Module 27401-14 describes differential leveling—differences in elevation between two or more points on a surface. This module is the first of two modules that focus on site layout.

Objectives

Learning Objective 1
1. Describe the responsibilities of the carpenter relative to construction drawings, control points, and hand signals.
   a. Read and interpret a set of civil plans and how they relate to elevations on a job site.
   b. Identify the types of control points and explain their use on a job site.
   c. Describe how to use hand signals to communicate.

Learning Objective 2
2. Recognize, use, and properly care for tools and equipment associated with differential leveling.
   a. Identify the instruments commonly used for differential leveling.
   b. Explain how to set up and calibrate a leveling instrument.
   c. Explain how to use a builder’s level and differential-leveling procedures to determine site and building elevations.

Learning Objective 3
3. Record site-layout data and information in field notes using accepted practices.

Learning Objective 4
4. Describe the applications involving differential leveling.
   a. Explain how to transfer an elevation up a structure.
   b. Discuss applications for profile, cross-section, and grid leveling.

Performance Tasks

Performance Task 1
- Set up, adjust, and field-test leveling instruments.

Performance Task 2
(Learning Objective 2)
- Convert measurements given in feet and inches to equivalent decimal measurements stated in feet, tenths, and hundredths, and vice versa.

Performance Task 3
(Learning Objective 3)
- Use a builder’s level, leveling rods, and/or laser level with appropriate differential-leveling procedures to determine site and building elevations.

Performance Task 4
(Learning Objective 4)
- Record differential-leveling data in field notes in accordance with accepted procedures.

Performance Task 5
(Learning Objective 4)
- Use differential-leveling procedures to transfer elevations up a structure.

Teaching Time: 20 hours
(Eight 2.5-hour Classroom sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites
Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three

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

Using your access code, download the Module Examinations and Performance Profile Sheets from www.nccerirc.com. The passing score for submission into NCCER’s Registry is 70 percent or above for the Module Examination; performance testing is graded pass or fail.
Additional Resources and References
This module presents thorough resources for task training. The following resource material is suggested for further study:


There are a number of online resources available for trainees who would like more information on differential leveling. A search for additional information may be assigned as homework to interested trainees.
<table>
<thead>
<tr>
<th>Session One</th>
<th>Sessions Three and Four</th>
<th>Sessions Five through Seven</th>
<th>Session Eight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session One introduces construction drawings, control points, and hand signals.</td>
<td>1. Show Session Three and Four PowerPoint® presentation slides.</td>
<td>Sessions Five, Six, and Seven introduce laying out building lines.</td>
<td>Session Eight is a review and testing session. Have trainees complete the module Review Questions and Trade Terms Quiz. (Alternatively, these may be assigned as homework at the end of Session Seven.) Answer any questions that trainees may have.</td>
</tr>
<tr>
<td>1. Show Session One PowerPoint® presentation slides.</td>
<td>2. Discuss the importance of accurately converting between measurement systems.</td>
<td>1. Show Sessions Five, Six, and Seven PowerPoint® presentation slides.</td>
<td>1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.</td>
</tr>
<tr>
<td>2. Discuss the use of site plans and have trainees identify elements shown on site plans.</td>
<td>3. Explain how to use a builder’s level and differential leveling procedures to determine site and building elevations.</td>
<td>2. Explain how to record field notes according to accepted practices.</td>
<td>2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.</td>
</tr>
<tr>
<td>3. Discuss the types of control points used on a construction site.</td>
<td>4. Describe hand signals commonly used in the field for site-layout work.</td>
<td>3. Describe the applications involving differential leveling.</td>
<td></td>
</tr>
</tbody>
</table>
### Materials Checklist for Module 27401-14, Site Layout One: Differential Leveling

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td>Auto level</td>
<td>Leveling rod</td>
</tr>
<tr>
<td>Eye protection</td>
<td>Blank set of field notes</td>
<td>Leveling rod target</td>
</tr>
<tr>
<td>Gloves</td>
<td>Builder’s level</td>
<td>Operator’s manuals for leveling instruments</td>
</tr>
<tr>
<td>Hard hat</td>
<td>Calculator</td>
<td>Permanent markers</td>
</tr>
<tr>
<td>Steel-toe boots</td>
<td>Copy of OSHA regulations for construction</td>
<td>Plumb bob</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Direct elevation rod</td>
<td>Scrap stakes and laths</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Examples of good and bad field notes</td>
<td>Set of construction drawings, including site plans</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Field notes with backsight and foresight measurements</td>
<td>Stakes</td>
</tr>
<tr>
<td><strong>Carpentry Level Four PowerPoint® Presentation Slides</strong></td>
<td>Laser beam detector</td>
<td>Tape measure</td>
</tr>
<tr>
<td>DVD player</td>
<td>Laser level</td>
<td>Tripod</td>
</tr>
<tr>
<td>Computer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor-supplied videos/DVDs showing differential leveling <em>(optional)</em></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27402-14 describes the principles, equipment, and methods used to perform angular and distance measurements. The use and care of laser instruments, transit levels, theodolites, electronic distance measurement, and total stations are covered.

### Objectives

#### Learning Objective 1
1. Complete calculations pertaining to angular measurements.
   a. Identify common elements of plane geometry.
   b. Use the Pythagorean theorem and right-triangle trigonometry to determine unknown values.
   c. Convert angular measurements stated in decimal degrees to degrees, minutes, seconds, and vice versa.

#### Learning Objective 2
2. Identify, safely use, and properly care for site-layout tools and instruments.
   a. List safety hazards associated with site layout.
   b. Identify distance measurement tools and equipment.
   c. Identify site-layout instruments and equipment.
   d. Describe the use of GPS devices for construction projects.
   e. Describe the initial setup and adjustment of a transit level or theodolite.

