

## Module Overview

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This module introduces trainees to tasks in the power transmission environment that are often conducted while lines and components are live, performed with intentional contact between the worker and the energy source. The essential safety practices related to such work, as well as the required PPE, are also presented.

## Objectives

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

1. Identify safety practices associated with live-line bare-hand work.
2. Identify the required personal protective equipment (PPE) used specifically in live-line bare-hand work.
3. Describe basic procedures for initiating live-line bare-hand tasks, such as:
  - Bonding to an energized line
  - Care and preparation of a bucket truck boom
  - Donning the required PPE

## Performance Tasks

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

1. Don and electrically test a conductive suit, including gloves and footwear.
2. Demonstrate how a worker bonds a conductive suit and a bucket to an energized line.
3. Demonstrate how to complete a current leakage test of a bucket boom.

## Materials and Equipment

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Multimedia projector and screen  
*Power Line Worker Level Three: Transmission*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-294910-1)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and paper

Bucket truck suitable for live-line bare-hand transmission level work, properly equipped with bonding cables and a bonding wand

Accessible energized transmission lines or an equally-equipped training facility

Conductive suits (a sufficient number of sizes to fit all trainees)

Conductive gloves (a sufficient number of sizes to fit all trainees)

Conductive socks (a sufficient number of sizes to fit all trainees)

Conductive footwear (a sufficient number of sizes to fit all trainees)

Class C hard hats

Other appropriate PPE, such as safety glasses

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

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Ensure that the trainees are equipped with any appropriate PPE and know how to use it properly. Emphasize the importance of proper housekeeping.

## Additional Resources

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

*OSHA Publication 3071, Job Hazard Analysis Guide.*

*Live Line Work Practices*, Second Edition. Alexander Publications.

## Teaching Time for This Module

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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 40 hours are suggested to cover *Construction Maintenance and Repair – Live-Line Bare-Hand*. 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.

Topic	Planned Time
<b>Sessions I and II. Introduction; Live-Line Safety Part 1</b>	
A. Introduction	_____
B. Live-Line Safety	_____
1. Job Safety Analysis	_____
2. Minimum Approach Distances	_____
3. Live-Line PPE	_____
C. PT/Laboratory	_____
Have trainees conduct an electrical test of a conductive suit, gloves, socks, and shoes with an ohmmeter. Then have them don a conductive suit, gloves, socks, shoes, and hard hat and demonstrate the proper way to make the required electrical connections between the garments. This laboratory corresponds to Performance Task 1.	
<b>Session III. Live-Line Safety, Part 2; Live-Line Equipment</b>	
A. Live-Line Safety	_____
1. Reclosers	_____
B. Live-Line Equipment	_____
1. Ladders and Work Platforms	_____
3. Conductor Pulling Tools	_____
4. Live-Line Rope	_____
5. The Bucket Truck	_____
<b>Session IV. Bare-Hand Work</b>	
A. Bare-Hand Work	_____
1. Bucket Truck	_____
2. Insulated Ladder	_____
3. Helicopter	_____
4. Cable Carts	_____
<b>Sessions V–XV. PT/Laboratory</b>	
A. PT/Laboratory	_____
Have trainees conduct current leakage testing of a bucket truck, don conductive PPE, and bond with a live conductor from the bucket. This laboratory corresponds with Performance Tasks 2 and 3.	

## Session XVI. 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

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This module describes the planning process and the methods used when replacing existing conductors. Coverage includes methods used when the existing conductors must remain energized, as well as situations where the existing conductors are used to pull the new conductors.

### Objectives

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

1. Plan a reconductoring project, including:
  - Obtaining permits
  - Selecting equipment and materials
  - Establishing the starting point
2. Prepare for a reconductoring project, including:
  - Performing a pre-job briefing
  - Equipment setup
  - Setting up guard structures
3. Describe how to pull conductors by alleying-out existing conductors.
4. Describe how to pull conductors using the existing conductors.

