current Measurement Device for use in Marina Applications by January 1, 2026, will assure that the device complies with specific safety and performance requirements. The listed test device will allow the marina or facility operators to identify vessels that are leaking current and help mitigate electrical hazards that could lead to potential electric shock drowning (*ESD*) event. *UL 1379, The Outline of Investigation for Leakage Currently, Measurement Devices for use in Marina Applications*, is under development to help the industry certify these devices.
- **555.36(C) Emergency Electrical Disconnect**
 Language has been added at a new subsection 555.36(C) to mandate that an emergency disconnect be located **within sight of a marina power outlet or enclosure** that provides shore power to boats. The location of the emergency disconnect is critical. A circuit breaker handle is expressly prohibited from being used for this purpose. Time is critical and disconnecting the boat nearest the swimmer is very important. This will help to save the lives of electric shock drowning (*ESD*) victims and responders. The installer and the AHJ will need to make sure that this requirement is adhered to for these locations. **Note:** The source of voltage threatening a swimmer may not be the nearest boat.
- **555.38 Luminaires**
 This new section should help both installers and AHJs address electrically safe installations of luminaires at docking facilities to help reduce the incidents of electric shock drowning (*ESD*). Luminaires and retrofit kits need to be identified and listed for environment. These items should be secured to the structure of the marina. If a luminaire is installed underwater in this environment:

- it should be identified as a submersible type
- conform to the low-voltage contact limit and
- receive power from an isolating transformer or power supply

Chapter 6 – Special Equipment: Article 600, 620, 625, 630, 646, 670, 680, and 690

- **620.22(A) Car Light Receptacles, Auxiliary Lighting and Ventilation**
Revised the requirements to specify permissible loads on the car light circuit. Article 620 covers elevators, dumbwaiters, escalators, moving walks, platform lifts, and stairway chairlifts. Clearly limits which loads may be powered by the car light circuit. Equipment now includes:
 - emergency responder radio coverage
 - air purification equipment
 - car emergency signing
 - communication devices
 Amperage for these additional items is very small, with the risk of tripping the overcurrent protective device minimal.
- **620.36 Different Systems in One Raceway or Traveling Cable**
Specifies which cable types may be installed in elevator raceway or traveling cable. The following cables are now specifically permitted:
 - shielded pair
 - coaxial and
 - other communication circuits**CMP-LP or CMR-LP cables** that comply with 800.179 are permitted **in raceways**. The addition of coaxial and shielded pair cables will allow for the greater design flexibility. Will allow for **maximum flexibility** while maintaining electrical safety.
- **620.51(A) Type Ex. No. 2 (Stairway Chair Lift)**
Clarification for situations where cord-and-plug connection of a stairway chair lift utilizing batteries is permitted. Revised existing exception concerning cord-and-plug connections. Some modern chairlifts are supplied by batteries as their primary power source. Recognizes this type of stairway chair lift as being suitable for plug-and-cord connection. This is in lieu of the previous requirement for a fused motor switch/lockable circuit breaker.
- **625.6 Listed (Electric Vehicle Power Transfer)**
Clarifies equipment for electric vehicle power transfer (*charging, power export, or bi-directional current flow*) that is required to be listed. The xxx.6 section has become the location associated with listing requirements in many articles of the *NEC*. This change removes confusion by stating plainly *NEC* listing requirements involved in this type of equipment. It will aid in achieving safety and simplify decisions for electrical professionals.
- **625.49 Island Mode (Electric Vehicles)**
Creates a new section stating that **electric vehicle power export equipment (EVPE)** and **bidirectional electric vehicle supply equipment (EVSE)** are permitted to be a part of interconnected power systems operating in an island mode condition. This change was brought forth by the PV Industry Forum (*PVIF*). This addresses the continued expansion of EVPE and EVSE equipment operated within interconnected power systems. Island mode allows energy to be supplied to loads that have been disconnected from an

electric power production and distribution network or other primary power sources. The section further clarifies that this EVPE and EVSE equipment can be a source for these types of systems.

- **630.8 GFCI Protection for Personnel (*Electric Welders*)**

Creates a new section requiring ground-fault circuit-interrupter (*GFCI*) protection for personnel involved with electric welder applications. This change is **not for the welder receptacle** but rather for **other receptacles** within the area where the welder is being used, and other tools might be connected – these other receptacles are the 125-volt, 15- and 20-ampere receptacles supplied by single-phase branch circuits rated 150 volts or less to ground. It was observed that secondary, trade schools, and community colleges provide welding equipment for their students. The use of this equipment and associated equipment expose these users to electrical risk. GFCI protection has been expanded for students using hand tools in these learning environments. **Note:** There was also concern expressed that CMP-2 had purview over GFCI protection requirements and should be involved in this new requirement.

