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March 15, 2017

Barry Walthall
Building Official, Planning & Development Services
City of Lawrence
1 Riverfront Plaza, Suite 110
Lawrence, KS 66044

Re: Code Modification Requests

Dear Barry,

As we've discussed, we are submitting an official code modification request to (2) local code amendments that the city has made to the 2014 National Electrical Code. The purpose would be to make an effort to bring the city's local code amendments up to date and in line with what the 2014 NEC requires as it pertains to multi-family construction. Our opinion would be that it would also clear up some inconsistencies where the city amendments appear to be more stringent than the NEC in one area and less stringent in another.

Item 1: Type NM (Romex) Wiring – Uses Permitted

There is a discrepancy between the 2014 NEC and the local city code in regards to where type NM (Romex) wiring is allowed and where it isn't.

NFPA 70, National Electrical Code, 2014 Edition, Section 334.10 (2) indicates that *Type NM (Romex), Type NMC and Type NMS cables shall be permitted to be used in the following....(2) Multi-family dwellings permitted to be of Types III, IV, and V construction.* See attached highlighted portion of the code. It does not indicate a building height or maximum quantity of stories in the building. This restriction of not allowing type NM wiring in buildings exceeding (3) stories was taken out of the NEC in 2002 and has not been in the code since 1999.

We have also attached Section 334.12 indicating the Uses Not Permitted for Type NM wiring. You can see that there is no restriction on building height or maximum number of stories.

In Article 5-417, the city of Lawrence has amended Section 334.12, (A) of the 2014 NEC to add an additional restriction (334.12, (11)) which states "*In any dwelling or structure exceeding (3) stories*". See attached highlighted portion of the city's code section.

We would propose a code modification request that Article 5-417, amended addition of 334.12 (11) prohibiting the use of type NM cable in buildings exceeding 3 stories in height be taken out of the city's code amendments and that the city adopt Section 334.12, (A) as it is written in the 2014 NEC without amendments.

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Item 2: Arc-Fault Circuit-Interrupter Protection in Dwelling Units

There is a discrepancy between the 2014 NEC and the local city code in regards to where arc-fault protection is required in dwelling units.

NFPA 70, National Electrical Code, 2014 Edition, Section 210.12 (A) indicates that *All 120-volt, single – phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12 (A) (1) through (6)*….[followed by requirements for AFCI protection].

NFPA 70, National Electrical Code, 2011 Edition is very similar to the 2014 edition, except it does not list kitchens or laundry areas as requiring arc-fault protection. We have found that most municipalities in the region have adopted the 2011 NEC, not the 2014 NEC and therefore enforce the spaces listed in the 2011 NEC for arc-fault requirements in dwelling units.

In Article 5-406, the city of Lawrence has amended Section 210.12 (A) to only require arc-fault protection in Bedrooms of Dwelling Units. See attached highlighted portion.

We would propose a code modification request to amend NEC, 2014 Edition, Section 210.12 (A) to the following, "*All 120 –volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by any of the means described in 210.12 (A) (1) through (6).*

We believe this revision provides an extra measure of safety in regards to what spaces in dwelling units require arc-fault protection when compared to the current Article 5-406 of the city's code.

In summary, we are asking the electrical board to consider these two code modifications for the purposes of bringing the adopted city of Lawrence codes up to date with the current National Electrical Code.

We would respectfully ask that the board expedite a response if possible, regarding these requests.

As always, please let me know if you have any questions. Thank you for your quick attention to this matter.

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Sincerely,

David B. Everhart, P.E., LEED AP
Partner

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Construction Specifications

104 Conductors

MI cable conductors shall be of solid copper, nickel, or
l-coated copper with a resistance corresponding to standard
and kcmil sizes.

108 Equipment Grounding Conductor

re the outer sheath is made of copper, it shall provide an
uate path to serve as an equipment grounding conductor.
re the outer sheath is made of steel, a separate equipment
nding conductor shall be provided.

copper sheath of Type MI cable must be constructed as an
and is permitted to be used as an EGC according to
118(9), but an alloy steel outer sheath is not. For Type MI
es with an alloy steel outer sheath, one of the conductors
in the cable assembly) is required to be used for equipment
nding.

