Module One (26401-17) examines basic load calculations for residential and commercial applications, including raceway fill, conductor derating, and voltage drop.

Objectives

Learning Objective 1
- Perform basic load calculations in accordance with National Electrical Code® (NEC®) requirements.
  a. Make adjustments in conductor size for various installations.
  b. Calculate feeder ampacity.
  c. Apply tap rules.
  d. Apply demand factors.

Learning Objective 2
- Make service calculations for residential installations.
  a. Calculate the minimum service size for simple electrical installations.
  b. Make service calculations for single-family dwellings.
  c. Make service calculations for multi-family dwellings.

Learning Objective 3
- Make service calculations for commercial installations.
  a. Size commercial and industrial lighting loads.
  b. Calculate loads for retail stores.
  c. Calculate loads for office buildings.
  d. Calculate loads for restaurants.
  e. Calculate loads for hotels and motels.
  f. Perform optional calculations for schools.
  g. Size shore power circuits for marinas and boatyards.
  h. Make farm load calculations.
  i. Size motor circuits.

Performance Tasks
This is a knowledge-based module. There are Performance Tasks.

Note
NFPA 70®, National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association, Quincy, MA.

Teaching Time: 20 hours
(Eight 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the Module Examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the written examination; performance testing is graded pass or fail.
Safety Considerations
This module covers material that relates to trainees working with and around electrical circuits and equipment used in residential and commercial applications. Safety must be emphasized at all times. Any trainees in an electrical environment should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to electrical circuits and equipment. Any deficiencies must be corrected to ensure the future safety of all trainees. Any practice sessions and Performance Tasks must be completed under your direct supervision.

Classroom Equipment and Materials
Whiteboard and markers
Pencils and paper
Electrical Level Four PowerPoint® Presentation
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
Module Review answer key
Module Examinations

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on load calculations for feeders and services. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26401-17

LOAD CALCULATIONS – FEEDERS AND SERVICES

The Lesson Plan for this module is divided into eight 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One covers Sections 1.0.0 through 1.1.3 and describes how to perform basic load calculations in accordance with National Electrical Code® (NEC®) requirements and make adjustments in conductor size.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the calculations needed to determine load center length.
3. Explain how to make adjustments in conductor size for various installations.

**SESSION TWO**

Session Two covers Sections 1.2.0 through 1.4.3 and describes how to calculate feeder ampacity and apply tap rules and demand factors.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the calculations needed to determine feeder ampacity.
3. Explain how to calculate feeder ampacity.
4. Explain how to apply tap rules.
5. Explain how to apply demand factors.

**SESSION THREE**

Session Three covers Sections 2.0.0 through 2.1.2 and describes how to make service calculations for simple electrical installations.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with using different multiplication factors when determining the general lighting load for different areas of a commercial facility.
3. Describe the steps for determining the service load for a building.
4. Explain how to calculate the load for a small rural pump house.
5. Explain how to calculate the load for a roadside vegetable stand.

**SESSION FOUR**

Session Four covers Sections 2.2.0 through 2.3.2 and describes how to make service calculations for residential installations.

1. Show the Session Four PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with factors that must be taken into consideration when calculating the area of occupancy (net living space) for the single-family dwelling.
3. Explain how to make service calculations for single-family dwellings.
4. Explain how to make service calculations for multi-family dwellings.
Session Outline for Module 26401-17

LOAD CALCULATIONS – FEEDERS AND SERVICES

SESSION FIVE

Session Five covers Sections 3.0.0 through 3.3.2 and describes how to size commercial and industrial lighting loads and calculate loads for retail stores and office buildings.

1. Show the Session Five PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the basic load types identified by the NEC® that pertain to calculating loads for commercial occupancies.
3. Explain how to size commercial and industrial lighting loads.
4. Explain how to calculate loads for retail stores.
5. Explain how to calculate loads for office buildings.

SESSION SIX

Session Six covers Sections 3.4.0 through 3.6.0 and describes how to make service calculations for restaurants, hotels and motels, and schools.

1. Show the Session Six PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with NEC® minimum load values that must be used during service calculations for commercial facilities.
3. Explain how to calculate loads for restaurants.
4. Explain how to calculate loads for hotels and motels.
5. Explain how to perform optional calculations for schools.

SESSION SEVEN

Session Seven covers Sections 3.7.0 through 3.9.0 and describes how to make service calculations for marinas and boatyards, farms, and motor circuits.

1. Show the Session Seven PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with applications where two or more motors are connected to the same feeder circuit to lower costs and maintain efficiency.
3. Explain how to size shore power circuits for marinas and boatyards.
4. Explain how to make farm load calculations.
5. Explain how to size motor circuits.

SESSION EIGHT

Session Eight is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class prior to the exam and answer any questions that the trainees may have.

1. Have trainees complete the written examination.
2. Record the testing results as required for paper-based exams. The results for exams administered through online testing systems are recorded automatically in the Registry System.
Module Two (26402-17) examines the installation of electrical systems in health care facilities, including the requirements for life safety and critical circuits.

### Objectives

**Learning Objective 1**
- List the types of health care facilities and their power requirements.
  - Identify types of essential electrical systems used in health care facilities.
  - Identify types of distribution systems used in health care facilities.

**Learning Objective 2**
- Describe the categories and branch portions of the distribution circuits.
  - Describe the operation and applications of hospital-grade receptacles.
  - Identify the receptacle requirements for general care (Category 2) spaces.
  - Identify the receptacle requirements for critical care (Category 1) spaces.
  - Identify the grounding requirements for receptacles and fixed electrical equipment.

**Learning Objective 3**
- List the required wiring methods in health care facilities.
  - Identify the wiring requirements for inhalation anesthetizing locations.
  - Identify the wiring requirements for low-voltage equipment and instruments.
  - Identify the wiring requirements for X-ray installations.
  - Identify the requirements for communication, signaling, data, and fire alarm systems installed in patient care areas.
  - Identify the requirements for isolated power systems.

### Performance Tasks

This is a knowledge-based module. There are Performance Tasks.

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**Note**

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**Teaching Time: 10 hours**

(Four 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

**Before You Begin**

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the Module Examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER’s Registry is 70% or above for the module examination.
Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on electrical systems in health care facilities. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.

Classroom Equipment and Materials
Whiteboard and markers
Pencils and paper
Electrical Level Four PowerPoint® Presentation Slides
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
Module Review answer key
Module Examinations

Safety Considerations
This module covers material that involves electrical circuits and equipment used in health care facilities. Safety must be emphasized at all times. When working in an electrical environment, instructors must ensure that trainees wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to electrical circuits and equipment. Any deficiencies must be corrected to ensure the future safety of all trainees.
Session Outline for Module 26402-17
HEALTH CARE FACILITIES

The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One covers Sections 1.0.0 through 1.2.4 and identifies different types of health care facilities and their electrical power requirements.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the electrical requirements for different areas of hospitals and health care facilities.
3. Identify and discuss essential electrical systems used in health care facilities.
4. Identify and discuss different types of distribution systems used in health care facilities.

