Working with Wire

Where to find wire

Many of the shops that sell stained glass supplies sell small rolls of bare copper and brass wire - both exposed metal and pre-tinned. Bare wire is also sometimes available in hardware stores and craft supply shops. WARNING - when you buy wire be careful to not buy copper wire with a varnish or plastic coating on it. Solder will not stick to it.

If you can't find a shop that sells bare wire, or you want sizes larger than carried in these shops, you can buy standard electrical wire and strip it. Wire in a huge variety of sizes can by bought by the foot in hardware stores, building suppliers, and electric supply stores. Or, you might find a friendly electrician who can give you his scraps or scavenge a local construction site. Electricians toss out a lot of foot long pieces of wire.

Stripping wire

Stripping the coating off electrical wire can be difficult, or it can be easy. It just depends on how you do it. It's not so much that you "strip" the coating off the copper inside - but instead you pull the copper out from inside the coating.

Cut the wire into lengths from 18" to 24". It's probably best to start with shorter lengths until you've had a bit of practice. If you still have trouble with 18" lengths, try 12" ones until you've got the hang of it. Longer than 24" can be done, but it is very difficult and rarely necessary. With a knife or wire stripper, remove about ½" of the coating on one end of the wire. If you use a knife, BE CAREFUL - it's very easy to cut yourself.

Then with one hand, hold the exposed wire end firmly with pliers. With the other hand, take a firm grip on the outside of the wire about halfway back from the pliers. Wearing a glove for this is a good idea. Now pull the copper wire out from inside the coating. This doesn't take much strength. It does however take a little practice to get the technique down. The idea is to pull the hand with the pliers in it, straight back in the same motion an archer would make while drawing back a bow to load an arrow. At the same time, the other hand pulls straight away in the opposite direction. The "trick" is not to pull hard, and not to pull quickly - but to pull steadily.

If you pull straight, the wire will easily slide out of the coating. If you curve it at all, you will increase the friction on the wire inside - and find it almost impossible to get out.

Wire sizes

Wire size is referred to as "gauge". Gauge is a percentage of an inch, so the smaller the gauge, the larger the wire. For example: 10 gauge wire is 1/10th of an inch in diameter. If 10 pieces of wire were laid out flat beside each other, the row would be exactly 1" across. If you had 20 gauge wire, it would take 20 pieces of wire to be 1" across.

The thickest solid strand wire that is generally available is 10 gauge. Thicker wire is multi-strand. That is, there would be a number of wires braided or wound together instead of just one piece of solid metal. Most commonly available are 12 and 14 gauge. These sizes are used extensively in household electrical wiring. Smaller size (larger gauge) wire is available, but usually as part of multiple line wire. For example: telephone wire contains 5 wires (each with its own distinctly colored coating) inside an outer coating. To use this kind of wire, you must first cut away the outer coating, then strip out the bare wire from each of the colored coatings the same as for heavier gauge

Straightening wire

Quite often wire gets a bit crumpled and needs to be straightened out. The best way to do this is to "draw" it. Hold one end in a vise or with a pair of pliers in one hand. Then take a firm grip on the wire with the other hand and steadily slide that hand along the wire towards you. Unless you've got fairly callused hands, you should wear a glove for this. The drawing motion is identical to the motion an archer makes when drawing back a bow before launching an arrow. Pull as straight back as possible, and as steady as possible. With a little practice, you can get pretty good at straightening even the most crumpled wire.

Heavy wire like 10 gauge, that is badly bent, can not be straightened this way. It must instead be "rolled". This is done by putting the wire on a hard smooth surface (like a concrete floor, a piece of plywood, or a table top). Then a piece of wood at least as long as the wire, and 6 to 12" wide, is put on top of the wire. (for example: if rolling 24" long wire, you will need a board at least 24" long and 6 to 12" wide). Pressing firmly down on this piece of wood, roll it back and forth to roll the wire beneath it. This is the same motion you would make with a pie roller rolling back and forth on a counter. The firm pressure downwards, combined with the rolling motion, will straighten the wire. This method also works well for straightening copper or brass pipe.

Fluxing

When soldering wire, instead of brushing flux onto the wire, it's easier to dip the wire into the flux. Fill a small glass jar 1 inch or more with flux. Then just dip the wire into the flux.

Tinning wire

To tin wire it's easier to draw the wire along the iron then it is to slide the iron along the wire. Coat the wire completely with flux and load solder onto the iron. Start at one end and draw the wire steadily along the soldering iron to the other end. This will just tin one side. Turn the wire over, reload solder onto the iron, and repeat for the other side.

Soldering same size wires together

When soldering two or more wires of the same size together, load solder onto the iron tip and hold the soldering iron so that it is touching both wires at the same time. As soon as the solder flows smoothly - remove the iron quickly.
Soldering different size wires together

When soldering a small wire to a large wire (i.e. 18 gauge onto 10 gauge), load solder onto the iron tip and hold the iron on the heaviest wire (without touching the smaller wire) until the solder starts to flow. Then slide the iron over to contact the smaller wire until solder spreads onto it - then remove the iron quickly. The larger mass of the heavier wire takes longer to heat up, so it must be heated before the smaller. The heavier the wire, the longer it will take before it heats up enough for the solder to flow. This is especially the case when trying to solder copper pipe.

Use a "Heat Sink"

A "heat sink" is anything that absorbs heat. If you are trying to attach a piece of wire to a small wire with another wire already soldered to it, there is a very good chance that when you heat it, the earlier soldered joint will let go. To avoid this, leave all the wires you are working with as long as possible. The extra lengths of wire will act as a "heat sink" to absorb enough heat to prevent

releasing other joints. Also, by having extra long lengths of wire, you'll avoid burning your fingers by holding on to a hot wire. After you have soldered all your connections, you can cut the wire to the finished lengths you want.

You can also create a heat sink by holding the wire in place with a flat blade screwdriver.

Soldering wire onto lead came

It takes very little heat in very little time to melt right through lead came. You must be especially careful when soldering wire onto lead. Flux the wire and hold it in position on or against the lead. Then load solder onto the iron and hold it on the wire about ½" away from the lead. When the solder runs smooth, slide the iron to touch the lead - and remove it INSTANTLY. It is not necessary to reduce the temperature of your iron. With a bit of practice, you can easily solder wire to lead - even with a high temperature tip.

What if it lets go?

If the soldered connection lets go, it's either from too little or too much heat. If you don't hold the iron in place long enough, the heat won't spread enough for the solder to stick to both pieces. If there is too much heat, the solder might still be liquid when you let go of the wire and it will release. To prevent this, either hold the wire a little longer before releasing, or if you're in a hurry, use the "blow it cool" trick. As soon as you remove the iron, blow on the solder just like you would to blow out a candle. This will cause the solder to cool and set quickly.

What is the best temperature?

Whatever you're comfortable with. It's a good idea to start with a relatively low temperature until you're familiar with soldering wire. But remember, the lower the temperature, the longer you must wait for the wire to heat up. The pros like to work with the highest possible temperatures, and learn to be quick with their motions. Using a temperature controller or rheostat is not a good idea. It takes a lot of time to keep changing temperatures. It's better to learn to do all work at the same temperature.