Module Overview

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

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

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

<table>
<thead>
<tr>
<th>Multimedia projector and screen</th>
<th>Conductive suits (a sufficient number of sizes to fit all trainees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Line Worker Level Three: Transmission PowerPoint® Presentation Slides (ISBN 978-0-13-294910-1)</td>
<td>Conductive gloves (a sufficient number of sizes to fit all trainees)</td>
</tr>
<tr>
<td>Computer</td>
<td>Conductive socks (a sufficient number of sizes to fit all trainees)</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Conductive footwear (a sufficient number of sizes to fit all trainees)</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Class C hard hats</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Other appropriate PPE, such as safety glasses</td>
</tr>
<tr>
<td>Bucket truck suitable for live-line bare-hand transmission level work, properly equipped with bonding cables and a bonding wand</td>
<td>Module Examinations*</td>
</tr>
<tr>
<td>Accessible energized transmission lines or an equally-equipped training facility</td>
<td>Performance Profile Sheets*</td>
</tr>
</tbody>
</table>

* 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 any appropriate PPE and know how to use it properly. 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.

*OSHA Publication 3071, Job Hazard Analysis Guide.*


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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 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Introduction; Live-Line Safety Part 1</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Live-Line Safety</td>
<td></td>
</tr>
<tr>
<td>1. Job Safety Analysis</td>
<td></td>
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<tr>
<td>2. Minimum Approach Distances</td>
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<tr>
<td>3. Live-Line PPE</td>
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<tr>
<td>C. PT/Laboratory</td>
<td></td>
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<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Live-Line Safety, Part 2; Live-Line Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>A. Live-Line Safety</td>
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<tr>
<td>1. Reclosers</td>
<td></td>
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<tr>
<td>B. Live-Line Equipment</td>
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<tr>
<td>1. Ladders and Work Platforms</td>
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<tr>
<td>2. Conductor Pulling Tools</td>
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<td>3. Live-Line Rope</td>
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<tr>
<td>4. The Bucket Truck</td>
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<tr>
<td><strong>Session IV. Bare-Hand Work</strong></td>
<td></td>
</tr>
<tr>
<td>A. Bare-Hand Work</td>
<td></td>
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<tr>
<td>1. Bucket Truck</td>
<td></td>
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<tr>
<td>2. Insulated Ladder</td>
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<td>3. Helicopter</td>
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<td>4. Cable Carts</td>
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<tr>
<td><strong>Sessions V–XV. PT/Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>A. PT/Laboratory</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>
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

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

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

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

Multimedia projector and screen
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)
Kellem’s 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**

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**

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

*OSHA Publication 3071, Job Hazard Analysis Guide.*


**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 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td><strong>Sessions I–IV. Introduction; Planning</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
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<tr>
<td>1. Reconductoring Methods</td>
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<tr>
<td>B. Planning</td>
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<td>1. Permits</td>
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<tr>
<td>C. PT/Laboratory</td>
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<tr>
<td>Have trainees develop a detailed plan for a conductor pull. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Sessions V and VI. Preparation</strong></td>
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<tr>
<td>A. Preparation</td>
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<tr>
<td>1. Job-Site Hazards</td>
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<tr>
<td>2. Guard Structures</td>
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<tr>
<td>3. Working With Helicopters</td>
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<tr>
<td>4. Installing Travelers</td>
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<tr>
<td>5. Pulling Equipment</td>
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<tr>
<td><strong>Sessions VII–IX. PT/Laboratory</strong></td>
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<tr>
<td>A. PT/Laboratory</td>
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<tr>
<td>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.</td>
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</tr>
<tr>
<td><strong>Sessions X–XV. Pulling Conductors</strong></td>
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<tr>
<td>A. Pulling New Conductors Using the Old Conductors</td>
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<tr>
<td>B. Pulling New Conductors While Old Conductors Remain Energized</td>
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<tr>
<td>C. PT/Laboratory</td>
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<tr>
<td>Have trainees pull conductors using one of the two methods covered in the module. This laboratory corresponds to Performance Task 4.</td>
<td></td>
</tr>
</tbody>
</table>
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

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

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

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

Multimedia projector and screen
* Power Line Worker Level Three: Transmission PowerPoint Presentation Slides
* 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

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

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

OSHA Publication 3071, Job Hazard Analysis Guide.

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 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.

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

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.

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

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

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

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

- Multimedia projector and screen
- Computer
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and scratch paper
- Appropriate personal protective equipment
- Copies of a critical lift plan
- Crane(s) and operator’s manuals available for performing lifts
- Copies of site emergency procedures
- 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

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

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 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.

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