Module Overview

This module provides an introduction to the theory of alternating current, along with AC circuits, inductors, capacitors, transformers, and three-phase systems.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. Describe how single-phase and three-phase alternating current is developed.
2. Calculate the peak and effective voltage or current values for an AC waveform.
3. Describe phase relationships in AC circuits.
4. Describe impedance and explain how it affects AC circuits.
5. Describe the operating principles and functions of inductors.
6. Describe the operating principles and functions of capacitors.
7. Explain the principles and functions of transformers.
8. Explain the following terms as they relate to AC circuits:
   - True power
   - Apparent power
   - Reactive power
   - Power factor

Performance Tasks

This is a knowledge-based module; there are no performance tasks.

Materials and Equipment

Markers/chalk
Pencils and scratch paper
Whiteboard/chalkboard
*Power Line Worker Level Two: Distribution* PowerPoint® Presentation Slides
Multimedia projector and screen
Computer
Appropriate personal protective equipment

Calculator
Common capacitors
Inductors, resistors, capacitors, power sources, and wiring to build RL, RC, RLC, and LC circuits
Voltmeter
Transformers
Copies of the Quick Quiz*
Module Examinations**

* Located at the back of this module.
**Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Ensure that trainees are briefed on basic electrical safety and shop safety policies.
Additional Resources

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


Teaching Time For This Module

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 17½ hours are suggested to cover *Alternating Current and Three-Phase Systems*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

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<td>B. Sine Wave Generation</td>
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<td><strong>Session II. AC Phase Relationships; Resistance; Inductance and Capacitance; Types of AC Circuits</strong></td>
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<td>A. AC Phase Relationships</td>
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<td>C. Inductance in AC Circuits</td>
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<td>D. Capacitance</td>
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<td>E. RL, RC, LC, and RLC Circuits</td>
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<td><strong>Session III. Power in AC Circuits</strong></td>
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<td>A. Power in AC Circuits</td>
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<td>1. True Power</td>
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<td>3. Reactive Power</td>
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<td>4. Power Factor</td>
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<td>3. Turns and Voltage Ratios</td>
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<td>4. Types of Transformers</td>
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<td>5. Transformer Selection</td>
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<td><strong>Session VI. Three-Phase Power Distribution Systems</strong></td>
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<td>A. Three-Phase Power Distribution Systems</td>
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<tr>
<td>1. Voltage and Current Imbalance in a Three-Phase System</td>
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</table>
Session VII. Review and Testing

A. Module Review

B. Module Examination

1. Trainees must score 70 percent or higher to receive recognition from NCCER.
2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
Module Overview

This module introduces the trainee to aerial distribution equipment and the role of transformers in a power distribution system.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. Describe the types of transformers and how they are used in aerial distribution systems.
2. Explain the construction of an aerial distribution transformer.
3. Describe the functions of aerial load management devices including:
   - Regulators
   - Reclosers
   - Capacitors
   - Fault indicators
   - Fuses and cutouts
   - Switches
4. Assemble overhead street lights.
5. Energize or de-energize a single-phase transformer using the proper hot stick.
6. Open a disconnect switch using a load break tool.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:

1. Energize or de-energize a single-phase transformer using a hot stick.
2. Open a disconnect switch using a load break tool.
3. Assemble overhead street lights.
4. Hook up a three-phase transformer per diagrams and instructions provided by the instructor.

Materials and Equipment

Multimedia projector and screen
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Access to a location with open transformers for inspection
Three-phase transformers and conductors required for hookup
* Located at the back of this module.

**Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.
Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review safety guidelines associated with working on or near power lines and power distribution equipment. Emphasize the importance of proper housekeeping.

