MODULE OVERVIEW
This module introduces trainees to the principles, equipment, and methods used to perform the site layout tasks of distance measurement and differential leveling. It also covers the site layout responsibilities of individuals on site, understanding and using site plan drawings, and methods of job site communications.

PREREQUISITES
Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Carpentry Level One; Carpentry Level Two; and Carpentry Level Three.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Describe the major responsibilities of the carpenter relative to site layout.
2. Convert measurements stated in feet and inches to equivalent measurements stated in decimal feet, and vice versa.
3. Use and properly maintain tools and equipment associated with taping.
4. Use manual or electronic equipment and procedures to make distant measurements and perform site layout tasks.
5. Determine approximate distances by pacing.
6. Recognize, use, and properly care for tools and equipment associated with differential leveling.
7. Use a builder’s level and differential leveling procedures to determine site and building elevations.
8. Record site layout data and information in field notes using accepted practices.
9. Check and/or establish 90-degree angles using the 3-4-5 rule.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Interpret a construction site/plot drawing and relate the man-made and topographical features and other project information to the layout and topography on the actual site.
2. Convert measurements given in feet and inches to equivalent decimal measurements stated in feet, tenths, and hundredths, and vice versa.
3. Properly use taping equipment and procedures to make distance and site layout measurements.
4. Determine the approximate distances by pacing.
5. Set up, adjust, and field test leveling instruments.
6. Use a builder’s level, leveling rods, and differential leveling procedures to determine site and building elevations.
7. Record differential leveling data in field notes in accordance with accepted procedures.
8. Use differential leveling and distance measurement procedures to transfer elevations up a structure.
9. Check and/or establish 90-degree angles using the 3-4-5 rule.

MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td>Markers/chalk</td>
</tr>
<tr>
<td>Transparencies</td>
<td>Pencils and scratch paper</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Appropriate personal protective equipment</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Site plot plans for selected construction sites</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Assortment of hubs, stakes, and laths</td>
</tr>
</tbody>
</table>

continued
Assortment of different colored flagging tape
Permanent markers for marking stakes
Field notebooks for recording data
2" × 4" or 2" × 6" ledger boards
2" × 4" batter boards
Nylon string
Calculator
100 foot steel tape
Range poles
Plumb bobs/gammon reels
Hand sight levels

* 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 use differential leveling equipment. Ensure that all trainees are briefed on field 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. This module may require trainees use laser equipment. Ensure all trainees are briefed on laser safety before using laser 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.


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 22½ hours are suggested to cover Site Layout I: Distance Measurement and Leveling. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction to Site Layout</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Building Plan Drawings</td>
<td></td>
</tr>
<tr>
<td>C. Characteristics of Contour Lines</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice interpreting a site/plot drawing. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
</tbody>
</table>

| **Session II. Site Control Points and Hand Signals** | |
| A. Site Control Points | |
| B. Communicating with Hand Signals | |
Sessions III and IV. Distance Measurements
A. Distance Measurement Tools and Equipment
B. Measuring Distance by Taping
C. Laboratory
   Trainees practice making measurements by taping. This laboratory corresponds to Performance Task 3.
D. Converting Distances
E. Laboratory
   Trainees practice converting measurements. This laboratory corresponds to Performance Task 2.
F. Estimating Distances by Pacing
G. Laboratory
   Trainees practice estimating distances by pacing. This laboratory corresponds to Performance Task 4.

Session V. Differential Leveling Equipment
A. Differential Leveling Tools and Equipment
B. Laboratory
   Trainees practice setting up, adjusting, and field testing a leveling instrument. This laboratory corresponds to Performance Task 5.

Sessions VI and VII. Basics of Differential Leveling
A. Basics of Differential Leveling
B. Laboratory
   Trainees practice using leveling equipment to determine site elevations. This laboratory corresponds to Performance Task 6.
C. Field Notes
D. Laboratory
   Trainees practice recording differential leveling data in field notes. This laboratory corresponds to Performance Task 7.

Session VIII. Leveling Applications
A. Leveling Applications
B. Laboratory
   Trainees practice using leveling procedures to transfer elevations. This laboratory corresponds to Performance Task 8.
C. Batter Boards
D. 3-4-5 Rule
E. Laboratory
   Trainees practice checking or establishing 90-degree angles using the 3-4-5 rule. This laboratory corresponds to Performance Task 9.

Session IX. Review and Testing
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.
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 introduces the carpentry trainee to various cements and other materials that, when mixed together, form various types of concrete. Concrete volume estimates and concrete forms are also covered. In addition, reinforcement materials such as reinforcement bars, bar supports, and welded-wire fabric are discussed.

PREREQUISITES
Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; and Carpentry Fundamentals Level One, Modules 27101-06 through 27107-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify the properties of cement.
2. Describe the composition of concrete.
3. Perform volume estimates for concrete quantity requirements.
4. Identify types of concrete reinforcement materials and describe their uses.
5. Identify various types of footings and explain their uses.
6. Identify the parts of various types of forms.
7. Explain the safety procedures associated with the construction and use of concrete forms.
8. Erect, plumb, and brace a simple concrete form with reinforcement.

PERFORMANCE TASKS
Under supervision of the instructor, the trainee should be able to do the following:
1. Perform volume estimates for concrete quantity requirements.
2. Construct a simple concrete form with reinforcement.

MATERIALS AND EQUIPMENT LIST

| Transparencies | Various mechanical splices for reinforcement steel |
| Markers/chalk  | Various sizes, types, and grades of reinforcement materials |
| Blank acetate sheets | Samples of various types and sizes of wire fabric |
| Transparency pens | Exterior plywood or plyform |
| Pencils and scratch paper | Steel tape or rule |
| Overhead projector and screen | Basic carpenter’s toolbox |
| Whiteboard/chalkboard | Level |
| Appropriate personal protective equipment | Plumb bob |
| Hand calculator | String line |
| Concrete calculator | Duplex nails |
| Copies of a concrete table | Plan for simple form |
| Form boards, stakes, braces, ties, and spreaders | Circular saw and extension cord |
| 16-gauge tying wire | Copies of Worksheet 1* |
| Samples of various aggregates | Module Examinations** |
| Samples of concrete mix | Performance Profile Sheets** |
| Various bar supports and accessories |

* Packaged with this Annotated Instructor’s Guide.

**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.

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.


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 Introduction to Concrete, Reinforcing Materials, and Forms. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction; Concrete and Concrete Materials; Normal Concrete Mix Proportions and Measurements; Special Types of Concrete; Curing Methods and Materials; Concrete Slump Testing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Concrete and Concrete Materials</td>
<td></td>
</tr>
<tr>
<td>1. Portland Cement</td>
<td></td>
</tr>
<tr>
<td>2. Aggregates for Concrete</td>
<td></td>
</tr>
<tr>
<td>3. Water for Concrete</td>
<td></td>
</tr>
<tr>
<td>4. Admixtures for Concrete</td>
<td></td>
</tr>
<tr>
<td>C. Normal Concrete Mix Proportions and Measurements</td>
<td></td>
</tr>
<tr>
<td>D. Special Types of Concrete</td>
<td></td>
</tr>
<tr>
<td>E. Curing Methods and Materials</td>
<td></td>
</tr>
<tr>
<td>F. Concrete Slump Testing</td>
<td></td>
</tr>
</tbody>
</table>

| **Session II. Estimating Concrete Volume; Concrete Reinforcement Materials** |             |
| A. Estimating Concrete Volume                                         |              |
| 1. Rectangular Volume Calculations                                    |              |
| 2. Circular Volume Calculations                                       |              |
| B. Laboratory                                                        |              |
| Hand out Worksheet 27108-1. Have the trainees complete the Worksheet. This laboratory corresponds to Performance Task 1. |             |
| C. Concrete Reinforcement Materials                                  |              |
| 1. Reinforcing Bars                                                   |              |
| 2. Bar Supports                                                      |              |
| 3. Splicing Reinforcing Bars                                          |              |
| 4. Welded-Wire Fabric                                                |              |
Session III. Concrete Forms
A. Concrete Forms
   1. Form Safety
   2. Footings
   3. Wall Forms
   4. Edge Forms
   5. Removing Forms
B. Laboratory
   Under your supervision, have the trainees erect, plumb, and brace a simple concrete form. 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 the tools, equipment, and procedures for handling, placing, and finishing concrete. It also covers the joints made in concrete structures, the use of joint sealants, and form removal procedures. It emphasizes safety procedures for handling, placing, and finishing concrete.

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; Carpentry Level One; Carpentry Level Two; and Carpentry Level Three, Modules 27301-07 through 27304-07.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Recognize the various equipment used to transport and place concrete.
2. Describe the factors that contribute to the quality of concrete placement.
3. Demonstrate the correct methods for placing and consolidating concrete into forms.
4. Demonstrate how to use a screed to strike off and level concrete to the proper grade in a form.
5. Demonstrate how to use tools for placing, floating, and finishing concrete.
6. Determine when conditions permit the concrete finishing operation to start.
7. Name the factors that affect the curing of concrete and describe the methods used to achieve proper curing.
8. Properly care for and safely use hand and power tools used when working with concrete.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Properly handle, place, and consolidate concrete in selected concrete forms.
2. Use a screed to strike off and level a concrete surface.
3. Use a bullfloat and/or darby to level and smooth a concrete surface.
4. Use an edger to form a radius at the edges of a concrete pad, slab, etc.
5. Use a jointer to make control joints in a concrete surface.
6. Use a hand float and finishing trowel to level high spots, remove imperfections, and smooth a concrete surface.

MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Overhead projector and screen</th>
<th>Belt conveyor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparencies</td>
<td>Concrete pump</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Pneumatic gun</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Internal vibrator</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Rollerbug tamper</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Equipment for screeding, leveling, and finishing concrete, including:</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>Manual/power screeds</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>Knee boards</td>
</tr>
<tr>
<td>Equipment for moving, placing, and consolidating concrete, including:</td>
<td>Darby floats/bullfloats</td>
</tr>
<tr>
<td>Moveable chutes (such as used with mixer trucks)</td>
<td>Pointed trowels</td>
</tr>
<tr>
<td>Drop chutes</td>
<td>Edgers</td>
</tr>
<tr>
<td>Elephant trunk</td>
<td>Jointers (groovers)</td>
</tr>
<tr>
<td>Wheelbarrow</td>
<td>Power saws</td>
</tr>
<tr>
<td>Power buggy and/or carts</td>
<td>Hand floats</td>
</tr>
<tr>
<td>Crane and bucket</td>
<td>Hand trowels</td>
</tr>
<tr>
<td></td>
<td>Finishing machines</td>
</tr>
</tbody>
</table>
Brooms
Assortment of combination tools
Pointing and margin trowels
Cement hammers
Carborundum rubbing stones
Sprayers
Power grinders
Properly-constructed concrete formworks

Sand
Boxes to contain wet sand
Copies of Quick Quiz*
Module Examinations**
Performance Profile Sheet**

*Located in the back of this module.
**Single-module AIG purchases include the printed exam and performance task sheet. If you have pur-chased 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. Concrete dust and its components are caustic; brief trainees on the hazards posed by dry and wet concrete and respiratory and skin protection needed. 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.

American Concrete Institute. www.concrete.org
Cement Association of Canada. www.cement.ca

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 22½ hours are suggested to cover Handling and Placing Concrete. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session I. Overview and Joints in Concrete Structures</td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Joints in Concrete Structures</td>
<td></td>
</tr>
<tr>
<td>Session II. Moving and Handling Concrete</td>
<td></td>
</tr>
<tr>
<td>A. Off-Site Equipment for Mixing and Conveying Concrete</td>
<td></td>
</tr>
<tr>
<td>B. On-Site Equipment for Mixing and Conveying Concrete</td>
<td></td>
</tr>
<tr>
<td>Sessions III and IV. Placing and Consolidating Concrete in Forms</td>
<td></td>
</tr>
<tr>
<td>A. Placing Concrete in Forms</td>
<td></td>
</tr>
<tr>
<td>B. Consolidating Concrete</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice placing, handling, and consolidating concrete in selected concrete forms. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
</tbody>
</table>
Session V. Finishing I

A. Screeding

B. Laboratory

Trainees practice using a screed to strike off and level a concrete surface. This laboratory corresponds to Performance Task 2.

C. Leveling Concrete

D. Laboratory

Trainees practice using a bullfloat and/or darby to level and smooth a concrete surface. This laboratory corresponds to Performance Task 3.

Session VI. Finishing II

A. Edging

B. Laboratory

Trainees practice using an edger to form a radius at the edges of a concrete pad or slab. This laboratory corresponds to Performance Task 4.

C. Jointing

D. Laboratory

Trainees practice using a jointer to make control joints in a concrete surface. This laboratory corresponds to Performance Task 5.

E. Floating and Troweling

F. Laboratory

Trainees practice using a hand float and finishing trowel to level high spots, remove imperfections, and smooth a concrete surface. This laboratory corresponds to Performance Task 6.

Session VII.

A. Curing Concrete

B. Joint Sealants

C. Removing Forms

Session VIII. Tools and Safety

A. Other Hand and Power Tools Used When Working with Concrete

B. Safety Precautions

Session IX. Module Testing

A. Module 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.

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 introduces the trainee to the historic and current methods and procedures used in the masonry trade. Brick and block manufacturing is explained, along with the types of brick and block that are currently used in various types of masonry construction. Knowledge, skill, and ability requirements of a mason are also described. An overview of the basic safety practices and requirements found in the masonry trade is also provided. The trainee is directed in the use of appropriate personal protective equipment, handling hazardous materials, and general work safety. Basic bricklaying techniques are also covered.

RECOMMENDED PREREQUISITES

Core Curriculum

OBJECTIVES

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

1. Discuss the history of masonry.
2. Describe modern masonry materials and methods.
3. Explain career ladders and advancement possibilities in masonry work.
4. Describe the skills, attitudes, and abilities needed to work as a mason.
5. State the safety precautions that must be practiced at a work site, including the following:
   - Safety practices
   - Fall-protection procedures
   - Forklift-safety operations
6. Perform the following basic bricklaying procedures:
   - Mixing of mortar
   - Laying a mortar bed
   - Laying bricks
7. Put on eye protection, respiratory protection, and a safety harness.
8. Use the correct procedures for fueling and starting a gasoline-powered tool.

PERFORMANCE TASKS

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

1. Put on eye protection, respiratory protection, and a safety harness.
2. Demonstrate the ability to properly use a trowel to spread and furrow bed joints and butter head joints.
MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td>Various types of brick</td>
</tr>
<tr>
<td>Transparencies</td>
<td>Various types of concrete blocks</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Various trowels</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Mortar mix</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Mortar mixing pan</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>Wheelbarrow</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>Various types of brick</td>
</tr>
<tr>
<td>Appropriate personal protective equipment:</td>
<td>Various types of concrete blocks</td>
</tr>
<tr>
<td>Various types of eye and respiratory protection</td>
<td>Standard concrete blocks</td>
</tr>
<tr>
<td>Safety harness and hardware</td>
<td>Module Examinations*</td>
</tr>
<tr>
<td>ASTM standards on concrete block and masonry mortar</td>
<td>Performance Profile Sheets*</td>
</tr>
</tbody>
</table>

*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.

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.


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 Introduction to Masonry. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session I. Introduction to Masonry</td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. The History of Masonry</td>
<td></td>
</tr>
<tr>
<td>C. Masonry Today</td>
<td></td>
</tr>
<tr>
<td>1. Clay Products</td>
<td></td>
</tr>
<tr>
<td>2. Brick Masonry Terms</td>
<td></td>
</tr>
<tr>
<td>D. Concrete Products</td>
<td></td>
</tr>
<tr>
<td>1. Block</td>
<td></td>
</tr>
<tr>
<td>2. Concrete Brick</td>
<td></td>
</tr>
<tr>
<td>3. Other Concrete Units</td>
<td></td>
</tr>
</tbody>
</table>
Session II. Stone, Mortars, Grouts, and Construction Techniques

A. Stone
B. Mortars and Grouts
C. Construction Techniques
   1. Wall Structures
   2. Modern Techniques
D. Field trip or presentation on different types of masonry units

Session III. Careers in Masonry

A. Masonry as a Career
B. Knowledge, Skills, and Ability
C. Field trip or presentation on masonry careers

Sessions IV–V. Basic Bricklaying

A. Preparing Mortar
B. Spreading Mortar
C. Picking Up Mortar
D. Spreading, Cutting, and Furrowing
E. Buttering Joints
F. General Rules
G. Laboratory – Trainees practice spreading and furrowing bed joints and buttering head joints. This laboratory corresponds to Performance Task 2.

Sessions VI–VII. Safety

A. Safety Practices
   1. Personal Protective Equipment
   2. Hazards on the Job
   3. Hazardous Materials Safety
   4. Modern Techniques
   5. Weather Hazards
B. Fall Protection
C. Forklift Safety
D. Laboratory – Trainees practice putting on eye protection, respiratory protection, and a safety harness. This laboratory corresponds to Performance Task 1.

Session VIII. Review, Module Examination and Performance Testing

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.
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.
Masonry Units and Installation Techniques
Annotated Instructor’s Guide

MODULE OVERVIEW
This module introduces the methods and procedures used in masonry unit installation. Topics include basic techniques for laying brick and block, using mortar to bond masonry units, and patterns. Hands-on skill development in constructing wythes and courses is also emphasized.

RECOMMENDED PREREQUISITES
Core Curriculum; Masonry Level One, Modules 28101-04 through 28104-04

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

1. Describe the most common types of masonry units.
2. Describe and demonstrate how to set up a wall.
3. Lay a dry bond.
4. Spread and furrow a bed joint, and butter masonry units.
5. Describe the different types of masonry bonds.
6. Cut brick and block accurately.
7. Lay masonry units in a true course.

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

1. Lay a dry bond.
2. Accurately cut masonry units with a brick set and masonry hammer, a block set and mash, and a masonry hammer, power saw, and splitter.
3. Spread, edge, and furrow bed joints.
4. Butter masonry units and place them on a bed joint.
5. Lay masonry units in courses that are true for height, level, plumb, and straightness.
6. Build a rackback corner lead.
7. Lay masonry units to the line.
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  
ASTM standards for CMUs  
ASTM standards for concrete bricks  
Bricks  
Chalkline  
Crayons or wax markers  
Medicine dropper  
Spacing jigs  
Concrete blocks  
Brick set chisels  
Block set chisels  
Hammers  
Mason’s hammers  
Mason’s lines  
Line blocks  
Line pins  
Line trigs  
Masonry saw  
Masonry power saw  
Mashes  
Mortar mix  
Mortar pans  
Trowels  
Mason’s levels  
Plumb bobs  
Rakers  
Jointers  
Sledrunners  
Splitters  
Masonry brushes  
Tuckpointers  
MSDS for masonry cleaning solution  
Module Examinations*  
Performance Profile Sheets*  

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic job site and tool 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.