**SESSION TWO**

Session Two covers Sections 2.0.0 through 2.4.0 and describes the categories and branch portions of the distribution circuits used in health care facilities.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with how electrical power is distributed throughout a health care facility.
3. Describe the operation and applications of hospital-grade receptacles.
4. Identify the receptacle requirements for general care (Category 2) spaces.
5. Identify the receptacle requirements for critical care (Category 1) spaces.
6. Identify the grounding requirements for receptacles and fixed electrical equipment.

**SESSION THREE**

Session Three covers Sections 3.0.0 through 3.5.2 and describes the required wiring methods for health care facilities.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the wiring requirements and equipment used in different areas of a health care facility.
3. Identify and describe the wiring requirements for inhalation anesthetizing locations.
4. Discuss the wiring requirements for low-voltage equipment and instruments.
5. Describe the wiring requirements for X-ray installations.
6. Identify and describe the requirements for communication, signaling, data, and fire alarm systems installed in patient care areas.
7. Identify and describe the requirements for isolated power systems.

**SESSION FOUR**

Session Four is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

1. Administer the Module Examination.
2. Submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26403-17

STANDBY AND EMERGENCY SYSTEMS

Module Three (26403-17) explains the NEC® installation requirements for electric generators and storage batteries.

Objectives

Learning Objective 1
- Differentiate between emergency and standby systems and identify their primary components.
  a. Identify emergency and standby power system components.
  b. Explain the principles of transfer switch operation and their configuration/sizing considerations.

Learning Objective 2
- Describe battery and UPS system types and explain their maintenance requirements.
  a. Describe the different types of batteries used.
  b. Explain the maintenance requirements of batteries and their charging considerations.
  c. Identify single- and double-conversion UPS systems.

Learning Objective 3
- Describe the NEC® requirements for emergency/standby power and lighting systems.
  a. Describe legally required standby systems.
  b. Describe the alternate power requirements for health care facilities.
  c. Describe the alternate power requirements for places of assembly.
  d. Describe emergency lighting requirements and devices for public buildings.

Performance Task
This is a knowledge-based module. There are no Performance Tasks.

Note
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Teaching Time: 10 hours
(Four 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination.
**Safety Considerations**

This module provides an overview of different types of standby and emergency systems and their operating characteristics. Instructors must ensure that trainees wear the proper PPE, follow safe practices, and give due respect to any hazards that may be present while working with or in the vicinity of generators and storage batteries. Any deficiencies must be corrected to ensure the future safety of all trainees. Point out that the safety procedures on each job site may be more stringent than OSHA or NEC® requirements.

**Classroom Equipment and Materials**

- Whiteboard and markers
- Pencils and paper
- *Electrical Level Four PowerPoint® Presentation*
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Engine-driven AC generator
- Transfer switches
- Storage batteries
- Battery charger
- Tools to perform resistance and capacity checks on batteries
- Chemical-resistant goggles and face shield
- Acid-resistant or alkali-resistant gloves
- Chemical-resistant protective aprons and overshoes
- Portable or stationary water facilities
- for rinsing eyes and skin in case of contact with electrolyte
- Acid- or alkali-neutralizing solution
- Insulated tools
- Class C fire extinguisher or other type as recommended by the battery manufacturer
- Respirator, if required
- Module Review answer key
- Module Examinations

**Additional Resources**

This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on standby and emergency systems. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**
Session One covers Sections 1.0.0 through 1.2.3 and describes how to identify standby and emergency systems.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with standby and emergency systems.
3. Describe how to identify standby and emergency system components.
4. Describe the operation of transfer switches and explain how they are sized.

**SESSION TWO**
Session Two covers Sections 2.0.0 through 2.3.2. It describes how to identify and maintain storage batteries and uninterruptible power supply (UPS) systems.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with uninterruptible power supplies.
3. Describe the different types of storage batteries.
4. Identify the maintenance requirements for storage batteries.
5. Identify single- and double-conversion UPS systems.

**SESSION THREE**
Session Three covers Sections 3.0.0 through 3.4.2 and describes the NEC® requirements for emergency systems.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the NEC® requirements for various systems.
3. Identify the NEC® requirements for legally required standby systems.
4. Describe the alternate power requirements for health care facilities.
5. Describe the alternate power requirements for places of assembly.
6. Describe emergency lighting requirements and devices for public buildings.

**SESSION FOUR**
Session Four is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class prior to the exam and answer any questions that the trainees may have.

1. Administer the Module Examination.
2. Submit the results to your Training Program Sponsor through the Registry System.
Module Four (26404-17) explains the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

### Objectives

#### Learning Objective 1
- Describe electronic fundamentals.
  - a. Explain basic electronic theory.
  - b. Explain semiconductor fundamentals.

#### Learning Objective 2
- Identify and describe semiconductor devices.
  - a. Describe the operation and uses of diodes.
  - b. Describe the operation and uses of transistors.
  - c. Describe the operation and uses of semiconductor switching devices.

### Performance Tasks

#### Performance Task 1 (Learning Objective 2)
- Test a transistor to determine whether it is an NPN or PNP.

#### Performance Task 2 (Learning Objective 2)
- Identify the cathode on three different styles of SCRs, using the shape or markings for identification.

### Note

NFPA 70®, National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association, Quincy, MA.

### Teaching Time: 10 hours

(Four 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

### Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
**Safety Considerations**

Remind the trainees to wear safety glasses and gloves when handling components and to follow all applicable safety precautions when using meters.

**Classroom Equipment and Materials**

<table>
<thead>
<tr>
<th>Items</th>
<th>Examples of conductors and insulators</th>
<th>Multimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whiteboard and markers</td>
<td>Standard eye protection and work gloves for handling components</td>
<td>Module Review answer key</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Various diodes, including light-emitting diodes (LEDs)</td>
<td>Module Examinations</td>
</tr>
<tr>
<td><em>Electrical Level Four PowerPoint® Presentation</em></td>
<td>Transistors</td>
<td>Copies of the Performance Profile sheets</td>
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<tr>
<td>DVD player</td>
<td>Silicon-controlled rectifiers (SCRs)</td>
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<tr>
<td>LCD projector and screen</td>
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<tr>
<td>Computer</td>
<td></td>
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<tr>
<td>Internet access during class (optional)</td>
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</tbody>
</table>

**Additional Resources**

This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on electronic theory. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26404-17

BASIC ELECTRONIC THEORY

The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

SESSION ONE
Session One covers Sections 1.0.0 through 1.2.3 and discusses electronic fundamentals.
1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with basic electronic theory.
3. Describe the principles of basic electronics.
4. Describe the operation of semiconductors.