Additional Resources

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


Teaching Time for This Module

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 25 hours are suggested to cover *Aerial Distribution Equipment*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

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<tr>
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<tr>
<td>Have trainees practice connecting three-phase transformers.</td>
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<td>This task corresponds to Performance Task 4.</td>
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<td>A. Load Management and Protective Devices</td>
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<td>2. Voltage Regulators</td>
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<td>3. Isolating Devices</td>
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</table>
Sessions VI and VII. Insulated Tools

A. Insulated Tools
   1. Hot Sticks
   2. Clamp Stick
   3. Extendo Stick
   4. Load Break Tool

B. PT/Laboratory
   1. Have trainees use a hot stick to energize and de-energize a single-phase transformer. This laboratory corresponds to Performance Task 1.
   2. Have trainees use a load break tool to open a disconnect switch. This laboratory corresponds to Performance Task 2.

Sessions VIII–IX. Overhead Street Lights

A. Overhead Street Lights
   1. Street Light Power Supply
   2. Pole Requirements
   3. Luminaire Installation
   4. Luminaire Control

B. PT/Laboratory
   1. Have trainees assemble a street light. This laboratory corresponds to Performance Task 3.

Session X. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module introduces the trainee to the installation, removal, and repair of the cables and conductors that tie the components of aerial distribution systems together.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. Install cables and conductors.
2. Describe how to remove cables and conductors.
3. Splice and terminate cables and conductors.
4. Explain how to select and size a conductor for a given application.
5. Operate cable-pulling equipment.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:

1. Install cables and conductors.
2. Splice and terminate cables and conductors.
3. Operate cable-pulling equipment.

Materials and Equipment

Markers/chalk
Pencils and scratch paper
Whiteboard/chalkboard
*Power Line Worker Level Two: Distribution PowerPoint® Presentation Slides
Multimedia projector and screen
Computer
Appropriate personal protective equipment
Short sections of cables and conductors for comparison
Several types of aluminum conductors
Examples of several sizes of conductors

Ties and tie kits
Appropriate cables for splicing
Tools for splicing, installing, pulling, removing, and repairing cable and conductor
Access to an area where trainees can install, pull, remove, and repair cable and conductor
Appropriate cables and conductors for installing and removing
Appropriate cables for pulling
Copies of Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located at the back of this module.
** Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.
**Safety Considerations**

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review safety guidelines associated with working on cables and conductors for aerial power distribution. Emphasize the importance of proper housekeeping.

**Additional Resources**

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


**Teaching Time for This Module**

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 20 hours are suggested to cover *Cable and Conductor Installation and Removal*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

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<tr>
<th>Topic</th>
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<td>5. Material Cost</td>
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<td>3. Tensioning and Sagging Conductors</td>
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<td>4. Tie Conductors to Insulators</td>
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<td>5. Installing Overhead Cables</td>
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<td>B. P/T Laboratory</td>
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<tr>
<td>Have trainees practice installing cables and conductors. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td>C. Laboratory</td>
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<tr>
<td>Have trainees practice tying conductors to insulators.</td>
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</table>
Sessions V and VI. Repair and Replace Cables and Conductors
   A. Repair and Replace Cables and Conductors
      1. Full-Tension Splice
      2. Full-Tension Crimp-On Splice
      3. Conductor Crimp-On Splice
      4. Splice Shunt
      5. Repair Sleeve
      6. Automatic Splice
   B. P/T Laboratory
      Have trainees splice and terminate cables and conductors. This laboratory corresponds to Performance Task 2.

Session VII. Cable-Pulling Equipment
   A. Cable-Pulling Equipment
   B. P/T Laboratory
      Have trainees operate cable-pulling equipment. This laboratory corresponds to Performance Task 3.

