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Electrical Licensing Concerns
And
Commonly Found Installation Deficiencies in the State of New Hampshire
2014

The Electricians' Board (Board) in conjunction with the State Electrical Inspectors, municipal electrical and building inspectors and other representatives of the electrical industry in the State of New Hampshire has put together this list of common installation deficiencies. Included are the problems encountered by the NH Joint Board's office staff relative to the State's electricians licensing law RSA 319-C and the Electrician's Board administrative rules. The Board welcomes any input from instructors, inspectors, licensees and other concerned parties relative to this list or any other items of concern.

The Board would like to inform all licensees and concerned parties that as of July 1, 2013 the Electrician' Board and all staff have moved to the NH Joint Board of Licensure located at 121 South Fruit Street Concord, NH 03301. The new web site for the Board is **http://www.nh.gov/jtboard/electricians.htm**

To all licensees: All licensees are required to complete their 15 hours of code change continuing education on the 2014 NEC between January 1, 2014 and December 31, 2014 regardless when they renew their license. All licensees who renew in 2014 will have the entire year to complete their 15 hour code update. Any licensee who does not complete the required 15 hour update with a NH approved provider by December 31, 2014 will have their license listed as invalid.

To all licensees: Effective January 1, 2014 any Board disciplinary action will be posted on the Boards website for one year from the date of the final decision of the Board.

The **2014 NEC will likely become effective January 1, 2015** as part of the State Building Code RSA 155-A, specifically 155-A:1 IV. Some local municipalities may adopt the 2014 NEC at an earlier date therefore it is recommended that you check with the local authority before starting an installation. Regardless of which edition of the NEC is enforced by the local municipality, installations in the State of New Hampshire must meet the minimum requirements of the current edition of the NEC as adopted by the NH Legislature as part of RSA 155-A.

Although adopting electrical installation Codes and Standards is the responsibility of the NH Legislature, Journeyman and Master electricians should be aware that continuing education for license renewal is the responsibility of the Electricians' Board. No matter which edition of the NEC has been adopted as the State's electrical installation Code, the Electrician's Licensing Board will base the continuing education requirements for license renewal on the most current edition of the NEC as published by the National Fire Protection Association. Only Board approved continuing education courses based on the changes to the 2014 NEC will be accepted.

Effective July 1, 2013, the Electricians' Licensing Board administrative rules (Elec) replaced Saf-C 9200 and Saf-C 9300. Elec 100 and 200 provides the Electricians Board Practice and Procedural Rules (formally Saf-C 9200) and Elec 300 and 400 provide the Electricians Board Licensing and Enforcement Rules (formally Saf-C 9300). Elec 100, 200, 300 & 400 are provided for viewing and downloading on the NH Joint Boards website at **http://www.nh.gov/jtboard/electricianrules.htm**.

Licensing Concerns

1. Licensees and apprentices must notify the Board's office if you have a change of address within **30 days**.

2. Registered apprentices should be aware that in order to perform electrical installations for heat, light and power purposes they must be employed by a master electrician or other employer who is not in the primary business of performing electrical installations but also employs a NH master electrician from whom the apprentice electrician receives direction and supervision. **They cannot perform installations on their own or as a subcontractor.**

3. Journeyman licensees should be aware that in order to perform electrical installations for heat, light and power purposes they must be employed by a master electrician. **They cannot perform installations on their own or as a subcontractor.**

4. The master licensee who employs electricians/apprentices or the corporate master of record for a corporation should be aware that they are responsible for:

Periodically inspecting the work of the journeyman licensees in their employ and performing a final inspection of the journeyman's completed installation.

Verifying that the licensees in their employ have valid licenses and all apprentices are properly registered.

Verifying that the ratios of licensees to apprentices performing electrical installations on the job site are in compliance as required in Elec 404.05(a).

5. All licensees and apprentices should be aware that when paying fees for licensure or renewal and apprentice registration or renewal the payment must be made in the form of a check, money order or credit card. The Joint Board office cannot accept cash. The office sends out renewal notices as a courtesy but you are responsible for renewing your license or apprentice card on time. Apprentices must renew before the expiration date on the apprentice card. If you haven't received a renewal notice you should contact the office. Renewal forms are also available online at **http://www.nh.gov/jtboard/elecforms.htm**.

