2020 National Electrical Code® Code Change Analysis

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Volume 1, Issue 2 - Changes in the 2020 National Electrical Code®

In the previous issue of this newsletter the topic focused on what is covered and what is not covered by the *National Electrical Code®* in *Article 90*. We then presented several more significant changes to *Article 100* definitions. However, we did not describe the changes to the new *Part III* of *Article 100*. This newly created *Part III* is now the location of all things, in terms of definitions, for Hazardous (Classified) Locations.

Let's start by saying that an effort was made by CMP 14 in partnership with CMP 1 to bring all relevant definitions regarding these "specific conditions or locations" to *Article 100*. Many of you (subscribers) are aware of the definitions that existed in *the 2017 National Electrical Code®,* hereby referred to as the *NEC®* as we move forward. There is no need to re-define what has already been defined for many code cycles. However, we do want to shed light on the new definitions that make their way into the new *Part III* of *Article 100* when they are brand new for the 2020 edition.

Electrical Resistance Trace Heating – *Type of protection for the purpose of producing heat on the principal of electrical resistance and typically composed of one or more metallic conductors and/or an electrically conductive material, suitably electrically insulated and protected.*

The term *Electrical Resistance Trace Heating* was used in many informational notes, notably *Article 426* and *427,* so the above definition was well warranted.

Inherently Safe Optical Radiation "op is" – *Type of protection to minimize the risk of ignition in explosive atmospheres from optical radiation where visible or infrared radiation is incapable of producing sufficient energy under normal or specified fault conditions to ignite a specific explosive atmosphere.*

This optical radiation specific devices or equipment are being utilizing for systems in the communication device industry, and in various measuring devices and surveying equipment. The most important and potentially dangerous use is within high data transmission where they may become mingled with potentially explosive atmospheres which can lead to a potentially explosive condition. Some key things to remember about *Optical Radiation* is that it is absorbed by surfaces and particles and as a result can heat up those surfaces or particles.

When conditions are right (or dare I say wrong) the optical radiation can result in temperatures on the surfaces or particles high enough to cause ignition in an atmosphere that is explosive, such as what is discussed in *Article(s) 500, 501, 502, and 503* to name a few within the *NEC®*.

There are three ways to prevent ignition within a volatile atmosphere:

1) Inherently safe Optical Radiation "op is" – is (inherently safe) when the visible or infrared radiation is of such levels that it is incapable of supplying a sufficient level of energy under normal or specific fault conditions to ignite a specific explosive atmosphere.

2) Protected Optical Radiation "op pr" – is confined or protected inside the optical device or equipment so that there is not potential for escape of the radiation to the outside confinements of the device.

3) Optical Systems with Interlock "op sh" – this protection method is to provide an interlock cut-off mechanism to optical radiation systems that are not considered

inherently safe. If the protection by the confinement fails, and the radiation becomes unconfined on time scales suitably shorter than the ignition delay time thus not allowing ignition to take place prior to system shut down.

While my descriptions of the various types of protection for *Optical Radiation* is entertaining the actual term *Optical Radiation*, *Protected Optical Radiation* and *Optical Systems with Interlocks* was added to *Article 100* definitions. For more information on Optical Radiation be sure to check out ***IEC 60079-28*** for more details.

Intrinsically Safe Systems – *An assembly of interconnected intrinsically safe apparatus, associated apparatus, and interconnected cables, in that those parts of the system hat may be used in hazardous (classified) locations are intrinsically safe circuits.*

In the *2017 NEC®* the use of the terms *Intrinsically Safe Apparatus (ISA)* and *Intrinsically Safe Circuits (ISC)* was used so many times I lost count. However, when you had multiple "ISA" or "ISC" components or circuits together it results in a system. Thus, the new definition is born. Also don't go looking for those acronyms I made them up, so I did not have to spell *Intrinsically* again.

That brings us to the end of newly added definitions of significance to the new *Part III* of *Article 100*. However, just a reminder to be aware that many existing definitions that were contained in the section *.2* of many of Articles, such as *500, 501, 502, 503, 504, 511, 513, 514, 515, 516* were relocated to *Article 100*.

Article 110 – Requirements for Electrical Installations – Part I

110.5 Conductors – *Conductors used to carry current shall be of copper, aluminum, or copper-clad aluminum unless otherwise provided in this Code. Where the conductor material is not specified, the sizes given in this Code shall apply to copper conductors. Where other materials are used, the size shall be changed accordingly.*

The change to *110.5* was the removal of the information note about copper-clad aluminum by incorporating the note into the body of the *Code* itself.

