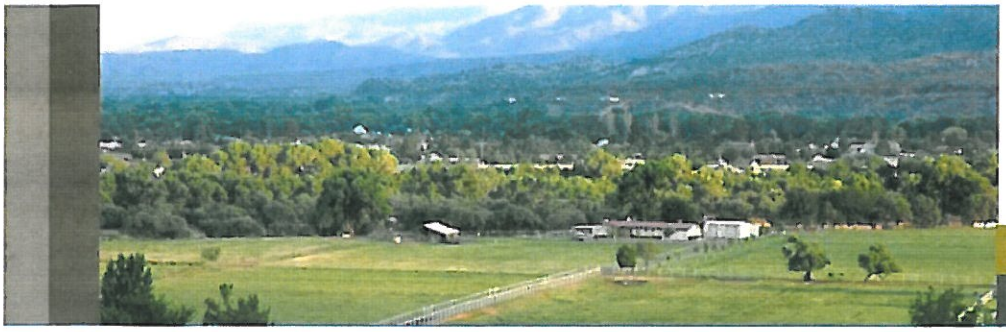

Camp Verde
ARIZONA

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AGENDA
2012 INTERNATIONAL BUILDING CODE ADOPTION MEETING
TOWN OF CAMP VERDE BUILDING DEPARTMENT
COUNCIL CHAMBERS – 473 S. MAIN ST. STE. 106
MONDAY, FEBRUARY 10th, 2014 AT 4:00 PM

Note: The Town of Camp Verde Building Department will be hosting public meetings beginning Monday, October 7th, 2013 to focus on the potential adoption of the 2012 International Building Codes. Architects, builders, contractors, designers and general public from the Town of Camp Verde and surrounding areas are encouraged to attend. Meetings have been tentatively scheduled through February of 2014 and will begin at 4:00 PM and will end no later than 6:00 PM. It is possible that some agenda items will be carried over to a subsequent meeting. **In addition, a majority of Council members, Planning and Zoning Commission members, and Board of Adjustments and Appeals members may be present at these meetings.** For additional information, please contact the Building Department at 473 S. Main St. Ste. 108, Camp Verde, AZ 86322 – (928) 554-0060 – www.campverde.az.gov.

1. Welcome.
2. General questions, comments, or concerns for staff in regards to February 3rd meeting.
3. General questions, comments, or concerns for staff in regards to the 2011 NEC.
4. Read only access to NFPA70 – 2011 National Electrical Code (NEC)
    a. http://www.nfpa.org/
    b. Signup as new user, select NFPA70 publication, agree to read only access terms.
5. IAEI – International Association of Electrical Inspectors: Analysis of Changes, NEC-2011 Part 1 & 2
    a. http://www.iaei.org/
6. Discussion of Chapter 6 – Special Equipment.
7. Discussion of Chapter 7 – Special Conditions.
8. Discussion of Chapter 8 – Communication Systems.
9. Discussion of Chapter 9 – Tables.
10. General questions, comments, or concerns for staff in regards to 2011 NEC Handouts.
11. General questions, comments, or concerns for staff in regards to the 2011 NEC.
12. Closing comments.

Posted By: _____ Date/Time: 2/7/14 7:24am

The Town of Camp Verde Council Chambers is accessible to the handicapped. Those with special accessibility or accommodation needs, such as large typeface print, may request these at the Office of the Town Clerk.

Analysis of Changes, NEC-2011 Part 1

Posted By ***Keith Lofland****, Tuesday, September 01, 2009*
Updated: Friday, February 08, 2013

Can you recall a time when you arrived at a restaurant early and had to wait for your friend or spouse to arrive? Doesn't that wait seem to take forever? How about waiting for that mechanic to finish up with the repairs to your vehicle? What about waiting in the checkout line at the grocery store with the nice lady in front of you sorting through all her coupons! Don't get me started with time spent in the doctor's waiting room. In reality, these scenarios are really short durations of time, but they seem much longer at the time. However, none of this seems to hold true when it comes to the

National Electrical Code (*NEC*). Perhaps because of the seemingly long development process that each edition of the *NEC* goes through, it seems like we have just enough time to catch our breath and the next edition is well on its way. Well, get ready, the 2011*NEC*is right around the corner. Let's take a closer look at some of the more substantial changes that have been proposed thus far in the *NEC* development process. So far, proposals have been submitted and acted upon by the different code-making panels. We are currently in the middle of the comment stage of the *NEC* development process where you and I have the opportunity to submit a comment on the actions taken so far on the proposals.

Photo 1. Locker room with adjacent showering facilitites

According to the National Fire Protection Association (NFPA), there were approximately 5,077 proposals submitted for modifications to the 2011 edition of the *NEC*. Of these proposals, 4,093 proposals were submitted by the public at large, while 174 proposals were developed by the code-making panels themselves during the proposal stage. As with every edition of the NEC, some of the anticipated changes include new requirements to sections while some of the changes include entirely new articles. Some changes are revisions to existing requirements while others are deletions to some existing requirements.

Code-Wide Changes

90.5(C) Mandatory Rules, Permissive Rules, and Explanatory Material.

90.5(D) Informative Annexes.

One of the first changes that one will notice is the familiar term fine print notes (FPN) has been removed throughout the*Code*and replaced with Informational Notes. "Fine print" refers to a type size, rather than clearly portraying its advisory nature. The*NEC*contains notes that are enforceable requirements of the code, such as table notes. "Fine print" in some legal documents does not necessarily make the text unenforceable requirements. This change will make the advisory nature of these notes clear. Also, a new section has been added at 90.5(D) introducing the concept of Informative Annexes to the*NEC*. Non-mandatory information relative to the use of the*NEC*is provided in the informative annexes found in the back of the*NEC*. Informative annexes are not part of the enforceable requirements of the*NEC*, but are included for information purposes only.

Chapter One – General

Article 100 Definitions.

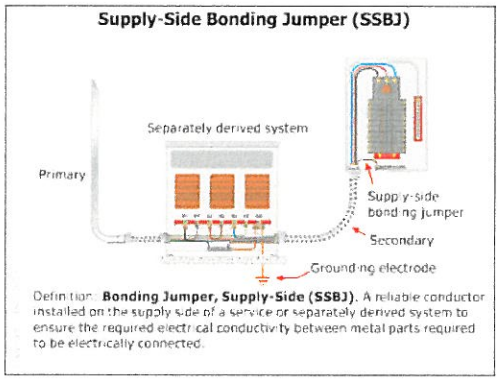

Figure 1. Supply-side bonding jumper

There were several proposals to add or revise definitions to Article 100. Some of these new or revised definitions include the following.

Automatic. Performing a function without the necessity of human intervention.

Bathroom. An area including a basin with one or more of the following: a toilet, a urinal, a tub, a shower, a foot bath, a bidet, or similar plumbing fixtures.