#### Learning Objective 3
3. Lay out building lines using traditional and radial layout techniques.
   a. Describe field checks for surveying instruments.
   b. Explain how to measure distances by taping.
   c. Describe how to measure horizontal and vertical angles.
   d. Explain how to lay out building lines.
   e. Describe additional distance and direction systems as they pertain to building layout.

### Performance Tasks

- **Performance Task 1 (Learning Objective 1)**
  - Perform calculations pertaining to angular measurements.

- **Performance Task 2 (Learning Objective 2)**
  - Identify, safely use, and properly care for site-layout tools and instruments.

- **Performance Task 3 (Learning Objective 2)**
  - Read transit level/theodolite scales and verniers.

- **Performance Task 4 (Learning Objective 3)**
  - Use a transit level to lay out building lines using traditional and radial layout techniques.

### Teaching Time: 37.5 hours
(Fifteen 2.5-hour Classroom sessions)

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

### Prerequisites

*Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three*

### Before You Begin

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

Using your access code, download the Module Examinations and Performance Profile Sheets from [www.nccerirc.com](http://www.nccerirc.com). The passing score for submission into NCCER’s Registry is 70 percent or above for the Module Examination; performance testing is graded pass or fail.
**Safety Considerations**

This module requires that trainees lay out construction sites. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

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### Classroom Equipment and Materials
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Carpentry Level Four PowerPoint® Presentation Slides
- Computer
- Copies of the Module Examination and Performance Profile Sheets
- Vendor-supplied videos/DVDs showing angular and distance measuring (optional)
- TV/DVD player

### Equipment and Materials for Laboratories and Performance Testing

**Personal protective equipment:**
- Eye protection
- Hard hat
- Steel-toed shoes
- 100-foot steel tape
- Blank copies of JHA forms
- Calculator
- Cardboard
- Chaining pins
- Digital theodolite
- EDMI
- Electronic data collection device
- Electronic distance measurement instrument (EDMI)
- Electronic transit level
- Gammon reel
- GPS app for smartphone
- GPS survey device
- Hand sight level

**Handheld GPS**
- Manufacturer’s data sheet from precision tape
- Masking/duct tape
- Operator’s manuals for site-layout instruments
- Photographs of construction sites in early phases
- Photographs of items/equipment found on construction sites
- Plumb bob
- Range pole
- Scissors
- Set of construction drawings
- Small mirrors
- Tack or small nail
- Theodolite
- Total station
- Transit level

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### Additional Resources and References

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


There are a number of online resources available for trainees who would like more information on angular and distance measurement. A search for additional information may be assigned as homework to interested trainees.
Session Outline for 27402-14

SITE LAYOUT TWO: ANGULAR AND DISTANCE MEASUREMENT

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

SESSION ONE
Session One introduces performing angular calculations.
1. Show Session One PowerPoint® presentation slides.
2. Identify common shapes of plane geometry.
3. Explain how to solve for unknown values of a triangle.
4. Discuss right-triangle trigonometry used in angular measurement.
5. Convert angular measurements stated in decimal degrees to degrees, minutes, seconds, and vice versa.

SESSION TWO
Session Two introduces site layout safety and distance-measurement equipment.
1. Show Session Two PowerPoint® presentation slides.
2. Discuss potential safety hazards associated with site layout.
3. Discuss the use and care of distance measurement equipment used in conjunction with the taping process.

SESSION THREE AND FOUR
Sessions Three and Four introduce site layout instruments and GPS devices.
1. Show Sessions Three and Four PowerPoint® presentation slides.
2. Continue the discussion of site layout instruments and equipment by discussing the use and care of precision instruments.
3. Describe how GPS devices are used for construction projects.

SESSION FIVE
Session Five introduces the setup and adjustment of transit levels and theodolites.
1. Show Session Five PowerPoint® presentation slides.
2. Explain how to set up over a point using a transit level or theodolite and a plumb bob.
3. Explain how to set up over a point using a transit level or theodolite and an optical plummet.

SESSION SIX
Session Six introduces field checks for site layout instruments.
1. Show Session Six PowerPoint® presentation slides.
2. Discuss field check procedures for surveying instruments.

SESSIONS SEVEN AND EIGHT
Sessions Seven and Eight introduce distance measurement by taping.
1. Show Sessions Seven and Eight PowerPoint® presentation slides.
2. Explain how to measure distances by taping.
3. Demonstrate the proper procedures for taping a distance.
Session Outline for 27402-14

SITE LAYOUT TWO: ANGULAR AND DISTANCE MEASUREMENT

SESSIONS NINE THROUGH ELEVEN

Sessions Nine through Eleven introduce measuring horizontal and vertical angles.

1. Show Sessions Nine, Ten, and Eleven PowerPoint® presentation slides.
2. Explain how to use theodolites and transit levels to measure horizontal, vertical, and traverse angles.
3. Demonstrate how to accurately measure horizontal, vertical, and traverse angles.

SESSIONS TWELVE AND THIRTEEN

Sessions Twelve and Thirteen introduce laying out building lines.

1. Show Sessions Twelve and Thirteen PowerPoint® presentation slides.
2. Explain how to lay out building lines using the traditional method.
3. Explain how to lay out building lines using the radial layout method.
4. Demonstrate how to lay out building lines.

SESSION FOURTEEN

Session Fourteen introduces distance and direction systems.

1. Show Session Fourteen PowerPoint® presentation slides.
2. Describe distance and direction systems as they pertain to building layout.
3. Demonstrate how to convert from one system to another.

