Arkansas CTE

# Agricultural Electricity: Grades 10, 11, 12

Adopted 2007

## Introduction to Agricultural Electricity

### 1.1 Define terminology

1. Prepare a list of terms with definitions 1.1.1

### 1.2 Examine the importance of agricultural electricity

1. List uses of electricity in the agricultural industry, including animal and plant production (farming and ranching), supplies and services, and processing and marketing 1.2.1
2. Use a local directory to identify businesses that do work in agricultural electricity 1.2.2
3. Investigate the source of electrical power in the local area 1.2.3
4. Invite a resource person from a local electrical source, such as the electric power association, to speak to the class about the role of electricity in agriculture 1.2.4

### 1.3 Discuss appropriate FFA activities and supervised experiences in agricultural electricity

1. List FFA activities available in agricultural electricity and explain the nature of the activities, including Career Development Events and Proficiency Awards 1.3.1
2. Plan and/or expand supervised experiences in agricultural electricity 1.3.2
3. Maintain records on FFA and supervised experience participation 1.3.3

## Safety with Agricultural Electricity

### 2.1 Define terminology

1. Prepare a list of terms with definitions 2.1.1

### 2.2 Discuss the meaning and importance of safety in agricultural electricity

1. List hazards associated with agricultural electricity 2.2.1
2. List safety practices that should be followed with agricultural electricity work 2.2.2
3. List precautions to take to prevent personal injuries 2.2.3
4. Distinguish between personal safety and grounding safety in working with electricity 2.2.4

### 2.3 Describe the use of Personal Protective Equipment (PPE) in agricultural electricity

1. Identify protective clothing and equipment that should be worn/used when doing work in agricultural electricity 2.3.1
2. Demonstrate how personal protective equipment is used 2.3.2
3. Demonstrate proper storage of personal protective equipment when it is not in use 2.3.3

### 2.4 Describe the meaning and use of grounding safety

1. List reasons for proper grounding safety 2.4.1
2. Identify the use of GFCI and AFCI in agricultural electricity 2.4.2
3. Identify locations where grounding protection is needed 2.4.3

## Careers and Licensing in Agricultural Electricity

### 3.1 Define terminology

1. Prepare a list of terms with definitions 3.1.1

### 3.2 Explain the meaning and importance of licensing in electrical careers

1. Research and report the licensing requirements to perform electrical work 3.2.1
2. Investigate electrician licensing requirements in Arkansas, including the role of the Arkansas Board of Electical Examiners 3.2.2
3. List requirements of experience and education needed for the classes of electrician license offered in Arkansas 3.2.3
4. List the mailing address and web site of the Arkansas Board of Electrical Examiners 3.2.4

### 3.3 Discuss employment opportunities in agricutural electricity

1. List and distinguish between the electrical occupations, including master electrician, journeyman electrician, industrial maintenance electrician, residential master electrician, residential journeyman, and air conditioning electrician 3.3.1
2. Identify education, skill preparation and license needed for entering an electrical occupation in agriculture 3.3.2
3. Identify personal attributes for success in an agricultural electricity occupation 3.3.3

## Identifying and Using Equipment and Tools

### 4.1 Define terminology

1. Prepare a list of terms with definitions 4.1.1

### 4.2 Discuss the selection and use of tools for electrical work

1. Identify common electrical hand tools 4.2.1
2. Demonstrate the proper use of common electrical hand tools 4.2.2

**4.3 Discuss the selection of cables, wires, conduit, and connectors**

1. Identify common electrical devices used in wiring, such as switches, boxes, and receptacles 4.3.1
2. Demonstrate the selection of appropriate devices for an electrical job 4.3.2
3. Demonstrate the selection of an appropriate service entrance panel 4.3.3

**4.4 Discuss the selection of cables, wires, conduit, and connectors**

1. Identify cables, wire, conduit, and connectors 4.4.1
2. Develop a display board identifying cables, wires, conduit, and connectors 4.4.2
3. Demonstrate the selection of appropriate cable, wire, conduit, and connectors for an electrical wiring job 4.4.3

