

Module Overview

This module introduces the uses of slings and common rigging hardware. Trainees will learn basic inspection techniques, hitch configurations, and load-handling safety practices, as well as how to use American Society of Mechanical Engineers hand signals.

Objectives

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

1. Identify and describe the use of slings and common rigging hardware.
2. Describe basic inspection techniques and rejection criteria used for slings and hardware.
3. Describe basic hitch configurations and their proper connections.
4. Describe basic load-handling safety practices.
5. Demonstrate proper use of American Society of Mechanical Engineers (ASME) hand signals.

Performance Tasks

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

1. Select and inspect appropriate slings for a lift.
2. Given various loads, determine the proper hitch to be used.
3. Select and inspect appropriate hardware and/or lifting equipment.
4. Demonstrate and/or simulate the proper techniques for connecting hitches.
5. Demonstrate the proper use of all hand signals according to *ASME B30.2* and *B30.5*.
6. Describe or demonstrate pre-lift safety checks.
7. Demonstrate and/or simulate how to lift the load level.
8. Describe and/or demonstrate safety precautions for attaching and disconnecting a load.

Materials and Equipment

Multimedia projector and screen	Anchor shackles and chain shackles
<i>Basic Rigger / Intermediate Rigger / Advanced Rigger</i>	Various types of pins, including:
PowerPoint® Presentation Slides	Screw pin shackle
(ISBN 978-0-13-257363-4)	Round pin or straight pin shackle
Computer	Safety shackle
Whiteboard/chalkboard	Damaged shackles and pins
Markers/chalk	Damaged and undamaged eyebolts
Pencils and scratch paper	Undamaged lifting clamps
Copies of your local code	Rusty or corroded lifting clamps
Appropriate personal protective equipment	Damaged and undamaged rigging hooks
Identification tags for slings	Trade Terms Quiz*
Copies of <i>Figure 16</i> with labels covered	Module Examinations**
Damaged slings or photos of damaged slings	Performance Profile Sheets**

* Located at the back of the Trainee Guide 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. Always work in a clean, well-lit, and appropriate work area.

Note

Due to liability issues, trainees under the age of 18 should not perform hoisting maneuvers; therefore, trainees under 18 should not perform the demonstration aspect of Performance Task numbers 4, 7, and 8. The instructor may choose to have trainees simulate the concepts underlying the tasks by using alternative methods.

If you do not have access to rigging hardware or equipment, there are many resources available to you including local contractors, rigging equipment manufacturers, or even your local Training Program.

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. Bob DeBenedictis. Leawood, KS: Pellow Engineering Services, Inc.

High Performance Slings and Fittings for the New Millennium, 1999 Edition. Dennis St. Germain. Aston, PA: I & I Sling, Inc.

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

Rigging Manual, 1997. Toronto, Ontario, Canada: Construction Safety Association 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 Rigging*. 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
Session I. Introduction and Slings	
A. Introduction	_____
B. Tagging Requirements	_____
C. Synthetic Slings	_____
D. Alloy Steel Chain Slings	_____
E. Wire Rope Slings	_____
F. Laboratory	_____
Have trainees practice selecting and inspecting slings for a lift. This laboratory corresponds to Performance Task 1.	
Session II. Hitches	
A. Vertical Hitch	_____
B. Choker Hitch	_____
C. Basket Hitch	_____
D. Laboratory	_____
Have trainees practice selecting appropriate hitches for loads. This laboratory corresponds to Performance Task 2.	

Session III. Rigging Hardware

- A. Shackles
- B. Eyebolts
- C. Lifting Clamps
- D. Rigging Hooks
- E. Laboratory

Have trainees practice selecting and inspecting appropriate hardware and/or lifting equipment. This laboratory corresponds to Performance Task 3.

Session IV. Sling Stress and Hoists

- A. Sling Stress
- B. Operation of Chain Hoists
- C. Hoist Safety and Maintenance

Session V. Rigging Operations and Practices

- A. Rated Capacity
- B. Sling Attachment
- C. Hardware Attachment
- D. Load Control
- E. Laboratory

Have trainees practice demonstrating proper use of all hand signals and completing pre-lift safety checks. These laboratories correspond to Performance Tasks 5 and 6.