.112 Insulation

conductor insulation in Type MI cable shall be a highly
pressed refractory mineral that provides proper spacing for
onductors.

.116 Sheath

outer sheath shall be of a continuous construction to provide
hanical protection and moisture seal.

ARTICLE 334
Nonmetallic-Sheathed Cable: Types NM, NMC, and NMS

General

4.1 Scope

is article covers the use, installation, and construction speci-
ations of nonmetallic-sheathed cable.

nmetallic-sheathed cable was first recognized in the 1928 *NEC* a substitute for concealed knob-and-tube wiring (Article 394) d open wiring on insulators (Article 398). The original advan-ges of nonmetallic-sheathed cable over knob-and-tube wiring re that the outer sheath provided continuous protection in dition to the insulation applied to the conductors; the cable is easily fished in partitions of finished buildings; no insulating pports were required; and only one hole needed to be bored, d that hole could accommodate more than one cable passing ough a wood cross member.

334.2 Definitions

Nonmetallic-Sheathed Cable. A factory assembly of two or more insulated conductors enclosed within an overall nonmetallic jacket.

Type NM. Insulated conductors enclosed within an overall nonmetallic jacket.

Type NMC. Insulated conductors enclosed within an overall, corrosion resistant, nonmetallic jacket.

Type NMS. Insulated power or control conductors with signaling, data, and communications conductors within an overall nonmetallic jacket.

334.6 Listed

Type NM, Type NMC, and Type NMS cables shall be listed.

ANSI/UL 719, *Standard for Nonmetallic-Sheathed Cables*, requires a construction and performance evaluation, including testing related to flammability, dielectric voltage-withstand, unwinding at low temperatures, pulling through joists, conductor pullout, crushing, and abrasion.

II. Installation

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:

(1) One- and two-family dwellings and their attached or detached garages, and their storage buildings.

The allowance to use of NM cable in garages of one- and two-family dwellings applies regardless of whether the garage is attached or detached. The allowance also applies to detached sheds or storage buildings associated with one- and two-family dwellings.

(2) Multi-family dwellings permitted to be of Types III, IV, and V construction.

(3) Other structures permitted to be of Types III, IV, and V construction. Cables shall 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.

Informational Note No. 1: Types of building construction and occupancy classifications are defined in NFPA 220-2012, *Standard on Types of Building Construction*, or the applicable building code, or both.

Informational Note No. 2: See Informative Annex E for determination of building types [NFPA 220, Table 3-1].

(4) Cable trays in structures permitted to be Types III, IV, or V where the cables are identified for the use.

Informational Note: See 310.15(A)(3) for temperature limitation of conductors.

(5) Types I and II construction where installed within raceways permitted to be installed in Types I and II construction.

A well-established means of codifying fire protection and fire safety requirements is to classify buildings by types of construction, based on materials used for the structural elements and the degree of fire resistance afforded by each element. The five fundamental construction types used by the model building codes are Type I (fire resistive), Type II (noncombustible), Type III (combination of combustible and noncombustible), Type IV (heavy timber), and Type V (wood frame). Types I and II basically require all structural elements to be noncombustible, whereas Types III, IV, and V allow some or all of the structural elements to be combustible (wood).

The selection of building construction types is regulated by the local building code, based on the occupancy, height, and area of the building. When a building of a selected height (in feet or stories above grade) and area is permitted to be built of combustible construction (i.e., Types III, IV, or V), the installation of nonmetallic-sheathed cable is permitted. The common areas (corridors) and incidental and subordinate uses (such as laundry rooms or lounge rooms) that serve a multifamily dwelling occupancy are also considered part of the multifamily occupancy, so NM cable is allowed in those areas.

If a building is to be of noncombustible construction (Type I or II) by the owner's choice, even though the building code would permit combustible construction, the building is allowed to be wired with NM cable. In such an instance, NM cable may be installed in the noncombustible building because the *Code* would have permitted the building to be of combustible construction.

Informative Annex E provides information on the types of construction as well as a table that cross references the five construction types to the types described in the model building codes.

