

Reciprocal Electrical Council Inc.
An Evening with the Electrical Inspectors
Code Questions Based on the MEC, MRC, & Part-8 Rules
October 20, 2011

1. Is “ground-fault protection of equipment” required for a 1,200 amp service disconnect that is fused at 800 amps? The service in question is on a three-phase, 480/277 volt system.

Answer:

Yes - 230.95 Ground-Fault Protection of Equipment. Ground-fault protection of equipment shall be provided for solidly grounded wye electric services of more than 150 volts to ground but not exceeding 600 volts phase-to-phase for each service disconnect rated 1000 amperes or more. The grounded conductor for the solidly grounded wye system shall be connected directly to ground through a grounding electrode system, as specified in 250.50, without inserting any resistor or impedance device.

2. A large electrical project has gone through a required plan review and the engineering requirements were more stringent than that required by the code. The contractor completed the project fulfilling the minimum code requirements but did not hold to the higher engineering requirements of the approved plans and specifications. Can the electrical inspector require the design professional to submit a document indicating that he recognizes and acknowledges the changes from the original drawing and standards? If so, can the electrical inspector withhold final approval for the project until receiving these documents?

Answer:

No - Electrical inspectors can only interpret and apply the Michigan Electrical Code.

Michigan Part 8 Rules 80.14

“The Code official; shall enforce the provisions of the code and act on any question relative to the installation, alteration, repair, maintenance or operation of electrical wiring and equipment, except as otherwise provided for by statute”

Michigan Part 8 Rules 80.19

“...if the electrical installation or alterations of, changes in, or addition to, electrical conductors or equipment are found to be in compliance with the provision of the code and if the work has passed the inspection of the enforcing agency, then the enforcing agency shall, upon the request of the permit holder to whom the permit was issued, issue a certificate of the final electrical inspection...”

Michigan Part 8 Rules 80.21.2 Review of Construction Documents

“The enforcing agency shall review the application, construction documents and other data filed by an applicant for a permit. If the enforcing agency finds that the proposed work conforms to the requirements of the code and related laws and ordinances and that the fees are paid, then the agency shall issue a permit to the applicant.”

3. When bonding the secondary of a transformer, can the neutral conductor be connected to the equipment grounding terminal at both the transformer and the first disconnect?

Answer:

No, not normally. Section 250.30(A)(1) prohibits that. The intent is to avoid circulating currents within the system.

However, Ex. No. 2 does permit it under some circumstances – mainly, nonmetallic raceways with no equipment grounding conductor.

4. Does an electrical inspector have the authority to require a registered electrical apprentice to stop work if there is no licensed journeyman on the site?

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Answer:

Yes - P.A. 217 of 1956 MCL, The Electrical Administrative Act, Section 338.883e (3) & (4) specify the ratio requirements for apprentice electricians. These requirements stipulate that the enforcing agency **shall** enforce the ratio on a jobsite basis. Further 80.20.1 in the Michigan Part 8 Code Rules requires a permit holder to have a person licensed pursuant to the act present at **all** times when electrical construction is in progress

5. If the interior of an electrical panel has been sprayed or over-sprayed with paint or any insulating material, what course of action should be taken if any?

Answer:

It is up to the AHJ to make the call. Depending on the severity of the spraying and whether or not any bus bars wiring terminals or insulating materials have been affected, you may have to replace the panel. UL has not evaluated the effects of paint or spray foam insulation or cleaning fluids on any part of the equipment and do not know what the long or short term effects would be on those materials.

See NEC 110.12(B) which states, (B) Integrity of Electrical Equipment and Connections.

Internal parts of electrical equipment, including bus bars, wiring terminals, insulators, and other surfaces, shall not be damaged or contaminated by foreign materials such as paint, plaster, cleaners, abrasives, or corrosive residues. There shall be no damaged parts that may adversely affect safe operation or mechanical strength of the equipment such as parts that are broken; bent; cut; or deteriorated by corrosion, chemical action, or overheating.

6. I have a building that has two services from the utility. Do I have to use the same grounding system for both?

Answer:

Yes - **NEC 250.58 Common grounding electrode.** Where an ac system is connected to a grounding electrode in or at a building or structure, the same electrode shall be used to ground conductor enclosures and equipment in or on that building or structure. Where separate services, feeders or branch circuits supply a building and are required to be connected to a grounding electrode(s), the same grounding electrode(s) shall be used. Two or more grounding electrodes that are effectively bonded together shall be considered as a single grounding electrode system.

MRC E3607.6 Common grounding electrode

MRC-E3601.6.3 Separate outdoor electric space conditioning equipment

MRC-E3601.6.4 Electric vehicle charging system service disconnect

7. A kitchen counter has a 60" window behind it in lieu of a wall. There is no backsplash high enough to install a receptacle within the 24" rule. Would a receptacle installed at each end of the glass be sufficient?