Bonding Jumper, Supply-Side (SSBJ). A reliable conductor installed on the supply side of a service or separately derived system to ensure the required electrical conductivity between metal parts required to be

Bathroom. An area including a basin with one or more of the following: a toilet, a urinal, a tub, a shower, a foot bath, a bidet, or similar plumbing fixtures.

Bonding Jumper, Supply-Side (SSBJ). A reliable conductor installed on the supply side of a service or separately derived system to ensure the required electrical conductivity between metal parts required to be electrically connected.

Ground Fault. An unintentional, electrically conducting connection between an ungrounded conductor of an electrical circuit and the normally non–current-carrying conductors, metallic enclosures, metallic raceways, metallic equipment, or earth.

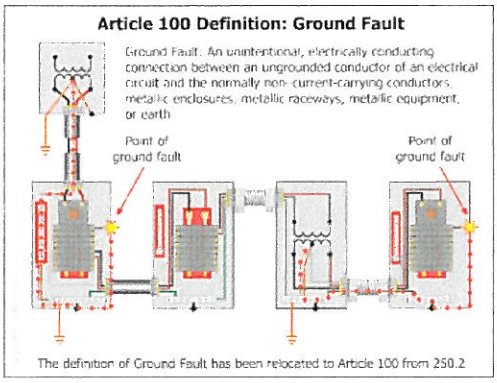

Figure 2. Ground fault definition

Grounding Electrode Conductor (GEC). A conductor used to connect the system grounded conductor, equipment, communications system protectors, antenna discharge units, communications cables, or network interface units to a grounding electrode or to a point on the grounding electrode system.
Nonautomatic. Requiring human intervention to perform a function.
Service Conductors, Overhead. The overhead conductors between the service point and the first point of connection to the service-entrance conductors at the building or other structure.

Service Conductors, Underground. The underground conductors between the service point and the first point of connection to the service-entrance conductors in a terminal box, meter or other enclosure, inside or outside the building wall. Where there is no terminal box, meter, or other enclosure, the point of connection is considered to be the point of entrance of the service conductors into the building.

Service Drop. The overhead conductors between the utility distribution system and the service point.

Service Lateral. The underground conductors between the utility distribution system and the service point.

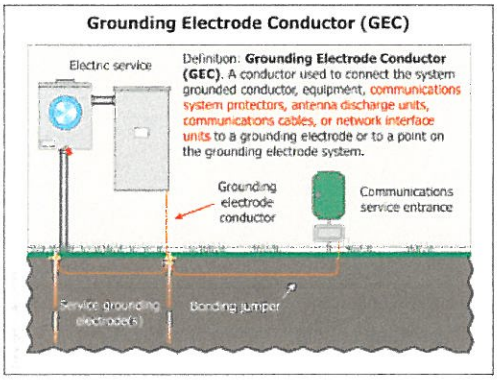

Figure 3. Gounding electrode conductor

Uninterruptible Power Supply. A power supply used to provide power to a load for some period of time in the event of a power failure. In addition, it may provide a more constant voltage and frequency supply to the load, reducing the effects of voltage and frequency variations.

Article 110 Requirements for Electrical Installations
New: 110.24 Available Fault Current.

This new section will require service equipment (other than dwelling units) to be field-marked with the amount of available short-circuit current when installed. Electrical equipment is required to have an interrupting rating or short-circuit current rating equal to or greater than the available fault current. Any equipment operating with ratings less than the available fault current is in violation of the NEC and creates a potentially unsafe condition. Knowing the available short-circuit current is an essential part of not only the installation of service equipment, but the inspection and approval of such equipment as well.

Photo 2. Large 500 kVA UPS (uninterruptible power supply) being installed in a datacenter

Photo 2. Large 500 kVA UPS (uninterruptible power supply) being installed in a datacenter

Chapter Two – Wiring and Protection
210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.
New: 210.8(A) Dwelling Units. (Readily Accessible Locations)

New: 210.8(B) Other Than Dwelling Units. (Readily Accessible Locations)

A new requirement has been added at both 210.8(A) and (B) requiring all GFCI devices to be installed in a readily accessible location. Per manufacturer's specifications, GFCIs are typically recommended to be tested on a monthly basis. When a GFCI device is installed behind such things as a refrigerator, the ability for someone, such as the homeowner, to test the device is greatly impaired. Installation of these devices in a readily accessible location will aid in this monthly testing process. However, on the other side of this coin, this could become an enforcement issue for the AHJ. When the AHJ typically inspects these GFCI devices on the electrical final, all these devices are typically readily accessible. The moment a bed, a dresser, or perhaps a copy machine or vending machine is placed in front of a GFCI receptacle, that receptacle just became not readily accessible (accessible, yes, but not readily accessible).

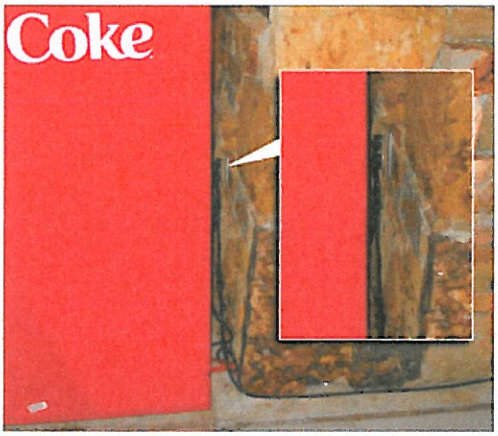

Photo 3. Ground-fault circuit-interrupter devices required to be installed in readily accessible locations (unlike what is illustrated in the above picture).

New: 210.8(B)(7) Ground-Fault Circuit-Interrupter Protection for Personnel. (Locker Rooms)

A new provision was added at 210.8(B)(7) to require GFCI protection for all 125-volt, single-phase, 15- and 20-ampere receptacles installed in locker rooms with adjacent showering facilities. Conditions in these areas very often mimic the conditions found in bathroom areas such as damp or wet flooring combined with the use of electrical appliances such as electric shavers and electric hair dryers. These are the same conditions which drive the requirements for GFCI protection in the bathroom areas.

New: 210.8(B)(8) Ground-Fault Circuit-Interrupter Protection for Personnel. (Commercial Garages)

New requirements added at 210.8(B)(8) will expand the requirements for GFCI protection for 125-volt, single-phase, 15- and 20-ampere receptacles to commercial garages, service bays, and similar areas. Currently, 511.12 would require these receptacles installed in commercial garage areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are used to be GFCI protected. This new requirement would apply to all 125-volt, single-phase, 15- and 20-ampere receptacles regardless of their intended use. This would apply to not only commercial garages, but service bays and similar areas.

Revision: 210.12, Ex. No. 1 Arc-Fault Circuit-Interrupter Protection for Dwelling Units.