6. Master and journeyman electricians should be advised they are not required to submit proof of the 15 hour update course when they renew their license. All Licensees are required to complete their 15 hours of continuing education on the 2014 NEC between January 1, 2014 and December 31, 2014, regardless of when their license expires. Any licensee who has not completed their update by December 31, 2014 will have their license listed as invalid, which is equivalent to working without a license. Submitting proof of continuing education will be done electronically by the provider. Master and journeyman electricians should verify that the provider is approved by the Electrician's Licensing Board prior to attending a continuing education seminar. All providers are required to be approved by the Electrician's Licensing Board whether they are conducting courses in or outside of the State of New Hampshire. Master and journeyman electricians must still receive a certificate from the provider.

7. Master electricians should be aware that they **cannot obtain a permit** for a journeyman electrician to perform an electrical installation when the journeyman is not in their employ. Even if the journeyman is receiving direction and supervision from the master electrician, as defined in RSA 319-C:2 a journeyman electrician must be employed by a master electrician. Procuring a permit for a journeyman electrician who is not employed by the master electrician is considered as unprofessional conduct that affects the practice of the trade by the Board. As noted in RSA 319-C:12 II, misconduct sufficient to support disciplinary proceedings includes; (c) any unprofessional conduct or dishonorable conduct unworthy of, and affecting the practice of the trade.

8. Apprentices should be aware that when filing an application for apprenticeship or apprenticeship renewal, the application must be signed by the supervising master. Each apprentice must be under the direct supervision of a licensed master or journeyman electrician when performing electrical installations.

For example; Elec 404.05(f) requires installations made by apprentice electricians without the direct supervision of a master, journeyman or high/medium voltage electrician to be recorded for future consideration by the Electricians' Board. This will be at the time the apprentice is applying to take the journeyman exam.

Most Common Electrical Installation Deficiencies in the State of New Hampshire 2014

The following is a list of the most common deficiencies found in electrical installations in the State of New Hampshire. The list has been formatted to the **2014** edition of the **National Electrical Code (NFPA 70-2014)**.

1. The use of electrical equipment without following the manufacturer's instructions.

Section 110.3(B) requires that listed or labeled products be installed in accordance with their listing or labeling. If specific installation requirements are provided by the manufacturer they must be adhered to by the installer. All too often the information provided on or with electrical equipment is overlooked by the installers. Two items that are frequently installed improperly are listed below.

A. Installation and securing of expansion fittings in runs of Rigid Polyvinyl Chloride (PVC) Conduit. Quite often when expansion fittings are installed they are secured on the wrong end. The manufacturer's listing requires that the expansion fitting be secured on the "bell" (fixed) end. Notice should be taken when mounting the fitting in a vertical position: the fitting must be installed with the "bell" end above the sliding or expanding end. In addition, the conduit must meet the securing requirements of the applicable raceway article.

B. Tightening of electrical connections. Manufacturers of connection equipment (i.e. lugs, terminal bars, etc.) generally include required torque values on the equipment and/or in the installation instructions. In some cases the NEC has specific torque requirements. An example of this is 430.9(C) which requires control circuit devices with screw-type pressure terminals used with 14 AWG or smaller conductors to be torqued to a minimum of 7 lb-in unless identified for a different torque value.

The 2014 NEC explains the importance of making proper field connections in Annex I (Page 863) which includes two tables that are based on UL 486A-B, Wire Connections. Although not enforceable text, this annex material will provide recommended torque values in the absence of connector or equipment manufacturer's information.

2. Clearances: working space, clear spaces, headroom and dedicated equipment space.

A number of concerns relating to the clearance requirements **of** 110.26 are often overlooked in the field. This section requires that sufficient access and working space be provided about electrical equipment to provide ready and safe operation and maintenance of the equipment.

The depth of working space described in 110.26(A)(1) is required about equipment operating at 600 volts or less to ground that may require examination, adjustment, servicing, or maintenance while energized. The depth of the space must be determined in accordance with Table 110.26(A)(1) which is based on the conditions described in the table notes.

Section 110.26(A)(2) "Width of Working Space" requires the working space to be at least 30 inches in width or the width of the equipment whichever is greater. This section further requires that in all cases the door or hinged panel of the equipment must open at least 90 degrees.

Section 110-26(A)(3) "Height of Working Space" requires the height of the working space to be at least 6 feet 6 inches, measured from the floor, grade, or platform, or the actual height of the equipment itself which ever is greater. Other equipment associated with the installation that is located within the working space is not permitted to extend more than 6 inches beyond the front of the electrical equipment. A new

Section 110.26(B) "Clear Spaces" requires the working space to be kept clear by not allowing it to be used for storage.

