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# **Electrical Construction Technology**

Code: 4230 / Version: 01  
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## General Assessment Information

### Blueprint Contents

General Assessment Information	Sample Written Items
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**Test Type:** The Electrical Construction Technology industry-based credential is included in NOCTI's Job Ready assessment battery. Job Ready assessments measure technical skills at the occupational level and include items which gauge factual and theoretical knowledge. Job Ready assessments typically offer both a written and performance component and can be used at the secondary and post-secondary levels. Job Ready assessments can be delivered in an online or paper/pencil format.

**Revision Team:** The assessment content is based on input from secondary, post-secondary, and business/industry representatives from the states of Georgia, Michigan, New York, Pennsylvania, Virginia, and West Virginia.



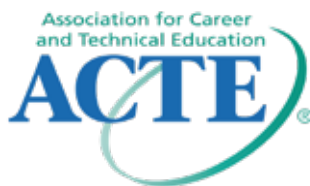
46.0399- Electrical and Power Transmission Installers, Other



Career Cluster 2- Architecture and Construction



47-2111.00- Electricians



The Association for Career and Technical Education (ACTE), the leading professional organization for career and technical educators, commends all students who participate in career and technical education programs and choose to validate their educational attainment through rigorous technical assessments. In taking this assessment you demonstrate to your school, your parents and guardians, your future employers and yourself that you understand the concepts and knowledge needed to succeed in the workplace. Good Luck!



The Pennsylvania Builder's Association utilizes this assessment to assist in determining competencies for granting skill certificates to students graduating from Pennsylvania secondary trade programs that have been endorsed by the Pennsylvania Builder's Association (PBA)

PBA's services include support to workforce training and education by linking industry employers with educators to grow the workforce of tomorrow. PBA serves Pennsylvania communities and consumers through its steadfast efforts to protect homeownership rights and advocate for affordable housing options. PBA is affiliated with the National Association of Home Builders.



Home Builders Institute (HBI), an affiliate of the National Association of Home Builders (NAHB), is a national leader for career training in the building industry. HBI's educational materials are designed to be relevant in today's rapidly changing environment, bringing increased professionalism, competency and effectiveness to those entering the residential construction workforce.

HBI/NAHB assessments are based on national skill standards set by NAHB industry professionals and educators as are the materials contained in the Residential Construction Academy Series. Participants passing the assessments are eligible for certification through HBI/NAHB at the entry, semi-skilled or skilled levels.



NATIONAL COLLEGE CREDIT RECOMMENDATION SERVICE  
University of the State of New York - Regents Research Fund

In the lower division baccalaureate/associate degree category, 3 semester hours in Construction, General Technology, Introduction to Electrical Construction Technology or Applied Science

