



# LOUISIANA FFA

CAREER DEVELOPMENT EVENT

# ELECTRICITY

# Electricity Career Development Event

## Purpose:

The electricity CDE provides an opportunity for students to develop skills in electrical wiring. It is a follow-up to the instruction given to FFA members in the Agriscience program. This event is not designated for national competition. It was created for Louisiana only.

## Objectives:

1. To prepare students to analyze and solve problems related to installing electrical outlets.
2. To develop students' abilities in applying national electric safety procedures to the process of electrical wiring.
3. To provide students with the experience of installing electrical outlets and wiring.

## Contest Format

The event will consist of:

- A. Part 1** – Student will develop a wiring diagram and a schematic diagram for the selected problem. *(Revised 2005)*
- B. Part 2** - Student will wire the wiring board as indicated on the developed wiring diagram for the selected problem.
- C. Part 3** - Student will take a written exam consisting of 50 multiple choice questions selected randomly from the test bank found on the LATA website. *(Adopted 95,07)*

## Rules and Regulations:

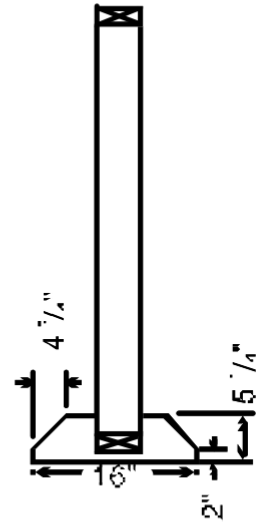
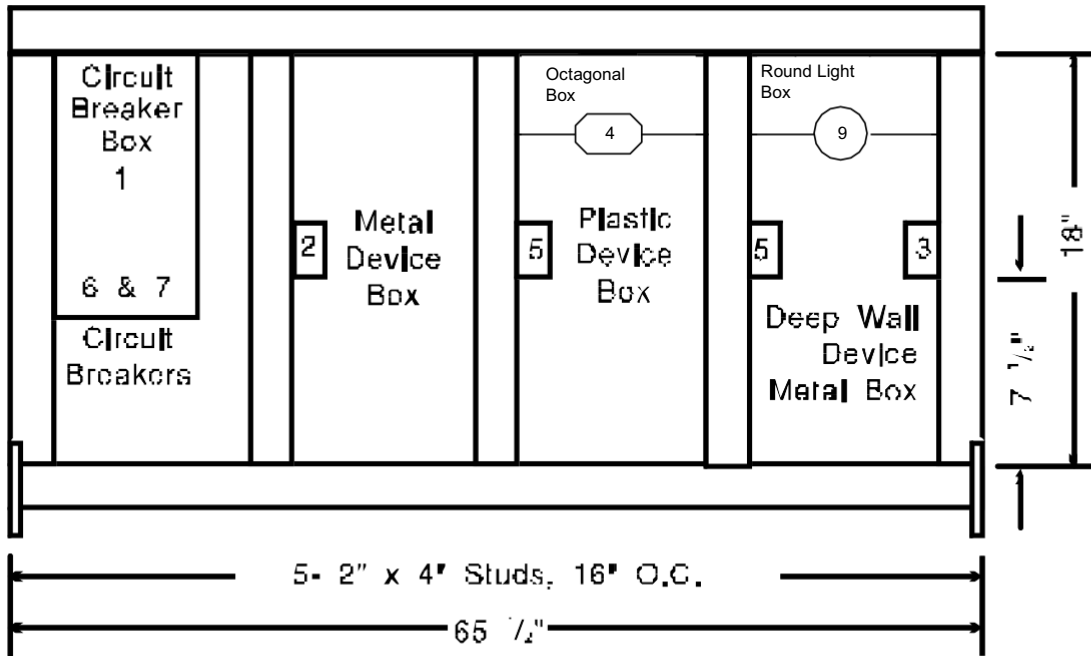
1. All general rules apply except as indicated in the specific rules for this event.
2. A team shall consist of one FFA member.
3. All contestants will be trained in the basic principles of electricity including but not necessarily limited to the National Electrical Code as related to 120/240V AC, two-, three-, and four-way switches, over-current protection, ground fault protection, resistance heating, incandescent and florescent lamps, lighting fixtures, wire sizing, and junction boxes. *(Revised 05)*