Section 110.26(E) "Dedicated Equipment Space" requires that switchboards, switchgear, panelboards, and motor control centers are located in dedicated spaces and be protected from damage.

Section 110.26(E)(1)(a) mandates a clear space, only for equipment listed in 110.26(E), that is the depth and width of the equipment that extends to a height of 6 feet above the equipment or the structural ceiling whichever is lower for equipment installed in indoor locations. Only equipment associated with the electrical installation is permitted in this space.
In indoor installations where the structural ceiling height is greater than 6 feet, **100.26(E)(1)(b)** permits foreign systems above the six foot space where protection from leaks, breaks or condensation has been provided.

Section 110.26(E)(2) in the 2014 NEC also includes that outdoor installations shall comply with 110.26(E)(2)(a) and (b).

3. The sealing of underground raceways.

Although often overlooked, there are specific requirements in the NEC with regard to sealing underground raceways entering buildings or where condensation is created in raceways or sleeves by the exposure to different temperatures within buildings or where a raceway passes from outdoor to indoor locations.

Section 225.27 Raceway seals. Where raceways enter a building or structure from an underground distribution system, it shall be sealed in accordance with 300.5(G). Sealants shall be identified for use with the cable installation, conductor insulation, bare conductor, shield, or other components.

Section 230.8 Raceway Seal. Where a service raceway entering a building or structure from an underground distribution system to be sealed in accordance with 300.5(G) (at either or both ends where moisture can contact live parts). Water can enter raceways through couplings or it can build up from condensation resulting from the exposure to different temperatures. However when water accumulates within the raceway, the intent of the requirement is to prevent water from entering the service equipment via the underground raceway system. A sealant such as duct seal or other types of sealants identified for use with the conductor or cable insulation, shield or other components must be used to seal the ends of raceway. Any type of sealing material used cannot have a deteriorating effect on the conductor insulation.

Section 300.5 provides requirements for underground installations and 300.5(G) states that conduits or raceways through which moisture can contact live parts shall be sealed or plugged at either or both ends. The requirements of this section are specific to where moisture can contact live parts so consideration must be given to how the conduit or raceway is installed. Not all underground conduits or raceways are installed in a manner that moisture would actually contact a live part. An example of this application would be

where an underground raceway enters the building below the equipment and then is connected to the enclosure below the live parts.

4. 250.50 Grounding Electrode System.

All grounding electrodes as described in 250.52(A)(1) through (A)(7) that are present at each building or structure served shall be bonded together to form the grounding electrode system. 250.52(A)(3) Concrete-Encased Electrode. A concrete-encased electrode shall consist of at least 6.0 m (20 ft.) of either (1) or (2):

(1) One or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (½ in.) in diameter, installed in one continuous 6.0 m (20 ft.) length, or if in multiple pieces connected together by the usual steel tie wires, exothermic welding, welding, or other effective means to create a 6.0 m (20 ft.) or greater length; or

(2) Bare copper conductor not smaller than 4 AWG

Metallic components shall be encased by at least 50 mm (2 in.) of concrete and shall be located horizontally within that portion of a concrete foundation or footing that is in direct contact with the earth or within vertical foundations or structural components or members that are in direct contact with the earth. If multiple concrete-encased electrodes are present at a building or structure, it shall be permissible to bond only one into the grounding electrode system.

5. The bonding of metal water piping in the vicinity of separately derived systems.
250.104 Bonding of Piping Systems and Exposed Structural Metal. (D) Separately Derived Systems. (1) Metal Water Piping System(s).

The grounded conductor of each separately derived system shall be bonded to the nearest available point of the metal water piping system(s) in the area served by each separately derived system. This connection shall be made at the same point on the separately derived system where the grounding electrode conductor is connected. Each bonding jumper shall be sized in accordance with Table 250.66 based on the largest ungrounded conductor of the separately derived system.

Exception No. 1: A separate bonding jumper connected to the metal water piping system shall not be required where the metal water piping system is used as the grounding electrode for the separately derived system and the water piping system is in the area served.

Exception No 2: A separate water piping bonding jumper shall not be required where the metal frame of a building or structure is used as the grounding electrode for a separately derived system and is bonded to the metallic water piping in the area served by the separately derived system.