Section 334.10(5) permits NM cables to be installed in Type I and Type II construction if the cables are within permitted raceways. A raceway is only permitted to be used if it complies with the article for the raceway and its use does not violate another article in the *Code*.

(A) Type NM. Type NM cable shall be permitted as follows:

(1) For both exposed and concealed work in normally dry locations except as prohibited in 334.10(3)
(2) To be installed or fished in air voids in masonry block or tile walls

For concealed work, cable should be installed where it is protected from physical damage often caused by nails or screws. Where practical, care should be taken to avoid areas where trim, door and window casings, baseboards, moldings, and so forth are likely to be nailed. See 300.4 for details on protection against physical damage.

(B) Type NMC. Type NMC cable shall be permitted as follows:

(1) For both exposed and concealed work in dry, moist, damp, or corrosive locations, except as prohibited by 334.10(3)
(2) In outside and inside walls of masonry block or tile
(3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a steel plate at least 1.59 mm (1/16 in.) thick and covered with plaster, adobe, or similar finish

If NM cable is used in dairy barns and similar farm buildings (see Article 547), it must be Type NMC (corrosion resistant). The cable will be exposed to fumes, vapors, or liquids such as ammonia and barnyard acids. Under such circumstances, ordinary types of NM cable can deteriorate rapidly due to ammonia fumes or the growth of fungus or mold.

(C) Type NMS. Type NMS cable shall be permitted as follows:

(1) For both exposed and concealed work in normally dry locations except as prohibited by 334.10(3)
(2) To be installed or fished in air voids in masonry block or tile walls

334.12 Uses Not Permitted

The list of uses not permitted for NM cable is not complete Restrictions exist elsewhere in the *Code*. For example, NM cable are not permitted to be installed in ducts, plenums, and other air handling spaces. See 300.22 limiting the use of materials in ducts plenums, and other air-handling spaces that may contribut smoke and products of combustion during a fire.

(A) Types NM, NMC, and NMS. Types NM, NMC, and NM cables shall not be permitted as follows:

(1) In any dwelling or structure not specifically permitted i 334.10(1), (2), (3), and (5)
(2) Exposed in dropped or suspended ceilings in other tha one- and two-family and multifamily dwellings

Nonmetallic-sheathed cables are prohibited in the space abov hung ceilings that allow access. This requirement does not affe dwelling-type occupancies. The term *exposed*, as used in th requirement, closely follows the definition of *exposed (as applied wiring methods)* found in Article 100, which states "on or attache to the surface or behind panels designed to allow access."

For example, cables installed above a dropped gypsum boa ceiling or dropped gypsum board soffit would not be consider exposed cable, provided the area above the ceiling is not accessib (does not have removable tiles or does not contain an access pan Often hung or dropped ceilings are accessible; therefore, cabl installed above these types of ceilings would be considered expos cables if the cables do not have additional physical protection.

A simple change to an architectural finish schedule during co struction could change the acceptability of the wiring method. F example, if a corridor ceiling in an occupancy (other than a dwelli

type) called for a painted gypsum board ceiling and the finish schedule changed the ceiling construction to a 2 foot by 2 foot accessible tile ceiling, the wiring method would no longer be permitted to be NM cable unless the cable was installed using additional protection. Examples of additional protection are found in 334.15(B).

(3) As service-entrance cable
(4) In commercial garages having hazardous (classified) locations as defined in 511.3
(5) In theaters and similar locations, except where permitted in 518.4(B)
(6) In motion picture studios
(7) In storage battery rooms
(8) In hoistways or on elevators or escalators
(9) Embedded in poured cement, concrete, or aggregate
(10) In hazardous (classified) locations, except where specifically permitted by other articles in this *Code*.

(B) Types NM and NMS. Types NM and NMS cables shall not be used under the following conditions or in the following locations:

(1) Where exposed to corrosive fumes or vapors
(2) Where embedded in masonry, concrete, adobe, fill, or plaster
(3) In a shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish
(4) In wet or damp locations

334.15 Exposed Work

In exposed work, except as provided in 300.11(A), cable shall be installed as specified in 334.15(A) through (C).

(A) To Follow Surface. Cable shall closely follow the surface of the building finish or of running boards.

