

MODULE OVERVIEW

This module describes and defines reinforcement materials used in concrete, such as reinforcement bars, bar supports, and welded-wire fabric. It explains the selection and uses of different types of reinforcing materials. It also describes general requirements for cutting, bending, splicing, and tying reinforcing steel, as well as placement of the steel in various types of footings, columns, walls, and slabs.

PREREQUISITES

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

OBJECTIVES

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

1. Describe the applications of reinforcing bars, the uses of reinforced structural concrete, and the basic processes involved in placing reinforcing bars.
2. Recognize and identify the bar bends standardized by the American Concrete Institute (ACI).
3. Read and interpret bar lists and describe the information found on a bar list and bar tag.
4. List the types of ties used in securing reinforcing bars.
5. Perform bar layout and mark bar crossings.
6. Demonstrate the proper use of common ties for reinforcing bars.
7. Describe methods by which reinforcing bars may be cut and bent in the field.
8. Use the tools and equipment needed for installing reinforcing bars.
9. Demonstrate the ability to safely use selected tools and equipment to cut, bend, and install reinforcing materials.
10. Explain the necessity of concrete cover in placing reinforcing bars.
11. Explain and demonstrate how to place bars in walls, columns, beams, girders, joists, and slabs.

PERFORMANCE TASKS

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

1. Lay out and tie rebar at every point in the perimeter of a mat (area to be decided individually).
2. Interpret tags.
3. Cut rebar.
4. Demonstrate and perform commonly used ties (wrap and snap, snap, figure 8, and saddle).

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Bar lists
Transparencies	Hooks and spirals
Blank acetate sheets	Steel wire bar supports
Transparency pens	Precast concrete bar supports
Whiteboard/chalkboard	Plastic bar supports
Markers/chalk	Standees
Pencils and scratch paper	Welded-wire fabric
Appropriate personal protective equipment	Deformed welded-wire fabric
Pieces of marked rebar	ACI standards for concrete coverage
Copies of ASTM standards	Bolt cutters
Bent bars	Electric shears

Hickey bar and jigs
Tie wire
Pliers
Spliced rebar

Mechanically spliced rebar
Copies of Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located in the back of this module.

**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 basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures. This module requires that trainees cut and work with rebar. Ensure that all trainees are properly briefed before working with rebar.

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.

Planning Reinforcing Bars, 2005. Concrete Reinforcing Steel Institute (CRI).

Manual of Standard Practice, Latest Edition. Concrete Reinforcing Steel Institute (CRI).

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 *Concrete Reinforcement*. 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, Overview, and Identification of Reinforcing Bars	
A. Introduction	_____
B. Overview of Reinforced Concrete	_____
C. Identification of Reinforcing Bars	_____
Sessions II and III. General Requirements	
A. Fabrication	_____
B. Laboratory – Trainees practice interpreting reinforcing bar tags. This laboratory corresponds to Performance Task 2.	_____
C. Bar Supports	_____
D. Welded-Wire Fabric	_____
Sessions IV through VI. Safety, Cutting and Bending Reinforcing Bar	
A. General Safety Precautions	_____
B. Cutting	_____
C. Laboratory – Trainees practice cutting reinforcing bar. This laboratory corresponds to Performance Task 3.	_____
D. Bending	_____

Sessions VII through X. Tying and Splicing Reinforcing Bar

- A. Tying and Splicing Reinforcing Bar _____
- B. Tying Tips _____
- C. Laboratory – Trainees practice various types of ties. This laboratory corresponds to Performance Task 4. _____

Sessions XI through XV. Placing Reinforcing Steel

- A. Placing Bars in Footings _____
- B. Column Dowels _____
- C. Placing Bars in Walls _____
- D. Wall Mat Supports _____
- E. Placing Bars in Columns _____
- F. Placing Bars in Beams and Girders _____
- G. Laboratory – Trainees practice laying and tying reinforcing bar. This laboratory corresponds to Performance Task 1. _____

Session XVI. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module explains safety requirements for concrete reinforcement. It provides information on work-zone safety, fall protection, and use of personal protective equipment. It also covers topics such as general work-site safety, how to safely use hand and power tools, trenching safety, and confined spaces.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum, Reinforcing Ironwork Level One*, Module 39101-05.

