Michigan Chapter IAEI

Annual Meeting Ann Arbor, Michigan
Code Panel Questions December 5 th and 6 th , 2013

1. Is a standard wire-nut approved for a wet location as in an outside j-box? Is there a listed wet location wire-nut other than the ones approved for direct burial or in below grade J-boxes?

Answer: Just as a conductor installed in a raceway in an outdoor location (wet location above grade) is considered to be a wet location in 300.9, the wire nut or connector would be in a wet location. Category Code ZMWQ in the 2013 UL White Book provides information on the listing requirements for wet location wire nuts. To the best of my knowledge, there are no other wire nuts, other than the ones listed for direct burial that are wet location rated.

2. Is it permissible to install aluminum SER cable in an underground PVC raceway between a house and a garage?

Answer: No. 338.12 Uses Not Permitted.
(A) Service-Entrance Cable. Service-entrance cable (SE) shall not be used under the following conditions or in the following locations:
(1) Where subject to physical damage unless protected in accordance with 230.50(B)
(2) Underground with or without a raceway

3. Engineers often ask for a ground rod at parking lot lights. Should the wire from the ground rod be connected to the equipment ground from the lighting circuit?

Answer: This is an Auxiliary Grounding Electrode and is permitted to be connected to the equipment grounding conductor per section 250.54.

4. What can be used as extra corrosion protection for steel conduits buried in the earth or concrete? Does the galvanization on some conduits meet the requirements?

Answer: **UL White Book** for Ferrous Intermediate Metal (DYBY) and Rigid Metal Conduit (DYIX) both have a statement that reads:
Galvanized (intermediate steel) (rigid steel) conduit installed in concrete does not require supplementary corrosion protection. Galvanized (intermediate steel) (rigid steel) conduit installed in contact with soil does not generally require supplementary corrosion protection.
344.10(B) Corrosive Environments.
(1) Galvanized Steel, Stainless Steel, and Red Brass RMC, Elbows, Couplings, and Fittings. Galvanized steel, stainless steel, and red brass RMC 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.

White book for RMC also stated: Rigid metal conduit with or without a nonmetallic coating has not been investigated for severely corrosive conditions.

5. How do we get the utilities to provide the information we need to calculate the fault currents as required in 110.24?

Answer: Unfortunately, with this provision having been excluded in the Part 8 Rules it would be difficult to make a case for it. We could possibly petition the MPSC as a group for a ruling requiring the utilities to respond to these requests in a timely manner. Otherwise, one can presume an infinite amount of current on the line side of the transformer supplying the system and do the calculation using worst case conditions.

6. Can a listed outlet branch-circuit type AFCI be installed on a 2-wire branch circuit to comply with 210.12(B)(2) without installing an equipment grounding conductor?

Answer: Where the raceway complies with 250.118, an equipment grounding conductor is not required since the raceway itself is acceptable as an equipment grounding path. Certainly 250.130(C) would permit one of the methods in (C)(1) through (5) to be used as follows:

(C) Nongrounding Receptacle Replacement or Branch Circuit Extensions. The equipment grounding conductor of a grounding-type receptacle or a branch-circuit extension shall be permitted to be connected to any of the following:

(1) Any accessible point on the grounding electrode system as described in 250.50

(2) Any accessible point on the grounding electrode conductor

(3) The equipment grounding terminal bar within the enclosure where the branch circuit for the receptacle or branch circuit originates

(4) An equipment grounding conductor that is part of another branch circuit that originates from the enclosure where the branch circuit for the receptacle or branch circuit originates

(5) For grounded systems, the grounded service conductor within the service equipment enclosure

(6) For ungrounded systems, the grounding terminal bar within the service equipment enclosure

Informational Note: See 406.4(D) for the use of a ground-fault circuit-interrupting type of receptacle.

Compliance with 406.4(D)(2) provides the requirements for replacing an ungrounded receptacle where an equipment grounding conductor does not exist in the receptacle enclosure by replacing it with another ungrounded conductor as follows:

(2) Non–Grounding-Type Receptacles. Where attachment to an equipment grounding conductor does not exist in the receptacle enclosure, the installation shall comply with (D)(2)(a), (D)(2)(b), or (D)(2)(c).

(a) A non–grounding-type receptacle(s) shall be permitted to be replaced with another non–grounding-type receptacle(s).