Example: Any metallic water pipe located in the vicinity served by the separately derived system must be bonded to the grounded conductor of the separately derived source. The connection must be made at the same point as the grounding electrode conductor. The metal water piping serving an office kitchenette with 120-volt power provided from a nearby transformer must be bonded to the transformer grounded conductor at the same point as the grounding electrode conductor connection.

6. Wireways and consideration of 310.15(B)(3)(a)

Section 376.22(A) identifies concern for the percentage of fill in any cross section of conductors of a wireway and section 376.22(B), relates to only where 31 current carrying conductors or more are encountered in the wireway before applying adjustment factors as determined in 310.15(B)(3)(a). A 12 AWG conductor with type "THHN" insulation in a wireway of 30 or fewer current carrying conductors is permitted to be protected with an overcurrent device of 20 amperes or less as determined by Table 310.15(B)(16) and 240.4(D). The same conductor when located within a wireway with 31 current carrying conductors is limited to 40% of its current carrying capacity as adjusted by 310.15(B)(3)(a). 40% of the ampacity from the 90° C column of Table 310.15(B)(16) (30 amperes) is only 12 amperes. The 12 AWG conductors would certainly not be suited to supply the intended 20 ampere branch circuit.

We are quick to take advantage of the permission to disregard the need to observe the ampacity adjustment factors prescribed in 310.15(B)(3)(a) but fall short when understanding that use of those adjustment factors are necessary when the wireway or any portion of the wireway exceeds 30 current-carrying conductors. This condition could occur in several different locations within the wireway each location requiring a separate set of adjustment factor**.**

7. The use of NM cable in other structures permitted to be Types III, IV or V construction.

Unlike the states bordering New Hampshire, the State of New Hampshire has no amendment to Section 334.10(3) with regard to NM cable installed in “other structures.”

Section 334.10, Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following, except as prohibited in 334.12:

Section 334.10(3). Other structures permitted to be types III, IV, and V construction. Cables must be concealed within walls, floors, or ceilings that provide a thermal barrier of material that has at least a 15-minute finish rating as identified in listings of fire-rated assemblies.
Quite often the focus of the reader of this section is on the 15-minute finish rating and the requirement for wiring method to be concealed is overlooked. The term “concealed” is defined in Article 100 as rendered inaccessible by the structure or finish of the building.

Examples of where NM cable is installed in a non-compliant manner with regard to being “concealed” is where it has been installed in an attic space of an “other structure” that is accessible through a scuttle hole or permanent stairway or above a suspended ceiling. Although the NM cable is not visible from below the sheetrock ceiling or the suspended ceiling, it has not rendered inaccessible by the building finish or structure and therefore does not meet the definition of “concealed.”

8. The Improper installation of exposed vertical risers from fixed equipment.

Sections 342.30(B)(3) and 344.30(B)(3) for Intermediate Metal Conduit and Rigid Metal Conduit respectively permit exposed vertical risers from industrial machinery or fixed equipment to be supported at intervals not exceeding 20’ provided there is no intermediate means of support available, the conduit is made up with treaded couplings and it is rigidly supported at the top and bottom of the riser. Essentially, this permits an intermediate or rigid metal conduit with threaded couplings to be run up 20’ from fixed

equipment. Quite often vertical riser installations are made using electrical metallic tubing (EMT). There is no allowance in Article 358 for exposed vertical risers to be installed in this manner.

A common application of this installation method occurs in open areas of retail stores when power is required for displays, cash registers or copying equipment and no power is readily available. Where installing a raceway in or under the floor is not an option an exposed vertical riser is run from the fixed equipment, which in many cases is a receptacle outlet, to the bottom of the metal structural framing member. It is not uncommon to find that EMT has been installed instead of intermediate or rigid metal conduit for the exposed vertical riser.

9. The use of Flexible Cords and Cables, Article 400

Flexible cords and cables are located in Chapter 4, Equipment for General Use and are not considered a Chapter 3 General Wiring Method. Unless specifically allowed elsewhere in the code, the requirements for flexible cords and cables are described in Section 400.7 Uses Permitted and Section 400.8 Uses Not Permitted.

