

ARTICLE 210 Branch Circuits

Introduction

This article contains the requirements for branch circuits, such as conductor sizing and identification, GFCI receptacle protection, and receptacle and lighting outlet requirements. It consists of three parts:

- PART I. GENERAL PROVISIONS
- PART II. BRANCH-CIRCUIT RATINGS
- PART III. REQUIRED OUTLETS

Table 210.2 of this article identifies specific purpose branch circuits. When people complain that the *Code* “buries stuff in the last few chapters and doesn’t provide you with any way of knowing where to find things,” that is because they didn’t pay attention to this table.

The following Sections and Tables contain a few key items to spend extra time on as you study Article 210:

- *210.4. Multiwire Branch Circuits.* The conductors of these circuits must originate from the same panel. These circuits can supply only line-to-neutral loads.
- *210.8. GFCI Protected Receptacles.* Crawl spaces, unfinished basements, and boathouses are just some of the eight locations that require GFCI protection.
- *210.11. Branch Circuits Required.* With three subheadings, 210.11 gives summarized requirements for the number of branch circuits in a given system, states that a load computed on a VA/area basis must be evenly proportioned, and covers rules for dwelling units.
- *210.12. Arc-Fault Circuit-Interrupter Protection.* An AFCI isn’t a GFCI, though combination units do exist. The purpose of an AFCI (trips at 30 mA) is to protect equipment. The purpose of a GFCI (trips at 4 to 6 mA) is to protect people.
- *210.19. Conductors—Minimum Ampacity and Size.* This gets complicated in a hurry, but we’ll guide you through it.
- *Table 210.21(B)(2)* shows that the maximum load on a given circuit is 80 percent of the receptacle rating and circuit rating. We’ll explain more about the implications of this later.
- *210.23. Permissible Loads.* This is intended to prevent a circuit overload from occurring just because someone plugs in a lamp or vacuum cleaner. We’ll show you how to conform.
- *210.52. Dwelling Unit Receptacle Outlets.* An area rife with confusion is receptacle spacing. We cut through the confusion, and you’ll understand the meaning of 210.52 and how to apply it correctly.

The rest of the material is also important. But mastering these key items will give you a decided edge in your ability to do work free of *Code* violations.

PART I. GENERAL PROVISIONS

210.1 Scope. Article 210 contains the requirements for conductor sizing, overcurrent protection, identification, and GFCI protection of branch circuits, as well as receptacle outlets and lighting outlet requirements.

Author’s Comments:

- See Article 100 for the definition of “Branch Circuit.”
- Article 100 defines a “branch circuit” as the conductors between the final overcurrent device and the receptacle outlets, lighting outlets, or other outlets. **Figure 210–1**

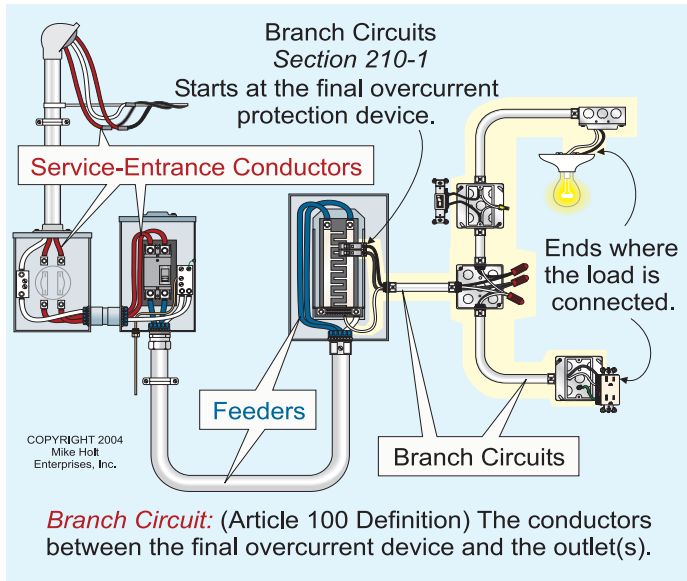


Figure 210-1

210.2 Other Articles. Other NEC sections that have specific requirements for branch circuits include:

- Air Conditioning and Refrigeration, 440.6, 440.31, and 440.32
- Appliances, 422.10
- Data-Processing (Information Technology) Equipment, 645.5
- Electric Space Heating, 424.3(B)
- Motors, 430.22
- Signs, 600.5

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

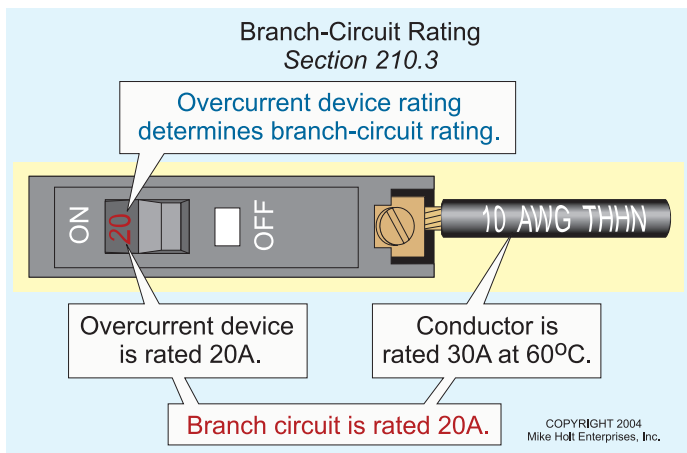


Figure 210-2

Author's Comment: For example, the branch-circuit ampere rating of 10 THHN (rated 30A at 60°C in Table 310.16) on a 20A circuit breaker is 20A. **Figure 210-2**

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 Article 100 for the definition of "Multiwire Branch Circuit."
- 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 branch circuit could be used for this purpose. In such a case it's considered a multiwire branch circuit.

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

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

FPN: Unwanted and potentially hazardous harmonic 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. To prevent fire or equipment damage from excessive harmonic neutral current, 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 2, and 310.15(B)(4)(c). **Figure 210-3**

Author's Comments:

- See Article 100 for the definition of "Nonlinear Load."

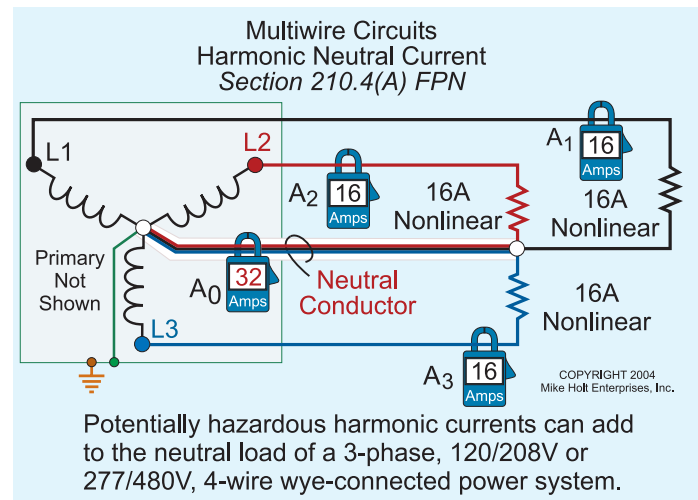


Figure 210-3