Session VIII. Review and Testing
   A. Review
   B. Module Examination
      1. Trainees must score 70% or higher to receive recognition from NCCER.
      2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
   C. Performance Testing
      1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
      2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module introduces trainees to URD systems, including switchgear, transformers, and conductors. The trainees will become familiar with connection and termination methods and will learn how to install lightning protection and fault-indicating devices.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. Describe the history and applications of URD systems.
2. Describe trenching and backfill methods used for URD systems, including common-trench applications.
3. Identify and describe common types of cable conductors and termination methods used in URD installations.
4. Describe common types of lightning protection and fault indicating devices used in URD systems.
5. Install lightning protection and fault indicating devices in URD systems.
6. Identify and describe pad-mounted switchgear and transformers used in URD systems.
7. Select the proper types of conductors and termination methods for specific URD applications.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:

1. Install lightning protection and fault indicating devices in URD systems.
2. Identify and describe pad-mounted switchgear and transformers used in URD systems.
3. Select the proper types of conductors and termination methods for specific URD applications.

Materials and Equipment

- Markers/chalk
- Pencils and scratch paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Computer
- Appropriate personal protective equipment
- Sample pieces of primary and secondary URD cables
- Sufficient vises, manual and battery-powered cable cutters, and cable-stripping tools
- Sufficient pieces of cable for cutting and stripping
- Sufficient sections of aluminum and copper conductors, compression connectors, and a compression tools and die
- Split-bolt connector, splice kit, and pieces of primary URD cable
- Mechanical crimping tool
- Hand-operated hydraulic tool
- Lightning protection devices
- Fault-indicating devices
- Access to an area with pad-mounted URD switchgear and transformers or, if not available, a selection of photographs
- Selection of URD conductors and termination methods
- Module Examinations*
- Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.
Safety Considerations

Ensure that the trainees are equipped with all appropriate PPE and know how to use it properly. This module includes optional activities that may require safety glasses and/or other PPE. Ensure that trainees are familiar with and use the proper PPE.

Additional Resources

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


Teaching Time for This Module

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 30 hours are suggested to cover *Underground Residential Distribution (URD) Systems*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

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<td>1. Conductors</td>
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<td>2. Termination Methods</td>
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<td>B. Laboratory</td>
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<tr>
<td>Have the trainees cut and strip pieces of cable.</td>
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<td><strong>Sessions III and IV. Cable Types and Termination Methods, Part Two</strong></td>
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<td>A. Cable Types and Termination Methods</td>
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<td>1. Termination Methods</td>
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<td>B. Laboratory</td>
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<tr>
<td>1. Have the trainees join conductors.</td>
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<td>2. Have the trainees splice conductors.</td>
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<td>3. Have the trainees crimp compression terminals and connectors.</td>
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<td><strong>Sessions V through VII. Lightning Protection and Fault-Indicating Devices</strong></td>
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<td>A. Lightning Protection and Fault-Indicating Devices</td>
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<td>1. Lightning Protection Devices</td>
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<td>2. Fault-Indicating Devices</td>
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<td>3. Lightning Protection and Fault-Indicating Device Installation</td>
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<td>B. PT/Laboratory</td>
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<tr>
<td>Have the trainees install lightning protection and fault-indicating devices in URD systems. This laboratory corresponds to Performance Task 1.</td>
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</tbody>
</table>
Sessions VIII and IX. Pad-Mounted Switchgear and Transformers

A. Pad-Mounted Switchgear and Transformers
   1. Switchgear
   2. Transformers

B. PT/Laboratory
   1. Have the trainees identify and describe pad-mounted switchgear and transformers. This laboratory corresponds to Performance Task 2.

Sessions X and XI. Transformer Connections

A. Transformer Connections
   1. Primary Connections
   2. Secondary Connections

B. PT/Laboratory
   Have the trainees select the proper types of conductors and termination methods for URDs. This laboratory corresponds to Performance Task 3.

Session XII. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module introduces trainees to overhead and URD service installation. Trainees will learn to install single- and three-phase loops and to install risers on poles. Trainees will also learn to terminate single- and three-phase underground secondary services.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. Describe the methods and equipment used in the installation of residential and commercial electrical services.
2. Install single- and three-phase overhead loops.
3. Install risers on poles (conduit or U-guard).
4. Terminate single- and three-phase underground secondary services.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:

1. Install single- and three-phase overhead loops.
2. Install risers on poles (conduit or U-guard).
3. Terminate a single- and/or three-phase underground secondary service.