A common installation of this product occurs when supplying power to a small window sign, ceiling mounted TV or overhead projector. When the items mentioned are installed adjacent to or under a suspended ceiling, the flexible supply cord is commonly passed through a hole in the suspended ceiling and the attachment plug of the flexible cord is then inserted into a receptacle above the suspended ceiling or when supplying a sump pump for an elevator pit, passing the flexible cord through the wall between the elevator mechanical room and the elevator shaft.

However, these types of flexible cord installation are a violation of Section 400.8(2) which prohibits the flexible cords from being passed through a hole in a fixed ceiling, wall, suspended or dropped ceiling and floors and Section 400.8(5) where concealed by walls, floors, or ceilings or located above suspended or dropped ceilings.

10. Outdoor Receptacles required to be listed Weather-Resistant (WR).

Weather-resistant receptacles were first required in 2008 for all 15- and 20-ampere, 125- and 250 –volt non-locking receptacles installed in damp or wet locations, per section 406.9(A)(1). In 2011, it was upgraded to require replacement GFCI receptacles to be of the weather-resistant type, as per section 406.4(D)(6). This WR listed receptacle is manufactured to resist the deterioration that can occur when exposed to wet and damp locations. It is also important to note that the 2014 edition of the NEC now requires an extra heavy duty outlet cover per section 406.9(B)(1). In some applications, like a residential wet location, an outdoor GFCI receptacle would be required to have a (tamper resistant) TR and WR identified stamp on the faceplate, and protected by an extra heavy duty hooded cover.

11. 404.8(A) The mounting height of switches

Switches and circuit breakers used as switches shall be located "such that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, is not more than 2.0 m (6 ft. 7 in.) above the floor or working platform." We must be careful when installing equipment that contains

switches and circuit breakers, particularly a "motor control center." These manufactured packages are built with the intention to get as much as possible within the width and height manufacturing restrictions. The switch height limitation is considered and therefore will influence the height of the switch when it is in its highest position.

The problem begins when the contractor decides to install the motor control center upon a 4" raised maintenance pad which elevates the switch height beyond the limit of 2.0 m (6 ft. 7 in.). The pad usually does not extend into the working area in front of the equipment and therefore in most cases a working platform has to be added to meet compliance regulations according to 404.8(A) of the NEC.

12. 408.4(A) Circuit Directories or Circuit Identification

Electricians need to pay close attention to the requirements of 408.4(A) to be sure that they understand the prescribed method. This section was not clear in past code cycles, circuit directories would identify circuits in simple terms such as: "stove, dw, hot water, lights, lights, lights, outlets, outlets or bath." Even commercial panels could contain such elaborate descriptions as: "office lights, office lights, office outlets, outlets, lights and HVAC, HVAC, HVAC." The 2005 NEC incorporated an important change in 408.4. "The identification shall include sufficient detail to allow each circuit to be distinguished from all others." The latter sentence was added to the 2005 NEC and has increased a challenge to the electrician to be more specific in order to distinguish each circuit breaker from all others located within the same panelboard. Be careful to identify each circuit as to its "clear, evident, and specific purpose or use." The 2008 NEC prohibited the description to include "transient conditions of occupancy." In other words the description cannot include such terms as: "Betty's room" or "Jack's office."

The 2014 NEC incorporated a change to section 408.4(A) that identification shall include an approved degree of detail that allows each circuit to be distinguished from all others. Section 408.4(B) requires all switchboards, switchgear and panelboards supplied by feeder(s) in other than one or two-family dwellings shall be marked to indicate each device or equipment where the power originates.

13. The improper connection of septic pumps.

There are several different problems that can stem from septic pump installations. First, 430.102(A) requires the installation of a disconnecting means in sight from a motor controller location that disconnects the controller. In the case of the typical residential septic pump installation the controller would be the float switch in the pump tank. Section 430.102(B) requires a disconnecting means in sight from a motor location to disconnect the motor. In this case it is possible to satisfy both requirements with one disconnecting means located at the tank as the controller and the motor are both within site of the disconnecting means. Article 100 defines "in sight from" to be visible and within 50'. So there must be a disconnecting means that is visible and located no more than 50' from the pump tank. In most residential cases the cords for the pump and controller (float switch) are supplied from a receptacle located near the tank so the attachment cap for the controller and pump cord can serve as the disconnecting means.

