

## **MODULE OVERVIEW**

This module introduces the Mobile Crane Operations trainee to the types of cranes and their varied uses, as well as career opportunities and personal requirements for mobile crane operators.

## **PREREQUISITES**

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following:

Core Curriculum

## **OBJECTIVES**

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

1. Identify career opportunities in the mobile crane industry.
2. Describe the duties and responsibilities of mobile crane operators.
3. Describe the physical requirements for mobile crane operators.
4. Name the different categories of mobile cranes and describe how each is used.
5. Identify common mobile crane attachments and explain how each is used.

## **PERFORMANCE TASKS**

There are no performance tasks for this module.

## **MATERIALS AND EQUIPMENT LIST**

Overhead projector and screen

Transparencies

Whiteboard/chalkboard

Markers/chalk

Blank acetate sheets

Transparency pens

Pencils and scratch paper

Appropriate personal protective equipment:

Hard hats

Work gloves

Safety harnesses

Safety shoes

Ear protection

Model crane (hydraulic boom)

Model crane (lattice boom)

Copies of company policies and procedures

Copies of site evacuation plans

Copies of ANSI and OSHA standards

TV and VCR

Videotape: *Construction Safety: Choice or Chance*,  
by the Occupational Safety and Health  
Administration

Module Examinations\*

\*Located in the Test Booklet.

## **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 trainees are briefed on site safety policies prior to any site visits.

## ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

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

*Crane Safety: A Guide to OSHA Compliance and Injury Prevention*, 1999. Carl O. Morgan. Rockville, MD: ABS Group, Inc.

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

*Occupational Safety and Health Standards for the Construction Industry, 29 CFR Part 1926*, Latest Edition. 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 5 hours are suggested to cover *Orientation to the Trade*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

Topic	Planned Time
<b>Session I. Introduction to the Mobile Crane Industry</b>	
A. Introduction	_____
B. The Mobile Crane Industry	_____
C. General Standards	_____
1. ANSI Standard B30.5	_____
2. Crane Operator's Typical Responsibilities	_____
D. Crane Types and Uses	_____
E. Attachments	_____
<b>Session II. Training Program and Operator Responsibilities</b>	
A. Your Training Program	_____
B. Your Responsibilities	_____
C. Human Relations	_____
D. Employer and Employee Safety Obligations	_____
E. Review	_____
F. Module Examination	_____
1. Trainees must score 70% or higher to receive recognition from NCCER.	
2. Record the testing results on Craft 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**

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following:

Core Curriculum; Mobile Crane Operations Level One, Module 21101-04

## **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. Define a critical lift.
7. Identify basic instrumentation, gauges, and safety devices.
8. Define the basic steps in preparing a mobile crane for transportation.

## **PERFORMANCE TASKS**

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

1. Verify the boom length of a hydraulic and/or lattice boom crane.
2. Measure the load radius of a hydraulic and/or lattice boom crane.
3. Calculate the amount of blocking needed to support a crane.
4. Verify a crane is level.

## **MATERIALS AND EQUIPMENT LIST**

Overhead projector and screen	Model crane (hydraulic boom)
Transparencies	Model crane (lattice boom)
Whiteboard/chalkboard	Crane blocks or pulley systems
Markers/chalk	Materials to construct a simple teeter-totter
Blank acetate sheets	Materials of different weights to use as loads on the teeter-totter
Transparency pens	Matting material to support a crane
Pencils and scratch paper	Copies of company safety policies and procedures
Appropriate personal protective equipment:	Copies of manufacturers' operating manuals and load charts
Hard hats	Module Examinations*
Work gloves	Performance Profile Sheets*
Safety harnesses	
Safety shoes	
Ear protection	

\*Located in the Test Booklet.

## 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 is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

*Crane Setup*. Sanford, FL: Crane Institute of America, Inc.

*Cranes and Derricks*, 1991. Howard I. Shapiro, P.E., Jay P. Shapiro, P.E., Lawrence K. Shapiro, P.E. New York, NY: McGraw Hill, 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 hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
<b>Session I. Introduction, Cranes, Terminology, and Reeving Patterns</b>	
A. Introduction	_____
B. Mobile Construction Cranes	_____
C. Crane Terminology	_____
D. Crane Reeving Patterns	_____
<b>Session II. Factors Affecting Lifting Capacity I</b>	
A. Ground Conditions	_____
B. Bearing Surface	_____
C. Crane Base	_____
D. Center of Gravity	_____
E. Quadrant of Operation	_____
F. Laboratory – Calculate the amount of blocking needed to support a crane and verify a crane is level. This laboratory corresponds to Performance Tasks 3 and 4.	_____
<b>Sessions III and IV. Factors Affecting Lifting Capacity II</b>	
A. Boom Length, Boom Angle, Operating Radius, and Boom Point Elevation	_____
B. Swing Out, Side Loading, and Dynamic Loading	_____

C. Capacity (Load) Charts

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D. Laboratory – Verify the boom length and measure the load radius of a hydraulic and/or lattice boom crane. This laboratory corresponds to Performance Tasks 1 and 2.