Bricklaying: Brick and Block Masonry. Reston, VA: Brick Institute of America.
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 60 hours are suggested to cover Masonry Units and Installation
Techniques. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction, Concrete Masonry, Clay and Other Materials</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Concrete Masonry Materials</td>
<td></td>
</tr>
<tr>
<td>C. Clay and Other Materials</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions II–III. Setting Up and Laying Out (2 Sessions)</strong></td>
<td></td>
</tr>
<tr>
<td>A. Setting Up</td>
<td></td>
</tr>
<tr>
<td>B. Job Layout</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory – Trainees practice laying a dry bond. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions IV–VI. Block Head Joints and Bonding Masonry Units (3 Sessions)</strong></td>
<td></td>
</tr>
<tr>
<td>A. Block Head Joints</td>
<td></td>
</tr>
<tr>
<td>1. Buttering Blocks</td>
<td></td>
</tr>
<tr>
<td>2. Block Bed Joints</td>
<td></td>
</tr>
<tr>
<td>3. General Rules</td>
<td></td>
</tr>
<tr>
<td>B. Bonding Masonry Units</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory – Trainees practice spreading, edging, and furrowing bed joints and buttering bricks and blocks and placing them on a bed joint. This laboratory corresponds to Performance Tasks 3 and 4.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions VII–IX. Cutting Masonry Units (3 Sessions)</strong></td>
<td></td>
</tr>
<tr>
<td>A. Brick Cuts</td>
<td></td>
</tr>
<tr>
<td>B. Block Cuts</td>
<td></td>
</tr>
<tr>
<td>C. Cutting with Hand Tools</td>
<td></td>
</tr>
<tr>
<td>D. Cutting with Saws and Splitters</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory – Trainees practice accurately cutting masonry units with a brick set and masonry hammer, a block set and mash, and a masonry hammer, power saw, and splitter. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions X–XIV. Laying Masonry Units (5 Sessions)</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laying Brick in Place</td>
<td></td>
</tr>
<tr>
<td>B. Checking Height</td>
<td></td>
</tr>
<tr>
<td>C. Checking Level, Plumb, and Straightness</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory – Trainees practice laying courses that are true for height, level, plumb, and straightness. This laboratory corresponds to Performance Task 5.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions XV–XIX. Building Corners and Leads (5 Sessions)</strong></td>
<td></td>
</tr>
<tr>
<td>A. Placing Block</td>
<td></td>
</tr>
<tr>
<td>B. Laying To the Line</td>
<td></td>
</tr>
<tr>
<td>C. Building Corners and Leads</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory – Trainees practice building a rackback corner lead and laying to the line. This laboratory corresponds to Performance Tasks 6 and 7.</td>
<td></td>
</tr>
</tbody>
</table>
Sessions XX–XXI. Mortar Joints (2 Sessions)
   A. Joint Finishes
   B. Striking the Joint
   C. Laboratory – Trainees practice striking mortar joints.

Sessions XXII–XXIII. Patching Mortar and Cleaning Masonry Units (2 Sessions)
   A. Patching Mortar
      1. Pointing
      2. Tuckpointing
      3. Laboratory – Trainees practice tuckpointing.
   B. Cleaning Masonry Units

Session XXIV. Review, Module Examination and Performance Testing
   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.
   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 introduces the carpentry trainee to residential floor systems. It covers the materials and general methods used to construct floor systems, with emphasis placed on the platform method of floor framing.

PREREQUISITES
Prior to training with this module, it is suggested that the trainee shall have successfully completed Core Curriculum; and Carpentry Fundamentals Level One, Modules 27101-06 through 27104-06.

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

1. Identify the different types of framing systems.
2. Read and interpret drawings and specifications to determine floor system requirements.
3. Identify floor and sill framing and support members.
4. Name the methods used to fasten sills to the foundation.
5. Given specific floor load and span data, select the proper girder/beam size from a list of available girders/beams.
6. List and recognize different types of floor joists.
7. Given specific floor load and span data, select the proper joist size from a list of available joists.
8. List and recognize different types of bridging.
9. List and recognize different types of flooring materials.
10. Explain the purposes of subflooring and underlayment.
11. Match selected fasteners used in floor framing to their correct uses.
12. Estimate the amount of material needed to frame a floor assembly.
13. Demonstrate the ability to:
   - Lay out and construct a floor assembly
   - Install bridging
   - Install joists for a cantilever floor
   - Install a subfloor using butt-joint plywood/OSB panels
   - Install a single floor system using tongue-and-groove plywood/OSB panels

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

1. Lay out and construct a floor assembly.
2. Install bridging.
3. Install joists for a cantilever floor.
4. Install a subfloor using butt-joint plywood/OSB panels.
5. Install a single floor system using tongue-and-groove plywood/OSB panels.
6. Estimate the amount of material needed to frame a floor assembly.
7. Given specific floor load and span data, select the proper girder/beam and joist size from a list of available girders/beams/joists.
MATERIALS AND EQUIPMENT LIST

- Transparencies
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Overhead projector and screen
- Whiteboard/chalkboard
- Appropriate personal protective equipment
- Floor adhesive (optional)
- Beam material
- Grout
- Plywood or OSB butt-joint panels to cover floor area
- Plywood or OSB (tongue-and-groove, 1/4”) to cover floor area
- Shim materials
- Sill sealer
- Steel bridging and instructions
- Termite shield
- 2 x 6s for sills
- 2 x 10s for joists and headers
- 1 x 4s or 2 x 10s for bridging
- 8d box nails for bridging
- 8d box, screw, or ring shank nails for flooring
- 16d box nails for joists and headers
- 8d doublehead box nails
- Pictures, photographs, etc., showing braced, balloon, platform, and post-and-beam framing
- Sets of building working drawings and specifications
- Examples of several floor plans and specifications
- Pictures/photos of building damage that resulted from defective floor and sill framing (optional)
- Tool box consisting of standard carpenter’s hand tools
- Chalkline
- Electric drill and assorted drill and flat bits
- Framing square
- Level
- 100’ tape
- Power circular saw and extension cord
- Reciprocating saw
- Tin snips
- Copies of Worksheets 1 through 3*
- Copies of Job Sheets 1 through 5*
- Module Examinations**
- Performance Profile Sheets**

* Packaged with this Annotated Instructor’s Guide.

** 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.

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.


Building with Floor Trusses. Madison, WI: Wood Truss Council of America (11-minute DVD or video).


## 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 Floor Systems. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction; Methods of Framing Houses; Building Working Drawings and Specifications</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Methods of Framing Houses</td>
<td></td>
</tr>
<tr>
<td>1. Platform Frame</td>
<td></td>
</tr>
<tr>
<td>2. Braced Frame</td>
<td></td>
</tr>
<tr>
<td>3. Balloon Frame</td>
<td></td>
</tr>
<tr>
<td>4. Post-and-Beam Frame</td>
<td></td>
</tr>
<tr>
<td>C. Building Working Drawings and Specifications</td>
<td></td>
</tr>
<tr>
<td>1. Architectural Drawings</td>
<td></td>
</tr>
<tr>
<td>2. Plumbing, Mechanical, and Electrical Plans</td>
<td></td>
</tr>
<tr>
<td>3. Reading Blueprints</td>
<td></td>
</tr>
<tr>
<td>4. Specifications</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. The Floor System</strong></td>
<td></td>
</tr>
<tr>
<td>A. The Floor System</td>
<td></td>
</tr>
<tr>
<td>1. Sills</td>
<td></td>
</tr>
<tr>
<td>2. Beams/Girders and Supports</td>
<td></td>
</tr>
<tr>
<td>3. Floor Joists</td>
<td></td>
</tr>
<tr>
<td>4. Bridging</td>
<td></td>
</tr>
<tr>
<td>5. Subflooring</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Laying Out and Constructing a Platform Floor Assembly</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laying Out and Constructing a Platform Floor Assembly</td>
<td></td>
</tr>
<tr>
<td>1. Checking the Foundation for Squareness</td>
<td></td>
</tr>
<tr>
<td>2. Installing the Sill</td>
<td></td>
</tr>
<tr>
<td>3. Installing a Beam/Girder</td>
<td></td>
</tr>
<tr>
<td>4. Laying Out Sills and Girders for Floor Joists</td>
<td></td>
</tr>
<tr>
<td>5. Laying Out Joist Locations for the Partition and Floor Openings</td>
<td></td>
</tr>
<tr>
<td>6. Cutting and Installing Joist Headers</td>
<td></td>
</tr>
<tr>
<td>7. Installing Floor Joists</td>
<td></td>
</tr>
<tr>
<td>8. Framing Opening(s) in the Floor</td>
<td></td>
</tr>
<tr>
<td>9. Installing Bridging</td>
<td></td>
</tr>
<tr>
<td>10. Installing Subflooring</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Worksheets 27105-1 and 27105-2. Have the trainees complete the tasks on the Worksheets. Note the proficiency of each trainee.</td>
<td></td>
</tr>
</tbody>
</table>
Session IV. Laboratory
A. Laboratory
Hand out Job Sheet 27105-1. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.

Session V. Laboratory
A. Laboratory
Hand out Job Sheet 27105-2. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.

Session VI. Laboratory
A. Laboratory
Hand out Job Sheet 27105-3. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 3.

Session VII. Laboratory
A. Laboratory
Hand out Job Sheet 27105-4. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 4.

Session VIII. Installing Joists for Projections and Cantilevered Floors
A. Installing Joists for Projections and Cantilevered Floors
B. Laboratory
Hand out Job Sheet 27105-5. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 5.