This proposal was reported by CMP-2 "Accept in Principle" at the ROP meetings in January 2009. However, this proposal did not receive the necessary two-thirds vote at the official balloting by the principal members of CMP-2. As of this moment, this proposal is reported as "Reject." We will have to wait and see if this proposal is altered in the comment stage. This proposal would have allowed a listed outlet branch-circuit AFCI device to be installed at the first outlet to provide protection for the remaining portion of the branch circuit without employing a metallic wiring method to the first outlet. Currently, the *Code* permits a listed combination AFCI at the first outlet when the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet is installed in a metallic wiring method with conditions.

New: 240.35 Marking with Available Short-Circuit Current.

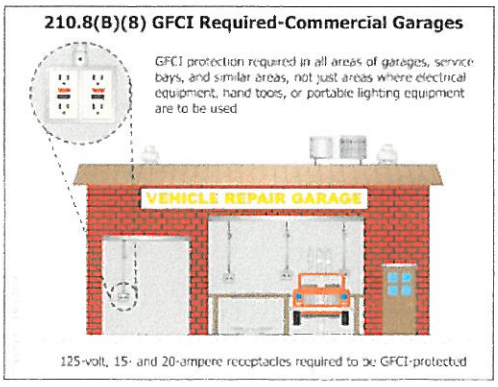

Figure 4. GFCI required in commerical garages

This is a new provision in the*NEC*pertaining to field marking requirements that identify the available short-circuit current at equipment enclosures (other than dwelling units) containing service- or feeder-circuit overcurrent protective devices. This change will increase the enforceability of numerous*NEC*requirements where the electrical equipment is based on the available short-circuit current. This change will simply require that this "already-determined" value be posted on the enclosure. Along with the date on which the short-circuit calculation was performed or obtained, these marking changes apply only to the available short-circuit current as calculated for equipment rating purposes. These marking requirements for available short-circuit current do not apply for arc-flash calculation purposes.

New: 240.87 Non-Instantaneous Trip.

New language was added to Article 240 to allow a circuit breaker without an instantaneous trip to be installed primarily for selective coordination purposes, but only under very specific conditions. One of three conditions must be provided: (1) zone-selective interlocking, (2) differential relaying, or (3) energy-reducing maintenance switching with a local status indicator. Non-instantaneous trip circuit breakers or short-time delay is an industry-proven method to achieve selective coordination of circuit breakers. It delays the opening of an upstream circuit breaker while the downstream overcurrent device clears a short circuit. If, however, a short occurs between the two devices, the upstream circuit breaker will still delay its tripping operation, allowing for more let-through energy than would have been allowed if the upstream circuit breaker had utilized an instantaneous trip. This type of installation is typical for electrical power distribution systems. This extra amount of let-through energy may injure workers or damage equipment.

Revision: 250.30 Grounding Separately Derived Alternating-Current Systems.

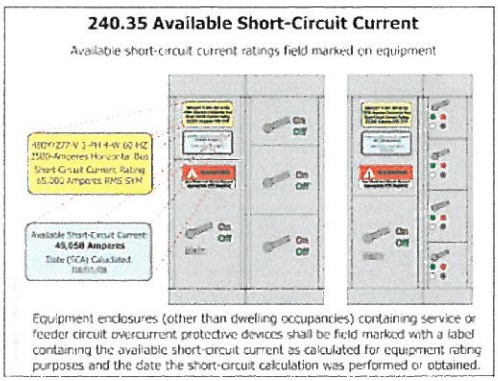

Figure 5. Available short-circuit current

Section 250.30 was extensively revised for the 2011 *NEC*. The revision of this section will provide a clearer understanding of the grounding and bonding requirements for separately derived systems. A new sentence has been added following the title of the section to alert users that a separately derived system must be grounded in accordance with either 250.30(A) for grounded systems or 250.30(B) for ungrounded systems. Additionally, separately derived systems must comply with 250.20, 250.21, 250.22, 250.24(A)(2) and 250.26.

New: 250.53(A)(2) Grounding Electrode System Installation – Rod, Pipe, and Plate Electrodes – Supplemental Electrode Required

Provisions were put in place to require rod, pipe, and plate grounding electrodes to be supplemented by an additional electrode of the type specified in 250.52(A)(2) through (A)(8). Currently, the only electrode that is required to be supplemented by an additional electrode is metal underground water piping. This proposed provision will essentially reverse the order of grounding electrode installation for such things as a driven ground rod. Under the current provisions of the*NEC*, one must install a driven ground rod and prove that it meets the 25-ohms-or-less provisions of 250.56. If the 25 ohms or less can't be met or verified, a supplemental electrode such as a second ground rod must be installed. Few AHJs and even fewer installers possess the instruments necessary to read the resistance of a rod, pipe, or plate electrode. Under the proposed new provisions, one would start with a ground rod supplemented by perhaps a second ground rod. An exception was developed to allow only one ground rod if the 25-ohms-or-less provisions of 250.56 can be achieved and verified.

New: Use of Equipment Grounding Conductors.

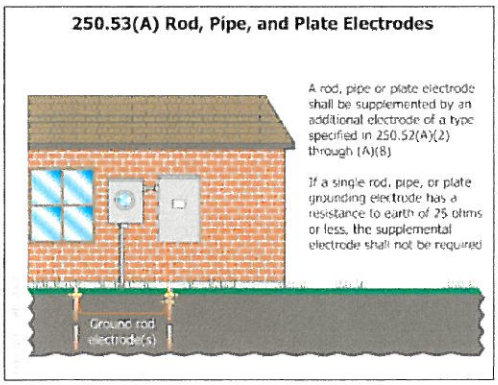

Figure 6. Rod, pipe and plate electrodes

This new provision will prohibit an equipment grounding conductor (EGC) from being used as a grounding

Figure 6. Rod, pipe and plate electrodes

This new provision will prohibit an equipment grounding conductor (EGC) from being used as a grounding electrode conductor (GEC). This new section will clarify that grounding electrode conductors and equipment grounding conductors serve different purposes in the electrical safety system. They are sized differently and have different installation requirements. Equipment grounding conductors do not normally carry current, while a grounding electrode conductor may normally carry current since it is often in parallel with the neutral conductor.

Chapter Three – Wiring Methods and Materials

Revision: 310.15(B) Ampacity Tables.

This revision to the Article 310 ampacity tables will put all these tables under Section 310.15, which is titled "Ampacities for Conductors 0 – 2000," and in particular, Section 310.15(B) titled "Tables." An example of this change will re-title the old standby table, which is perhaps the most used table in the*NEC*, Table 310.16 to new Table 310.15(B)(16). Existing Table 310.17 will become Table 310.15(B)(17) and so on. This change was brought about through the*NEC*/CEC Ampacity Harmonization Task Group.

Revision: Table 310.15(B)(2)(a) and Table 310.15(B)(2)(b) Ambient Temperature Correction Factors.