OBJECTIVES

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

1. Identify hazards associated with working with concrete reinforcing bar.
2. Identify signs and barricades that will help you perform your job safely.
3. Identify safety hazards associated with concrete construction work.
4. Demonstrate and explain proper on-site safety, including the use of appropriate personal protective equipment (PPE).
5. Describe how to safely use ladders and scaffolding.
6. Explain and identify safety hazards associated with excavations.
7. Demonstrate proper lifting and carrying techniques for reinforcing bar.
8. Demonstrate the proper technique for using a positioning device.

PERFORMANCE TASKS

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

1. Demonstrate proper lifting techniques (and setting down) after stretching.
2. Put on fall protection.
3. Wear proper appropriate personal protective equipment (PPE).
4. In real or simulated climbing, demonstrate proper tie-off, body positioning, and three-point contact.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Gloves
Transparencies	Safety shoes
Blank acetate sheets	Hearing protection
Transparency pens	Personal fall arrest system, including:
Whiteboard / chalkboard	Safety harness
Markers / chalk	Lanyards
Pencils and scratch paper	Positioning devices
Samples of common safety signs	Deceleration devices
Safety tags	Lifelines
Safety vest	Anchoring devices
Rebar safety caps	Equipment connectors
Personal protective equipment, including:	Atmospheric hazard detection meter
Hard hats	Copies of Quick Quiz*
Safety glasses	Module Examinations**
	Performance Profile Sheets**

* Located in the back of this module.

** 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 basic site safety. This module may require trainees to visit job sites. Make sure that all trainees are briefed on site safety procedures.

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.

Construction Back Safety. Videocassette. 10 minutes. Coastal Training Technologies Corp. Virginia Beach, VA.

Construction Confined Space Entry. Videocassette. 10 minutes. Coastal Training Technologies Corp. Virginia Beach, VA.

Construction Fall Protection: Get Arrested! Videocassette. 11 minutes. Coastal Training Technologies Corp. Virginia Beach, VA.

Construction Safety. 1996. Jimmie Hinze. Englewood Cliffs, NJ: Prentice Hall.

Construction Safety Council Home Page, <http://buildsafe.org/home.htm>.

Construction Stairways & Ladders. Videocassette. 10 minutes. Coastal Training Technologies Corp. Virginia Beach, VA.

Field Safety, 2003. NCCER. Upper Saddle River, NJ: Prentice Hall.

Handbook of OSHA Construction Safety and Health, 1999. James V. Eidson et al. Boca Raton, FL: Lewis Publishers, Inc.

HazCom for Construction. Videocassette. 11 minutes. Coastal Training Technologies Corp. Virginia Beach, VA.

NAHB-OSHA Jobsite Safety Handbook, 1999. Washington, DC: Home Builder Press. Available online at www.osha.gov.

Occupational Safety and Health Standards for the Construction Industry. Washington, DC: Occupational Safety and Health Administration, U.S. Department of Labor, U.S. Government Printing Office.

Safety Orientation, 2003. NCCER. Upper Saddle River, NJ: Prentice Hall.

Safety Technology, 2003. NCCER. Upper Saddle River, NJ: Prentice Hall.

United States Department of Labor, Occupational Safety and Health Administration Home Page, <http://www.osha.gov>.

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 *Concrete Reinforcement Safety*. 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 Work-Zone Safety	
A. Introduction	_____
B. Work-Zone Safety	_____
1. Signs, Tags, Barricades, and Barriers	_____
2. Highway Work Zones	_____
3. Falling Objects and Tool and Equipment Safety	_____
4. Concrete Construction	_____

- 5. Personal Protective Equipment _____
- 6. Personal Safety _____
- C. Laboratory – Trainees practice proper lifting techniques. This laboratory corresponds to Performance Task 1. _____
- D. Laboratory – Trainees practice putting on personal protective equipment. This laboratory corresponds to Performance Task 3. _____

Session II. Fall Protection

- A. Falling Hazards and Safeguards _____
- B. Guardrails _____
- C. Personal Fall-Arrest Systems _____
- D. Safety Net Systems _____
- E. Rescue After A Fall _____
- F. Laboratory – Trainees practice putting on fall protection. This laboratory corresponds to Performance Task 2. _____
- G. Laboratory – Trainees practice proper climbing techniques. This laboratory corresponds to Performance Task 4. _____

