



## 2020 National Electrical Code® Code Change Analysis

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### Volume 1, Issue 3 - Changes in the 2020 National Electrical Code®

In the previous issue of this newsletter the topic was about the changes in Article 110. This issue we are moving into **Chapter 2 Wiring and Protection** by starting at **Article 200 – Use and Identification of Grounded Conductors** and begin to examine limited portions of **Article 210 – Branch Circuits**. Our goal is to better understand the changes to help apply them more uniformly; and reduce the probability of installer confusion. We Hope.

#### Article 200 – Use and Identification of Grounded Conductors.

**200.3 Connection to Grounded System.** Grounded conductors of premise wiring systems shall be electrically connected to the supply system grounded conductor to ensure a common, continuous grounded system. For the purpose of this section, electrically connected shall mean making a direct electrical connection capable of carrying current, as distinguished from induced current.

In the 2017 National Electrical Code®, it is stated that the Premise Wiring shall not be electrical connected to the supply system unless the latter, latter means the second mentioned thing, in this case the supply system, contains a grounded conductor of the interior system. Basically, this demands that the supply system and the building interior system are identical with regards to both having a grounded conductor. The concept was if the supply source does not have a grounded conductor and our premise systems does then they are prohibited from being electrically connected. This seems obvious to me (and maybe you as well). This language has been virtually unchanged since 1938.

However, in the 2020 NEC® this rule changes slightly for clarity. It appears that the long-standing verbiage implied that

the need for a grounded conductor in the supply system only applied when the wiring in the premise was limited to interior locations only. So, to correct that the word “interior” was replaced with “premise wiring”. Now, based on the way it is written the supply source, which typically would be a grounded system, containing a grounded conductor that would electrically connect to the premise wiring regardless of being of an interior or exterior proximity. While all this seems rather obvious again I think one of the most significant changes to the section is the last paragraph, which reads: “For the purpose of this section, electrically connected shall mean making a direct electrical connection capable of carrying current, as distinguished from induced current.”

The phrase “making a direct electrical connection” makes it 100% clear that the supply systems grounded conductor and the premise wiring systems grounded conductor are to be directly connected, typically via busbars within panel enclosures.

There is also an exception that allows listed interactive inverters that are identified for use in the distributed resource, such as photovoltaic or fuel cell for example, to be permitted to connect to the premise wiring without a grounded conductor if the premise wiring or the utility source includes a grounded conductor. The change from 2017 NEC was the removal of the term “utility” since we have a new Article 100 definition “Interactive Inverter” that makes it clear of the inverter’s intent.

#### 200.6 Means of Identifying Grounded Conductors.

**(A) Sizes 6 AWG or Smaller.** This subdivision was edited for clarity by adding the phrase “The insulated conductor shall have a” added to items (1), (2), (3) and only “Insulated conductors” added to item (4). Item 5 was updated and shuffled (switched places) with Item 6. The only change was to reflect a change from section 690.31 to 690.41 for Photovoltaic

applications and the use of outdoor rated cables and marking them in accordance with 200.6(A)(1) through (4), where applicable.

**(E) Grounded Conductors of Multiconductor Cables.** This subdivision was revised. The phrase *“For conductors that are 4 AWG or larger in cables, identification of the grounded conductor shall be permitted to comply with 200.6(B).”* This rule is to allow re-identification at the time of installation of any color conductor, other than a green, as a grounded conductor with white or gray markings at the termination of the conductors. This has been a long-accepted practice for conductors in raceways under 200.6(B)(4) and is now permitted in cables as well. Of course, you still can have it be continuous in a white, gray, or other color, except green, with three continuous white or gray stripes along the conductor’s entire length.

Now, here is where it gets interesting as it appears that in the body of the rule [200.6(E)] you can only use the “re-identified” option if the conductor is 4 AWG and larger. Well, let us examine the newly changed exception.

