WIRE SIZE CALCULATOR

	Input Values	Result
Source Voltage:	(•) 120 ( ) 240 ( ) 480	120
Number of Phases:	(•) Single-Phase ( ) 3-Phase	1
*Amperes:	40	40
One Way Distance (feet):	15	15
Allowable Voltage Drop:	(•) 3% of source ( ) 5% of source ( ) Volts	3%
Wire Size		Copper: 8 AWG Aluminum: 6 AWG

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Calculator Instructions

The wire size calculator will give you a very simple and quick solution to the problem of calculating the size of wires and cables for pump applications in golf courses, landscape projects, and agriculture. The requirements of the National Electrical Code (NEC) and local codes must always be followed.

Source Voltage

– The choices in the calculator are the most common and are nominal values.

Number of Phases

– This is usually single-phase or 3-phase. For single-phase, three conductors are required whereas four conductors are required for 3-phase circuits. One of these conductors is the equipment ground, which can be a reduced size as governed by NEC article 250-122. A Paige Electric representative can help you determine your exact needs.

Amperes

– The number of amperes drawn by the load is to be obtained from the manufacturer of the equipment. For motors, the current must be obtained from tables 430-148 (single-phase) and 430-150 (3-phase) of the NEC. Care must be taken to follow the guidelines of the NEC with regard to the number plugged into the calculator.

The NEC requires that for single motor installation, the current used in the calculation be 1.25 times the load current from the above mentioned tables. When more than one motor is used, the current of the largest load must be multiplied by 1.25, plus the sum of the rest.

Example:
Three pumps of a pump station (30, 10, and 1 ½ horsepower) are connected to the power source of 460-volts, 3-phase. From table 430-150, they draw 40 amps, 14 amps, and 3 amps respectively. The figure we would plug into the calculator would be:

$$(40 \times 1.25) + 14 + 3 = 50 + 14 + 3 = \underline{67 \text{ amps}}.$$

Allowable Voltage Drop

– The calculator allows entry of a voltage drop, but caution should be used when doing so to make sure you are calculating the wire sizes in accordance with NEC article 210-19 (FPN No. 4.) The NEC allows a maximum of a 3% voltage drop on the main branch of a circuit at the farthest outlet of power and 5% total to both feeders and branch circuits to the farthest outlet.

Calculations

– The calculator uses the following formulas for calculating wire size, which are based on Ohm's Law.

For single-phase circuits:

$$\text{Wire Circular Mils} = \frac{(\textit{Conductor Resistivity})(2)(\textit{Amps})(\textit{One Way Distance in Feet})}{\textit{Allowable Voltage Drop}}$$

For 3-phase circuits:

$$\text{Wire Circular Mils} = \frac{(\textit{Conductor Resistivity})(2)(\textit{Amps})(\textit{One Way Distance in Feet})(.866)}{\textit{Allowable Voltage Drop}}$$

Note – Conductor resistivity is 11.2 for copper and 17.4 for aluminum at a temperature of 127º F (53º C)