Session VI. Review and Testing

- A. Review
- B. Module Examination
 - 1. Trainees must score 70 percent or higher to receive recognition from the 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 00106-09 – ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. d	2.1.0
2. b	2.2.4
3. a	2.3.3
4. a	2.4.1
5. c	3.1.0
6. d	3.1.0
7. c	3.2.0
8. b	4.1.0
9. c	4.3.0
10. c	5.0.0
11. b	5.0.0
12. c	6.1.0
13. b	6.2.0
14. b	7.2.0
15. a	7.3.3

MODULE 00106-09 – ANSWERS TO TRADE TERMS QUIZ

1. block and tackle
2. eyebolts
3. bull ring
4. sling reach
5. cribbing
6. ANSI hand signals
7. stress
8. grommet sling
9. hitch
10. bridle
11. shackle
12. hoist
13. lifting clamp
14. load
15. sling angle, sling stress
16. load stress
17. master link
18. spliced
19. one rope lay
20. plane
21. sling
22. rated capacity
23. rejection criteria
24. rigging hook
25. sheave
26. pad eye
27. side pull
28. sling legs
29. strand
30. tag line
31. warning yarn
32. core
33. threaded shank
34. load control
35. wire rope
36. risk management
37. weight capacity
38. tattle-tail

Module Overview

This module covers how to inspect and use common rigging hardware, slings, and tag lines. It also explains how to select, inspect, use, and maintain special rigging equipment, including block and tackle, chain hoists, ratchet-lever hoists, jacks, and base-mounted drum hoists (tuggers).

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger*, Module 00106-09.

Objectives

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

1. Identify and describe the uses of common rigging hardware and equipment.
2. Perform a safety inspection on hooks, slings, and other rigging equipment.
3. Describe common slings and determine sling capacities and angles.
4. Select, inspect, use, and maintain special rigging equipment, including:
 - Block and tackle (bull rigging)
 - Chain hoists
 - Ratchet-lever hoists
 - Jacks
 - Base-mounted drum hoists (tuggers)
5. Inspect heavy rigging hardware.
6. Tie knots used in rigging.

Performance Tasks

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

1. Perform a safety inspection on hooks, slings, and other rigging equipment.
2. Select, inspect, and use special rigging equipment, including:
 - Block and tackle (bull rigging)
 - Chain hoists
 - Ratchet-lever hoists
 - Jacks
 - Base-mounted drum hoists (tuggers)
3. Tie knots in rigging.

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
Manufacturer's literature on different rigging hooks
Various rigging hooks with wear, cracks, and corrosion

Manufacturer's literature on shackles
Various types of shackles
Various eyebolts
Various lifting lugs
Turnbuckles
Manufacturer's literature on plate clamps
Various rigging plates and links
Various types of slings
A rigging pocket guide
ASME B30.9, Slings
Samples of wire rope that have failed inspection
Rope for tying knots
Block and tackle lifting system

continued

Sample loads for lifting
 Spur-gearred chain hoist
 Electric chain hoist
 Ratchet-lever hoist or come-along
 Ratchet jack

Screw jack
 Hydraulic jack
 Base-mounted drum hoists (tuggers)
 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 requires trainees to use various types of hoists, jacks, and base-mounted drum hoists. Ensure that all trainees are briefed on lifting safely and any other shop safety procedures. This module may require that the trainees visit job sites. Ensure that 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.

Machinery's Handbook, Latest Edition. Erik Oberg, Franklin D. Jones, Holbrook L. Horton, and Henry H. Ryffel. New York, NY: Industrial Press Inc.

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

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 *Rigging Equipment*. 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; Rigging Hardware	
A. Introduction	_____
B. Rigging Hardware	_____
1. Hooks	_____
2. Shackles	_____
3. Eyebolts	_____
4. Lifting Lugs	_____
5. Turnbuckles	_____
6. Beam Clamps	_____
7. Plate Clamps	_____
8. Rigging Plates and Links	_____
9. Spreader and Equalizer Beams	_____

Session II. Slings; Tag Lines

- A. Slings _____
 - 1. Sling Capacity _____
 - 2. Sling Care and Storage _____
 - 3. Chain Slings _____
- B. Laboratory _____

Have trainees practice performing a safety inspection on hooks, slings, and other rigging equipment. This laboratory corresponds to Performance Task 1.
- C. Tag Lines _____
- D. Laboratory _____

Have trainees practice tying knots used in rigging. This laboratory corresponds to Performance Task 3.