4. For the state and area events, the contestants will know the principles for which they will be responsible, but will not be told ahead of time what the problem will be or given a set of problems from which the contest problem will be chosen. The event problem can include any of the concepts and principles for which the contestants are responsible. *(Revised 98)*
5. Contestants will be allotted 75 minutes to complete the wiring exercise, 20 minutes for the wiring diagram and 45 minutes to complete the written exam. Individual times on the wiring exercise will be kept for the purpose of tie-breaking. *(Revised 17)*
6. Jobs to be performed will be announced by the judge at the time of the events.
7. Contestants must have their own electrical wiring panel and tools.
8. All contestants entering the Electricity event must furnish the material required to compete (see pages 6 and 7 for material required). The wiring panel must be constructed to the specifications listed on page 5 otherwise the contestant will be disqualified.
9. No pre-cut wire will be allowed.
10. Students must use a manual screw driver only.
11. Wire Economy - All wire should be routed so that it can be stapled within 12 inches of any electrical box, but contestants that follow the contour of the board unnecessarily will be penalized for wasting wire.
12. Neatness - The wire does not have to follow the path of the frame to receive full credit for neatness. In fact, wasted wire will incur a penalty.
13. All wiring must conform to the National Electrical Code.
14. Safety goggles/glasses must be worn by the participant during the wiring exercise. *(Revised 05)*
15. The top four contestants will receive banners at the area competitions and will be eligible to compete in the State Event.
16. The top four competitors in the State Event will receive banners.
17. Results of the electricity event will be considered in determining the sweepstakes winners in the area and state events.

18. Each board will be reviewed and scored by 2 judges. Scoresheets for each FFA member will be kept with the panel until after the panels have been evaluated.
  - A. After the panel has been evaluated, the top 8 boards present and their scoresheets will be reviewed again before the results are determined final. (Adopted 2023)
  - B. All boards will be judged “blind.” The judge/judges will be sequestered in a location other than, but close to, the competition floor and the contestant boards will be taken to that location upon completion. (Adopted 2023)
19. Tie Breakers: (applied in the following order) *(Revised 2014)*
  - a. Test
  - b. Drawing
  - c. Time
20. All boxes, devices (receptacles, switches, breakers, etc.), clamps, components, etc. must be in proper working order and properly secured to the electrical board. Devices not working properly or boxes not properly secured will incur a penalty under “Section L” of the score sheet. *(Revised 2005)*
21. The electrical board should have proper footing to insure the board stands rigid vertically. (See suggested footing on page 5. You may use your own version as long as it is unobtrusive and keeps the board from rocking back and forth or falling.) Boards not properly secured will incur a penalty under “Section L” of the score sheet. Boards will remain vertical at all times during the competition. *(Revised 2005)*
22. All 240 Volt circuits must have 3 insulated conductors for all applications. Bare wires are to be used only for equipment grounding. *(Revised 2005)*
23. When drawing the wiring diagram, cable runs between the boxes must be designated by a single or double line. The line should be labeled with the wire size, e.g.; 14-2 wg. (See page 10 for an example of a double line used to designate a cable.) *(Revised 2005)*
24. No pocket knives, box cutters, or any type of open knife will be allowed in the competition. Only approved pliers or strippers will be allowed for use in stripping the outer sheath as well as individual conductors. Failure to comply will result in disqualification. *(Revised 2005)*
25. Switches and receptacles may not be “back-loaded” (wires connected to slots in the rear of receptacles and switches). *(Revised 2005)*
26. All connections must be on screw terminals. The only exception is when using a GFCI. The GFCI must be back-loaded. *(Revised 2005)*
27. All contestants will have their materials checked and must be as per the approved list as indicated in these rules. Anyone not having all materials will lose points in the Part L on the score card. *(Revised 2005)*

## Electrical Wiring Panel

All contestants entering the electricity CDE must furnish the following to compete. The panel must be constructed to the specifications listed to be approved for the contest.



Suggested Footing

REFERENCE NUMBER	ITEM DESCRIPTION	NUMBER REQUIRED
1	4 or 6 - 60 amp circuit box (Square D, Cutler-Hammer, ITE, etc.)	1
2	Metal device box with ground screw or green metal clip and wire clamps (3" x 2" x 2" depth) <i>(Revised 2005)</i>	1
3	Deep wall device metal box with ground screw or green metal clip and wire clamps (3" x 2" x 3 ½ " depth) <i>(Revised 2005)</i>	1
4	4" octagonal metal box mounted on a bar hanger facing contestant with wire clamps and ground screws. Wire clamps should be the type used with Romex wire (not BX-type wire). Romex connectors must be used on boxes with no clamps. <i>(Revised 05)</i>	1
5	Plastic nail-on device boxes	2
6	Circuit Breakers - 15 amp	2
7	Circuit Breaker - Double pole 20 amp	1
8	Circuit Breaker - 20 amp	1
9	Light box – 4" round PVC box mounted on bar hanger facing contestant <i>(Revised 05,08)</i>	1