SESSION FIFTEEN

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

1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
### Materials Checklist for Module 27402-14, Site Layout Two: Angular and Distance Measurement

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th>100-foot steel tape</th>
<th>Blank copies of JHA forms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye protection</td>
<td>Transit level</td>
<td>Total station</td>
</tr>
<tr>
<td>Hard hat</td>
<td>Theodolite</td>
<td>Tack or small nail</td>
</tr>
<tr>
<td>Steel-toe shoes</td>
<td>Calculator</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Chaining pins</td>
<td>Digital theodolite</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>EDMI</td>
<td>Electronic data collection device</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Electronic distance measurement instrument (EDMI)</td>
<td>Electronic transit level</td>
</tr>
<tr>
<td><strong>Carpentry Level Four</strong></td>
<td>Gammon reel</td>
<td>GPS app for smartphone</td>
</tr>
<tr>
<td>PowerPoint® Presentation Slides</td>
<td>GPS survey device</td>
<td>Hand sight level</td>
</tr>
<tr>
<td>TV/DVD player</td>
<td>Handheld GPS</td>
<td>Manufacturer’s data sheet from precision tape</td>
</tr>
<tr>
<td>Computer</td>
<td>Masking/duct tape</td>
<td>Operator’s manuals for site-layout instruments</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
<td>Photographs of construction sites in early phases</td>
<td>Photographs of items/equipment found on construction sites</td>
</tr>
<tr>
<td><strong>Vendor-supplied videos/DVDs showing angular and distance measuring (optional)</strong></td>
<td>Photographs of items/equipment found on construction sites</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Plumb bob</td>
<td>Range pole</td>
</tr>
<tr>
<td></td>
<td>Scissors</td>
<td>Set of construction drawings</td>
</tr>
<tr>
<td></td>
<td>Small mirrors</td>
<td></td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27403-14 describes commercial roofing materials and structures and as well as the procedures for installing commercial roofing, such as standing-seam, lap-seam, and built-up roofs.

Objectives

Learning Objective 1
1. Describe the characteristics and properties of metals as they relate to roofing applications.
   a. Identify physical characteristics of metals.
   b. Identify mechanical properties of metals.
   c. Describe standard metal forms and structural shapes.

Learning Objective 2
2. Identify types of advanced roof structures.
   a. Discuss the use of steel trusses and joists used in commercial roofing.
   b. Identify other trusses used for commercial roofing.

Learning Objective 3
3. Describe the installation of a metal roof.
   a. Identify safety precautions and hazards when installing roof systems.
   b. Identify design considerations when installing metal roofs.
   c. Explain how to install a lap-seam metal roof.
   d. Explain how to install a standing-seam metal roof.

Learning Objective 4
4. Describe the installation of a built-up roof.

Performance Tasks

Performance Task 1
(Learning Objective 3)
- Prepare an eave for a metal roof.

Performance Task 2
(Learning Objective 3)
- Install panels for a lap-seam roof.

Performance Task 3
(Learning Objective 3)
- Install endlapped standing-seam metal roof panels.

Performance Task 4
(Learning Objective 3)
- Seal sidelpop seams for a standing-seam metal roof.

Teaching Time: 20 hours
(Eight 2.5-hour Classroom sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites
Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three

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

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

This module requires that trainees work at elevations when installing roofs. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

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### Classroom Equipment and Materials

- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- **Carpentry Level Four**
- PowerPoint® Presentation Slides
- Computer
- Copies of the Module
- Examination and Performance Profile Sheets
- Vendor-supplied videos/DVDs showing advanced roof systems *(optional)*
- TV/DVD player

### Equipment and Materials for Laboratories and Performance Testing

**Personal protective equipment:**
- Cut-resistant gloves
- Face shield
- Hard hat
- Personal fall-arrest system, including lifelines
- Safety glasses
- Steel-toed shoes
- A-bolts
- Batten strip
- Blank copy of JHA
- Blanket insulation
- Blocking for purlins
- Caulk
- Caulking gun
- Chalk and chalkline
- Cinch strap
- Dunnage
- Hand seaming tools
- Lap-seam metal panels
- Manufacturer literature for lap-seam metal roofs
- Mockup of a roof support structure
- Mockup of an eave
- Open-web steel joists
- OSHA **Safety and Health Standards for the Construction Industry**, Part 1926, Subpart M
- Panel clips

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### Additional Resources and References

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


There are a number of online resources available for trainees who would like more information on advanced roof systems. A search for additional information may be assigned as homework to interested trainees.
Session Outline for 27403-14

ADVANCED ROOF SYSTEMS

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

**SESSION ONE**

Session One introduces the characteristics and properties of metal.
1. Show Session One PowerPoint® presentation slides.
2. Review the physical characteristics of different types of metals.
3. Identify the mechanical properties of different types of metals.
4. Describe standard metal forms and structural shapes.

**SESSION TWO**

Session Two introduces advanced roof structures.
1. Show Session Two PowerPoint® presentation slides.
2. Discuss the configurations and installation of steel trusses and joists used in commercial roofing.
3. Identify other trusses used for commercial roofing.

**SESSION THREE**

Session Three introduces safety hazards and precautions related to installing metal roofs.
1. Show Session Three PowerPoint® presentation slides.
2. Emphasize safety precautions and hazards associated with installing roof systems.
3. Identify design considerations when installing metal roofs.

**SESSIONS FOUR AND FIVE**

Sessions Four and Five introduce lap-seam roofing installation.
1. Show Sessions Four and Five PowerPoint® presentation slides.
2. Explain and demonstrate how to install a lap-seam metal roof.

**SESSIONS SIX AND SEVEN**

Sessions Six and Seven introduce standing-seam metal roof installation and built-up roofs.
1. Show Sessions Six and Seven PowerPoint® presentation slides.
2. Explain and demonstrate how to install a standing-seam metal roof.
3. Explain how a built-up roof is installed.