(B) Protection from Physical Damage. Cable shall be protected from physical damage where necessary by rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC conduit, Type RTRC marked with the suffix -XW, or other approved means. Where passing through a floor, the cable shall be enclosed in rigid metal conduit, intermediate metal conduit, electrical metallic tubing, Schedule 80 PVC conduit, Type RTRC marked with the suffix -XW, or other approved means extending at least 150 mm (6 in.) above the floor.

Type NMC cable installed in shallow chases or grooves in masonry, concrete, or adobe shall be protected in accordance with the requirements in 300.4(F) and covered with plaster, adobe, or similar finish.

(C) In Unfinished Basements and Crawl Spaces. Where cable is run at angles with joists in unfinished basements and crawl spaces, it shall be permissible to secure cables not smaller than two 6 AWG or three 8 AWG conductors directly to the lower edges of the joists. Smaller cables shall be run either through bored holes in joists or on running boards. Nonmetallic-sheathed cable installed on the wall of an unfinished basement shall be permitted to be installed in a listed conduit or tubing or shall be protected in accordance with 300.4. Conduit or tubing shall be provided with a suitable insulating bushing or adapter at the point the cable enters the raceway. The sheath of the nonmetallic-sheathed cable shall extend through the conduit or tubing and into the outlet or device box not less than 6 mm (¼ in.). The cable shall be secured within 300 mm (12 in.) of the point where the cable enters the conduit or tubing. Metal conduit, tubing, and metal outlet boxes shall be connected to an equipment grounding conductor complying with the provisions of 250.86 and 250.148.

Crawl spaces pose dangers similar to those of unfinished basements and in some case are more dangerous due to limited height. The means of providing physical protection in crawl spaces and unfinished basements includes specific protection techniques. Where NMC is installed close to the surface in masonry, concrete, or adobe-type construction, physical protection must be afforded to the cable by using steel plate–type protectors as described in 300.4(F).

Nonmetallic-sheathed cables installed in an unfinished basement or crawl space can be run through holes in joists, attached to the side of joists or beams, and installed on running boards as shown on the left side in Exhibit 334.1. Section 300.4(D) requires

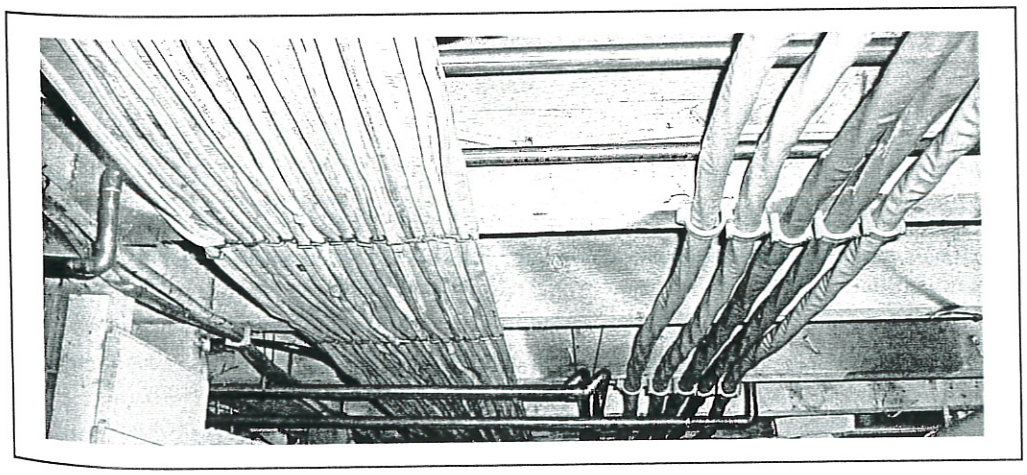

EXHIBIT 334.1 *Nonmetallic-sheathed cables and Type SE cables installed in an unfinished basement or crawl space.*

(2) The metal structural frame of a building shall be permitted to be used as a conductor to interconnect electrodes that are part of the grounding electrode system, or as a grounding electrode conductor.

(3) A concrete-encased electrode of either the conductor type, reinforcing rod or bar installed in accordance with 250.52(A)(3) extended from its location within the concrete to an accessible location above the concrete shall be permitted.