Most often the homeowner does not want to see a pedestal with a receptacle and the cords so the attachment caps are cut off and the cords are wired directly (hard wired) into a junction box that is located in the tank. If the pump and controller have been hard wired many times there is no disconnect at all located within site from the motor or controller. In some cases the manufacturer prohibits the removal of the cord cap and float assembly end so this would be a violation of 110.3(B) installing in accordance with

the manufacturer's requirements. In other cases the receptacle has been installed inside the pump tank. Before making this kind of installation, consideration should be given to the issues of accessibility and corrosion. Also, depending on the size and type of the system, there may be sufficient hazardous vapor in the pump chamber to consider classification of the location. Classified locations are more common in commercial and industrial applications.

14. There are signage requirements that are not being performed in the field as required by the NEC.

Section 700.7(A) - 701.7(A) - 700.2(A). The NEC requires the following signage shall be placed at the service-entrance equipment that indicates the type and location of on-site by power sources.

Section 700.7(B) -701.7(B) -702.7(B) a warning sign is needed to identify the shock hazard if the bonding jumper is removed while the source is energized.

WARNING
SHOCK HAZARD EXISTS IF GROUNDING
ELECTRODE CONDUCTOR OR BONDING JUMPER
CONNECTION IN THIS EQUIPMENT IS REMOVED
WHILE ALTERNATE SOURCE(S) IS ENERGIZED.

Photovoltaic Systems are more popular than ever. The signage for this electric system is very important for the safety of the electrician, owners, and first responders to an emergency such as a fire in or on the roof of a structure.

690.5(C) Labels and Markings.

690.7(E) Bipolar Source and Output Circuits.

690.13(B) Marking.

690.17(E) Interrupting Rating.

690.18(B) Identification and Grouping.

Arc-Flash and Available Fault Current signage are not being installed in the field on electrical services and equipment as required by the NEC.

Section 110.16 Arc-Flash Hazard Warning.

Section 110.24 Available fault currents.

Section 110.24(B) Modifications

Section 110.21 Marking. Has been revised for the 2014 NEC and is worthy of a second look for signage requirements.

15. The separation of Emergency System Conductors from other conductors.
700.10 Wiring, Emergency Systems.

Section 700.10(B) requires that wiring from an emergency source or emergency source distribution overcurrent protection to the loads be kept entirely independent of all other wiring and equipment unless it is otherwise permitted in 700.10(B)(1)–(5). These numbered paragraphs permit the emergency system wiring to be combined with: (1) The wiring from the normal power source located in transfer equipment enclosures; (2) The wiring from two sources in exit or emergency luminaires; (3) The wiring from two sources in a listed load control relay supplying exit or emergency luminaires or in a common junction box, attached to exit or emergency luminaries; (4) The wiring within a common junction box attached to unit equipment, containing only the branch circuits supplying the unit equipment and the emergency circuit supplied by the unit equipment. (5) Wiring from an emergency source to supply emergency and other loads in accordance with 700.10(B)(5)a, b, c, and d as follows:
a. Separate vertical switchgear sections or separate vertical switchboard sections, with or without a common bus, or individual disconnects mounted in separate enclosures shall be used to separate emergency loads from all other loads;
b. The common bus of separate sections of the switchgear, separate switchboard sections can be supplied by single or multiple feeders without overcurrent protection at the source;

Exception to (5)(b), Overcurrent protection shall be permitted at the source or for the equipment, provided that the overcurrent protection complies with the requirements of 700.28.

c. Emergency circuits shall not originate from the same vertical switchgear section, vertical switchboard section, panelboard enclosure, or individual disconnect enclosure as other circuits.
d. It is permissible to utilize single or multiple feeders to supply distribution equipment between an emergency source and the point where the emergency loads are separated from all other loads.

There is often confusion related to the phrase “wiring from the emergency source to the loads or source distribution overcurrent protection to the emergency loads shall be kept entirely independent of all other wiring.” This was especially true from the source to the distribution equipment.

Although a much debated topic, this phrase means that we must keep the wiring from the emergency source to the emergency loads entirely independent of all other wiring or we must keep the wiring from the emergency source distribution overcurrent protection to the emergency loads entirely independent from all other wiring. The widely varying interpretations of: “keeping the emergency wiring entirely independent of all other wiring” was significantly reduced by the 2008 language in 700.9(B)(5). The revision of that section in the 2008 NEC clarified how the separation should take place.

One of the common misapplications is to run a feeder from the source to one distribution panelboard while combining the emergency system overcurrent protection in the same enclosure with the legally required standby and/or optional standby overcurrent protection. Under this circumstance the “wiring” to the emergency loads has been combined in the same enclosure with legally required standby and/or the optional standby wiring. Therefore, the wiring to the emergency loads has not been kept “entirely independent of all other wiring.”

