

Wires for Antenna and Grounding

What kind of conductor should and should not use for an antenna wire and grounding system? It is usual question that amateur asks himself at a shop when the person sees lots different wires on the shelves.

The below given [Table](#) could give the answer. Some words about conductors value given in the [Table](#). It is a Specific Resistance, Relative Resistance and Relative Conductivity.

In scientific writings, Specific Resistance is usually given as resistance between two opposite faces of a cube of the material at 0 Centigrade. The following table gives the Specific Resistance for a centimeter cube of the materials, also the relative resistance and conductivity.

Silver, the best conductor, has conductivity of 100%. Relative resistance of a material shows how worst the material as conductor is, compare to silver. The same things are to Relative conductivity.

RF current flows onto a thin outer layer (so called "skin effect"). So, as you can see, it ought to be used silver (!!!!), copper, aluminum material for antenna wire.

Zinc and iron may be used with some losses of the RF energy along the antenna.

However, as it is seen from the [Table](#), wires, made of or covered by stainless steel material, cannot be used for an antenna wire due huge losses. However, It is possible to find lots such stainless steel wires intended for utility use at home. Most of the RF energy would be dissipated on to wire. Therefore the SWR at the antenna would be good by efficiency very bad.

However, wires, made of or covered by stainless steel material, dug into the ground, may be used at electro-technical grounding system. To improve the efficiency of the ground system on the RF it is possible to dig copper wire in strong isolation together with the stainless steel wires. Copper wires give good efficiency on RF. Stainless steel wires give good electro- technical grounding system.

What kind of grounding I have seen at some professional transmitting center it was iron (wire 1...10 mm in diameter) net (20...50- cm x 20... 50- cm) placed on 10... 50- cm above the ground.

Points of the big squares (near 1... 2- m x 1... 2- m) were grounded by iron tube (20... 30- mm in diameter) inserted into the ground on 1... 1.2- meters deep.

Antenna wires for commercial and military LW- MW antennas as usual made of iron wire covered by copper or zinc. Commercial antennas for HF may be made from the same wire. Military use to different stuff for HF antennas. It may be iron wire covered by copper or zinc, iron or aluminum tubes. Sometimes a part of a vehicle, plane or ship serves as an antenna HF.

UHF- VHF antenna both military and commercial, as usual made of aluminum, copper or some stuff covered by aluminum or copper.

My Helical HF antenna (for 10-, 15-, 20-, 30-, 40- meter Band) made from electrical copper wire (33-cent/m, Home Depot is supplier). Antenna is fed through buried coaxial (BFLEX, DAVIS- RF is supplier). Antenna is surrounded by 10 burred counterpoises. Each counterpoise (3- meter long) consists of two wires. There is copper wire in strong insulation (similar to antenna wire) and stainless steel wire (bought in Home Depot). Antenna works well on all bands.



VA3ZNW Vertical Helical HF Antenna

Table*

Specific Resistance, Relative Resistance, and Conductivity of Conductors

Metals	Specific Resistance In microOhms At 0 Centigrade	Relative Resistance	Relative Conductivity
Silver (annealed)	1.521	1.000	100
Copper (annealed)	1.639	1.075	93
Copper (hard)	1.670	1.096	91
Gold	2.326	1.52	65
Aluminum (annealed)	2.76	1.81	55
Duralumin	2.77... 8.66	*Depend on supplier	
Brass	4.0... 11.0	*Depend on supplier	
Magnesium	4.2	2.76	36
Magnesium alloy (AVIA Alloy)	4.9... 14.3	*Depend on supplier	
Wolfram	5.5	3.61	27
Zinc	5.87	3.86	26
Nickel	6.9	4.53	22
Cadmium	7.3	4.79	20
Bronze	9.0... 21.2	*Depend on supplier	
Platinum	9.04	5.93	16.8
Iron	9.7	6.37	15.7
Mild Steel	10.0... 19.7	*Depend on supplier	
Tin	12.6	8.28	12
Chrome	13.2	8.6	11
Soldering Alloy Tin- Lead	15.0.. 18.0	*Depend on supplier	
Lead	19.60	12.90	7.7
Alloy Silver- Nickel	29.0	19.0	5.2
Titanium	54.0	35.5	2.8
Titanium alloy	52.0... 170.0	*Depend on supplier	
Stainless Steel	56.9... 78.0	*Depend on supplier	
Mercury	96.14	63.2	1.6
Nichrome	98.0... 160.0	*Depend on supplier	

- Data for the table taken from several References Books and Internet

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Buried Counterpoises



Buried Coaxial Cable and Buried Counterpoises