5-417 **Section 334.12 of the NPFA 70, *National Electrical Code, 2014 Edition,*** is hereby amended to read as follows:

334.12 Uses Not Permitted.

(A) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used as follows:

(1) In any occupancy other than Group R.

(2) Exposed in dropped or suspended ceilings in other than one and two-family and multifamily dwellings.

(3) As service-entrance cable.

(4) In commercial garages having hazardous (classified) locations as defined in 511.3.

(5) In theaters and similar locations, except where permitted in 518.4(B).

(6) In motion picture studios.

(7) In storage battery rooms.

(8) In hoistways or on elevators or escalators.

(9) Embedded in poured cement, concrete or aggregate.

(10) In hazardous (classified) locations, except where specifically permitted by other articles in this Code

(11) In any dwelling or structure exceeding three (3) stories.

Informational Note No. 1: The intent of this subsection is not to restrict the use of nonmetallic-sheathed cable in garages or carports directly associated with an apartment.

Informational Note No. 2: The intent of this subsection is not to restrict the use of nonmetallic-sheathed cable in residential garages, carports, or other occupancies directly associated with one- and two-family dwellings.

(B) Types NM and NMS. Types NM and NMS cables shall not be used under the following conditions or in the following locations:

(1) Where exposed to corrosive fumes or vapors.

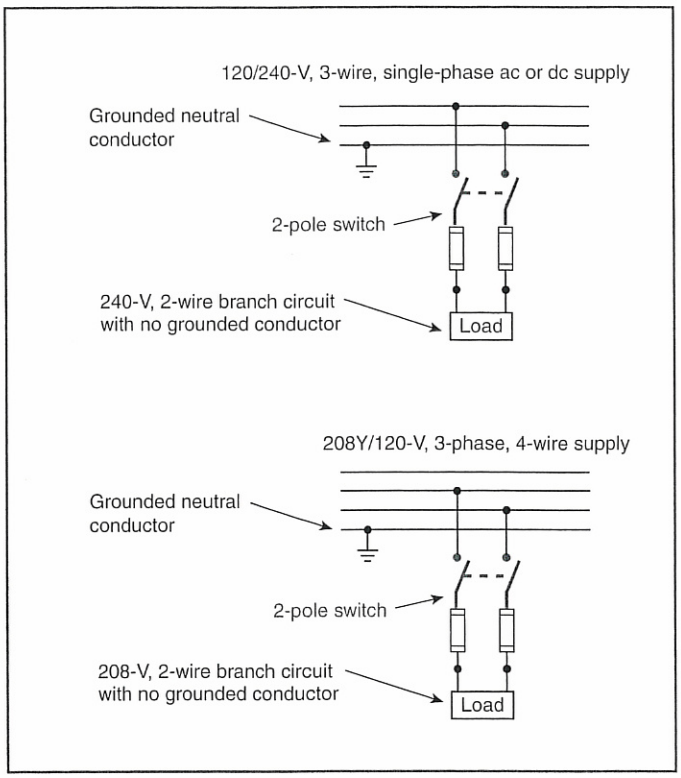

EXHIBIT 210.21 *Branch circuits tapped from ungrounded conductors of multiwire systems.*

(A) Number of Branch Circuits. The minimum number of branch circuits shall be determined from the total calculated load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served. In no case shall the load on any circuit exceed the maximum specified by 220.18.

(B) Load Evenly Proportioned Among Branch Circuits. Where the load is calculated on the basis of volt-amperes per square meter or per square foot, the wiring system up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the calculated load. This load shall be evenly proportioned among multioutlet branch circuits within the panelboard(s). Branch-circuit overcurrent devices and circuits shall be required to be installed only to serve the connected load.

(C) Dwelling Units.

(1) Small-Appliance Branch Circuits. In addition to the number of branch circuits required by other parts of this section, two or more 20-ampere small-appliance branch circuits shall be provided for all receptacle outlets specified by 210.52(B).

(2) Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by 210.52(F). This circuit shall have no other outlets.

(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one 120-volt, 20-ampere branch circuit shall be provided to supply a bathroom receptacle outlet(s). Such circuits shall have no other outlets.

Exception: Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).