**SESSION EIGHT**

Session Eight is a review and testing session. Have trainees complete the module Review Questions and Trade Terms Quiz. (Alternatively, these may be assigned as homework at the end of Session Seven.) Answer any questions that trainees may have.
1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
# Materials Checklist for Module 27403-14, Advanced Roof Systems

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td>A-bolts</td>
</tr>
<tr>
<td>Cut-resistant gloves</td>
<td>Blank copy of JHA</td>
</tr>
<tr>
<td>Face shield</td>
<td>Blocking for purlins</td>
</tr>
<tr>
<td>Hard hat</td>
<td>Caulking gun</td>
</tr>
<tr>
<td>Personal fall-arrest system, including lifelines</td>
<td>Cinch strap</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>Hand seaming tools</td>
</tr>
<tr>
<td>Steel-toed shoes</td>
<td>Manufacturer literature for lap-seam metal roofs</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Mockup of an eave</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>OSHA Safety and Health Standards for the Construction Industry, Part 1926, Subpart M</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Personal fall-arrest system</td>
</tr>
<tr>
<td>Carpentry Level Four</td>
<td>Power drill</td>
</tr>
<tr>
<td>PowerPoint® Presentation Slides</td>
<td>Ridge covers</td>
</tr>
<tr>
<td>TV/DVD player</td>
<td>Power seaming tools</td>
</tr>
<tr>
<td>Computer</td>
<td>Scrap pieces of various types of metals</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
<td>Sealant</td>
</tr>
<tr>
<td>Vendor-supplied videos/ DVDs showing advanced roof systems <em>(optional)</em></td>
<td>Self-tapping screws</td>
</tr>
<tr>
<td></td>
<td>Set of construction drawings</td>
</tr>
<tr>
<td></td>
<td>Set of roofing drawings (lap-seam metal roof)</td>
</tr>
<tr>
<td></td>
<td>Tape measure</td>
</tr>
<tr>
<td></td>
<td>Wrenches</td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27404-14 describes curtain walls, types of firewalls, fire-rated openings through these walls, and fire-protection methods for structural members.

**Objectives**

**Learning Objective 1**
1. Identify safety hazards to consider when erecting an advanced wall system.
   a. Describe hazards that may be present when installing wall systems.
   b. Identify the fall protection equipment to be used when installing wall systems.

**Learning Objective 2**
2. Describe the different types of advanced wall systems.
   a. Describe the use of curtain walls and identify the types of curtain walls.
   b. Identify various types of insulated wall systems and explain the carpenter’s role in their installation.
   c. Identify the carpenter’s role in the installation of masonry walls.
   d. Define fire-rated construction and explain methods used to fireproof a wall system.

**Performance Tasks**

**Performance Task 1**
(Learning Objective 2)
- Erect a hollow metal-frame buck for a masonry wall.

**Performance Task 2**
(Learning Objective 2)
- Construct firewalls in accordance with specifications.

**Teaching Time:** 25 hours
(Ten 2.5-hour Classroom sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

**Prerequisites**
*Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three*

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

Using your access code, download the Module Examinations and Performance Profile Sheets from [www.nccerirc.com](http://www.nccerirc.com). The passing score for submission into NCCER’s Registry is 70 percent or above for the Module Examination; performance testing is graded pass or fail.
Safety Considerations

This module requires that trainees install curtain wall components and construct fire-rated assemblies. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

Classroom Equipment and Materials
- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Carpentry Level Four
- PowerPoint® Presentation Slides
- Computer
- Copies of the Module Examination and Performance Profile Sheets
- Vendor-supplied videos/DVDs showing advanced wall systems (optional)
- TV/DVD player

Equipment and Materials for Laboratories and Performance Testing
- Personal protective equipment:
  - Anchorage points
  - Body harnesses
  - Eye protection
  - Gloves
  - Hard hat
  - Lanyards
  - Lifelines
  - Snap hooks or carabiners
  - Steel-toed shoes
- Adhesive
- Aluminum curtain wall components (mullions, subframe, etc.)
- Blank copies of JHA form
- Circular saw
- Clips
- Concrete
- Concrete block
- Different types of ICFs
- Dimensional lumber
- Drywall screws
- Extension cord
- Fan
- Gypsum board
- Gypsum board manufacturer catalogs containing information on fire-rated assemblies
- Hammer
- Hinges and door closers for fire doors
- Installation manuals for door closers
- International Building Code®
- Level
- Local building code
- Metal bracing
- Nails
- OSHA Safety and Health Standards for the Construction Industry, Part 1926, Subpart M
- Photographs of various types of curtain wall systems
- Plywood
- Power drill
- Power screwdriver
- Reciprocating saw
- Samples of IMPs
- Samples of SIPs
- Scrap closed-core foam packing materials
- Screwdrivers
- Self-tapping sheet metal screws
- Set of construction drawings for masonry veneer structure
- Spray bottle
- Tape measure
- Wall mockup
- Water
- Water hose
- Window or door buck
- Wood or metal base and top plates
- Wood or metal studs

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


Underwriters Laboratories. www.ul.com

There are a number of online resources available for trainees who would like more information on advanced wall systems. A search for additional information may be assigned as homework to interested trainees.
The lesson plan for this module is divided into ten 2.5-hour sessions. Each session includes 10 minutes for administrative tasks and one 10-minute break.

**SESSIONS ONE AND TWO**

Sessions One and Two introduce wall system safety.
1. Show Sessions One and Two PowerPoint® presentation slides.
2. Describe hazards that may be present when installing wall systems.
3. Identify the fall protection equipment used when installing wall systems.

