The Electrical CONTACTOR

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Volume 6
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Fall 2010

FAEC Central Florida Chapter First Aid Class

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EXECUTIVE VICE PRESIDENT'S *REPORT*

Janice Ficarrotto

The end of 2010 is quickly approaching and as I sit and reflect on the past 11 months, I truly wonder what has happened to our Nation to put us all in such recession. I guess we can all revisit the past several years and depending upon your political beliefs, we could all come up with a multitude of reasons "why" but, more importantly, when and how will we be able to pull out of this "mess"?

As a small business owner, myself, as many of you are, we are all facing the same employer troubles. Whether you are a contractor, a supply house, a manufacturer's representative or a management-consulting firm, our problems are all the same. We face reduction in income and try to contain, to the best of our abilities, our expenses.

This is not always easy. I know from many of you, you have had massive lay-offs, cutbacks in employee benefits, loss of work, etc., the list goes on and on.

As we wait for Congress to decide whether or not to extend the Bush Tax Credits for 2011 and beyond, each of us, as small business entrepreneurs have to ask ourselves "what will 2011 bring to the current business climate"? Personally, I am hopeful that the tax credits will be extended, at least for several years, and things will begin to move shortly after the first of the new year.

We, here at FAEC, have tightened our belts, dug in for the "long haul", and have worked hard for every member we've earned this year. I am pleased to report that membership in on the rise and we are very grateful for that. We have some new board members that have signed-on to help our existing board and we are all very grateful for their help. We have included a page for "New Members" in this issue and will be running the same section in each magazine from this one – forward! We have many great associate members who have helped out this year – especially with the Mike Holt Seminar. I am pleased to report that our seminar sponsors gave so generously that we were able to bring this event to our industry – FREE – to all members and Non-members alike. We hosted over 125 persons for this event and it is one of the best seminars FAEC has ever sponsored. Again, Thanks to all our Seminar sponsors. We will be featuring a special article in the Winter 2011 issue with photos and a synopsis of the event so – watch for that shortly after the first of the new year.

We are busy working on the Spring (April 2011) Educational Symposium, which will take place here in Orlando. We will be doing contractor CE classes along with journeyman/key personnel programs so watch your e-mail for that line-up as well.

I am also looking at implementing a "Project Manager Boot Camp" program that has an amazing agenda but, will require 8 hours for presentation. I know many of you can't afford to have your project managers out for an entire day so, I'll be gathering input from you via e-mail to tell us what would be the best method for presentation of such a program.

One of the programs we will be hosting in April will be on Employment Practices including e-verify, how to be sure your employees are "legal", what are the consequences of using illegal labor, etc. As of this writing, I am trying to secure our Labor Attorney, Robin Fawsett with Shutts & Bowen here in Orlando, Fl. as one of our speakers. You all know what a great presenter Robin is and his knowledge is endless when it comes to fair labor practices. I think this is a program you won't want to miss so, once it is announced, please sign up early.

We have seen many of our new associate members come forward with sponsorships and educational opportunities for our members this year. For this we are extremely grateful. Without their support, we could not host the type of events we bring to you so affordably.

We will also be working diligently next year to try and bring you more FREE educational opportunities. We know things are tight and we would like to do our best to help you all out. We're not quite sure how we will do this but, we are working on bringing it to reality. You all need CE and if we can deliver some credits to you, free of charge, it would be a real return on your dues investment dollars.

Please remember we are doing everything possible to retain our members. Last year was difficult but, we are gaining new members and have even recouped some of what we lost earlier last year due to the economy. I hope 2011 is a much better year for us all and hope we can return to pre-recession work levels.

I want to take this opportunity to wish all our members a Happy, Healthy, Prosperous New Year and please, plan on getting involved in FAEC in 2011 – This is your organization and we NEED you!

Hope to see you all in April in Orlando.

~ Janice

PRESIDENT'S *MESSAGE*

By Kimberly DeBerry
Kim's Electric
Jacksonville, Florida

As "2010" comes to an end we need to go into the new year with a positive outlook and look at ways that we can survive the current market. We need to take time to stop chasing project and start building relationships and nourishing the current ones we have. We also need to take this time to get involved with training workshops, education, networking sessions, and safety training to incorporate into our companies so that when things do turn around we will be better equipped to work smarter and more effectively.

This year the FAEC had so many classes and opportunities to gain from, providing information to help us keep current with the changes in our industry.

We need to continue to build the FAEC by attracting new members. We need to mentor to the new members and continue to network with the existing ones.

I was very honored to serve as President of the FAEC this past year and look forward to the challenge and opportunity to serve as President in "2011". We are going to have a great year with so many opportunities and fun! So get involved and I hope to see everyone in April at our educational symposium at the Sonesta Hotel in Orlando, Florida.

Merry Christmas and Happy New Year!

~ Kim

FAEC BENEFITS OF MEMBERSHIP INCLUDE:

- A Voice in the Legislative Process through a lobbyist in Tallahassee.
- An Annual 'Spring Conference" & "Fall Convention" offering Continuing Education classes relative to license renewal.
- The official publication of FAEC - The "Contactor" bringing you up-to-date on association information and industry news.
- A Group Major Medical Insurance Program.
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GARY S. REDWINE

Gary has over 35 years of experience in the consulting and alternate workforce industry. As President/ CEO of RAMS/RPG, Gary has full responsibility for all marketing, sales and operations for the company and its subsidiaries.

RAMS/RPG, headquartered in Tampa, Florida, specializes in providing quality and compliant alternate workforce solutions to the skilled trades industry. RAMS/RPG began operations in 1994 and provides services throughout Florida. The company implemented its JUMPSTART program in late 2003, which was developed to train individuals in the electrical trade. The program starts with inexperienced students and takes them through a series of classroom and hands-on training sessions. These trainees are then assigned with existing clients and they work alongside skilled tradesmen while further developing their skills. Throughout the course of the following year, the trainees are brought back to the classroom and given additional training. After completion of the program, students are eligible for enrollment in a number of state-approved Apprenticeship Programs. The program was expanded to include the field of plumbing in 2006.

RAMS/RPG, through its TEC Division, had developed a number of safety, skill enhancement, supervisory and management awareness training classes for the company's employees and client employees. TEC is approved by the State of Florida Electrical Construction License Board for training and issuance of continuing education units in Fire Alarm Systems Agent (FASA), Burglary Alarm System Agent (BASA), their respective license renewal courses and OSHA 10 and 30 Safety Training.

Prior to RAMS/RPG, Gary held various senior management positions, ending as Division President for a billion dollar consulting, engineering, and staffing firm with over 32,000 employees worldwide. Gary has been an international guest speaker on the subject of Developing Strategic Business Alliances and served on the Department of Defense Task Force on developing Computer-Aided Logistic Design Standards.

FAEC Central Florida Chapter First Aid Class

By Mike Holt, NEC Expert

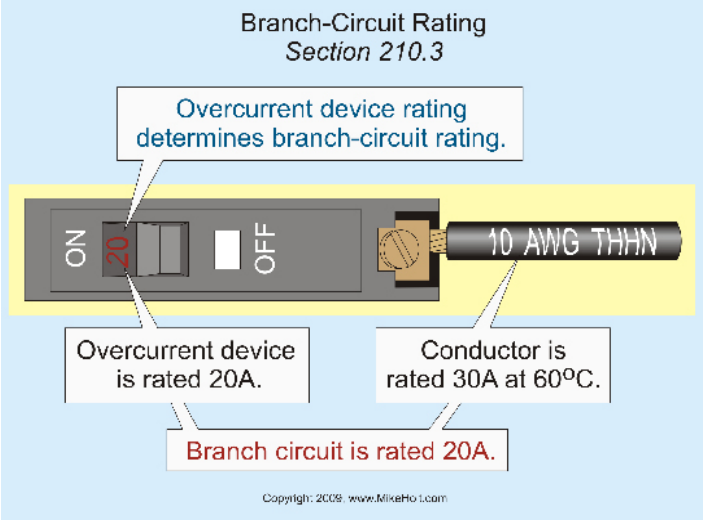
Introduction to Article 210

Branch Circuits

Part 3 of 6:
Mike Holt's Illustrated Guide to Understanding the National Electrical Code

210.3 Branch-Circuit Rating. The rating of a branch circuit is determined by the rating of the branch-circuit overcurrent device, not the conductor size.

Author's Comment: For example, the branch-circuit ampere rating of 10 THHN conductors on a 20A circuit breaker is 20A. Figure 210–1 -2(210-03 01)



210.4 Multiwire Branch Circuits.

(A) General. A multiwire branch circuit can be considered a single circuit or a multiple circuit.

Author's Comments:

• See the definition of "Multiwire Branch Circuit" in Article 100.

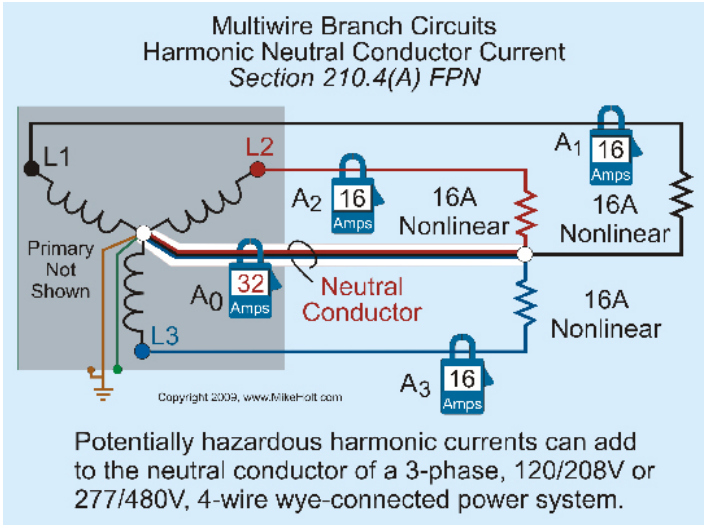
• Two small-appliance circuits are required for receptacles that serve countertops in dwelling unit kitchens [210.11(C)(1) and 210.52(B)]. One 3-wire, single-phase, 120/240V multiwire branch circuit can be used for this purpose.

To prevent inductive heating and to reduce conductor impedance for fault currents, all conductors of a multiwire branch circuit must originate from the same panelboard.

Author's Comment: For more information on the inductive heating of metal parts, see 300.3(B), 300.5(I), and 300.20.

FPN: Unwanted and potentially hazardous harmonic neutral currents can cause additional heating of the neutral conductor of a 4-wire, three-phase, 120/208V or 277/480V wye-connected system, which supplies nonlinear loads.

Author's Comment: To prevent fire or equipment damage from excessive harmonic neutral currents, the designer should consider: (1) increasing the size of the neutral conductor, or (2) installing a separate neutral for each phase. Also see 220.61(C)(2) FPN No. 2, and 310.15(B)(4)(c) in this text-book. Figure 210–2 -3(210-04A0 01 FPN)



Author's Comments:

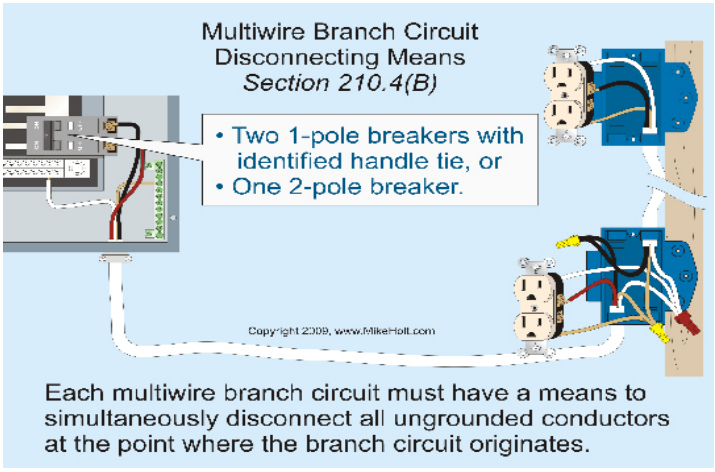
• See the definition of "Nonlinear Load" in Article 100.

• For more information, please visit www.MikeHolt.com. Click on "Technical Information" on the left side of the page, then select "Power Quality."

(B) Disconnecting Means. Each multiwire branch circuit must have a means to simultaneously disconnect all ungrounded conductors at the point where the branch circuit originates. Figure 210–3 -4(210-04B0 01)

Author's Comment: Individual single-pole circuit breakers with handle ties identified for the purpose, or a breaker with common internal trip, can be used for this application [240.15(B)(1)].

Caution: This rule is intended to prevent people from

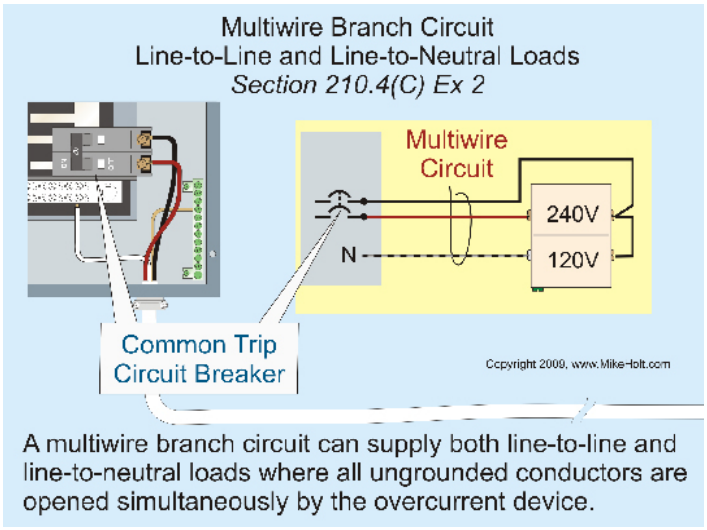


working on energized circuits they thought were disconnected.

(C) Line-to-Neutral Loads. Multiwire branch circuits must supply only line-to-neutral loads.