### Performance Tasks

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

1. Develop a pulling plan.
2. Properly fill out a pre-job briefing.
3. Properly set up and use a tensioner and puller.
4. Alley-out wire and either install a layout structure or pull wire using the old conductor.

### Materials and Equipment

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Multimedia projector and screen  
*Power Line Worker Level Three: Transmission*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-294910-1)

Computer  
Whiteboard/chalkboard  
Markers/chalk  
Pencils and paper  
Required PPE for transmission-level work,  
including fall arrest harnesses  
Bucket truck suitable for transmission work  
Accessible de-energized transmission lines or an  
equally-equipped training facility  
Telescoping stick(s)  
Hydraulic hot stick(s)  
Wire tongs  
Wire tong saddles  
Wire tong swivels

Wire tong bands  
Strain poles of various lengths  
Strain pole accessory yokes and trunnions  
Line spacer(s)  
Vibration damper(s)  
Articulated running board (if required)  
Kellems grip with swivel  
Travelers  
Running ground  
Reel(s) of conductor  
Pilot line  
Bull rope  
Bull wheel puller  
Bull wheel tensioner  
Pilot line winder  
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

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Ensure that the trainees are equipped with any appropriate PPE and know how to use it properly. Emphasize the importance of safety when working near live transmission lines.

## Additional Resources

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

*OSHA Publication 3071, Job Hazard Analysis Guide.*

*Live Line Work Practices, Second Edition. Alexander Publications.*

## Teaching Time for This Module

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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 40 hours are suggested to cover *Reconductoring Transmission Lines*. 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.

Topic	Planned Time
<b>Sessions I–IV. Introduction; Planning</b>	
A. Introduction	_____
1. Reconductoring Methods	_____
B. Planning	_____
1. Permits	_____
C. PT/Laboratory	_____
Have trainees develop a detailed plan for a conductor pull. This laboratory corresponds to Performance Task 1.	
<b>Sessions V and VI. Preparation</b>	
A. Preparation	_____
1. Job-Site Hazards	_____
2. Guard Structures	_____
3. Working With Helicopters	_____
4. Installing Travelers	_____
5. Pulling Equipment	_____
<b>Sessions VII–IX. PT/Laboratory</b>	
A. PT/Laboratory	_____
Have trainees set up a job site for a conductor pull, including performing a pre-job briefing and obtaining the necessary equipment, tools, and materials. This laboratory corresponds to Performance Tasks 2 and 3.	
<b>Sessions X–XV. Pulling Conductors</b>	
A. Pulling New Conductors Using the Old Conductors	_____
B. Pulling New Conductors While Old Conductors Remain Energized	_____
C. PT/Laboratory	_____
Have trainees pull conductors using one of the two methods covered in the module. This laboratory corresponds to Performance Task 4.	

## Session XVI. 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

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This module introduces trainees to tasks in the power transmission environment that are often conducted while lines and components are live, performed using hot sticks and avoiding all contact with the energy source. The essential safety practices related to such work, as well as the required PPE, are also presented.

## Objectives

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

1. Identify safety practices and PPE associated with live-line hot stick work.
2. Identify and maintain tools and accessories used in live-line hot stick work.
3. Describe the procedures for performing various live-line hot stick tasks:
  - Moving energized conductors
  - Removing and replacing insulators
  - Replacing crossarms
  - Installing vibration dampers
  - Installing line spacers

## Performance Tasks

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

1. Inspect and clean a hot stick or similar FRP tool.
2. Move a conductor off and remove/reinstall an insulator using hot sticks.