**SESSIONS THREE AND FOUR**

Sessions Three and Four introduce curtain walls.
1. Show Sessions Three and Four PowerPoint® presentation slides.
2. Describe the use of curtain walls.
3. Identify the types of curtain walls and explain how they are installed.

**SESSIONS FIVE AND SIX**

Sessions Five and Six introduce insulated wall systems and masonry veneer walls.
1. Show Sessions Five and Six PowerPoint® presentation slides.
2. Identify various types of insulated wall systems.
3. Explain the carpenter’s role in the installation of insulated wall systems.
4. Identify the carpenter’s role in the installation of masonry walls.

**SESSIONS SEVEN THROUGH NINE**

Sessions Seven, Eight, and Nine introduce fire-rated construction.
1. Show Sessions Seven, Eight, and Nine PowerPoint® presentation slides.
2. Define fire-rated construction.
3. Explain methods used to fireproof a wall system.

**SESSION TEN**

Session Ten is a review and testing session. Have trainees complete the module Review Questions and Trade Terms Quiz. (Alternatively, these may be assigned as homework at the end of Session Nine.) Answer any questions that trainees may have.
1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
### Materials Checklist for Module 27404-14, Advanced Wall Systems

<table>
<thead>
<tr>
<th><strong>Equipment and Materials</strong></th>
<th><strong>Aluminum curtain wall components (mullions, subframe, etc.)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td><strong>Adhesive</strong></td>
</tr>
<tr>
<td>Anchorage points</td>
<td>Blank copies of JHA form</td>
</tr>
<tr>
<td>Body harnesses</td>
<td>Clips</td>
</tr>
<tr>
<td>Eye protection</td>
<td>Concrete block</td>
</tr>
<tr>
<td>Gloves</td>
<td>Dimensional lumber</td>
</tr>
<tr>
<td>Hard hat</td>
<td>Extension cord</td>
</tr>
<tr>
<td>Lanyards</td>
<td>Gypsum board</td>
</tr>
<tr>
<td>Lifelines</td>
<td>Hammer</td>
</tr>
<tr>
<td>Snap hooks or carabiners</td>
<td>Installation manuals for door closers</td>
</tr>
<tr>
<td>Steel-toed shoes</td>
<td>Level</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Metal bracing</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>OSHA Safety and Health Standards for the Construction Industry, Part 1926, Subpart M</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Plywood</td>
</tr>
<tr>
<td>TV/DVD player</td>
<td>Samples of IMPs</td>
</tr>
<tr>
<td>Computer</td>
<td>Scrap closed-core foam packing materials</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
<td>Self-tapping sheet metal screws</td>
</tr>
<tr>
<td>Vendor-supplied videos/ DVDs showing advanced wall systems (optional)</td>
<td>Spray bottle</td>
</tr>
<tr>
<td>Wall mockup</td>
<td>Water</td>
</tr>
<tr>
<td>Water hose</td>
<td>Window or door buck</td>
</tr>
<tr>
<td>Wood or metal base and top plates</td>
<td>Wood or metal studs</td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27405-14 provides extensive coverage of the materials and techniques used in finishing wood stairways. The module also covers a variety of stair systems used in commercial construction.

Objectives

Learning Objective 1
1. Identify the stair parts in various systems.

Learning Objective 2
2. Describe the procedure for cutting and installing various stairway systems.
   a. Describe the procedure for cutting and installing open service stairways.
   b. Describe the procedure for cutting and installing closed service stairways.
   c. Describe the procedure for cutting and installing main stairways.
   d. Describe the procedure for cutting and installing exterior wood stairways.
   e. Describe the procedure for cutting and installing L- and U-shaped stairways.

Learning Objective 3
3. Describe the procedure for cutting and installing various custom stairway systems.
   a. Describe the procedure for cutting and installing elliptical stairways.
   b. Describe the procedure for cutting and installing shop-built stairways.
   c. Describe the procedure for cutting and installing winder treads.

Learning Objective 4
4. Identify the materials that can be used to build commercial stairways.
   a. Describe the procedure for constructing concrete stairways.
   b. Describe advantages of using prefabricated concrete-filled steel stairways.
   c. Explain the purpose of commercial stair-tread facing and nosing.

Performance Tasks

Performance Task 1 (Learning Objective 2)
• Install open and closed service-stairway treads and risers.

Performance Task 2 (Learning Objective 2)
• Install treads and risers on open, closed, and/or combination open/closed main stairways.

Performance Task 3 (Learning Objective 2)
• Miter a finished stringer and risers.

Performance Task 4 (Learning Objective 2)
• Install a return nosing.

Performance Task 5 (Learning Objective 2)
• Install a post-to-post balustrade system.

Performance Task 6 (Learning Objective 3)
• Lay out an elliptical stairway.

Teaching Time: 25 hours
(Ten 2.5-hour Classroom sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites
Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three

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

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

This module requires that trainees work at elevations when installing or constructing stairways. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

<table>
<thead>
<tr>
<th>Classroom Equipment and Materials</th>
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</thead>
<tbody>
<tr>
<td>Whiteboard/chalkboard</td>
</tr>
<tr>
<td>Markers/chalk</td>
</tr>
<tr>
<td>Pencils and paper</td>
</tr>
<tr>
<td><em>Carpentry Level Four PowerPoint® Presentation Slides</em></td>
</tr>
<tr>
<td>Computer</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
</tr>
<tr>
<td>Vendor-supplied videos/DVDs showing advanced stair systems <em>(optional)</em></td>
</tr>
<tr>
<td>TV/DVD player</td>
</tr>
</tbody>
</table>