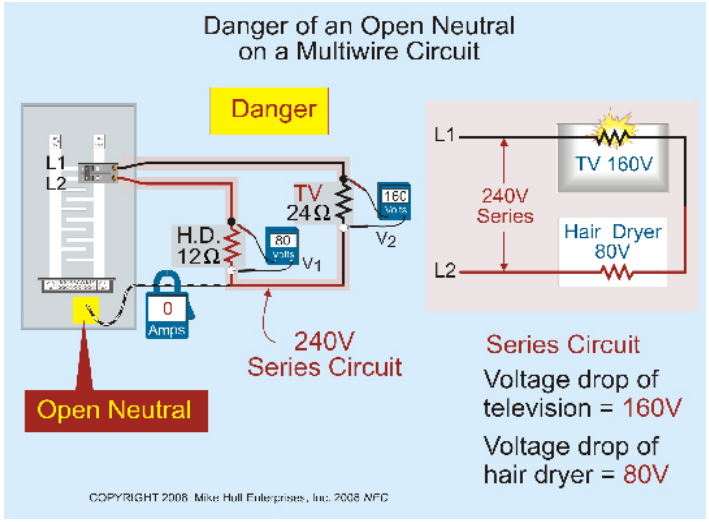
Exception No. 1: A multiwire branch circuit is permitted to supply an individual piece of line-to-line utilization equipment, such as a range or dryer.

Exception No. 2: A multiwire branch circuit is permitted to supply both line-to-line and line-to-neutral loads if the circuit is protected by a device (multipole circuit breaker) that opens all ungrounded conductors of the multiwire branch circuit simultaneously (common internal trip) under a fault condition. Figure 210–4 -5(210-04Cx2 01)

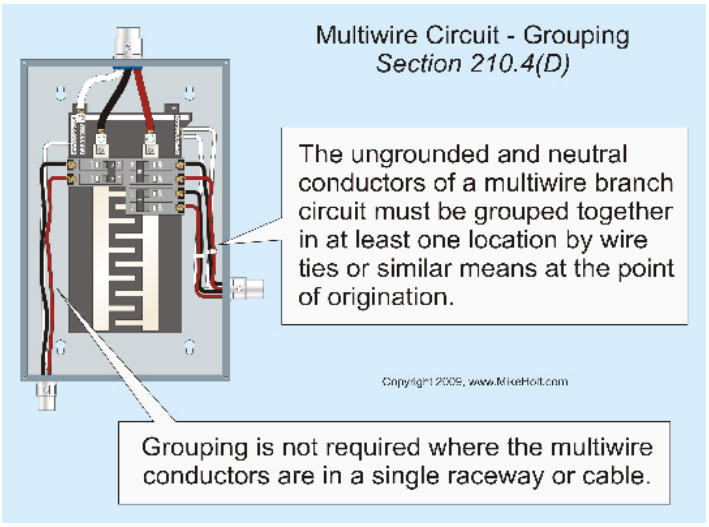


FPN: See 300.13(B) for the requirements relating to the continuity of the neutral conductor on multiwire branch circuits.

Caution: If the continuity of the neutral conductor of a multiwire circuit is interrupted (open), the resultant over- or undervoltage can cause a fire and/or destruction of electrical equipment. For details on how this occurs, see 300.13(B) in this textbook. Figure 210–5 -6(210-04Cx2 03 FPN)



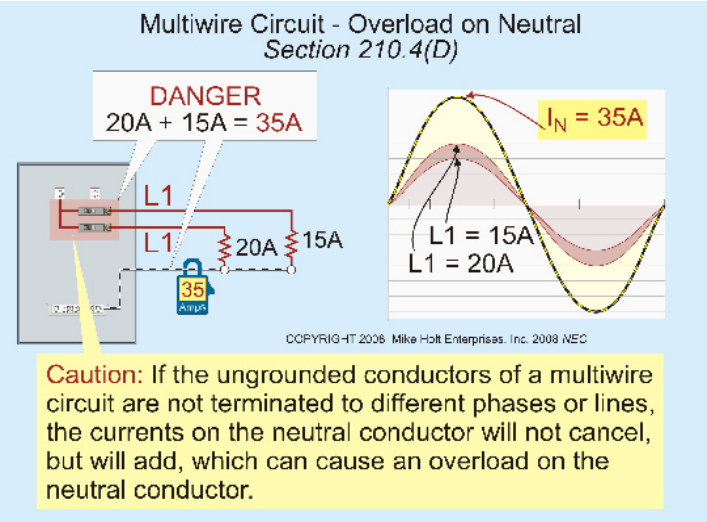
(D) Grouping. The ungrounded and neutral conductors of a multiwire branch circuit must be grouped together in at least one location by wire ties or similar means at the point of origination. Figure 210–6 -7(210-04D0 01)



Exception: Grouping is not required where the circuit conductors are contained in a single raceway or cable that makes the grouping obvious.

Author's Comment: Grouping all associated conductors of a multiwire branch circuit together by wire ties or other means within the panel or origination point of the circuit makes it easier to visually identify the conductors of the multiwire branch circuit. The grouping will assist in connecting multiwire branch circuit conductors to circuit breakers correctly, particularly where twin breakers are used. If proper diligence is not exercised when making these connections, two circuit conductors could be accidentally connected to the same phase conductor.

Caution: If the ungrounded conductors of a multiwire circuit are not terminated to different phases or lines, the currents on the neutral conductor will not cancel, but will add, which can cause an overload on the neutral conductor. Figure 210–7 -8(210-04D0 02)



210.5 Identification for Branch Circuits.

(A) Neutral Conductor. The neutral conductor of a branch circuit must be identified in accordance with 200.6.

(B) Equipment Grounding Conductor. Equipment grounding conductors can be bare, covered, or insulated. Insulated equipment grounding conductors size 6 AWG and smaller must have a continuous outer finish either green or green with one or more yellow stripes [250.119].

On equipment grounding conductors larger than 6 AWG, insulation can be permanently reidentified with green marking at the time of installation at every point where the conductor is accessible [250.119(A)].

(C) Ungrounded Conductors—More Than One Voltage System. Where the premises wiring system contains branch circuits supplied from more than one voltage system, each ungrounded conductor, at all termination, connection, and splice points, must be identified by phase and system. Identification can be by color coding, marking tape, tagging, or other means approved by the authority having jurisdiction. The method of identification must be documented in a manner readily available or permanently posted at each branch-circuit panelboard. Figure 210–8 -9(210-05C 01)

Author's Comment: Although the NEC doesn't require a specific color code for ungrounded conductors, electricians often use the following color system for power and lighting conductor identification:

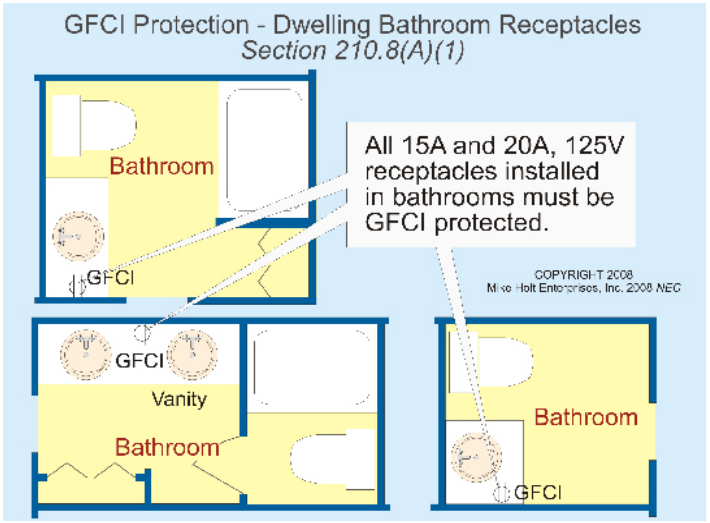
- 120/240V, single-phase—black, red, and white
- 120/208V, three-phase—black, red, blue, and white
- 120/240V, three-phase—black, orange, blue, and white
- 277/480V, three-phase—brown, orange, yellow, and gray; or, brown, purple, yellow, and gray
- Conductors with insulation that is green or green with one or more yellow stripes can't be used for an ungrounded or neutral conductor [250.119].

210.8 GFCI Protection.

(A) Dwelling Units. GFCI protection is required for all 15A and 20A, 125V receptacles located in the following locations of a dwelling unit:

Author's Comment: See the definitions of GFCI and Dwelling Unit in Article 100.

(1) Bathroom Area. GFCI protection is required for all 15A and 20A, 125V receptacles in the bathroom area of a dwelling unit. Figure 210–9 -11(210-08A1 01)



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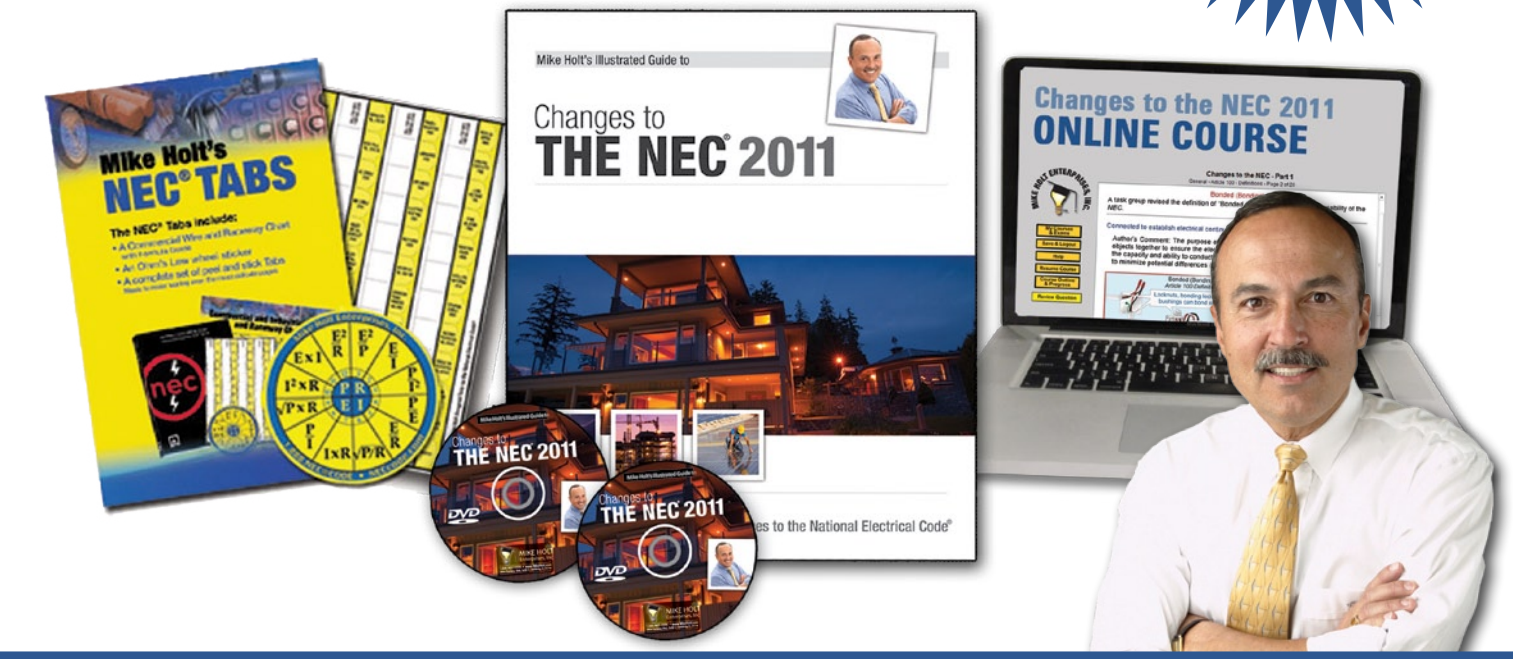

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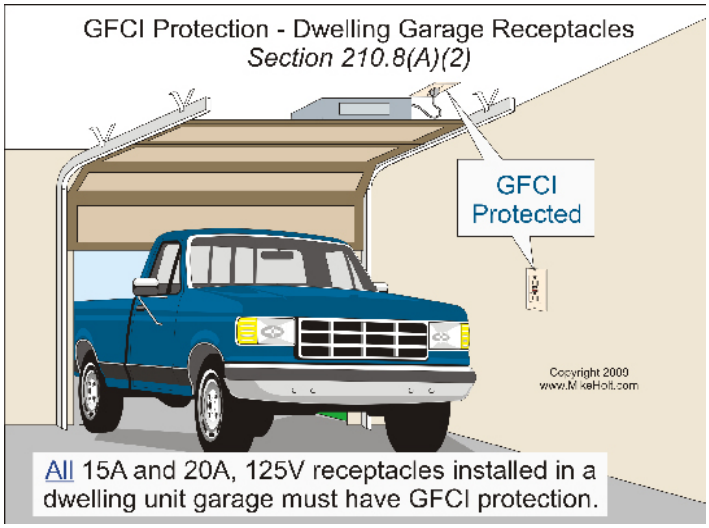
"but as for me and my house, we will serve the Lord" [Joshua 24:15]

Author's Comments:

• See the definition of "Bathroom" in Article 100.

• In the continued interests of safety, proposals to allow receptacles for dedicated equipment in the bathroom area to be exempted from the GFCI protection requirements have been rejected.