210.12 Arc-Fault Circuit-Interrupter Protection

Arc-fault circuit-interrupter protection shall be provided as required in 210.12(A) (B), and (C). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(A) Dwelling Units. All 120-volt, single-phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit kitchens, family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, laundry areas, or similar rooms or areas shall be protected by any of the means described in 210.12(A)(1) through (6):

(1) A listed combination-type arc-fault circuit interrupter, installed to provide protection of the entire branch circuit
(2) A listed branch/feeder-type AFCI installed at the origin of the branch-circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.
(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:
   a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.
   b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50 ft) for a 14 AWG conductor or 21.3 m (70 ft) for a 12 AWG conductor.
   c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

AFCI devices are evaluated in accordance with UL 1699, *Standard for Arc-Fault Circuit-Interrupters.* Testing methods create or simulate arcing conditions to determine a product's ability to detect and interrupt arcing faults. These devices are also tested to verify that arc detection is not unduly inhibited by the presence of loads and circuit characteristics that may mask the hazardous arcing

single-phase system to supply a small motor. Exhibit 210.21 (bottom) illustrates a 3-phase, 4-wire wye system. Based on the characteristics of the depicted loads (line-to-line connected) supplied by the tapped circuits, a neutral or grounded conductor is not required to be installed with the ungrounded conductors.

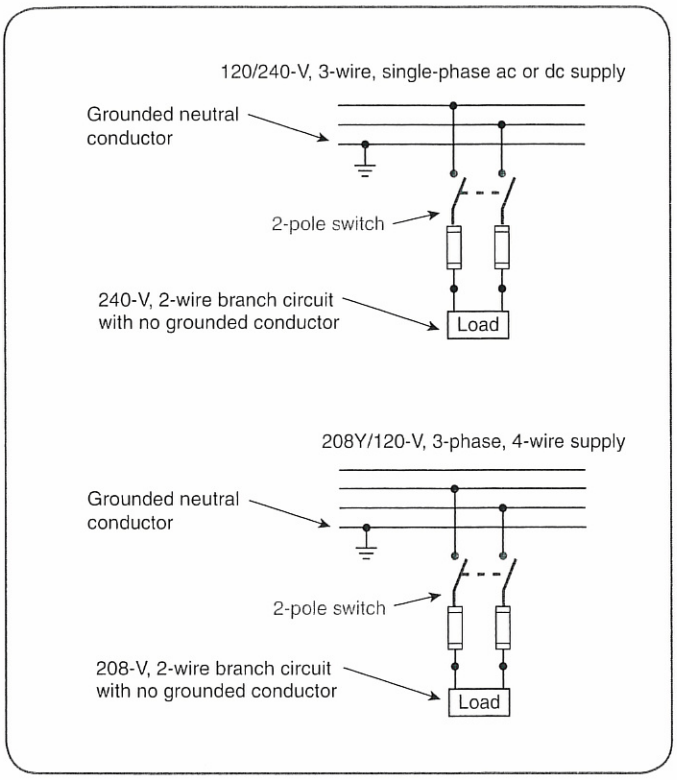

EXHIBIT 210.21 *Branch circuits tapped from ungrounded conductors of multiwire systems.*

Circuit breakers or switches that are used as the disconnecting means for a branch circuit must open all poles simultaneously using only the manual operation of the disconnecting means. Therefore, if switches and fuses are used and one fuse blows, or if circuit breakers (two single-pole circuit breakers with a handle tie) are used and one breaker trips, one pole could possibly remain closed. The intention is not to require a common trip of fuses or circuit breakers but rather to disconnect (manually) the ungrounded conductors of the branch circuit with one manual operation. See 240.15(B) for information on the use of identified handle ties with single-pole circuit breakers.

210.11 Branch Circuits Required

Branch circuits for lighting and for appliances, including motor-operated appliances, shall be provided to supply the loads calculated in accordance with 220.10. In addition, branch circuits shall be provided for specific loads not covered by 220.10 where required elsewhere in this *Code* and for dwelling unit loads as specified in 210.11(C).

(A) Number of Branch Circuits. The minimum number of branch circuits shall be determined from the total calculated load and the size or rating of the circuits used. In all installations, the number of circuits shall be sufficient to supply the load served. In no case shall the load on any circuit exceed the maximum specified by 220.18.

