Panel upgrade lab part 1

Program: Electrician Technician

Course: EL190 Residential Applications

Objectives: Under the supervision of your instructor, you should be able to do the following:

- Properly make up and phase a residential panel.

Lab Equipment:

- Residential Panels

Required Tools:

- 1 – Pair of strippers
- 1 – Box cutting knife
- 1 – Diagonal Cutters
- 1 – Lineman Pliers
- 1 – Flathead screwdriver
- 1 – Phillips's screwdriver

Materials:

- 4 – 3/4" 2-screw Romex connectors
- 20' – 14/2 Romex
- 10' – 14/3 Romex
- 4 – Single pole 15-amp breakers
- 2 – Single pole 15-amp breakers

Safety (PPE):

- Safety glasses/goggles
- Hard hat

Resources:

- N/A

Required Time: One Day

Shop Maintenance:

- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.
- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are students' responsibility

Procedures: (Eye protection must always be worn)

Step 1

- Knock out 4 - 3/4" knockouts in a residential panel.

- Install 1 – 3/4" 2-screw connector in each of the four holes.
- Loosen 12 terminal screws on the ground / neutral buss.

Step 2

- Cut the 20' of 14/3 Romex into four equal pieces.
- Cut the 10' of 14/2 Romex into two equal pieces.
- Insert all the wires through the four connectors, leaving 3' inside the panel on each wire. Have no more than two wires per connector.
- Tighten all the screws on the connectors until they are snug against the wires.

Step 3

- Using the knife, cut the top of the wire insulation, once on each side, and then pull the outer insulation off each of the wires. Make sure to leave only about 1/3" – 3/4" of insulation from the connector.
- Unwind the 14/3 Romex until all the wires are straight.
- Pull or cut all the paper and/or nylon string off at the base of the wire.

Step 4

- Separate the black and red wires and then push them up and to the side.
- Separate the white wires and push them up and to the opposite side of the blacks and reds.
- Bend the remaining ground wires, following the edge of the inside of the panel towards the ground buss. Then bend at a right angle towards the buss, measure so the wires go just past the screw terminal in the ground buss and then cut the wires.
- Slide each of the ground wires into the screw on the ground buss, making sure only one wires per terminal. Tight the terminal screw once the wire just passes the screw.
- Follow the same procedure with the white wires (neutrals), only strip about
- 1/2" off the ends of the wires once you cut them.

Step 5

- Install 15-amp 2- pole breaker at the top.
- Install 15-amp single breakers.
- Loosen all the screws on the breakers so the wires can easily fit in.

Step 6

- Bend the black and red wires following the inside edge of the panel, one at a time and terminate into the proper breaker following the next steps.
- Take one of the 14/2 black wires, bend, cut and strip 1/2" off the end and terminate into the top of the first twin breaker.
- Take the black and red from the same 14/3 Romex and terminate into the next two breaks in order, red then black. Follow this for the next 3 - 14/3 red and black wires.
- Take the last 14/2 black and terminate it into the last breaker.
- Make sure all the wires are bent at 90o and pushed into the panel with a clean look.