Answer:

No - E3901.4.1 Wall countertop space. A receptacle outlet shall be installed at each wall countertop space 12 inches (305 mm) or wider. Receptacle outlets shall be installed so that no point along the wall line is more than 24 inches (610mm), measured horizontally from a receptacle outlet in that space.

Exception: Receptacle outlets shall not be required on a wall directly behind a range, counter-mounted cooking unit or sink in the installation described in Figure E3901.4.1.

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E3901.4.5 Receptacle outlet location. Receptacle outlets shall be located not more than 20 inches (508 mm) above the countertop. Receptacle outlets shall not be installed in a face-up position in the work surfaces or countertops. Receptacle outlets rendered not readily accessible by appliances fastened in place, appliance garages, sinks or range tops as addressed in the exception to Section E3901.4.1, or appliances occupying dedicated space shall not be considered as these required outlets.

Exception: Receptacle outlets shall be permitted to be mounted not more than 12 inches (305 mm) below the countertop in construction designed for the physically impaired and for island and peninsular countertops where the countertop is flat across its entire surface and there are no means to mount a receptacle within 20 inches (508 mm)

8. Can electrical equipment rooms containing overcurrent devices be locked? Does the same hold true for locking panel covers and disconnecting means?

Answer:

Yes - First Define "enclosure"

Enclosure. The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. NEC Art 100

ART 110.26(G)

G) Locked Electrical Equipment Rooms or Enclosures. Electrical equipment rooms or enclosures housing electrical apparatus that are controlled by a lock(s) shall be considered accessible to qualified persons.

9. Is it a code requirement to install a ground rod at the base of light poles for a commercial parking lot?

Answer:

No, it is not a code requirement, although, it is commonly specified. (See Question No. 2 for a discussion about whether specifications are enforceable.)

Section 250.32(A) does require grounding electrode systems for all buildings or structures. But, there is an exception for buildings or structures that are supplied by a single branch circuit, including multiwire branch circuits.

The same pattern is followed in Section 225.32 Ex. No. 3, which exempts light poles from the requirement for disconnects at buildings or structures.

10. Can a junction box contain conductors fed at both 277V and 120V?

Answer:

Yes - Article 300.3 (C) (1) in the 2008 NEC/NFPA 70 allows conductors of different systems to occupy the same equipment wiring enclosure, cable, or raceway provided that all conductors have an insulation rating equal to at least the maximum system voltage applied. Article 200.6 (D) requires that grounded conductors of different systems installed in the same raceway shall be identified by system in accordance with (D) (1) through (3). Equipment grounding conductor identification is covered in 250.119. Branch Circuit conductor identification is covered in 210.5 (C).

11. Which is the proper way to install the grounding terminal of a receptacle? Should the ground terminal go up or down?

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Answer:

This has recently been hotly debated on Charlie Trout's Code Question of the day. There is nothing in the NEC that dictates the ground pin orientation nor the UL Standard for Attachment Plugs and Receptacles, UL 498. It is up to your preference or the way you were trained. I would also suggest checking the local requirements in the jurisdiction that you are doing the job in, just in case there is a preference by the electrical inspector.

12. Are there any special requirements for installing electrical panels in closets?

Answer:

Yes - **NEC 240.24 Location in or on Premises (D) Not in Vicinity of Easily ignitable Material.** Overcurrent devices must not be located near easily ignitable material, such as in clothes closets.

Article 100, Clothes Closet. Clothes closet is a nonhabitable room or space intended primarily for storage of garments and apparel.

MRC- E3705.7 Location of overcurrent devices in or on premises.

13. What is the limit on how far the bathroom receptacle must be from a shower or bathtub?

Answer:

Not in tub or shower space— E4002.11 Bathtub and shower space. A receptacle shall not be installed within or directly over a bathtub or shower stall.

E4001.7 Damp or wet locations. A surface mounted switch or circuit breaker located in a damp or wet location or outside of a building shall be enclosed in a weatherproof enclosure or cabinet. A flush-mounted switch or circuit breaker in a damp or wet location shall be equipped with a weatherproof cover. Switches shall not be installed within wet locations in tub or shower spaces unless installed as part of a listed tub or shower assembly.

14. When installing recessed fixtures what is the smallest size wire you can use for a lighting fixture whip?

Answer:

410.110 (C) Tap Conductors. Tap conductors of a type suitable for the temperature encountered shall be permitted to run from the luminaire terminal connection to an outlet box placed at least 300 mm (1 ft) from the luminaire. Such tap conductors shall be in suitable raceway or Type AC or MC cable of at least 450 mm (18 in.) but not more than 1.8 m (6 ft) in length.

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15. Can a GFCI receptacle be installed on an AFCI-protected circuit?