Materials and Equipment

- Markers/chalk
- Pencils and scratch paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Computer
- Appropriate personal protective equipment
- Sufficient poles, risers, U-guard, conduit, and other necessary equipment/materials for installing risers
- Watt-hour meters and meter bases
- Meter mounts, conduit, and a selection of connectors
- Lengths of direct burial and overhead triplex
- Sufficient pad-mounted single- and three-phase transformers
- Spade terminals and ring terminals
- Appropriate tools for terminating single- and three-phase secondary services
- Module Examinations*
- Performance Profile Sheets*

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review safety guidelines associated with working on or near electrical distribution systems, especially conductors and transformers. Emphasize the importance of proper housekeeping.
Additional Resources

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


Teaching Time for This Module

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 15 hours are suggested to cover *Overhead and URD Service Installations.* You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

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<td>B. Installing an Overhead Service Drop</td>
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<td>C. Commercial Overhead Service Installation</td>
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<td>D. Watt-Hour Meters</td>
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<tr>
<td><strong>Session III. Laboratory</strong></td>
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<tr>
<td>A. PT/Laboratory</td>
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<tr>
<td>Have the trainees install single- and three-phase overhead loops. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Session IV. Installing and Terminating Underground Secondary Services</strong></td>
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<tr>
<td>A. Installing and Terminating Underground Secondary Services</td>
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<tr>
<td>1. Underground Conductors</td>
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<td>2. Pad-Mounted Conductors</td>
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<tr>
<td>3. Underground Secondary Distribution Systems</td>
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<tr>
<td>4. Installing Underground Meter Loops</td>
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<td>5. Street Lighting</td>
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<tr>
<td>6. Commercial Underground Service</td>
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<tr>
<td><strong>Session V. Laboratory</strong></td>
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<tr>
<td>A. PT/Laboratory</td>
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<tr>
<td>1. Have the trainees install risers on poles, including conduit or U-guard. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>2. Have the trainees terminate a single- and three-phase underground secondary service. This laboratory corresponds to Performance Task 3.</td>
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</tbody>
</table>
Session VI. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.
Module Overview

This module introduces the trainee to maintenance of distribution lines, including inspection and replacement of equipment. The trainee will learn to recognize damage and other problems in aerial and URD distribution systems.

Objectives

Upon completion of this module, the trainee will be able to do the following:

1. State the safety precautions associated with power line maintenance.
2. Describe the requirements for pole and distribution line inspections.
3. Describe the maintenance requirements for pole-mounted equipment and conductors.
4. Describe methods used to achieve load management and fuse coordination.
5. Re-conductor overhead lines.
6. Replace cross-arms, arresters, switches, insulators, and associated hardware.
7. Replace an aerial transformer.
8. Describe the methods used to locate and correct faults in URD cabling systems.
9. Perform testing and inspection of aerial transformers.

Performance Tasks

Under the supervision of the instructor, the trainee should be able to do the following:

1. Re-conductor overhead lines.
2. Replace cross-arms, arresters, switches, insulators, and associated hardware.
3. Replace an aerial transformer.
4. Perform testing and inspection of aerial transformers.

Materials and Equipment

Markers/chalk
Pencils and scratch paper
Whiteboard/chalkboard
*Power Line Worker Level Two: Distribution*
  *PowerPoint® Presentation Slides*
Multimedia projector and screen
Computer
Appropriate personal protective equipment
Screwdriver and hammer
Access to a wood pole with rotted sections
Access to wood poles with cross-arms, arresters, switches, insulators, and associated hardware
Guy wire grip
Come-along
Pulling eye
Guy wrap
Replacement cross-arms, arresters, switches, insulators, and associated hardware