## Electricity Theory and Measurement

**5.1 Define terminology**

1. Prepare a list of terms with definitions 5.1.1

**5.2 Discuss the meaning and kinds of electricity**

1. Identify how electricity is an interaction known as electromagnetism and harnessed to do work as electrical energy and electric power 5.2.1
2. Contrast Alternating Current (AC) and Direct Current (DC) 5.2.2
3. Relate electric fields to practical uses in electric motors and other agricultural devices 5.2.3

**5.3 Explain the measurement of electricity and how rates are calculated**

1. Describe the relationship between Volts (V), Watts (W), and Amps (A); relate these to Ohm's Law 5.3.1
2. Demonstrate the use of a multimeter 5.3.2
3. Calculate electrical load for a variety of agricultural devices used separately and in various combinations 5.3.3
4. Calculate electrical power costs 5.3.4
5. Solve an electrical cost problem 5.3.5

## Using Electrical Plans and Diagrams

**6.1 Define terminology**

1. Prepare a list of terms with definitions 6.1.1

### 6.2 Discuss the meaning and use of plans in agricultural electricity

1. Identify electrical symbols used in plans 6.2.1
2. Identify the kinds of circuits in an electrical plan 6.2.2
3. Identify the locations of switches, lights, outlets, and other common devices in an electrical plan as related to the service entrance panel 6.2.3
4. Perform the installations shown in an agricultural electrical plan 6.2.4

### 6.3 Discuss the meaning and use of circuit diagrams

1. Identify the meaning of color in a circuit diagram, including red, black, blue, and green 6.3.1
2. Demonstrate the preparation of a circuit diagram for switches, receptacles, and lights 6.3.2

## Selecting and Connecting Wire

### 7.1 Define terminology

1. Prepare a list of terms with definitions 7.1.1

### 7.2 Discuss the meaning and importance of wire materials, size, and insulation

1. List the kinds of wire insulation and the uses of each 7.2.1
2. Visually observe the different wire insulation types 7.2.2
3. Describe how wire is sized and why size is important in electrical wiring 7.2.3
4. State relationships between wire size and amperage 7.2.4
5. Compare copper conductors to those made of other kinds of metal materials 7.2.5

### 7.3 Discuss the meaning and importance of voltage drop

1. List causes of voltage drop 7.3.1
2. Use a voltmeter to demonstrate voltage drop 7.3.2
3. List procedures to overcome problems with voltage drop 7.3.3

### 7.4 Discuss the meaning and importance of quality connections between wires

1. List ways wires may be connected 7.4.1
2. Demonstrate the construction of end, rattail, and tap splices 7.4.2
3. Demonstrate the use of connectors such as wire nuts 7.4.3
4. Demonstrate the use of appropriate insulation materials on splices 7.4.4

## Planning and Protecting Circuits

### 8.1 Define terminology

1. Prepare a list of terms with definitions 8.1.1

**8.2 Describe the meaning and importance of protection devices in agricultural electricity**

1. List the various circuit protection devices and indicate the advantages and disadvantages of each 8.2.1
2. Identify the meaning and use of surge arresters/suppressors/protectors 8.2.2

**8.3 Discuss the types, design, and installation of circuits**

1. List and distinguish between the types of circuits, including feeder, branch, applicance, and individual circuits 8.3.1
2. Prepare and/or use a circuit diagram in planning and installing a circuit 8.3.2

## Installing the Service Entrance Panel (SEP)

**9.1 Define terminology**

1. Prepare a list of terms with definitions 9.1.1

**9.2 Discuss the meaning and importance of a service entrance**

1. Identify the major parts (components) of a service entrance panel 9.2.1
2. List factors in the proper installation of a service entrance panel 9.2.2
3. Distinguish between 120V and 240V service 9.2.3
4. Discuss overhead clearance for service wires 9.2.4
5. Identify factors to consider in the location of a service entrance 9.2.5