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**Session V. Critical Lifts, Instrumentation, and Transportation**

A. Critical Lifts

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B. Instrumentation and Safety Devices

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C. Transportation to and from the Job Site

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**Session VI. Review, Module Examination, and Performance Testing**

A. Review

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B. Module Examination

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

C. Performance Testing

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



**Annotated Instructor's Guide****MODULE OVERVIEW**

This module introduces the trainee to the fundamentals of rigging, including rigging hardware, wire rope, and the various types of slings and their configurations. It also covers rigging safety, use of tag lines, and load handling for crane operations.

**PREREQUISITES**

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following:

Core Curriculum; Mobile Crane Operations Level One, Modules 21101-04 and 21102-04

**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 common rigging hardware and equipment.
3. Identify common slings and describe their uses.
4. Determine sling capacities and sling angles.

**PERFORMANCE TASKS**

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

1. Configure a sling to produce a single leg/single wrap basket hitch.
2. Configure a sling to produce a single leg/double wrap basket hitch.
3. Configure a sling to produce a single leg/single wrap choker hitch.
4. Configure a sling to produce a single leg/double wrap choker hitch.
5. Select the correct tag line for a specified load.

**MATERIALS AND EQUIPMENT LIST**

Overhead projector and screen	Various types and sizes of slings
Transparencies	Various sizes of shackles and other load attachment devices
Whiteboard/chalkboard	Copies of safety policies and procedures
Markers/chalk	Samples of damaged wire rope
Blank acetate sheets	Copies of site evacuation procedures
Transparency pens	Scrap piping or lumber to simulate loads
Pencils and scratch paper	A selection of tag line material
Appropriate personal protective equipment:	Module Examinations*
Hard hats	Performance Profile Sheets*
Safety glasses and goggles	
Work gloves	
Safety harnesses	
Safety shoes	
Ear protection	

\*Located in the Test Booklet.

## **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.

## **ADDITIONAL RESOURCES**

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

*Cranes and Derricks*, Videotape. 1991. Howard I. Shapiro, P.E., Jay P. Shapiro, P.E., Lawrence K. Shapiro, P.E. New York, NY: McGraw Hill.

*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 15 hours are suggested to cover *Rigging Practices*. 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.

<b>Topic</b>	<b>Planned Time</b>
<b>Session I. Introduction, Rigging Hardware, and Wire Rope</b>	
A. Introduction	_____
B. Rigging Hardware	_____
C. Wire Rope	_____
<b>Sessions II and III. Slings</b>	
A. Wire Rope and Synthetic Web Slings	_____
1. Wire Rope Slings	_____
2. Synthetic Web Slings	_____
3. Metal Mesh Slings	_____
4. Sling Angles	_____
5. Sling Capacity	_____
6. Sling Care and Storage	_____
B. Chain Slings	_____
1. Storage	_____
2. Care and Inspection	_____
C. Laboratory – Trainees practice configuring a sling to produce a single leg/single wrap basket hitch, a single leg/double wrap basket hitch, a single leg/single wrap choker hitch, and a single leg/double wrap choker hitch This laboratory corresponds to Performance Tasks 1 through 4.	_____
<b>Sessions IV and V. Safety</b>	
A. Tag lines	_____
B. Rigging Safety	_____
1. Barricades	_____
2. Rigging Precautions	_____
3. Load Preparations and Handling	_____



C. Guidelines for Unloading and Yarding Materials

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D. Laboratory – Trainees practice selecting correct tag lines for a specified load.  
This laboratory corresponds to Performance Task 5.

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**Session VI. Review, Module Examination, and Performance Testing**

A. Review

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B. Module Examination

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

C. Performance Testing

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



**Annotated Instructor's Guide****MODULE OVERVIEW**

This module introduces various safety aspects of mobile crane operations. Communications, job site hazards, and personal safety issues are covered.

**PREREQUISITES**

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following:

Core Curriculum; Mobile Crane Operations Level One, Modules 21101-04 through 21103-04

**OBJECTIVES**

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

1. Identify basic mobile crane safety and rigging procedures.
2. Identify and explain how to avoid the swing paths of a crane.
3. Identify site and environmental hazards associated with mobile cranes.
4. State the safety practices associated with driving a mobile crane.

**PERFORMANCE TASKS**

There are no performance tasks for this module.

**MATERIALS AND EQUIPMENT LIST**

Overhead projector and screen	Copies of ANSI and OSHA standards
Transparencies	Weights
Whiteboard/chalkboard	Fishing pole
Markers/chalk	Copies of site evacuation procedures
Blank acetate sheets	Copies of material safety data sheets (MSDSs)
Transparency pens	Model crane (hydraulic boom)
Pencils and scratch paper	Model crane (lattice boom)
Appropriate personal protective equipment	Manufacturer's operator/maintenance manual
Standard hand signals chart	Module Examinations*
Copies of safety policies and procedures	

\*Located in the Test Booklet.

**SAFETY CONSIDERATIONS**

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly.