Exception # 1 says: *“Conductors within multiconductor cables shall be permitted to be re-identified at their terminations at the time of installation by a distinctive white or gray marking or other effective means.”*

Well, when utilized this exception basically removes the 4 AWG and larger restriction in the general rule of 200.6(E) at the time of installation. So, If I have a Type MC (Metal-Clad) cable assembly with multiple phase conductors and I need another grounded conductor, say to meet 200.4(A) compliance, I could simply take an unused, let’s say red conductor, and re-identify the ends at termination as a grounded conductor with white or gray marking tape and be 100 % compliant in my installation. Now, this begs us to ask why include the 4 AWG and larger rule in the body of 200.6(E) if the exception removes the limitation?

As a member of that code making panel [CMP-5] who remembers the debate very well, it was just easier to just move on than to spend another 5 hours rehashing the removal of the need for *“maintenance and supervision”* and *“qualified persons”* within the previous exception. So, we just moved on and it effectively took care of itself. We all knew that since a cable is a pre-designed assembly that re-identifying conductors as grounded conductors raises no legitimate safety concerns that should limit the well-established and proven practice of conductor re-identification at termination.

**200.9 Means of Identification of Termination.** This change added the phrase *“In devices or utilization equipment with*

*polarized connections”*, such as those on receptacles (devices) with an ungrounded (hot) and grounded (neutral) terminals or utilization equipment, to be either white or “silver” in color. The discussion was that on all these devices or utilization equipment there were never white terminals so adding the silver helps clarify the termination. This rule also carries over into 200.9(B) as well for Receptacles, Plugs, and Connectors.

In 200.9(B) it is also important to note that where the terminations are not visible, the entrance hole for the connection shall be colored white or marked with the word “white” the letter “W”. However, that last tidbit is not part of the change to the 2020 NEC so let us move on.

## Article 210 – Branch Circuits.

### 210.5 Identification of Branch Circuits.

**(C)(1) Branch Circuits Supplied from More Than One Nominal Voltage System.** This subdivision has seen many changes since it was added in the 2005 NEC. The latest change simply permits multiple voltage classes in the same premise to use the same identification. In other words, If I have a 120/208V system that uses Black, Red, Blue, and White and I derive another system (different system) in the same premise that is of the same voltage class (i.e., the same 120/208V) I can use the same color scheme and identification methods for both systems because they are the same voltage and within the same premise.

### 210.6 Branch-Circuit Voltage Limitations.

**(C) 277 Volts to Ground.** This subdivision did not change in terms of intent but did change in terms of clarity. In the 2017 NEC the use of cord-and-plug connected or permanently connected utilization equipment was embedded into the list of items as *item 6*. However, now that item has been relocated to the body of the code rule itself for ease of understanding and clarity to what the body of this subdivision applies too.

The most significant addition to the list of items in this subdivision is *item (1)* which deals with Electric-discharge luminaries with integral ballasts. Another is *item (2)* which is permitted on branch circuits not exceeding 277 volts, nominal to ground. This is *“LED luminaries with LED drivers between the branch circuit and the lampholder”*.

Lastly, the addition of item (8) to 200.6(C) deals with *“Luminaries converted with listed retrofit kits incorporating integral LED light sources or accepting LED lamps that also conform with 210.6(C)(1), (C)(2), (C)(3), (C)(4), or (C)(5)”*, which are all the allowable applications of 277 Volts to Ground

previously mentioned. Also, in 200.6(A)(1) through (C)(7) the term “light-emitting diode” was changed to “LED” for uniformity.

**210.8 Ground-Fault Circuit-Interrupter Protection for Personnel.** This section has seen many changes over the years and continues to change in the 2020 NEC. In the 2017 NEC you had seven (7) subdivisions noted as (A) through (E). However, in the 2020 NEC we have increased those subdivisions to eight (8). Along with the addition of (F) there was a significant change in the measurement requirements within this section. In the 2017 NEC, the measurement to a receptacle was to be measured as the shortest path the cord of an appliance to the receptacle would follow without piercing a floor, wall, ceiling, or fixed barrier, or pass through a door, doorway, or window.

