



Technical Bulletin

Earth Grounding Construction Materials

We are often asked about the types of materials that make the best earth grounding systems. Wire conductors are available in many gauge sizes, and also in stranded, solid, woven, covered, bare, and strap forms. Compounding the choices are the availabilities of different metals such as copper, aluminum, brass, etc.

So which is best? The answer is to make an appropriate choice for the application intended, but the length of the conductor is the most serious consideration. Grounding protection for lightning or RF interference is best served by the shortest possible conductor length, including even zero length (bolting items together with no wire length). In fact, conductor length is so significant that often the effectiveness of short length can be hundreds of times the effectiveness of larger wire in longer length. Whatever you use, use the least amount possible.

As to the materials, here are some important observations to keep in mind:

Brass has about 5% higher resistance than copper and aluminum about 20% more than copper. For that reason copper and brass make the best choices, but not overwhelmingly. Any of these three materials are well suited for most grounding applications, but the availability and price of copper make it the preferred choice. Another advantage of copper and brass is that they do not react unfavorably with oxygen as much as aluminum. Copper can be placed in direct burial for additional ground surface contact without suffering from short lifespan. In many cases copper in the ground may outlive you, and you may have to include it in your will!

Take a look at the specific application. If you are grounding a tower where concern over direct lightning hits is a factor always use a conductor that has a similar current carrying capacity as the tower frame itself. In most cases that size will be in the range of 14 copper or larger. If the current capacity of the tower frame is much larger than the ground wires attached to the base then the ground wire may act like a fuse, burning open and compromising the ground system. Make sure connections are tight and clean - then add long term weather protection for the joints by employing anti-oxidant compounds and/or moisture coverings. If you are grounding equipment internally inside a structure smaller

wiring can be used, perhaps in the range of #12 down to #4 or the largest cable that can be physically managed.

Don't be misled by the various claims of "perfect types" of conductors. There's barely a measurable difference between solid, heavy stranded, strap, coated, bare, etc. The most important element is still length, but it's also a good idea to NOT use bare braided conductors, such as recirculated coaxial cable shield. The reason for this is that when exposed to air these collections of woven tiny conductors oxidize and the electrical contact between adjacent conductors is compromised. To large fast rising currents and RF signals the entire woven assembly appears to be a large number of tiny parallel conductors, and some of the package grounding effect is lost. Best bet - covered stranded wire such as THW or THHN, or even soft welding cable. They offer good flexible workability and they maintain long term conductivity. Solid strap is also a good choice but somewhat more difficult to obtain and work with.

Visit us on the web at www.surgestop.com.