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Answer:

Yes - There is no code issue or any technical conflict.

The only issue could be a practical one when troubleshooting a tripped AFCI and trying to determine why it tripped. Since most (but not all) AFCI's include a level of GFP that is set at either 30 or 50 mA, determining if an AFCI tripped on an arc-fault or a ground fault becomes the first question in the troubleshooting process.

16. Can an electrical inspector require that an apprentice leave a commercial job site if there is only one journeyman but three apprentices? Do the same ratios apply to industrial facilities?

Answer:

Yes - Section 338.883e(3) (4) of P.A. 217 of 1956 requires that the ratio of electrical apprentices to journeyman or master electricians be on a one to one basis on all electrical work which includes commercial or industrial electrical installations. The enforcing agency shall enforce this requirement on a jobsite basis. Parentheses' (4) of this section allows for a ratio of 2 electrical apprentices to one journey or master electrician on single family dwellings and multifamily dwellings up to 8 units. Violations of this requirement may result in sanctions set forth in the act of both the electrical contractor and the electrical apprentice.

17. Can EMT be used in poured concrete or in poured masonry wall?

Answer:

Yes, provided the EMT is judged to have adequate corrosion protection. NEC 358.10(B) Uses permitted, Corrosion protections states: Ferrous or nonferrous EMT, elbows, couplings, and fittings shall be permitted to be installed in concrete, in direct contact with the earth, or in areas subject to severe corrosive influences where protected by corrosion protection and judged suitable for the condition.

UL Lists EMT under the product category Electrical Metallic tubing (FJMX) located on page 141 of the 2011 UL White Book. The Guide Information for FJMX states:

Galvanized steel electrical metallic tubing installed in concrete on grade or above generally requires no supplementary corrosion protection. Galvanized steel electrical metallic tubing in concrete slab below grade level may require supplementary corrosion protection.

In general, galvanized steel electrical metallic tubing in contact with soil requires supplementary corrosion protection. Where galvanized steel electrical metallic tubing without supplementary corrosion protection extends directly from concrete encasement to soil burial, severe corrosive effects are likely to occur on the metal in contact with the

18. What are the standard heights for mounting receptacles and switches in a commercial building if the building is required to be accessible to disabled persons?

Answer:

Section 308 of ICC/ANSI A117.1-2003. Unobstructed: The standard unobstructed reach ranges are from 15 to 48 in.

American National Standard Institute-Accessible and Usable Buildings and Facilities. Adopted as part of the MBC

19. What is the minimum burial depth for a conduit feeding a wet niche swimming pool light?

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Answer:

E4203.7 6" for metal conduit, 18" for non-metallic conduit— Underground wiring. Underground wiring shall not be installed under or within the area extending 5 feet (1524 mm) horizontally from the inside walls of pools and outdoor hot tubs and spas except where the wiring is installed to supply pool, spa or hot tub equipment or where space limitations prevent wiring from being routed 5 feet (1524 mm) or more horizontally from the inside walls. Where installed within 5 feet (1524 mm) of the inside walls, the wiring method shall be a complete raceway system of rigid metal conduit, intermediate metal conduit or a nonmetallic raceway system. Metal conduit shall be corrosion resistant and suitable for the location. The minimum cover depth shall be in accordance with Table E4203.7.

20. Are there different requirements regarding the installation of receptacles face up on counter tops in commercial and residential occupancies?

Answer:

In residential occupancies:

Art 406.4(E) (E) Receptacles in Countertops and Similar Work Surfaces in Dwelling Units. Receptacles shall not be installed in a face-up position in countertops or similar work surfaces.

In commercial installations...I could find no requirement. I would say that the receptacle has to be suitably protected with an adequate cover.

21. Is it allowable to use Type NM Cable (Romex) in a four-story apartment building?

Answer:

There are different answers based on the NEC vs. the MEC.

In the NEC, Sec 334.10, NM Cable – Uses Permitted, the answer is maybe. It depends on the type of building construction.

However, in the Michigan Electrical Code the answer is yes. That Section has been amended in the MEC to permit NM cable in multi-story apartment buildings, regardless of the construction type.

22. Is a receptacle required behind the swing of a door in a bedroom of a dwelling unit, even if the wall is only 30 inches long?

Answer:

Yes - Chapter 39 in the 2009 Michigan Residential Code (MRC) covers the requirements for receptacle spacing in dwelling units. E3901.2.1 in the 2009 MRC specifies that receptacles shall be installed so that no point measured horizontally along the floor line in any wall space is more than 6 feet from a receptacle outlet. The wall space behind the swing of a door would be included in this requirement however if an adjacent wall running perpendicular to the space behind the door swing contained a receptacle outlet that complied with the requirements of E3901.2.1 than that would be acceptable. If the 30 inch wide space behind the door swing was a stand alone space cut off by a doorway or other obstruction than a receptacle outlet would be required in that 30 inch wall space.