Session IX. Estimating the Quantity of Floor Materials
A. Estimating the Quantity of Floor Materials
  1. Sill, Sill Sealer, and Termite Shield
  2. Beams/Girders
  3. Joists and Joist Headers
  4. Bridging
  5. Flooring
B. Laboratory
Hand out Worksheet 27105-3. Have the trainees complete the tasks on the Worksheet. This laboratory corresponds to Performance Task 6.

Session X. Guidelines for Determining Proper Girder and Joist Sizes; Review; Module Examination and Performance Testing
A. Guidelines for Determining Proper Girder and Joist Sizes
  1. Sizing Girders
  2. Sizing Joists
B. Laboratory
Have the trainees select the proper girder/beam and joist size from the tables in the Trainee Module for various floor plans, floor loads, and span data. This laboratory corresponds to Performance Task 7.
C. Review
D. 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.
E. 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 introduces the carpentry trainee to the materials and general procedures used in wall and ceiling framing.

PREREQUISITES

Prior to training with this module, it is suggested that the trainee shall have successfully completed Core Curriculum; and Carpentry Fundamentals Level One, Modules 27101-06 through 27105-06.

OBJECTIVES

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

1. Identify the components of a wall and ceiling layout.
2. Describe the procedure for laying out a wood frame wall, including plates, corner posts, door and window openings, partition Ts, bracing, and firestops.
3. Describe the correct procedure for assembling and erecting an exterior wall.
4. Identify the common materials and methods used for installing sheathing on walls.
5. Lay out, assemble, erect, and brace exterior walls for a frame building.
6. Describe wall framing techniques used in masonry construction.
7. Explain the use of metal studs in wall framing.
8. Describe the correct procedure for laying out ceiling joists.
9. Cut and install ceiling joists on a wood frame building.
10. Estimate the materials required to frame walls and ceilings.

PERFORMANCE TASKS

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

1. Lay out, assemble, erect, and brace exterior walls.
2. Cut and install ceiling joists on a wood frame building.
3. Estimate the materials required to frame walls and ceilings.

MATERIALS AND EQUIPMENT LIST

- Transparencies
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Overhead projector and screen
- Whiteboard/chalkboard
- Appropriate personal protective equipment
- 8d common nails
- 16d box nails
- Floor plan
- 2 × 4 or 2 × 6 framing lumber for studs and joists
- 2 × 12 header material
- 2½" CD plywood for header spacers
- ½" CD plywood
- Stock for blocking
- Metal brace material
- Sheathing material
- Joist lumber
- Chalkline
- 25' tape
- Steel tape
- Framing hammer
- Framing square or speed square
- Circular saw
- Extension cord
- 4' level
- 6' stepladder
- Copies of Job Sheets 1 through 5*
- Module Examinations**
- Performance Profile Sheets**

* Packaged with this Annotated Instructor’s Guide.

**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.

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.

Framing Floors, Walls and Ceilings. Newton, CT: Taunton Press.
Framing Walls (DVD). Newton, CT: Taunton Press.
Precision Framing for Pros by Pros. Newton, CT: Taunton Press.
National Association of Home Builders. A trade association whose mission is to enhance the climate for housing and the building industry. www.nahb.org

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 Wall and Ceiling Framing. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction; Components of a Wall; Laying Out a Wall; Measuring and Cutting Studs; Assembling and Erecting Walls</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Components of a Wall</td>
<td></td>
</tr>
<tr>
<td>1. Corners</td>
<td></td>
</tr>
<tr>
<td>2. Partition Intersections</td>
<td></td>
</tr>
<tr>
<td>3. Headers</td>
<td></td>
</tr>
<tr>
<td>C. Laying Out a Wall</td>
<td></td>
</tr>
<tr>
<td>1. Laying Out Wall Openings</td>
<td></td>
</tr>
<tr>
<td>D. Measuring and Cutting Studs</td>
<td></td>
</tr>
<tr>
<td>E. Assembling the Wall</td>
<td></td>
</tr>
<tr>
<td>1. Firestops</td>
<td></td>
</tr>
<tr>
<td>F. Erecting the Wall</td>
<td></td>
</tr>
<tr>
<td>1. Plumbing and Aligning Walls</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Laying Out a Wall</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laying Out a Wall</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27106-1. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
</tbody>
</table>
Session III. Measuring and Cutting Studs

A. Measuring and Cutting Studs
   B. Laboratory
      Hand out Job Sheet 27106-2. Under your supervision, have the trainees perform
      the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.

Session IV. Assembling Walls

A. Assembling Walls
   B. Laboratory
      Hand out Job Sheet 27106-3. Under your supervision, have the trainees perform
      the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.

Session V. Erecting Walls

A. Erecting Walls
   B. Laboratory
      Hand out Job Sheet 27106-4. Under your supervision, have the trainees perform
      the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.

Session VI. Ceiling Layout and Framing

A. Ceiling Layout and Framing
   1. Cutting and Installing Ceiling Joists

Session VII. Laboratory

A. Laboratory
     Hand out Job Sheet 27106-5. Under your supervision, have the trainees perform
     the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.

Session VIII. Estimating Materials; Wall Framing in Masonry; Steel Studs
in Framing; Review; Module Examination and Performance Testing

A. Estimating Materials
   B. Laboratory
      Have the trainees estimate the materials required to frame example walls
      and ceilings. This laboratory corresponds to Performance Task 3.

C. Wall Framing in Masonry
   1. Framing Door and Window Openings in Masonry

D. Steel Studs in Framing
   1. Fabrication

E. Review

F. 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.

G. 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 introduces the carpentry trainee to the methods and procedures used in roof framing.

PREREQUISITES
Prior to training with this module, it is suggested that the trainee shall have successfully completed Core Curriculum; and Carpentry Fundamentals Level One, Modules 27101-06 through 27106-06.

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

1. Understand the terms associated with roof framing.
2. Identify the roof framing members used in gable and hip roofs.
3. Identify the methods used to calculate the length of a rafter.
4. Identify the various types of trusses used in roof framing.
5. Use a rafter framing square, speed square, and calculator in laying out a roof.
6. Identify various types of sheathing used in roof construction.
7. Frame a gable roof with vent openings.
8. Frame a roof opening.
10. Estimate the materials used in framing and sheathing a roof.

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

1. Use a framing square and speed square in laying out a roof.
2. Frame and sheathe a gable roof with an opening.
3. Erect a gable roof using trusses.
4. Estimate the materials used in framing and sheathing a roof.

MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Transparencies</th>
<th>Nails for sheathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Markers/chalk</td>
<td>H-clips</td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td>Roof trusses</td>
</tr>
<tr>
<td>Transparency pens</td>
<td>1 × 6 lumber or plywood for catwalk</td>
</tr>
<tr>
<td>Pencils and scratch paper</td>
<td>2 × 4 lumber for braces and stakes</td>
</tr>
<tr>
<td>Overhead projector and screen</td>
<td>Sample blueprints</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Chalkline</td>
</tr>
<tr>
<td>Appropriate personal protective equipment</td>
<td>String line</td>
</tr>
<tr>
<td>Scientific calculator</td>
<td>Steel tape with markings at 16” OC</td>
</tr>
<tr>
<td>8d common nails</td>
<td>Framing hammer</td>
</tr>
<tr>
<td>8d box nails</td>
<td>Claw hammer</td>
</tr>
<tr>
<td>16d box nails</td>
<td>Spreader for lifting trusses (if applicable)</td>
</tr>
<tr>
<td>16d common nails</td>
<td>Crane for lifting trusses (if applicable)</td>
</tr>
<tr>
<td>Roof framing plan</td>
<td>Rafter framing square</td>
</tr>
<tr>
<td>2 × 4 or 2 × 6 framing lumber for rafters and ridgeboards</td>
<td>Sawhorses</td>
</tr>
<tr>
<td>Joist and header material for roof opening</td>
<td>Speed square and booklet</td>
</tr>
<tr>
<td>½” CD plywood or other sheathing material</td>
<td>Circular saw</td>
</tr>
<tr>
<td></td>
<td>Extension cord</td>
</tr>
</tbody>
</table>

continued
Handsaw
4’ level
6’ stepladders
Plumb bob and line

* Packaged with this Annotated Instructor’s Guide.
** 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.

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.

Framing Roofs. Newton, CT: Taunton Press.


Cedar Shake and Shingle Bureau. A trade organization that promotes the common interests of members involved in quality cedar shake and shingle roofing. [www.cedarbureau.org](http://www.cedarbureau.org).


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 57½ hours are suggested to cover Roof Framing. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction; Types of Roofs; Basic Roof Layout</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Types of Roofs</td>
<td></td>
</tr>
<tr>
<td>C. Basic Roof Layout</td>
<td></td>
</tr>
<tr>
<td>1. Rafter Framing Square</td>
<td></td>
</tr>
<tr>
<td>2. Basic Rafter Layout</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27107-1. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Erecting a Gable Roof</strong></td>
<td></td>
</tr>
<tr>
<td>A. Erecting a Gable Roof</td>
<td></td>
</tr>
<tr>
<td>1. Installing Rafters</td>
<td></td>
</tr>
<tr>
<td><strong>Session IV. Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27107-2. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Session V. Framing the Gable Ends; Framing a Gable Overhang</strong></td>
<td></td>
</tr>
<tr>
<td>A. Framing the Gable Ends</td>
<td></td>
</tr>
<tr>
<td>B. Framing a Gable Overhang</td>
<td></td>
</tr>
<tr>
<td><strong>Session VI. Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27107-3. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Session VII. Framing an Opening in the Roof</strong></td>
<td></td>
</tr>
<tr>
<td>A. Framing an Opening in the Roof</td>
<td></td>
</tr>
<tr>
<td><strong>Session VIII. Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>A. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27107-4. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Session IX. Installing Sheathing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Installing Sheathing</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Hand out Job Sheet 27107-5. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Session X. Rafter Layout Using a Speed Square</strong></td>
<td></td>
</tr>
<tr>
<td>A. Rafter Layout Using a Speed Square</td>
<td></td>
</tr>
<tr>
<td>1. Procedure for Laying Out Common Rafters</td>
<td></td>
</tr>
</tbody>
</table>
Session XI. Truss Construction
A. Truss Construction
   1. Truss Installation
   2. Bracing of Roof Trusses

Session XII. Laboratory
A. Laboratory
   Hand out Job Sheet 27107-6. Under your supervision, have the trainees perform the tasks on the Job Sheet. This laboratory corresponds to Performance Task 3.