Appropriate tools for replacing pole-mounted equipment
Lengths of conductors, cross-arm insulator, and cross-arm extender
Appropriate tools for replacing conductors
Conductor splices with manufacturer’s instructions
Lengths of conductor, filler rods, and tape
Appropriate tools for installing a full-tension splice
Dynamometer and sag scope
Access to aerial conductors
New conductors and tools for replacing overhead conductors
Manufacturer’s instructions for installation, operation, and maintenance of pole-mounted equipment
Access to pole-mounted equipment
Service literature for a recloser

continued
If possible, access to a damaged transformer
Access to aerial transformers
Replacement aerial transformers
Tools required for replacing aerial transformers

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.

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**Safety Considerations**

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review safety guidelines associated with working on or performing maintenance on or near power distribution lines, including fall protection. Emphasize the importance of proper housekeeping.

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**Additional Resources**

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


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**Teaching Time for This Module**

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 50 hours are suggested to cover *Distribution Line Maintenance*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td><strong>Session I. Introduction; Safety</strong></td>
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<tr>
<td>A. Introduction</td>
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<td>B. Safety</td>
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<tr>
<td>1. Personal Protective Equipment (PPE)</td>
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<td>2. Protective Grounds</td>
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<tr>
<td>3. Insulating Line Covers</td>
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<td>4. Effects of Fatigue</td>
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<td>5. Working Near Traffic</td>
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<td><strong>Sessions II and III. Pole Inspection</strong></td>
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<td>A. Pole Inspection</td>
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<tr>
<td>1. Wood Pole Problems</td>
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<tr>
<td>2. Inspecting Pole Guys</td>
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<tr>
<td>B. Laboratory</td>
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<tr>
<td>Have trainees practice tensioning pole guys, using a guy grip, come-along, pulling eye, and guy wrap.</td>
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</tbody>
</table>
Sessions IV and V. Inspection and Maintenance of Conductors
A. Inspection and Maintenance of Conductors
   1. Conductor Inspection
   2. Abrasion
   3. Trees and Brush
   4. Repairing and Replacing Conductors
   5. Laboratory
      Have the trainees practice installing splices.
   6. Conductor Sag
   7. Conductor Ties
   8. Vibration Dampers

Sessions VI through VIII. Laboratory
A. PT/Laboratory
   Have trainees remove and replace existing conductors. This laboratory corresponds to Performance Task 1.

Sessions IX and X. Inspection and Maintenance of Pole-Mounted Equipment
A. General Inspection Requirements
   1. Thermal Testing
   2. Oil-Filled Equipment
B. Field Maintenance
   1. Reclosers
   2. Sectionalizers
   3. Capacitors
   4. Pole-mounted Switches
   5. Distribution Transformers
   6. Voltage Regulators
   7. Insulators

Sessions XI through XIV. Laboratory
A. PT/Laboratory
   Have trainees replace cross-arms, arresters, switches, insulators, and associated hardware. This laboratory corresponds to Performance Task 2.

Session XV. Transformer Testing and Diagnostics
A. Visual Inspection
B. Operation of Switches or Breakers
C. Secondary Voltage Test

Sessions XVI and XVII. Laboratory
A. PT/Laboratory
   1. Have trainees replace an aerial transformer. This laboratory corresponds to Performance Task 3.
   2. Have trainees inspect and test an aerial transformer. This laboratory corresponds to Performance Task 4.
Sessions XVIII-XIX. Locating and Correcting Faults in URD Systems; Load Management Overview; Protective Device Coordination

A. Locating and Correcting Faults in URD Systems
   1. Transformer Faults
   2. Cable Faults
   3. Repairing Damaged Underground Systems

B. Load Management Overview
   1. Voltage Regulators
   2. Tap-Changing Transformers
   3. Computing a Tap Change
   4. Capacitor Banks

C. Protective Device Coordination

Session XX. Review and Testing

A. Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200 and submit the results to the Training Program Sponsor.