(B) In Metal Raceway or Enclosure. Where installed in a metal raceway or other metal enclosure, all conductors of all feeders using a common neutral conductor shall be enclosed within the same raceway or other enclosure as required in 300.20.

If ac feeder conductors, including the neutral conductor, are installed in metal raceways, the conductors are required to be grouped together to avoid induction heating of the surrounding metal. If it is necessary to run parallel conductors through multiple metal raceways, conductors from each phase plus the neutral must be run in each raceway.

See also

250.102(E), 250.134, 300.3, 300.5(I), and **300.20** for requirements associated with conductor grouping of feeder circuits

A 3-phase, 4-wire (208Y/120 or 480Y/277) system is often used to supply both lighting and motor loads. The 3-phase motor loads typically are not connected to the neutral and, thus, will not cause current in the neutral conductor. The maximum current on the neutral is due to lighting loads or circuits where the neutral is used. 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 in excess of 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). No reduction of the neutral capacity for that portion of the load consisting of electric-discharge lighting is permitted.

Section 310.15(E) points out 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

215.5 Diagrams of Feeders. If required by the authority having jurisdiction, a diagram showing feeder details shall be provided prior to the installation of the feeders. Such a diagram shall show the area in square feet of the building or other structure supplied by each feeder, the total calculated load before applying demand factors, the demand factors used, the calculated load after applying demand factors, and the size and type of conductors to be used.

215.6 Feeder Equipment Grounding Conductor. Where a feeder supplies branch circuits in which equipment grounding conductors are required, the feeder shall include or provide an equipment grounding conductor, to which the equipment grounding conductors of the branch circuits shall be connected. Where the feeder supplies a separate building or structure, the requirements of 250.32 shall apply.

215.7 Ungrounded Conductors Tapped from Grounded Systems. Two-wire dc circuits and ac circuits of two or more ungrounded conductors shall be permitted to be tapped from the ungrounded conductors of circuits having a grounded neutral conductor. Switching devices in each tapped circuit shall have a pole in each ungrounded conductor.

215.9 Ground-Fault Circuit-Interrupter Protection for Personnel. Feeders shall be permitted to be protected by a listed ground-fault circuit interrupter installed in a readily accessible location in lieu of the provisions for such interrupters as specified in 210.8 and 590.6(A).

Ground-fault circuit-interrupter (GFCI) protection of the feeder circuit protects all branch circuits supplied by that feeder. This type of GFCI installation is permitted in lieu of the branch-circuit GFCI requirements of 210.8. GFCI protection in the feeder can also be used to protect construction site receptacles, as covered in 590.6(A), provided the feeder supplies no lighting branch circuits.

Although it may be more economical or convenient to install GFCIs for feeders, consideration should be given to the possibility that a GFCI might be monitoring several branch circuits and will de-energize all branch circuits in response to a line-to-ground fault from one branch circuit.

Δ **215.10 Ground-Fault Protection of Equipment.** Each feeder disconnect rated 1000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 1000 volts phase-to-phase, shall be provided with ground-fault protection of equipment in accordance with 230.95.

Informational Note: See 517.17 for buildings that contain health care occupancies.

Exception No. 1: This section shall not apply to a disconnecting means for a continuous industrial process where a nonorderly shutdown will introduce additional or increased hazards.

Prior to this requirement, an unusually high number of burndowns on feeders and services operating in this voltage range were reported. Solidly grounded systems operating at 480Y/277 volts were the primary focus of this requirement when it was first introduced in the *NEC*®, but other solidly grounded, wye-connected systems operating over 150 volts to ground and not more than 600 volts phase-to-phase are covered by this requirement. Each ground-fault protection system must be performance tested and documented according to the requirements of 230.95(C) before being put into service.

Ground-fault protection of feeder equipment is not required if protection is provided on an upstream feeder or at the service. However, additional levels of ground-fault protection for feeders might be preferred so that a single ground fault does not de-energize the whole electrical system.