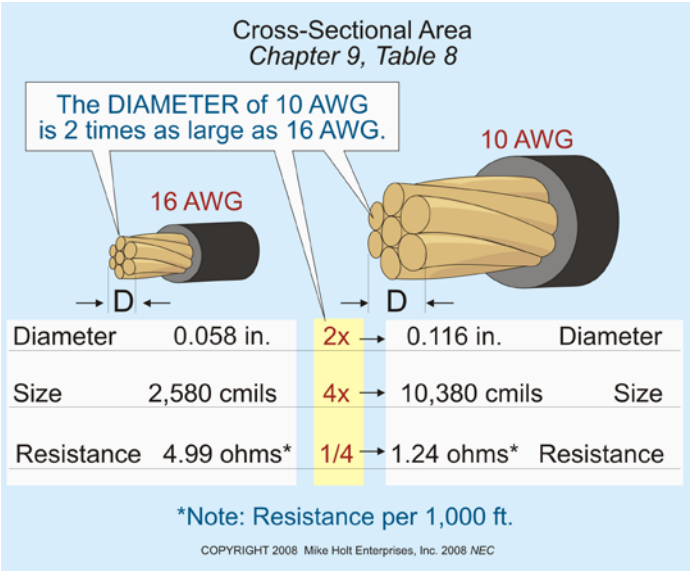

Figure 8–4

Table 8–1. Conductor Properties, *NEC* Chapter 9, Table 8

Conductor Size American Wire Gage	Conductor Resistance Per 1,000 Feet at 75°C	Conductor Diameter Inches	Conductor Area Circular Mils
14 AWG	3.140 ohms (stranded)	0.073	4,110
12 AWG	1.980 ohms (stranded)	0.092	6,530
10 AWG	1.240 ohms (stranded)	0.116	10,380
8 AWG	0.778 ohms (stranded)	0.146	16,510
6 AWG	0.491 ohms (stranded)	0.184	26,240

Temperature

The resistance of a conductor changes with temperature. The amount of change per degree is called the temperature coefficient. Positive temperature coefficient indicates that as the temperature rises, the conductor resistance also rises; this reduces conductor ampacity. Copper and aluminum conductors have a positive temperature coefficient.

The conductor resistances listed in the *NEC* Chapter 9, Tables 8 and 9, are based on an operating temperature of 75°C. A three-degree rise in temperature results in a 1 percent increase in conductor resistance for both copper and aluminum conductors. The formula to determine the change in conductor resistance with changing temperature is listed at the bottom of Table 8 in Note 2. For example, the resistance of copper at 90°C is about 5 percent more than at 75°C.

Temperature Adjustment, Table 8, Note 2:

R for CU = Table R x [1 + (0.00323 x (Temp°C - 75°))]
R for AL = Table R x [1 + (0.00333 x (Temp°C - 75°))]

8.2 Conductor Resistance—Direct-Current Circuits [Chapter 9, Table 8]

The *NEC* lists the resistance and area in circular mils for both dc and ac circuit conductors. Direct-current circuit conductor resistances are listed in Chapter 9, Table 8, and alternating-current circuit conductor resistances are listed in Chapter 9, Table 9. The tables include both solid and stranded conductors. Stranded conductors will be used in this textbook unless specified otherwise.

The dc conductor resistances listed in Chapter 9, Table 8 apply to conductors 1,000 ft long. The following formula can be used to determine the conductor resistance for conductor lengths other than 1,000 ft:

◆ **DC Conductor Resistance Formula**

DC Conductor Resistance =
(Conductor Resistance Ohms/1,000 ft) x Conductor Length

▶ **Conductor Resistance Copper**

Question: *What is the dc resistance of 200 ft of 12 AWG copper?*

(a) 0.21 ohms *(b) 0.29 ohms*
(c) 0.396 ohms *(d) 0.72 ohms*

Answer: *(c) 0.396 ohms*

The dc resistance of 12 AWG copper 1,000 ft long is 1.98 ohms [Chapter 9, Table 8].

The dc resistance of 200 ft is:
(1.98 ohms/1,000 ft) x 200 ft = 0.396 ohms