The temperature correction factor tables, which have been located at the bottom of Table 310.16 through Table 310.20, have been relocated to their own tables at Table 310.15(B)(2)(a) [based on 30°C (86°F)] and Table 310.15,(B)(2)(b) [based on 40°C (104°F)]. Acceptance of this relocation will harmonize the ampacity correction factors for various ambient temperatures between the*NEC*and the CEC, consolidate the ampacity correction and adjustment factors into a single section [310.15(B)], and consolidate seven ambient temperature correction tables into two tables. Since the NEC is used internationally, lower and higher ambient temperatures were added to provide the appropriate ampacity correction factors for colder and warmer climates. This proposal was generated by the NFPA/CSA NEC/CEC Ampacity Harmonization Task Group.

Revision: Table 310.15(B)(6) [now Table 310.15(B)(7)] Dwelling Unit Services and Feeders.

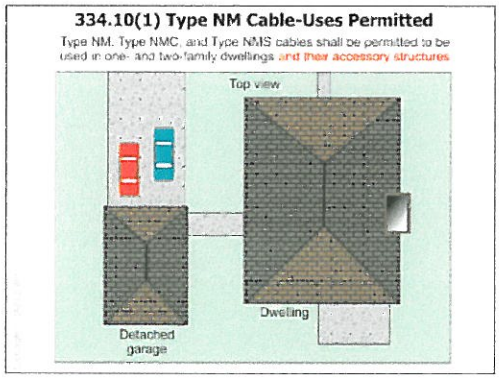

Figure 7. Type NM cable – uses permitted

Table 310.15(B)(6) [now Table 310.15(B)(7)] has once again been revised by CMP-6. Using this section, main power feeders are no longer permitted to be sized by this table. Section 310.15(B)(7) covers only service conductors and service lateral conductors. However, Section 215.2(A)(4) permits feeder conductors for individual dwelling units (or mobile homes) never to be required to be sized larger than service conductors. This section also permits Section 310.15(B)(6) [now Table 310.15(B)(7)] to be used for feeder conductor sizing. Perhaps some well-worded comments are needed for the proposed change. Additionally, Table 310.15(B)(6) only applied to 120/240-volt, 3-wire, single-phase dwelling unit services and feeders. The 3-wire reference has been removed to allow for a feeder that may have 4-wire including the equipment grounding conductor.

New: 312.10(B) Enclosure Edges.

This new requirement will require all sharp edges of Article 312 metal enclosures that are subject to hand contact during typical installation activity to be protected or de-burred and rounded to minimize the risk of injury. This shall take effect at the time of manufacture. Sharp edges on enclosures have caused numerous injuries to installers as well as thousands of lost man hours. These sharp edges have also caused damage to the integrity of conductor insulation during installation resulting in potential ground-fault conditions or sometimes immediate arc flash. However, it should also be noted that what constitutes a sharp edge is subjective, and with any subjective requirement, the code user is placed at a disadvantage when applying the requirements. CMP-9 would welcome comments on this controversial issue.

Revision: 334.10(1) Uses Permitted – Dwelling Units Accessory Structures

This is a revision that would allow the use of nonmetallic-sheathed cable (Type NM) to be used in one- and two-family dwelling accessory structures or buildings without being concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating. The proposed revision will clarify that Type NM cable(s) are also permitted to be used in private garages, accessory buildings, storage sheds, or similar structures that are incidental, supplemental, or secondary in nature to the one- and two-family dwelling. Lacking this clarification, the AHJ often has no choice but to consider such accessory structures as "other structures" and apply the rules of 334.10(3), whereby cables are required to be installed behind a rated thermal barrier material. With the present language, an attached garage could utilize Type NM cable as an exposed wiring method, whereas a detached garage, only a couple of feet away from the main dwelling, could not utilize Type NM cable as an exposed wiring method. Under normal circumstances, an uninhabitable accessory building should not be required to comply with rules that are more restrictive and excessive than what is required for a habitable building.

Deletion: 342.30(C) Unsupported Raceways

This change removes Item (C) Unsupported Raceways from Section 344.30 and restores the provisions of the 2005 *NEC*. The concept of special support rules or negating any support rules for a short length of a raceway run between enclosures was added to the 2008*NEC*. This change for the 2008 *NEC* was considered by many to be too restrictive, especially when concentric or eccentric knockouts were

This change removes Item (C) Unsupported Raceways from Section 344.30 and restores the provisions of the 2005 *NEC*. The concept of special support rules or negating any support rules for a short length of a raceway run between enclosures was added to the 2008*NEC*. This change for the 2008 *NEC* was considered by many to be too restrictive, especially when concentric or eccentric knockouts were encountered. This change addresses intermediate metal conduit. The same change is being proposed for rigid metal conduit, rigid PVC conduit, reinforced thermosetting resin conduit, and EMT conduit.

New: Article 399 Outdoor, Overhead Conductors, Over 600 Volts

Premises wiring installations utilizing over-600-volt systems currently exist in numerous locations and have become more common as electrical usage has increased. Many of these installations utilize overhead bare conductors on insulators as feeders and branch circuits to safely distribute power to multiple building, structure and equipment locations. *NEC* Chapter 3 wiring methods do not currently recognize this "wiring method" nor provide prescriptive permission or limitation for these installations. This new article will allow designers of these systems to utilize existing industry standards for the specific details of such designs and will provide enforcement a basis for approval of these over-600-volt installations. This proposal was the result of the "High Voltage Task Group" appointed by the Technical Correlating Committee to look at these increasingly popular systems.

These and other changes to the 2011 *NEC* will be included in IAEI's textbook entitled, *Analysis of Changes NEC-2011*. This book has always been and will continue to be about providing insightful firsthand information and training on impending revisions and changes to the upcoming edition of the*NEC*. This insight is valuable to the installer as well as to the enforcement community. This article is an effort to provide our readers a small preview of proposed changes to the subsequent edition of the*NEC* and to hopefully spur interest to those same readers in getting involved in the comment stage of the NEC development process. Part two of this article will be included in the next issue of*IAEI News*and will include significant proposed changes to Chapters 4–8 of the 2011 *NEC*.

Analysis of Changes, NEC-2011 – Part II

*Posted By **Keith Lofland**, Sunday, November 01, 2009*
Updated: Friday, February 08, 2013

In the previous edition of the *IAEI News*, we took a look at some of the more significant changes that have been proposed for the upcoming *NEC*-2011 in Chapters 1–3. Let's continue that process by taking a look at proposed changes to Chapters 4–8. Keep in mind that these proposed changes are just that—proposed. These changes could still be altered or removed by a public comment during the upcoming Comments stage of the code-making process. You have until Friday, October 23, 2009 (5 p.m. EST) to submit a comment on the proposed changes to *NEC*-2011.

Chapter Four – Equipment for General Use

ARTICLE 404 Switches

New: 404.2(C) Switches Controlling Lighting Loads

Photo 1. Switch locations will generally require a grounded conductor for such devices as occupancy sensors.