## Materials and Equipment

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Multimedia projector and screen  
*Power Line Worker Level Three: Transmission*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-294910-1)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Required PPE for transmission-level work,  
including fall arrest harnesses

Bucket truck suitable for live-line hot stick work  
at the transmission level

Accessible de-energized transmission lines or an  
equally equipped training facility

Common hot sticks(s) with universal tool heads

Shotgun stick(s)

Telescoping stick(s)

Telescoping measuring stick(s)

Hydraulic hot stick(s)

Hydraulic crimper and/or cutter(s)

Hydraulic pressure source suitable for the  
hydraulic hot stick in use

A variety of universal hot stick attachments, such  
as an ammeter, voltmeter, wire brushes, wire  
gauge, ball socket adjuster, and safety barrier

Wire tongs of various sizes and capacities

A variety of wire tong saddles

Wire tong swivels

Wire tong bands

Strain poles of various lengths

Strain pole accessory yokes and trunnions

Hook ladder(s)

Spliced ladder(s)

Pulling grip(s)

Ratcheting chain hoist(s)

Strain link sticks of various lengths

Live-line rope

Rope block

Hot stick cleaning wipes

Line spacer(s)

Vibration damper(s)

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

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Ensure that the trainees are equipped with any appropriate PPE and know how to use it properly. Emphasize the importance of proper housekeeping.

## Additional Resources

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

*OSHA Publication 3071, Job Hazard Analysis Guide.*

*Live Line Work Practices*, Second Edition. Alexander Publications.

## Teaching Time for This Module

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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 40 hours are suggested to cover *Construction Maintenance and Repair – Hot Stick*. 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.

Topic	Planned Time
<b>Session I. Introduction; Live-Line Safety</b>	
A. Introduction	_____
B. Live-Line Safety	_____
1. Job Safety Analysis	_____
2. Minimum Approach Distances	_____
3. Live-Line PPE	_____
4. Reclosers	_____
5. Live-Line Safety Review	_____
<b>Session II. Live-Line Tools and Equipment, Part 1</b>	
A. Live-Line Tools and Equipment	_____
1. Tool Safety and Maintenance	_____
2. Hot Sticks	_____
B. PT/Laboratory	_____
Have trainees inspect and clean an FRP tool. This laboratory corresponds to Performance Task 1.	
<b>Session III. Live-Line Tools and Equipment, Part 2</b>	
A. Live-Line Tools and Equipment	_____
1. Wire Tongs	_____
2. Strain Poles and Carriers	_____
3. Insulator Cradles	_____
4. Ladders and Work Platforms	_____
5. Conductor Pulling Tools	_____
6. Live-Line Rope	_____
7. Protective Insulation	_____

**Sessions IV and V. Live-Line Tasks**

A. Live-Line Tasks

- 1. General Considerations
- 2. Moving Energized Conductors
- 3. Insulators
- 4. Conductor Spacers and Vibration Dampers

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**Sessions VI–XV. PT/Laboratory**

A. PT/Laboratory

Assemble trainees into teams of an appropriate size for the planned movement of a conductor(s) and insulator. Have each team complete the task of moving one or more conductors using wire tongs and saddles, and then removing and reinstalling an insulator. This laboratory corresponds to Performance Task 2.

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**Session XVI. Review and Testing**

A. Review

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B. Module Examination

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- 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

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- 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

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This module provides in-depth information on lift plan implementation, including the use of load charts. The topics covered include reference information, calculations, single- and multiple-crane lifting, critical lifts, and engineering considerations.

### Objectives

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

1. Reference available material that will assist in a safe lifting operation.
2. Describe the importance of following and adhering to a lift plan.
3. Define the terms on a load/capacity chart to indicate boom angle, load radius, and boom length.
4. Calculate crane capacity using a load/capacity chart.
5. Identify the differences between on-rubber and on-outrigger charts.
6. Provide the necessary information requested on a lift plan.
7. Calculate additions and deductions involved in lifting operations.
8. Identify existing operations that need special approval.
9. Identify engineering considerations in a lift plan.
10. Identify the various types of lift plans and their differences.
11. Identify the importance of lift plan implementation.

### Performance Tasks

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

1. Fill out portions of a critical lift plan as given/directed by the instructor.
2. Perform single-crane lifting calculations.
3. Perform multiple-crane lifting calculations.
4. Identify boom angle, boom length, and load radius on a load/capacity chart.
5. Identify the requirements of the on-rubber load/capacity chart.
6. Identify the requirements of the on-outrigger load/capacity chart.