SESSION TWO
Session Two covers Sections 2.0.0 through 2.3.3. It describes how to identify semiconductor devices.
1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with diode identification.
3. Describe the operation and use of diodes.
4. Describe the operation and use of transistors.
5. Describe the operation and use of semiconductor switching devices.

SESSION THREE
This session is set aside for lab work needed to satisfy Performance Tasks 1 and 2. Note that there is no PowerPoint® presentation associated with this session.
1. Demonstrate how to test a transistor to determine whether it is an NPN or PNP.
2. Demonstrate how to identify the cathode on three different styles of SCRs, using the shape or markings for identification.
3. Have each trainee demonstrate how to identify NPN and PNP transistors and identify the cathode end of one or more SCRs. These activities correspond to Performance Task 2.
4. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.

Upon completion of the lab work, ask the trainees to complete the Module Review questions and Supplemental Exercises before the upcoming review and testing session.

SESSION FOUR
Session Four is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

Administer the Module Examination and any outstanding performance testing, and submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26405-17

FIRE ALARM SYSTEMS

Module Five (26405-17) covers the technologies, codes, and wiring approaches used to assemble a fire alarm system. Installation and troubleshooting techniques are also explained.

Objectives

Learning Objective 1
- Describe the various codes and standards that relate to fire alarm systems.
  a. Explain how codes and standards are implemented and list organizations responsible for their creation and maintenance.
  b. List the various NFPA codes and standards that apply to fire alarm systems.

Learning Objective 2
- Describe the basic types of fire alarm systems and their primary components.
  a. Describe the basic types of fire alarm communication systems.
  b. Describe the primary components of fire alarm systems.

Learning Objective 3
- Describe fire alarm control panels and their primary features.
  a. Describe fire alarm control panels and their power source requirements.
  b. Explain how users interface with the control panel.
  c. Define and describe initiating circuits and panel outputs.

Learning Objective 4
- Identify and describe approaches to fire alarm notification and communication/monitoring.
  a. Describe visual and audible notification devices and systems.
  b. Describe important considerations in the use of fire alarm notification signals.
  c. Describe communication and monitoring options for fire alarm systems.

Learning Objective 5
- Describe fire alarm system installation guidelines and requirements.
  a. Describe the general wiring requirements.
  b. Describe the general installation requirements for wiring and various components.
  c. Describe the installation guidelines for totally protected premises.
  d. Describe the installation guidelines for fire alarm-related systems and devices.
  e. Describe how to troubleshoot fire alarm systems.

Performance Task

Performance Task 1 (Learning Objectives 1–5)
- Connect selected fire alarm system(s).

Note

NFPA 70®, National Electrical Code® and NEC® are registered trademarks of the National Fire Protection Association, Quincy, MA.

Teaching Time: 15 hours
(Six 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
Safety Considerations
This module covers material that involves working with and around fire alarm systems and equipment used in various facilities. Safety must be emphasized at all times. When working in an electrical environment, instructors must ensure that trainees wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to electrical circuits and equipment. Any deficiencies must be corrected to ensure the future safety of all trainees. Practice sessions and Performance Tasks must be completed under your direct supervision.

Classroom Equipment and Materials
- Whiteboard and markers
- Pencils and paper
- Electrical Level Four PowerPoint® Presentation Slides
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Samples of the following devices:
  - Various automatic and fixed-temperature heat detectors
  - Rate-of-rise with fusible link heat detectors
  - Rate-of-rise with bimetallic heat detectors
  - Ionization detectors
  - Photoelectric detectors
  - Duct detectors
  - Cloud chamber smoke detectors
  - Restorable semiconductor line-type heat detectors
  - Non-restorable fusible line-type heat detectors
  - Selected detectors for completion of the Performance Task
  - Access to a circuit setup to connect a selected fire alarm system
  - Access to Certified Alarm Technician Level 1
  - Access to Practical Fire Alarm Course
  - Access to Understanding Alarm Systems
  - Module Review answer key
  - Module Examinations
  - Copies of Performance Profile Sheets

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on fire alarm systems. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26405-17

FIRE ALARM SYSTEMS

The Lesson Plan for this module is divided into six 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One covers Sections 1.0.0 through 2.1.3. It covers various codes and standards that relate to fire alarm systems, and describes basic types of fire alarm systems.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with different types of fire alarm equipment and systems, as well as the codes and standards that apply to those systems.
3. Explain how codes and standards are implemented and list organizations responsible for their creation and maintenance.
4. List the various NFPA codes and standards that apply to fire alarm systems.
5. Describe the basic types of fire alarm systems.

**SESSION TWO**

Session Two covers Sections 2.2.0 through 2.2.8 and examines the primary components of fire alarm systems.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with different types of flame, heat, and smoke sensing devices that can be integrated into a fire alarm system to provide detection, warning, and alerting in the event of a fire.
3. Describe the primary components of fire alarm systems.

**SESSION THREE**

Session Three covers Sections 3.0.0 through 4.3.3 and describes fire alarm control panels and their primary features. It also identifies and describes approaches to fire alarm notification and communication/monitoring.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the capabilities of fire alarm control panels.
3. Describe fire alarm control panels and their power source requirements.
4. Explain how users interface with the control panel.
5. Define and describe initiating circuits and panel outputs.
6. Describe visual and audible notification devices and systems.
7. Describe important considerations in the use of fire alarm notification signals.
8. Describe communication and monitoring options for fire alarm systems.

**SESSION FOUR**

Session Four covers Sections 5.0.0 through 5.3.9 and describes fire alarm system installation guidelines and requirements.

1. Show the Session Four PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the placement of fire detection devices and the wiring of a fire alarm control panel.
3. Describe the general wiring requirements.
4. Describe the general installation requirements for wiring and various components.
5. Describe the installation guidelines for totally protected premises.
Session Outline for Module 26405-17
FIRE ALARM SYSTEMS

SESSION FIVE
Session Five covers Sections 5.4.0 through 5.5.2 and describes fire alarm-rated systems and troubleshooting. The end of the session is devoted to a laboratory and the completion of Performance Task 1.
1. Show the Session Five PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with troubleshooting problems in a fire alarm system.
3. Describe the installation guidelines for fire alarm-related systems and devices.
4. Describe how to troubleshoot fire alarm systems.
5. Have trainees practice and/or complete the tasks associated with Performance Task 1 to conclude the session.

SESSION SIX
Session Six is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class prior to the exam and answer any questions that the trainees may have.
Administer the Module Examination and any outstanding performance testing, and submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26406-17

SPECIALTY TRANSFORMERS

**Module Six (26406-17)** covers various types of transformers and their applications. It also provides information on selecting, sizing, and installing this equipment.

## Objectives

### Learning Objective 1
- Identify and describe various types of transformers.
  - a. Identify common transformer types.
  - b. Explain how three-phase transformers can be wired internally.
  - c. Identify types of specialty transformers.