Session XIII. Determining Quantities of Materials
A. Determining Quantities of Materials
   1. Determine Materials Needed for a Gable Roof
B. Laboratory
   Have the trainees estimate the materials used in framing and sheathing a roof. This laboratory corresponds to Performance Task 4.

Session XIV. Dormers; Plank-and-Beam Framing
A. Dormers
B. Plank-and-Beam Framing

Session XV. Metal Roof Framing; Review; Module Examination and Performance Testing
A. Metal Roof Framing
B. Review
C. 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.
D. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from the 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 the common materials used in residential and light commercial roofing, along with the safety practices and application methods for these materials. It includes shingles, roll roofing, shakes, tiles, and metal and membrane roofs, as well as the selection and installation of roof vents.

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 Core Curriculum; Carpentry Fundamentals Level One; and Carpentry Framing and Finishing Level Two, Module 27201-07.

OBJECTIVES

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

1. Identify the materials and methods used in roofing.
2. Explain the safety requirements for roof jobs.
3. Install fiberglass shingles on gable and hip roofs.
4. Close up a valley using fiberglass shingles.
5. Explain how to make various roof projections watertight when using fiberglass shingles.
6. Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.
7. Lay out, cut, and install a cricket or saddle.
8. Install wood shingles and shakes on roofs.
9. Describe how to close up a valley using wood shingles and shakes.
10. Explain how to make roof projections watertight when using wood shakes and shingles.
11. Complete the cuts and install the main and hip ridge caps using wood shakes/shingles.
12. Demonstrate the techniques for installing other selected types of roofing materials.

PERFORMANCE TASKS

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

1. Install fiberglass shingles on gable and hip roofs.
2. Close up a valley using fiberglass shingles.
3. Complete the proper cuts and install the main and hip ridge caps using fiberglass shingles.
4. Lay out, cut, and install a cricket or saddle.
5. Install wood shingles and shakes on roofs.
6. Complete the cuts and install the main and hip ridge caps using shakes/shingles.
7. Demonstrate the techniques for installing other selected types of roofing materials.

MATERIALS AND EQUIPMENT LIST

| Markers/chalk | Hardboard simulated shingle panels |
| Pencils and scratch paper | Metal simulated shingle panels |
| Whiteboard/chalkboard | Slate shingles |
| Multimedia projector and screen | Metal roofing |
| Computer | Synthetic tiles, shakes, and shingles |
| Appropriate personal protective equipment | Membrane roofing |
| Composition shingles | Corrugated metal roofing |
| Architectural shingles | Installation literature on standing-seam metal roofing |
| Roll roofing material | Scaffolding tags |
| Wood roofing shingles | Roofing brackets |
| Wood roofing shakes | Metal drip edge |
| Wood shingle panels | Flashing |

continued
Fiberglass shingles
Torch-down roofing material
Single-ply roofing material
Ice edging
Prepared roof deck for composite shingles with a valley, hip roof intersection, horizontal abutment, and sidewall (all sheathed and with underlay in place)
Prepared roof deck for wood shingles with spaced sheathing and hip roof intersection
Prepared low-pitch (flat roof) roof with sheathing in place
2 × 4s to build saddle
Roofing nails
Plastic cement
Felt underlayment
Weatherproof membrane
Prefabricated soil pipe flashing
Backsaw
Power circular saw
Crowbar
Handsaw
Carpenter’s level
Nail apron
Sliding T-bevel
Keyhole saw
Pop riveter
Chalkline
Power saber saw
Angle square

Power drill
Caulking gun
Tin snips
Pry bar
Utility knife
Scribing compass
Drill bit set (regular and masonry)
Framing square
Claw hammer
Pneumatic nail guns
Shingle hatchet
Straightedge
Composition shingle knife
Roofing hammer
Slater’s tools
Score and snap tile cutter
Hand grinder with diamond wheel
Portable metal brake
Margin trowel
Scaffolding
Materials moving equipment
Ladders and jacks
Full body harness with lanyard and deceleration devices
Damaged personal fall protection equipment
Propane torch and tank
Copies of the Quick Quiz*
Module Examinations**
Performance Profile Sheets**

* Located at 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. Ensure that all trainees are briefed on job site safety. This module requires trainees to install roofing. Ensure that all trainees are briefed on tool safety, shop safety, and fall protection as required.

ADDITIONAL RESOURCES

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

Asphalt Manufacturers Association website, www.asphaltroofing.org
National Roofing Contractors Association website, www.ncra.net
Roof Coating Manufacturers Association website, www.roofcoating.org
**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 *Roofing Applications*. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction and Typical Roofing Materials</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Typical Roofing Materials</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice identifying typical roofing materials.</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Tools and Safety</strong></td>
<td></td>
</tr>
<tr>
<td>A. Tools</td>
<td></td>
</tr>
<tr>
<td>B. Safety</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice donning safety equipment.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions III through V. Preparation for Roofing Applications, Composition Shingle Installation</strong></td>
<td></td>
</tr>
<tr>
<td>A. Preparation for Roofing Applications</td>
<td></td>
</tr>
<tr>
<td>B. Composition Shingle Installation: Gable and Hip Roofs</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing fiberglass shingles on gable and hip roofs. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td>D. Composition Shingle Installation: Valleys</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice closing up a valley using fiberglass shingles. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td>F. Composition Shingle Installation: Roof Projections and Flashing</td>
<td></td>
</tr>
<tr>
<td>G. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing a cricket or saddle. This laboratory corresponds to Performance Task 4.</td>
<td></td>
</tr>
<tr>
<td>H. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing the main and hip ridge caps using fiberglass shingles. This laboratory corresponds to Performance Task 3.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions VI and VII. Alternative Roofing Materials I</strong></td>
<td></td>
</tr>
<tr>
<td>A. Roll Roofing Installation</td>
<td></td>
</tr>
<tr>
<td>B. Wood Shingles and Shakes</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing wood shingles and shakes. This laboratory corresponds to Performance Task 5.</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing the main and hip ridge caps using wood shakes/shingles. This laboratory corresponds to Performance Task 6.</td>
<td></td>
</tr>
</tbody>
</table>
Sessions VIII and IX. Alternative Roofing Materials II

A. Common Metal Roofing
B. Slate and Tile Roofing
C. Single-Ply Roofing Application
D. Torch-Down Roofing Application
E. Laboratory

Trainees practice installing other selected types of roofing materials. This laboratory corresponds to Performance Task 7.

Session X. Ventilation and Ice Edging, Review, and Testing

A. Roof Ventilation and Ice Edging
B. Module Review
C. 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.

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 Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
Exterior Finishing
Annotated Instructor’s Guide

MODULE OVERVIEW
This module covers the various types of exterior siding used in residential construction including wood, metal, vinyl, and cement board siding, and their installation procedures.

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 Core Curriculum; Carpentry Fundamentals Level One; and Carpentry Framing and Finishing Level Two, Modules 27201-07 through 27203-07.

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

1. Describe the purpose of wall insulation and flashing.
2. Install selected common cornices.
3. Demonstrate lap and panel siding estimating methods.
4. Describe the types and applications of common wood siding.
5. Describe fiber-cement siding and its uses.
6. Describe the types and styles of vinyl and metal siding.
7. Describe the types and applications of stucco and masonry veneer finishes.
8. Describe the types and applications of special exterior finish systems.
9. Install three types of siding commonly used in your area.

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

1. Install a selected cornice or box cornice using the proper safety precautions.
2. Estimate the amount of lap or panel siding required for a structure.
3. Install three of the most common siding types in your area.

MATERIALS AND EQUIPMENT LIST
Markers/chalk
Pencils and scratch paper
Whiteboard/chalkboard
Carpentry Level Two PowerPoint® Presentation
Multimedia projector and screen
Computer
Sample of building wrap
MSDS
Samples of aluminum and vinyl fascia and soffits and installation instructions
2 × 4s with different types of tail rafter cuts
2 × 4s for lookout
2 × 4s for lookout ledger
2 × 6s for false fascia
1 × 8s for fascia
1 × 2s for frieze
Plywood for soffit
Galvanized 4d box nails for soffit
Galvanized 8d casing nails for fascia
8d box nails for lookout ledger
16d box nails for lookouts

Samples of various types of wood siding
Nails used to secure wood siding
Samples of vinyl or metal siding
Manufacturer’s installation instructions for metal and vinyl siding
Quantity of one style of vinyl or metal siding
Various manufactured vinyl or metal siding trim and starter components
Metal and PVC trim coils
Samples of various stucco, brick, stone, and synthetic stone veneer
Samples of DEFS/EIFS wall cladding
1 × 3s for story poles
6” bevel wood siding and/or wood lap siding
Board-and-batten siding
Tongue-and-groove siding
Shiplap siding
Shingles and shakes
Panelized shake or shingle siding
4 × 8 plywood siding
4 × 8 panel and lap-style hardboard/particleboard siding

continued
Lap and panel styles of fiber-cement siding
Manufacturer’s installation instructions for fiber-cement siding
Manufacturer’s installation instructions for plywood siding
Caulk
Inside and outside corner materials
Furring strips for starter course
Spacing gauges (fabricated)
Siding gauges (fabricated)
Drip caps
Flashings
Building paper
Nails
Radial arm saw
Framing square
Steel measuring tape
Claw hammer
4’ level
Hand saw
Chalkline
Combination square
Water level
Circular saw or table saw
Fine-toothed, carbide-tipped, circular saw blade
Dry-diamond circular saw blade
Sawhorses or cutting table
Electric/pneumatic carbide-tipped power hand shears
Score-and-snap knife with tungsten carbide tip
Caulking gun
Pliers
Tin snips
Aviation shears
Steel awl
Putty knife
Utility knife
Snaplock punch
Vinyl siding unlocking tool
Nail hole punch
Flat-blade screwdriver
Portable brake
Copies of the Quick Quiz*
Module Examinations**
Performance Profile Sheets**

*Located at 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. Ensure that they are briefed on site safety procedures. This module requires trainees to use power tools to perform exterior finishing. Ensure that all trainees are properly briefed on site safety procedures and tool safety.