(b) A non–grounding-type receptacle(s) shall be permitted to be replaced with a ground-fault circuit interrupter-type of receptacle(s). These receptacles shall be marked "No Equipment Ground." An equipment grounding conductor shall not be connected from the ground-fault circuit-interrupter- type receptacle to any outlet supplied from the ground-fault circuit-interrupter receptacle.

(c) A non–grounding-type receptacle(s) shall be permitted to be replaced with a grounding-type receptacle(s) where supplied through a ground-fault circuit interrupter.

Grounding-type receptacles supplied through the ground-fault circuit interrupter shall be marked “GFCI Protected” and “No Equipment Ground.” An equipment grounding conductor shall not be connected between the grounding-type receptacles.
Nowhere does it permit an AFCI outlet device to be to be installed without an equipment ground of some type.

7. Is it permitted to use the same EGC (equipment grounding conductor) for two separate systems with two different voltages, such as a 277/480 and a 120/240 volt system

Answer: Yes.— 250.122(C) Multiple Circuits. *Where a single equipment grounding conductor is run with multiple circuits in the same raceway, cable, or cable tray, it shall be sized for the largest overcurrent device protecting conductors in the raceway, cable, or cable tray. Equipment grounding conductors installed in cable trays shall meet the minimum requirements of 392.10(B)(1)(c).*

8. Can SO cord be dropped from a bar joist to a display shelf (end cap) and hard-wired to a junction box on that display unit or does it have to be installed in conduit?

Answer: No to the first part of the question. 400.7 lists the uses permitted for cord and what is being described in the question is not listed. No to the second part. The wiring method does not necessarily have to be conduit but would have to meet all the requirements for whichever method is used.

9. Is a supplemental grounding electrode required for a concrete-encased electrode? My inspector says I have to drive a ground rod. The water piping system serving the building is plastic.

Answer: No. Section 250.53 A supplemental grounding electrode is required if you only have a single rod, pipe or plate electrode. If you have a Concrete Encased Electrode or Structural Steel as a grounding electrode supplemental electrodes are not required. If the concrete encased electrode is the only electrode present you would not need to supplement with another electrode.

10. I have installed liquidtight metal flexible conduit to several RTU's (rooftop units). The space above the ceiling is used for environmental air return. The inspector has asked me to replace it. Can't it be used in this application?

Answer: The answer to this question is contained in 300.21(C). The installation is prohibited.
(C) Other Spaces Used for Environmental Air (Plenums). This section shall apply to spaces not specifically fabricated for environmental air-handling purposes but used for air-handling purposes as a plenum. This section shall not apply to habitable rooms or areas of buildings, the prime purpose of which is not air handling.

(1) Wiring Methods. The wiring methods for such other space shall be limited to totally enclosed, nonventilated, insulated busway having no provisions for plug-in connections, Type MI cable, Type MC cable without an overall nonmetallic covering, Type AC cable, or other factory assembled multiconductor control or power cable that is specifically listed for use within an air-handling space, or listed prefabricated cable assemblies of metallic manufactured wiring systems without nonmetallic sheath. Other types of cables, conductors, and raceways shall be permitted to be installed in electrical metallic tubing, flexible metallic tubing, intermediate metal conduit,

rigid metal conduit without an overall nonmetallic covering, flexible metal conduit, or, where accessible, surface metal raceway or metal wireway with metal covers.

11. A small building was built on a concrete foundation away from the main building. The building has a 100 amp panel fed underground from the main building. The feeder contains a grounded conductor and an equipment grounding conductor. Is it required to connect this sub-panel to the rebar in the footing?

Answer: Yes, 250.32 requires the following: 250.32 Buildings or Structures Supplied by a Feeder(s) or Branch Circuit(s).

(A) Grounding Electrode. Building(s) or structure(s) supplied by feeder(s) or branch circuit(s) shall have a grounding electrode or grounding electrode system installed in accordance with Part III of Article 250. The grounding electrode conductor(s) shall be connected in accordance with 250.32(B) or (C). Where there is no existing grounding electrode, the grounding electrode(s) required in 250.50 shall be installed.

(B) Grounded Systems.