23. Does a wall-mounted emergency light that contains a wiring compartment need a box in the wall or can you make up the wires inside the light?

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Answer:

I don't see why they couldn't if the light was Listed that way. This is a NEC 110.3(B) issue; see the installation instructions provided with the unit. NEC 700.9(B) 3 and 4 permit wiring from emergency and normal circuits to be comingled in a common junction box attached to the emergency luminaire.

UL Lists emergency luminaires under the category Emergency Lighting and Power Equipment (FTBR), located on page 150 in the 2011 UL White Book.

24. Is plenum rated cable allowed to be installed inside of a supply air duct to wire the temperature sensor that is located inside of the duct?

Answer:

No - NEC 300.22 Wiring in Ducts, Plenums and Other Air-Handling Spaces. (B) Ducts or Plenums Used for Environmental Air. Only wiring methods consisting of Type MI cable, Type MC cable employing a smooth or corrugated impervious metal sheath without an overall nonmetallic covering, electrical metallic tubing, flexible metallic tubing, intermediate metal conduit, or rigid metal conduit without an overall nonmetallic covering shall be installed in ducts or plenums specifically fabricated to transport environmental air. Flexible metal conduit shall be permitted, in lengths not to exceed 1.2 m (4 ft), to connect physically adjustable equipment and devices permitted to be in these ducts and plenum chambers. The connectors used with flexible metal conduit shall effectively close any openings in the connection. Equipment and devices shall be permitted within such ducts or plenum chambers only if necessary for their direct action upon, or sensing of, the contained air.

NEC 725.3 Other Articles. (C) Ducts, Plenums, and Other Air-Handling Spaces. Class 1, Class 2, and Class 3 circuits installed in ducts, plenums, or other space used for environmental air shall comply with 300.22.

25. Is it the electrical inspector's responsibility to inspect cable TV, telephone, and fiber optic installations even if no permit is required?

Answer:

Yes - Michigan Electrical Code 2009

80.1. Scope. The code regulates the design, installation, maintenance, alteration, and inspection of electrical systems including **all wiring**, fixtures, appliances, and appurtenances in connection with the utilization of electrical energy, within or on a building, structure, or properties, and including service entrance wiring as defined by the code.

Exception: Electrical wiring and equipment within 1- and 2-family dwellings shall be constructed, installed, and maintained in accordance with the Michigan residential code.

80.1.3. Code conformity required. A person shall not install, alter, maintain, service, or repair, or cause or permit the installation, altering, maintaining, servicing, or repairing of electrical equipment in or on any building, structure, or part thereof, or on any premises, if by the person's action the work does not conform to the provisions of the code.

26. A high-rise structure requires a fire pump. Is the pump required to have an emergency generator? Is it required to be on an emergency system?

Answer:

The answer is in NEC Article 695 and NFPA 20.

695.3 Power Source(s) for Electric Motor-Driven Fire Pumps.

Electric motor-driven fire pumps shall have a reliable source of power.

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- A. Individual Sources. Where reliable, and where capable of carrying indefinitely the sum of the locked-rotor current of the fire pump motor(s) and the pressure maintenance pump motor(s) and the full-load current of the associated fire pump accessory equipment when connected to this power supply, the power source for an electric motor driven fire pump shall be one or more of the following:
 - 1. A separate utility service connection, or from a connection located ahead of and not within the same cabinet, enclosure, or vertical switchboard section as the service disconnecting means...
 - 2. On-site power production facility
- B. Where reliable power cannot be obtained, power shall be supplied from an approved combination of two or more of either of such sources' or from an approved combination of feeders constituting two or more power sources, or from an approved combination of one or more such sources in combination with an on-site stand-by generator

SO what's "Reliable"?

Annex to NFPA 20-2007 says:

- 1. The source power plant has not experienced any shut-downs longer than 4 hours in the prior year.
- 2. No Grid "power failures not caused by natural disaster or grid management failure
- 3. Normal source not supplied by overhead conductors only the disconnect switches and over current protection devices permitted by 9.2.3 are installed in the normal source of power. Everything else is in the controller

Also, MUST be able to carry Indefinitely the locked-rotor current of the pump and associated equipment,.

There are NO generators listed as "emergency generators: all are "stand-by generators. If the generator is ONLY for the fire pump, it does NOT have to meet the requirements in ART 700.

Article 700 is ONLY for emergency equipment directly related to life safety., fire pumps are usually considered ART 701 equipment, Legally Required Standby. Initiation can be much longer, wiring can be combined with other loads, etc.

27. Is there a code requirement for bonding CSST gas piping?

Answer:

Yes - But it depends on which code are we talking about.