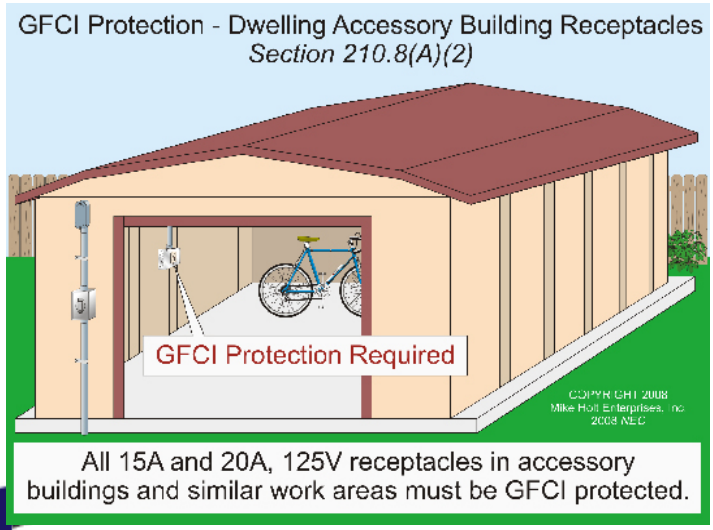
(2) Garages and Accessory Buildings. GFCI protection is required for all 15A and 20A, 125V receptacles in garages, and in grade-level portions of accessory buildings used for storage or work areas of a dwelling unit. Figure 210–10 -12(210-08A2 01)



Author's Comments:

• See the definition of "Garage" in Article 100.

• A receptacle outlet is required in a dwelling unit attached garage [210.52(G)], but a receptacle outlet isn't required in an accessory building or a detached garage without power. If a 15A or 20A, 125V receptacle is installed in an accessory building, it must be GFCI protected. Figure 210–11 -13(210-08A2 02)



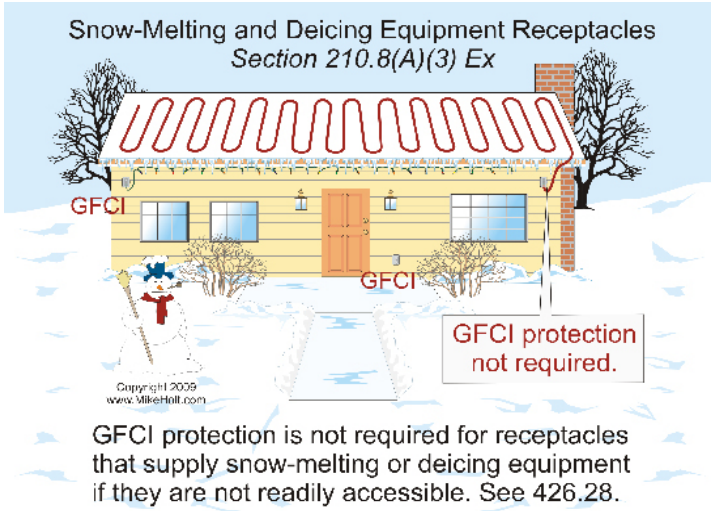
(3) Outdoors. All 15A and 20A, 125V receptacles located outdoors of dwelling units, including receptacles installed under the eaves of roofs, must be GFCI protected. Figure 210–12 -14(210-08A3 01)

Author's Comments:

• Each dwelling unit of a multifamily dwelling that has an individual entrance at grade level must have at least one GFCI-protected receptacle outlet accessible from grade level located not more than 6½ ft above grade [210.52(E)(2)].

• Balconies, decks, and porches over 20 sq ft that are attached to the dwelling unit and are accessible from inside the dwelling must have at least one GFCI-protected receptacle outlet accessible from the balcony, deck, or porch [210.52(E)(3)].

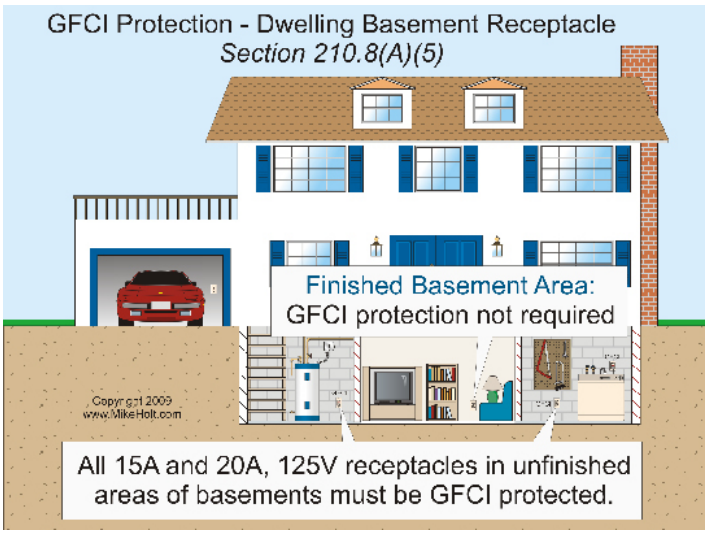
Exception: GFCI protection isn't required for a fixed electric snow-melting or deicing equipment receptacle supplied by a dedicated branch circuit, if the receptacle isn't readily accessible and the equipment or receptacle has ground-fault protection of equipment (GFPE) [426.28]. Figure 210–13 -15(210-08A3x 01)



(4) Crawl Spaces. All 15A and 20A, 125V receptacles installed in crawl spaces at or below grade of a dwelling unit must be GFCI protected.

Author's Comment: The Code doesn't require a receptacle to be installed in a crawl space, except when heating, air-conditioning, and refrigeration equipment is installed there [210.63].

(5) Unfinished Basements. GFCI protection is required for all 15A and 20A, 125V receptacles located in the unfinished portion of a basement not intended as a habitable room and limited to storage and work areas. Figure 210–14 -16(210-08A5 01)



Exception: A receptacle supplying only a permanently installed fire alarm or burglar alarm system is not required to be GFCI protected [760.41(B) and 760.121(B)].

Author's Comment: A receptacle outlet is required in each unfinished portion of a dwelling unit basement [210.52(G)].

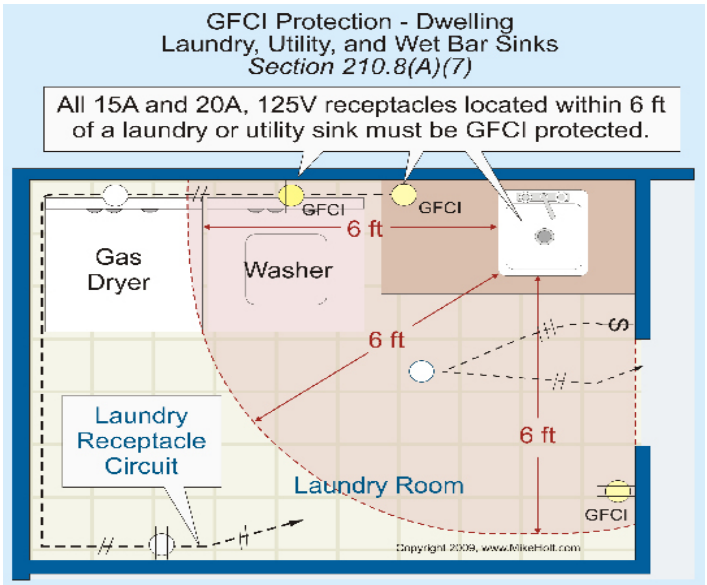
(6) Kitchen Countertop Surfaces. GFCI protection is required for all 15A and 20A, 125V receptacles that serve countertop surfaces in a dwelling unit. Figure 210–15

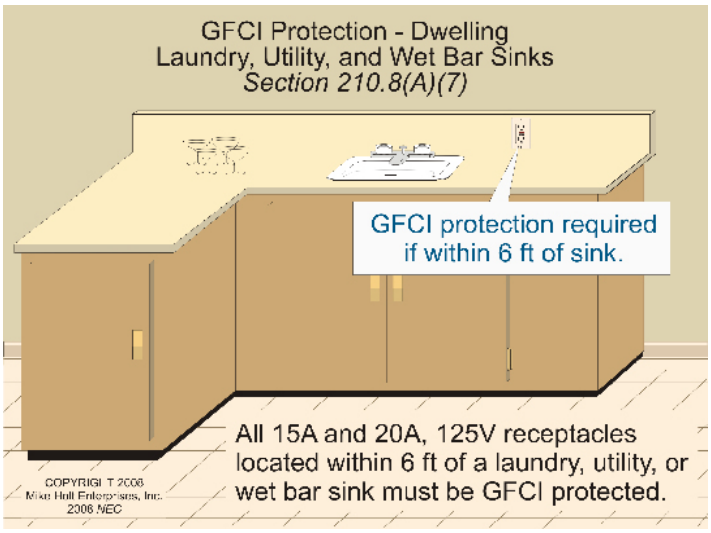
Author's Comments:

• GFCI protection is required for all receptacles that serve countertop surfaces. But GFCI protection isn't required for receptacles that serve built-in appliances, such as dishwashers or kitchen waste disposals.

• See 210.52(C) for the location requirements of countertop receptacles.

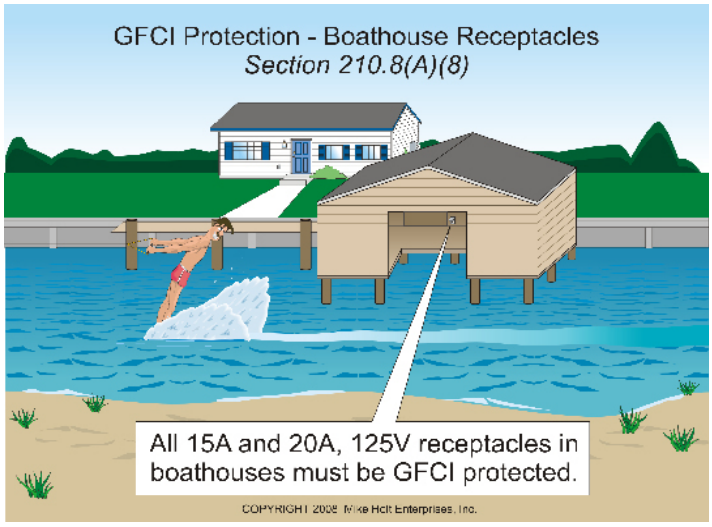
(7) Laundry, Utility, and Wet Bar Sinks. GFCI protection is required for all 15A and 20A, 125V receptacles located within an arc measurement of 6 ft from the sink. Figures 210–16 and 210–17 -18/19(210-08A7 01 and 210-08A7 02)





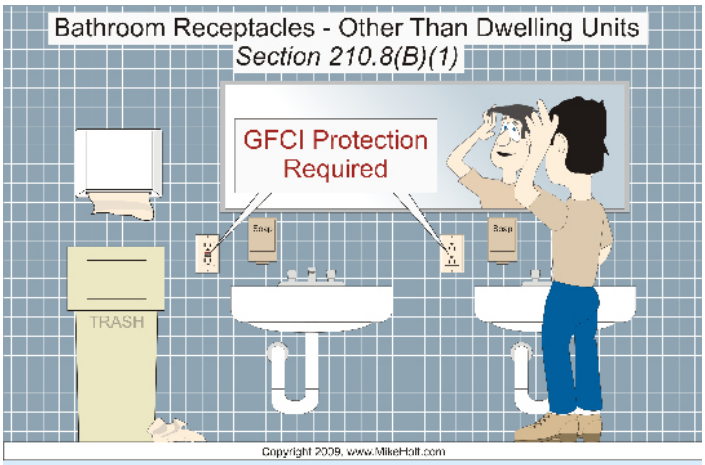
(8) Boathouses. GFCI protection is required for all 15A and 20A, 125V receptacles located in a dwelling unit boathouse. Figure 210–18 -20(210-08A8 01)

Author's Comment: The Code doesn't require a 15A or 20A, 125V receptacle to be installed in a boathouse, but if one is installed, it must be GFCI protected.



(B) Other than Dwelling Units. GFCI protection is required for all 15A and 20A, 125V receptacles installed in the following commercial/industrial locations:

(1) Bathrooms. All 15A and 20A, 125V receptacles installed in commercial or industrial bathrooms must be GFCI protected. Figure 210–19 -21(210-08B1 01)



All 15A and 20A, 125V receptacles in bathrooms for other than dwelling units must be GFCI protected.

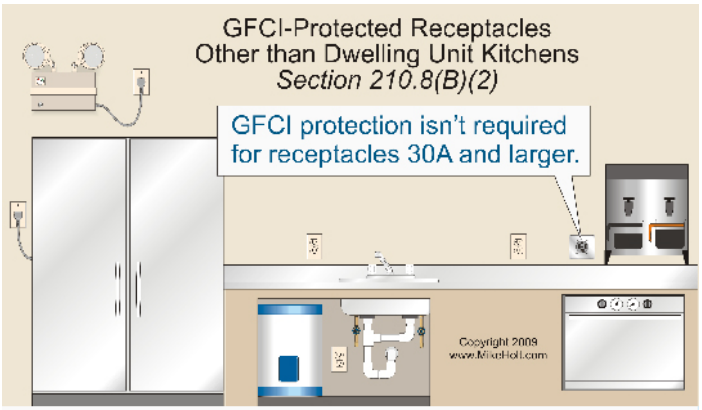
Author's Comments:

• See the definition of a "Bathroom" in Article 100.

• A 15A or 20A, 125V receptacle isn't required in a commercial or industrial bathroom, but if one is installed, it must be GFCI protected.

(2) Kitchens. All 15A and 20A, 125V receptacles installed in an area with a sink and permanent facilities for food preparation and cooking [Article 100], even those that don't supply the countertop surface, must be GFCI protected.

Figure 210–20 -22(210-08B2 01)



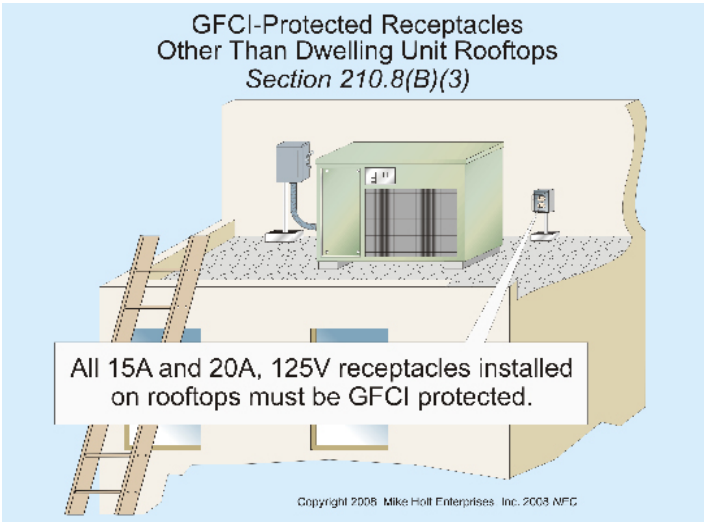
All 15A and 20A, 125V receptacles located in an area with a sink and permanent facilities for food preparation and cooking [Article 100 Kitchen] must be GFCI protected.