### Learning Objective 2
- Identify instrument transformers.
  - a. Identify and describe the use of current transformers.
  - b. Identify and describe the use of potential transformers.

### Learning Objective 3
- Define harmonics and explain how harmonic issues are identified and resolved.
  - a. Describe the common sources of harmonics in office buildings and industrial plants.
  - b. Explain how to survey a system to identify the source of harmonics.
  - c. Explain how to resolve harmonics.

## Performance Tasks

### Performance Task 1 (Learning Objective 1)
- Identify various specialty transformers.

### Performance Task 2 (Learning Objective 1)
- Connect a buck-and-boost transformer to a single-phase circuit so that it will first be in the boost mode and then in the buck mode. Record the voltage increase and decrease for each configuration.

### Performance Task 3 (Learning Objective 2)
- Using a clamp-on ammeter, demonstrate the principles of a current transformer; identify the primary winding, and then calculate and measure the effects of increasing the number of turns (loops) in the primary winding.

## Note

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**Teaching Time: 10 hours**

(Four 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

**Before You Begin**

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
Safety Considerations
Remind the trainees to wear safety glasses and gloves when handling components and to follow all applicable safety precautions when using meters.

Classroom Equipment and Materials
- Whiteboard and markers
- Pencils and paper
- Electrical Level Four PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Standard eye protection and work gloves for handling components
- Potential (voltage) and current transformers
- Various specialty transformers, including one or more buck-and-boost transformers
- Clamp-on ammeter
- Multimeter
- Single-phase circuit
- Module Review answer key
- Module Examinations
- Copies of the Performance Profile sheets

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on specialty transformers. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Specialty Transformers

Session Outline for Module 26406-17

SPECIALTY TRANSFORMERS

The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

### Session One

Session One covers Sections 1.0.0 through 1.3.8. It describes how to identify various types of transformers.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with transformer operation.
3. Identify common transformer types.
4. Explain how three-phase transformers can be wired internally.
5. Identify types of specialty transformers.
6. Demonstrate how to connect a buck-and-boost transformer to a single-phase circuit so that it will first be in the boost mode and then in the buck mode. Record the voltage increase and decrease for each configuration.
7. Have the trainees practice identifying transformers and making connections for buck-and-boost transformers. These activities correspond to Performance Tasks 1 and 2.
8. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.

### Session Two

Session Two covers Sections 2.0.0 through 2.2.0. It describes how to identify instrument transformers.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with instrument transformers.
3. Identify and describe the use of current transformers.
4. Identify and describe the use of potential transformers.
5. Using a clamp-on ammeter, demonstrate the principles of a current transformer; identify the primary winding, and then calculate and measure the effects of increasing the number of turns (loops) in the primary winding.
6. Have the trainees practice demonstrating the principles of a current transformer using a clamp-on ammeter. This activity corresponds to Performance Task 3.
7. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.
**SESSION THREE**

Session Three covers Sections 3.0.0 through 3.3.2. It describes how to identify and resolve harmonics.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with harmonics.
3. Describe the common sources of harmonics in office buildings and industrial plants.
4. Explain how to survey a system to identify the source of harmonics.
5. Explain how to resolve harmonics.

**SESSION FOUR**

Session Four is a review and testing session. Note that there is no PowerPoint® presentation associated with this session. Go over the module Review Questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

Administer the Module Examination and any outstanding performance testing, and submit the results to your Training Program Sponsor through the Registry System.
**Module Seven (26407-17)** discusses applications and operating principles of solid-state controls, reduced-voltage starters, and adjustable-frequency drives. It also covers basic troubleshooting procedures.

### Objectives

**Learning Objective 1**
- Describe the various types of relays used in motor control circuits.  
  a. Identify and describe solid-state relays and their uses.  
  b. Identify and describe programmable and nonprogrammable solid-state protective relays and their uses.  
  c. Identify and describe timing relays and their uses.  

**Learning Objective 2**
- Explain how reduced-voltage starting is accomplished.  
  a. Describe the use and selection of conventional reduced-voltage motor starting methods.  
  b. Describe solid-state reduced-voltage motor starting methods.  
  c. Describe the precautions associated with solid-state controls.  
  d. Describe the preventive maintenance procedures associated with solid-state controls.  

**Learning Objective 3**
- Describe the types and uses of adjustable-frequency drives.  
  a. Describe the operation and types of adjustable-frequency drives.  
  b. Identify the selection considerations for adjustable-frequency drives.

**Learning Objective 4**
- Describe motor braking methods.  
  a. Describe dynamic braking methods.  
  b. Describe friction braking.

**Learning Objective 5**
- Describe how to troubleshoot motor controls.  
  a. Explain basic troubleshooting methods.  
  b. Describe the electrical troubleshooting methods used to check control circuits and devices.

### Performance Tasks

**Performance Task 1 (Learning Objectives 1 and 2)**

- Identify and connect various control devices.

### Note

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### Teaching Time: 20 hours

(Eight 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

### Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the module examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on advanced controls. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26407-17

ADVANCED CONTROLS

The Lesson Plan for this module is divided into eight 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One covers Sections 1.0.0 through 1.3.4. It describes various types of relays.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the operation of relays.
3. Identify and describe solid-state relays and their uses.
4. Identify and describe programmable and nonprogrammable solid-state protective relays and their uses.
5. Identify and describe timing relays and their uses.

**SESSION TWO**

Session Two covers Sections 2.0.0 through 2.4.0. It describes reduced-voltage starting methods.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with reduced-voltage starting methods.
3. Describe the use and selection of conventional reduced-voltage motor starting methods.
4. Describe solid-state reduced-voltage motor starting methods.
5. Describe the precautions associated with solid-state controls.
6. Describe the preventive maintenance procedures associated with solid-state controls.

**SESSION THREE**

Session Three covers Sections 3.0.0 through 3.2.5. It describes adjustable-frequency drives.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with adjustable-frequency drives.
3. Describe the operation and types of adjustable-frequency drives.
4. Identify the selection considerations for adjustable-frequency drives.

**SESSION FOUR**

Session Four covers Sections 4.0.0 through 4.2.0. It describes motor braking methods.

1. Show the Session Four PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with motor braking methods.
3. Describe dynamic braking methods.
4. Describe friction braking.
Session Outline for Module 26407-17

**ADVANCED CONTROLS**

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**SESSION FIVE**

Session Five covers Sections 5.0.0 through 5.2.8. It describes how to troubleshoot motor controls.

1. Show the Session Five PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with motor control troubleshooting.
3. Explain basic troubleshooting methods.
4. Describe the electrical troubleshooting methods used to check control circuits and devices.

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**SESSIONS SIX & SEVEN**

Sessions Six and Seven are laboratory sessions. Note that there is no PowerPoint® presentation associated with these sessions.

1. Demonstrate how to connect various control devices.
2. Have the trainees identify and connect various control devices. This activity corresponds to Performance Task 1.
3. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.