## Equipment and Materials for Laboratories and Performance Testing

<table>
<thead>
<tr>
<th>Personal protective equipment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloves</td>
</tr>
<tr>
<td>Hard hat</td>
</tr>
<tr>
<td>Safety glasses</td>
</tr>
<tr>
<td>Safety shoes</td>
</tr>
<tr>
<td>1⁄₂&quot; plywood</td>
</tr>
<tr>
<td>12-point hand saw</td>
</tr>
<tr>
<td>2 x 4s</td>
</tr>
<tr>
<td>4 x 4 posts</td>
</tr>
<tr>
<td>4 x 4 shores</td>
</tr>
<tr>
<td>4d finish nails</td>
</tr>
<tr>
<td>6d finish nails</td>
</tr>
<tr>
<td>8d finish nails</td>
</tr>
<tr>
<td>Assorted screws</td>
</tr>
<tr>
<td>Baluster components</td>
</tr>
<tr>
<td>Balusters</td>
</tr>
<tr>
<td>Centering drill guide</td>
</tr>
<tr>
<td>Chalkline</td>
</tr>
<tr>
<td>Circular saw</td>
</tr>
<tr>
<td>Cleats</td>
</tr>
<tr>
<td>Combination square</td>
</tr>
<tr>
<td>Construction adhesive</td>
</tr>
<tr>
<td>Construction drawings for a two- (or more) story residence with exterior wood stairway</td>
</tr>
<tr>
<td>Construction drawings for a two-story residence</td>
</tr>
<tr>
<td>Construction drawings for an L- or U-shaped wood stairway</td>
</tr>
<tr>
<td>Construction drawings for main stairway</td>
</tr>
<tr>
<td>Cove molding</td>
</tr>
<tr>
<td>Dowel rod</td>
</tr>
<tr>
<td>Drill bits</td>
</tr>
<tr>
<td>Framing square</td>
</tr>
<tr>
<td>Glue blocks</td>
</tr>
<tr>
<td>Gooseneck fitting</td>
</tr>
<tr>
<td>Hammer</td>
</tr>
<tr>
<td>Handrails</td>
</tr>
<tr>
<td>Heavy paper or cardboard</td>
</tr>
<tr>
<td><em>International Building Code®</em></td>
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<tr>
<td><em>International Residential Code®</em></td>
</tr>
<tr>
<td>Joists</td>
</tr>
<tr>
<td>Lag bolts and washers</td>
</tr>
<tr>
<td>Landing (balcony) newel</td>
</tr>
<tr>
<td>Local building code</td>
</tr>
<tr>
<td>Locking pliers</td>
</tr>
<tr>
<td>Nail set</td>
</tr>
<tr>
<td>Newel post</td>
</tr>
<tr>
<td>Over-the-post connection</td>
</tr>
<tr>
<td>Panel braces</td>
</tr>
<tr>
<td>Photographs of elaborate main stairways</td>
</tr>
<tr>
<td>Photographs of elliptical stairways</td>
</tr>
<tr>
<td>Photographs of stairways under construction and/or stairway components</td>
</tr>
<tr>
<td>Photographs of stairways with balusters</td>
</tr>
<tr>
<td>Pins</td>
</tr>
<tr>
<td>Pitch block</td>
</tr>
<tr>
<td>Plywood panels</td>
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<tr>
<td>Post-to-post connection</td>
</tr>
<tr>
<td>Power drill</td>
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<tr>
<td>Power miter saw</td>
</tr>
<tr>
<td>Power sander</td>
</tr>
<tr>
<td>Pre-assembled stairway framework</td>
</tr>
<tr>
<td>Pressure-treated 2 x 4, 2 x 6, 2 x 10, and 2 x 12 lumber</td>
</tr>
<tr>
<td>Quarterturn</td>
</tr>
<tr>
<td>Rail bolts</td>
</tr>
<tr>
<td>Rebar</td>
</tr>
<tr>
<td>Rebar tie wire</td>
</tr>
<tr>
<td>Equipment and Materials for Laboratories and Performance Testing</td>
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<tr>
<td>---------------------------------------------------------------</td>
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<tr>
<td>Right-hand volute</td>
</tr>
<tr>
<td>Riser boards</td>
</tr>
<tr>
<td>Sawhorse</td>
</tr>
<tr>
<td>Stringers</td>
</tr>
<tr>
<td>Table saw with rip fence</td>
</tr>
<tr>
<td>Tape measure</td>
</tr>
<tr>
<td>Tempered hardboard</td>
</tr>
<tr>
<td>Toggle bolts</td>
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<tr>
<td>Tread and riser stock</td>
</tr>
<tr>
<td>Tread and riser templates</td>
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<td>Tread return nosing</td>
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<tr>
<td>Utility knife</td>
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<tr>
<td>Volute</td>
</tr>
<tr>
<td>Wall brackets for handrail</td>
</tr>
<tr>
<td>Wood chisel</td>
</tr>
<tr>
<td>Wood plugs</td>
</tr>
<tr>
<td>Wood rasp</td>
</tr>
<tr>
<td>Wrenches (assorted sizes)</td>
</tr>
</tbody>
</table>

**Additional Resources and References**

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


*International Code Council, [www.iccsafe.org](http://www.iccsafe.org)*

There are a number of online resources available for trainees who would like more information on advanced stair systems. A search for additional information may be assigned as homework to interested trainees.
Session Outline for 27405-14

ADVANCED STAIR SYSTEMS

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

SESSIONS ONE THROUGH THREE

Sessions One, Two, and Three introduce stairway and balustrade components as well as open and closed service stairways.

