PURDUE EXTENSION
INDIANA 4-H

Electric (All Levels)

Wire Connectors

What's it all About?

Wire connectors are used in all wiring applications. Choosing the correct wire connector and installing them correctly is important to avoid wiring/voltage problems due to a poor wiring connection. This methodology is important to all levels of electricians.

Keys to Remember

- Wire connectors are UL Listed fasteners used to make tight low impedance/resistance connection between two or more electrical wires in an electrical box. Made of flame-retardant materials, wire connectors prevent wires from contacting other wires or exposed metal surfaces, which could cause a dangerous fault or short circuit.
- Wire connectors are available in a variety of sizes and shapes. While their exterior covering is typically made from insulating plastic, their means of connection is a tapered coiled metal spring or interior grooves that thread onto the wires and hold them securely. There are push-in style connectors, but they should only be used on lightly loaded circuits and will not be covered here.
- When a connector is twisted onto the striped and twisted-together ends of wires, the wires are drawn into the connector's metal spring and squeezed together inside it. Electrical continuity is maintained by both the direct twisted wire-to-wire contact and by contact with the metal spring or insert.
- Twist-on wire connectors are typically installed by hand. They may have external grooves to make them easier to handle and apply. Wing-like extensions are commonly molded into higher quality connectors to make attachment easier. Such extensions also allow these connectors to be installed with linesman pliers or a specialized tool (see below).
- Twist-on wire connectors are:
    - Commonly color-coded to indicate the connector size/capacity
    - Frequently used as an alternative to terminal blocks or the soldering of conductors together, since they are quicker to install and, unlike soldered connections, allow easy subsequent removal for future modifications.
    - Not often used on wire gauges thicker than AWG # 10, because such solid wires are too stiff to be reliably connected with this method. Instead, set screw connectors, clamp or crimp connectors are used.
    - Typically used in electrical wiring systems for light switches, receptacles, ceiling fans, can lights, thermostat controls, HVAC, smoke/CO detectors, garage doors, door bells, security systems, signage and more.

For the Project

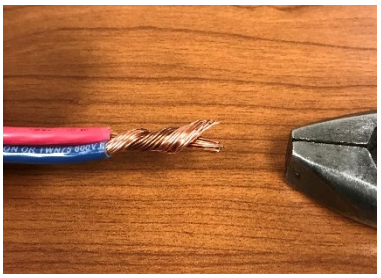
- Appropriately sized display board, video explanation, or other informative exhibit
- Record sheet
- 4-H Exhibit Skills & Knowledge Sheet

Tips for Effective Installation of Wire Connectors

- Follow label recommendations for the number and sizes of conductors to be used with each wire connector.
- Use a multi-tool that will work with different types of wire connectors. This will make for a tighter connection and be easier to use.

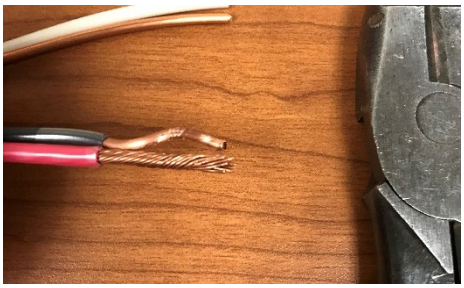


1. Strip wire longer than necessary, then align the insulation. 2. Twist the wires clockwise and cut the conductors to the desired length. This way you are assured they are the same length. 3. Push the connector on while twisting clockwise. This result is what the conductors will look like under the connector.


Stranded-to-stranded splices are connected in a similar way. 1. Strip wire longer than necessary and twist each wire separately. 2. Twist wires clockwise, by hand, then with pliers squeeze wires tight and cut to length. Each strand will be the same length. 3. Push the wire connector on while twisting clockwise.

A solid-to-stranded splice is a little more difficult, but can be done successfully using the previous principles. 1. Strip wire longer than necessary. 2. Put a tight twist on the stranded wire with pliers. 3. Preform the solid wire as if it had been twisted together with another solid wire.




4. Wrap the two in a clockwise direction and cut to length. 5. Push wire connector on while twisting clockwise. This type of splice gets easier with practice and experience.

Final Note

- Twisting the conductors together prior to installing the wire connector assures the individual of what happened under the connector. Most all wiring problems boil down to a poor connection somewhere (loose wires start fires). All connections, splices, and terminations should be contained in some type of enclosure.