By Mike Holt for EC&M Magazine

Here's the follow up to yesterday's newsletter. This includes all of the answers to the questions sent, so you can see how you did.

Note: These questions are based on the 2014 NEC. Any underlined text indicates a change to the Code rule for the 2014 NEC.

Q1. Where is GFCI protection required for 15A and 20A 125V rated receptacles in dwelling units?

A1. Ground-fault circuit interruption for personnel must be provided as required in 210.8(A) through (D). The ground-fault circuit-interrupter device must be installed at a readily accessible location.

Authors Comment: According to Article 100, readily accessible means capable of being reached quickly without having to climb over or remove obstacles, or resort to portable ladders.

(A) Dwelling Units. GFCI protection is required for 15A and 20A, 125V receptacles installed in the following locations:

Authors Comment: See the definitions of GFCI and Dwelling Unit in Article 100.

(1) Bathroom Area. GFCI protection is required for 15A and 20A, 125V receptacles in the bathroom area of a dwelling unit.

Authors Comment: 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 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.

Authors Comment: See the definition of Garage in Article 100.

A receptacle outlet is required in a dwelling unit attached garage [210.52(G)(1)], 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.

(3) Outdoors. 15A and 20A, 125V receptacles located outdoors of dwelling units, including receptacles installed under the eaves of roofs, must be GFCI protected.

Authors Comment: 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 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)].

Ex: GFCI protection isn't required for a receptacle that's supplied by a branch circuit dedicated to fixed electric snow-melting or deicing or pipeline and vessel heating equipment, if the receptacle isn't readily accessible and the equipment or receptacle has ground-fault protection of equipment (GFPE) [426.28 and 427.22].

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

Authors 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 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.

Ex: A receptacle supplying only a permanently installed fire alarm or burglar alarm system isn't required to be GFCI protected [760.41(B) and 760.121(B)].

Authors Comment: A receptacle outlet is required in each unfinished portion of a dwelling unit basement [210.52(G)(3)].

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

Authors Comment: 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, trash compactors, exhaust fans, or kitchen waste disposals.

See 210.52(C) for the location requirements of countertop receptacles.
Sinks. GFCI protection is required for 15A and 20A, 125V receptacles located within an arc measurement of 6 ft from the outside edge of a sink.

Boathouses. GFCI protection is required for 15A and 20A, 125V receptacles located in a dwelling unit boathouse.

Bathtubs or Shower Stalls. GFCI protection is required for 15A and 20A, 125V receptacles located within 6 ft of the outside edge of a bathtub or shower stall.

Laundry Areas. 15A and 20A, 125V receptacles installed in laundry areas of a dwelling unit must be GFCI protected.

Q2. Where is GFCI protection required for 15A and 20A 125V rated receptacles in locations other than dwelling units?

A2. GFCI protection is required for 15A and 20A, 125V receptacles installed in the following commercial/industrial locations [210.8(B)]:

1. Bathrooms. 15A and 20A, 125V receptacles installed in commercial or industrial bathrooms must be GFCI protected.

   Authors Comment: See the definition of Bathroom in Article 100.

2. Kitchens. 15A and 20A, 125V receptacles installed in a kitchen, even those that don’t supply the countertop surface, must be GFCI protected.

   Authors Comment: A kitchen is an area with a sink and permanent provisions for food preparation and cooking [Article 100]. GFCI protection isn’t required for receptacles rated other than 15A and 20A, 125V in these locations.

3. Rooftops. 15A and 20A, 125V receptacles installed on rooftops must be GFCI protected.

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

Ex 1 to (3): Receptacles on rooftops aren’t required to be readily accessible other than from the rooftop.

4. Outdoors. 15A and 20A, 125V receptacles installed outdoors must be GFCI protected.

Ex 2 to (3) and (4): GFCI protection isn’t required for a receptacle that’s supplied by a branch circuit dedicated to fixed electric snow-melting or deicing or pipeline and vessel heating equipment. If the receptacle isn’t readily accessible and the equipment or receptacle has ground-fault protection of equipment (GFPE) [426.28 and 427.22].

5. Sinks. 15A and 20A, 125V receptacles installed within 6 ft of the outside edge of a sink must be GFCI protected.

Ex 1: In industrial laboratories, receptacles used to supply equipment where removal of power would introduce a greater hazard aren’t required to be GFCI protected.

Ex 2: Receptacles located in patient bed locations of general care or critical care areas of health care facilities aren’t required to be GFCI protected.