ADDITIONAL RESOURCES

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

The Vinyl Siding Institute website, www.vinylsiding.org
Cedar Shake & Shingle Bureau website, www.cedarbureau.org
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 35 hours are suggested to cover *Exterior Finishing*. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Introduction, Insulation, Flashing, and Cornices</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Safety</td>
<td></td>
</tr>
<tr>
<td>C. Insulation</td>
<td></td>
</tr>
<tr>
<td>D. Flashing</td>
<td></td>
</tr>
<tr>
<td>E. Cornices</td>
<td></td>
</tr>
<tr>
<td>F. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing a cornice. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Estimating</strong></td>
<td></td>
</tr>
<tr>
<td>A. Estimating Panel and Board Siding</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice estimating the amount of lap or panel siding required for a structure. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions IV through VII. Wood Siding</strong></td>
<td></td>
</tr>
<tr>
<td>A. Beveled Siding</td>
<td></td>
</tr>
<tr>
<td>B. Board-and-Batten Siding</td>
<td></td>
</tr>
<tr>
<td>C. Tongue-and-Groove Siding</td>
<td></td>
</tr>
<tr>
<td>D. Shingle Siding or Shakes</td>
<td></td>
</tr>
<tr>
<td>E. Plywood Siding</td>
<td></td>
</tr>
<tr>
<td>F. Hardboard and Particleboard Siding</td>
<td></td>
</tr>
<tr>
<td>G. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing siding. This laboratory corresponds to Performance Task 3.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions VIII and IX. Fiber-Cement Siding</strong></td>
<td></td>
</tr>
<tr>
<td>A. Types</td>
<td></td>
</tr>
<tr>
<td>B. Installation Procedures</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing siding. This laboratory corresponds to Performance Task 3.</td>
<td></td>
</tr>
<tr>
<td><strong>Sessions X through XII. Vinyl and Metal Siding</strong></td>
<td></td>
</tr>
<tr>
<td>A. Materials and Components</td>
<td></td>
</tr>
<tr>
<td>B. Tools and Equipment</td>
<td></td>
</tr>
<tr>
<td>C. Installation Procedures</td>
<td></td>
</tr>
<tr>
<td>D. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice installing siding. This laboratory corresponds to Performance Task 3.</td>
<td></td>
</tr>
</tbody>
</table>
Session XIII. Exterior Finishes
A. Stucco (Cement) Finishes
B. Brick and Stone Veneer
C. DEFS and EIFS

Session XIV. Review and Testing
A. Module Review
B. Module Examination
   1. Trainees must score 70% or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
MODULE OVERVIEW
This module introduces the Carpentry trainee to the materials and methods used to construct interior and exterior wooden stairs.

PREREQUISITES
Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; and Carpentry Fundamentals Level One, Modules 27101-06 through 27109-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify the various types of stairs.
2. Identify the various parts of stairs.
3. Identify the materials used in the construction of stairs.
4. Interpret construction drawings of stairs.
5. Calculate the total rise, number and size of risers, and number and size of treads required for a stairway.
7. Build a small stair unit with a temporary handrail.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Lay out and build a small stair unit with a handrail to a given rise.

MATERIALS AND EQUIPMENT LIST

| Transparencies | Stair gauges |
| Markers/chalk | Calculator |
| Blank acetate sheets | 2 × 12s for stringers |
| Transparency pens | 2 × 12s for treads |
| Pencils and scratch paper | 1 × 8s for risers |
| Overhead projector and screen | Handrail and brackets |
| Whiteboard/chalkboard | 8d box nails |
| Appropriate personal protective equipment | 16d box nails |
| Basic carpenter’s toolbox | 16d casing nails |
| Framing square | Stair plans |
| Level | Copies of Job Sheet 1* |
| Circular saw and extension cord | Module Examinations** |
| Hand saw | Performance Profile Sheets** |

* Packaged with this Annotated Instructor’s Guide.

**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.
ADDITONAL 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.

Basic Stairbuilding. Newton, CT: Taunton Press, Inc. (Book with companion video or DVD.)
For Pros By Pros: Building Stairs. Newton, CT: Taunton Press, Inc.
Framing Floors and Stairs. Berkeley, CA: Publishers Group West. (Book with companion video or DVD.)

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 12½ hours are suggested to cover Basic Stair Layout. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction; Types of Stairs; Stairway Components and Typical Code Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Types of Stairs</td>
<td></td>
</tr>
<tr>
<td>C. Stairway Components and Typical Code Requirements</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Stair Framing</strong></td>
<td></td>
</tr>
<tr>
<td>A. Stair Framing</td>
<td></td>
</tr>
<tr>
<td>1. Headroom</td>
<td></td>
</tr>
<tr>
<td>2. Stringers</td>
<td></td>
</tr>
<tr>
<td>3. Treads and Risers</td>
<td></td>
</tr>
<tr>
<td>4. Width Requirement</td>
<td></td>
</tr>
<tr>
<td>5. Handrails</td>
<td></td>
</tr>
<tr>
<td>6. Stairwells</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Stairway and Stairwell Design and Layout</strong></td>
<td></td>
</tr>
<tr>
<td>A. Stairway and Stairwell Design and Layout</td>
<td></td>
</tr>
<tr>
<td>1. Stairway Design</td>
<td></td>
</tr>
<tr>
<td>2. Stairwells</td>
<td></td>
</tr>
<tr>
<td>3. Laying Out and Cutting a Stringer</td>
<td></td>
</tr>
<tr>
<td>4. Reinforced Cutout Stringers</td>
<td></td>
</tr>
</tbody>
</table>
Session IV. Laboratory
A. Laboratory
   Hand out Job Sheet 27110-1. Under your supervision, have the trainees lay out and construct a stairway. This laboratory corresponds to Performance Task 1.

Session V. Forms for Concrete Stairs; Review; Module Examination and Performance Testing
A. Forms for Concrete Stairs
   □
B. Review
   □
C. 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.
D. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from the 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 introduces the trainees to the safety rules and regulations for electricians, including the necessary precautions for avoiding various job site hazards.

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; Electrical Level One, Module 26101-08.

OBJECTIVES

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

1. Recognize safe working practices in the construction environment.
2. Explain the purpose of OSHA and how it promotes safety on the job.
3. Identify electrical hazards and how to avoid or minimize them in the workplace.
4. Explain electrical safety issues concerning lockout/tagout procedures, confined space entry, respiratory protection, and fall protection systems.
5. Develop a task plan and a hazard assessment for a given task and select the appropriate PPE and work methods to safely perform the task.

PERFORMANCE TASKS

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

1. Perform a visual inspection on various types of ladders.
2. Set up a ladder properly to perform a task.
3. Properly don a harness.
4. Perform a hazard assessment of a job such as replacing the lights in your classroom.
   - Discuss the work to be performed and the hazards involved.
   - Locate the phone closest to the work site and ensure that the local emergency telephone numbers are either posted at the phone or known by you and your partner(s).
   - Plan an escape route from the location in the event of an accident.

MATERIALS

| Overhead projector and screen | Shorting probes |
| Transparencies                | Safety glasses  |
| Blank acetate sheets          | Face shields    |
| Transparency pens            | Company safety manual |
| Whiteboard/chalkboard        | GFCI device     |
| Markers/chalk                | Company lockout/tagout procedures |
| Pencils and scratch paper    | Step ladders    |
| Copy of the latest edition of the National Electrical Code® | Straight ladders |
| OSHA Electrical Safety Guidelines (pocket guide) | Solvent MSDS |
| NFPA 70E                     | Fall arrest system |
| Various types of personal protective and safety equipment, including: | Safety harnesses |
| Rubber gloves                | Lockout/tagout devices and labels |
| Insulating blankets          | Access to eye wash station |
| Hot sticks                   | TV/DVD/VCR player (optional) |
| Fuse pullers                 | Safety videos (optional) |
|                              | Module Examinations* |
|                              | Performance Profile Sheet* |

* Single-module AIG purchases include the printed exam and performance task sheet. If you have purchased the perfect-bound version of this title, download these materials from the IRC using your access code.
SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to work with ladders. Make sure that all trainees are briefed on appropriate safety procedures. Emphasize electrical 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.