1. Show Sessions One, Two, and Three PowerPoint® presentation slides.
2. Identify the stair parts in various systems.
3. Describe and demonstrate the procedure for cutting and installing open service stairways.
4. Describe and demonstrate the procedure for cutting and installing closed service stairways.

SESSIONS FOUR THROUGH SIX

Sessions Four, Five, and Six introduce main stairways.

1. Show Sessions Four, Five, and Six PowerPoint® presentation slides.
2. Describe and demonstrate the procedure for cutting and installing main stairways.

SESSION SEVEN

Session Seven introduces exterior wood stairways and L- and U-shaped stairways.

1. Show Session Seven PowerPoint® presentation slides.
2. Describe and demonstrate the procedure for cutting and installing exterior wood stairways.
3. Describe and demonstrate the procedure for cutting and installing L- and U-shaped stairways.

SESSION EIGHT

Session Eight introduces custom stair systems.

1. Show Session Eight PowerPoint® presentation slides.
2. Describe the procedures for laying out, cutting, and installing elliptical stairways.
3. Describe the procedure for installing shop-built stairways.
4. Describe the procedure for cutting and installing winder treads.

SESSION NINE

Session Nine introduces commercial stairways and prefabricated steel and concrete-filled stairways.

1. Show Session Nine PowerPoint® presentation slides.
2. Describe the procedure for constructing concrete stairways.
3. Describe the advantages of using prefabricated steel and concrete-filled stairways.
4. Discuss the use of safety and antiwear tread facings and nosings on stairways.

SESSION TEN

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

1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
<table>
<thead>
<tr>
<th>Equipment and Materials</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Personal protective equipment:</td>
<td>1/2&quot; plywood</td>
</tr>
<tr>
<td>Gloves</td>
<td>2 × 4s</td>
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<tr>
<td>Hard hat</td>
<td>4 × 4 shores</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>4 × 4 posts</td>
</tr>
<tr>
<td>Safety shoes</td>
<td>Assorted screws</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Balusters</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Chalkline</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Cleats</td>
</tr>
<tr>
<td>Carpentry Level Four PowerPoint® Presentation Slides</td>
<td>Construction adhesive</td>
</tr>
<tr>
<td>TV/DVD player</td>
<td>Construction drawings for a two-story residence</td>
</tr>
<tr>
<td>Computer</td>
<td>Construction drawings for a two-story residence</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
<td>Dowel rod</td>
</tr>
<tr>
<td>Vendor-supplied videos/DVDs showing advanced stair systems (optional)</td>
<td>Framing square</td>
</tr>
<tr>
<td>Gooseneck fitting</td>
<td>Hammer</td>
</tr>
<tr>
<td>Handrails</td>
<td>Heavy paper or cardboard</td>
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<tr>
<td>International Building Code® International Residential Code®</td>
<td>Joists</td>
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<tr>
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<td>Lag bolts and washers</td>
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<td>Locking pliers</td>
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<tr>
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<tr>
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<td>Photographs of stairways under construction and/or stairway components</td>
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<td>Photographs of stairways with balusters</td>
<td>Pins</td>
</tr>
<tr>
<td>Pitch block</td>
<td>Plywood panels</td>
</tr>
<tr>
<td>Post-to-post connection</td>
<td>Power drill</td>
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<tr>
<td>Power miter saw</td>
<td>Power sander</td>
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<td>Rebar</td>
<td>Rebar tie wire</td>
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<tr>
<td>Right-hand volute</td>
<td>Riser boards</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Sawhorse Screwdriver bits</td>
<td>for power drill</td>
</tr>
<tr>
<td>Scribe</td>
<td>Set of box-end wrenches</td>
</tr>
<tr>
<td>Shoe molding</td>
<td>Skirt board</td>
</tr>
<tr>
<td>Stair stringers</td>
<td>Stair treads</td>
</tr>
<tr>
<td>Starting easing</td>
<td>Starting newel</td>
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<tr>
<td>Starting step</td>
<td>Stick</td>
</tr>
<tr>
<td>String</td>
<td>Stringers</td>
</tr>
<tr>
<td>Table saw with rip fence</td>
<td>Tape measure</td>
</tr>
<tr>
<td>Tempered hardboard</td>
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<td>Tread and riser stock</td>
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<td>Wall brackets for handrail</td>
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<tr>
<td>Wood chisel</td>
<td>Wood plugs</td>
</tr>
<tr>
<td>Wood rasp</td>
<td>Wrenches (assorted sizes)</td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27406-14 describes various pieces of equipment commonly used at a construction site, including the aerial lift, skid-steer loader, electric power generator, compressor, compactor, forklift, and backhoe. The module provides an overview of general safety, operation, and maintenance procedures for each type of equipment.

### Objectives

#### Learning Objective 1

1. State the safety precautions associated with construction equipment.
   a. Identify safety precautions when transporting construction equipment.
   b. Identify safety precautions related to interlocking and hydraulic systems.
   c. Identify safety precautions to observe when fueling construction equipment.
   d. Identify safety precautions related to batteries of construction equipment.

#### Learning Objective 2

2. Identify and explain the safe operation and use of various pieces of construction equipment.
   a. Explain the safe operation of aerial lifts.
   b. Explain the safe operation of skid-steer loaders.
   c. Explain the safe operation of generators.
   d. Explain the safe operation of compressors.
   e. Explain the safe operation of compactors.
   f. Explain the safe operation of forklifts.
   g. Explain the safe operation of backhoes.

### Performance Tasks

This is a knowledge-based module; there no required performance tasks.

### Teaching Time: 7.5 hours

(Three 2.5-hour Classroom sessions)

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

### Prerequisites

*Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three*

### Before You Begin

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

Using your access code, download the Module Examinations from [www.nccerinc.com](http://www.nccerinc.com). The passing score for submission into NCCER’s Registry is 70 percent or above for the Module Examination.