**9.3 Discuss the meaning and importance of a distribution board**

1. Name the components of a distribution board 9.3.1
2. Identify breaker arrangement in a distribution board 9.3.2
3. Determine the size of distribution board needed by calculating the load for an agricultural structure 9.3.3

**9.4 Describe the meaning and importance of grounding for a service entrance**

1. Identify why grounding is important with service entrance installation 9.4.1
2. Demonstrate proper way of grounding a service entrance 9.4.2

**9.5 Discuss the meaning and importance of the electric meter**

1. Demonstrate how to read an electric meter 9.5.1
2. Identify factors to consider in locating an electric meter 9.5.2
3. Determine the requirements of meter base location from the local electric power provider 9.5.3

**9.6 Discuss the meaning and importance of emergency generators**

1. Identify considerations in hooking up an emergency generator `9.6.1`
2. List kinds, sizes, and sources of fuel for emergency generators `9.6.2`
3. Identify circuits to be included with an emergency generator `9.6.3`

## Installing Outlet and Switch Boxes

**10.1 Define terminology**

1. Prepare a list of terms with definitions `10.1.1`

**10.2 Discuss the importance and use of outlet and switch boxes**

1. Name and identify the types of electrical boxes `10.2.1`
2. Name the materials used in manufacturing boxes `10.2.2`
3. Identify the different face plates for boxes `10.2.3`

**10.3 Discuss the installation of boxes**

1. List the requirements for installing boxes `10.3.1`
2. Demonstrate the proper installation of a switch box, outlet box, and light box using code standards `10.3.2`

## Installing Switches and Outlets

**11.1 Define terminology**

1. Prepare a list of terms with definitions `11.1.1`

**11.2 Discuss the meaning and importance of switches and outlets**

1. Identify the different kinds of outlets and switches `11.2.1`
2. Explain the uses of the three kinds of switches `11.2.2`

**11.3 Describe the proper selection and installation of switches and receptacles**

1. Discuss the capacity (amps) of switches and outlets `11.3.1`
2. List factors to consider in selecting switches and receptacles `11.3.2`
3. Demonstrate the installation of switches and receptacles following electric code regulations `11.3.3`

## Using Conduit

**12.1 Define terminology**

1. Prepare a list of terms with definitions `12.1.1`

**12.2 Discuss the meaning and kinds of conduit**

1. List reasons conduit is used 12.2.1
2. Identify the different types of conduit 12.2.2
3. List the sizes of conduit and explain how the size of conduit to use is determined 12.2.3
4. Explain how the number of wires to be run in conduit is determined 12.2.4

**12.3 Describe the installation of conduit**

1. Demonstrate how conduit is measured, cut, and bent 12.3.1
2. Demonstrate how conduit is connected to boxes and mounted to structures using conduit support hardware 12.3.2
3. Demonstrate how metallic conduit is grounded 12.3.3
4. Demonstrate how cable and/or wire is pulled in conduit 12.3.4

## Selecting and Using Electric Motors and Appliances

**13.1 Define terminology**

1. Prepare a list of terms with definitions 13.1.1

**13.2 Discuss the types and uses of electric motors**

1. List the types of electric motors 13.2.1
2. List uses of electric motors 13.2.2
3. Explain how electric motors are classified on the basis of power 13.2.3
4. Calculate pulley/speed ratio on electric motors 13.2.4

**13.3 Discuss the meaning and importance of electrical appliances**

1. List common electrical appliances used in agriculture 13.3.1
2. Indicate how appliances are classified on the basis of connection, such as permanently connected, cord-and-plug connected, and fastened in place 13.3.2
3. Classify appliances based on electrical power needs 13.3.3

**13.4 Describe the importance of nameplates on motors and appliances**

1. List the information found on an electric nameplate 13.4.1
2. Identify uses of information on a nameplate 13.4.2

## 13.5 Discuss the maintenance and operating costs of electric motors and appliances

1. List common maintenance practices with electric motors `13.5.1`
2. List benefits of performing maintenance practices on electric motors and appliances `13.5.2`
3. Demonstrate common maintenance practices on electric motors and appliances `13.5.3`