**Other material required to build board:**

- A. 2 - 2" x 4" - 65 ½" in length
- B. 5 - 2" x 4" - 18" in length
- C. 2 - 1" x 6" - 16" in length **OR**
- D. 2 - 2" x 6" - 16" in length

**Additional required material to be brought by students:**

## 1) Switches

- a) 2 - 3 way switches\* (Rev 96)
  - b) 1 - 4 way switches\*
  - c) 2 - single pole switches\*
  - d) 1 - double pole single throw on/off switch\* (not a four way switch)
- \*Grounded switches are mandatory (Rev.96)

## 2) Receptacles

- a) 1 – 240V, 20 amp receptacle \*(single)
  - b) 2 – 120V, 20 amp receptacles \*(duplex)
  - c) 2 – 120V 15-amp duplex receptacles \*
  - d) 1 – GFCI receptacle
- \* Grounded receptacles are mandatory. (Revised 05)

## 3) 2 – Porcelain/plastic light fixtures (Revised 05, Updated 19)

## 4) Copper wire – ROMEX (Revised 96)

- a) 14 - 3 with ground
- b) 12 - 2 with ground
- c) 14 - 2 with ground
- d) 12 – 3 with ground

**NOTE: No pre-cut wire allowed.**

## 5) Color-coded pencils or pens for drawing schematic - red, black, green as ground and blue for white wire. All lines must be solid. No dotted or dashed lines allowed.(Revised 05)

## 6) Romex connectors (minimum of 6). (Revised 05)

## 7) All metal boxes (Junction, Panel, Receptacle, Light, and Switch) should be plugged with knockout plugs or factory cable clamps. (Cable clamps in device boxes will cover the hole. Taping holes is not required.) (Revised 05)

## SPECIAL NOTES SECTION

1. Grounded connectors (neutrals) of multi-wire branch circuits supplying receptacles, lamp holders, or other such devices are not permitted to depend on terminal connections for continuity between devices. For such installation (3 or 4 wire circuits), a splice is made and jumper is connected to the terminal, unless the neutral is “looped.”
2. The length of free conductors of outlets, junctions, switch boxes, and light boxes should be 6 to 8 inches from the back of the box. *(Revised 05)*
3. When making loops or hooks in the wire for terminals, the strip should be long enough not to allow insulation under the screw, but not long enough for bare wire to extend beyond the device case. Stripped wire used in connections must not extend beyond the skirt of the wire nut. *(Revised 05)*
4. Although National Electric Code states that switches and receptacles with their own grounding screws do not need grounding to the back of the box, for safety reasons during testing the box SHALL be grounded. *(Revised 02)*
5. Panel boards scoring a perfect score of 60 under Section I of the score card (Functional Operation) at the Area and State levels must be checked with a meter (continuity tester or ohm meter) or by powering up the boards with an AC source to validate complete and perfect function. Visual inspection only will not suffice at the Area and State levels. *(Revised 05)*
6. All boards must be equipped with a 120V power entrance cable and standard 120V male plug attached to the breaker box to facilitate powering the board when establishing proper function of all circuits by the judge. *(Revised 05)*

### Area and State Electricity CDE Problems Revised 2005

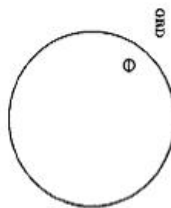
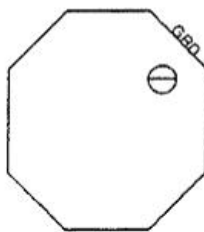
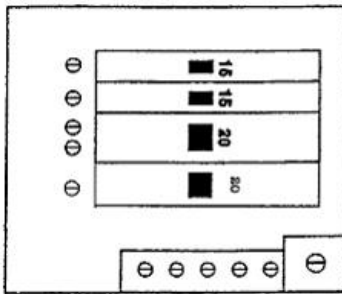
Draw the schematic wiring diagram for the problem indicated by the judges. The judges may select any of the following items or multiples of the following items to include in the problem. Each problem will contain a maximum of six components.