Session III. Ladders and Scaffolding

- A. Ladders _____
- B. Scaffolding _____

Session IV. Trenching

- A. Trenching and Soil Hazards _____
- B. Trench Failure _____
- C. Shoring Systems _____
- D. Sloping Systems _____
- E. Combined Systems _____

Session V. Confined Spaces

- A. Classification and Permits _____
- B. Hazards _____
- C. Responsibilities and Duties _____
- D. Personal Protective Equipment _____
- E. Communication and Training _____

Session VI. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

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, come-alongs, jacks, and tuggers.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Reinforcing Ironwork Level One*, Modules 39101-05 and 39102-05.

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
 - Chain hoists
 - Come-alongs
 - Jacks
 - 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
 - Chain hoists
 - Come-alongs
 - Jacks
 - Tuggers
3. Tie knots used in rigging.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	Various rigging hooks with wear, cracks, and corrosion
Transparencies	Manufacturer's literature on shackles
Blank acetate sheets	Various types of shackles
Transparency pens	Various eyebolts
Whiteboard/chalkboard	Various lifting lugs
Markers/chalk	Turnbuckles
Pencils and scratch paper	Manufacturer's literature on plate clamps
Appropriate personal protective equipment	Various rigging plates and links
Manufacturer's literature on different rigging hooks	Various types of slings

A rigging pocket guide
 29 CFR Section 1926.251, *Rigging Equipment for Material Handling*
 Samples of wire rope that have failed inspection
 Rope for tying knots
 Block and tackle lifting system
 Sample loads for lifting
 Spur-gear chain hoist
 Electric chain hoist

Ratchet-lever hoist or come-along
 Ratchet jack
 Screw jack
 Hydraulic jack
 Tugger
 Quick Quiz*
 Module Examinations**
 Performance Profile Sheets**

*Located in the back of this module.

**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. This module requires trainees to use various types of hoists, jacks, and tuggers. 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 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 10 hours are suggested to cover *Rigging Equipment*. 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 Rigging Hardware	
A. Introduction	_____
B. Rigging Hardware	_____
Session II. Slings and Tag Lines	
A. Slings	
B. Laboratory – 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 – Trainees practice tying knots used in rigging. This laboratory corresponds to Performance Task 3.

Session III. Block and Tackle and Hoists

A. Block and Tackle

B. Chain Hoists

C. Ratchet-Lever Hoists and Come-Alongs

D. Jacks

E. Tuggers

F. Laboratory – Trainees practice selecting, inspecting, and using special rigging equipment. This laboratory corresponds to Performance Task 2.

Session IV. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

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 *Core Curriculum; Reinforcing Ironwork Level One*, Modules 39101-05 through 39103-05.

OBJECTIVES

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

1. Identify and use the correct 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. Identify the components of a lift plan.
7. Perform sling tension calculations.

PERFORMANCE TASKS

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

1. Determine the center of gravity of a load.
2. Properly attach rigging hardware for routine lifts.
3. Use and interpret hand signals.
4. Perform sling tension calculations.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen	<i>ASME B30.5 Consensus Standard</i>
Transparencies	<i>29 CFR 1926.550</i>
Blank acetate sheets	Completed lift plan
Transparency pens	Crane manufacturer's literature
Whiteboard/chalkboard	Typical teeter-totter and weights
Markers/chalk	Various lifting eyebolts
Pencils and scratch paper	Rigging hardware
Appropriate personal protective equipment	Copies of Quick Quiz*
Walkie-talkies	Module Examinations**
Throat microphone	Performance Profile Sheets**
Hardwired communication system	

* Located in the back of this module

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

Rigging Handbook, 2003. Jerry A. Klink. 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 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 Communication	
A. Introduction	_____
B. Methods of Communication	_____
C. Laboratory – Trainees practice using and interpreting hand signals. This laboratory corresponds to Performance Task 3.	_____
Session II. Safety	
A. General Rigging Safety	_____
B. Working Around Power Lines	_____
C. Site Safety	_____
D. Emergency Response	_____
Session III. Lifting Personnel and Lift Planning	
A. Lifting Personnel	_____
B. Lift Planning	_____
Session IV. Load Charts and Load Balancing	
A. Load Charts	_____
B. Load Balancing	_____
C. Laboratory – Trainees practice determining the center of gravity of a load. This laboratory corresponds to Performance Task 1.	_____
D. Laboratory – Trainees practice performing sling tension calculations. This laboratory corresponds to Performance Task 4.	_____
Session V. Rigging Pipe, Rigging Valves, Unloading, and Yarding	
A. Rigging Pipe	_____
B. Rigging Valves	_____
C. Guidelines for Unloading and Yarding Materials	_____
D. Laboratory – Trainees practice properly attaching rigging hardware for routine lifts. This laboratory corresponds to Performance Task 2.	_____

Session VI. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.