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**SESSION EIGHT**

Session Eight is a review and testing session. Note that there is no PowerPoint® presentation associated with this session. Go over the Module Review questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

1. Administer the Module Examination and any outstanding performance testing.
2. Submit the results to your Training Program Sponsor through the Registry System.
Module Eight (26408-17) provides a basic overview of HVAC systems and their controls. Electrical troubleshooting and NEC® requirements are emphasized.

Objectives

Learning Objective 1
• Describe the operating principles and major components of HVAC systems.
  a. Describe the basic principles of heating and ventilation.
  b. Describe the basic principles and components of comfort air conditioning systems.

Learning Objective 2
• Identify the types of thermostats and their uses.
  a. State the operating principles of thermostats.
  b. Install different types of thermostats.

Learning Objective 3
• Identify and describe HVAC control systems and devices.
  a. Identify and describe controls used in comfort cooling systems.
  b. Identify and describe furnace controls.
  c. Identify and describe heat pump defrost controls.
  d. Describe digital controls used in HVAC systems.
  e. Analyze the operating sequences of various HVAC control systems.
  f. Describe troubleshooting methods used for HVAC systems.

Learning Objective 4
• Identify the NEC® requirements that apply to HVAC systems.
  a. Identify the NEC® requirements that apply to HVAC controls.
  b. Identify the NEC® requirements that apply to HVAC equipment.

Performance Tasks

Performance Task 1 (Learning Objective 2)
• Identify various types of thermostats and describe their operation and uses.

Performance Task 2 (Learning Objective 2)
• Install a conventional 24V bimetal thermostat, and hook it up using the standard coding system for thermostat wiring.

Performance Task 3 (Learning Objective 2)
• Check and adjust a thermostat, including the heat anticipator setting and indicator adjustment.

Note
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Teaching Time: 15 hours
(Six 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
Safety Considerations
This module covers material that involves working with and around HVAC systems and equipment used in various facilities. Safety must be emphasized at all times. When working in an electrical environment, instructors must ensure that trainees wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to electrical circuits and equipment. Any deficiencies must be corrected to ensure the future safety of all trainees. Practice sessions and Performance Tasks must be completed under your direct supervision.

Classroom Equipment and Materials
Whiteboard and markers
Pencils and paper
Electrical Level Four PowerPoint® Presentation Slides
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
Specific PPE required by the site

The following types of thermostats:
  - Mechanical
  - Electronic
  - Programmable electronic
  - Heating-only
  - Cooling-only
  - Heating-cooling
  - Automatic-changeover
  - Multistage

Tools needed to install a conventional 24V bimetal thermostat
Tools needed to check and adjust a thermostat
Copies of Refrigeration and Air Conditioning: An Introduction to HVAC/R, Latest Edition
Copies of ABC's of Air Conditioning, Latest Edition
Copies of System Diagnostics and Troubleshooting Procedures, Latest Edition
Module Review answer key
Module Examinations
Performance Profile sheets

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.

ABC's of Air Conditioning. Syracuse, NY: Carrier Corporation.

There are a number of online resources available for trainees who would like more information on HVAC controls. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26408-17

HVAC CONTROLS

The Lesson Plan for this module is divided into six 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

SESSION ONE

Session One covers Sections 1.0.0 through 1.2.3. It describes the operating principles and major components of HVAC systems.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with basic HVAC operating principles and components, as well as requirements and standards that relate to the systems.
3. Discuss the basic principles of heating and ventilation.
4. Identify and describe the basic principles and components of comfort air conditioning systems.

SESSION TWO

Session Two covers Sections 2.0.0 through 2.2.7 and describes the types of thermostats and their uses.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with different types of thermostats and HVAC controls.
3. Explain the operating principles of thermostats.
4. Identify and discuss the different types of thermostats.
5. Explain how to install and test thermostats.

SESSION THREE

Session Three is set aside for lab work needed to satisfy the module performance tasks. You can allocate lab time for these activities based on class size and available facilities. One approach would be to have some trainees complete one performance task while others work on another performance task.

1. Have the trainees demonstrate how to properly identify various types of thermostats and describe their operation and uses.
2. Have the trainees demonstrate how to properly install a conventional 24V bimetal thermostat and hook it up using the standard coding system for thermostat wiring.
3. Have the trainees demonstrate how to properly check and adjust a thermostat, including the heat anticipator setting and indicator adjustment.

Upon completion of the lab work, ask the trainees to read Sections 3.0.0–3.6.0 to prepare for the next session.
Session Outline for Module 26408-17

HVAC CONTROLS

**SESSION FOUR**

Session Four covers Sections 3.0.0 through 3.6.0 and describes HVAC control systems and devices.

1. Show the Session Four PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with modern microprocessor-based HVAC control systems.
3. Identify and describe controls used in comfort cooling systems.
4. Identify and describe furnace controls.
5. Identify and describe heat pump defrost controls.
6. Describe digital controls used in HVAC systems.
7. Analyze the operating sequences of various HVAC control systems.
8. Describe troubleshooting methods used for HVAC systems.

**SESSION FIVE**

Session Five covers Sections 4.0.0 through 4.2.4. It identifies and describes the NEC® requirements that apply to HVAC systems.

1. Show the Session Five PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the NEC® requirements for HVAC equipment.
3. Identify and discuss the NEC® requirements that apply to HVAC controls.
4. Identify and discuss the NEC® requirements that apply to HVAC equipment.

**SESSION SIX**

Session Six is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class before the exam, and answer any questions that the trainees may have.

1. Administer the Module Examination and any outstanding performance testing.
2. Submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26409-17

HEAT TRACING AND FREEZE PROTECTION

Module Nine (26409-17) presents heat-tracing and freeze-protection systems along with various applications and installation requirements.

Objectives

Learning Objective 1

- Describe heat-tracing applications, components, controls, and selection/installation considerations related to piping.
  a. Describe common pipeline heat-tracing applications, cables, and power distribution considerations.
  b. Describe methods of controlling and monitoring heat-tracing systems.
  c. Explain how typical heat-tracing systems operate.
  d. Explain how to select the equipment and components for a typical heat-tracing system.
  e. Explain how heat-tracing system components are installed and the related NEC® requirements.

Learning Objective 2

- Describe roof, gutter, and downspout de-icing systems and the relevant selection/installation considerations.
  a. Describe roof, gutter, and downspout de-icing systems.
  b. Explain how roof, gutter, and downspout de-icing system components are selected and installed.

Learning Objective 3

- Describe snow-melting and anti-icing systems and the relevant selection/installation considerations.
  a. Describe snow-melting and anti-icing system components.
  b. Explain how snow-melting and anti-icing system components are selected and installed.