(B) Load Evenly Proportioned Among Branch Circuits. Where the load is calculated on the basis of volt-amperes per square meter or per square foot, the wiring system up to and including the branch-circuit panelboard(s) shall be provided to serve not less than the calculated load. This load shall be evenly proportioned among multioutlet branch circuits within the panelboard(s). Branch-circuit overcurrent devices and circuits shall be required to be installed only to serve the connected load.

(C) Dwelling Units.

(1) Small-Appliance Branch Circuits. In addition to the number of branch circuits required by other parts of this section, two or more 20-ampere small-appliance branch circuits shall be provided for all receptacle outlets specified by 210.52(B).

(2) Laundry Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one additional 20-ampere branch circuit shall be provided to supply the laundry receptacle outlet(s) required by 210.52(F). This circuit shall have no other outlets.

(3) Bathroom Branch Circuits. In addition to the number of branch circuits required by other parts of this section, at least one 20-ampere branch circuit shall be provided to supply bathroom receptacle outlet(s). Such circuits shall have no other outlets.

Exception: Where the 20-ampere circuit supplies a single bathroom, outlets for other equipment within the same bathroom shall be permitted to be supplied in accordance with 210.23(A)(1) and (A)(2).

Informational Note: See Examples D1(a), D1(b), D2(b), and D4(a) in Informative Annex D.

210.12 Arc-Fault Circuit-Interrupter Protection

(A) Dwelling Units. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets installed in

dwelling unit family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas shall be protected by a listed arc-fault circuit interrupter, combination-type, installed to provide protection of the branch circuit.

Informational Note No. 1: For information on types of arc-fault circuit interrupters, see UL 1699-1999, *Standard for Arc-Fault Circuit Interrupters.*

Informational Note No. 2: See 11.6.3(5) of *NFPA 72*-2010, *National Fire Alarm and Signaling Code*, for information related to secondary power supply requirements for smoke alarms installed in dwelling units.

Informational Note No. 3: See 760.41(B) and 760.121(B) for power-supply requirements for fire alarm systems.

Exception No. 1: If RMC, IMC, EMT, Type MC, or steel armored Type AC cables meeting the requirements of 250.118 and metal outlet and junction boxes are installed for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install an outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception No. 2: Where a listed metal or nonmetallic conduit or tubing is encased in not less than 50 mm (2 in.) of concrete for the portion of the branch circuit between the branch-circuit overcurrent device and the first outlet, it shall be permitted to install an outlet branch-circuit type AFCI at the first outlet to provide protection for the remaining portion of the branch circuit.

Exception No. 3: Where an individual branch circuit to a fire alarm system installed in accordance with 760.41(B) or 760.121(B) is installed in RMC, IMC, EMT, or steel-sheathed cable, Type AC or Type MC, meeting the requirements of 250.118, with metal outlet and junction boxes, AFCI protection shall be permitted to be omitted.

The definition of arc-fault circuit interrupter in Article 100 explains the safety function of this type of device. The objective is to de-energize the branch circuit when an arc fault is detected.

Arc-fault circuit interrupters are evaluated in UL 1699, *Standard for Arc-Fault Circuit-Interrupters,* using testing methods that create or simulate arcing conditions to determine a product's ability to detect and interrupt arcing faults. These devices are also tested to verify that arc detection is not unduly inhibited by the presence of loads and circuit characteristics that may mask the hazardous arcing condition. In addition, these devices are evaluated to determine resistance to unwanted tripping due to the presence of arcing that occurs in control and utilization equipment under normal operating conditions or to a loading condition that closely mimics an arcing fault, such as a solid-state electronic ballast or a dimmed load.

UL 1699 is the standard covering arc-fault devices that have a maximum rating of 20 amperes and intended for use in 120-volt ac, 60-Hz circuits. These devices may also have the capability to perform other functions such as overcurrent protection, ground-fault circuit interruption, and surge suppression. UL 1699 currently recognizes five types of arc-fault circuit interrupters: branch/feeder AFCI, combination AFCI, cord AFCI, outlet AFCI, and portable AFCI.