(1) Supplied by a Feeder or Branch Circuit. An equipment grounding conductor, as described in 250.118, shall be run with the supply conductors and be connected to the building or structure disconnecting means and to the grounding electrode(s). The equipment grounding conductor shall be used for grounding or bonding of equipment, structures, or frames required to be grounded or bonded. The equipment grounding conductor shall be sized in accordance with 250.122. Any installed grounded conductor shall not be connected to the equipment grounding conductor or to the grounding electrode(s).

12. Is a neutral conductor to be installed in all 3 and 4 way switches?

Answer: No.— **Michigan Part 8 Rules 2011 — 404.2 (c). Switches controlling lighting loads.** *Where switches control lighting loads supplied by a grounded general purpose branch circuit, the grounded circuit conductor for the controlled lighting circuit shall be provided at the switch location.*

Exception 1: The grounded circuit conductor shall be permitted to be omitted from the switch enclosure where either of the following conditions apply:

(1) Conductors for switches controlling lighting loads enter the box through a raceway. The raceway shall have sufficient cross-sectional area to accommodate the extension of the grounded circuit conductor of the lighting circuit to the switch location whether or not the conductors in the raceway are required to be increased in size to comply with 310.15(B)(3)(a).

(2) Cable assemblies for switches controlling lighting loads enter the box through a framing cavity that is open at the top or bottom on the same floor level, or through a wall, floor, or ceiling that is unfinished on 1 side.

Exception 2: Where lighting loads supplied by a grounded general purpose circuit and controlled by 3-way, or 3-way and 4-way switches, the grounded neutral conductor shall be required to only 1 switch location.

13. A transformer has the neutral bonded inside the transformer. Where is the GEC connected, the panel or the transformer? Does this need to be a separate conductor to the grounding electrodes?

Answer: In this installation in the transformer, yes a separate conductor is required to the electrodes. 250.30(A)(5)

14. If a spare ungrounded conductor is installed from switch locations in dwelling units to ceiling mounted outlet boxes, but not connected to a switch, would the ceiling mounted outlet box be required to be suitable for fan support?

Answer: Yes, Section 314.27(C) has added a new paragraph in the 2011 NEC to read: Where spare, separately switched, ungrounded conductors are provided to a ceiling mounted outlet box, in a location acceptable for a ceiling-suspended (paddle) fan in single or multi-family dwellings, the outlet box or outlet box system shall be listed for sole support of a ceiling suspended (paddle) fan.

There is a similar section in the 2012 International Residential Code E3905.8. We are assuming that same section will appear in the 2012 Michigan Residential Code.

15. We installed a 1200 Ampere, 480 Volt panel with a front workspace of 3 ½ feet to a concrete wall. The inspector says we need 7 feet of workspace. Is she correct?

Answer: This scenario is covered under Condition 2 of Table 110.26(A)(1), where there are exposed live parts on one side of the working space and grounded parts (the concrete) on the other. However, Section 110.26(C)(2)(b) may require a doubling of the working space if the equipment is rated at 1200A or more, over 6 feet wide, and there is not an unobstructed path of egress as recognized in 110.26(C)(2)(a).

16. A motor nameplate does not state "thermally protected", but has a winding embedded motor thermostat. Can you consider that this thermostat provides the thermal protection for the motor?

Answer: The answer to this question is in 430.32(A)(2) and (3) as follows:
(A)(2) Thermal Protector. A thermal protector integral with the motor, approved for use with the motor it protects on the basis that it will prevent dangerous overheating of the motor due to overload and failure to start. The ultimate trip current of a thermally protected motor shall not exceed the following percentage of motor full-load current given in Table 430.248, Table 430.249, and Table 430.250:

Motor full-load current 9 amperes or less	170%
Motor full-load current from 9.1 to, and including, 20 amperes	156%
Motor full-load current greater than 20 amperes	140%

(3) Integral with Motor. A protective device integral with a motor that will protect the motor against damage due to failure to start shall be permitted if the motor is part of an approved assembly that does not normally subject the motor to overloads.

17. If I am wiring 5 208V 3 phase welders for welders in a shop. They are positioned on production lines and there will never be more than one welder operating at a time. Can I put them on the same circuit?

Answer: My answer would be yes, based on design data. If the plans showed a system where there would only be one welder in use due the assembly line process. Assume the conductors are protected per 630.12 (A) & (B) if all the same size.

If they are not all the same size then 630.11(B) applies for calculating the size of the conductors and fusing.