Learning Objective 4

- Describe other electric heat-tracing and warming systems and the relevant selection/installation considerations.
  a. Describe domestic hot-water temperature maintenance systems and the relevant selection/installation considerations.
  b. Describe electric floor heating systems and the relevant selection/installation considerations.

Performance Task

Performance Task 1 (Learning Objective 1)

- Prepare and connect heat-tracing cable in a power connection box or splice box.

Note

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Teaching Time: 10 hours

(Four 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the module examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination; performance testing is graded pass or fail.
Additional Resources

This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on heat tracing and freeze protection. A search for additional information may be assigned as homework to interested trainees. Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.

Classroom Equipment and Materials

- Whiteboard and markers
- Pencils and paper
- Electrical Level Four PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)

- Standard eye protection and work gloves for handling components
- Self-regulating cables, power-limiting cables, and mineral-insulated cables
- Manufacturer’s application/design guides
- Components used in pipeline heat-tracing systems
- Access to an installed power connection box or splice box

- Components used in roof, gutter, and downspout de-icing systems
- Components used in snow-melting and anti-icing systems
- Electric heating mats and cables
- Module Review answer key
- Module Examinations
- Copies of the Performance Profile sheets

Safety Considerations

Remind the trainees to wear safety glasses and gloves when handling components, and to follow all applicable safety precautions when using meters.
Session Outline for Module 26409-17  
HEAT TRACING AND FREEZE PROTECTION

The Lesson Plan for this module is divided into four 2.5-hour sessions.  
This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSION ONE**

Session One covers Sections 1.0.0 through 1.5.3. It describes various heat-tracing applications.
1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with heat tracing.
3. Describe common heat-tracing applications, cables, and power distribution considerations.
5. Explain how typical heat-tracing systems operate.
6. Explain how to select the equipment and components for a typical heat-tracing system.
7. Explain how heat-tracing system components are installed and the related NEC® requirements.
8. Have the trainees prepare and connect heat-tracing cable in a power connection box or splice box.  
   This activity corresponds to Performance Task 1.
9. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.

**SESSION TWO**

Session Two covers Sections 2.0.0 through 3.2.2. It describes de-icing and snow-melting systems.
1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with de-icing systems.
3. Describe roof, gutter, and downspout de-icing systems.
4. Explain how roof, gutter, and downspout de-icing system components are selected and installed.
5. Describe snow-melting and anti-icing systems.
6. Explain how snow-melting and anti-icing system components are selected and installed.

**SESSION THREE**

Session Three covers Sections 4.0.0 through 4.2.2. It describes other electric heat-tracing and warming systems and the relevant selection/installation considerations.
1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with floor-warming systems.
3. Describe domestic hot-water temperature maintenance systems and the relevant selection/installation considerations.
4. Describe electric floor heating systems and the relevant selection/installation considerations.
Session Four is a review and testing session. Note that there is no PowerPoint® presentation associated with this session. Go over the module Review Questions and Supplemental Exercises in class prior to the exam and answer any questions that the trainees may have.

Administer the Module Examination and any outstanding performance testing, and submit the results to your Training Program Sponsor through the Registry System.
Module Ten (26410-17) covers motor cleaning, testing, and preventive maintenance. Basic troubleshooting procedures are also presented.

### Objectives

**Learning Objective 1**
- Identify the factors that affect motor reliability and lifespan.
  a. Identify the common causes of motor failure.
  b. Identify motor characteristics.

**Learning Objective 2**
- Describe maintenance and troubleshooting requirements for electric motors.
  a. Identify the tools and basic care and maintenance requirements for electric motors.
  b. Explain the requirements for maintaining motor bearings.
  c. Explain how to perform motor insulation testing.
  d. Explain how to troubleshoot an electric motor.

**Learning Objective 3**
- Describe the guidelines for installing and commissioning electric motors.
  a. Explain alignment and adjustment requirements.
  b. Describe startup procedures.

### Performance Tasks
- This is a knowledge-based module. There are no Performance Tasks.

### Teaching Time: 10 hours

(Four 2.5-Hour Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

### Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the module examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER's Registry is 70% or above for the module examination.
Safety Considerations
Remind the trainees to wear safety glasses and gloves when handling components, and to follow all applicable safety precautions when using meters.

Classroom Equipment and Materials
- Whiteboard and markers
- Pencils and paper
- Electrical Level Four PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Standard eye protection and work gloves for handling components
- Manufacturer’s troubleshooting tables for one or more motors
- Access to one or more installed operative and faulty motors for troubleshooting and maintenance
- Vibration tester
- Infrared thermometer
- Grease gun and grease
- Magnetic V-base holder or clamp
- base holder with a dial indicator
- Megohmmeter
- Continuity tester
- Various couplings
- Shims
- Module Review answer key
- Module Examinations

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.

Millwright Level Five, Module 15507-09, Installing Electric Motors. Alachua, FL: NCCER.

There are a number of online resources available for trainees who would like more information on motor operation and maintenance. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
# Session Outline for Module 26410-17

## Motor Operation and Maintenance

The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

### Session One

Session One covers Sections 1.0.0 through 1.2.3. It describes the factors that affect motor reliability and lifespan.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the causes of motor failures.
3. Identify the common causes of motor failure.
4. Identify motor characteristics.

### Session Two

Session Two covers Sections 2.0.0 through 2.4.3. It describes maintenance and troubleshooting requirements for electric motors.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with motor maintenance.
3. Identify the tools and basic care and maintenance requirements for electric motors.
4. Explain the requirements for maintaining motor bearings.
5. Explain how to perform motor insulation testing.
6. Explain how to troubleshoot an electric motor.

### Session Three

Session Three covers Sections 3.0.0 through 3.2.2. It describes the guidelines for installing and commissioning electric motors.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with motor alignment.
3. Explain alignment and adjustment requirements.
4. Describe startup procedures.

### Session Four

Session Four is a review and testing session. Note that there is no PowerPoint® presentation associated with this session.

Go over the Module Review questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

Administer the Module Examination and submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26411-17

MEDIUM-VOLTAGE TERMINATIONS/SPLICES

Module Eleven (26411-17) identifies types of medium-voltage cable and describes how to make various splices and terminations. It also covers hi-pot testing.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Learning Objective 1</th>
<th>Learning Objective 2</th>
</tr>
</thead>
</table>
|            | • Describe how to splice medium-voltage cable.  
|            |   a. Identify medium-voltage power cable configurations and components.  
|            |   b. Describe a typical procedure for making a straight splice.  
|            |   c. Describe a typical procedure for making an inline tape splice.  
|            |   d. Identify various manufactured termination and splice kits.  
|            | • Describe termination classes and important considerations when creating terminations.  
|            |   a. Identify termination classes.  
|            |   b. Identify stress control methods.  
|            | • Define high-potential testing and explain how such testing is conducted.  
|            |   a. Identify types of hi-pot tests.  
|            |   b. Explain how to make various test connections.  
|            |   c. Describe typical procedures for conducting high-potential tests.  