## Written Assessment

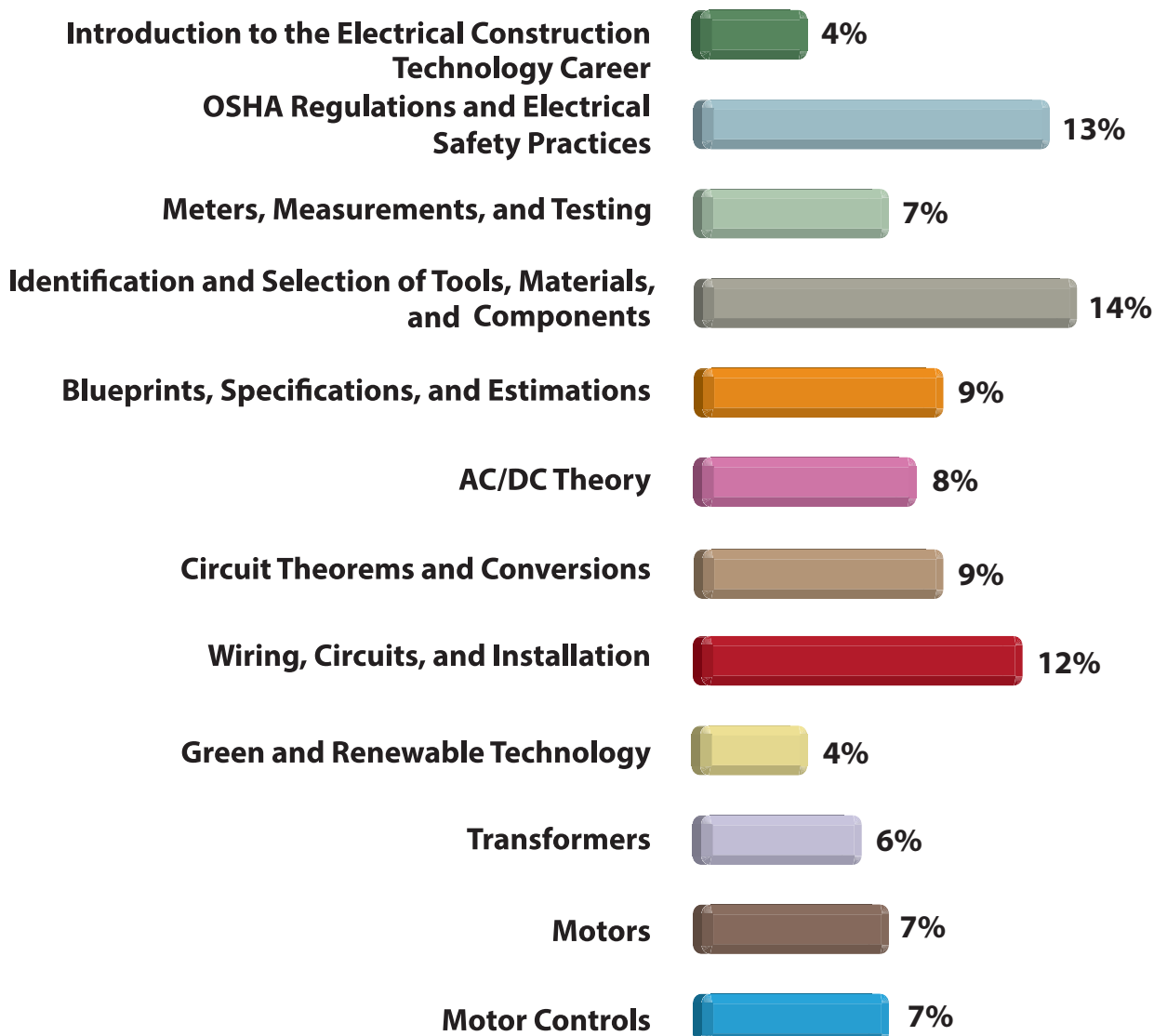
NOCTI written assessments consist of questions to measure an individual's factual theoretical knowledge.

**Administration Time:** 3 hours

**Number of Questions:** 174

**Number of Sessions:** This assessment may be administered in one, two, or three sessions.

### Areas Covered



## Specific Standards and Competencies Included in this Assessment

### Introduction to the Electrical Construction Technology Career

- Identify various electrical construction technology positions and responsibilities
- Identify career-related professional organizations and their purpose

### OSHA Regulations and Electrical Safety Practices

- Identify proper use of personal protective equipment (PPE) according to NFPA 70E standards
- Explain the purpose of OSHA
- Identify procedures for fire, ladder, and environmental safety according to OSHA standards
- Identify procedures for lock-out/tag-out
- Explain basic first-aid procedures

### Meters, Measurements, and Testing

- Identify characteristics, uses, and connections of meters and measuring devices
- Identify meter safety procedures
- Interpret meter readings

### Identification and Selection of Tools, Materials, and Components

- Identify and correctly use hand and power tools
- Identify and select proper conductor cable type
- Identify and select proper conduit, boxes, and fittings
- Identify the function and purpose of various specialty equipment, including Ground Fault Circuit Interrupter (GFCI), Arc-Fault Circuit Interrupter (AFCI)
- Identify commonly used listed and labeled equipment (UL or CSA)



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## Specific Standards and Competencies (continued)

### Blueprints, Specifications, and Estimations

- Identify and interpret electrical symbols and specifications in blueprints and plan symbols
- Identify and interpret wiring and schematic diagrams
- Demonstrate planning and layout of a circuit

### AC/DC Theory

- Identify characteristics of AC circuits
- Explain amperage, power, voltage, and resistance
- Identify materials as insulators, conductors, and semi-conductors
- Identify characteristics and components of DC circuits

### Circuit Theorems and Conversions

- Identify and apply various circuit theorems, including Ohm's Law, Kirchhoff's Law, Watt's Law, and electron theory
- Identify and apply various mathematical conversions, including scientific, engineering, and notations/conversions (milliamps to amps; kilowatts to horsepower)