In the 2008 NEC, Sec. 250.104(B) does require the bonding of "metal piping" (other than metal water piping) without any specific reference to CSST or any differentiation between CSST and standard, black-iron gas piping.

The 2011 NEC, which has not yet been adopted in Michigan, has added Informational Note No. 2, to Section 250.104(B) referencing NFPA 54, the National Fuel Gas Code. NFPA 54 does have a mandatory requirement. However, informational (or fine print) notes in the NEC are not mandatory requirements (see Sec. 90.5). So, this has no effect since Michigan has not adopted NFPA 54. (Note: what have been "Fine Print Notes", until now, are called "Informational Notes" in the 2011 NEC).

However, the 2009 Michigan Residential Code does have a mandatory CSST bonding requirement in Sec. E3609.7.2. In summary, it requires a bonding jumper, sized to the grounding electrode conductor. It must be connected to the hard-wall gas piping between the gas meter and the first CSST fitting. The other end of this bonding conductor is required to be connected to the service neutral or to a point on the grounding electrode system.

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For other than one and two family dwellings, the 2009 International Fuel Gas Code, in Section 310.1.1, requires bonding to CSST with a 6 AWG copper conductor, where the gas service enters the building. Michigan has adopted this code.

28. Should the inspector require that all fixtures be lamped at the time of the final inspection to ensure the correct type of lamp is installed according to the listing of the fixture?

Answer:

Yes - Both the MEC and The MRC require that listed and labeled equipment shall be installed and used in accordance with any instructions include in the listing and labeling.

29. Can USE cable with dual rated conductors (RHH, RHW or THWN) be taken into a structure?

Answer:

Yes, if it is dually rated and marked, then you can treat it as USE cable and whatever it is dually rated as such as RHW. You would then have to follow the rules for RHW.

UL Lists USE cable under the category Service Entrance cable (TYLZ), located on page 378 in the 2011 UL White Book.

30. Are the working space clearances the same for a fire alarm control panel as those 110.26?

Answer:

Yes - **NEC 110.26 Spaces About Electrical Equipment.** Sufficient access and working space shall be provided and maintained about all electrical equipment to permit ready and safe operation and maintenance of such equipment.

NEC 110.26 (A) Working Space. Working space for equipment operating at 600 volts, nominal, or less to ground and likely to require examination, adjustment, servicing, or maintenance while energized shall comply with the dimensions of 110.26(A)(1), (A)(2), and (A)(3) or as required or permitted elsewhere in this Code. Article 110 contains the general requirements of the Code, and is applicable to all installations covered in Chapters one through seven (such as fire alarms in Article 760). Nothing in Article 760 supplements or modifies [90.3] the general rule of 110.26, so compliance is mandatory.

31. Section E4002.15 of the Michigan Residential Code addresses receptacle replacement. It allows replacing a non-grounded receptacle with a non-grounded receptacle. Being that a non-grounded tamper resistant outlet is not made, I assume a standard non-grounded outlet will meet the residential code for replacement only.

Answer:

Assumption is correct— E4002.14 Tamper-resistant receptacles. In areas specified in Section E3901.1, 125-volt, 15- and 20-ampere receptacles shall be listed tamper-resistant receptacles.

E4002.14 is for new construction circuits or extensions of existing circuits.

E4002.15 is for replacements on existing circuits.

Same rules as the NEC 406.4(D)

32. What are the lighting and switching requirements for stairways in both residential and commercial applications?

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Answer:

210.70 (A)(2)(C) (c) Where one or more lighting outlet(s) are installed for interior stairways, there shall be a wall switch at each floor level, and landing level that includes an entryway, to control the lighting outlet(s) where the stairway between floor levels has six risers or more.

Exception to (A)(2)(a), (A)(2)(b), and (A)(2)(c): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

There are no switching requirements in commercial applications except on: Emergency lighting and 20 wall switch control required in hotel/motel suites in kitchens and baths

33. Can a dry type transformer be continuously loaded to its full rating (i.e. can a 75 kva transformer be used with 75kva of load) or should the maximum continuous load be limited to 80%?

Answer:

Yes, it can be both fully and continuously loaded. There is no code requirement to limit the continuous load to 80%. To put it differently, transformers are not treated like overcurrent devices – where there are continuous load restrictions.

ANSI/IEEE Standard C57.96, the Guide for Loading Dry-Type Distribution and Power Transformers, indicates that operating a fully loaded transformer continuously should result in a normal useful life of 20 years.

34. A lot of the new ceiling fan/lights are equipped with a remote device. If this remote device is mounted on the wall in the traditional wall switch location, is it an acceptable alternative?

Answer:

No - Section E3903.2 Ex. 2. in the 2009 MRC allows the use of occupancy sensors with a manual override feature as an acceptable alternative to a customary wall switch however the exception does not include remote controlled switching devices.