Author's Comments:

• GFCI protection is not required for receptacles rated other than 15A and 20A, 125V in these locations.

• GFCI protection is not required for hard-wired equipment in these locations.

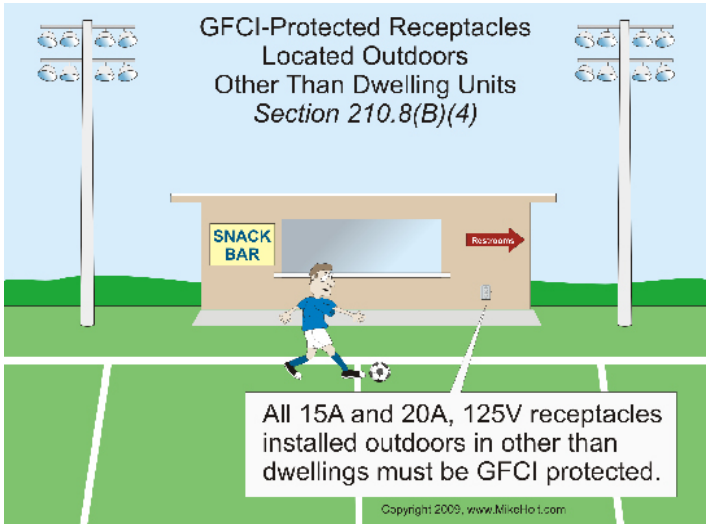
(3) Rooftops. All 15A and 20A, 125V receptacles installed on rooftops must be GFCI protected. Figure 210–21 -23(210-08B3 01)



Author's Comment: A 15A or 20A, 125V receptacle outlet must be installed within 25 ft of heating, air-conditioning, and refrigeration equipment [210.63].

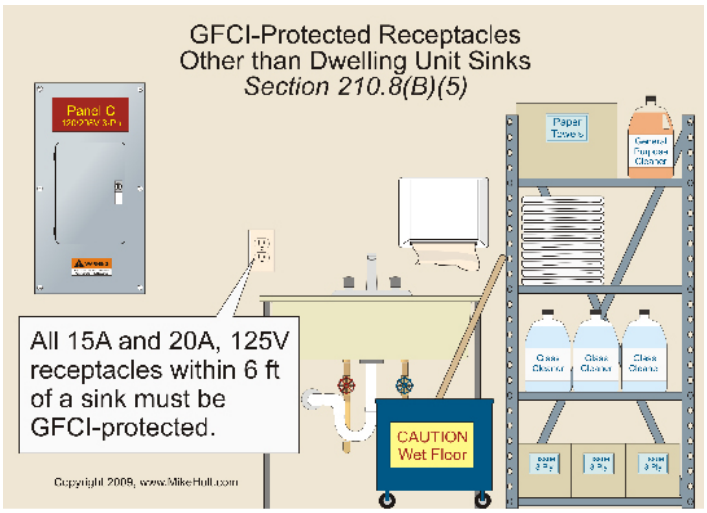
Exception: GFCI protection isn't required for a fixed electric snow-melting or deicing equipment receptacle that isn't readily accessible [426.28].

(4) Outdoors. All 15A and 20A, 125V receptacles installed outdoors must be GFCI protected. Figure 210–22 -24(210-08B4 01)



Exception No. 1 to (3) and (4): GFCI protection isn't required for a fixed electric snow-melting or deicing equipment receptacle supplied by a dedicated branch circuit, if the receptacle isn't readily accessible and the equipment or receptacle has ground-fault protection of equipment (GFPE) [426.28].

(5) Sinks. All 15A and 20A, 125V receptacles installed within 6 ft of the outside edge of a sink must be GFCI protected. Figure 210–23 -25(210-08B5 02)



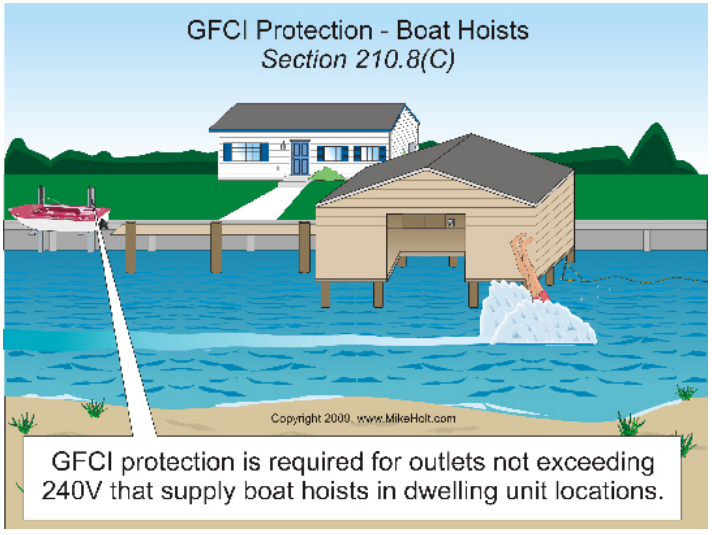
(C) Boat Hoists. GFCI protection is required for outlets not exceeding 240 volts that supply boat hoists in dwelling unit locations. Figure 210–24 -26(210-08C0 01)

Author's Comments:

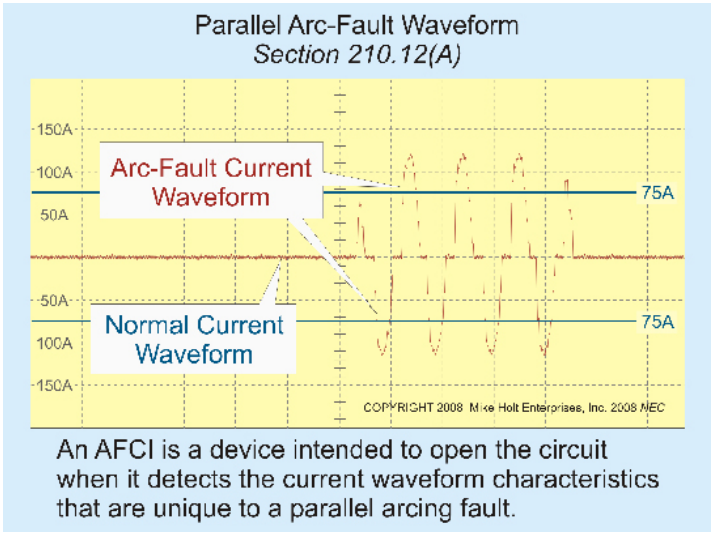
• See the definition of "Outlet" in Article 100.

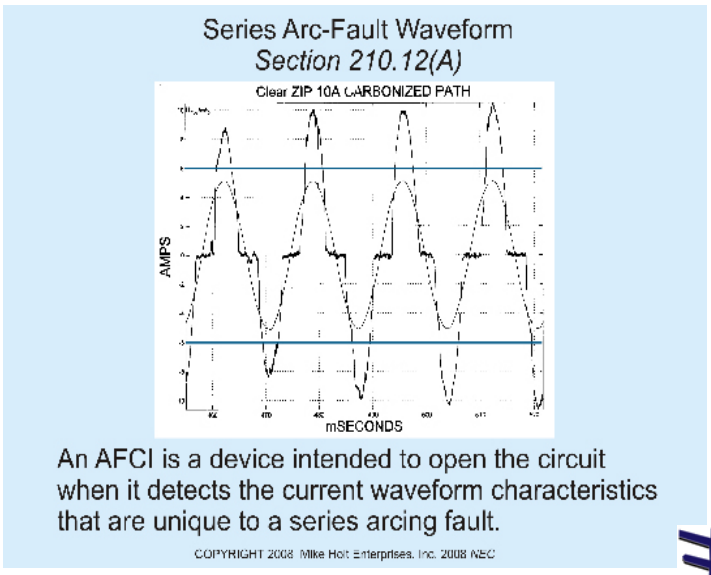
• This ensures GFCI protection regardless of whether the boat hoist is cord-and-plug-connected or hard-wired.

210.12 Arc-Fault Circuit-Interrupter—Protected Circuits.

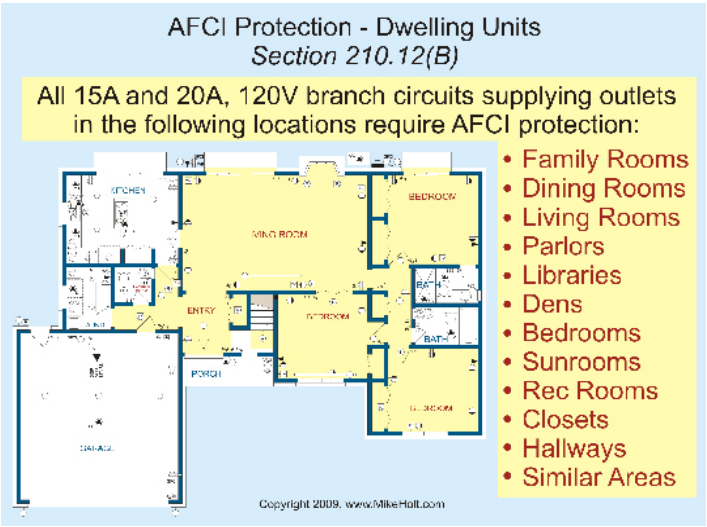


(A) AFCI Definition. An arc-fault circuit interrupter is a device intended to de-energize the circuit when it detects the current waveform characteristics unique to an arcing fault. Figures 210–25 and 210–26 -34/35(210-12A0 01 and 210-12A0 02)





(B) Dwelling Unit Circuits. All 15A or 20A, 120V branch circuits in dwelling units supplying outlets in family rooms, dining rooms, living rooms, parlors, libraries, dens, bedrooms, sunrooms, recreation rooms, closets, hallways, or similar rooms or areas must be protected by a listed AFCI device of the combination type. Figure 210–27 -36(210-12B0 01)



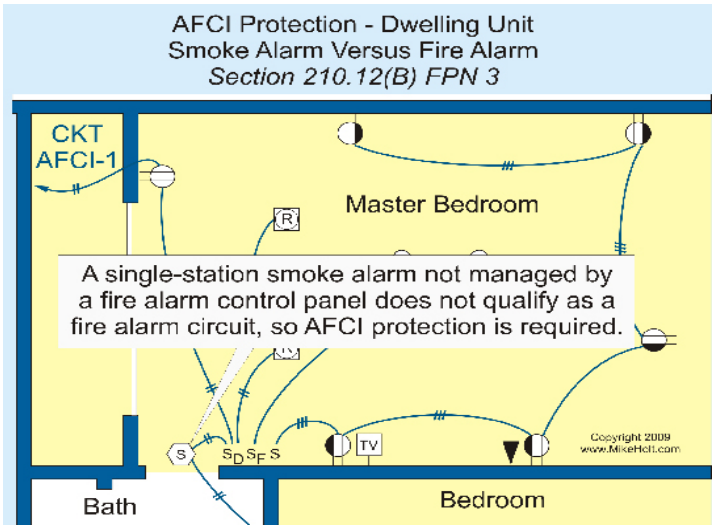
Author's Comment: The 120V circuit limitation means AFCI protection isn't required for equipment rated 230V, such as a baseboard heater or room air conditioner. For more information, visit www.MikeHolt.com, click on the "Search" link, and search for "AFCI."

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

Author's Comment: Smoke alarms connected to a 15A or 20A circuit of a dwelling unit must be AFCI protected if the smoke alarm is located in one of the areas specified In 210.12(B). The exemption from AFCI protection for the "fire alarm circuit" contained in 760.41(B) and 760.121(B) doesn't apply to the single-or multiple-station smoke alarm circuit typically installed in dwelling unit bedroom areas. This is because a smoke alarm circuit isn't a fire alarm circuit as defined in NFPA 72, National Fire Alarm Code. Unlike single-or multiple-station smoke alarms, fire alarm systems are managed by a fire alarm control panel. Figure 210–28 -37(210-12B0 02 FPN3)

Exception No. 1: The AFCI protection can be located at the first outlet if the circuit conductors are installed in RMC, IMC, EMT or steel armored Type AC cable, and the AFCI device is contained in a metal outlet or junction box.

Exception No. 2: AFCI protection can be omitted for branch-circuit wiring to a fire alarm system in accordance with 760.41(B) and 760.121(B), if the circuit conductors are



installed in RMC, IMC, EMT, or steel armored Type AC cable.

210.19 Conductor Sizing.

(A) Branch Circuits.

(1) Continuous and Noncontinuous Loads. Conductors must be sized no less than 125 percent of the continuous loads, plus 100 percent of the noncontinuous loads, based on the terminal temperature rating ampacities as listed in Table 310.16, before any ampacity adjustment [110.14(C)].

Exception No. 1: Where the assembly and the overcurrent device are both listed for operation at 100 percent of its rating, the conductors can be sized at 100 percent of the continuous load.

Author's Comment: Equipment suitable for 100 percent continuous loading is rarely available in ratings under 400A.

Exception No. 2: Neutral conductors can be sized at 100 percent of the continuous and noncontinuous load.

Author's Comments:

• See the definition of "Continuous Load" in Article 100.