- **646.19 Entrance to and Egress from Working Space**

Specifies requirements for egress doors in modular data centers. The *Code* did not clearly specify egress door opening requirements when the door was not of a “swing-type” – now will include requirements for situations where the egress opening may be a sliding or “barn-door” style. Removes a gap in the *Code* requirements concerning egress from modular data centers. For equipment over 1.8 m (6 ft) wide or in depth the working space is required to be:

- one entrance for egress to and from
- 610 mm (24 in.) in width
- 2.0 m (6 ½ ft) high at both ends

- **680.5 GFCI and SPGFCI Protection**

Text has been revised and subdivided to address ground-fault circuit-interrupter (*GFCI*) protection and introduce Special Purpose Ground-Fault Circuit-Interrupter (*SPGFCI*) protection in swimming pool locations. SPGFCI protection is a relatively new GFCI protection requirement for circuits above 150 volts to ground, but not more than 480 volts phase to phase, single or three phase. The protection for higher voltage circuits shall not exceed 20-mA ground-fault trip current. GFCI protection has been required and the equipment to be readily available for pool installations at typical single-family dwellings and smaller commercial facilities (*120/240, single phase and 208Y/120, single and three phase installations*). Some larger installations utilize electrical systems that operate outside the voltage system parameters of Class A GFCI protection. This change is directed at providing protection at those installations.

- **680.9(A) Power (*Swimming Pools*)**

Clarifies that **overhead wiring in raceways** are not subject to the clearance requirements in Table 680.9(A) and Figure 680.9(A). Literal reading of previous text had the potential to be a problem for overhead wiring in raceways in ceilings of indoor pool installations. This change clarifies the clearance requirements were focused on outdoor open wiring type installations. Will help bring clarity and useability to the *Code* and eliminate misunderstandings between the AHJ and the installer.

- 680.10 Electric Pool Water Heaters**
Text has been revised by and subdivided to include provisions for pool water temperature conditioning equipment that incorporates technology other than resistance heating. Section full title is *Electric Pool Water Heaters Incorporating Resistive Heating Elements and Electrically Powered Swimming Pool Heat Pumps and Chillers*. Has traditionally addressed installation of electric resistance heating equipment to improve water temperature in pools. More recently, installation of heat pump and chiller equipment has been used to heat or cool water temperature. Recognizes that this type of installation and provides requirements to size circuits and protective devices.
- 680.12 Equipment Rooms, Vaults, and Pits**
Revised and subdivided to require equipment rooms, vaults, or pits with equipment to have drainage or be suitable for submersion and a receptacle for maintenance. Addresses a concerns related to the risk of water rising over electrical equipment. Mandates a general-purpose receptacle for maintenance – requires a 125-volt, 15-or 20-ampere receptacle. Provide shock protection for personnel for any receptacle installed – requires any receptacle in the space rated 150 volts or less to be ground-fault circuit-interrupter (*GFCI*) protected.
- 680.21(D) Pool Pump Motor Replacement**
Expands the requirement to provide ground-fault circuit-interrupter (*GFCI*) protection for replaced pool pump motors and now includes those that are repaired. GFCI protection enhances safety for pool users and workers maintaining pool equipment. Previous edition only required GFCI protection for installations where the pump motor was replaced. Now adds an additional condition where GFCI protection must be provided (*motor repair*). Includes repair of motors that operate on systems that exceed Class A GFCI limitations. These motors must be addressed by Special Purpose Ground-Fault Circuit-Interrupter (*SPGFCI*) Protection. The electrical professional, facility owner, and pool maintenance personnel will need to be aware of these important safety requirements.
- 680.54(C) Equipotential Bonding of Splash Pads**
Substantiation was submitted for the creation of 680.54(C) to address **bonding requirements** for splash pads. Provides additional information to assist with identification of the splash pad boundary. Many splash pads are constructed such that the area outside the splash pad perimeter is also concrete. This change is an effort to identify the termination point(s). This will help to assure the electrical safety of the user of this equipment. The electrical professional should seek information and understanding of splash pad structure from the splash pad (*pool*) designer. Communication will have a significant impact on the installation and inspection approval of these bonding provisions.
- Article 690 Solar Photovoltaic (PV) Systems**
The use of the term PV Output has been removed throughout Article 690. Circuits and conductors will be considered **PV Source** whether individual or combined. The definitions of PV circuits also changed to properly align with these changes. “PV Source Circuit” and “PV String Circuit” are both subsets of “PV System DC Circuit.” It was stated that the existing language at times created confusion in the field. There was an opinion expressed by enforcement representatives that the term PV output circuit assisted

enforcers in applying a clear line of demarcation between power sources that were combined with others to establish output currents and voltages.