1. Ceiling light – incandescent (2)
2. 4-way switch (1)
3. 3-way switch (2)
4. Single pole switch (2)
5. 120 volt receptacle (2)
6. Double pole, single throw switch (1)
7. 240 volt, 20 amp receptacle (1)
8. 20 amp double poled breaker (1)
9. GFCI (ground fault circuit interrupt) outlet (1)
10. 15 amp single breakers (2)
11. 20 amp single breaker (1)

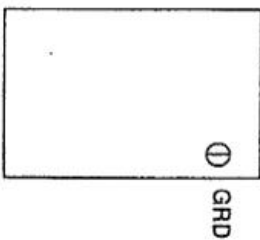
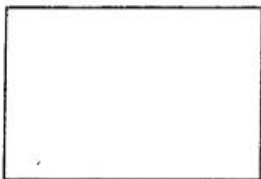
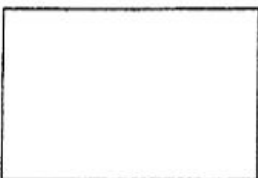
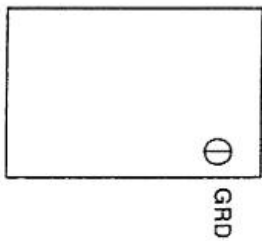


Contestant Name: \_\_\_\_\_  
Contestant Number: \_\_\_\_\_

School Name: (Blue or Gold) \_\_\_\_\_  
Circle One  
Board Wiring Time: (60 Minutes Maximum) \_\_\_\_\_



*Color Code Legend:*  
 Black Wire - Black Solid Line  
 White Wire - Blue Solid Line  
 Bare Ground - Green Solid Line  
 Red Wire - Red Solid Line



**ELECTRICAL JUDGING CRITERIA**  
**ELECTRIFICATION CDE**

\_\_\_\_\_  
CONTESTANT'S NAME

\_\_\_\_\_  
CONTESTANT'S NO.

\_\_\_\_\_  
CHAPTER NAME

POSSIBLE SCORE	CRITERIA	CONTESTANT SCORE
10	A. Drawing of wiring diagram 2 pts Schematic 2 pts Proper device drawing 2 pts Proper wire drawing/labeling 2 pts Proper device connections/junctions 2 pts Proper panel/breaker connections	_____
16	B. Choice of path/Wire Economy 4 pts Follows specific instructions on where to run wires 4 pts Path allows for wires to be stapled within 12 inches 4 pts Path properly follows contours of the board 4 pts Path demonstrates best use of 2 & 3 wire material as well as junctions to conserve wire	_____
5	C. Length of leads in boxes 1 pt Lighting Boxes 1 pt Device box 1 1 pt Device box 2 1 pt Device box 3 1 pt Device box 4	_____
10	D. Wire preparation for terminal & junctions 2 pts Panel Neutrals/Grounds 2 pts Panel Breakers 2 pts Lighting Connections 2 pts Device Connections 2 pts Wire Nut Connections	_____
5	E. Use of clamps in boxes 2 pts Panel 1 pt Octagon Box 1 pt Metal Device Box 1 1 pt Metal Device Box 2	_____
10	F. Time for job	_____
12	G. Neatness 3 pts Panel 3 pts Lighting Boxes 3 pts Device Boxes 3 pts Wires run between panels and boxes	_____

60	H. Functional operation	
	10 pts Panel	
	10 pts Lighting	
	10 pts Device 1	
	10 pts Device 2	
	10 pts Device 3	
	10 pts Device 4	
12	I. Equipment grounding	
	2 pts Panel	
	2 pts Metal box grounding	
	2 pts Device 1	
	2 pts Device 2	
	2 pts Device 3	
	2 pts Device 4	
5	J. Proper circuit breaker selection	
60	K. Following event rules & regulations	
	10 pts Board meets all rule specifications	
	10 pts Individuals have all required devices	
	10 pts Individuals have proper wire	
	10 pts All tools meet rule specifications	
	10 pts All neutral connections follow special note 1	
	Page 7	
	10 pts All terminal connections are made according to	
	Rules 22-26, pg 3	
20	L. Safety (including use of safety goggles)	
50	M. Exam (1 point per question)	
Total Score	(275 points possible)	

**NOTE:** Contestants will be allotted 75 minutes to complete the wiring exercise, 20 minutes for the wiring and diagram, and 45 minutes to complete the written exam. Individual times will be kept for the purpose of tie-breaking.