6. Indoor Wet Locations. 15A and 20A, 125V receptacles installed indoors in wet locations must be GFCI protected.

7. Locker Rooms. 15A and 20A, 125V receptacles installed in locker rooms with associated showering facilities must be GFCI protected.

8. Garages. 15A and 20A, 125V receptacles installed in garages, service bays, and similar areas must be GFCI protected, unless they’re in show rooms or exhibition halls.

Q3. Is GFCI protected for locations that may be either hard wired or receptacle connected in dwellings?

A3. GFCI protection is required for outlets supplying boat hoists [210.8(C)] at dwelling unit locations and outlets supplying dishwashers [210.8(D)] in dwelling unit locations.

Authors Comment: See the definition of Outlet in Article 100.

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

Q4. How do you determine the minimum number of general lighting and general-use branch circuits required by the NEC for dwellings?

A4. The minimum number of general lighting and general-use receptacle branch circuits must be determined by dividing the total calculated load in amperes by the ampere rating of the circuits used [210.11(A)].

Question: How many 15A, 120V circuits are required for the general lighting and general-use receptacles for a dwelling having floor area of 1,500 ft2, exclusive of an unfinished cellar not adaptable for future use [Example D1(a) in Annex D]?

(a) 1  (b) 2  (c) 3  (d) 4

Answer: (c) 3

Step 1: Determine the total VA load: \( VA = 1,500 \text{ sq ft} \times 3 \text{ VA per sq ft} \) [Table 220.12] \( VA = 4,500 \text{ VA} \)

Step 2: Determine the amperes: \( I = VA/E \) \( I = 4,500\text{VA}/120V \) \( I = 38A \)

Step 3: Determine the number of circuits: Number of Circuits = \( 38A/15A \) Number of Circuits = Three 15A, or two 20A, 120V

Authors Comment: There’s no limit to the number of receptacles on a circuit in a dwelling unit.

(B) Load Evenly Proportioned Among Branch Circuits. If the load is calculated on the volt-amperes/square foot, the wiring system must be provided to serve the calculated load, with the loads evenly proportioned among multioutlet branch circuits within the panelboard. Q11. What other specific branch circuits are required for a
Q5. What other specific branch circuits are required for a dwelling unit in addition to the general lighting circuits and those provided to supply specific loads?

**A5.** Small-Appliance Branch Circuits. Two or more 20A, 120V small-appliance receptacle branch circuits are required for the 15A or 20A receptacle outlets in a dwelling unit kitchen, dining room, breakfast room, pantry, or in similar dining areas as required by 210.52(B) [210.11(C)(1)].

**Authors Comment:** See the definition of Receptacle Outlet in Article 100.

A 15A, 125V receptacle is rated for 20A feed-through, so it can be used for this purpose [210.21(B)(3)].

Lighting outlets or receptacles located in other areas of a dwelling unit must not be connected to the small-appliance branch circuit [210.52(B)(2)].

The two 20A small-appliance branch circuits can be supplied by one 3-wire multiwire circuit or by two separate 120V circuits [210.4(A)].

Laundry Branch Circuit. One 20A, 120V branch circuit must be provided for the receptacle outlets required by 210.52(F) for a dwelling unit laundry room. The 20A laundry room receptacle circuit is permitted to supply more than one receptacle in the laundry room. The 20A laundry receptacle must not serve any other outlets, such as the laundry room lighting or receptacles in other rooms [210.11(C)(2)].

**Authors Comment:** The 20A, 120V laundry branch circuit is required, even if the laundry appliance installed is a 30A, 230V combination washer/dryer.

A 15A receptacle is rated for 20A feed-through, so it can be used for this purpose [210.21(B)(3)].

GFCI protection is required for 15A and 20A, 125V receptacles located in a laundry room [210.8(A)(10)].

Bathroom Branch Circuit. One 20A, 120V branch circuit must be provided for the receptacle outlets required by 210.52(D) for a dwelling unit bathroom. This 20A bathroom receptacle circuit must not serve any other outlet, such as bathroom lighting outlets or receptacles in other rooms [210.11(C)(3)].

**Authors Comment:** A 15A, 125V receptacle is rated for 20A feed-through, so it can be used for this purpose [210.21(B)(3)].

Ex: A single 20A, 120V branch circuit is permitted to supply all of the outlets in a single bathroom, as long as no single load fastened in place is rated more than 10A [210.23(A)].

**Question:** Can a luminaire, ceiling fan, or bath fan be connected to the 20A, 120V branch circuit that supplies only one bathroom?

**Answer:** Yes.