110.12 (C) Cables and Conductors. – *Cables and conductors installed exposed on the surface of ceilings and sidewalls shall be supported by the building structure in such a manner that the cables and conductors will not be damaged by normal building use. Such cables and conductors shall be secured by hardware including straps, staples, cable ties, hangers, or similar fittings designed and installed so as not to damage the cable. The installation shall also conform with 300.4 and 300.11. Nonmetallic cable ties and other nonmetallic cable accessories used to secure and support cable in other spaces used for environmental air plenums) shall be listed as having low smoke and heat release properties.*

With the addition of a new *item (C)* to the ever popular *110.12* ***Mechanical Execution of Work*** section, the user of the *NEC®* now understand the securing requirements when cables are installed exposed on the ceiling or sidewalls. The new rule also picks up similar language found for wiring methods listed in *300.22(C)(1)* as well.

110.14(C)(1) – Equipment Provisions – don't panic as the intent of this sub-section did not change. You still have the terminal limitations in *110.14(C)(1)(a)* of 60°C when 1 AWG and smaller and 100 amperes or less and *110.14(C)(1)(b)* for 1/0 AWG and larger at the 75°C limitations. Of course, we have the provisions for use of higher rated insulation but that's not part of this code change series. However, what has changed is the reference to *Table 310.15(B)(16)*, the ampacity tables which has changed to *Table 310.16* and the reference to *310.15(B)(7),* which is now *310.12*. We will cover those changes in more detail in later issues of this code change series.

110.14(D) Terminal Connection Torque – *Tightening torque values for terminal connections shall be as indicated on equipment or in installation instructions provided by the manufacturer. An approved means shall be used to achieve the indicated torque value.*

The first thing any code savvy individual will notice is the heading change from *"installation"* to *"Terminal Connection Torque"*. But the biggest change is the removal of the phrase *"a calibrated torque tool shall be used to achieve the indicated torque value"*.

There are many methods to achieve a specific tightening torque value other than by using a calibrated torque tool. In fact, some manufacturer may even provide accessories, such as breakaway-style devices, that can perform the necessary torque values needed to meet the manufacturers intended torque values. The intent of this change was to express that there are many ways to achieve a desired torque value and a calibrated torque tool is just one acceptable method. With this change comes three new informational notes that will serve to give guidance on other options to calibrated tools, such as but

not limited to shear bolts and breakaway-style devices with visible indicators.

110.21 (A)(2) Reconditioned Equipment, Exception – *In industrial occupancies, where conditions of maintenance and supervision ensures that only qualified persons service the equipment, the markings indicated in 100.21(A)(2) shall not be required for equipment that is reconditioned by the owner or operator as part of a regular equipment maintenance program.*

The above change to the *exception* for markings to reconditioned equipment, was given in the *2017 NEC®* but did not state who was to beneficiary of the *exception*. The *2020 NEC®* revision makes it clear that it applies to reconditioned equipment under regular maintenance programs by owners or operators of such equipment.

110.22 (A) General. – *Each disconnecting means shall be legibly marked to indicate its purpose unless located and arranged so the purpose is evident. In other than one- and two-family dwellings, the markings shall include the identification of the circuit source that supplies the disconnecting means. The marking shall be of sufficient durability to withstand the environment involved.*

The above change is to subdivision ***(A) General*** of section ***110.22 labeled Identification of Disconnection Means***. This generally applies, the identification of the disconnection means, in all cases. However, in the *2020 NEC®,* the code language that requires the markings to include the identification of the circuit source will apply to everything except one- and two-family dwellings.

In those other than one- and two-family dwelling situations, properly locating the source of a circuit when attempting to work on it so it can properly deenergized will go a long way in creating a safer working condition in the event the circuit needs servicing.

110.24 (A) Field Markings – Informational Note # 2 – *Values of available fault current for use in determining appropriate minimum short-circuit current and interrupting ratings of service equipment are available from electric utilities in published or other forms.*

The above change to subdivision ***(A) Field Markings*** of section ***110.24 Available Fault Current*** is to express that when performing a fault current calculation, you may gain information from the local utility to aid in performing the necessary calculation. The ratings of the utility transformer(s) and length of subsequent conductors can influence the amount of available fault current that affects the appropriate short-circuit ratings [*110.10*] as well as the interrupting rating [*110.9*] of the service equipment and associated components, where applicable.

Article 110 – Requirements for Electrical Installations – Part II

We are now moving into Part II, which is for 1000 volts, Nominal, or less.

110.26(C)(2) Large Equipment – *For large equipment that contains overcurrent devices, switching devices, or control devices, there shall be one entrance to and egress from the required working space not less than 610 mm (24 in.) wide and 2.0 m (6½ ft) high at each end of the working space. This requirement shall apply to either of the following conditions:*

1) *For equipment rated 1200 amperes or more and over 1.8 m (6 ft) wide.*

2) *For service disconnection means installed in accordance with 230.71 where the combined ampere rating is 1200 amperes or more and over 1.8 m (6 ft) wide.*

Open equipment doors shall not impede the entry to or egress from the working space.