As a result of the 2017 NEC language, a receptacle that was 6 feet or less from the inside top edge of a sink, along the shortest path the cord of an appliance would follow, required GFCI protection per 210.8(A)(7) for Dwelling Units or 210.8(B)(5) for Other Than Dwelling Units. However, you place a door, such as a cabinet door in the measurement and the measurement stops at that door. So, in the example above no GFCI receptacle would be required if the receptacle was behind a door, even if it was a cabinet door.

Well, say goodbye to the door and doorway portion of the rule in the 2020 NEC. The change simply removed the door and doorway component. So, in our above example of the sink and receptacle within 6 feet of the top inside edge, the receptacle would be required to be GFCI Protected regardless of a door being present. [Figure 1]

**210.8 (A) Dwelling Units.** This subdivision changes significantly and economically as well. Here is the Code language as written to better explain this change.

*“All 125-volt through 250-volt receptacles installed in the locations specified in 210.8(A)(1) through (A)(11) and supplied by single-phase branch circuits rated 150 volts or less to ground shall have ground-fault circuit-interrupter protection for personnel.”*

As you can see the ampacity values of 15- and 20- amperes electricians are familiar with in the 2017 NEC have been removed. In the 2020 NEC the voltage thresholds have been increased from 125-volts to now encompasses 125-volt through 250-volts for all applications under subdivision (A) Dwelling Units. The substantiation was that the same conditions that result in a possible injury or death can occur at 250 volts or less so the previous threshold of 125 volts was inadequate.

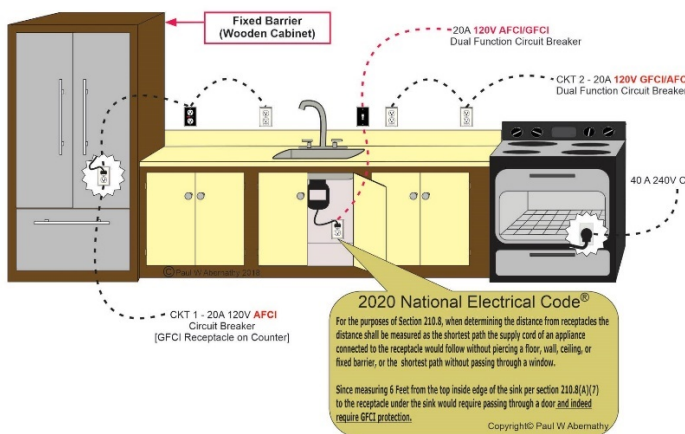
**(5) Basements.** In the 2017 NEC this was titled “unfinished portions” of basements not intended as habitable rooms. However, this created a situation where electrical system installers and enforcers of the NEC debated over what was considered “unfinished”. Also, during the NEC development process, argument was presented to the committee that “all” basements regardless of being finished or unfinished are subject to potential flooding or surface moisture will increase the shock risk to the consumer.

This is a perfect time to discuss the importance of the voltage change and removal of the ampacity limitations for utilization equipment and/or appliances located in any of the locations specified in 210.8(A)(1) through (A)(11). We just discussed basements so let us use that as our example. In the 2017 NEC, we could have a 30 ampere, 250-volt NEMA rated receptacle, installed for a clothes dryer in our unfinished basement that would not have required GFCI Protection. In the 2020 NEC, the ampacity makes no difference, being a finished or unfinished basement become irrelevant as well because “all” receptacles located in the basement that are 150 volts or less to ground and of single-phase will require GFCI Protection regardless of the ampacity of the receptacle.

**NOTE:** The above example will also apply the same way to all the other areas/locations specified in (A)(1) through (A)(11).

**(11) Indoor damp and wet locations.** This new item was added to cover indoor damp and wet locations as the same potential for shock exists as would any exterior location where subject to damp or a wet condition.