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 Electrical 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session I. Introduction to Electrical Hazards</td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Electrical Shock</td>
<td></td>
</tr>
<tr>
<td>C. Protective Equipment</td>
<td></td>
</tr>
<tr>
<td>D. OSHA</td>
<td></td>
</tr>
<tr>
<td>E. NFPA 70E</td>
<td></td>
</tr>
<tr>
<td>Session II. Ladders, Lifts, and Lifting</td>
<td></td>
</tr>
<tr>
<td>A. Ladders and Scaffolds</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice visually inspecting ladders. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice setting up a ladder. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
<tr>
<td>D. Lifts, Hoists, and Cranes</td>
<td></td>
</tr>
<tr>
<td>E. Lifting</td>
<td></td>
</tr>
<tr>
<td>F. Basic Tool Safety</td>
<td></td>
</tr>
<tr>
<td>Session III. General Construction Safety Topics</td>
<td></td>
</tr>
<tr>
<td>A. Confined Space Entry Procedures</td>
<td></td>
</tr>
<tr>
<td>B. First Aid</td>
<td></td>
</tr>
<tr>
<td>C. Solvents and Toxic Vapors</td>
<td></td>
</tr>
<tr>
<td>D. Asbestos, Batteries, PCBs, and Vapor Lamps</td>
<td></td>
</tr>
</tbody>
</table>
Session IV. Fall Protection, Hazard Assessment, Review, and Testing

A. Fall Protection

B. Laboratory
   Trainees practice donning a safety harness. This laboratory corresponds to Performance Task 3.

C. Hazard Assessment

D. Laboratory
   Trainees practice performing a hazard assessment. This laboratory corresponds to Performance Task 4.

E. Module 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.

G. 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 introduces trainees to the various types of devices and installation procedures used in residential wiring. It also covers service-entrance and branch circuit calculations and National Electrical Code® requirements.

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; and Electrical Level One, Modules 26101-08 through 26110-08.

OBJECTIVES

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

1. Explain the role of the National Electrical Code® in residential wiring and describe how to determine electric service requirements for dwellings.
2. Explain the grounding requirements of a residential electric service.
3. Calculate and select service-entrance equipment.
4. Select the proper wiring methods for various types of residences.
5. Compute branch circuit loads and explain their installation requirements.
6. Explain the types and purposes of equipment grounding conductors.
7. Explain the purpose of ground fault circuit interrupters and tell where they must be installed.
8. Size outlet boxes and select the proper type for different wiring methods.
9. Describe rules for installing electric space heating and HVAC equipment.
10. Describe the installation rules for electrical systems around swimming pools, spas, and hot tubs.
11. Explain how wiring devices are selected and installed.
12. Describe the installation and control of lighting fixtures.

PERFORMANCE TASKS

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

1. For a residential dwelling of a given size, and equipped with a given list of major appliances, demonstrate or explain how to:
   - Compute lighting, small appliance, and laundry loads.
   - Compute the loads for large appliances.
   - Determine the number of branch circuits required.
   - Size and select the service-entrance equipment (conductors, panelboard, and protective devices).
2. Using an unlabeled diagram of a panelboard (Performance Profile Sheet 3), label the lettered components.
3. Select the proper type and size outlet box needed for a given set of wiring conditions.

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
- Copy of the latest edition of the National Electrical Code®
- Calculator
- Residential floor plan
- Blank worksheet
- Various types of GFCIs
- Panelboard
- Examples of cable, including:
  - Type NM
  - Type AC
  - Type UF
  - Type SE/USE
Examples of raceways, including:
- Rigid
- IMC
- EMT
- Flexible
- PVC

Various grounding devices
Examples of made-type grounding electrodes
Assortment of metallic and plastic outlet boxes
Assorted types of electrical receptacles

Assortment of switches, including:
- Single-pole
- Three-way
- Four-way
- Photoelectric switches
- Dimmer

* 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 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 work is suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task 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 15 hours are suggested to cover Residential Electrical Services. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessions I and II. Sizing Electrical Service</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Sizing Electrical Service</td>
<td></td>
</tr>
<tr>
<td>C. Sizing Residential Neutral Conductors</td>
<td></td>
</tr>
<tr>
<td>D. Sizing the Load Center</td>
<td></td>
</tr>
<tr>
<td>E. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice computing various branch loads. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Grounding</strong></td>
<td></td>
</tr>
<tr>
<td>A. Grounding Electrical Services</td>
<td></td>
</tr>
<tr>
<td>B. Main Bonding Jumper</td>
<td></td>
</tr>
<tr>
<td>C. Laboratory</td>
<td></td>
</tr>
<tr>
<td>Trainees practice identifying the components of a panelboard. This laboratory corresponds to Performance Task 2.</td>
<td></td>
</tr>
</tbody>
</table>
Session IV. Installation I
A. Installing the Service Entrance
B. Panelboard Location
C. Wiring Methods
D. Equipment Grounding System
E. Branch Circuit Layout for Power

Session V. Installation II
A. Branch Circuit Layout for Lighting
B. Outlet Boxes
C. Laboratory
  Trainees practice selecting the proper type and size outlet box needed for a given set of wiring conditions. This laboratory corresponds to Performance Task 3.
D. Wiring Devices
E. Lighting Control

Session VI. Heating, Pools, Review and Testing
A. Electric Heating
B. Residential Swimming Pools, Spas, and Hot Tubs
C. Module Review
D. 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.
E. 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 the principles of heating, ventilation, and air conditioning, career opportunities in HVAC, and apprenticeship programs.

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. Explain the basic principles of heating, ventilation, and air conditioning.
2. Identify career opportunities available for people in the HVAC trade.
3. Explain the purpose and objectives of an apprenticeship training program.
4. Describe how certified apprentice training can start in high school.
5. Describe what the Clean Air Act means to the HVAC trade.
6. Describe types of regulatory codes encountered in the HVAC trade.
7. Identify the types of schedules/drawings used in the HVAC trade.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Interpret the following within an HVAC drawing provided by the instructor:
   - Piping
   - Air-handling equipment
   - AC system(s)
   - HVAC component diagram
   - Schematics

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
HVAC drawings for a commercial building
(Air conditioner
Commercial drawing set
Building codes
Copy of an employee manual
Job announcements for HVAC technicians from local newspapers (want ads)
NCCER Apprentice Training Recognition Forms
Module Examinations*
Performance Profile Sheets*)

SAFETY CONSIDERATIONS
Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Emphasize basic site safety.
ADDITONAL RESOURCES
This module is intended to present thorough resources for task training. The following reference work is suggested for both instructors and motivated trainees interested in further study. This is optional material for continued education rather than for task 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 7½ hours are suggested to cover *Introduction to HVAC*. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction to HVAC</strong></td>
<td></td>
</tr>
<tr>
<td>A. Introduction</td>
<td></td>
</tr>
<tr>
<td>B. Heating</td>
<td></td>
</tr>
<tr>
<td>C. Ventilation</td>
<td></td>
</tr>
<tr>
<td>D. Air Conditioning</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Blueprints, Careers, and Training</strong></td>
<td></td>
</tr>
<tr>
<td>A. Blueprints, Codes, and Specifications</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory—Trainees practice identifying various types of prints. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td>C. Careers in HVAC</td>
<td></td>
</tr>
<tr>
<td>D. Types of Training Programs</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Environmental Issues, Review, and Testing</strong></td>
<td></td>
</tr>
<tr>
<td>A. The HVAC Technician and the Environment</td>
<td></td>
</tr>
<tr>
<td>B. Module Review</td>
<td></td>
</tr>
<tr>
<td>C. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
<td></td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
<td></td>
</tr>
<tr>
<td>D. Performance Testing</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
<td></td>
</tr>
</tbody>
</table>
MODULE OVERVIEW

This module explains the factors that influence DWV system design and how different types of drains, fittings, vents, and pipe are used to move waste out of a building. Trainees will learn installation requirements that prevent malfunctions in the system.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Plumbing Level One, Modules 02101-05 through 02111-05.

OBJECTIVES

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

1. Explain how waste moves from a fixture through the drain system to the environment.
2. Identify the major components of a drainage system and describe their functions.
3. Identify the different types of traps and their components, explain the importance of traps, and identify the ways that traps can lose their seals.
4. Identify the various types of drain, waste, and vent (DWV) fittings and describe their applications.
5. Identify significant code and health issues, violations, and consequences related to DWV systems.

PERFORMANCE TASK

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

1. Sketch a simple DWV system, label its components, and size the pipe.

MATERIALS AND EQUIPMENT LIST

- Transparencies
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Overhead projector and screen
- Whiteboard/chalkboard
- Appropriate personal protective equipment
- Copies of your local code
- DWV system design drawings
- P-traps
- Copies of Figure 8 with the callouts covered
- Drainage fittings made from a variety of materials

- DWV fittings, including:
  - Bends
  - Adapters
  - Cleanouts
  - Tees
  - Wyes
  - Increasers
  - Offsets
  - Torpedo level
  - Plans for a municipal waste treatment plant
  - Plans for a private waste disposal system
  - 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 trainees are equipped with appropriate personal protective equipment, and that they are properly instructed on its use. Stress the specific hazards of working with DWV systems, such as exposure to toxic gases, and explain the related necessary safety precautions.
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.