A new subdivision will require a grounded conductor to be provided to switch locations that control lighting, unless the wiring is installed in a raceway or the physical construction of the building allows for relative ease of future addition of other conductors. There are electronic lighting control devices, such as occupancy sensors that require a standby current to maintain the ready state and detection capability of the device. This allows immediate switching of the load to the "on" condition. These devices require standby current when they are in the "off" state, i.e., when no current is flowing to the lighting load. In many, if not most, commercial installations, a grounded conductor is not typically provided in the switch box for switches controlling lighting loads. When these devices are added after the initial installation, the installer of these control devices typically employs the use of the equipment grounding conductor to maintain this standby current. This introduces circulating currents on the equipment grounding conductor and any non-current-carrying metal in contact with these EGCs.

ARTICLE 406 Receptacles, Cord Connectors, and Attachment Plugs (Caps)

New: 406.4(D)(4) Replacements – Arc-Fault Circuit Interrupters
This proposal would require AFCI protection in existing locations where a replacement receptacle is installed in a location where AFCI protection would be required in new installations. The existing requirement in 406.3(D)(2) requires GFCI-protected receptacles where replacements are installed at receptacle outlets that are required to be so protected elsewhere in the NEC. The benefits of AFCI protection have been well substantiated over the last few NEC code cycles. There is no practical reason to limit the level of safety provided by an AFCI to new homes only. This proposal will provide AFCI protection for older homes by requiring the gradual replacement of non-AFCI-protected receptacles with new AFCI-protected ones.

These same receptacle replacement requirements have been proposed for tamper-resistant receptacles at 406.4(D)(5) and for weather-resistant receptacles at 406.4(D)(6).

ARTICLE 406 Receptacles, Cord Connectors, and Attachment Plugs (Caps)

New: 406.12 Tamper-Resistant Receptacles for Dwelling Units

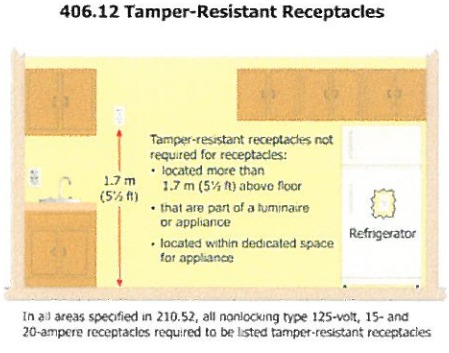

Figure 1. Exceptions proposed for tamper-resistant receptacle requirements

Three new exceptions were proposed to be added to the requirements for tamper-resistant receptacles in dwelling units. The requirement for tamper-resistant receptacles in all areas of a dwelling specified by 210.52 was added in the 2008 NEC process. This requirement applied to the majority of receptacles

Figure 1. Exceptions proposed for tamper-resistant receptacle requirements

Three new exceptions were proposed to be added to the requirements for tamper-resistant receptacles in dwelling units. The requirement for tamper-resistant receptacles in all areas of a dwelling specified by 210.52 was added in the 2008 NEC process. This requirement applied to the majority of receptacles installed in dwelling units. Exception No.1 will exempt receptacles in areas specified in 210.52 that are installed more than 1.7 m (5½ ft) above the floor. Exception No. 2 would exempt receptacles in these areas that are part of a luminaire or appliance, and Exception No. 3 would exempt receptacles in areas specified in 210.52 that are behind a cord- and plug-connected appliance. Required spacing of receptacles in 210.52 must be installed at a height below 1.7 m (5½ ft.) to be considered as meeting the requirements for wall spacing. Receptacles installed above 1.7 m (5½ ft.) are not accessible and well out of reach of small children. Allowing the exception for a single receptacle or duplex receptacle located within dedicated space will eliminate the need for tamper-resistant receptacles to be installed behind dishwashers, refrigerators, washing machines and in other areas that are not typically accessible to children.

ARTICLE 410 Luminaires, Lampholders, and Lamps

New: 410.130(G) Special Provisions for Electric-Discharge Lighting Systems of 1000 Volts or Less – General – Disconnecting Means
Proposed change will require a disconnecting means to be added to existing florescent luminaires that do not have a disconnecting means when the ballast is replaced. A disconnecting means provides a safer working environment for the installer. It can be added with minimal extra effort at the time of replacement for an existing ballast, and it will provide a safer installation of the next ballast replacement. There are quite a few ballast disconnecting components available that can be easily installed during ballast replacement to meet this requirement.

ARTICLE 424 Fixed Electric Space-Heating Equipment

424.44(G) Installation of Cables in Concrete or Poured Masonry Floors – Ground-Fault Circuit-Interrupter Protection

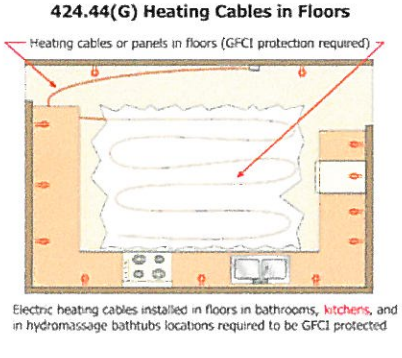

Figure 2. Kitchens were added to the areas requiring GFCI protection when electric heating cables are installed in concrete or masonry floors.

GFCI protection of electrical heating cables in kitchen floors will now be required in addition to bathrooms and hydromassage tub locations. For safety while one is washing dishes or mopping floors, GFCI protection of electrical heating cables in kitchen masonry floors should include the same GFCI protection currently provided in bathrooms and hydromassage tub locations.

ARTICLE 430 Motors, Motor Circuits, and Controllers

Revision: 430.24 Several Motors or a Motor(s) and Other Load(s)
This section for sizing of conductors supplying several motors or a motor(s) and other load(s) has been revised in its entirety to clarify the method of calculating motor-circuit conductors. The current language in NEC-2008 states that the conductors shall have an ampacity not less than 125 percent of the full-load current rating of the highest rated motor plus the sum of the full-load current ratings of all the other motors in the group, plus the ampacity required for the other loads. To some, this left questions as to what "ampacity required for the other loads" means. The new proposed language will clarify this uncertainty. These "other loads" are defined as 100 percent of the non-continuous non-motor loads and 125 percent of the continuous non-motor loads.

ARTICLE 430 Motors, Motor Circuits, and Controllers

Revision: 430.225(B)(1) Over 600 Volts, Nominal – Motor-Circuit Overcurrent Protection– Overload Protection – Type of Overload Device

Photo 2. Engineering supervision will now be required to determine the sizing of overload and short-circuit

Photo 2. Engineering supervision will now be required to determine the sizing of overload and short-circuit protective devices for motors over 600 volts.