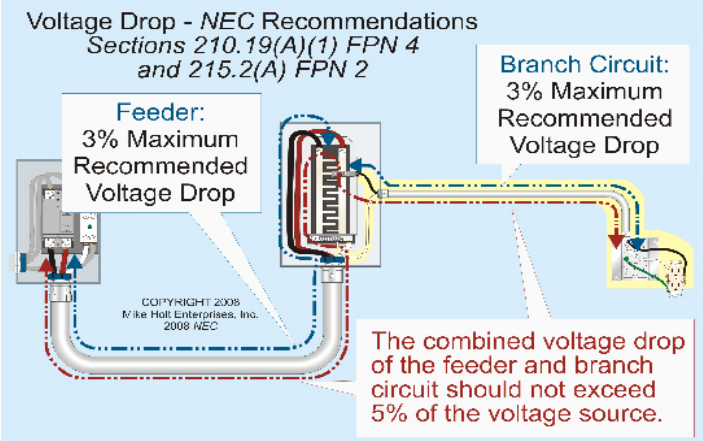
• See 210.20 for the sizing requirements for the branch-circuit overcurrent device for continuous and noncontinuous loads.

Question: What size branch-circuit conductors are required for the ungrounded conductors of a 44A continuous load, if the equipment terminals are rated 75ºC? Figure 210–29 -38(210-19A1 01)

(a) 10 AWG (b) 8 AWG (c) 6 AWG (d) 4 AWG

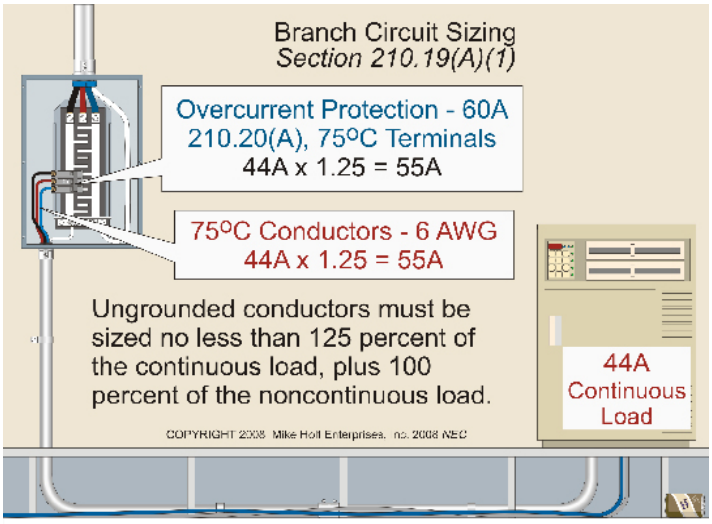
Answer: (c) 6 AWG

Since the load is 44A continuous, the ungrounded



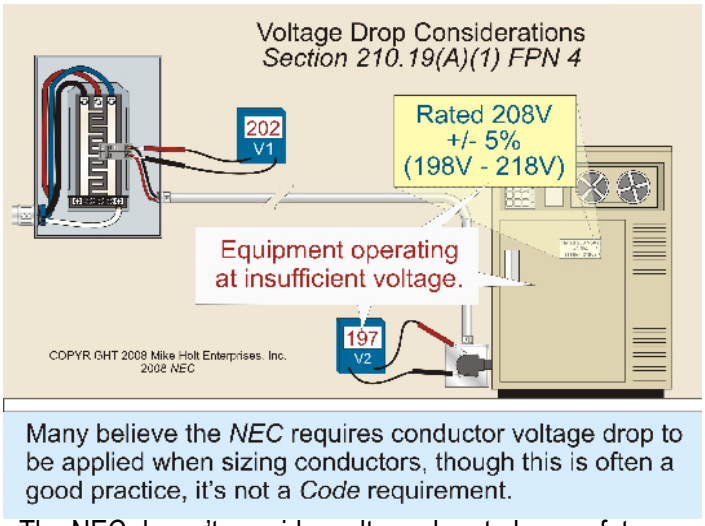
conductors must be sized to have an ampacity of not less than 55A (44A x 1.25). According to the 75ºC column of Table 310.16, a 6 AWG conductor is suitable, because it has an ampere rating of 65A at 75ºC before any conductor ampacity adjustment and/or correction.

FPN No. 4: To provide reasonable efficiency of operation of electrical equipment, branch-circuit conductors should be sized to prevent a voltage drop not to exceed 3 percent. In addition, the maximum total voltage drop on both feeders and branch circuits should not exceed 5 percent. Figure 210–30 -39(210-19A1 01 FPN4)



Author's Comments:

• Many believe the NEC requires conductor voltage drop, as per Fine Print Note No. 4 to be applied when sizing conductors. Although this is often a good practice, it's not a Code requirement because FPNs are only advisory statements [90.5(C)]. Figure 210–31 -40(210-19A1 02 FPN4)



Many believe the *NEC* requires conductor voltage drop to be applied when sizing conductors, though this is often a good practice, it's not a *Code* requirement.

• The NEC doesn't consider voltage drop to be a safety issue, except for sensitive electronic equipment [647.4(D)] and fire pumps [695.7].

(2) Multioutlet Branch Circuits. Branch-circuit conductors that supply more than one receptacle for cord-and-plug-connected portable loads must have an ampacity not less than the rating of the circuit overcurrent device [210.3].

(3) Household Ranges and Cooking Appliances. Branch-circuit conductors that supply household ranges, wall-mounted ovens or counter-mounted cooking units must have an ampacity not less than the rating of the branch circuit, and not less than the maximum load to be served. For ranges of 8¾ kW or more rating, the minimum branch-circuit ampere rating is 40A.

Exception No. 1: Conductors tapped from a 50A branch circuit for electric ranges, wall-mounted electric ovens and counter-mounted electric cooking units must have an ampacity not less than 20A, and must have sufficient ampacity for the load to be served. The taps must not be longer than necessary for servicing the appliances.

(4) Other Loads. Branch-circuit conductors must have an ampacity sufficient for the loads served and must not be smaller than 14 AWG.

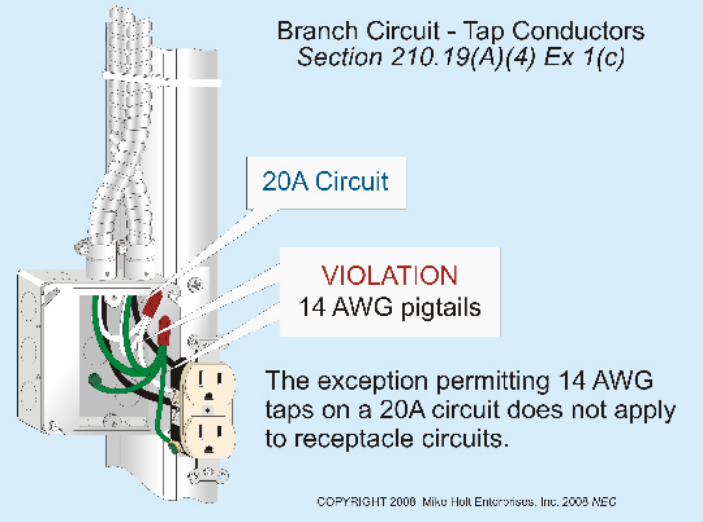
Exception No. 1: Tap conductors must have sufficient ampacity for the load to be served and have an ampacity not less than 15A for circuits rated less than 40A and not less than 20A for circuits rated at 40A or 50A for the following:

(b) Luminaires having tap conductors sized according to 410.117.

(c) Individual outlets, other than receptacle outlets, with taps not over 18 in. long.

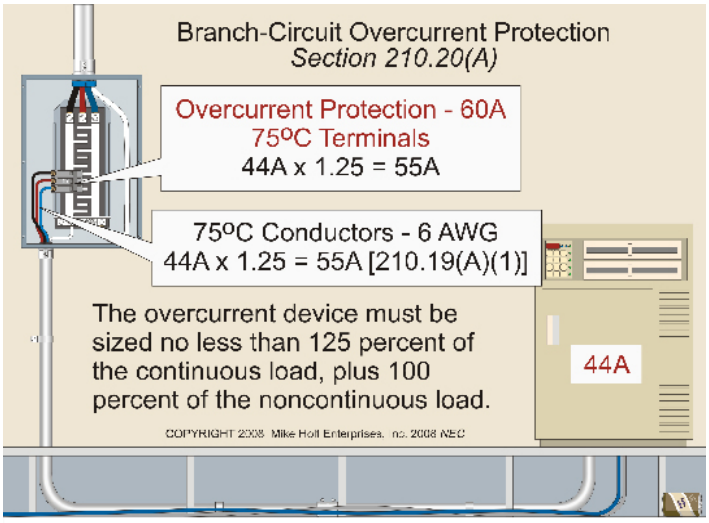
Author's Comment: Branch-circuit tap conductors aren't

permitted for receptacle outlets. Figure 210–32 -41(210-19A4x1c 01)



210.20 Overcurrent Protection.

(A) Continuous and Noncontinuous Loads. Branch-circuit overcurrent devices must have an ampacity of not less than 125 percent of the continuous loads, plus 100 percent of the noncontinuous loads. Figure 210–33 -42(210-20A0 01)



Author's Comment: See 210.19(A)(1) for branch-circuit conductor sizing requirements.

Exception: Where the assembly and the overcurrent devices are both listed for operation at 100 percent of their rating, the branch-circuit overcurrent device can be sized at 100 percent of the continuous load.

Author's Comment: Equipment suitable for 100 percent continuous loading is rarely available in ratings under 400A.

(B) Conductor Protection. Branch-circuit conductors must be protected against overcurrent in accordance with 240.4.

(C) Equipment Protection. Branch-circuit equipment must be protected in accordance with 240.3.

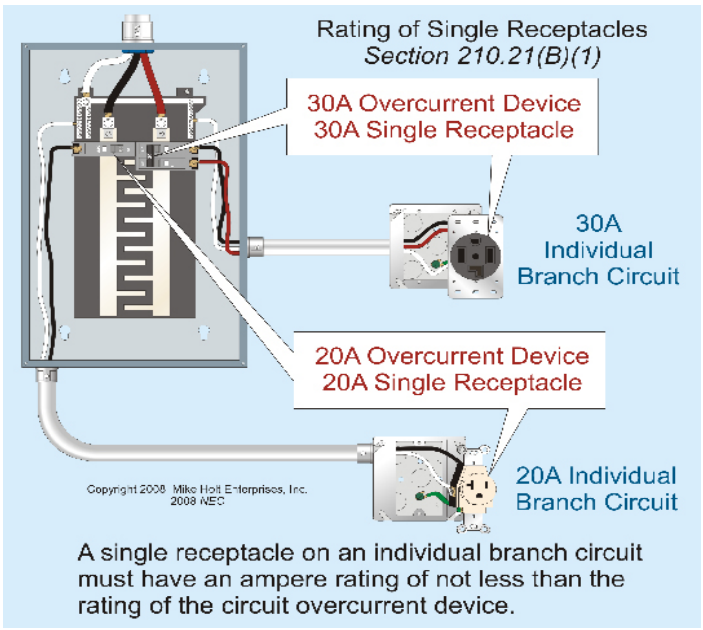
210.21 Outlet Device Rating.

(A) Lampholder Ratings. Lampholders connected to a branch circuit rated over 20A must be of the heavy-duty type.

Author's Comment: Fluorescent lampholders aren't rated heavy duty, so fluorescent luminaires must not be installed on circuits rated over 20A.

(B) Receptacle Ratings and Loadings.

(1) Single Receptacles. A single receptacle on an individual branch circuit must have an ampacity not less than the rating of the overcurrent device. Figure 210–34 -43(210-21B1 01)



FPN: A single receptacle has only one contact device on its yoke [Article 100]. This means a duplex receptacle is considered two receptacles.

(2) Multiple Receptacle Loading. Where connected to a branch circuit that supplies two or more receptacles, the total cord-and-plug-connected load must not exceed 80 percent of the receptacle rating.

Author's Comment: A duplex receptacle has two contact devices on the same yoke [Article 100]. This means even one duplex receptacle on a circuit makes that circuit a multioutlet branch circuit.