- **690.12 Exception No.2 and Informational Note**

New language to **eliminate rapid shutdown requirements** for structures where firefighters will not need to access the roof. The PV Industry Forum (*PVIF*) helped provide substantiations for these changes. **Rapid shutdown** requirements were created to provide a greater degree of **safety for rooftop firefighting operations**. Previous language did not clearly delineate any exceptions for rapid shutdown requirements. **Ground-mounted PV system and carport structures do not present similar hazards** as a roof-mounted system on buildings for first responders. Rapid shutdown equipment is not as critical for a ground-mounted PV system because it is not installed on the roof of a structure.

- **690.15 Disconnecting Means for Isolating PV Equipment**

A requirement for an equipment disconnecting means to be within 10 feet of the equipment and also be within sight was modified. The change goes toward the reorganization of 690.15(C) and (D) in the 2020 *NEC*. 690.15(A) now refers to 690.15(C) for an equipment disconnect – requires the disconnecting means to be within sight and within 10 feet of the equipment or capable of being lockable in accordance with 110.25. Changes in the reorganizing of 690.15(C) does not mandate the 10-foot requirements provided the disconnect complies with 110.25. This only applies to disconnecting means and not isolating devices. Also a few grammatical changes were made in the existing text.

Chapter 7 – Special Conditions: Article 700, 701, 705, 706, 722, 725, 726, and 760

- **700.3(F) Temporary Source of Power- List Item (4)**

Revised subsection (4) for Maintenance or Repair of the Alternate Source of Power to require listing. There have been failures to properly isolate the two out-of-phase sources from each other, resulting in injury or damage. The switching device should be listed, and the interlock should be listed for use with the specific switching device. Language revised pertaining to a permanent switching means connecting a portable or temporary alternate source of power. This switching means is also responsible for functioning as a transfer switch. The switching device and interlocking are critical to operator safety and the emergency system's overall operations.

- **700.3(F) Temporary Source of Power- List Item (6)**

Added subsection (6) for Maintenance or Repair of the Alternate Source of Power for the permanent connection point and routing requirements for cables. List item (6) is new and directs that the permanent connection point must be accessible at an exterior location for the temporary power source. Cables cannot be routed through exterior windows, doors, or similar openings. This helps to assure that building egress pathways remain unimpeded by these cables and the cables are not subject to being pinched and damaged by door or window operation.

- **Article 722 Cables for Power-Limited Circuits, Fault-Managed Power (Class 4) Circuits**

New Article 722 was created for the **general requirements** for these cables. There are concerns that installations and inspections of Chapter 7 work is not conducted to the level that you would find for installations covered by Chapters 1-4. In some jurisdictions an electrical permit is not required for installations of this nature. Combines common

cabling requirements found in Articles 725, 760, and 770 and also relocates other cabling requirements from those articles into a single article. This change is intended to make it easier for the electrical professional to find requirements, which will aid with installation and enforcement.

- **Article 726 Class 4 (CL4) Power Systems**

A new Article 726 was created for fault-managed power (*FMP*) systems in occupancies other than dwelling units. There have been over 1,000 installations of “**Digital Electricity**” in the United States. These are mostly at stadiums where large numbers of people gather. A failure in this environment could be disastrous, causing needless loss of life. Class 4 systems have ground-fault circuit-interrupter (*GFCI*) equivalent protection (*line to ground*) while also introducing similar protection line to line. This allows for installations that do not require raceway systems. The higher voltage associated with this technology leads to lower current allowing the electrical professional to install smaller conductors when compared to 120-volt AC systems.

5. **Announcements**

Next special meeting – October 20, 2022 @ 9:00 a.m., Minnesota Room, DLI with call-in option

6. **Adjournment**

A motion was made by Haiby, seconded by Hanson, to adjourn the meeting at 12:00 p.m. The roll call vote was unanimous with 5 votes in favor of the motion; the motion carried.

Respectfully Submitted,

Desiree Weigel

Desiree Weigel
Secretary

Green meeting practices

The State of Minnesota is committed to minimizing environmental impacts by following green meeting practices. DLI is minimizing the environmental impact of its events by following green meeting practices. DLI encourages you to use electronic copies of handouts or to print them on 100% post-consumer processed chlorine-free paper, double-sided.