

Module Overview

This module provides an overview of personnel lifting and lift planning, and introduces crane load charts and load balancing. It explains how the center of gravity is calculated and affects the lift. It also covers sling selection, and explains the uses of jacks, tuggers, hoists, skids, and rollers.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger*.

Objectives

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

1. Describe the basic requirements to lift personnel.
2. Explain how a sling stress is determined.
3. Describe the basic elements of a lift plan.
4. Explain the purpose of a load chart.
5. Calculate and explain how the center of gravity is determined.
6. Given a particular load, select the appropriate sling(s) for a lift.
7. Describe how jacks, hoists, skids, and rollers are used to move load laterally.

Performance Tasks

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

1. Calculate the center of gravity of a load.
2. Given a particular load, select the appropriate sling(s) for a lift.

Materials and Equipment

Multimedia projector and screen
Basic Rigger / Intermediate Rigger / Advanced Rigger
PowerPoint® Presentation Slides
(ISBN 978-0-13-257363-4)

Computer

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

OSHA regulations on lifting personnel

OSHA guidance on personnel platforms:

Crane or Derrick Suspended Personnel Platforms

Various types of slings and hitches

Sample lift plan

Manufacturer's literature for different types of cranes

Sample load charts

ASME B30.5

ANSI/SAE J987

Teeter-totter and weights

Several jacks

Grip hoist

Tuggers

Rollers

Skids

Copies of the Quick Quiz*

Module Examinations**

Performance Profile Sheets**

* Located in 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. This module requires trainees to work with hand tools and slings. Ensure that trainees are briefed on shop safety policies and hand tool safety.

Additional Resources

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.

Crane Safety on Construction Sites, 1998. Task Committee on Crane Safety on Construction Sites. Reston, VA: ASCE.

Occupational Safety and Health Standards for the Construction Industry, 29 CFR Part 1926. Washington, DC: OSHA Department of Labor, U.S. Government Printing Office.

Rigging Handbook, 2003. Jerry A. Klinke. Stevensville, MI: ACRA Enterprises, Inc.

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 10 hours are suggested to cover *Intermediate Rigging*. 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
Session I. Introduction; Personnel Lifting; Slings	
A. Introduction	_____
B. Personnel Lifting	_____
1. Platform Requirements	_____
C. Slings	_____
1. Sling Tensions	_____
2. Bridle Hitches	_____
3. Basket Hitches	_____
4. Choker Hitches	_____
D. Laboratory	_____
Have trainees practice selecting the appropriate sling(s) for a lift. This laboratory corresponds to Performance Task 2.	
Session II. Lift Planning; Types of Cranes; Crane Load Charts	
A. Lift Planning	_____
1. Lift Plan Data	_____
B. Types of Cranes	_____
1. Industrial Hydraulic Cranes	_____
2. Rough-Terrain Cranes	_____
3. All-Terrain Cranes	_____
4. Truck-Mounted Telescopic Crane	_____
5. Lattice Boom Cranes	_____
6. Crane Component Terminology	_____
C. Crane Load Charts	_____
1. Importance of Load/Capacity Charts for Lift Planning	_____
2. Operating Conditions	_____

Module Overview

This module covers the components of wire rope, wire rope inspection, load block inspection, sheave inspection, proper installation of wire rope, maintenance guidelines, and end terminations and preparations.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger* and *Intermediate Rigger*, Module 38201-11.

Objectives

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

1. Describe how wire rope is constructed and secured.
2. Determine the allowable working load of wire rope.
3. Perform a wire rope inspection.
4. Identify wire rope replacement criteria and describe procedures for replacement.
5. Describe the proper maintenance procedures for wire rope.
6. Describe proper procedures and methods of reeving all wire ropes and multiple-part lines (D/d ratio).
7. Describe the advantages of using multi-part reeving.

Performance Task

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

1. Perform a wire rope inspection.

Materials and Equipment

Multimedia projector and screen
Basic Rigger/Intermediate Rigger/Advanced Rigger
PowerPoint® Presentation Slides
(ISBN 978-0-13-257363-4)
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Wire rope, including:
 Right and left regular lay
 Right and left lang lay
 Right and left alternate lay
Wire rope with various strand patterns
Wire rope with taped end and seizing

Wire rope with various end fittings
Wedge socket assembly and manufacturer's literature on wedge sockets
U-bolt and fist grip clip
Wire Rope User's Manual
Wire rope with deformations, including:
 Birdcaging
 Fatigue breaks
 Kinking
Load block with safety latch and safety specifications
Sheave
Copies of the Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in 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. This module requires trainees to work with hand tools and wire rope. Ensure that trainees are briefed on shop safety policies and hand tool safety.