Placement of the device in the circuit and a review of the UL guide information must be considered when complying with 210.12. The *NEC* is clear that the objective is to provide protection of the entire branch circuit. (See Article 100 for the definition of branch circuit.) For instance, a cord AFCI cannot be used to comply with the requirement of 210.12 to protect the entire branch circuit.

To provide the full range of AFCI protection covered in the UL standard for the branch-circuit conductors and at the outlets supplied by the branch circuit, the use of combination-type AFCI devices is required. These devices provide the combined protection required by UL 1699 for branch/feeder and outlet type AFCIs. The product standard requires specific marking on AFCI devices to indicate the type of protection provided. Combination-type AFCIs bear such a marking. Exhibit 210.22 is an example of a circuit breaker that provides combination-type AFCI protection. Exceptions No. 1 and No. 2 to 210.12(A) permit the AFCI device to be located at the first outlet supplied by a branch circuit, provided that the wiring method from the branch-circuit overcurrent protective device to the outlet is rigid metal conduit, intermediate metal conduit, electrical metallic tubing, or steel armored cable, or is listed metal or nonmetallic conduit or tubing that is encased in not less than 2 in. of concrete. These wiring methods afford a higher level of physical protection for branch-circuit conductors. There is no length restriction on the branch-circuit conductors from the branch-circuit overcurrent protective device to the first outlet as long as the conductors are contained within one of the wiring methods identified in Exception No. 1 or the physical protection afforded by encasement in 2 in. of concrete specified in Exception No. 2 is provided for conduit or tubing.

Section 210.12(A) requires that AFCI protection be provided for all 15- and 20-ampere, 120-volt branch circuits that supply outlets (including receptacle, lighting, and other outlets; see definition of outlet in Article 100) located throughout a dwelling unit other than outlets installed in kitchens, bathrooms, unfinished basements, garages, and outdoors. Because circuits are often shared between a bedroom and other areas such as closets and hallways, providing AFCI protection on the complete circuit would comply with 210.12. There is no prohibition against using AFCI pro-

Exception No 2 to (5): For receptacles located in patient bed locations of general care or critical care areas of health care facilities other than those covered under 210.8 (B)(1), GFCI protection shall not be required.

(6) Indoor wet locations

(7) Locker rooms with associated showering facilities.

(8) Garages, service bays, and similar areas other than vehicle exhibition halls and showrooms.

(C) Boat Hoists. GFCI protection shall be provided for outlets not exceeding 240 volts that supply boat hoists installed in dwelling unit locations.

5-406 **Section 210.12 of the NPFA 70, *National Electrical Code, 2014 Edition,*** is hereby amended to read as follows:

210.12 Arc-Fault Circuit-Interrupter Protection. Arc-fault circuit-interrupter protection shall be provided as required in 201.12(A), (B), and (C). The arc-fault circuit interrupter shall be installed in a readily accessible location.

(A) Bedrooms of Dwelling Units. All 120-volt, single phase, 15- and 20-ampere branch circuits supplying outlets or devices installed in dwelling unit shall be protected by any of the means described in 210.12(A)(1) through (6):

(1) A listed combination-type arc-fault circuit interrupter installed to provide protection of the entire branch circuit

(2) A listed branch/feeder type AFCI installed at the origin of the branch–circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(3) A listed supplemental arc protection circuit breaker installed at the origin of the branch circuit in combination with a listed outlet branch-circuit type arc-fault circuit interrupter installed at the first outlet box on the branch circuit where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.

b. The maximum length of the branch-circuit wiring from the branch-circuit overcurrent device to the first outlet shall not exceed 15.2 m (50ft.) for a 14 AWG conductor or 21.3 m (70ft.) for a 12 AWG conductor.

c. The first outlet box in the branch circuit shall be marked to indicate that it is the first outlet of the circuit.

(4) A listed outlet branch-circuit type arc-fault interrupter installed at the first outlet on the branch circuit in combination with a listed branch-circuit overcurrent protective device where all of the following conditions are met:

a. The branch-circuit wiring shall be continuous from the branch-circuit overcurrent device to the outlet branch-circuit arc-fault circuit interrupter.