<table>
<thead>
<tr>
<th>Performance Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Task 1 (Learning Objectives 1 and 2)</td>
</tr>
<tr>
<td>• Prepare a cable and complete a splice or stress cone.</td>
</tr>
</tbody>
</table>

Note
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Teaching Time: 10 hours
(Four 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentation and Performance Profile Sheets from www.nccerirc.com. For information and updates about accessing the Module Examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the written examination; performance testing is graded pass or fail.
Safety Considerations
Remind the trainees to wear safety glasses and gloves when handling components, and to follow all applicable safety precautions when using meters.

Classroom Equipment and Materials
- Whiteboard and markers
- Pencils and paper
- Electrical Level Four PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Standard eye protection and work gloves for handling components
- Common types of medium-voltage cable
- Inline tape splicing kits
- Cable stripping tool
- Appropriate solvent for cleaning cable
- Clean rags
- Soldering gun and solder
- Nonconductive abrasive cloth
- Various types of tape applied for primary insulation
- Manufactured termination and splice kits
- Quick inline splicing kit
- Photos of terminations/cables that have been damaged by flashover and/or tracking
- Insulators used with medium-voltage terminations
- Hi-pot tester
- Medium-voltage cable setup to demonstrate various types of hi-pot testing
- Module Review answer key
- Module Examinations
- Copies of Performance Profile Sheets

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.

3M™ Premium MV Outdoor Cold Shrink Termination - Fully Integrated (QTIII) video: solutions.3m.com.
Inline Crimp Connector Splice Installation video: solutions.3m.com.

There are a number of online resources available for trainees who would like more information on medium-voltage terminations and splices. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
**Session Outline for Module 26411-17**

**MEDIUM-VOLTAGE TERMINATIONS/SPLICES**

The Lesson Plan for this module is divided into four 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

### Session One

Session One covers Sections 1.0.0 through 1.4.2. It describes how to splice medium-voltage cable.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with splices.
3. Identify medium-voltage power cable configurations and components.
4. Describe a typical procedure for making a straight splice.
5. Describe a typical procedure for making an inline tape splice.
6. Identify various manufactured termination and splice kits.

### Session Two

Session Two covers Sections 2.0.0 through 2.2.2. It describes termination classes and important considerations when creating terminations.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with shrink-fit splice kits.
3. Identify termination classes.
4. Identify stress control methods.
5. Have the trainees prepare a cable and complete a splice or stress cone. This activity corresponds to Performance Task 1.
6. Document successful Performance Task completions for each trainee on the Performance Profile Sheet and submit the results to the Training Program Sponsor.

### Session Three

Session Three covers Sections 3.0.0 through 3.3.2. It describes high-potential (hi-pot) testing.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with hi-pot testing.
3. Identify types of hi-pot tests.
4. Explain how to make various test connections.
5. Describe typical procedures for conducting high-potential tests.

### Session Four

Session Four is a review and testing session. Note that there is no PowerPoint® presentation associated with this session. Go over the Module Review questions and Supplemental Exercises in class prior to the exam and answer any questions that the trainees may have.

1. Administer the Module Examination and any outstanding performance testing.
2. Submit the results to your Training Program Sponsor through the Registry System.
Lesson Plans for Module 26412-17

SPECIAL LOCATIONS

Module Twelve (26412-17) describes the NEC® requirements for selecting and installing equipment, enclosures, and devices for special locations that require unique attention. These locations include sites such as places of public assembly, theaters, carnivals, agricultural and livestock facilities, marinas, swimming pools, and temporary facilities.

Objectives

Learning Objective 1
- Identify and select equipment, components, and wiring methods for various special locations and applications.
  a. Identify and select equipment, components, and wiring methods for places of assembly.
  b. Identify and select equipment, components, and wiring methods for theaters and similar locations.
  c. Identify and select equipment, components, and wiring methods for carnivals, circuses, and fairs.
  d. Identify and select equipment, components, and wiring methods for agricultural buildings.
  e. Identify and select equipment, components, and wiring methods for temporary installations.
  f. Identify and select equipment, components, and wiring methods for wired office partitions.

Learning Objective 2
- Identify and select equipment, components, and wiring methods for marinas, boatyards, and bodies of water.
  a. Identify and select equipment, components, and wiring methods for marinas and boatyards.
  b. Identify and select equipment, components, and wiring methods for natural and man-made bodies of water.

Learning Objective 3
- Identify and select equipment, components, and wiring methods for pools, spas, tubs, and fountains.
  a. Identify general wiring requirements for pools, spas, tubs, and fountains.
  b. Identify and select equipment, components, and wiring methods for permanently installed pools.
  c. Identify and select equipment, components, and wiring methods for storable pools.
  d. Identify and select equipment, components, and wiring methods for spas, hot tubs, and therapeutic tubs.
  e. Identify and select equipment, components, and wiring methods for fountains.

Performance Task
This is a knowledge-based module. There are no Performance Tasks.

Note
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Teaching Time: 20 hours
(Eight 2.5-Hour Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations from www.nccerirc.com. For information and updates about accessing the module examinations, visit www ncce r.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the module examination.
Safety Considerations
This module may require trainees to visit a variety of special locations. Instructors should ensure that trainees wear the proper PPE, follow safe practices, and give due respect to any hazards that may be present when visiting job sites to observe installations.

Classroom Equipment and Materials
Whiteboard and markers
Pencils and paper
Electrical Level Four PowerPoint® Presentation
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
Module Review answer key
Module Examinations

Additional Resources
This module presents thorough resources for task training. The following resource material is suggested for further study.


There are a number of online resources available for trainees who would like more information on special locations. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.
Session Outline for Module 26412-17

SPECIAL LOCATIONS

The Lesson Plan for this module is divided into eight 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

**SESSIONS ONE THROUGH THREE**

Sessions One through Three cover Sections 1.0.0 through 1.6.0. They describe the requirements for various special locations and applications.

1. Show the Sessions One through Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the installation of wiring in a special location.
3. Describe how to identify and select equipment, components, and wiring methods for places of assembly.
4. Describe how to identify and select equipment, components, and wiring methods for theaters and similar locations.
5. Describe how to identify and select equipment, components, and wiring methods for carnivals, circuses, and fairs.
6. Describe how to identify and select equipment, components, and wiring methods for agricultural buildings.
7. Describe how to identify and select equipment, components, and wiring methods for temporary installations.
8. Describe how to identify and select equipment, components, and wiring methods for wired office partitions.

**SESSIONS SIX AND SEVEN**

Sessions Six and Seven cover Sections 3.0.0 through 3.5.5. They describe the requirements for pools, spas, hot tubs, and fountains.