### Materials and Equipment

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Multimedia projector and screen  
*Power Line Worker Level Three: Transmission*  
PowerPoint® Presentation Slides  
(ISBN 978-0-13-294910-1)  
Computer  
Whiteboard/chalkboard  
Markers/chalk  
Pencils and scratch paper  
Appropriate personal protective equipment  
*OSHA 29 CFR 1910.180*  
*OSHA 29 CFR 1926.550*  
*ASME B30.5*  
*ANSI/SAE J987*

Copies of a critical lift plan  
Crane(s) and operator's manuals available for performing lifts  
Copies of site emergency procedures  
Copies of sample pre-lift worksheets and lift plans  
Load/capacity charts for different machines  
Copies of site safety manual or procedures  
Videotape: *Lift Calculations*  
TV and VCR  
Load moment indicator  
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

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Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module may require trainees to visit construction sites and observe crane operations. Brief trainees on site safety and crane safety procedures.

## Additional Resources

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

*Bob's Rigging and Crane Handbook*, Latest Edition. Leawood, KS: Pellow Engineering Services.

*IPT's Crane and Rigging Handbook*, Latest Edition. Edmonton, Alberta, Canada: IPT Publishing and Training.

## Teaching Time for This Module

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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 40 hours are suggested to cover *Lift Planning*. You will need to adjust the time required for 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.

Topic	Planned Time
<b>Session I. Introduction; Lift Plan</b>	
A. Introduction	_____
B. Lift Plan	_____
C. Laboratory	_____
Have trainees practice filling out portions of a lift plan.	
<b>Sessions II and III. Calculations for Single Crane Lifts</b>	
A. Calculations for Single-Crane Lifts	_____
B. PT/Laboratory	_____
Have trainees practice performing calculations for single-crane lifts.	
This laboratory corresponds to Performance Task 2.	
<b>Sessions IV through VI. Calculations for Multiple Crane Lifts</b>	
A. Calculations for Multiple-Crane Lifts	_____
B. PT/Laboratory	_____
Have trainees practice performing calculations for multiple-crane lifts.	
This laboratory corresponds to Performance Task 3.	
<b>Session VII. Lift Plan Laboratory</b>	
A. Laboratory	_____
Have trainees practice preparing a lift plan based on criteria provided by the instructor.	

**Sessions VIII and IX. Crane Configuration, Part One**

A. Boom Length, Boom Angle, and Load Radius \_\_\_\_\_

B. PT/Laboratory \_\_\_\_\_

Have trainees practice identifying boom angle, boom length, and load radius on a load/capacity chart. This laboratory corresponds to Performance Task 4.

C. Quadrants of Operation \_\_\_\_\_

D. Configuration of the Crane Base \_\_\_\_\_

E. PT/Laboratory \_\_\_\_\_

Have trainees practice identifying requirements of the on-rubber load/capacity chart and the on-outrigger load/capacity chart. This laboratory corresponds to Performance Tasks 5 and 6.

F. Tower and Ring Attachments \_\_\_\_\_

**Sessions X and XI. Crane Configuration, Part Two**

A. Counterweight Configurations \_\_\_\_\_

B. Laboratory \_\_\_\_\_

Have trainees practice identifying load/capacity charts that are used in different configurations.

C. Deduction Charts \_\_\_\_\_

D. Laboratory \_\_\_\_\_

Have trainees practice identifying parts of line and counterweight considerations in load/capacity chart information.

**Sessions XII through XIV. Calculating Crane Capacity**

A. Calculating Crane Capacity \_\_\_\_\_

B. PT/Laboratory \_\_\_\_\_

Have trainees practice calculating crane capacities using load/capacity charts. This laboratory corresponds to Performance Task 1.

**Session XV. Critical Lifts; Engineering Considerations; Lift Plan Implementation**

A. Critical Lifts \_\_\_\_\_

B. Engineering Considerations \_\_\_\_\_

C. Lift Plan Implementation \_\_\_\_\_

D. PT/Laboratory \_\_\_\_\_

Have trainees practice filling out portions of a critical lift plan. This laboratory corresponds to Performance Task 1.

**Session XVI. 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.