(3) Multiple Receptacle Rating. Where connected to a

branch circuit that supplies two or more receptacles, receptacles must have an ampere rating in accordance with the values listed in Table 210.21(B)(3). Figure 210–35 -44(210-21B3 01)

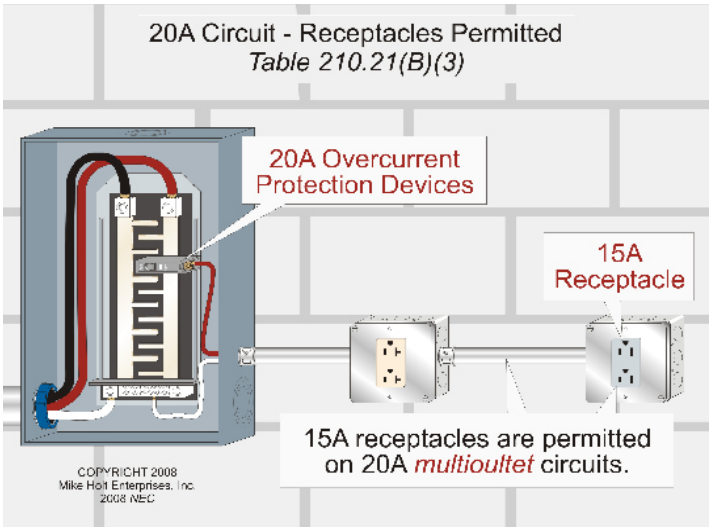


Table 210.21(B)(3) Receptacle Ratings

Circuit Rating	Receptacle Rating
15A	15A
20A	15A or 20A
30A	30A
40A	40A or 50A
50A	50A

210.52 Dwelling Unit Receptacle Outlet Requirements. Receptacles rated 15A and 20A, 125V must be installed as required in (A) through (H), and the receptacles required by this section are in addition to any receptacle that is:

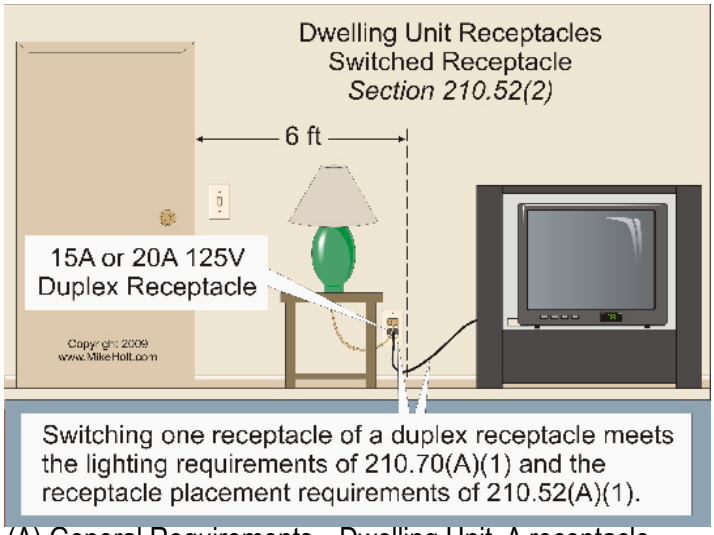
(1) Part of a luminaire or appliance,

(2) Controlled by a wall switch to meet the illumination requirements of 210.70(A)(1) Ex 1,

Author's Comment: Receptacle outlets in a dwelling unit must be installed so that no point measured horizontally along the floor line in any wall space is more than 6 ft from a receptacle outlet [210.52(A)(1)]. Switching one receptacle of a duplex receptacle can meet the lighting requirements of 210.70(A)(1) and the receptacle placement requirements of this section. Figure 210–36 -51(210-52(2) 01)

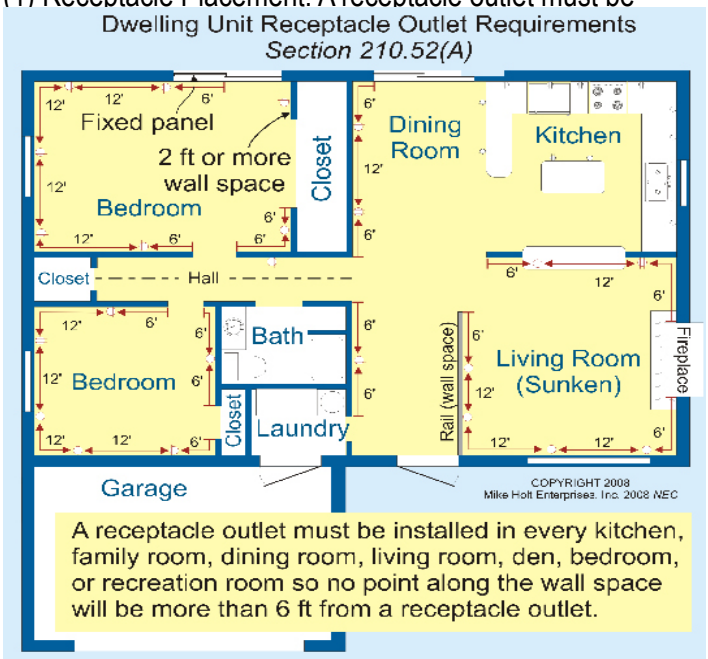
(3) Located within cabinets or cupboards, or

(4) Located more than 5½ ft above the floor.



(A) General Requirements—Dwelling Unit. A receptacle outlet must be installed in every kitchen, family room, dining room, living room, sunroom, parlor, library, den, bedroom, recreation room, and similar room or area in accordance with (1), (2), and (3): Figure 210–37 -52(210-52A0 01)

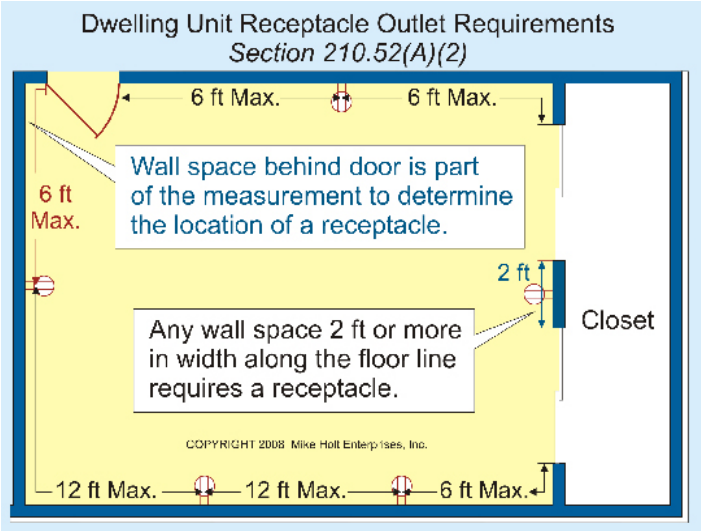
(1) Receptacle Placement. A receptacle outlet must be



installed so that no point along the wall space is more than 6 ft, measured horizontally along the floor line, from a receptacle outlet.

Author's Comment: The purpose of this rule is to ensure that a general-purpose receptacle is conveniently located to reduce the chance that an extension cord will be used.

(2) Definition of Wall Space. Figure 210–38 -53(210-52A2 01)

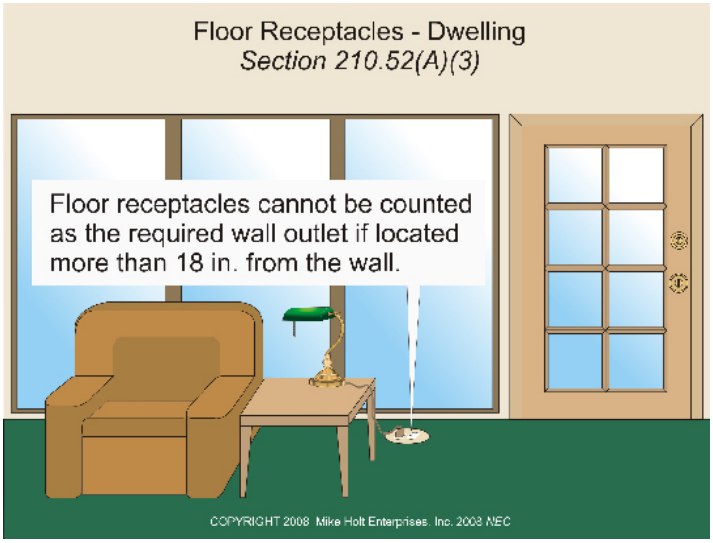


(1) Any space 2 ft or more in width, unbroken along the floor line by doorways, fireplaces, and similar openings.

(2) The space occupied by fixed panels in exterior walls.

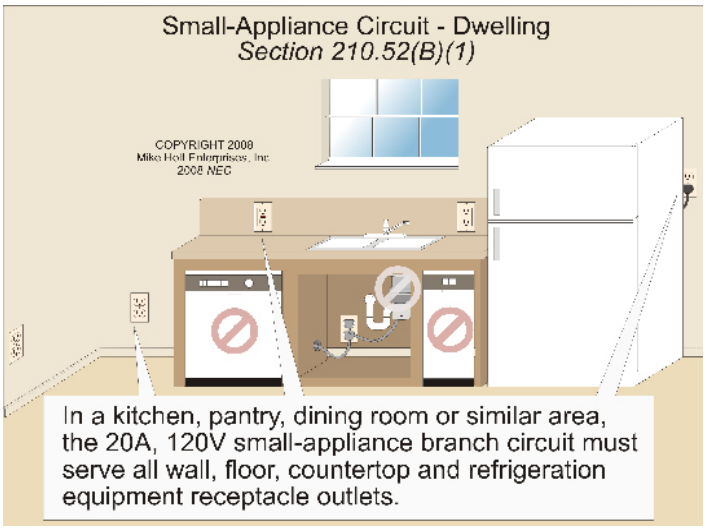
(3) The space occupied by fixed room dividers, such as freestanding bar-type counters or guard rails.

(4) Floor Receptacle Outlets. Floor receptacle outlets are not counted as the required receptacle wall outlet if they are located more than 18 in. from the wall. Figure 210–39 -54(210-52A3 01)

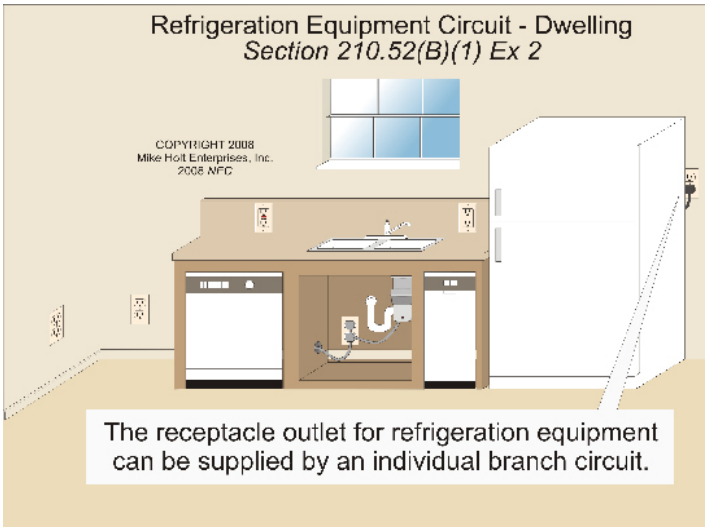


(B) Small-Appliance Circuits.

(1) Receptacle Outlets. The two or more 20A, 120V small-appliance branch circuits serving the kitchen, pantry, breakfast room, and dining room area of a dwelling unit [210.11(C)(1)] must serve all wall, floor and countertop receptacle outlets [210.52(C)], and the receptacle outlet for refrigeration equipment. Figure 210–40 -55(210-52B1 01)



Exception No. 2: The receptacle outlet for refrigeration equipment can be supplied from an individual branch circuit rated 15A or greater. Figure 210–41 -56(210-52B1x2 01)

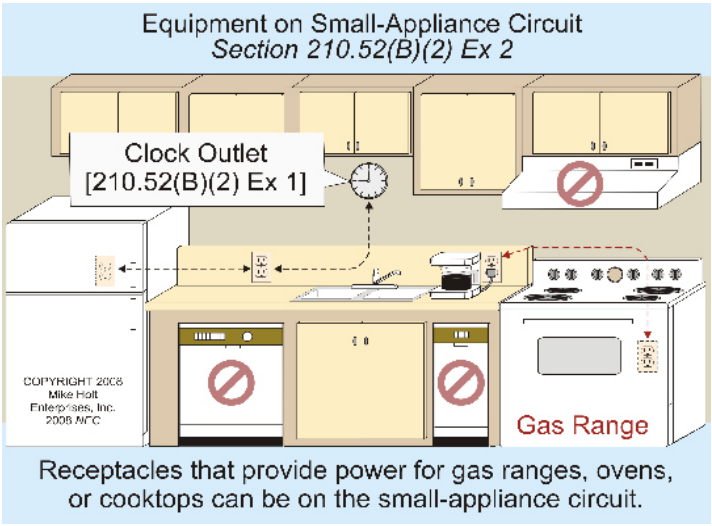


(2) Not Supply Other Outlets. The 20A, 120V small-appliance circuits required by 210.11(C)(1) must not supply outlets for luminaires or appliances.

Exception No. 1: The 20A, 120V small-appliance branch circuit can be used to supply a receptacle for an electric clock.

Exception No. 2: A receptacle can be connected to the small-appliance branch circuit to supply a gas-fired range, oven, or counter-mounted cooking unit. Figure 210–42 -57(210-52B2x2 01)

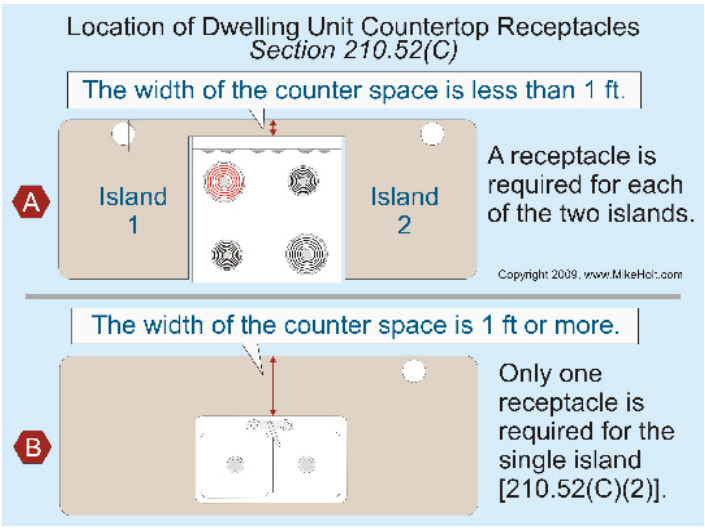
Author's Comment: A range hood or above the range microwave listed as a range hood must be supplied by an individual branch circuit if connected by cord and receptacle [422.16(B)(4)(5)].



(3) Kitchen Countertop Receptacles. Kitchen countertop receptacles, as required by 210.52(C), must be supplied by not less than two 20A, 120V small-appliance branch circuits [210.11(C)(1)]. Either or both of these circuits can supply receptacle outlets in the same kitchen, pantry, breakfast room, or dining room of the dwelling unit [210.11(C)(1) and 210.52(B)(1)].