Engineering supervision will now be required to determine the sizing of overload and short-circuit protective devices for motors over 600 volts. Selecting the proper overload and short-circuit protection for medium voltage motor circuits is much more complicated than for low-voltage circuits. For medium-voltage motor circuits, it becomes very critical for the overload relay to coordinate with the short-circuit protection because some short-circuit protective devices cannot safely open below certain multiples of their rating. In these overload cases, the overload relay must open before the short-circuit protective device is asked to open. At the same time, the overload relay cannot safely open beyond certain multiples of its rating, requiring the short-circuit protective device to open. This all requires engineering supervision to lay out the curves of both the overload relay and the short-circuit protective device and to make sure that they are coordinated so that each opens only on levels of current for which it can safely open.

ARTICLE 445 Generators

New: 445.20 Ground-Fault Circuit-Interrupter Protection for Receptacles on 15 kW or Smaller, Portable Generators

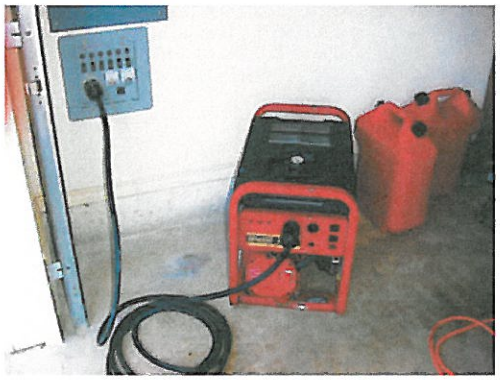

Photo 3. 15 kW or smaller portable generators are required to have GFCI protection for personnel, with the GFCI protection integral to the generator or receptacle.

This change will require all 125-volt, single-phase, 15- 20-, and 30-ampere receptacle outlets, that are a part of a 15 kW or smaller portable generator to have GFCI protection for personnel, with the GFCI protection integral to the generator or receptacle. Small portable generators, sized at 15 kW or smaller, are used for many different purposes, such as power on camping trips, on construction sites for temporary power, and for power during emergency situations for all different types of installations due to natural disasters. In all of these applications, there are many potential hazards associated with these temporary installations, such as cut and abraded wire and cable and standing water and wet locations. During power outages from storms and other natural disasters, persons who may not be familiar with adequate safety procedures often use these generators to supply power in less than optimal conditions. Requiring all 125-volt, single-phase, 15-, 20-, and 30-amperes on 15 kW or smaller generators to be integrally GFCI-protected will help eliminate the possibilities of shock hazards from damaged circuits, damaged equipment, or use of equipment in wet locations. This new proposed section will ensure that portable generators will have adequate personnel protection for these receptacles wherever these generators are used.

Chapter Five – Special Occupancies

Revision: 501.30(B) Grounding and Bonding, Class I, Divisions 1 and 2; 502.30(B) Grounding and Bonding, Class II, Divisions 1 and 2; 503.3(B) Grounding and Bonding, Class III, Divisions 1 and 2; 505.25(B) Class I, Zone 0, 1, and 2 Locations – Grounding and Bonding; 506.25(B) Zone 20, 21, and 22 Locations for Combustible Dusts or Ignitible Fibers/Flyings

Types of Equipment Grounding Conductors

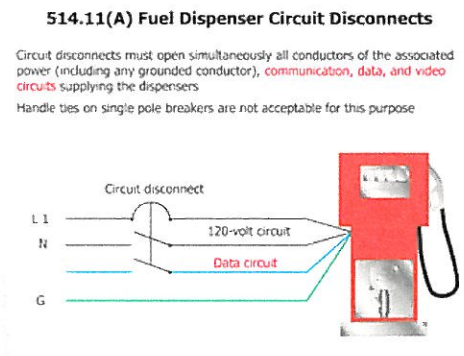

Figure 3. Isolated power systems conductors are to be identified with distinctive marking "along the entire length of the conductor."

These five sections have been revised to clearly require an equipment bonding jumper for flexible metal conduit and liquidtight flexible metal conduit when used in these zones and divisions. Current language in these sections states that flexible metal conduit and liquidtight flexible metal conduit cannot be used as the sole ground-fault current path. The language goes on to state that if an equipment bonding jumper is installed, it shall comply with 250.102, Equipment Bonding Jumpers. The proposed language will leave no choice as to the installation of an equipment bonding jumper in conjunction with these flexible wiring

conduit and liquidtight flexible metal conduit when used in these zones and divisions. Current language in these sections states that flexible metal conduit and liquidtight flexible metal conduit cannot be used as the sole ground-fault current path. The language goes on to state that if an equipment bonding jumper is installed, it shall comply with 250.102, Equipment Bonding Jumpers. The proposed language will leave no choice as to the installation of an equipment bonding jumper in conjunction with these flexible wiring methods.

ARTICLE 514 Motor Fuel Dispensing Facilities

Revision: 514.11(A) Circuit Disconnects – General
This revision will add associated power, communication, data, and video circuits (low voltage) to the simultaneous disconnection requirements of power circuits for motor fuel dispensing facilities. The current wording of 514.11 can lead to discrepancies in the way this section is applied to the design, installation and the inspection of motor fuel dispensing equipment. In many cases, the emergency stop disconnecting power to the dispenser is sometimes considered to be acceptable in the disconnection of external voltage sources. Dispensing equipment is supplied by more than just one external voltage source such as 120-volt power circuits for dispenser operation plus low-voltage circuits for data and communication equipment. While an emergency control may be an acceptable means for disconnecting the nominal power source from dispensing equipment, the emergency controls currently do not disconnect the low-voltage data/communication circuits. When not properly disconnected, the data/communication circuits have the potential to create an explosion and an electrical shock hazard. Adding data, communication, and video circuits to this section becomes even more important due to the increased number of circuits being connected to the motor fuel dispensing equipment. Today's advanced dispensing equipment often requires additional circuits to add features such as "marketing at the pump." This feature uses closed caption video feeds, advanced networking and display options. Other circuits can include such things as intercom, serial data, and current loop circuits.

ARTICLE 517 Health Care Facilities

Revision: 517.2 Definitions – Patient Bed Location
This change will no longer allow a small area of a room or space to be designated as a "critical care area" as the entire room will have to be considered to be subject to rules for this care level. Patient care is given in specific rooms within a health care facility. The term area can be misleading to the electrical installers and inspector. Using the term room is more easily defined. NFPA 99, Standard for HealthCare Facilities, uses this proposed definition to distinguish the location of various performance requirements for the health care facility. As such, the definition is a necessary part of NFPA 99, and should be common between the NEC and NFPA 99.

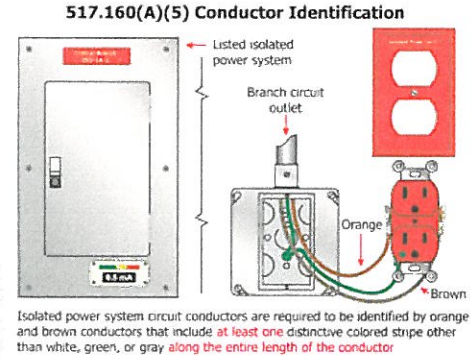

Figure 4. Isolated power systems conductors are to be identified with distinctive marking "along the entire length of the conductor."

