

Lesson Plans for Module 27304-14

REINFORCING CONCRETE

Module 27304-14 describes the selection and uses of different types of reinforcing materials. The text discusses requirements for cutting, bending, splicing, and tying reinforcing steel and the placement of steel in footings, columns, walls, and slabs.

Objectives

Learning Objective 1

- List applications of reinforced concrete.
 - a. Describe how forces are resisted in concrete through the use of reinforcing bars.
 - b. List applications for reinforced structural concrete.
 - c. Discuss how posttensioned concrete is created.

Learning Objective 2

- Describe the general requirements for working with reinforcing steel, including tools, equipment, and fabricating methods.
 - a. List general safety precautions when working with reinforcing steel.
 - b. Describe the general characteristics of reinforcing steel.
 - c. Discuss how reinforcing steel is fabricated.
 - d. Explain the purpose of bar supports.
 - e. Explain how welded-wire fabric reinforcement is used to reinforce concrete.

Learning Objective 3

- Describe methods by which reinforcing bars may be bent and cut in the field.
 - a. Describe how to cut rebar.
 - b. Describe how to bend rebar.

Learning Objective 4

- Explain the methods for placing reinforcing steel.
 - a. Discuss the proper method for tying and splicing reinforcing steel.
 - b. Explain the proper procedure for placing reinforcing steel.

Performance Tasks

Performance Task 1 (Learning Objective 3)

- Use appropriate tools to cut and bend reinforcing bars.

Performance Task 2 (Learning Objective 4)

- Demonstrate five types of ties for reinforcing bars.

Performance Task 3 (Learning Objective 4)

- Demonstrate proper lap splicing of reinforcing bars using wire ties.

Performance Task 4 (Learning Objective 4)

- Demonstrate the proper placement, spacing, tying, and support for reinforcing bars.

Teaching Time: 15 hours

(Six 2.5-hour Classroom Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites

Core Curriculum, Construction Craft Laborer Level One

Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the Module Examinations and Performance Profile Sheets from www.nccerirc.com. The passing score for submission into NCCER's Registry is 70 percent or above for the Module Examination; performance testing is graded pass or fail.



Safety Considerations

This module requires that trainees cut, bend, tie, splice, and place reinforcing bars. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

Classroom Equipment and Materials

Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Construction Craft Laborer Level Two
PowerPoint® Presentation Slides
Computer
Copies of the Module Examination and Performance Profile Sheets
Vendor-supplied videos/DVDs showing the reinforcement of concrete (optional)
TV/DVD player

Equipment and Materials for Laboratories and Performance Testing

Personal protective equipment:
ANSI-approved footwear
Hard hat
Leather-palm gloves
Safety glasses
2" leather belt
ACI standards for concrete coverage
Bar lists
Bent bars
Bolt cutters
Copies of ASTM standards
Deformed welded-wire fabric
Electric shears
Hickey bar and jigs
Hooks and spirals
Keel holder
Level
Mechanically spliced rebar
Pieces of marked rebar
Plastic bar supports
Pliers
Plumb bob
Precast concrete bar supports
Sample bar list
Samples of welded-wire fabric reinforcement
Side-cutting pliers
Sledgehammer
Spliced rebar
Standees
Steel wire bar supports
Tape measure
Tie wire
Tie-wire reel
Tool pouch
Unlabeled copies of *Figures 9, 11, 17, and 23*
Welded-wire fabric

Additional Resources and References

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

29 CFR 1926, Safety and Health Regulations for Construction, Latest Edition. Washington, D.C.: Occupational Safety and Health Administration.

ACI 315, Details and Detailing of Concrete Reinforcement, Latest Edition. Farmington Hills, MI: American Concrete Institute.

ACI 318-95, Building Code Requirements for Structural Concrete, Latest Edition. Farmington Hills, MI: American Concrete Institute.

ASTM A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, Latest Edition. West Conshohocken, PA: ASTM International.

ASTM A706, Standard Specification for Low-Alloy Steel Deformed Bars and Plain Bars for Concrete Reinforcement, Latest Edition. West Conshohocken, PA: ASTM International.

ASTM A996, Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement, Latest Edition. West Conshohocken, PA: ASTM International.

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

Placing Reinforcing Bars. 2005. Concrete Reinforcing Steel Institute (CRSI).

There are a number of online resources available for trainees who would like more information on reinforcing concrete. A search for additional information may be assigned as homework to interested trainees.



REINFORCING CONCRETE

The lesson plan for this module is divided into six 2.5-hour sessions. Each session includes 10 minutes for administrative tasks and one 10-minute break.

SESSION ONE

Session One introduces the various applications of reinforced concrete.

1. Show Session One PowerPoint® presentation slides.
2. Introduce trainees to applications requiring reinforcing bars in concrete.
3. Introduce trainees to applications requiring reinforced structural concrete.
4. Introduce trainees to applications requiring post-tensioned concrete.

SESSIONS TWO AND THREE

Sessions Two and Three introduce the general requirements for working with reinforcing steel.

1. Show Sessions Two and Three PowerPoint® presentation slides.
2. Introduce trainees to the safety precautions required when working with reinforcing steel.
3. Introduce trainees to the general characteristics of reinforcing steel.
4. Introduce trainees to the process of fabricating reinforcing steel.
5. Introduce trainees to the purpose of bar supports.
6. Introduce trainees to applications requiring welded-wire fabric reinforcement.

SESSIONS FOUR AND FIVE

Sessions Four and Five introduce tying, bending cutting, and splicing reinforcing bars.

1. Show Sessions Four and Five PowerPoint® presentation slides.
2. Introduce trainees to the process of cutting and bending reinforcing bars.
3. Introduce trainees to the process of lap splicing reinforcing bars using wire ties.
4. Introduce trainees to the placement of reinforcing steel.

SESSION SIX

Session Six is a review and testing session. Have trainees complete the module Review Questions and Trade Terms Quiz. (Alternatively, these may be assigned as homework at the end of Session Five.) Answer any questions that trainees may have.

1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on the Registration of Training Modules Form, and submit the report to your Training Program Sponsor.

Materials Checklist for Module 27304-14, Reinforcing Concrete

Equipment and Materials					
Personal protective equipment:		2" leather belt		Plumb bob	
ANSI-approved footwear		ACI standards for concrete coverage		Precast concrete bar supports	
Hard hat		Bar lists		Sample bar list	
Leather-palm gloves		Bent bars		Samples of welded-wire fabric reinforcement	
Safety glasses		Bolt cutters		Side-cutting pliers	
Whiteboard/chalkboard		Copies of ASTM standards		Sledgehammer	
Markers/chalk		Deformed welded-wire fabric		Spliced rebar	
Pencils and paper		Electric shears		Standeeds	
<i>Construction Craft Laborer Level Two</i> PowerPoint® Presentation Slides		Hickey bar and jigs		Steel wire bar supports	
Computer		Hooks and spirals		Tape measure	
Copies of the Module Examination and Performance Profile Sheets		Keel holder		Tie wire	
Vendor-supplied videos/DVDs showing the reinforcement of concrete (optional)		Level		Tie-wire reel	
TV/DVD player		Mechanically spliced rebar		Tool pouch	
		Pieces of marked rebar		Unlabeled copies of <i>Figures 9, 11, 17, and 23</i>	
		Plastic bar supports		Welded-wire fabric	
		Pliers			

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.