Session III. Block and Tackle; Chain Hoists; Ratchet-Lever Hoists and Come-Alongs; Jacks; Base-Mounted Drum Hoists

- A. Block and Tackle (Bull Rigging) _____
- B. Chain Hoists _____
 - 1. Spur-Geared Chain Hoists _____
 - 2. Electric Chain Hoists _____
 - 3. Care of Chain Hoists _____
- C. Ratchet-Lever Hoists and Come-Alongs _____
- D. Jacks _____
 - 1. Ratchet Jacks _____
 - 2. Screw Jacks _____
 - 3. Hydraulic Jacks _____
 - 4. Inspecting and Using Jacks _____
- E. Base-Mounted Drum Hoists (Tuggers) _____
- F. Laboratory _____

Have trainees practice selecting, inspecting, and using special rigging equipment. This laboratory corresponds to Performance Task 2.

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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. b	2.0.0
2. d	2.1.0
3. c	2.1.0
4. b	2.2.0
5. c	2.2.0
6. b	2.2.0
7. b	2.3.0
8. c	2.4.0
9. b	2.7.0
10. b	2.8.0
11. b	2.9.0
12. a	2.9.0
13. d	3.0.0
14. b	3.1.0
15. a	3.3.0
16. c	3.3.2
17. c	5.0.0
18. a	7.0.0
19. b	8.1.0
20. d	8.1.0

Module Overview

This module covers communications, basic rigging safety precautions, lift planning, and load and sling calculations. It also covers load charts and load balancing.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger*, Modules 00106-09 and 38101-11.

Objectives

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

1. Identify and use the correct ASME hand signals to guide a crane operator.
2. Identify basic rigging and crane safety procedures and determine the center of gravity of a load.
3. Identify the pinch points of a crane and explain how to avoid them.
4. Identify site and environmental hazards associated with rigging.
5. Properly attach rigging hardware for routine lifts and pipe lifts.
6. Explain the importance of sling tension calculations.

Performance Tasks

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

1. Use and interpret hand signals.
2. Determine the center of gravity of a load.
3. Properly attach rigging hardware for routine lifts and pipe lifts.

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
Walkie-talkies

Throat microphone
Hardwired communication system
ASME B30.5 Consensus Standard 29 CFR 1926.550
Completed lift plan
Crane manufacturer's literature
Typical teeter-totter and weights
Various lifting eyebolts
Rigging hardware
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 that the trainees visit job sites. Ensure that 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 Safety on Construction Sites, 1998. Task Committee on Crane Safety on Construction Sites. Reston, VA: ASCE.

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 15 hours are suggested to cover *Rigging Practices*. 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
Sessions I and II. Introduction; Methods and Modes of Communication	
A. Introduction	_____
B. Methods and Modes of Communication	_____
1. Verbal Modes of Communication	_____
2. Nonverbal Modes of Communication	_____
C. Laboratory	_____
Have trainees practice using and interpreting hand signals. This laboratory corresponds to Performance Task 1.	
Session III. General Rigging Safety; Working Around Power Lines; Site Safety	
A. General Rigging Safety	_____
1. Personal Protection	_____
2. Equipment and Supervision	_____
3. Basic Rigging Precautions	_____
4. Load Path, Load Control, and Tag Lines	_____
5. Barricades	_____
6. Load-Handling Safety	_____
B. Working Around Power Lines	_____
C. Site Safety	_____
1. Site Hazards and Restrictions	_____
Session IV. Emergency Response	
A. Emergency Response	_____
1. Fire	_____
2. Malfunctions During Lifting Operations	_____
3. Hazardous Weather	_____

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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. c	2.1.0
2. a	2.2.0; Figure 4
3. a	2.2.0
4. d	2.2.0
5. c	2.2.0
6. a	2.2.0; Figure 17
7. b	3.3.0
8. a	3.3.0
9. b	3.3.0
10. a	3.3.0
11. a	3.4.0
12. b	3.4.0
13. b	3.4.0
14. a	3.6.0
15. a	4.0.0; Table 1
16. c	4.0.0
17. b	6.3.1
18. d	6.3.2
19. b	8.2.0
20. c	9.0.0