35. Are there differences on how 15 and 20 amp receptacle are constructed and tested?

Answer:

I assume the 20A receptacles are constructed to carry the higher current. The test program for them is the same, however, for the 20A receptacles the test currents are higher based on the higher current rating in accordance with the Standard for Safety for Attachment Plugs and Receptacles, UL 498.

36. What is the required burial depth for a grounding electrode conductor?

Answer:

There is no depth requirement for grounding electrode conductors, so, you can bury them as shallow as you like as long as you follow:

250.64 Grounding Electrode Conductor Installation.

B) Securing and Protection Against Physical Damage. Where exposed, a grounding electrode conductor or its enclosure shall be securely fastened to the surface on which it is carried. A 4 AWG or larger copper or aluminum grounding electrode conductor shall be protected where exposed to physical damage.

37. Is a warning tape required in a ditch if the conductors are in conduit?

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Answer:

No - See 300.5(D) 2009 NEC

(D) Protection from Damage. Direct-buried conductors and cables shall be protected from damage in accordance with 300.5(D)(1) through (D)(4).

(3) Service Conductors. Underground service conductors that are not encased in concrete and that are buried 450 mm (18 in.) or more below grade shall have their location identified by a warning ribbon that is placed in the trench at least 300 mm (12 in.) above the underground installation.

38. Do beverage machine dispensers at service stations and convenience stores need to be GFCI protected?

Answer:

Yes - 422.51 Cord-and-Plug-Connected Vending Machines.

Cord-and-plug-connected vending machines manufactured or re-manufactured on or after January 1, 2005, shall include a ground-fault circuit interrupter as an integral part of the attachment plug or be located within 300 mm (12 in.) of the attachment plug. Older vending machines manufactured or remanufactured prior to January 1, 2005, shall be connected to a GFCI-protected outlet. For the purpose of this section, the term vending machine means any self-service device that dispenses products or merchandise without the necessity of replenishing the device between each vending operation and is designed to require insertion of a coin, paper currency, token, card, key, or receipt of payment by other means.

39. Is there a listed wet location wire-nut other than the ones listed for direct burial or in below grade j-boxes?

Answer:

First of all, this is, in part, a trick question. The term Wire Nut[®] is a registered trade name of the Ideal Company. So, only they can make a "Wire Nut[®]".

Leaving that aside, yes, there are other companies that have these listings. They are listed under ZMWQ in the UL Directory.

NEC Section 110.3(B) requires listed products to be installed and used in accordance with the terms of their listing.

40. How could the calculations of the selective coordination, required by NEC 700.27, be verified in the electrical plan review?

Answer:

When reviewing a plan review where selective coordination is required for code compliance additional documentation may be required. Section 80.21 in the MEC Part 8 Rules states in part that "The selection of suitable disconnect and overcurrent devices to provide proper coordination and interrupting capacity for a wiring system is the responsibility of the designer. The enforcing agency, when approving electrical plans, does not assume responsibility for the design or for any deviations from any electrical drawings".

41. Can a receptacle be used as a splicing device by using all four screws for the hots and neutrals on the receptacle? Or, are pigtailed required? If that is okay, can the side-mounted screws and the push-in terminals be used at the same time?

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Answer:

Yes, you can use a receptacle as a splicing device by using all four screws for the hots and neutrals. Pigtails would be required for the neutral (grounded conductor) on a multiwire branch circuit. NEC 310.13(B) Device Removal. States that "In multiwire branch circuits, the continuity of a grounded conductor shall not depend on device connections such as lampholders, receptacles, and so forth, where the removal of such devices would interrupt the continuity" If you interrupt the neutral at a device on a multiwire branch circuit, you could impose higher voltages on the downstream devices.

Can the side-mounted screws and the push-in terminals be used at the same time? Yes, see the White Book starting on page 349 and ending on 351 under the category Receptacles for Plugs and Attachment Plugs, (RTRT). Under the heading of Terminals on page 350 it states:

.Single and duplex receptacles rated 15 and 20 A that are provided with more than one set of terminals for the connection of line and neutral conductors have been investigated to feed branch-circuit conductors connected to other outlets on a multi-outlet branch circuit, as follows:

- Back-wire (screw-actuated clamp type) terminations with multiple wire-access holes used concurrently to terminate more than one conductor
- Side-wire (binding screw) terminals used concurrently with their respective push-in (screwless) terminations to terminate more than one conductor

42. Can one duplex receptacle rated at 15 amps such as a Leviton TR5320 be the only device on a laundry circuit in a dwelling unit?

Answer:

Yes - 210.21 Outlet Devices. Outlet devices shall have an ampere rating that is not less than the load to be served and shall comply with 210.21(A) and (B).

210.21(B) Receptacles.