Additional Resources

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.

Rigging Handbook, 2003. Jerry A. Klinke. Stevensville, MI: ACRA Enterprises, Inc.

Wire Rope User's Manual, 2005. Alexandria, VA: Wire Rope Technical Board.

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 10 hours are suggested to cover *Wire Rope*. 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
Session I. Introduction; Wire Rope Construction	
A. Introduction	_____
B. Wire Rope Construction	_____
1. Wire Rope Components	_____
2. Wire Rope Component Configuration	_____
3. Identification of Wire Rope	_____
4. End Terminations and Preparations	_____
Session II. Inspection and Maintenance Requirements	
A. Inspection and Maintenance Requirements	_____
1. Inspection Guidelines	_____
2. Inspection Criteria	_____
3. Laboratory	_____
Have trainees practice performing a wire rope inspection. This laboratory corresponds to Performance Task 1.	_____
4. Sheave and Load Block Inspection	_____
5. D/d Ratio	_____
6. Maintenance Guidelines	_____
Session III. Wire Rope Reeving; Reeving a Drum	
A. Wire Rope Reeving	_____
1. Determining Parts of Line	_____
2. Block Twisting	_____
B. Reeving a Drum	_____
Session IV. 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 provides a step-by-step look at short- and long-lattice and telescopic boom assembly and disassembly. It also provides examples of the procedures used for assembling crane boom attachments or an A-frame jib.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger* and *Intermediate Rigger*, Modules 38201-11 and 38202-11.

Objectives

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

1. Determine if there is adequate space and resources for crane assembly and disassembly.
2. Identify boom components.
3. Define the relationship of the counterweight to the assembly and disassembly of the boom.
4. Assemble and disassemble a boom.
5. Assemble and disassemble a jib at a boom top.
6. Define and evaluate foundation requirements for boom erection.
7. Assemble and disassemble boom attachments.

Performance Task

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

1. Assemble and disassemble boom attachments.

Materials and Equipment

Multimedia projector and screen
Basic Rigger / Intermediate Rigger / Advanced Rigger
PowerPoint® Presentation Slides
(ISBN 978-0-13-257363-4)
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment
Lattice boom crane manufacturer's assembly and disassembly instructions
Jib manufacturer's assembly instructions
Manufacturer's assembly instructions for a short lattice boom
Manufacturer's assembly instructions for a long lattice boom
Lattice boom crane and counterweights
Short and long lattice boom sections
Jib and rigging hardware

Blocking
Tools and rigging hardware for attachment of boom sections
Copies of site safety manual or procedures
Copies of mobile crane operator's manuals
Mobile crane
Swing-away lattice extension
A-frame jib
Manufacturer's assembly and disassembly instructions for crane and components
Auxiliary single-sheave boom head
Wire rope
Blocking
Tools and accessories to attach and stow crane components
Copies of the Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in 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. This module requires trainees to assemble and disassemble cranes. Review site safety procedures and site evacuation procedures. Ensure that all trainees are familiar with hand signals and other site communication procedures. Brief trainees on pinching and crushing hazards associated with assembling and disassembling cranes. This module may require trainees to visit a construction site. Ensure that all trainees are briefed on site safety procedures.

Additional Resources

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.

Crane Safety on Construction Sites, 1998. Task Committee on Crane Safety on Construction Sites. Reston, VA: ASCE.

Occupational Safety and Health Standards for the Construction Industry, 29 CFR Part 1926. Washington, DC: OSHA Department of Labor, U.S. Government Printing Office.

Rigging Handbook, 2003. Jerry A. Klinke. Stevensville, MI: ACRA Enterprises, Inc.

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 *Boom Assembly and Disassembly*. 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
Session I. Introduction; Pre- and Post-Assembly Considerations; Counterweight Considerations; Boom Parts	
A. Introduction	_____
B. Pre- and Post-Assembly Considerations	_____
C. Counterweight Considerations	_____
D. Boom Parts	_____
Session II. Lattice Boom Assembly	
A. Lattice Boom Assembly	_____
1. Assembling Short Lattice Booms	_____
2. Assembling Long Lattice Booms	_____
Session III. Jib Assembly	
A. Jib Assembly	_____
Session IV. Disassembly of Lattice Booms	
A. Disassembly of Lattice Booms	_____
Session V. Swing-Away Lattice Extension	
A. Swing-Away Lattice Extension	_____
1. Installing a Swing-Away Lattice Extension	_____
2. Stowing a Swing-Away Lattice Extension	_____

Session VI. A-Frame Jib

A. A-Frame Jib

1. Installing an A-Frame Jib
2. Stowing an A-Frame Jib

Sessions VII. Auxiliary Single-Sheave Boom Head; Rope Installation

A. Auxiliary Single-Sheave Boom Head

B. Laboratory

Have trainees practice installing and removing an auxiliary single-sheave boom head.

