TABLE OF CONTENTS

CHANGES TO THE 2011 NATIONAL ELECTRICAL CODE

The Electrical trade requires ongoing compliance with the National Electrical Code (NEC). **It is revised on a three-year cycle.** One would think that a document that has been around since the late 1890s would only require minor tweaks and revisions. However, the steady introduction of new products and technologies into the marketplace, coupled with the release of new research findings by various public and private groups, creates a seemingly never-ending flow of necessary revisions (some of which are comprehensive) to this widely accepted electrical code.

Code-Wide Changes

 There were approximately **5,016** proposals and **2,910** public comments submitted for modifications to the 2011 edition of the NEC.

 Three new articles added to the 2011 NEC

- **Article 399 –** Outdoor, Overhead Conductors, Over 600 Volts
- **Article 694 –** Small Wind Electric Systems
- **Article 840 –** Premises-Powered Broadband Communication Systems

90.2 Scope

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

90.5 Mandatory Rules, Permissive Rules, and Explanatory Material

90.5(C) Explanatory Material
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.”**

90.5(D) adds the term "Informative" to the Annex portion of the NEC:
"Non-mandatory information relative to the use of the NEC is provided in 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."

Article 100 - Definitions

Ampacity: The maximum current, in amperes, that a conductor can carry continuously under the conditions of use without exceeding its temperature rating.

Arc-Fault Current Interrupter (AFCI): A device intended to provide protection from the effects of arc faults by recognizing characteristics unique to arcing and by functioning to de-energize the circuit when an arc fault is detected.

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 bidet, or similar plumbing fixtures.

Bonding Conductor or Jumper: A reliable conductor to ensure the required electrical conductivity between metal parts required to be electrical connected.

Bonding Jumper, System: The connection between the grounded circuit conductor and the supply-side bonding jumper, or the equipment grounding conductor, or both, at a separately derived system.

Explosionproof Equipment: Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby.

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

Interrupting Rating: The highest current at rated voltage that a device is identified to interrupt under standard test conditions.

Intersystem Bonding Termination: A device that provides a means for connecting bonding conductors for communication systems to the grounding electrode system.

Kitchen: An area with a sink and permanent provisions for food preparation and cooking.

Nonautomatic: Requiring human intervention to perform a function.

Overcurrent Protective Device, Branch Circuit: A device capable of providing protection for service, feeder, and branch circuits and equipment over the full range of overcurrents between its rated current and its interrupting rating. Branch-circuit overcurrent protective devices are provided with interrupting ratings appropriate for the intended use but no less than 5000 amperes.

Overcurrent Protective Device, Supplementary: A device intended to provide limited overcurrent protection for specific applications and utilization equipment such as luminaires and appliances. This limited protection is in addition to the protection provided in the required branch circuit by the branch-circuit overcurrent protective device.

Separately Derived System: A premises wiring system whose power is derived from a source of electric energy or equipment other than a service. Such systems have no direct connection from circuit conductors of one system to circuit conductors of another system, other than connections through the earth, metal enclosures, metallic raceways, or equipment grounding conductors.

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.

> **Informational Note**: 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 electric supply system and the service point.

Service-Entrance Conductors, Overhead System: The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop or overhead service conductors.

Service-Entrance Conductors, Underground System: The service conductors between the terminals of the service equipment and the point of connection to the service lateral or underground service conductors.

Service Lateral: The underground conductors between the utility electric supply system and the service point.

Service Point: No change in definition, the below informational note was added.

> **Informational Note:** The service point can be described as the point of demarcation between where the serving utility ends and the premises wiring begins. The serving utility generally specifies the location of the service point based on the conditions of service.

Uninterruptible Power Supply: A power supply used to provide alternating current power to a load for some period of time in the event of a power failure.

> **Informational Note:** 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

110.24 Available Fault Current: This new section will require non-dwelling unit service equipment to be field-marked with the amount of available fault current when installed or modified.

All equipment must have an interrupting rating or short circuit current rating that is equal to or greater than the available fault current **(110.9 and 110.10)**. This NEC change is intended to alert *Code* users to the fact that when utilities change transformers, or when emergency or standby systems are installed, the ratings of equipment must be re-evaluated.

110.26(A)(3), Exception No.2 Height of Working Space. This exception is new in the 2011 *Code*. The exception permits the meter to extend further, provided the meter socket does not exceed the 6 inches depth**.** It is a violation if equipment infringes on required working space more than 6 inches.

110.26(D) Illumination About Electrical Equipment. Lighting sources for working spaces about electrical equipment cannot be controlled by automatic means only. Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, or motor control centers installed indoors. Additional luminaire are not required where space is illuminated by adjacent light source.

Article 210 - Branch Circuits

There were several changes made to this section of the *Code*, addressing accessibility and location issues.

210.8(A) and (B) GFCI Protection For Personnel: A new requirement addresses the accessibility of the test and reset functions of GFCI devices.