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	Blocking
<i>Basic Rigger / Intermediate Rigger / Advanced Rigger</i>	Tools and rigging hardware for attachment of boom sections
PowerPoint® Presentation Slides (ISBN 978-0-13-257363-4)	Copies of site safety manual or procedures
Computer	Copies of mobile crane operator's manuals
Whiteboard/chalkboard	Mobile crane
Markers/chalk	Swing-away lattice extension
Pencils and scratch paper	A-frame jib
Appropriate personal protective equipment	Manufacturer's assembly and disassembly instructions for crane and components
Lattice boom crane manufacturer's assembly and disassembly instructions	Auxiliary single-sheave boom head
Jib manufacturer's assembly instructions	Wire rope
Manufacturer's assembly instructions for a short lattice boom	Blocking
Manufacturer's assembly instructions for a long lattice boom	Tools and accessories to attach and stow crane components
Lattice boom crane and counterweights	Copies of the Quick Quiz*
Short and long lattice boom sections	Module Examinations**
Jib and rigging hardware	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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. a	1.0.0
2. d	1.0.0
3. c	1.0.0
4. d	1.0.0
5. a	2.0.0
6. c	2.0.0
7. a	2.0.0
8. c	2.0.0
9. b	2.0.0
10. a	3.0.0
11. c	4.0.0
12. d	4.0.0
13. a	4.0.0
14. c	4.0.0
15. b	4.0.0, Trade Terms
16. b	5.0.0
17. a	5.1.0
18. b	5.1.0
19. d	5.1.0
20. b	5.1.0
21. b	5.1.0
22. d	5.1.0, Trade Terms
23. c	5.2.0
24. c	8.1.0
25. d	10.0.0

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*

* 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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. a	2.0.0
2. b	2.1.0
3. a	2.2.0
4. c	2.3.0
5. d	3.1.0
6. c	3.3.0
7. b	3.5.0
8. a	4.0.0
9. c	5.1.0; Table 1
10. d	5.1.0; Table 1
11. b	5.1.0; Table 1
12. b	5.2.0
13. d	5.3.2
14. c	5.4.0
15. a	5.5.0
16. b	5.6.2
17. d	5.7.2
18. b	6.0.0
19. a	7.1.0
20. c	8.0.0

Module Overview

This module covers specialized rigging techniques and equipment. Load dynamics are explained. The use of specialized equipment including cribbing, slings, and beams is described.

Prerequisites

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

Objectives

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

1. Explain how the center of gravity of the load affects the rigging.
2. Explain how the weight of the load and the position of the crane boom affect the load capacity of the crane.
3. Explain how cribbing is used to support loads.
4. Select the appropriate spreader bars or equalizer beam for a given load.
5. Demonstrate the ability to determine the center of gravity for a non-symmetrical load.
6. Given a particular load, select the appropriate sling(s) for a lift.

Performance Tasks

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

1. Select the appropriate spreader bars or equalizer beam for a given load.
2. Demonstrate the ability to determine the center of gravity for a non-symmetrical load.
3. Given a particular load, select the appropriate sling(s) for a given 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
Cribbing
Copies of *ASME B30.5-2004*
Beams and spreader bars
Slings
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 may require trainees to visit construction sites. Brief trainees on site safety procedures. This module requires trainees to use specialized rigging equipment and may require trainees to work around cranes. Ensure that all trainees know site safety and crane safety procedures and emphasize crane 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.

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

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 *Advanced 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
Sessions I and II. Introduction; Load Dynamics	
A. Introduction	_____
B. Load Dynamics	_____
1. Rotational Forces or Moments	_____
2. Crane Stability	_____
C. Laboratory	_____
Have trainees practice determining the center of gravity for a non-symmetrical load. This laboratory corresponds to Performance Task 2.	
Session III. Special Equipment Used in Heavy Rigging	
A. Special Equipment Used in Heavy Rigging	_____
1. Cribbing	_____
2. Inclined Planes	_____
Sessions IV and V. Slings	
A. Slings	_____
1. Sling Tensions	_____
2. Bridle Hitches	_____
3. Basket Hitches	_____
4. Choker Hitches	_____
B. Laboratory	_____
Have trainees practice selecting the proper sling(s) for a given lift. This laboratory corresponds to Performance Task 3.	

Sessions VI and VII. Using Beams; Rigging Rebar Bundles

A. Using Beams

- 1. Adjustable Beams
- 2. Equalizer Beams

B. Laboratory

Have trainees practice selecting the appropriate beam or spreader bar for a given lift. This laboratory corresponds to Performance Task 1.