MODULE OVERVIEW

This module builds upon the basic information presented in the *Introduction to Blueprints* module studied in the *Core Curriculum*. Trainees will learn the techniques for reading and using blueprints and specifications, with an emphasis placed on those drawings and types of information that are relevant to the reinforcing ironworker trade. It introduces the subject of quantity takeoffs.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum, Reinforcing Ironwork Level One*, Modules 39101-05 through 39104-05.

OBJECTIVES

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

1. Recognize the difference between commercial and residential construction drawings.
2. Identify the basic keys, abbreviations, and other references contained in a set of commercial drawings.
3. Accurately read a set of commercial drawings.
4. Explain basic construction details and concepts employed in commercial construction.
5. Read and interpret the information on a set of commercial drawings.

PERFORMANCE TASKS

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

1. Identify and document the design and location of ten items contained in a set of commercial drawings (the drawings and items will be chosen by the instructor).
2. Using structural drawings (either in the Appendix or of the instructor's choosing), identify the sizes, lengths, configurations, and locations of rebar specified.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen

Transparencies

Blank acetate sheets

Transparency pens

Whiteboard/chalkboard

Markers/chalk

Pencils and scratch paper

Appropriate personal protective equipment

A set of commercial drawings

Quick Quiz*

Module Examinations**

Performance Profile Sheets**

*Located in the back of this module

**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. 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 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.

Architectural Graphic Standards, Eighth Edition, The American Institute of Architects, John Wiley & Sons, New York, NY, 1988.

Basics for Builders: Plan Reading & Material Takeoff, Wayne J. DelPico, R.S. Means Company, Inc., Kingston, MA, 1994.

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 *Commercial Blueprints*. 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 Drawing Requirements and Contents	
A. Introduction	_____
B. Requirements and Contents	_____
Sessions II and III. Architectural and Structural Drawings	
A. Architectural Drawings	
B. Structural Drawings	_____
Sessions IV and V. Mechanical and Electrical Drawings	
A. Mechanical Drawings	_____
B. Electrical Drawings	_____
C. Laboratory – Trainees practice identifying and documenting the design and location of ten items contained in a set of commercial drawings. This laboratory corresponds to Performance Task 1.	_____
Sessions VI and VII. Written Specifications and Rebar Drawings	
A. Written Specifications	_____
B. Rebar Drawings	_____
C. Laboratory – Trainees practice identifying the sizes, lengths, configurations, and locations of rebar specified in a set of commercial drawings. This laboratory corresponds to Performance Task 2.	_____
Session VIII. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.	

MODULE OVERVIEW

This module explains the safety requirements for oxyfuel cutting. It identifies oxyfuel cutting equipment and setup requirements. It explains how to light, adjust, and shut down oxyfuel equipment. Trainees will perform cutting techniques that include straight line, piercing, bevels, washing, and gouging.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Core Curriculum; Reinforcing Ironwork Level One*, Modules 39101-05 through 39105-05.

OBJECTIVES

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

1. Identify and explain the use of oxyfuel cutting equipment.
2. Set up oxyfuel equipment.
3. Light and adjust an oxyfuel torch.
4. Shut down oxyfuel cutting equipment.
5. Disassemble oxyfuel equipment.
6. Change empty cylinders.
7. Perform oxyfuel cutting:
 - Straight line and square shapes
 - Piercing and slot cutting
 - Bevels
 - Washing
 - Gouging
8. Operate a motorized, portable oxyfuel gas cutting machine.

PERFORMANCE TASKS

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

1. Set up oxyfuel equipment.
2. Light and adjust an oxyfuel cutting torch.
3. Shut down oxyfuel cutting equipment.
4. Disassemble oxyfuel equipment.
5. Change empty cylinders.
6. Perform straight line and square shape cutting.
7. Perform piercing and slot cutting.
8. Perform bevel cutting.
9. Perform washing.
10. Perform gouging.