2020 NEC® Code Change - 210.8



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[Figure 1]

**210.8 (B) Other Than Dwelling Units.** This subdivision also had some significant changes as well. The actual voltage parameters were missing in the 2017 *NEC* in this subdivision, so they have been added in the 2020 *NEC*. The same “125-volt through 250-volt” receptacles reference was added. Also, the term “branch circuit” was added after three-phase so that it is clear the three-phase circuit in question is a branch circuit and nothing else. The same ampacity threshold of 50 amperes or less for single-phase and 100 amperes or less for three-phase still applies as it did in the 2017 *NEC*.

As with 210.8(A) for *Dwelling Units*, 210.8(B) for *Other Than Dwelling Units* experienced two new items added to the list where GFCI Protection of Personnel was required where receptacles are used. Let us examine each change.

**(2) Kitchens or other areas with a sink and permanent provisions for either food preparation or cooking.** This change is clear in the title of the item. In the 2017 *NEC*, it only said “Kitchens” so if all the elements that comprised a kitchen are not present then GFCI Protection was not required, except for those receptacles within 6 feet of the top inside edge of a sink per 210.8(B)(5). Luckily, we all know what kitchens are because of the definition found in *Article 100*.

However, in the 2020 *NEC* those branch circuits supplying the receptacles in a break room, in an “*other than dwelling unit*”, that has a sink and countertop that is used or can be used for food preparation will require GFCI Protection. Because of the “or” there is no need to have permanent provisions for cooking to kick in this requirement.

**(6) Indoor damp and wet locations.** The only change here was to add the words “damp and” to the location to harmonize with that was done in 210.8(A)(11) for *Dwelling Units*.

**(8) Garages, accessory buildings, service bays, and similar areas other than vehicle exhibition halls and showrooms.** The change here is the adding of “*accessory building*”. It is very common to have accessory buildings to “*other than dwelling unit*” locations that will now require GFCI Protection to the receptacles supplied by branch circuits within those accessory buildings.

**(11) Laundry areas.** Yes, as you guessed in “*other than dwelling unit*” laundry areas branch circuits supplying 125-volt through 250-volt receptacles supplied by single-phase branch circuits rated 150 volts or less to ground, and 50 amperes or less and likewise for three-phase branch circuits rated 100 amperes or less will now require GFCI Protection. This is common to all the locations in 210.8(B)(1) through (B)(11) as stated in the general rule of 210.8(B).

**(12) Bathtubs and shower stalls – Where receptacles are installed within 6 feet of the outside edge of the bathtub or shower stall.** This new addition is the result of its counterpart in 210.8(A)(9) for *Dwelling Units*. Since the same shock hazard exists with regards to bathtubs and shower stalls regardless of being a dwelling unit or other than dwelling unit it was added in the 2020 *NEC*.

Before we continue, we wanted to point out some of the deleted items or those that might have been renumbered. You may remember that in the 2017 *NEC* subdivision (C) was *Boat Hoists*. Well, a new informational note was added to 210.8 to point the electrical installer to section 555.9 for the GFCI requirements for boat hoists so the subdivision (C) was changed to “*Crawl Space Lighting Outlets*”, which previously was (E). You will also notice that (D) previously was “*Kitchen Dishwashers Branch Circuit*”. Well, that subdivision has significantly changed so let us continue with (D) below.

**210.8 (D) Specific Appliances** Unless GFCI protection is provided in accordance with 422.5(B)(3) through (B)(5), the outlets supplying the appliance specified in 422.5(A) shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

Where the appliance is a vending machine as specified in 422.5(A)(5) and GFCI protection is not provided in accordance with 422.5(B)(3) or (B)(4), branch circuits supplying vending machines shall have GFCI protection in accordance with 422.5(B)(1) or (B)(2).

