General Conductor Ampacity Requirements

By Mike Holt, NEC Consultant

When performing conductor ampacity calculations, you must consider the rules of Art. 310, which cover the general requirements for conductors such as type designations, insulation, markings, and ampacity ratings. However, Art. 310 does not apply to the conductors that serve as an integral part of equipment, such as motors, motor controllers, and similar equipment.

Art. 100 defines the ampacity of a conductor as the current (in amperes) that a conductor can carry continuously under use without exceeding its temperature rating. You can determine the ampacity of conductors by referencing Table 310-16 or using a formula under approved engineering supervision.

The ampacities of a conductor, as listed in Table 310-16 (below), are based on the condition

Table 310–16. Copper Ampacities

60°C (140°F) AWG TW Or kcmil		75°C (167°F) THHN, THW THWN, XHHW	90°C (194°F) THHN, THHW XHHW
14	20	20	25
12	25	25	30
10	30	35	40
8	40	50	55
6	55	65	75
4	70	85	95
3	85	100	110
2	95	115	130
1	110	130	150
1/0	125	150	170
2/0	145	175	195
3/0	165	200	225
4/0	195	230	260
250	215	255	290
300	240	285	320
350	260	310	350
400	280	335	380
500	320	380	430

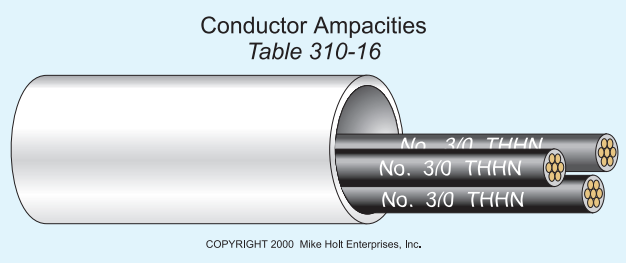

Fig. 1. *Conductor ampacities for copper cable, as listed in Table 310-16, are based on an ambient temperature of 86°F and three current-carrying conductors in a raceway or cable.*

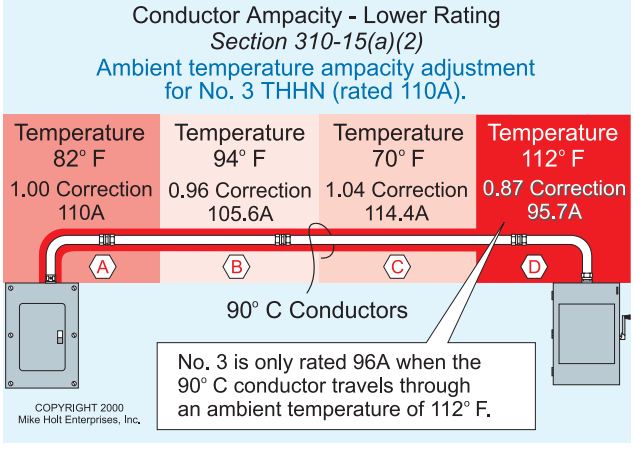

Fig. 2. *Ambient temperature ampacity adjustment for No. 3 THHN (rated 110A).*

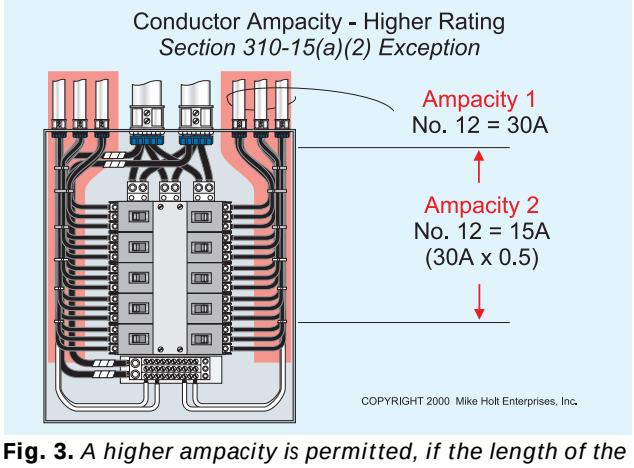

Fig. 3. *A higher ampacity is permitted, if the length of the reduced ampacity doesn't exceed 10 ft and is not longer than 10% of the total length of the circuit.*

where no more than three current-carrying conductors are bundled together at an ambient temperature of 86°F (see Fig. 1, on page 68).

Where more than one calculated ampacity could apply to a given conductor length, you must use the lowest ampacity for the entire circuit in your calculations.

Example No. 1:

Q. What's the circuit ampacity for three No. 3 THHN conductors run in a raceway through the ambient temperature zones, as shown in Fig. 2, on page 68?

(a) 110A (c) 100A
(b) 105A (d) 96A

A. The answer is (d), 96A. The ampacity for No. 3 THHN (90°C) is 110A, but the correction factors of Table 310 reduce the conductor ampacity to only 96A [i.e. 110A × 0.87 = 95.7A]. You round up to get 96A per Sec. 220-2(b).

When multiple ampacities apply to a conductor, use the higher ampacity for the circuit, if the conductor's length doesn't exceed 10 ft and isn't longer than 10% of the total length of the circuit [Sec. 310-15(a)(2), Exception].

Example No. 2:

Q. What is the circuit ampacity for 17 No. 12 THHN conductors bundled together in a panelboard? (See Fig. 3, on page 68.)

(a) 30A (c) 15A
(b) 20A (d) 10A

A. The answer is (c), 15A. The ampacity for each No. 12 THHN is 30A, but the correction factors in Table 310-15(b)(2)(a) reduce the conductor ampacity by 50% [Sec. 110-14(c)]. EC&M

Editor's Note: We'll cover the calculations for conductor correction factors for elevated ambient temperature and conductor bundling in future Code Calculations articles.