C. Wire Rope

D. Laboratory

Have trainees practice properly installing wire rope and all lifting attachments.

E. Laboratory

Have trainees practice assembling and disassembling boom attachments.
This laboratory corresponds to Performance Task 1.

Session VIII. 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 explains the basic principles of cranes with an in-depth discussion of the terminology and nomenclature. The principles of a fulcrum and lever and center of gravity are explained in relation to crane operations.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Intermediate Rigger*, Modules 38201-11 through 38203-11.

Objectives

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

1. Identify the types of mobile cranes found on construction sites.
2. Identify mobile crane components and boom attachments.
3. Identify mobile crane reeving patterns.
4. Define the effects of leverage as it applies to mobile cranes.
5. Define the factors affecting mobile crane lifting capacities.
6. Discuss the criteria for a critical lift.
7. Describe the effects of load movement on measured radius.
8. Define the effects of a submerged lift on crane capacity.

Performance Tasks

There are no performance tasks for this module.

Materials and Equipment

Multimedia projector and screen
Basic Rigger / Intermediate Rigger / Advanced Rigger
PowerPoint® Presentation Slides
(ISBN 978-0-13-257363-4)
Computer
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper
Appropriate personal protective equipment,
including:
Hard hats
Work gloves
Safety harnesses
Safety shoes
Ear protection

Model crane (hydraulic boom)
Model crane (lattice boom)
Crane blocks or pulley systems
Materials to construct a simple teeter-totter
Materials of different weights to use as loads on
the teeter-totter
Matting material to support a crane
Copies of company safety policies and proce-
dures
Copies of manufacturers' operating manuals and
load charts
Fishing pole
Small swimming pool
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. Emphasize heavy equipment and work site safety. The topics in this module require the trainee to observe cranes in different configurations. This may require that the trainees visit job sites or crane yards. Ensure that the trainees are briefed on site safety policies prior to any site visits.

Additional Resources

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

Crane Setup, Latest Edition. Sanford, FL: Crane Institute of America, Inc.

Cranes: Design, Practice and Maintenance, 1999. Ing J. Verschoof. London: Professional Engineering Publishing, Ltd.

Cranes in Action, 2000. Larry Shapiro. Osceola, WI: Motorbooks International.

IPT's Crane and Rigging Handbook, 1991. Ronald G. Garby. Clinton, NC: Construction Trades Press.

Machinery's Handbook, 2000. Erik Oberg, et al. New York, NY: Industrial Press, Inc.

Mobile Crane Manual, 1999. Donald E. Dickie, D.H. Campbell. Toronto, Ontario: Construction Safety Association of Ontario.

Mobile Craning Today, Latest Edition. Morrisburg, Ontario: Operating Engineers Training Institute of Ontario.

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 *Basic Principles of Cranes*. You will need to adjust the time required for testing based on your class size and resources.

Topic	Planned Time
Session I. Introduction; Mobile Construction Cranes; Crane Terminology; Crane Reeving Patterns	
A. Introduction	_____
B. Mobile Construction Cranes	_____
1. Crawler Cranes	_____
2. Wheeled Truck Cranes	_____
3. Wheeled Rough-Terrain Cranes	_____
C. Crane Terminology	_____
1. Component Terminology	_____
2. Operations Terminology	_____
3. Counterweights	_____
4. Jibs	_____
5. Pendants and Hoist Lines	_____
6. Telescoping Boom	_____
D. Crane Reeving Patterns	_____
Session II. Factors Affecting Lifting Capacity, Part One	
A. Factors Affecting Lifting Capacity	_____
1. Ground Conditions	_____
2. Bearing Surface	_____
3. Crane Base	_____
4. Center of Gravity	_____
5. Quadrant of Operation	_____

Sessions III and IV. Factors Affecting Lifting Capacity, Part Two

A. Factors Affecting Lifting Capacity

1. Boom Length, Boom Angle, Operating Radius, and Boom Point Elevation
2. Swing Out, Side Loading, and Dynamic Loading
3. Capacity (Load) Charts
4. Wind Effect on Stability

Session V. Critical Lifts; Boom Stops and Angle Indicators; Submerged Lifts

A. Critical Lifts

B. Boom Stops and Angle Indicators

1. Crane Safety Features

C. Submerged Lifts

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.