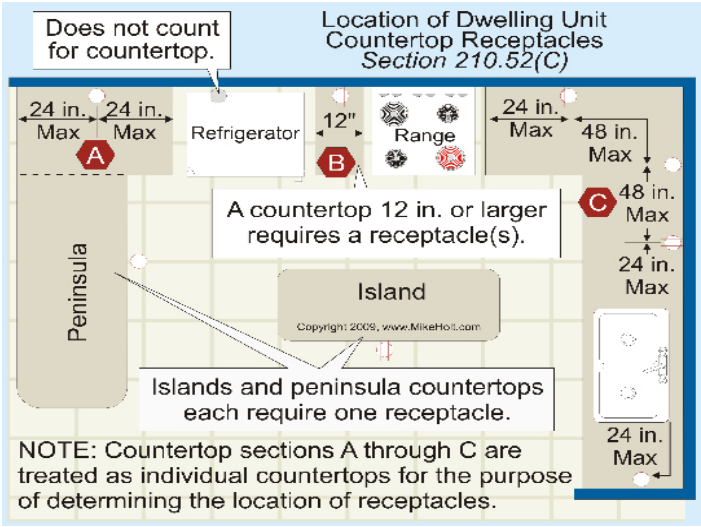
(C) Countertop Receptacles. In kitchens, pantries, breakfast rooms, dining rooms and similar areas of dwelling units, receptacle outlets for countertop spaces must be installed according to (1) through (5) below.

Where a range, counter-mounted cooking unit, or sink is installed in an island or peninsular countertop, and the width of the counter behind the range, counter-mounted cooking unit, or sink is less than 12 in., the countertop space is considered to be two separate countertop spaces. Figure 210–43 -58(210-52C0 01)

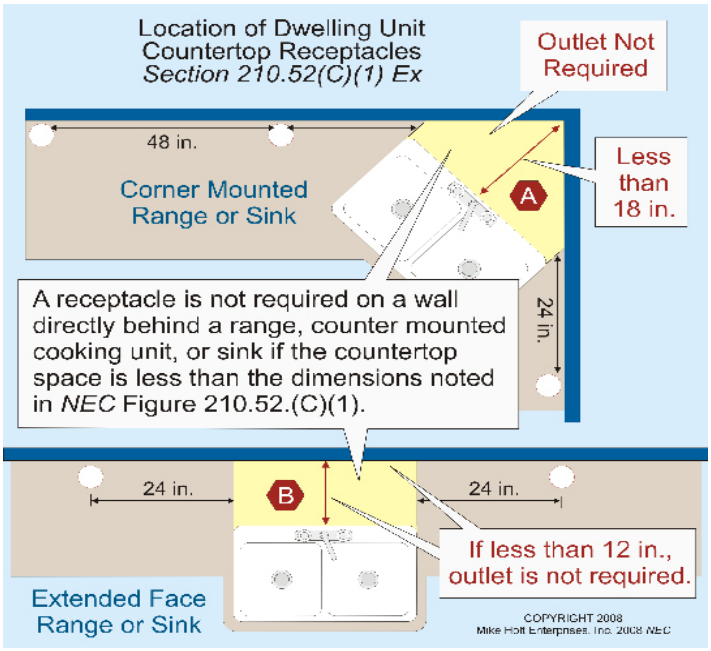


Author's Comment: GFCI protection is required for all 15A and 20A, 125V receptacles that supply kitchen countertop surfaces [210.8(A)(6)].

(1) Wall Countertop Spaces. A receptacle outlet must be installed for each kitchen and dining area countertop wall space 1 ft or wider, and receptacles must be placed so that no point along the countertop wall space is more than 2 ft, measured horizontally, from a receptacle outlet. Figure 210–44 -59(210-52C0 02)



Exception: A receptacle outlet isn't required on a wall directly behind a range, counter-mounted cooking unit, or sink, in accordance with Figure 210.52(C)(1) in the NEC. Figure 210–45 -60(210-52C1x 01)

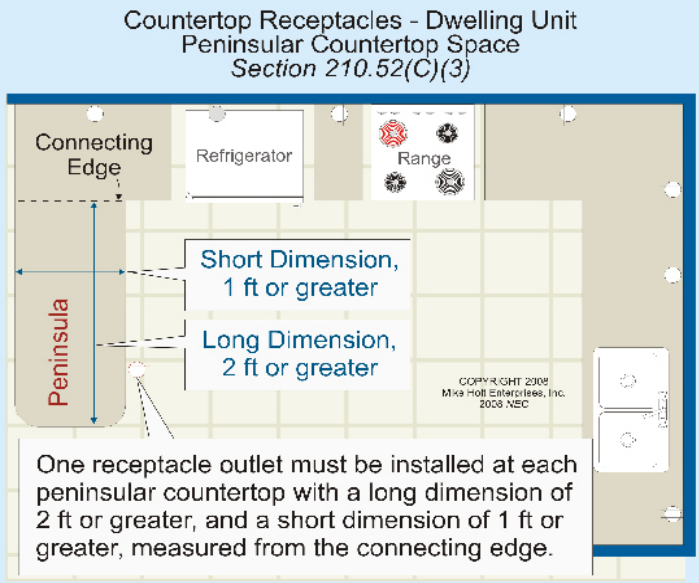


Author's Comment: If the countertop space behind a range or sink is larger than the dimensions noted in Figure 210.52(C)(1) of the NEC, then a GFCI-protected

receptacle must be installed in that space. This is because, for all practical purposes, if there's sufficient space for an appliance, an appliance will be placed there.

(2) Island Countertop Spaces. At least one receptacle outlet must be installed at each island countertop space with a long dimension of 2 ft or more, and a short dimension of 1 ft or more.

(3) Peninsular Countertop Spaces. At least one receptacle outlet must be installed at each peninsular countertop with a long dimension of 2 ft or more, and a short dimension of 1 ft or more, measured from the connecting edge. Figure 210–46 -61(210-52C3 01)

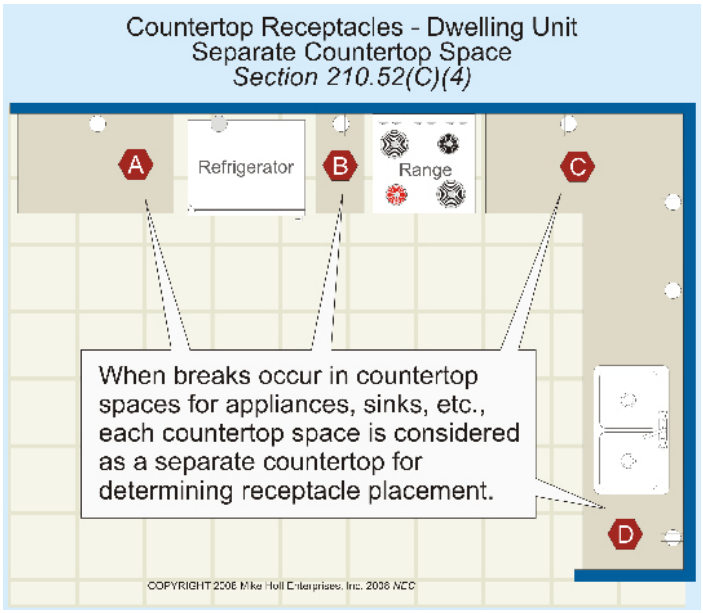


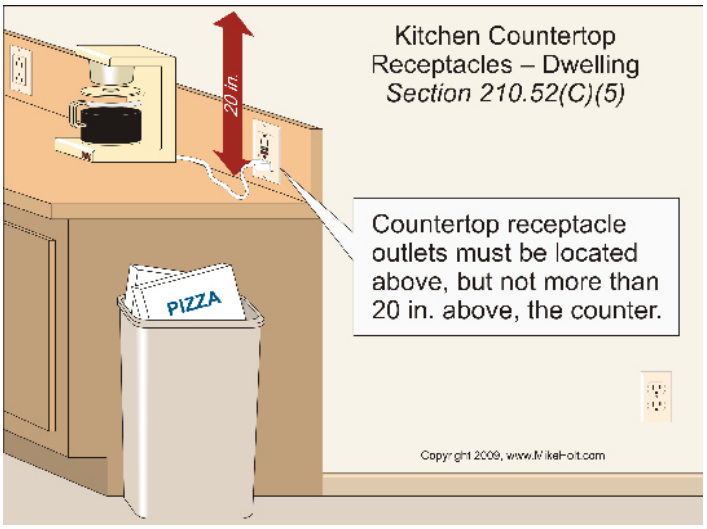
Author's Comment: The Code doesn't require more than one receptacle outlet in an island or peninsular countertop space, regardless of the length of the countertop, unless the countertop is broken as described in 210.52(C)(4).

(4) Separate Countertop Spaces. When breaks occur in countertop spaces for rangetops, refrigerators, or sinks, each countertop space is considered as a separate countertop for determining receptacle placement. Figure 210–47 -62(210-52C4 01)

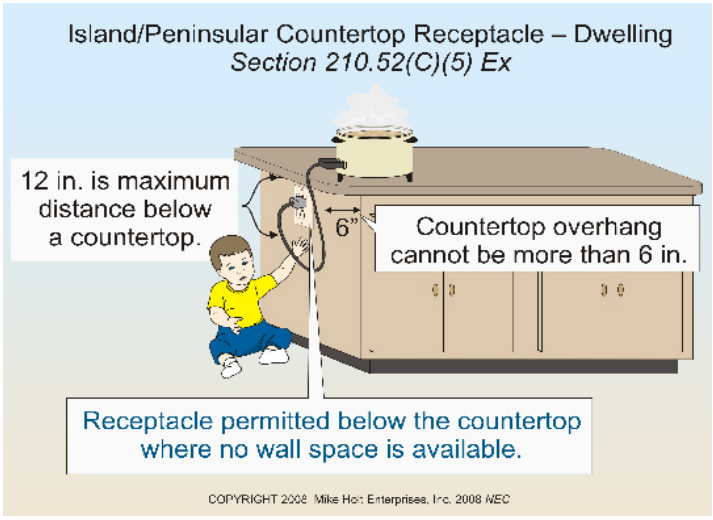
(5) Receptacle Location. Receptacle outlets required by 210.52(C)(1) for the countertop space must be located above, but not more than 20 in. above, the countertop surface. Figure 210–48 -63(210-52C5 01)

Exception: The receptacle outlet for the countertop space can be installed below the countertop only when wall space or a backsplash is not available, such as in an island or peninsular counter. Under these conditions, the required receptacle(s) must be located no more than 1 ft below the countertop surface and no more than 6 in. from the





countertop edge, measured horizontally. Figure 210–49 -64(210-52C5x 01)

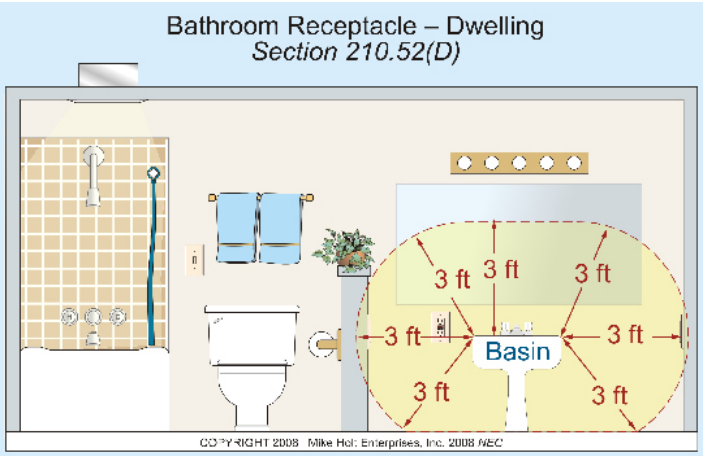


Receptacle outlets rendered not readily accessible by

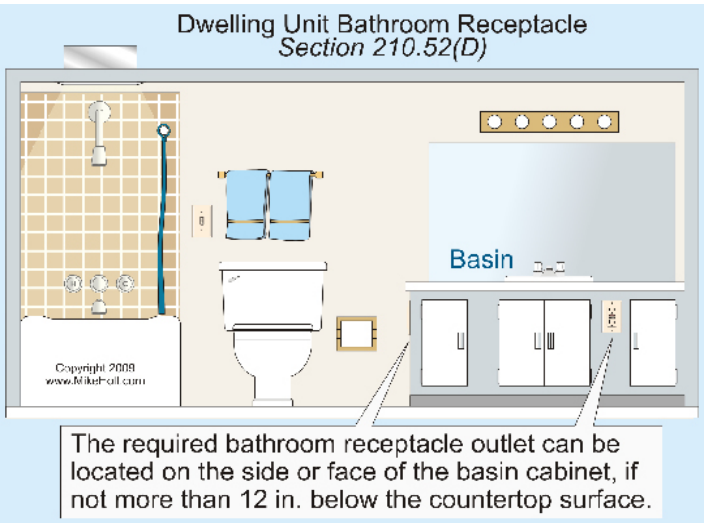
appliances fastened in place, located in an appliance garage, behind sinks, or rangetops [210.52(C)(1) Ex], or supplying appliances that occupy dedicated space do not count as the required countertop receptacles.

Author's Comment: An "appliance garage" is an enclosed area on the countertop where an appliance can be stored and hidden from view when not in use. If a receptacle is installed inside an appliance garage, it doesn't count as a required countertop receptacle outlet.

(D) Dwelling Unit Bathrooms. In dwelling units, not less than one 15A or 20A, 125V receptacle outlet must be installed within 3 ft from the outside edge of each bathroom basin. The receptacle outlet must be located on a wall or partition adjacent to the basin counter surface, or on the side or face of the basin cabinet not more than 12 in. below the countertop [210.11(C)(3)]. Figures 210–50 and Figure 210–51 -65/66(210-52D0 01 and 210-52D0 02)



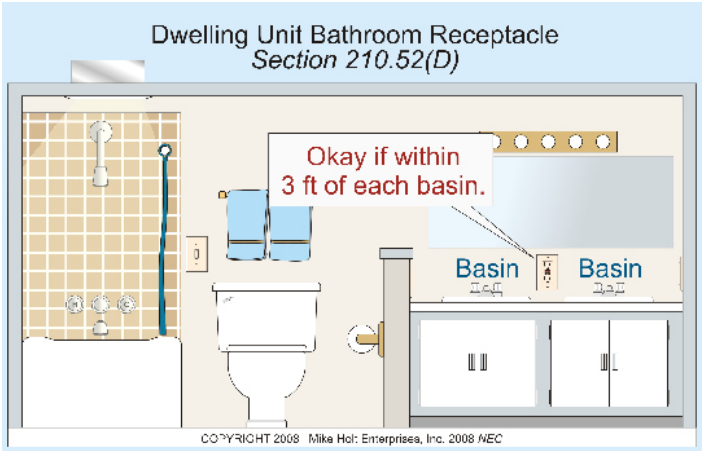
A 15A or 20A, 125V receptacle outlet must be installed within 3 ft of the outside edge of each basin.