Revision: 517.160(A)(5) Isolated Power Systems – Installations – Conductor Identification

This proposal will require the conductor insulation for isolated power systems to be identified with distinctive marking "along the entire length of the conductor." The previous language called for a distinctive coloring on the conductor, but not along its entire length. The requirement for a distinctive stripe is unclear as to the physical characteristics of the stripe. As currently written, a distinctive stripe can be applied to the conductor using vinyl marking tape or other means. This change clarifies that a wrap of marking tape or other marking made at the time of installation with colored tape is not acceptable to meet this requirement.

ARTICLE 547 Agricultural Buildings

Deletion: 547.5(G) Wiring Methods – Receptacles
All 125-volt, single-phase, 15- and 20-ampere general-purpose receptacles installed in agricultural buildings in areas having an equipotential plane, outdoors, damp and wet locations, and dirt confinement areas for livestock are required to have ground-fault circuit-interrupter protection. Previous language that relaxed GFCI protection for an accessible receptacle supplying a dedicated load where a GFCI-protected receptacle is located within 900 mm (3 ft) of the non-GFCI-protected receptacle has been proposed to be deleted. This allowance, which was added to NEC-2008 seems counter-intuitive to other areas of the NEC where GFCI protection is called for, such as 210.8. Equipment that is functioning correctly should operate without issues on a GFCI-protected outlet. A GFCI doesn't open until a circuit has a leakage current of 4–6 mA, and, considering that listed equipment should have no more than 0.5 mA of leakage current, this allowance seems unnecessary.

ARTICLE 550 Mobile Homes, Manufactured Homes, and Mobile Home Parks

Revision: 550.25(B) Arc-Fault Circuit-Interrupter Protection – Mobile Homes and Manufactured Homes
AFCI protection for mobile homes and manufactured homes has been revised to coincide with other residential areas listed in 210.12(A). AFCI protection was expanded to more areas of the dwelling unit other than the bedroom in NEC-2008—areas such as family rooms, dining rooms, living rooms, parlors, libraries, dens, sunrooms, recreation rooms, closets, hallways. These same areas are proposed for AFCI expansion in mobile homes and manufactured homes as well. From 1999–2002, the fire death rate is roughly twice as high in manufactured homes as in other one- and two-family dwellings, and electrical distribution equipment continues to be one of the leading causes of manufactured home fires. By making

other than the bedroom in NEC-2008—areas such as family rooms, dining rooms, living rooms, parlors, libraries, dens, sunrooms, recreation rooms, closets, hallways. These same areas are proposed for AFCI expansion in mobile homes and manufactured homes as well. From 1999–2002, the fire death rate is roughly twice as high in manufactured homes as in other one- and two-family dwellings, and electrical distribution equipment continues to be one of the leading causes of manufactured home fires. By making the requirements for mobile and manufactured homes consistent with the requirements for other dwelling units, additional electrical wiring system fires can be diminished.

Chapter Six – Special Equipment

ARTICLE 600 Electric Signs and Outline Lighting

Revision: 600.5(B)(2) Branch Circuits – Rating – All Other Signs

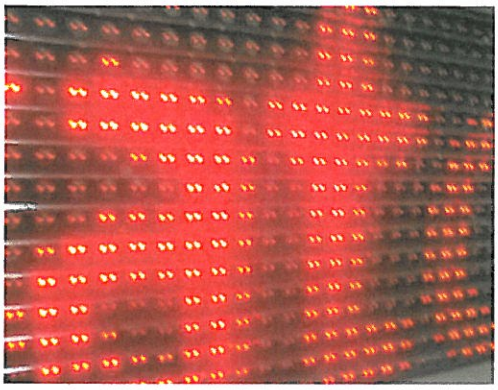

Photo 4. LED type signs are limited to a maximum branch-circuit rating of 20 amperes.

In NEC-2008 there are no provisions for limiting the maximum size branch circuit for new sign technologies such as a light emitting diode (LED) type sign. This change will set this value at a maximum of 20 amperes. The previous language at 600.5(B) only addressed incandescent, fluorescent, and neon type signs. The new proposed language will address neon, with a maximum branch-circuit rating of 30 amperes and "all other signs" at a maximum rating of 20 amperes.

ARTICLE 625 Electric Vehicle Charging System

New: 625.2 Definitions – Plug-in Hybrid Electric Vehicle (PHEV)

Photo 5. Plug-in hybrid electric vehicles (PHEV) are considered electric vehicles.

A new definition was added to Article 625 for a plug-in hybrid electric vehicle (PHEV): "a hybrid vehicle intended for on-road use with the ability to store and use off-vehicle electrical energy in the rechargeable energy storage system." The PHEV also has a second source of motive power. PHEV type vehicles are a relatively new type of vehicle with many similarities to electric vehicles with respect to their connection to a supply of electricity for vehicle charging. This particular proposal identifies plug-in hybrid electric vehicle supply equipment as an alternative and equivalent type of supply equipment and recognizes PHEV as an electric vehicle.

ARTICLE 680 Swimming Pools, Fountains, and Similar Installations

Revision: 680.22(B) Permanently Installed Pools – Area Lighting, Receptacles, and Equipment – GFCI Protection

This revision will clarify that all 15- or 20-amperes, 120-volt through 240-volt, single-phase outlets that supply pool pumps are to be GFCI-protected (cord-and-plug and hard-wired). Wording in NEC-2008 does not require GFCI protection for such things as 208-volt motors. Only two selected voltages (125-volt and 240-volt) require GFCI protection as currently written. In addition, this proposal recommends changing 125-volt to 120-volt. 125-volt may not be applicable in all instances. As an example, if a 120-volt pool pump motor is direct wired, the "outlet" is not rated 125-volt. The 125-volt rating is applicable to a receptacle, but not to a generic reference to an "outlet." This appears to be an inadvertent oversight in NEC-2008 development process.

Revision: 680.26(B)(1)(b)(1) and (2) Permanently Installed Pools – Equipotential Bonding – Bonded Parts – Conductive Pool Shells – Copper Conductor Grid

This revision will clarify how connections are to be made for the bonding conductors being bonded to each other "at all points of crossing" for a copper conductor grid system. An equipotential bonding grid has to be established for a conductive pool shell at a permanently installed pool. Two methods are acceptable to establish this equipotential bonding grid: (a) structural reinforcing steel, and (b) a copper conductor grid

This revision will clarify how connections are to be made for the bonding conductors being bonded to each other "at all points of crossing" for a copper conductor grid system. An equipotential bonding grid has to be established for a conductive pool shell at a permanently installed pool. Two methods are acceptable to establish this equipotential bonding grid: (a) structural reinforcing steel, and (b) a copper conductor grid system. Where structural reinforcing steel is encapsulated in a nonconductive compound or is not available, a copper conductor grid shall be installed. Present language provides no method for bonding conductors being bonded to each other "at all points of crossing." There is no detail as to how the connections are to be made by the installer and as well as being acceptable for the authority having jurisdiction. This change would provide a method for connections and detail what type of identified devices are acceptable for maintaining the continuity of the system. The proposed language would require bonding of these bonding conductors in accordance with 250.8, Connection of Grounding and Bonding Equipment, or other approved means.