### Wiring, Circuits, and Installation

- Explain the NEC and how it is organized
- Select appropriate wiring for specific installations (residential and commercial)
- Install various switching arrangements
- Install cabling, raceways, conduit, boxes, wiring, devices, and trims
- Test and troubleshoot completed installation



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## Specific Standards and Competencies (continued)

### Green and Renewable Technology

- Discuss wind turbine, solar energy, and other renewable sources of energy
- Describe energy management devices (e.g., LED lighting, CFLs, occupancy sensors)

### Transformers

- Identify and calculate voltage/current for primary and secondary windings
- Determine KVA capacity of a single-phase and 3-phase transformer
- Differentiate between Delta and Wye connections

### Motors

- Describe operating characteristics of basic single-phase and 3-phase induction motors
- Identify and connect motor connections per nameplate (3-phase and single-phase)
- Identify and interpret motor nameplate information (e.g. voltage and phases)

### Motor Controls

- Explain basic operation of circuitry
- Test, troubleshoot, and reverse 3-phase motor rotation
- Identify commonly used symbols in motor controls



## Sample Questions

### **An apprentice electrician should**

- A. be supervised while on the job site
- B. be pre-qualified to operate hand tools
- C. hold a journeyman license
- D. pass local standards electrical test

### **A ladder may be used in front of a door only if**

- A. no one is at home
- B. no glass is present
- C. the door is locked or blocked
- D. it is the last fixture to hang

### **Measure electromotive force with a/an**

- A. ammeter
- B. anemometer
- C. galvanometer
- D. voltmeter

### **AWG units are used to express conductor sizes and represent the**

- A. Associated Wire Gauge
- B. American Wire Gauge
- C. Absolute Wire Gauge
- D. Approximate Wire Gauge

### **The symbol normally used for a single receptacle is a**

- A. circle with two parallel lines drawn through it
- B. circle with one line drawn through it
- C. square box with an X drawn inside
- D. square box with the letter R next to it

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### Sample Questions (continued)

**The AC voltage waveform is called a \_\_\_\_\_ wave.**

- A. cosine
- B. full
- C. half
- D. sine

**The basic law for current in a series circuit states that current is the**

- A. sum of the branch circuits
- B. same in all parts of the circuit
- C. vector sum of all the parts of the circuit
- D. reciprocal of the individual parts

**What terminal on a three-way switch is identified with a color different from the others?**

- A. common
- B. neutral
- C. traveler A
- D. traveler B

**Power transformers are rated in**

- A. amps or kiloamps
- B. volts or kilovolts
- C. VA or KVA
- D. KVAR

**Multiple stop switches in a three-wire motor control circuit are wired**

- A. normally open
- B. in series
- C. in parallel
- D. normally bypassed



## Performance Assessment

NOCTI performance assessments allow individuals to demonstrate their acquired skills by completing actual jobs using the tools, materials, machines, and equipment related to the technical area.

**Administration Time:** 3 hours and 20 minutes

**Number of Jobs:** 3

### Areas Covered:

#### **34% Bend Conduit**

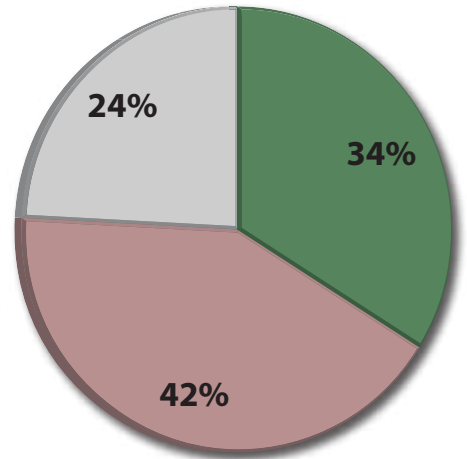
Participants will safely install boxes onto the wall, and use proper bending and cutting techniques to install conduit.

#### **42% Switching and GFCI Receptacle in a Residential Setting**

Participants will properly mount boxes, install wiring and devices, and complete the job in a neat operational manner following safety standards.

#### **24% Install Two Smoke Alarms in a Commercial Setting**

Participants will install interconnected components to operate properly following safety standards.



## Sample Job

### Install Two Smoke Alarms in a Commercial Setting

**Maximum Time:** 1 hour

**Participant Activity:** The participant will install two smoke alarms in a commercial setting referring to the drawings provided, using MC 14-2 and 14-3 AWG, install two interconnected smoke alarms, use a separate circuit, and home run first smoke alarm; interconnect between the two smoke alarms.