Note that none of the previously discussed items in 700.10(B)(1)-(5) permit this application. In fact, the language in 700.10(B)(5) c. specifically prohibits emergency wiring from originating in the same vertical

switchgear section, vertical switch board section, panelboard enclosure, or individual disconnect enclosure as other circuits enclosures with the either the legally required standby or the optional standby wiring. You would, however, be allowed to run two or more feeders from the source to separate panelboards. The first panelboard would contain strictly emergency system overcurrent protection and wiring and the other panelboard(s) could contain the legally required standby and/or the optional standby system overcurrent protection and wiring. In this case, the wiring to the emergency loads has been kept "entirely independent of all other wiring."

Where there is no overcurrent protection located at the source or the equipment or where those overcurrent devices have been coordinated with the downstream overcurrent protection, it is permitted to run one feeder to separate sections of switchgear with a common bus containing emergency, legally required standby and optional standby system overcurrent protection where the emergency source distribution overcurrent protection and wiring to the emergency load(s) is located in a separate section of the switchgear. Installed in this manner, the wiring from the emergency source distribution overcurrent protection to the emergency loads has been kept entirely independent of all other wiring.

There is still one issue that is not specifically addressed that requires careful consideration and may still be subject to varying interpretations. The question is: how is the separation to take place when there is more than one overcurrent device located at the source? The example would be where a generator has been provided with two or more overcurrent devices and at least one is supplying emergency wiring and the other(s) is supplying legally required standby or optional standby. In this example the separation requirements of 700.10(B) take place at the source as the delineation of the emergency wiring from the other wiring (legally required standby or optional standby) is at the source. Therefore, the emergency circuit wiring (which is connected to the load side of the overcurrent device) must be separated from the other system's circuit wiring in order to meet the requirement that the emergency circuit wiring be kept entirely independent of all other wiring. This could be by a permanent barrier or by mounting the overcurrent devices in separate enclosures.

16. The installation of branch circuits supplying emergency lighting.

The most common misunderstanding of the requirements for the installation of branch circuits that supply emergency lighting occurs in stairwells. An example of this would be where a single branch circuit has been utilized to supply all the luminaires in a stairwell from an emergency panelboard. This section was revised for 2011to clarify how emergency lighting branch circuits are to be installed and to more clearly identify the section applies to branch circuits.

Section 700.17 requires branch circuits supplying emergency lighting to provide service from a source complying with 700.12 when the normal supply for lighting is interrupted. Such installations shall provide either:

(1) An emergency lighting supply, independent of the general lighting supply, with provisions for automatically transferring the emergency lights upon the event of a failure of the normal lighting branch circuit.

The most common application of 700.17(1) is where a single branch circuit has been used to supply the normal lighting in a stairwell and unit equipment or luminaires with self-contained ballasts have been

installed to provide the emergency lighting. In this case, there are provisions for automatically transferring to the emergency lighting upon failure of the normal lighting branch circuit.

(2) Two or more branch circuits supplied from separate and complete systems with independent power sources. One of the two power sources and systems shall be part of the emergency system, and the other shall be permitted to be part of the normal power source and system. Each system shall provide sufficient power for emergency lighting purposes.

The section goes on to explain that unless both systems are used for regular lighting purposes and both are kept lighted, means shall be provided for automatically energizing either system upon the failure of the other system. Either or both systems are permitted to be part of the general lighting of the protected occupancy if circuits supplying lights for emergency illumination are installed in accordance with other sections of Article 700.

The most common compliant application of 700.17(2) is where two branch circuits have been installed to supply the lighting in a stairwell. One branch circuit is supplied from the normal lighting panelboard and the other is supplied from the emergency lighting panelboard. Each of the circuits individually must supply a sufficient number of luminaires to provide the minimum required emergency egress lighting. In this case we have independent power supplies and because we have two branch circuits supplied by independent power we have complete and separate systems.

A common misapplication of 700.17(2) is where a single branch circuit has been run from the emergency lighting panelboard to the stairwell. There is independent power supply because one power system originates from the normal supply and the other originates from the emergency power source. However, they are sharing a common transfer switch, a common feeder from the transfer switch to emergency panelboard and a common panelboard so they are not "separate and complete systems."