Further revision to this section addressed the copper conductor grid system having to conform to the contour of the pool and the pool deck. The proposed revised language would remove the requirement for the copper conductor grid to conform to the contour of the pool deck. This requirement for the pool deck (perimeter surface) seems to conflict with the requirements for the perimeter surface described at 680.26(B)(2). Perimeter surfaces are required to extend for 1 m (3 ft) horizontally beyond the inside walls of the pool, not to the contour of the pool deck.

New: ARTICLE 694 Small Wind Electric Systems

Photo 6. Small wind electric system

Hundreds of small wind turbines are being installed in the USA every month and there is no specific article to address the particular characteristics of their electrical systems. While many installations are stand-alone applications, most are utility interactive, and so requirements similar to Article 690, Photovoltaic Systems, should apply. Small wind electric systems are also being installed at rural, and now increasingly, in urban locations. The electrical safety of these installations can be improved by clear requirements for grounding and other aspects of the electrical installation. As wind turbine towers are typically tall structures, they are subject to lightning strikes and as such deserve special attention when connected to a premises electrical system. The proposed text follows the structure and, in many cases, the language of Articles 690, Solar Photovoltaic Systems, and Article 692, Fuel Cell Systems. This new article is a welcome and needed addition to NEC-2011 for installers and inspectors of small wind electric systems.

ARTICLE 695 Fire Pumps

New: 695.6(A)(3) Power Wiring – Supply Conductors – Multi-Building Campus Style Complexes

Photo 7. Fire pump covered by Article 695

This new requirement will generally require fire pumps for multi-building campus style complexes to be physically routed outside a building(s). This action was part of a larger proposal to rearrange the material in 695.6(A) and (B) to make it clear to the user how the rules should be applied. The present text mixes rules for service conductors with feeder rules and then has "other conductors" in item (B). This creates confusion because the exception in (A) deals with feeders only (because it applies on the load side of the automatic connection), but is located in a manner that is being interpreted by many to apply to service conductors. The proposed new language puts campus distribution provisions into its own section and gives it a title. A new sentence has been added to allow routing through the building in accordance with 230.6(1) or (2) to parallel the provision for services if the feeder conductors cannot be physically routed outside the building.

Revision: 695.6(E) through (J) Fire Pumps – Power Wiring The revision provides correlation and proper extract attribution between Article 695 and the recommendation for Chapter 9 in the 2010 edition of NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection. The new text is essentially verbatim from NFPA 20, Sections 9.3.6, 9.3.7 and 9.3.8. These proposed installation requirements are needed to supplement those already in Article 695.

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Chapter Seven – Special Conditions

ARTICLE 760 Fire AlarmSystems

Deletion: 760.41(B) Non-Power-Limited Fire Alarm (NPLFA) Circuits – NPLFA Circuit Power Source Requirements – Branch Circuits

Photo 8. The requirements that NPLFA and PLFA fire alarm panels are not be fed from AFCI- or GFCI-protected circuits has been deleted.

Deletion: 760.121(B) Power-Limited Fire Alarm (PLFA) Circuits – Power Sources for PLFA Circuits – Branch Circuits

The requirements that non-power-limited (NPLFA) and power-limited (PLFA) fire alarm panels not be fed from AFCI- or GFCI-protected circuits has been deleted. The substantiation used in the past to justify this requirement was that de-energizing the fire alarm control panel (FACP) would result in the system ceasing to function with no indication of a loss of power, or that nuisance tripping would be an issue. However, the building occupants will be aware of the loss of power if the fire alarm is installed in accordance with NFPA 72, the National Fire Alarm Code. Section 4.4.1.5.3 of NFPA 72 requires that fire alarm systems be provided with a minimum of 24 hours of standby power, with enough power available at the end of the 24-hour period for the system to go into full alarm for 5 minutes (15 minutes of maximum connected load for emergency voice communications systems). Section 4.4.7.3.1 of NFPA 72 requires that failure of either the primary or secondary power supplies is to be annunciated with a trouble signal in accordance with Section 4 4.3.5, that requires the trouble condition to be annunciated within 200 seconds at a location where it is likely to be heard.

Another substantiation used in past revision cycles was that often times the secondary power supply of batteries are not provided, are missing, or are dead. Again, loss of the secondary power supply is required to be annunciated with a trouble signal within 200 seconds of the condition occurring. Furthermore, Chapter 10 of NFPA 72 details specific inspection and testing procedures that are to be performed at required intervals. A visual inspection of the primary and secondary power supplies is required to be performed at the time of initial acceptance or during any reacceptance of the system. Batteries, depending on the type, are required to be visually inspected at either monthly or semiannual intervals depending on the type used. The primary and secondary power supplies are required to be tested at regular intervals as well, with Table 10.4.2.2 detailing how those tests are to be performed. For a system to be up and running, the batteries would have to be in place and operating correctly.

There seems to be no justification for the exclusion of AFCI or GFCI protection in conjunction with these fire alarm systems. No substantiation has been provided to indicate that non-power-limited (NPLFA) and power-limited (PLFA) fire alarm systems are incompatible with AFCI or GFCI technology.

Chapter Eight – Communications Systems

New: ARTICLE 840 Premises-Powered Broadband Communications Systems Broadband services are being offered that are non-network powered. At present, no specific article of the NEC addresses all the applications involved in these types of services resulting in state regulatory agencies, authorities having jurisdiction, and even companies making judgments on installations with loose interpretation or in some limited cases no interpretations of the NEC at all. Installations of these type systems have been found to create fire hazards and the potential for shock. This proposed Article 840 is an attempt to address these installation issues with these unique communication systems.

Summary

In this article and the previous article pertaining to Part I of the proposed changes to the 2011 NEC, the objective was to give the reader a first-hand look at some of the proposed changes to the next edition of the NEC. These articles include revisions, deletions, and new requirements as well as a look at some new proposed articles for NEC-2011. The information provided in this article is based on proposed changes and the code-making panel actions to the proposals at the Report on Proposals (ROP) stage of the NEC development process. The revisions and information in this article could be affected by public comments to the proposed changes. IAEI encourages public comments on the proposals. The NEC is a work in progress, and continues to evolve with new materials and growing technology in the electrical industry. These changes and many more will be fully explored in IAEI's Analysis of Changes, NEC-2011 textbook. Look for this authoritative textbook to be available from IAEI about September–October of 2010.

Read more by L. Keith Lofland

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