C. Rigging Rebar Bundles

- 1. Unloading Procedure
- 2. Hoisting Equipment

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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. c	2.0.0
2. c	2.2.0
3. a	2.2.1
4. c	2.2.1
5. b	2.2.2
6. a	2.2.3
7. a	2.2.4
8. c	2.2.5
9. c	3.1.0
10. b	4.1.0
11. b	4.2.0
12. c	5.0.0
13. b	5.1.0
14. d	6.2.0
15. b	6.2.0

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.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger*; *Intermediate Rigger*; and *Advanced Rigger*, Module 38301-11.

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 the supervision of the instructor, 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
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 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

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.

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

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
Session I. Introduction; Lift Plan	
A. Introduction	_____
B. Lift Plan	_____
C. Laboratory	_____
Have trainees practice filling out portions of a lift plan.	
Sessions II and III. Calculations for Single Crane Lifts	
A. Calculations for Single-Crane Lifts	_____
B. Laboratory	_____
Have trainees practice performing calculations for single-crane lifts.	
This laboratory corresponds to Performance Task 2.	
Sessions IV through VI. Calculations for Multiple Crane Lifts	
A. Calculations for Multiple-Crane Lifts	_____
B. Laboratory	_____
Have trainees practice performing calculations for multiple-crane lifts.	
This laboratory corresponds to Performance Task 3.	
Session VII. Lift Plan Laboratory	
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. 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. 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. 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. 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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. a	1.0.0, Trade Terms
2. a	1.0.0
3. b	2.0.0
4. a	2.0.0
5. c	2.0.0
6. b	2.0.0
7. d	2.0.0
8. d	3.0.0
9. b	3.0.0
10. a	3.0.0
11. c*	3.1.0
12. b*	3.1.0
13. c*	3.1.0
14. c	3.2.0
15. d	3.2.0
16. b	3.2.0
17. a	3.2.0
18. a*	3.2.0
19. c*	3.2.0
20. c*	3.2.0
21. a	3.2.0
22. a	3.2.0
23. a	4.1.0
24. a	4.1.0; Trade Terms
25. a	4.1.0
26. b	4.1.0
27. c	4.2.0
28. c	4.2.0
29. a	4.2.0
30. a	4.3.1; Figure 23
31. b	4.3.1
32. a	4.5.0
33. b	4.6.0
34. b	4.6.1
35. c	4.6.1
36. b	4.6.2
37. c	4.6.2
38. b*	5.0.0
39. b*	5.0.0
40. c*	5.0.0
41. a	5.0.0
42. d*	5.0.0
43. b	6.0.0
44. b	6.0.0
45. d	8.0.0

* Math calculations appear on the following pages.

REVIEW QUESTION MATH CALCULATIONS

11. Gross capacity = net capacity + deductions

$$\text{Gross capacity} = 95,000 + 2,500$$

$$\text{Gross capacity} = 97,500 \text{ lbs}$$

12. Net capacity = gross capacity – deductions

$$\text{Net capacity} = 83,000 - (1,500 + 865 + 335 + 1,900)$$

$$\text{Net capacity} = 83,000 - 4,600$$

$$\text{Net capacity} = 78,400 \text{ lbs}$$

13. Deductions = gross capacity – net capacity

$$\text{Deductions} = 90,000 - 83,425$$

$$\text{Deductions} = 6,575 \text{ lbs}$$

18. Total load weight = 100,000 lbs

$$\text{Total net capacity of Crane One} = 80,000 \text{ lbs}$$

The sum of the lowest rated net capacities of the cranes must exceed 100,000 lbs.

To meet the 75-percent capacity guidelines, 75 percent of the sum of the lowest rated net capacities of the cranes must be greater than or equal to 100,000.

$$0.75(80,000 + x) = 100,000$$

$$60,000 + 0.75x = 100,000$$

$$0.75x = 40,000$$

$$x = 40,000 \div 0.75$$

$$x = 53,333 \text{ lbs}$$

19. $B = (\text{load of Crane One} / \text{load of Crane Two}) \times A$

$$B = (100,000 \div 50,000) \times 20$$

$$B = 40 \text{ ft}$$

20. Load on Crane One = $B \div (A+B) \times \text{load weight}$

$$\text{Load on Crane One} = 15 \div (10 + 15) \times 150,000$$

$$\text{Load on Crane One} = 15 \div 25 \times 150,000$$

$$\text{Load on Crane One} = 90,000 \text{ lbs}$$

38. 17,950 lbs (gross capacity)

