

## Conductors -- The Electron Superhighway

Although used in many different applications, electrical conductors all perform the same basic function -- they conduct electrons. In other words, they are electron "superhighways". Electron flow through a conductor is often considered to be analogous to water flowing through a garden hose. When a cable is used for communication purposes only a trickle of "water" is required so the conductor can be very small, for example, 32 AWG (American Wire Gauge) to about 20 AWG. When large amounts of electrical power must be transported, a large flow is required and the conductor must be large, typically 14 AWG through about 1000 kcmil (one million **circular mils**).

Conductors come in many different designs so they can cost-effectively satisfy the needs of thousands of different applications. Two of the most important considerations when choosing a conductor type for a specific application are conductor size and stranding.

### Conductor Size

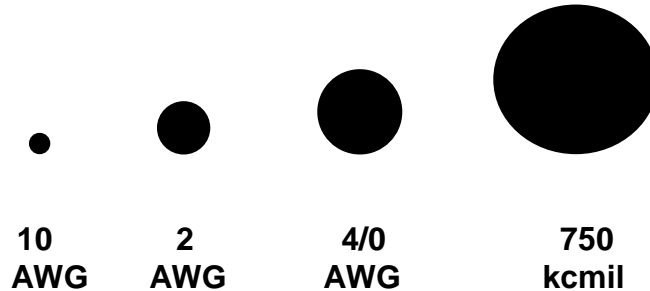
In the US, conductor cross-sectional area is usually specified in units of either AWG (American Wire Gauge) or in units of MCM (thousand circular mils). AWG is used for sizes up through 4/0 (pronounced "four naught") and MCM is normally used for the larger sizes. The term "kcmil" (pronounced "k" "c" "mil") is used interchangeably with "MCM" and is the most up-to-date terminology, but MCM is still widely used. Tables that show the relationship between AWG and circular mil area can be found in Anixter's Wire and Cable Technical Information Manual (part # 104113) or the back side of Anixter's Voltage Drop Calculator (part # 136419).

A few common conductor sizes are listed below along with their diameters to give you a "feel" for their actual size. If you can not "see" common conductor sizes in your "mind's eye", you are not yet a true wire woman or cable man.

<u>Conductor Size</u>	<u>Conductor Area</u>	<u>Approximate Diameter</u>
10 AWG	10,380 cmils	0.10 inches
2 AWG	66,360 cmils	0.25 inches
4/0 AWG	211,600 cmils	0.50 inches
750 kcmil	750,000 cmils	1.0 inches

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A few actual size conductor cross-sections are illustrated below:



### Stranding

Any given conductor can be composed of from one to thousands of individual wires stranded together to make up the conductor. ICEA (Insulated Cable Engineers Association) and ASTM (American Society for Testing and Materials) sets the standards for the various stranding types. For our purposes, it is usually enough to know that more and finer wires in a given conductor give the cable greater flexibility and also greater flex life. The cost of the cable is also increased because stranding together all those little wires takes additional time and equipment. The fineness of the strand is indicated by letters of the alphabet. In a 4/0 conductor, for example, the number of wires for a few common strand classes are as follows:

<u>Class of Strand</u>	<u>Number of Wires</u>
A	7
B	19
C	37
D	61
G	133
H	259
I	532
K	2107
M	5320

Congratulations! You are now a full-fledged, first class, certified "wire whiz".