MATERIALS AND EQUIPMENT LIST

Overhead projector and screen
Transparencies
Blank acetate sheets
Transparency pens
Whiteboard/chalkboard
Markers/chalk
Pencils and scratch paper

Appropriate personal protective equipment,
including:
Safety goggles
Face shields
Welding helmets
Ear protection
Welding cap
Leather jacket
Leather pants or chaps

Gauntlet-type welding gloves
 Respirators
ANSI Z49.1-1999
OSHA 29 CFR 1920.146
 MSDS for cutting products
 Oxygen cylinder with cap
 Fuel gas cylinder with cap
 Regulators (oxygen and fuel gas)
 Hose set
 One-piece cutting torch
 Combination cutting torch and torch tips
 Assorted acetylene, liquefied fuel gas, and special
 purpose cutting torch tips
 Tip cleaners
 Tip drills
 Mechanical guide
 Cylinder cart

Motorized oxyfuel track cutter
 Framing squares
 Combination squares with protractor head
 Tape measure
 Soapstone
 Penknife
 Pliers
 Chipping hammer
 Friction lighter
 Vendor cutting tip chart
 Wrenches (torches, hose, and regulator)
 Thin steel plate (16 to 10 gauge)
 Thick steel plate (¼ inch to 1 inch)
 Portable oxyfuel cutting machine
 Module Examinations*
 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. This module requires that the trainees operate oxyfuel cutting equipment. Ensure that trainees are briefed on fire and shop safety policies prior to performing any work. Emphasize the special safety precautions associated with the use of cylinders and oxyfuel cutting equipment.

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.

Modern Welding, 2000. A.D. Althouse, C.H. Turnquist, W.A. Bowditch, and K.E. Bowditch. Tinley Park, IL: The Goodheart Willcox Company, Inc.

Safety in Welding, Cutting, and Allied Processes, ANSI Z49.1-99, 1999. Miami, FL: American Welding Society.

Welder's Handbook, Richard Finch, 1997. New York, NY: The Berkley Publishing Group, 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 17.5 hours are suggested to cover *Oxyfuel Cutting*. 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, Safety, and Oxyfuel Cutting Equipment	
A. Introduction	_____
B. Oxyfuel Cutting Safety	_____

C. Oxyfuel Cutting Equipment

- 1. Cutting Torches
- 2. Cutting Torch Tip and Tip Equipment
- 3. Friction Lighters
- 4. Cylinders
- 5. Soapstone Markers
- 6. Specialized Equipment

Session II. Setting Up Oxyfuel Equipment

A. Setting Up Oxyfuel Equipment

- 1. Cylinders
- 2. Hoses and Regulators
- 3. Torches and Tip
- 4. Purging and Testing

B. Laboratory – Trainees practice setting up oxyfuel equipment. This laboratory corresponds to Performance Task 2.

Sessions III. Torch Operations

A. Controlling the Oxyfuel Torch Flame

B. Laboratory – Trainees practice lighting, adjusting, and shutting down an oxyfuel cutting torch. This laboratory corresponds to Performance Tasks 3 and 4.

C. Shutting Down Oxyfuel Equipment

D. Disassembling Oxyfuel Equipment

E. Laboratory – Trainees practice disassembling an oxyfuel cutting torch. This laboratory corresponds to Performance Task 5.

F. Changing Empty Cylinders

G. Laboratory – Trainees practice changing empty cylinders on an oxyfuel cutting torch. This laboratory corresponds to Performance Task 6.

Sessions IV through VI. Performing Cutting Operations

A. Performing Cutting Procedures

B. Portable Oxyfuel Cutting Machine Operation

C. Laboratory – Trainees practice straight line and square shape cutting with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 6.

D. Laboratory – Trainees practice piercing and slot cutting with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 7.

E. Laboratory – Trainees practice bevel cutting with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 7.

F. Laboratory – Trainees practice washing with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 7.

G. Laboratory – Trainees practice gouging with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 7.

H. Laboratory – Trainees practice using a portable oxyfuel cutting machine. This laboratory corresponds to Performance Task 8.

Session VII. Review, Module Examination, and Performance 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 Craft 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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.