The required bathroom receptacle outlet can be located on the side or face of the basin cabinet, if not more than 12 in. below the countertop surface.

Author's Comments:

• One receptacle outlet can be located between two basins to meet the requirement, but only if the receptacle outlet is located within 3 ft of the out-side edge of each basin. Figure 210–52 -67(210-52D0 03)

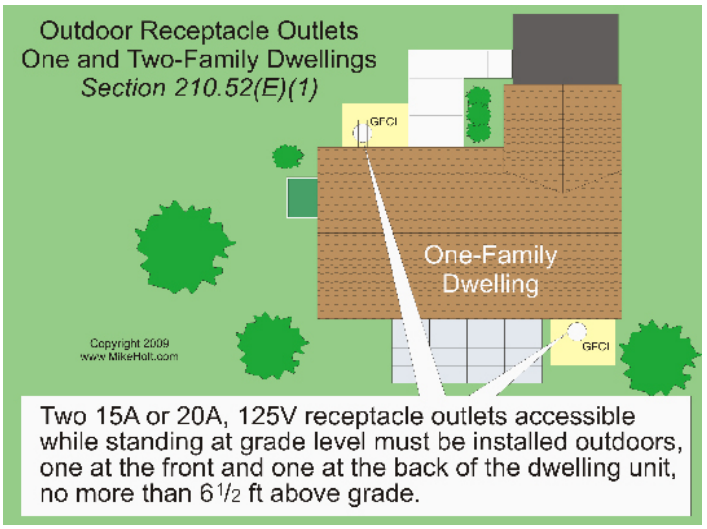


One 15A or 20A, 125V receptacle outlet must be installed within 3 ft from the outside edge of each bathroom basin.

• The bathroom receptacles must be GFCI protected [210.8(A)(1)].

(E) Dwelling Unit Outdoor Receptacles.

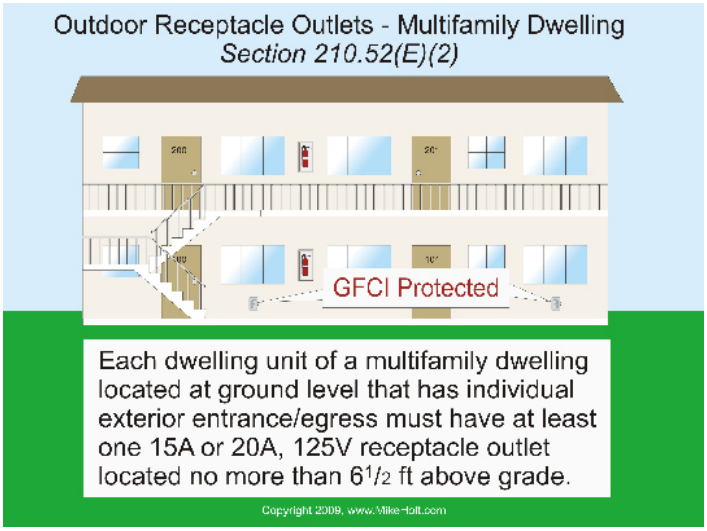
(1) One- and Two-Family Dwellings. Two GFCI-protected 15A or 20A, 125V receptacle outlets that are accessible while standing at grade level must be installed outdoors for each dwelling unit, one at the front and one at the back, no more than 6½ ft above grade. Figure 210–53 -68(210-52E1 01)



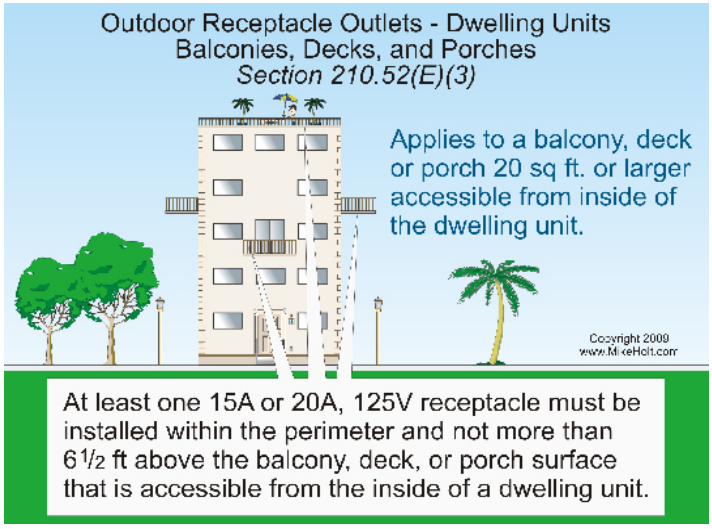
Two 15A or 20A, 125V receptacle outlets accessible while standing at grade level must be installed outdoors, one at the front and one at the back of the dwelling unit, no more than 6½ ft above grade.

(2) Multifamily Dwelling. Each dwelling unit of a multifamily dwelling that has an individual entrance at grade level must have at least one GFCI-protected 15A or 20A, 125V receptacle outlet accessible from grade level located not

more than 6½ ft above grade. Figure 210−54 -69(210-52E2 01)



(3) Balconies, Decks, and Porches. At least one 15A or 20A, 125V receptacle must be installed within the perimeter and not more than 6½ ft above the balcony, deck, or porch surface that is accessible from the inside of a dwelling unit. Figure 210−55 -70(210-52E3 01)

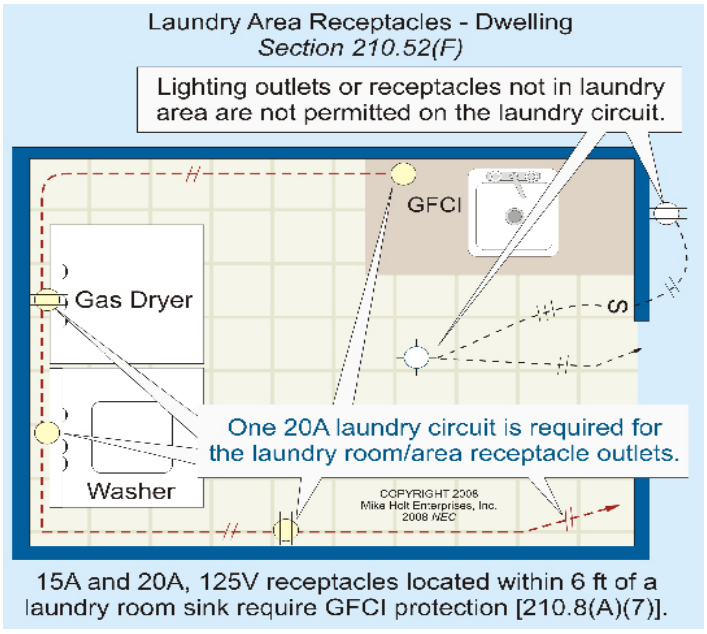


Exception: Balconies, decks or porches with a usable area of less than 20 sq ft are not required to have a receptacle installed.

Author's Comment: These receptacles must be GFCI protected [210.8(A)(3)].

(F) Dwelling Unit Laundry Area Receptacles. Each dwelling unit must have not less than one 15A or 20A, 125V receptacle installed in the laundry area. This receptacle(s) must be supplied by the 20A, 120V laundry branch circuit, which must not supply any other outlets [210.11(C)(2)].

Figure 210–56 -71(210-52F0 01)

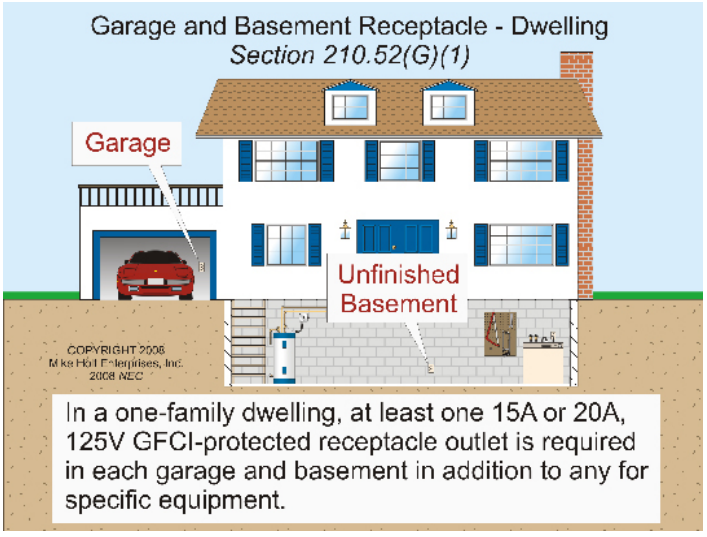


Author's Comment: Receptacles located within 6 ft of a laundry room sink require GFCI protection [210.8(A)(7)].

Exception No. 1: A laundry receptacle outlet isn't required in a dwelling unit located in a multifamily building with laundry facilities available to all occupants.

(G) Dwelling Unit Garage and Basement Receptacles.

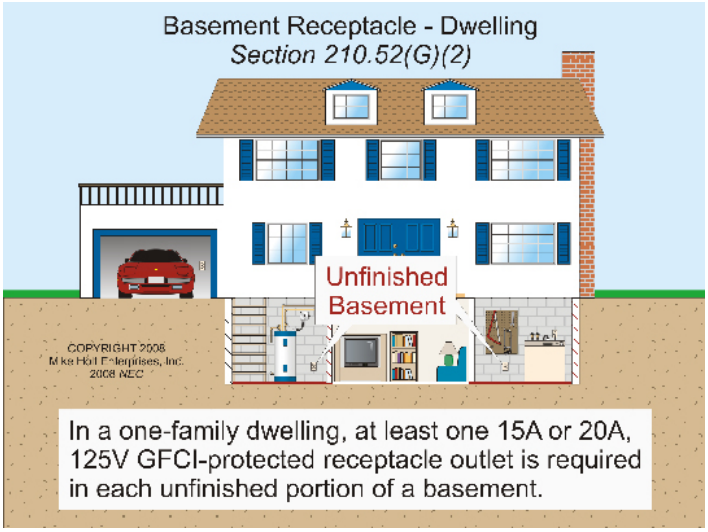
(1) Not less than one 15A or 20A, 125V receptacle outlet, in addition to any provided for a specific piece of equipment, must be installed in each basement, each attached garage, and each detached garage with electric power. Figure 210–57 -72(210-52G1 01)



Author's Comment: The garage and basement receptacles must be GFCI protected in accordance with 210.8(A)(2) for

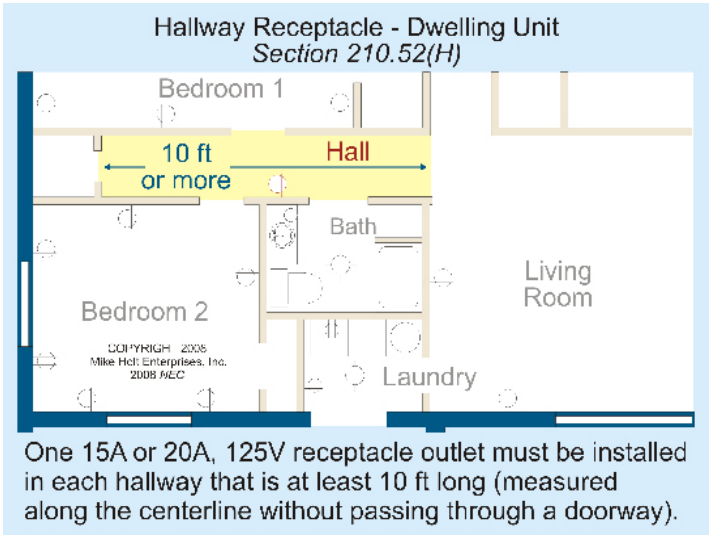
garages and 210.8(A)(5) for unfinished basements.

(2) Where a portion of the basement is finished into habitable rooms, each separate unfinished portion must have a 15A or 20A, 125V receptacle outlet installed. Figure 210–58 -73(210-52G2 01)



Author's Comment: The purpose of this requirement is to prevent an extension cord from a non-GFCI-protected receptacle from being used to supply power to loads in the unfinished portion of the basement.

(H) Dwelling Unit Hallway Receptacles. One 15A or 20A, 125V receptacle outlet must be installed in each hallway that is at least 10 ft long, measured along the centerline of the hall without passing through a doorway. Figure 210–58 -74(210-52H0 01)



"Strength Design" Code

I wanted to make you aware of the New code referring to "Strength Design" for concrete anchors and the requirement for the ESR # that must accompany the anchor according to the ACI318 Appendix D code. Most of you are aware of this and have been brought up to speed, but recently we have helped engineers get their specs updated to reflect this new code demand so there is no delay with the inspector and contractors. I am attaching three links that will help make sure your project is code compliant. If you or anyone on your team needs more info or would like to set up a L&L to discuss this further, just contact me and we will set up a time that works with your schedule. Also, there have been many anchors eliminated do to this code change and many new products have been developed to meet it. If you are not familiar with the new products available, it may be worth the time to investigate as many of them have major benefits in labor savings, safety and reliability.

The first link is Code Jurisdiction and does it apply to you (all 50 states have this code in play and FL is State wide) http://www.powers.com/building_code_states.html

The second link is the approved products with the ESR#'s that are available to you.

http://www.powers.com/approvals.html

The third link is our "Powers Design Assist" program. It's fast, easy to use and offers you everything you need for anchor calculation. Oh yea..and it's free!

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