Note: I will skip the remainder of that subdivision since the portion about **Unobstructed Egress and Extra Working Space** did not change.

In the above change is to ***110.26(C)(2)*** of subdivision ***110.26(C) Entrance to and Egress from Working Spaces***, which is a subdivision of section ***110.26 Spaces About Electrical Equipment***. Do not let the rewording of this subdivision confuse you. There are only two actual changes. 1) any open doors of the equipment can't impede the entry to and egress from the working space, in other words if the doors were opened, ask yourself, would they impede the entry to and egress from the working space and if so changes will need to be made to the design. 2) the next change is for service disconnection means installed per *230.71* that have a combined ampere rating of 1,200 amperes or more and over 1.8 m (6 ft) wide. We know that *230.71* has to do with the maximum number of disconnections means so if we have (2) two of them, let's say 600 amperes each for a total of 1,200 amperes combined and a combined width of over 6 ft then the requirement of one entrance at each end entrance to and egress from the required working space is established no differently than if it was one service disconnection means that

was 1,200 amperes and over 6 feet wide. Otherwise, the subdivision was just reworded to provide for these changes and to structurally flow better.

While we are still on subdivision ***110.26(C)***, we might as well talk about the changes to ***110.26(C)(3)*** **Personnel Doors.** The only change is the addition of "listed fire exit hardware" to go along with the "listed panic hardware" that was already provided for in the code rule.

Just a reminder the "listed hardware" we are speaking of is when the equipment is rated 800A or more and contains overcurrent devices, switching devices, or control devices and when personnel door(s) intended for entrance to and egress from the working space less than 7.6 m (25 ft) from the nearest edge of the working space are utilized. These doors shall open in the path of egress of course and be equipped with *"listed panic hardware"* or now in the *2020 NEC® "listed fire exit hardware"* can be utilized to meet this requirement.

110.26(E)(2) Outdoor. Exception – *Structural overhands or roof extension shall be permitted in the zone.*

We know what you are saying, the above exception already existed in the *2017 NEC®* and you are 100% correct. However, it was improperly placed after the subdivision *110.26(E)(2)(a)* and *(b)* and did not apply to *item (c)* for ***Dedicated Equipment Space***. So, in the *2020 NEC®* it was relocated after *110.26(E)(2)(c)* so that it now applies to the entire rule of *110.26(E)(2)(a)*, *110.26(E)(2)(b)*, and now *110.26(E)(2)(c)* as it was intended.

Lastly, we will mention the changes that have taken place to *Table 110.28* for ***Enclosure Selections***. This table is critical in understanding the various *NEMA* ratings, derived from the *NEMA 250 Standard*, for enclosure utilized in a wide variety of applications and conditions of use. The *2020 NEC®* version of this table introduces (2) two more informational notes that serve to give additional guidance for dusttight enclosures for use in specific hazardous (classified) locations, such as *502.10(B)(4), 503.10(A)(2),* and *506.15(C)* as well as *Class II, Division 2*, *Class III*; and *Zone 22 hazardous (classified) locations* as well as locations considered unclassified.

Article 110 – Requirements for Electrical Installations – Part III

We are now moving into *Part III*, which is for over 1000 volts, Nominal. To be totally honest I usually do not cover these types of changes. However, we will press on with some of the significant changes to Part III of *Article 110*.

110.32 Work Space About Equipment- *Sufficient space shall be provided and maintained about electrical equipment to permit ready and safe operation and maintenance of such equipment…….*

So why did I stop writing the actual code language. Well because the only real change to this rule is in the last paragraph and to be honest, I got lazy so here is the portion to *110.32* that changed.

"Within the height requirements of this section, other equipment that is associated with the electrical installation and is located above or below the electrical equipment shall be permitted to extend not more than 150 mm (6 in.) beyond the front of the electrical equipment. Working space required by this section shall not be used for storage. When normally enclosed life parts are exposed for inspection or servicing, the working space, if in a passageway or general open space, shall be suitably guarded."

So, the change to *110.32* is remarkably similar to the rules we have in *110.26(A)(3)* for ***Height of Working Space*** for systems 1000 volts, nominal or less, for items like the associated equipment not extending more than 6 inches beyond the front of the electrical equipment as well as the clear storage areas in *110.26(B)* in *Part II*.

In the next issue we will begin ***Chapter 2 Wiring and Protection*** beginning with ***Article 200 – Use and Identification of Grounded Conductors***.