The *Code* previously did not address the accessibility of the test and reset functions of GFCI devices. This presents two problems: First, building owners are subjected to the inconvenience of using ladders (or less safe devices) to reach the reset button should a GFCI device trip. Secondly, the listing standards of GFCIs require that they be tested on a monthly basis. While it is true that many people do not test their GFCI devices, some who would perform such tests will not go through the extra effort of finding a ladder to access these devices if they are not readily accessible.

This change will require GFCIs in obvious locations, such as bathrooms and dwelling unit garages, to have their test and reset buttons readily accessible, but it also applies to less obvious locations, such as receptacles on rooftops and in soffits for holiday lighting.

210.8(B)(5) Sinks: A revision to this next requirement increases the locations of GFCI-protected outlets in patient care areas of health care facilities.

A change to the 2008 NEC required GFCI protection near all sinks in nondwelling occupancies. One of the concerns raised by this change was the need for life support equipment to be supplied by an outlet that is not GFCI-protected. Due to this, an exception was written that exempted all receptacles in patient care areas (other than bathrooms). Although this certainly took care of the life support issue, it also removed GFCI protection from all other equipment that is not life safety oriented. For example, the many sinks found in a dental office were exempt, despite the fact that the patient is often very vulnerable to electric shock due to the invasive nature of many dental procedures. This change more accurately expresses the concerns of the medical community, while adding protection to equipment that is not essential to life support.

210.8(B)(6) Indoor Wet Locations: GFCI protection was added to indoor wet locations of non-dwelling occupancies.

Many areas, such as car washes, food processing areas, and similar locations, share the same hazards as outdoor locations, yet GFCI protection has never been required in these locations. This change will now require that these areas receive the same protection against electric shock as required for outdoor locations. It is worth noting that this change was accepted without any documented incidents cited.

210.8 (B)(7) 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.

Requirements for GFCI protection of receptacles in bathrooms have been in place for a very long time. In Article **100**, a bathroom is very clearly defined, and not all locker rooms fall under that definition. The hazards that exist in a bathroom are the same as those encountered in a locker room, and perhaps even more so. A typical locker room

that has associated showering facilities will probably contain tiled floors that are wet, people with bare feet, and people using electrical appliances (razors, hair dryers, curling irons, etc.). Therefore, GFCI protection was added for all 15A and 20A, 125V receptacles located in these facilities.

210.8(B)(8) Garages: Currently, **511.12** would require these receptacles installed in garage areas where electrical diagnostic equipment, electrical hand tools, or portable lighting equipment are used to be GFCI protected. 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 garages, service bays and similar areas.

This change expands GFCI protection requirements to all commercial garages. Article **511** applies only to those garages "in which volatile flammable liquids or flammable gases are used for fuel or power." A facility that repairs only diesel-powered vehicles does not fall under the requirements of Article **511**, because diesel fuel is a combustible liquid, not a flammable liquid. Although the same electric shock hazards exist regardless of the fuel type employed, areas that use only diesel fuel did not require GFCI protection in previous editions of the *Code*.

210.12 AFCI Protection for Dwelling Units: Changes have been made to address fire alarm circuiting, Type MC Cables, concrete-encased raceways, and branch circuit extensions or modifications**.**

Fire alarm systems covered by Article **760** have been exempted from the requirements of AFCI protection, but the circuiting of those systems was previously not addressed. This inadvertently left a loophole for installers to incorporate other outlets in areas specified by **210.12** on the same circuit as the fire alarm system and omit the AFCI protection required for circuits in those areas. This change also includes MC cable as a permitted wiring method when employing this exception.

210.52 Dwelling Unit Receptacle Outlet Requirements: A change to the wall spacing requirements has been made to address fixed cabinets, and the wall spacing requirements have been clarified.

The substantiation for the change to **(A)(2)(1)** is to address kitchen cabinets. The *Code* does not require a receptacle installed in front of lower kitchen cabinets to satisfy the wall space receptacles of this section. This is a clarification worth noting.

Changes to **210.52(A)(4)** have been made to address a fairly odd situation. It is quite common for a kitchen peninsular or island countertop to create a "wall" between the kitchen and dining room (or other room). When this occurs, **210.52(A)(1)** requires receptacles on the back of the peninsula or island in order to accommodate the dining area. In previous NEC editions, the required countertop receptacle could be used to

satisfy this requirement, provided the receptacle was not higher than 5½ feet above the floor **(210.52(4))**. This not only made for a *Code*-compliant installation, but also an invitation to have cords stretched across the dining room in order to reach the elevated receptacle. This change eliminates that loophole from the NEC and clearly states that the required countertop receptacles required by **210.52(C)** are in addition to any receptacles required in other parts of **210.52(A)**.

210.52(G) Dwelling Unit Garage, Basement, and Accessory Building Receptacles: A 15A or 20A, 125V receptacle is now required in dwelling unit accessory buildings.