210.21(B)(1) Single Receptacle on an Individual Branch Circuit. A single receptacle installed on an individual branch circuit shall have an ampere rating not less than that of the branch circuit.

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Receptacle. A receptacle is a contact device installed at the outlet for the connection of an attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is two or more contact devices on the same yoke.

Receptacle Outlet. An outlet where one or more receptacles are installed.

210.21(B)(3) Receptacle Ratings. Where connected to a branch circuit supplying two or more receptacles or outlets, receptacle ratings shall conform to the values listed in Table 210.21(B)(3)

Table 210.21(B)(3) Receptacle Ratings For Various Size Circuits

Circuit Rating (Amperes)	Receptacle Rating (Amperes)
15	Not over 15
20	15 or 20
30	30

43. Would a GFCI receptacle located in a garage that is within 25 ft. of the outdoor A/C unit meet the requirements of 210.63?

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Answer:

Possibly—210.63 Heating, Air-Conditioning, and Refrigeration Equipment Outlet.

A 125-volt, single-phase, 15- or 20 ampere-rated receptacle outlet shall be installed at an accessible location for the servicing of heating, air conditioning, and refrigeration equipment. The receptacle shall be located on the same level and within 7.5 m (25 ft) of the heating, air-conditioning, and refrigeration equipment. The receptacle outlet shall not be connected to the load side of the equipment disconnecting means.

Exception: A receptacle outlet shall not be required at one and two-family dwellings for the service of evaporative coolers.

FPN: See 210.8 for ground-fault circuit-interrupter requirements.

Define accessible— In the garage may be an issue if the garage were locked

44. How many feet of USE cable can enter a house to feed a service?

Answer:

230.70 General.

Means shall be provided to disconnect all conductors in a building or other structure from the service-entrance conductors.

(A) Location. The service disconnecting means shall be installed in accordance with 230.70(A)(1), (A)(2), and (A)(3).

(1) Readily Accessible Location. The service disconnecting means shall be installed at a readily accessible location either outside of a building or structure or inside nearest the point of entrance of the service conductors.

No maximum distance is specified from the point of entrance of service conductors to a readily accessible location for the installation of a service disconnecting means. The authority enforcing this Code has the responsibility for, and is charged with, making the decision on how far inside the building the service-entrance conductors are allowed to travel to the service disconnecting means. The length of service-entrance conductors should be kept to a minimum inside buildings, because power utilities provide limited over current protection. In the event of a fault, the service conductors could ignite nearby combustible materials.

Some local jurisdictions have ordinances that allow service-entrance conductors to run within the building up to a specified length to terminate at the disconnecting means. The authority having jurisdiction may permit service conductors to bypass fuel storage tanks or gas meters and the like, permitting the service disconnecting means to be located in a readily accessible location.

45. If I can use an existing sub-panel without an insulated ground to feed a swimming pool, why is the insulated ground required for new sub-panels feeding swimming pools? Shouldn't one installation be as safe as the next?

Answer:

There is no technical answer to the question, just a practical one.

Section 680.25(A) Ex. allows a lower standard for existing feeders to panelboards that serve pool equipment.

When the requirement for an insulated equipment grounding conductor in these feeders was first added, in the 1968 Code, it included this exception so that existing feeders could still be used.

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There are other code requirements that include exceptions for existing conditions. See, for example Section 680.22(C)(3) for existing lighting outlets near swimming pools. Or, see Section 408.36 Ex. No. 3 for existing split-bus panelboards.

46. Can a service disconnecting means be located in the bathroom of a commercial or industrial building?

Answer:

No - Article 230.70 (A) (2) in the 2008 NEC prohibits the installation of a service disconnecting means in a bathroom.

47. What is the difference between weather-resistant receptacles and standard ones? Why were the standard type receptacles acceptable in the past but are suddenly not acceptable?

Answer:

15 and 20A, 125 and 250 volt weather resistant receptacles as required in damp and wet locations per 406.8 are required to be constructed with a sufficiently UV rated insulating material for the face and shutters of the receptacles as well as all the metal parts must be more corrosion resistant than under the old requirements. In addition to the general performance and construction requirements for receptacles in the Standard for Safety for Attachment Plugs and Receptacles UL 498, weather-resistant receptacles shall also comply with requirements for corrosion resistance, cold impact, accelerated aging, and resistance to ultraviolet light and water exposure. They are also required to be identified by the words "Weather Resistant" (or the letters "WR") where they will be visible after installation with the cover plate secured as intended. See the Guide Information for Receptacles for Plugs and Attachment Plugs, (RTRT) starting on page 349 in the 2011 UL White Book.

