

Question: Can #4/0 AL be used with an overcurrent protection device of 200 Amps?

Service Entrance Conductors.

In dwelling units the answer would be yes, as per table 310.15(B)(6), as long as the feeder/service conductors are serving the entire load of the dwelling. If not, then Table 310.16 will take precedence [new for the 2008 NEC, See 310.15 (B)(6)].

The story is different, however, for commercial buildings. Table 310.16, under the aluminum side, in the 75 degree column for XHHW, limits #4/0 AL to the ampacity of 180 Amps. However, article 240.4(B) approves the increasing of OCP to 200 Amps, “the next highest standard size” OCP device (240.6).

There are two questions we need to ask when applying the rule of 240.4(B):

- 1) What is the calculated load served, and:
- 2) Are there any adjustments required for the wiring method such as derating for the number of conductors in the raceway or cable?

Let us first consider the load served. In article 230.23, Part II (Overhead Service Drop-Conductors), and 230.31, Part III (Underground Service-Lateral Conductors), the code language is much the same.

“Conductors shall have sufficient ampacity to carry the current for the load as calculated in accordance with Article 220...”

Under Article 230.42 (Minimum Size And Rating), Part IV (Service-Entrance Conductors), the code can be difficult to understand, but with a little dissecting the picture becomes clear:

“The ampacity of the service-entrance conductors before the application of any adjustment or correction factors shall not be less than either (A)(1) **or** (A)(2).”

In the first sentence we are given a choice:

“(A)(1) The sum of the noncontinuous loads plus 125 percent of continuous loads”

“(A)(2) The sum of the noncontinuous load plus the continuous load if the service-entrance conductors terminate in an overcurrent device where both the overcurrent device and its assembly are listed for operation at 100 percent of their rating”

The second sentence of this paragraph then points us to article 220:

“Loads shall be determined in accordance with Article 220.”

The final sentence in the paragraph directs us to 310.15 in which we then end up at Table 310.16: “Ampacity shall be determined from 310.15.”

This leads us to the second consideration; “adjustments factors.” When there are four or more conductors in a raceway or cable we need to apply a derating factor to the ampacity found in T310.16. However, the neutral conductor is not counted as current carrying when the condition of 310.15(4)(a) is met.

(a) “A neutral conductor that carries only the unbalanced current from other conductors of the same circuit shall not be required to be counted when applying the provisions of 310.15(B)(2)(a).”

The neutral is considered current carrying in one of the two conditions:

(b) “In a 3-wire circuit consisting of two phase wires and the neutral of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral load currents of the other conductors and shall be counted when applying the provisions of 310.15(B)(2)(a).”

(c) “On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents are present in the neutral conductor, the neutral shall therefore be considered a current-carrying conductor.”

Therefore, the derating factors of table 310.15(B)(2) must apply to the ampacity of the conductors which would lower the ampere rating to 175 amp OCP device.

When derating, we can use the 90 degree column for XHHW in damp and dry locations which allows for 205 amps, with four current carrying conductors at 80% is only good for 164 Amps. As a result 175 amp OCP devices are required.

The same concerns about calculated load are found for feeders and branch circuits in 215.5 & 225.5.

Now to attempt to make a long story short: Yes, #4/0 AL can be installed on 200 OCP if the calculated load as determined in article 220 is less than 180 Amps and the adjustment factors do not apply. The inspecting jurisdiction will probably require a load calculation at the time of the inspection if he encounters this during the inspection.