The NEC has long required a 15A or 20A, 125V receptacle for detached dwelling unit garages that are provided with electric power. This *Code* change recognizes the fact that many accessory buildings to dwellings are not garages, but rather workshops, storage sheds, and similar buildings. Storage sheds are often used to house lawn and garden equipment, some of which require electricity for battery charging and other purposes. The NEC now requires a receptacle to be installed in these buildings whenever there is electric power installed in them.

210.52(I) Foyer Receptacles: A new requirement to provide receptacles in foyers was added.

Newer homes are often built with substantial foyers, some of which can be larger than other rooms of the house. In previous editions of the *Code*, these areas were typically treated as hallways, with only one receptacle being required and only one being installed. This change will now require foyers to have the same receptacle requirements as a bedroom, family room, dining room, or similar area.

Article 225 - Outside Branch Circuits and Feeders

225.27 Raceway Seal: A raceway seal is required at outside underground branch circuit and feeder raceways entering a building.
Where a raceway enters a building or structure from an underground distribution system, it shall be sealed in accordance with **300.5(G)**. Spare or unused raceways shall also be sealed. Sealants shall be identified for use with the cable insulation, shield or other components.

Article 240 - Overcurrent Protection

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 exist:

(1) Zone-selective Interlocking
(2) Differential Relaying
(3) Energy-reducing maintenance switching with 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 installation is typical for electrical power distribution systems. This extra amount of let-through energy may injure workers or damage equipment.

Article 250 - Grounding and Bonding

A new definition for "supply side bonding jumper" was added to **250.2** and is also discussed at **250.30(A)(2)** for grounding of separately derived AC systems.

250.2 Supply Side Bonding Jumper: A conductor installed on the supply side of a service or within a service equipment enclosure(s), or for a separately derived system, that ensures the required electrical conductivity between metal parts required to be electrically connected.

In the previous edition of the *Code*, the term "equipment bonding jumper" was used, but the new definition of "supply side bonding jumper" was necessary to ensure the proper identification and installation of bonding conductors installed within or on the supply side of service equipment and between the source of the separately derived system and the first disconnecting means. Equipment bonding jumpers are installed on the load side of the overcurrent device.

Equipment bonding jumpers are used often in the NEC, although the manner in which they are sized depends on the location (in the circuit) of the bonding jumper. Generally speaking, bonding conductors located downstream of an overcurrent device are sized in accordance with **250.122**, based on the rating of the overcurrent device. Bonding conductors upstream of an overcurrent device, such as the supply side of a service or between a transformer and panelboard, are typically sized using Table **250.66** and the 12½% rule discussed in **250.102(C)**. This *Code* change not only provides a new term to more accurately describe an existing conductor, but also should help clear up the sizing confusion that many people have with bonding conductors.

250.30 Grounding Separately, Derived System: This section has been reorganized and includes many revisions and notes to clarify the grounding and bonding requirements of separately derived systems.

Considering the amount of changes that have occurred in this section, it would not be entirely inaccurate to say that the whole section has been rewritten. Here are a couple of items worth noting:

- Section **250.30(A)(3)** mainly borrows the text that was previously in **250.30(A)(8)**. It does, however, add new text to provide guidance on sizing the grounded conductor for a delta (corner grounded) system. In these applications, the grounded conductor must be the same size as the ungrounded conductors.
- In **250.30(A)(6)**, the grounding electrode conductor(s) for multiple separately derived systems has been changed to clarify that structural metal can be used to ground multiple separately derived systems, provided that the structural metal complies with **250.52(A)(2)** or is connected to the grounding electrode system by a conductor not smaller than 3/0 AWG CU or 250kcmil AL.
- Section **250.30(C)** is new to the NEC. This subsection addresses separately derived systems that are installed outside of a building or other structure. When this is the case, a grounding electrode connection to the transformer must be provided.

250.52 Electrodes Permitted for Grounding: The rule explaining when a structural metal frame can serve as a grounding electrode has been changed again, and the requirements for concrete encased electrodes, ground rods, and ground plates have been clarified.

Over the last few *Code* cycles, the NEC has tried to make clear when the structural metal of a building or structure can be used as a grounding electrode. The first prescribed method will find the structural metal with direct earth contact for 10 feet or more. As an alternative, the hold-down bolts securing the structural metal column can be connected to a concrete-encased electrode. Previously, the *Code* allowed the structural metal to serve as an electrode if it was connected to a ground rod meeting the 25-ohm requirement of (formerly) **250.56**. This option has now been removed and is no longer a suitable method of bonding the structural metal to qualify it as a grounding electrode.

The ways of creating a concrete-encased electrode have been changed into an easy-to-use list format, and a clarification has been made regarding the use of vapor barriers.

When a vapor barrier (typically a plastic sheet) is installed beneath the footing, NEC users have debated whether or not the concrete is still considered to be in direct contact with the earth. A new Informational Note was added to clarify that such a footing is not