Weather resistant receptacles were added because there was statistical data submitted as substantiation to Code Making Panel -18 that demonstrated that receptacles over time installed in damp and wet locations indicated that deterioration and other detrimental conditions have a negative effect on receptacles, often resulting in receptacle faces becoming brittle and breaking. Even though the NEC has made significant progress in the cover requirements for receptacles installed in wet and damp locations, receptacles are often still exposed to varying degrees of moisture, UV, and impact under detrimental conditions (low and high temperatures). Non weather resistant or "standard" receptacles are not constructed or evaluated for such exposure to these conditions.

48. Can a 75 KVA transformer be installed in the space above a grid ceiling not used as a return air plenum?

Answer:

No - **450.13 Accessibility. (B) Hollow Space Installations.** Dry-type transformers 600 volts, nominal, or less and *not exceeding 50 kVA* shall be permitted in hollow spaces of buildings not permanently closed in by structure, provided they meet the ventilation requirements of 450.9 and separation from combustible materials requirements of 450.21(A). Transformers so installed shall not be required to be readily accessible.

49. Is type NM-B cable allowed in a barn where animals are housed if it is a dry location?

Answer:

No - 547.1(B)

(B) Corrosive Atmosphere. Agricultural buildings where a corrosive atmosphere exists. Such buildings include areas where the following conditions exist:

- (1) Poultry and animal excrement may cause corrosive vapors.
- (2) Corrosive particles may combine with water.
- (3) The area is damp and wet by reason of periodic washing for cleaning and sanitizing with water and cleansing agents.
- (4) Similar conditions exist.

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547.5 Wiring Methods.

(A) Wiring Systems. Types UF, NMC, copper SE cables, jacketed Type MC cable, rigid nonmetallic conduit, liquid tight flexible nonmetallic conduit, or other cables or raceways suitable for the location, with approved termination fittings, shall be the wiring methods employed. The wiring methods of Article 502, Part II, shall be permitted for areas described in 547.1(A)

50. PV system rooftop micro-inverters keep the DC voltages on the roof. Does the A/C wiring from the combiners passing through the attic also need to meet the rules for metallic conduit in 690.31(E)?

Answer:

(E) Direct-Current Photovoltaic Source and Output Circuits Inside a Building. Where direct-current photovoltaic source or output circuits of a utility-interactive inverter from a building-integrated or other photovoltaic system are run inside a building or structure, they shall be contained in metal raceways, or metal enclosures, from the point of penetration of the surface of the building or structure to the first readily accessible disconnecting means. The disconnecting means shall comply with 690.14(A) through (D).

The answer is no

51. Assuming that AFCI and GFCI technologies are compatible, as we have been told, why aren't all dwelling receptacles required to have AFCI protection if the aim is to prevent fires? Isn't there the same possibility of an arcing fire in the kitchen or bathroom?

Answer:

Most of original proposals to require AFCI's (for the 1999 NEC) did call for protecting all or almost all 120 volt circuits. The code-making panel chose to start modestly – with bedroom receptacles.

The 2008 NEC considerably broadened the required areas. And, there are continuing debates about how far and how quickly to go even farther.

However, the homebuilders association, and others who (in my opinion) are more concerned with profits than with safety, have been able to affect amendments to the NEC requirements in the Michigan code adoption process.

Note: the Consumer Product Safety Commission estimates that the use of AFCI's would eliminate over half of residential electrical fires.

52. Is there any requirement to install covers or lamp tube guards on surface mounted fluorescent fixtures on commercial applications such as refrigerated coolers?

Answer:

No - Article 410.145 in the 2008 NEC specifies lamps shall not be located where normally exposed to physical damage for that electric discharge lighting systems with an open circuit voltage of **more than** 1000 volts.

53. Can I shorten the factory-installed neutral on a GFCI breaker to make a neater looking job without violating the listing of the breaker?

Answer:

I would say yes, unless the installation instructions say otherwise. UL Lists GFCI circuit breakers under the product category Circuit Breakers and Ground Fault Circuit Interrupters (DKUY), located on page 101 in the 2011 UL White Book.

54. What type of sealing compound is allowed in the conduit seals at the boundaries of a Class 1 Division 2 location where they are not required to be explosion-proof?

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Answer:

NEC 501.15(B)(2) Conduit Seals, Class I, Division 2 Boundary Conduits shall be sealed to minimize the amount of gas or vapor within the Division 2 portion of the conduit from being communicated to the conduit beyond the seal. ***Such seals shall not be required to be explosionproof*** but shall be identified for the purpose of minimizing passage of gases under normal operating conditions and shall be accessible. Since the code is specific in stating it not be required to be explosionproof, the AHJ could allow duct seal if they approved it for the purpose.

55. Does a circuit breaker used to control the lighting in a tenant area have to have the SWD mark on the breaker?

Answer:

Section 240.83(D) requires that all 120 and 277 volt circuit breakers that are used as switches to control florescent lighting must be listed and marked SWD. This applies to all occupancy types.

The MRC does not include this requirement.