Wire and Wiring

Electrical wire comes in two basic types: Stranded and Solid. Solid wire can either be insulated or bare. Generally, teams should always use insulated wire for all of their wiring regardless of the voltage being used. It is not only safer but it reduces the chance of shorting out something and damaging your creation.

Stranded wire is made up of a lot of smaller wires wrapped in insulation. This is the type of wire found in extension cords. Stranded wire is more flexible and should be used when wires have to move. Solid wire should be used for wiring inside of devices where the wire doesn't need to flex or move around when the device is in use. Stranded wire connections can be more difficult to make. If they are not done carefully then teams risk having stray smaller wires loose that can create shorts.

Wire is measured by gauge. DI Teams typically would use wire with a gauge in the range of 16 to 22 gauge although there may be times when a team finds itself needing to use 14,12 or even 10 gauge wire. The larger the gauge number the smaller the wire. This is just the opposite of what you would think. Gauge of wire relates to how wire is made. Wire is made by pulling copper (or aluminum) rods through a series of smaller and smaller dies. Each time it is pulled through the die the diameter of the rod gets smaller. Gauge is a count of how many times the rod is drawn through the dies to create the wire size. Thus, 22 gauge wire is pulled through a series of 22 dies. Sixteen gauge wire is pulled through a series of 16 dies. Stranded wires are calculated by calculating the equivalent cross sectional copper area. Thus 20 gauge stranded wire contains approximately the same amount of copper (in cross section) as 20 gauge solid wire.

It is important to understand wire gauge because teams need to wire their devices with wire that is appropriate for the voltage and current that the device is using.

When teams are using small motors or devices that have little current requirements (something that runs on household batteries such as AA,A, C,D or 9V) they do not have to concern themselves with wire gauge as any gauge wire should work. However, as they start to use more powerful motors and devices they use larger voltages and current they need to understand the concepts of voltage and current and use the

appropriate size wire. Using a wire that is too small for the device being wired can create many problems. In some cases using wire that is too small could result in the insulation melting off the wire.

DC Wire size Chart. This chart has suggested wiring sizes for different voltages, amperages and lengths of wiring runs.

Considerations when wiring your devices

Make a Plan

- Make a plan and layout all of your pieces before you do any permanent wiring.
- Where is your power supply? If you are using batteries can you access them easily so that they can be replaced?
- Does your device need a fuse? See the rules of the road for rules on what type of devices MUST have a fuse or current limiting device. Place fuses or other current limiting device can be easily reached. If your device uses a fuse it is a good idea to have spare fuses available during your performance should there be some problem that causes the fuse to blow.
- Are there certain components that need to be removed, replaced or changed out on a regular basis? If so make sure that your plan allows for easy access.

Color Code your Wire

When possible, try to color code your wiring. Wire is available in a wide variety of colors of insulation. For instance, if you wire the motor with blue and green wire and a light with red and yellow wire then you can easily trace the wires through your device. This also makes it easier to explain your device to appraisers because you can easily show them how the wiring is run. When you do not have color coded wire available you can use colored electrical tape to mark your wiring.

Neatness Counts

Try to be as neat as possible when running your wires. Use wire holders and ties to keep your wiring in order. This serves two purposes. It makes it easy for you to trace your wiring should you have a problem and it makes it easier to explain things to the appraisers. Don't let THIS happen to you. The device that this wiring is from works but the wiring is very hard to follow and it would be difficult to troubleshoot should their be problems. The wires are also not properly secured so there is a risk that they could hang on something and be torn apart.

Source: http://tech.texasdi.org/3030wireandwiring