

Equipment and Materials for Laboratories and Performance Testing (Continued)

Assorted mechanical anchors and assorted anchor fastening tools, including:

- Wedge
- Stud
- Sleeve
- One-piece
- Hammer-driven
- Drop-in
- Expansion shields
- Screw (fiber, lead, plastic)
- Self-drilling
- Toggle bolts
- Sleeve-type
- Wallboard
- Metal drive-in
- Metal boxes
- Nonmetallic boxes
- Bushings and locknuts

Access to job site where trainees can observe a variety of wireway components, including:

- Connectors
- End plates
- Closing plates
- Tee fittings
- Crosses
- Elbows
- Nipples
- Slip fittings

Access to job site where trainees can observe a variety of cable tray support systems, including:

- Direct rod
- Trapeze mounting
- Center hung support
- Wall mounting
- Pipe rack mounting

Additional Resources

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

National Electrical Code[®] Handbook, Latest Edition. Quincy, MA: National Fire Protection Association.

There are a number of online resources available for trainees who would like more information on installing raceways and fittings. 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.



RACEWAYS AND FITTINGS

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 1.0.0–1.1.10, and describes various types of conduit and their applications.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with types of conduit.
3. Identify various types of conduit and their applications.

SESSIONS TWO AND THREE

Sessions Two and Three cover Sections 1.2.0–1.6.4, and describe procedures for bonding conduit and selecting metal conduit fittings.

1. Show the Session Two and Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with metal conduit fittings.
3. Demonstrate how to bond conduit for use as a ground path.
4. Demonstrate how to install metal conduit fittings.
5. Demonstrate how to make conduit-to-box connections.
6. Identify various types of raceway supports and describe how they are installed.
7. Identify the installation requirements for various construction methods.
8. Have the trainees identify the appropriate conduit body for a given application. This laboratory corresponds to Performance Task 1.

SESSIONS FOUR THROUGH SIX

Sessions Four through Six cover Section 2.0.0, and describe procedures for selecting fasteners and anchors.

1. Show the Sessions Four through Six PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with the fasteners and anchors used in raceway systems.
3. Demonstrate how to select and install various fasteners, including tie wraps, screws, and hammer-driven pins and studs.
4. Identify the safety requirements for stud-type guns.
5. Demonstrate how to select and install various anchors, including masonry anchors, hollow-wall anchors, and epoxy anchoring systems.
6. Demonstrate how to install and terminate a raceway system.
7. Have the trainees complete the following tasks:
 - Identify and select various types and sizes of raceways, fittings, and fasteners for a given application.
 - Demonstrate how to install a raceway system.
 - Terminate a selected raceway system.

This laboratory corresponds to Performance Tasks 2 through 4.

RACEWAYS AND FITTINGS

SESSION SEVEN

Session Seven covers Section 3.0.0, and describes procedures for selecting and installing wireways and other specialty raceways.

1. Show the Session Seven PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with wireways and raceways.
3. Identify various types of wireways and their components.
4. Explain how to install wireway supports.
5. Identify types of specialty raceways and describe how they are installed.

SESSION EIGHT

Session Eight covers Sections 4.0.0 and 5.0.0, and describes procedures for selecting and installing cable trays. In addition, this session includes a review of the complete module and administering the module exam.

1. Show the Session Eight PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with cable tray systems.
3. Provide an overview of various cable tray types and fittings.
4. Explain how to install cable tray supports.
5. Demonstrate how to connect, bond, and support a cable tray system.
6. Discuss the proper storage and handling of raceways.
7. Have the trainees complete the module review questions. Go over the review questions in class prior to the exam and answer any questions that the trainees may have.
8. 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 26106-17

DEVICE BOXES

Module Six (26106-17) describes the various types of boxes and explains how to calculate the *NEC*[®] fill requirements for outlet and junction boxes under 100 cubic inches (1,650 cubic centimeters). It also covers mounting methods.

Objectives

Learning Objective 1

- Size and install outlet boxes.
 - a. Identify boxes and their applications.
 - b. Size outlet boxes.
 - c. Install outlet boxes.

Learning Objective 2

- Size and install pull and junction boxes.
 - a. Size pull and junction boxes.
 - b. Install pull and junction boxes.

Performance Tasks

Performance Task 1 (Learning Objective 1)

- Identify the appropriate box type and size for a given application.

Performance Task 2 (Learning Objective 2)

- Select the minimum size pull or junction box for the following applications:
 - Conduit entering and exiting for a straight pull.
 - Conduit entering and exiting at an angle.

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.

Prerequisites

Core Curriculum

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 requires trainees to work with various types of boxes. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any safety hazards. Remind trainees that knockouts have sharp edges and gloves/safety goggles must be worn at all times.

Classroom Equipment and Materials

Whiteboard and markers
Pencils and paper
Electrical Level One PowerPoint®
Presentation Slides
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
Copy of the latest edition of the *National Electrical Code*®
Module Review answer key
Module Examinations
Performance Profile Sheets

Equipment and Materials for Laboratories and Performance Testing

Safety glasses/goggles
Hard hats
Work gloves
Electrician's hand tools
Conduit caps

Examples of different types of metallic and nonmetallic outlet boxes, device covers, and extension rings
Examples of pull and junction boxes
Wire nuts
NM cable

Additional Resources

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

National Electrical Code® Handbook, Latest Edition. Quincy, MA: National Fire Protection Association.

There are a number of online resources available for trainees who would like more information on sizing and installing boxes. 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.

DEVICE BOXES

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 1.1.5, and describes outlet boxes and their applications.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with outlet boxes.
3. Explain how to identify various types of boxes and their applications.

SESSION TWO

Session Two covers Sections 1.2.0 through 1.3.2, and covers outlet box sizing and installation.

1. Show the Session Two PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with installing outlet boxes.
3. Explain how to size outlet boxes.
4. Explain how to install outlet boxes.
5. Have the trainees identify the appropriate box type and size for a given application. This laboratory corresponds to Performance Task 1.

SESSION THREE

Session Three covers Sections 2.0.0 through 2.2.0, and describe procedures for pull and junction box sizing and installation.

1. Show the Session Three PowerPoint® presentation.
2. Use the Kickoff Activity to encourage trainees to familiarize themselves with pull box sizing.
3. Describe how to size pull and junction boxes.
4. Describe how to install pull and junction boxes.

SESSION FOUR

Session Four is reserved for a laboratory and performance testing.

1. Demonstrate how to install pull and junction boxes.
2. Have the trainees select the minimum size pull or junction box for the following applications (this laboratory corresponds to Performance Task 2):
 - Conduit entering and exiting for a straight pull.
 - Conduit entering and exiting at an angle.
3. Have the trainees complete the module review questions. Go over the review questions in class prior to the exam and answer any questions that the trainees may have.
4. Administer the Module Examination and any outstanding performance testing, and submit the results to your Training Program Sponsor through the Registry System.