18. If you extend existing circuits that have a shared neutral, is it required to install handle ties on the breakers if they were existing without the tie?

Answer: Yes, 80.9.1(c). requires that electrical wiring added to an existing service, feeder, or branch circuit shall not result in an installation that violates the provisions of the code in force at the time the additions are made.

19. NEC 310.10(G) requires conductors installed in corrosive conditions to have insulation suitable for the application. What type conditions would cause deleterious effects on conductors or insulation and what type insulation would be suitable for those applications? Please give an example of such environment.

Answer: When I first read the question, I thought who would use such a weird word as ***deleterious*** and what does that mean. Well Don gave me the question so I knew who used such a strange word.
Webster defines deleterious as damaging or harmful.

310.10(G) Corrosive Conditions. Conductors exposed to oils, greases, vapors, gases, fumes, liquids, or other substances having a deleterious effect on the conductor or insulation shall be of a type suitable for the application.

This code section wording has been in the code a long time. I am not sure when it was added somewhere between 1940 and 1947. It is almost identical to the current wording with the exception of the last few words which used to say “approved for the purpose” instead of the current wording “suitable for the application”.
The conductor types, insulation, and the applications for use are listed in Table 310.104(A) (page 168)
The beginning of the code section 310.10(G) gives you examples of wiring in such an environment.

20. Is each 120-volt receptacle required for an electrified truck parking space required to be served by an individual 120-volt branch circuit? Are there a minimum number of 120-volt receptacles required for each electrified truck parking space?

Answer: There is no minimum number of receptacles required. 626.24(B)(1) states:
A maximum of three receptacles, each 2-pole, 3-wire grounding type and rated 20 amperes,125 volts, and two of the three connected to two separate branch circuits.

However, there is no clear indication that the circuits used need to be individual branch circuits.

In the initial ROP for the 2011 Code the CMP accepted a requirement for two duplex receptacles supplied by two individual (single) branch circuits. During the ROC this was changed to allow up to three single receptacles, connected to two individual branch circuits. During this transition the requirement for at least two receptacles was lost. The issue remains unresolved for the 2014 Code.

21. Are there special wiring requirements for commercial woodworking shop fluorescent lighting?

Answer: Yes, depending upon whether the woodworking shop has wood flour or sawdust then either 502.130(A) or (B) would apply for dust ignition-proof lighting or 503.130(A) or (B) would apply.

22. Does Section 230.71(A)1 require a service disconnect on the structure or could it be located away from the structure (pole)? If it can be located away, what is the maximum distance?

Answer: No. I believe the code reference should have been 230.70(A)(1) but in any event the code does not require a Service Disconnect to be "on" a building. The words in 230.70(A)(1) are: *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.*
Locating a Service Disconnect on a pole would involve not only the disconnect but also fusing involved. See 230.91:

Location. *The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto.*

Now the conductors supplying the structure are considered to be Feeders and must comply with the rules in 225 for outside branch circuits and feeders. Similar requirements Readily Accessible.
Accessible, Readily (Readily Accessible). *Capable of being reached quickly for operation, renewal, or inspections without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, and so forth.*

QUESTION FROM THE FLOOR

"I have inspected the electrical installation of "Ductless Mini-Slit" HVAC systems and have found Mechanical Contractors are supplying a type TC tray cable for interconnecting the condenser and evaporator with 240v for the blower and 24v for controls. The installations I have inspected have this cable running along the line set outside and inside to the evaporator sometimes 20-30ft without a raceway system. This is a violation of 2011 NEC article 336.12 (1) & (2) the way that I interpret the code. I have gotten a lot of push back from this violation mainly from the Mechanical Contractors and their suppliers. I am sure that you have heard the comment that "everyone else is approving this"
Answer: Article 336 Power and Control Tray Cable Type TC
336.2. Definitions. Power and Control Tray Cable, Type TC. A factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors, under a

nonmetallic jacket.

336.10 Uses Permitted
(4) In outdoor locations supported by a messenger wire.

336.12 Uses not permitted.
(1) Installed where it will be exposed to physical damage
(2) Installed outside a raceway or cable tray system, except as permitted in 336.10(4) and 336.10(7)
(3) Used where exposed to direct rays of the sun, unless identified as sunlight resistant

The Mini-Split systems require a chapter three wiring method from the disconnect to the condenser and from the condenser to the unit inside the building.