**ADDITIONAL RESOURCES**

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

*Cranes and Derricks*, Videotape. 1991. Howard I. Shapiro, P.E., Jay P. Shapiro, P.E., Lawrence K. Shapiro, P.E. New York, NY: McGraw Hill.

*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 *Crane Safety*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

Topic	Planned Time
<b>Session I. Introduction and General Safety</b>	
A. Introduction	_____
B. General Mobile Crane Safety	_____
1. Personal Protection	_____
2. Equipment and Supervision	_____
3. Basic Rigging Precautions	_____
4. ANSI Hand Signals	_____
<b>Session II. Load Control and Safety Standards</b>	
A. Load Control	_____
1. Load Path, Load Control, and Tag Lines	_____
2. Load-Handling Safety	_____
B. Safety Standards	_____
1. OSHA Standards	_____
2. Manufacturers' Standards	_____
3. Corporate Policies and Procedures	_____
<b>Session III. Power Lines and Site Safety</b>	
A. Working Around Power Lines	_____
B. Site Safety	_____
1. Site Hazards and Restrictions	_____
2. Manufacturers' Requirements and Restrictions	_____
<b>Session IV. Emergency Response</b>	
A. Fire	_____
B. Malfunctions During Lifting Operations	_____
C. Hazardous Weather	_____
<b>Session V. Moving Cranes Safely and Using Cranes to Lift Personnel</b>	
A. Moving Cranes Safely	_____
B. Using Cranes to Lift Personnel	_____
<b>Session VI. Review and Module Examination</b>	
A. Review	_____
B. Module Examination	_____
1. Trainees must score 70% or higher to receive recognition from NCCER.	
2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	

## **MODULE OVERVIEW**

This module describes the basic functions of a crane, including standard startup and shutdown procedures. This module provides the trainee with the opportunity to become familiar with the actual crane and the functions of its controls.

## **PREREQUISITES**

Please refer to the Course Map in the Trainee Module. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following:

Core Curriculum; Mobile Crane Operations Level One, Modules 21101-04 through 21104-04

## **OBJECTIVES**

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

1. Perform site analysis and pre-operation and post-operation inspections.
2. Set up cribbing, matting, outriggers, and barricades as required for the safe operation of a crane.
3. Interpret and follow hand signals.
4. Manipulate crane controls to smoothly maneuver a load.
5. Shut a crane down to ensure safety and security.

## **PERFORMANCE TASKS**

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

1. Perform pre-operation and post-operation inspections.
2. Safely set up a crane, outriggers, cribbing, matting, and barricades.
3. Interpret and follow hand signals.
4. Manipulate crane controls to smoothly maneuver a load.
5. Safely shut down a crane.
6. Survey a job site for adequacy of ground support.
7. Analyze a job site for assembly/disassembly room.
8. Select and determine lift location.

## **MATERIALS AND EQUIPMENT LIST**

Overhead projector and screen	Appropriate personal protective equipment
Transparencies	Mobile crane
Whiteboard/chalkboard	Copies of site evacuation procedures
Markers/chalk	Hand signal chart
Blank acetate sheets	Crane manufacturer's operator's manual
Transparency pens	Module Examinations*
Pencils and scratch paper	Performance Profile Sheets*

\*Located in the Test Booklet.

## **SAFETY CONSIDERATIONS**

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Review site safety policies and emergency crane shutdown procedures with the trainees.

## ADDITIONAL RESOURCES

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

*Cranes and Derricks*, 1991. Howard I. Shapiro, P.E., Jay P. Shapiro, P.E., Lawrence K. Shapiro, P.E. New York, NY: McGraw Hill, Inc.

*Crane Setup*, Sanford, FL: Crane Institute of America, 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 25 hours are suggested to cover *Operating a Crane*. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

Topic	Planned Time
<b>Sessions I–III. Introduction and Preparation for Operation</b>	
A. Introduction	_____
B. Site Conditions and Setup Responsibilities	_____
C. Site Analysis	_____
D. Transit	_____
E. Setup	
1. Assembly/Disassembly Clearance	_____
2. Lift Location	_____
3. Ground Conditions	_____
F. Laboratory – Survey a job site for ground support, adequate space, and lift location. This laboratory corresponds to Performance Tasks 6 through 8.	_____
<b>Session IV–VI. Inspection</b>	
A. Pre-Operation Inspection	_____
B. Laboratory – Set up a crane and perform a pre-operation inspection. This laboratory corresponds to Performance Tasks 1 and 2.	_____
<b>Session VII–IX. Operating a Crane</b>	
A. Lifting Operations	_____
B. Operator Aids	_____
C. Controls	_____
D. Practical Operations With and Without a Load	_____
E. Post-Operation Inspection	_____
F. Laboratory – Interpret and follow hand signals, manipulate crane controls, and safely shut down a crane. This laboratory corresponds to Performance Tasks 3 through 5.	_____

## Session X. Review, Module Examination, and Performance Testing

A. Review

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B. Module Examination

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

C. Performance Testing

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

