

can occur between the neutral and any ungrounded conductor. For a household electric range or clothes dryer, the maximum unbalanced load for a single-phase feeder or service can be assumed to be 70 percent, so the neutral can be sized on that basis. If the unbalanced load exceeds 200 amperes, 220.61(B) permits the reduction of the feeder neutral conductor size under specific conditions of use. However, 220.61(C)(1) and (C)(2) cite a circuit arrangement and a load characteristic as applications where the capacity of a neutral or grounded conductor of a feeder or service is not permitted to be reduced.

The neutral is considered a current-carrying conductor if the load of the electric-discharge lighting, data-processing, or similar equipment on the feeder neutral consists of more than half the total load, in accordance with 310.15(E)(3). Electric-discharge lighting and data-processing equipment could have harmonic currents in the neutral that might exceed the load current in the ungrounded conductors. The Informational Note to item (2) cautions designers and installers to be aware of harmonic contribution and to design the electrical installation to accommodate the harmonic load imposed on neutral conductors. In some instances, the neutral current could exceed the current in the phase conductors.

A 3-phase, 4-wire (208Y/120-volt or 480Y/277-volt) system is often used to supply both lighting and motor loads. The 3-phase motor loads are balanced loads that are not connected to the neutral and, thus, would not be considered when determining the maximum unbalanced load. The maximum current on the neutral is due to lighting loads or circuits that are connected line-to-neutral. On this type of system (3-phase, 4-wire), a demand factor of 70 percent is permitted by 220.61(B) for that portion of the neutral load more than 200 amperes.

For example, if the maximum possible unbalanced load is 500 amperes, the neutral would have to be large enough to carry 410 amperes (200 amperes plus 70 percent of 300 amperes, or 410 amperes). The 70 percent demand cannot be applied for that portion of the line-to-neutral load consisting of electric-discharge lighting.

Section 310.15(C)(1) specifies that a neutral conductor must be counted as a current-carrying conductor if the load it serves consists of harmonic currents. The maximum unbalanced load for feeders supplying clothes dryers, household ranges, wall-mounted ovens, and counter-mounted cooking units is required to be considered 70 percent of the load on the ungrounded conductors.

See also

220.61(B) for other systems in which the 70-percent demand factor can be applied

Informative Annex D, Examples D1(a) through D2(c), which provide one-family dwelling calculation examples

N 220.70 Energy Management Systems (EMSs). If an energy management system (EMS) is used to limit the current to a feeder or service in accordance with 750.30, a single value equal to the maximum ampere setpoint of the EMS shall be permitted to be used in load calculations for the feeder or service.

The setpoint value of the EMS shall be considered a continuous load for the purposes of load calculations.

Part IV. Optional Feeder and Service Load Calculations

220.80 General. Optional feeder and service load calculations shall be permitted in accordance with Part IV.

220.82 Dwelling Unit.

(A) Feeder and Service Load. This section applies to a dwelling unit having the total connected load served by a single 120/240-volt or 208Y/120-volt set of 3-wire service or feeder conductors with an ampacity of 100 or greater. It shall be permissible to calculate the feeder and service loads in accordance with this section instead of the method specified in Part III of this article. The calculated load shall be the result of adding the loads from 220.82(B) and (C). Feeder and service-entrance conductors whose calculated load is determined by this optional calculation shall be permitted to have the neutral load determined by 220.61.

This optional calculation method applies to a single dwelling unit, whether a separate building or located in a multifamily dwelling. See Article 100 for the definition of *dwelling unit*.

See also

Informative Annex D, Examples D2(a), D2(b), D2(c), and D4(b), for examples of the optional calculations for a dwelling unit

(B) General Loads. The general calculated load shall be not less than 100 percent of the first 10 kVA plus 40 percent of the remainder of the following loads:

- (1) 33 volt-amperes/m² or 3 volt-amperes/ft² for general lighting and general-use receptacles. The floor area for each floor shall be calculated from the outside dimensions of the dwelling unit. The calculated floor area shall not include open porches, garages, or unused or unfinished spaces not adaptable for future use.
- (2) 1500 volt-amperes for each 2-wire, 20-ampere small-appliance branch circuit and each laundry branch circuit covered in 210.11(C)(1) and (C)(2).
- (3) The nameplate rating of the following:
 - a. All appliances that are fastened in place, permanently connected, or located to be on a specific circuit
 - b. Ranges, wall-mounted ovens, counter-mounted cooking units
 - c. Clothes dryers that are not connected to the laundry branch circuit specified in 220.82(B)(2)
 - d. Water heaters
- (4) The nameplate ampere or kVA rating of all permanently connected motors not included in 220.82(B)(3).

(C) Heating and Air-Conditioning Load. The largest of the following six selections (load in kVA) shall be included:

- (1) 100 percent of the nameplate rating(s) of the air conditioning and cooling.