– 604 lbs (23 ft – 38 ft. telescoping jib stowed)

– 300 lbs (15-ton, 2-sheave block)

– 150 lbs (5-ton headache ball)

– 100 lbs (auxiliary boom head)

– 65 lbs (rigging)

16,731 lbs (net capacity)

39. 4,330 lbs (gross capacity)
– 381 lbs (23 ft A-frame jib stowed)
– 285 lbs (12-ton, 1-sheave (12 $\frac{1}{8}$ " OD) block)
– 70 lbs (rigging)
3,594 lbs (net capacity)

40. 29,850 lbs (gross capacity)
– 490 lbs (22-ton, 3-sheave block)
– 45 lbs (rigging)
29,315 lbs (net capacity)

42. 24,500 lbs (gross capacity)
– 1,500 lbs (2-sheave boom point)
– 865 lbs (15-ton hook block)
– 2,065 lbs (100-ton block)
– 345 lbs (rigging)
47 lbs (20' rope)*
– 1,400 lbs (149.5' rope)**
18,278 lbs (net capacity)

* 20' rope @ 2.34 lbs/ft = 46.8 lbs (47 lbs)

** 149.5' rope @ 2.34 lbs/ft \times 4 = 1,399.2 lbs (1,400 lbs)

Module Overview

This module provides an in-depth discussion of the *ASME B30.23* and *29 CFR 1926.550(g)* requirements as it presents advanced operating techniques for hoisting personnel.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Basic Rigger*; *Intermediate Rigger*; and *Advanced Rigger*, Modules 38301-11 and 38302-11.

Objectives

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

1. Identify which federal regulations and consensus standards apply to hoisting personnel.
2. Visually inspect the platform, suspension system, and attachment points.
3. Define operation techniques for hoisting personnel near power lines.

Performance Task

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

1. Visually inspect the platform, suspension system, and attachment points.

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
Copies of OSHA and ASME regulations
OSHA 29 CFR 1926.104, 1926.106, 1926.550(g),
and *1926.753*

OSHA document: *Crane or Derrick Suspended Personnel Platforms ASME B30.23*
Fall protection equipment
Fall protection safety video or DVD
TV and VCR or DVD player
Personnel platform
Personnel platform pre-lift inspection form
Rigging hardware for personnel platform
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 may require trainees to observe crane operations. 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 crane operations. This module requires trainees to work with lifting equipment. Brief trainees on slip and fall hazards of platform work.

Additional Resources

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

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 5 hours are suggested to cover *Personnel Lifts*. 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; Fall Protection; Platform Requirements; Boom-Attached Platform Requirements; Crane and Operational Requirements; Personnel Platform Inspection; Trial Lift	
A. Introduction	_____
B. Fall Protection	_____
C. Platform Requirements	_____
1. Design Criteria	_____
2. Platform Specifications	_____
3. Personnel Platform Loading	_____
4. Rigging	_____
D. Boom-Attached Platform Requirements	_____
E. Crane and Operational Requirements	_____
1. Operational Criteria	_____
2. Instruments and Components	_____
3. Work Practices	_____
4. Traveling	_____
F. Personnel Platform Inspection	_____
1. ASME-Prescribed Personnel Platform Inspection	_____
G. Laboratory	_____
Have trainees practice inspecting the platform, suspension system and attachment points. This laboratory corresponds to Performance Task 1.	
H. Trial Lift	_____
1. Proof Testing	_____

**Session II. Advanced Operations Techniques for Hoisting Personnel;
Review and Testing**

- A. Advanced Operations Techniques for Hoisting Personnel _____
- B. Review _____
- C. 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.
- D. 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.

ANSWERS TO REVIEW QUESTIONS

Answer	Section Reference
1. d	2.0.0, Trade Terms
2. b	2.0.0
3. a	2.0.0
4. d	2.0.0
5. d	3.1.0
6. b	3.2.0
7. b	3.2.0
8. a	3.2.0
9. a	3.3.0
10. a	4.0.0
11. d	4.0.0
12. c	4.0.0
13. d	4.0.0
14. c	4.0.0
15. b	5.1.0
16. d	5.1.0
17. c	5.2.0
18. b	5.2.0
19. b	6.1.0
20. d	7.1.0