1. Show the Sessions Six and Seven PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with pools, spas, hot tubs, and fountains.
3. Identify general wiring requirements for pools, spas, tubs, and fountains.
4. Describe how to identify and select equipment, components, and wiring methods for permanently installed pools.
5. Describe how to identify and select equipment, components, and wiring methods for storable pools.
6. Describe how to identify and select equipment, components, and wiring methods for spas, hot tubs, and therapeutic tubs.
7. Describe how to identify and select equipment, components, and wiring methods for fountains.

**SESSION EIGHT**

Session Eight is a review and testing session. Go over the Module Review questions and Supplemental Exercises in class before the exam and answer any questions that the trainees may have.

1. Administer the Module Examination.
2. Submit the results to your Training Program Sponsor through the Registry System.

Sessions Four and Five cover Sections 2.0.0 through 2.2.4. They describe the requirements for marinas and boatyards.

1. Show the Sessions Four and Five PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with dock wiring.
3. Describe how to identify and select equipment, components, and wiring methods for marinas and boatyards.
4. Describe how to identify and select equipment, components, and wiring methods for natural and man-made bodies of water.
Module 46101-17 teaches skills needed to become an effective crew leader, as well as knowledge and abilities required to transition from craftworker to crew leader. The module also covers workforce diversity and organization, basic leadership skills, safety, and project control.

**Objectives**

**Learning Objective 1**
- Describe current issues and organizational structures in industry today.
  - Describe the leadership issues facing the construction industry.
  - Explain how gender and cultural issues affect the construction industry.
  - Explain the organization of construction businesses and the need for policies and procedures.

**Learning Objective 2**
- Explain how to incorporate leadership skills into work habits, including communications, motivation, team-building, problem-solving, and decision-making skills.
  - Describe the role of a leader on a construction crew.
  - Explain the importance of written and oral communication skills.
  - Describe methods for motivating team members.
  - Explain the importance of teamwork to a construction project.
  - Identify effective problem-solving and decision-making methods.

**Learning Objective 3**
- Identify a crew leader’s typical safety responsibilities with respect to common safety issues, including awareness of safety regulations and the cost of accidents.
  - Explain how a strong safety program can enhance a company’s success.
  - Explain the purpose of OSHA and describe the role of OSHA in administering worker safety.
  - Describe the role of employers in establishing and administering safety programs.
  - Explain how crew leaders are involved in administering safety policies and procedures.

**Learning Objective 4**
- Demonstrate a basic understanding of the planning process, scheduling, and cost and resource control.
  - Describe how construction contracts are structured.
  - Describe the project planning and scheduling processes.
  - Explain how to implement cost controls on a construction project.
  - Explain the crew leader’s role in controlling project resources and productivity.

**Performance Tasks**

**Performance Task 1 (Learning Objective 4)**
- Develop and present a look-ahead schedule.

**Performance Task 2 (Learning Objective 4)**
- Develop an estimate for a given work activity.

**Before You Begin**

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids, including the PowerPoint® presentation, and these lesson plans, and to gather the required equipment and materials. Consider the time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint® presentations and Performance Profile Sheets from www.nccerirc.com. For information about accessing the Module Examinations, visit www.nccer.org/testing. The passing score for submission into NCCER's Registry is 70% or above for the module exam; performance testing is graded pass or fail.
Recommended Teaching Time: 22.5 hours

This Lesson Plan (LP) is divided into sections that correspond to the sections in the Trainee Guide module. As you plan your class times, review the objectives, content, and lesson plan outline for the section you plan to teach. Allow sufficient class time for demonstrations, laboratories, field trips, and testing. Each class period should also include time for administrative tasks and periodic breaks.

Be sure to gather the required equipment, materials, visual aids, and answer keys. Using your access code, download the PowerPoint® presentations and Performance Sheets for this module from NCCER’s Instructor Resource Center at www.nccerirc.com.

It is advisable to assign the reading of a module section prior to the classroom instruction. The Section Review and Module Review questions may be assigned as homework. At their discretion, instructors may assign additional homework to meet the teaching objectives.

Performance Testing may be administered at any suitable time in the course of the module training. Tasks are graded pass/fail. Trainee performance and proficiency during practice sessions that meets or exceeds the standards for a task can be accepted as Performance Task completion. Complete the Performance Profile Sheet for each trainee.

The final class is generally reserved for a brief review and the written module examination. For information about accessing the Module Examinations, visit www.nccer.org/testing. The passing score for submission into NCCER’s Registry is 70% or above for the written exam. Record the testing results for each trainee on the Registration of Training Modules form and submit the form to the Training Program Sponsor.

Classroom Equipment and Materials

<table>
<thead>
<tr>
<th>Whiteboard</th>
<th>LCD projector and screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markers</td>
<td>Computer with Internet access during class (optional)</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Blank copies of a look-ahead schedule</td>
</tr>
<tr>
<td>Fundamentals of Crew Leadership</td>
<td>Module Review answer key</td>
</tr>
<tr>
<td>PowerPoint® Presentation</td>
<td>Module examinations</td>
</tr>
<tr>
<td>Blank copies of takeoff and summary worksheets</td>
<td>Performance Profile Sheets</td>
</tr>
</tbody>
</table>
Additional Resources

This module presents thorough resources for task training. The following reference material is recommended for further study.


The following websites offer resources for products and training:

- Aging Workforce News, [www.agingworkforcenews.com](http://www.agingworkforcenews.com)
- American Society for Training and Development (ASTD), [www.astd.org](http://www.astd.org)
- Architecture, Engineering, and Construction Industry (AEC), [www.aecinfo.com](http://www.aecinfo.com)
- Equal Employment Opportunity Commission (EEOC), [www.eeoc.gov](http://www.eeoc.gov)
- National Association of Women in Construction (NAWIC), [www.nawic.org](http://www.nawic.org)
- National Census of Fatal Occupational Injuries (NCFOI), [www.bls.gov](http://www.bls.gov)
- National Institute of Occupational Safety and Health (NIOSH), [www.cdc.gov/niosh](http://www.cdc.gov/niosh)
- National Safety Council, [www.nsc.org](http://www.nsc.org)
- Occupational Safety and Health Administration (OSHA), [www.osha.gov](http://www.osha.gov)
- Society for Human Resources Management (SHRM), [www.shrm.org](http://www.shrm.org)
- United States Census Bureau, [www.census.gov](http://www.census.gov)
- United States Department of Labor, [www.dol.gov](http://www.dol.gov)
- US Green Building Council (USGBC), [www.usgbc.org/leed](http://www.usgbc.org/leed)
- Wi-Fi® is a registered trademark of the Wi-Fi Alliance, [www.wi-fi.org](http://www.wi-fi.org)

There are a number of online resources available for trainees who would like more information on effective leadership skills and professionalism in the construction industry. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan before using them to ensure their suitability. The videos can provide examples of both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are encouraged to locate additional audiovisual aids available on the internet, make personal videos, and take still pictures related to the subject matter and add them to the PowerPoint® presentations throughout the program.