

Voltage Drop Using the Formula Method

When the circuit conductors have already been installed, the voltage drop of the conductors can be determined by using one of the following formulas:

$$VD = 2 \times K \times Q \times I \times D/CM - \text{Single Phase}$$

$$VD = 1.732 \times K \times Q \times I \times D/CM - \text{Three Phase}$$

“VD” = Volts Dropped: The voltage drop of the circuit conductors as expressed in volts.

“K” = Direct Current Constant: This is a constant that represents the direct current resistance for a one thousand circular mils conductor that is one thousand feet long, at an operating temperature of 75° C. The direct current constant value to be used for copper is 12.9 ohms and 21.2 ohms is used for aluminum conductors. The “K” constant is suitable for alternating current circuits, where the conductors do not exceed No. 1/0.

“Q” = Alternating Current Adjustment Factor: Alternating current circuits No. 2/0 and larger must be adjusted for the effects of self-induction (skin effect). The "Q" adjustment factor is determined by dividing alternating current resistance as listed in NEC Chapter 9, Table 9, by the direct current resistance as listed in Chapter 9, Table 8.

“I” = Amperes: The load in amperes at 100 percent, not 125 percent for motors or continuous loads.

“D” = Distance: The distance the load is located from the power supply, not the total length of the circuit conductors.

“CM” = Circular-Mils: The circular mils of the circuit conductor as listed in Chapter 9, Table 8.