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 *Introduction to Drain, Waste, and Vent (DWV) Systems*. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. DWV Systems, Fixtures, Drains, and Traps</strong></td>
<td></td>
</tr>
<tr>
<td>A. DWV Systems</td>
<td></td>
</tr>
<tr>
<td>B. Fixture Drains</td>
<td></td>
</tr>
<tr>
<td>C. Types of Traps</td>
<td></td>
</tr>
<tr>
<td>D. Parts of Traps</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Installation Requirements</strong></td>
<td></td>
</tr>
<tr>
<td>A. Trap Installation Requirements</td>
<td></td>
</tr>
<tr>
<td>B. Why a Trap Loses Its Seal</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Vents, Drains, and Fittings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Vents</td>
<td></td>
</tr>
<tr>
<td>B. Sizing Drains and Vents</td>
<td></td>
</tr>
<tr>
<td>C. Fittings and Their Applications</td>
<td></td>
</tr>
<tr>
<td><strong>Session IV. DWV System Design</strong></td>
<td></td>
</tr>
<tr>
<td>A. Grade</td>
<td></td>
</tr>
<tr>
<td>B. Building Drain</td>
<td></td>
</tr>
<tr>
<td>C. Building Sewer</td>
<td></td>
</tr>
<tr>
<td>D. Sewer Main</td>
<td></td>
</tr>
<tr>
<td>E. Waste Treatment</td>
<td></td>
</tr>
<tr>
<td>F. Code and Health Issues</td>
<td></td>
</tr>
<tr>
<td>G. Review</td>
<td></td>
</tr>
<tr>
<td>H. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70% or higher to receive recognition from NCCER.</td>
<td></td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
<td></td>
</tr>
<tr>
<td>I. Performance Testing</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
<td></td>
</tr>
</tbody>
</table>
MODULE OVERVIEW

This module introduces the various types of materials, schedules, and applications of plastic piping. Trainees will learn how to determine the appropriate types of fittings, valves, hangers, and supports needed for plastic piping. Trainees will learn to properly measure, cut, and join plastic piping.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Plumbing Level One, Modules 02101-05 through 02105-05.

OBJECTIVES

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

1. Identify types of materials and schedules of plastic piping.
2. Identify proper and improper applications of plastic piping.
3. Identify types of fittings and valves used with plastic piping.
4. Identify and determine the kinds of hangers and supports needed for plastic piping.
5. Identify the various techniques used in hanging and supporting plastic piping.
6. Properly measure, cut, and join plastic piping.
7. Explain proper procedures for the handling, storage, and protection of plastic pipes.

PERFORMANCE TASKS

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

1. Select correct types of materials for plastic piping systems.
2. Identify types of fittings and valves and their uses.
3. Select the appropriate personal protective equipment for working with plastic piping.
4. Properly measure, cut, and join plastic piping.
5. Select the correct hanger or support for the application.

MATERIALS AND EQUIPMENT LIST

- Transparencies
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Overhead projector and screen
- Whiteboard/chalkboard
- Appropriate personal protective equipment
- Copies of your local code
- Flexible pipe
- Pipe labels
- Sections of plastic pipe, including:
  - ABS (acrylonitrile-butadiene-styrene)
  - PVC (polyvinyl chloride)
  - CPVC (chlorinated polyvinyl chloride)
  - PE (polyethylene)
  - PEX (cross-linked polyethylene)
  - PB (polybutylene)
- Sample material safety data sheets (MSDS) for plastic pipe
- Tools for measuring
- Tools for cutting pipe
- Deburring tools
- Miter box
- Plastic saw for cutting PVC pipe
- CPVC or PVC cement or all-purpose cement conforming to ASTM F-493 standards
- PVC bell-and-spigot pipe
- Lubricant
- Tools used to join PEX tubing, including:
  - Insert and crimp-ring system
  - Tubing cutter
  - Hand-crimping tool
  - Go-no-go gauge
  - Cutter designed for plastic tubing
  - PEX ring
  - Expander tool
  - Mechanical joints and clamps
  - Compression collars
  - Tools for the butt-fusion method, including:
    - Temperature indicator stick
    - Heating tool
**SAFETY CONSIDERATIONS**

Ensure that trainees are equipped with appropriate personal protective equipment, and that they are properly instructed on its use. Emphasize safety precautions specific to pipe-cutting operations. Stress the importance of following manufacturers’ recommendations when cutting or sawing pipe or when using any flame, heat, or power tools. Remind trainees of the environmental and physical hazards related to working with ignition sources and hazardous substances such as primer and cement.

**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.


**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 21/2 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 *Plastic Pipe and Fittings*. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction to Plastic Pipe</strong></td>
<td></td>
</tr>
<tr>
<td>A. Advantages and Disadvantages</td>
<td></td>
</tr>
<tr>
<td>B. Properties</td>
<td></td>
</tr>
<tr>
<td>C. Sizing</td>
<td></td>
</tr>
<tr>
<td>D. Labeling</td>
<td></td>
</tr>
<tr>
<td>E. Manufacturers</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Plastic Pipe and Fittings</strong></td>
<td></td>
</tr>
<tr>
<td>A. Types of Plastic Pipe</td>
<td></td>
</tr>
<tr>
<td>B. Laboratory – Trainees practice identifying types of plastic pipes. This laboratory corresponds to Performance Task 1.</td>
<td></td>
</tr>
<tr>
<td>C. Material Storage and Handling</td>
<td></td>
</tr>
<tr>
<td>D. Water Supply Fittings</td>
<td></td>
</tr>
</tbody>
</table>

* 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.

**Located at the end of this module.**
E. DWV Fittings
F. Laboratory – Trainees practice identifying fittings and valves and their uses. This laboratory corresponds to Performance Task 2.

Session III. Measuring, Cutting, and Joining
A. Measuring
B. Cutting
C. Joining
D. Laboratory – Trainees practice measuring, cutting, and joining plastic piping. Trainees must select appropriate personal protective equipment. This laboratory corresponds to Performance Tasks 3 and 4.

Session IV. Pipe Supports and Pressure Testing
A. Hangers
B. Fasteners
C. Review
D. 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.
E. Performance Testing (Task 5)
   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 discusses the materials, schedules, and properties of copper piping, fittings, and valves. Trainees will learn how to measure, ream, cut, join, and groove copper piping, as well as how to hang and support copper piping.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Plumbing Level One, Modules 02101-05 through 02105-05.

OBJECTIVES

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

1. Identify the types of materials and schedules used with copper piping.
2. Identify the material properties, storage, and handling requirements of copper piping.
3. Identify the types of fittings and valves used with copper piping.
4. Identify the techniques used in hanging and supporting copper piping.
5. Properly measure, ream, cut, and join copper piping.
6. Identify the hazards and safety precautions associated with copper piping.

PERFORMANCE TASKS

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

1. Select correct types of materials for copper piping systems.
2. Identify types of fittings and valves and their uses.
3. Select the appropriate personal protective equipment for working with copper piping.
4. Correctly measure, cut, ream, join, and groove copper piping.
5. Select the correct hanger or support for the application.

MATERIALS AND EQUIPMENT LIST

- Transparencies
- Markers/chalk
- Blank acetate sheets
- Transparency pens
- Pencils and scratch paper
- Overhead projector and screen
- Whiteboard/chalkboard
- Appropriate personal protective equipment
- Copies of your local code
- Access to a fire extinguisher
- Sections of copper pipe
- Tee-pulling tool
- Fittings and valves, including:
  - Water supply fittings
  - Water supply valves
  - DWV fittings
  - Alternative fittings
- Tools for measuring copper pipe
- Copper cutter
- Handheld tube cutter
- Internal tube cutter
- Sizing tool
- Tools to form sweat joints, compression joints, and flare joints
- Variety of soldering tools, including an acetylene torch
- Tools to roll groove and cut groove copper pipe
- Pipe attachments for wood-frame construction
- National Fire Protection Association (NFPA) Chapter 13
- Manufacturers Standardization Society MSS40 hanger standards
- Pressure gauge
- Test plug
- 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 trainees are equipped with appropriate personal protective equipment, and that they are properly instructed on its use. Emphasize safety precautions specific to pipe-cutting operations. Stress the importance of following manufacturers’ recommendations when cutting or sawing pipe or when using any flame, heat, or power tools. Remind trainees of the environmental and physical hazards related to soldering work.

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.


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 Copper Pipe and Fittings. 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.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Session I. Introduction to Copper Pipe</strong></td>
<td></td>
</tr>
<tr>
<td>A. Types</td>
<td></td>
</tr>
<tr>
<td>B. Sizing</td>
<td></td>
</tr>
<tr>
<td>C. Labeling</td>
<td></td>
</tr>
<tr>
<td>D. Applications</td>
<td></td>
</tr>
<tr>
<td>E. Material Storage and Handling</td>
<td></td>
</tr>
<tr>
<td>F. Performance Testing (Task 1)</td>
<td></td>
</tr>
<tr>
<td><strong>Session II. Fittings and Valves</strong></td>
<td></td>
</tr>
<tr>
<td>A. Water Supply Fittings</td>
<td></td>
</tr>
<tr>
<td>B. Water Supply Valves</td>
<td></td>
</tr>
<tr>
<td>C. DWV Fittings</td>
<td></td>
</tr>
<tr>
<td>D. Alternative Fittings</td>
<td></td>
</tr>
<tr>
<td>E. Performance Testing (Task 2)</td>
<td></td>
</tr>
<tr>
<td><strong>Session III. Measuring, Cutting, Bending, Joining, and Grooving</strong></td>
<td></td>
</tr>
<tr>
<td>A. Measuring</td>
<td></td>
</tr>
<tr>
<td>B. Cutting</td>
<td></td>
</tr>
<tr>
<td>C. Bending</td>
<td></td>
</tr>
<tr>
<td>D. Joining</td>
<td></td>
</tr>
</tbody>
</table>
E. Grooving
F. Performance Testing (Tasks 3 and 4)

Session IV. Installing, Insulating, and Pressure Testing

A. Types of Pipe Hangers and Supports
B. Performance Testing (Task 5)
C. Insulating Pipes
D. Pressure Testing
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.

G. 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.