The latter part of the new requirement deals with vending machines. The 422.5(A)(5) is the vending machine location reference and 422.5(B)(3) is for the GFCI device being an integral part of the attachment plug and 422.5(B)(4) is where the GFCI device is in the cord within 12 inches of the attachment plug. So, where those options are not available then the vending machine has to be protected in accordance with 422.5(B)(1) which is by a GFCI circuit breaker or 422.5(B)(2) which is at the outlet location via a GFCI device, such as a GFCI receptacle or blank face style GFCI device.

In looking at the bigger picture of this change, the subdivision now references the user to various parts of section 422.5 for appliances. The dishwasher branch circuit requirement for GFCI Protection did not go away, it was simply relocated to 422.5(A)(7) and now applies to dwelling units and other than dwelling unit dishwasher applications. We will not dig into 422.5(A) and (B) in this issue but once we get to *Article 422*, we will most certainly circle back to GFCI Protection discussions.

**210.8 (E) Equipment Requiring Servicing.** GFCI protection shall be provided for the receptacles required by 210.63.

This change is demanding that all receptacles demanded by 210.63 require GFCI Protection. Now, 210.63 had a significant change take place by combining the familiar requirements of 210.63 for at least one 125-volt, 15- or 20-ampere rated receptacles within 25 feet at the same level for heating, air-conditioning, and refrigeration equipment, excluding one- and two family dwellings, and the 210.64 requirements of at least one 125-volt, 15- or 20- ampere rated receptacle within 25 feet and in the same room or area of the indoor service equipment, also excluding one- and two- family dwellings.

The 2020 *NEC* combined both 210.63 and 210.64 into a well-formed 210.63(A) and (B). We will go into more detail on that change in a future issue of this newsletter.

**210.8 (F) Outdoor Outlets.** All outdoor outlets for dwellings, other than those covered in 210.8(A)(3), Exception to (3), that are supplied by single-phase branch circuits rated 150 volts to ground or less, 50 amperes or less, shall have ground-fault circuit-interrupter protection for personnel.

Exception: Ground-fault circuit- interrupter protection shall not be required on lighting outlets other than those covered in 210.8(C).

This change is exactly as it appears. Any outdoor “outlet” rated 150 volts to ground or less, 50 amperes or less, be it a receptacle outlet or a junction box that has a liquidtight conduit supplying an AC unit shall be GFCI Protected. The key to understanding this rule is to know exactly what an “outlet”. Thankfully, we have *Article 100* to help.

**Outlet. A point on the wiring system at which current is taken to supply utilization equipment.**

This was proposed and accepted based on a death that occurred when an individual was electrocuted by an AC condenser unit. It is interesting to note that the AC condenser unit that was the catalyst for this change was not *NEC* compliant in the first place and was already considered an installation hazard. But nothing spawns change in the *NEC* like a death so there you go. Do not get me wrong as any loss of life is sad and unfortunate. Things like this should not happen but I happen to be one of those folks who want to see data to support a change rather than a gut reaction. If the AC unit had been wired properly then this would not have happened in the first place resulting in no need for the subsequent change.

## 210.11 Branch Circuit Requirements

### (C) Dwelling Units

**(3) Bathroom Branch Circuits.** In addition to the number of branch circuits required by other parts of this section, one or more 120-volt, 20-ampere branch circuits shall be provided to supply bathroom (s) receptacle outlet (s) required by 210.52(D) and any countertop and similar work surface receptacle outlets. Such circuits shall have no other outlets.

The language in the above change is simply to remind us that the branch circuits, which can be more than one, shall not only supply the receptacle requirements of 210.52(D), which is the requirement for a receptacle within 3 feet of the outside edge of the basin (s), there may also be receptacles in the bathroom to serve the countertop and possible work surface as well and the branch circuits demanded by this code subdivision can also be served by those 120-volt, 20-ampere branch circuits.

Now, don't forget about the exception which does allow other outlets on the bathroom branch circuit within the same bathroom, such as lighting outlets, as long as the branch circuit supplies no additional bathrooms and all loads in that same bathroom meet the requirements of 210.23(A)(1) and (A)(2).

Here is where we will leave off and pick up in the next issue.

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