K Method VOLTAGE DROP FORMULAS

The NEC recommend a maximum of 3% voltage drop for either a Feeder or a Branch with not more than 2% additional for the other. Thus no circuit should have more than 5% total Voltage Drop.

Single-Phase:

$$VD = \frac{2 \times K \times I \times L}{CM}$$

Three-Phase:

$$VD = \frac{1.732 \times K \times I \times L}{CM}$$

VD = Volts dropped within the circuit
K = 12.9 Ohms for Copper, and 21.2 Ohms for Aluminum, (based on an operating temperature of
I = Amps, based on 100% of Actual load
L = Length in Feet, one way distance
CM = Circular-Mills, of Conductor wire size, based on Chapter 9 Table 8 NEC
2 = Single Phase Value of a Complete Single Phase Circuit
1.732 = Three Phase Value of a Complete Three Phase Circuit

CONDUCTOR SIZE / VOLTAGE DROP

Increase the size of the conductor to decrease the Voltage drop of a Circuit (Reduces Resistance)

Single-Phase:

$$CM = \frac{2 \times K \times I \times L}{VD}$$

Three-Phase:

$$CM = \frac{1.732 \times K \times I \times L}{VD}$$

CONDUCTOR LENGTH / Circuit x K x I

Reduce the Length of the conductor to decrease the Voltage drop of a Circuit (Reduces Resistance)

Single-Phase:

$$L = \frac{CM \times VD}{(2 \times K \times I)}$$

Three-Phase:

$$L = \frac{CM \times VD}{(1.732 \times K \times I)}$$

CONDUCTOR AMPERAGE / Circuit x K x L

Reduce the Amps placed on a conductor to decrease the Voltage drop of a Circuit (Reduces Amps)

Single-Phase:

$$I = \frac{CM \times VD}{(2 \times K \times L)}$$

Three-Phase:

$$I = \frac{CM \times VD}{(1.732 \times K \times L)}$$

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