Electrical Construction

Exam Information

Exam number
902

Items
59

Points
78

Prerequisites
None

National Career Cluster
Architecture & Construction

Performance standards
Included (Optional)

Certificate available
Yes

Description

The Electrical Construction industry certification covers electrical safety, tool identification and usage, electrical theory, and wiring and installation. Students will learn about safe work practices, OSHA standards, PPE, and hazard identification. They will become familiar with electrical tools and equipment, including meters, conduit benders, and hand and power tools. The course also teaches electrical theory and circuits, focusing on circuit identification, Kirchoff's law, and calculations in series, parallel, and combination circuits, as well as Ohm's and Watt's laws, and AC/DC currents. Additionally, students will learn wiring, circuits, and installation, including using the NEC, identifying conductors and cables, selecting and installing wiring and switching arrangements, installing GFCI receptacles, and testing and troubleshooting. The course also includes conduit bending and basic blueprint reading.

***All standards are taught in accordance to NEC requirements**

Exam Blueprint

Standard	Percentage of exam
1. Safety	8%
2. Tools	14%
3. Theory	26%
4. Installation	35%
5. Conduit	9%
6. Blueprints	9%

Standard 1 Electrical Safety*

Students will identify and understand electrical construction worker safety training, including safe work practices, OSHA's role, PPE, SDS, and hazard avoidance.

Objective 1 Identify safe working practices

Objective 2 Explain the purpose of OSHA

1. PPE
2. SDS

Objective 3 Identify workplace hazards and how to avoid them

Objective 4 Identify Lockout, Tagout, Blockout

Standard 1 Performance Evaluation included below (Optional)

Standard 2 Tools for the Electrician

Students will understand and be able to describe basic electrical tools and equipment, including electrical meters, conduit benders and accessories, basic hand tools, and basic power tools.

Objective 1 Identify, use and maintain basic tools and equipment for the electrical field

1. Electrical meters
    - Multimeter
    - Clamp on meter
    - Voltage tester
    - Receptacle tester
    - Continuity tester
        - Perform a continuity test with an electrical meter
2. Conduit benders and accessories
    - Hand bender
    - Hickey bender
    - Pipe reamer
    - Hydraulic bender
    - Hydraulic pipe threader
    - Hot box
    - Heat blanket
3. Basic hand tools
    - Wire strippers
    - Diagonal pliers
    - Lineman pliers
    - Needle nose pliers
    - Screwdrivers
    - Hammer
    - Utility knife
    - Tape measure

- Torpedo level
- Hacksaw

4. Basic power tools
    - Right angle drill
    - Impact drill
    - Portaband saw
    - Cordless drill
    - Holehawg drill
    - Reciprocating saw

Standard 1 Performance Evaluation included below (Optional)

Standard 3 Electrical Theory

Students will understand electrical theory and circuits, focusing on circuit identification, Kirchoff's current law, and calculations in series, parallel, and combination circuits. Students will also learn Ohm's and Watt's laws, and AC/DC currents.

Objective 1 Identify different circuits and wiring connections

Objective 2 State and use Kirchoff's current law and the current divider formula to solve circuit problems.

Objective 3 Calculate the theoretical values of voltage drop, current, resistance and power in all parts of a circuit.

1. Parallel Circuits
2. Series Circuits
3. Combination Circuits

Objective 4 Describe basic principles of electrical theory.

1. Describe the units of voltage, current, resistance, and power.
2. Describe the factors that affect the movement of electrical charges.
3. Clearly distinguish between direct (DC) and alternating (AC) current.

Objective 5 Verify Ohms Law

1. State Ohms Law and the relationships between current, resistance, and voltage in circuits.
2. Describe the effect on current when changing voltage or resistance.
3. Use formulas and basic mathematics to solve Ohms Law problems.

Objective 6 Verify Watts Law

1. State Watts Law and graph the relationships between voltage, current, and power in circuits.
2. Describe the effect on power if voltage, current or resistance is changed.
3. Use formulas and basic mathematics to solve Watts Law problems.

Standard 1 Performance Evaluation included below (Optional)

Standard 4 Wiring, Circuits and Installation*

Students will be able to identify the tasks and skills required for electrical construction work, including using the NEC, identifying conductors and cables, selecting and installing wiring and switching arrangements, installing GFCI receptacles, and testing and troubleshooting.

Objective 1 Use the NEC to identify specifications to complete an identified task

Objective 2 Identify different types of conductors or cables for use in various applications

1. Nonmetallic sheath cable
2. Metal clad cable
3. Armour clad cable
4. Single stranded and solid conductors that meet NEC requirements

Objective 3 Select appropriate wiring for specific installations (residential and commercial)

Objective 4 Install various switching arrangements

1. Install a single pole switch circuit controlling a light to meet NEC requirements
2. Install a multi-switch location to meet NEC requirements

Objective 5 Identify and properly install cabling, raceways, conduit, boxes, wiring, devices, and fittings

Objective 6 Install a GFCI receptacle circuit meeting NEC requirements

Objective 7 Test and troubleshoot completed installation

1. Pretest before power using a continuity meter
2. Use a multimeter to test for correct voltage

Standard 1 Performance Evaluation included below (Optional)

Standard 5 Conduit Bending*

Students will understand how to work with conduit, including identifying types, cutting and reaming, and bending techniques.

Objective 1 Identify different types of conduit and their applications

Objective 2 Properly cut and ream the conduit before installation

Objective 3 Explain how to properly bend conduit

1. Bend a stub 90 and a box offset

Standard 1 Performance Evaluation included below (Optional)

Standard 6 Basic Blueprint Reading*

Students will understand and identify basic blueprint reading, including Symbols and specifications; Wiring and schematics; Circuit planning and layout; Electrical drawing interpretation.

Objective 1 Identify and interpret basic electrical symbols and specifications

Objective 2 Identify and interpret wiring and schematic diagrams

Objective 3 Demonstrate planning and layout of a circuit

Objective 4 Interpret a set of electrical drawings

Standard 1 Performance Evaluation included below (Optional)

*All standards are taught in accordance to NEC requirements

Performance standards rating scale

0	Limited skills	2	→	4	Moderate skills	6	→	8	High skills	10

Standard 1 – Safety **Score:**

- Don harness, helmet, PPE
- Setup and climb step ladder
- Use lock out tag out system

Standard 2 – Tools **Score:**

- Demonstrate how to use electrical hand tools
- Demonstrate how to use power tools

Standard 3 – Residential wiring/ installation **Score:**

- GFCI
- 3-way
- 4-way
- Single pole
- GFCI protecting outlet
- Split outlet
- Smoke alarms in series

Standard 4 – Theory **Score:**

- Test series circuit
  - voltage
  - resistance
  - current
- Test parallel circuit
  - voltage
  - resistance
  - current
- OHM's law
- Kirkoffs' law

Standard 5 – Conduit **Score:**

- 8" stub 90 with box offset
- 30 degree offset
- 45 degree offset

Standard 6 – Blueprint **Score:**

- Mount boxes off blueprint to meet NEC code
- Read electrical blueprints

Performance standard average score:

Evaluator Name: _____

Evaluator Title: _____

Evaluator Signature: _____

Date: _____