**Important Note:** The Core Curriculum Basic Safety module and the Safety Review Questions at the back of the Trainee Guide must be successfully completed before a trainee can operate any type of construction equipment.

Instructors may wish to establish a relationship with a local equipment rental facility that will allow the class to visit and observe demonstrations of the equipment covered in this module.
**Safety Considerations**

This module requires that trainees work in and around construction equipment. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

---

**Classroom Equipment and Materials**

- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Carpentry Level Four
- PowerPoint® Presentation Slides
- Computer
- Copies of the Module Examination
- Vendor-supplied videos/DVDs showing construction equipment (optional)
- TV/DVD player

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**Equipment and Materials for Laboratories and Performance Testing**

- **Personal protective equipment:**
  - Hard hat
  - Safety glasses
  - Safety shoes
  - Personal fall arrest system
- Aerial lift
- Air compressor
- Backhoe
- Blank copies of the following forms:
  - Forklift operator’s daily checklist
  - Generator preventive maintenance schedule
  - Aerial lift maintenance and inspection schedule
  - Skid-steer loader service schedule
- Cam-operated twist locks
- Copy of Subpart O (Motor Vehicles, Mechanized Equipment, and Marine Operations) of OSHA construction regulations
- Flat-plate compactor
- Forklift
- Generator
- Operator’s manual for aerial lift or skid-steer loader
- Photographs of the following types of construction equipment:
  - Aerial lift
  - Air compressor
  - Backhoe
  - Compactor
  - Forklift
  - Generator
  - Skid-steer loader
- Set of construction drawings for a small commercial building
- Skid-steer loader
- Whip checks

---

**Additional Resources and References**

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


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

Session One introduces general construction equipment safety and describes the use of aerial lifts and skid-steer loaders.

1. Show Session One PowerPoint® presentation slides.
2. Identify general safety precautions associated with construction equipment.
3. Discuss how to safely operate an aerial lift.
4. Discuss how to safely operate a skid-steer loader.

SESSION TWO

Session Two introduces generators, air compressors, compactors, forklifts, and backhoes.

1. Show Session Two PowerPoint® presentation slides.
2. Discuss how to safely operate a generator.
3. Discuss how to safely operate a compressor.
4. Discuss how to safely operate a compactor.
5. Discuss how to safely operate a forklift.
6. Discuss how to safely operate a backhoe.

SESSION THREE

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

1. Have trainees complete the Module Examination.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
| Personal protective equipment: | Aerial lift | Air compressor |
| Hard hat | Backhoe | Blank copy of a forklift operator’s daily checklist |
| Safety glasses | Blank copy of a generator preventive maintenance schedule | Blank copy of aerial lift maintenance and inspection schedule |
| Safety shoes | Forklift | Generator |
| Personal fall arrest system | Blank copy of skid-steer loader service schedule | Cam-operated twist locks |
| Whiteboard/chalkboard | Copy of Subpart O (Motor Vehicles, Mechanized Equipment, and Marine Operations) of OSHA construction regulations | Photograph of air compressor |
| Markers/chalk | Set of construction drawings for small commercial building | Photograph of compactor |
| Pencils and paper | Operator’s manual for aerial lift or skid-steer loader | Photograph of generator |
| *Carpentry Level Four*  
PowerPoint® Presentation Slides | Flat-plate compactor | Photograph of aerial lift |
| TV/DVD player | Skid-steer loader | Photograph of backhoe |
| Computer | Whip checks | Photograph of forklift |
| Copies of the Module Examination | | Photograph of skid-steer loader |

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27407-14 introduces the equipment, procedures, and safety practices associated with oxyfuel cutting and arc welding.

**Objectives**

**Learning Objective 1**
1. State the safety rules for oxyfuel cutting.
   a. Identify the proper protective equipment to be used in oxyfuel cutting.
   b. Describe ventilation required when oxyfuel cutting.
   c. Explain the purpose of a hot-work permit.
   d. Identify oxygen hazards that may be present when oxyfuel cutting.
   e. Define *backfire* and *flashback*; describe how to avoid them, and what to do if they occur.
   f. Explain how to safely cut containers.

**Learning Objective 2**
2. Identify the components of an oxyfuel cutting outfit.
   a. Identify gases used for oxyfuel cutting.
   b. Identify the parts of a regulator.
   c. Explain the purpose of hoses and cutting torches.
   d. Identify oxyfuel cutting accessories.

**Learning Objective 3**
3. Describe how to set up and use oxyfuel cutting equipment.
   a. Explain how to set up oxyfuel cutting equipment.
   b. Explain how to use oxyfuel cutting equipment.

**Learning Objective 4**
4. State the safety rules for arc welding.
   a. Identify electrical hazards associated with arc welding.
   b. Identify the proper protective equipment to be used for arc welding.
   c. Describe ventilation required when arc welding.
   d. Explain how to safely weld containers.

**Learning Objective 5**
5. Identify the components of an arc-welding outfit.
   a. Identify types of arc welding machines.
   b. Describe the proper type of cable used for arc welding machines.
   c. Identify arc welding accessories.
   d. Identify the types of arc welding electrodes and interpret meanings of the electrode classification codes.
   e. Identify factors to consider when selecting electrodes.

**Learning Objective 6**
6. Describe how to set up and use arc welding equipment.
   a. Explain how to strike an arc.
   b. Describe how to restart and terminate a weld.
   c. Identify types of weld beads.
   d. Explain how to create a fillet weld.
   e. Identify various welding symbols.

**Learning Objective 7**
7. Describe other methods of cutting and welding.
   a. Describe the plasma and air-carbon arc cutting processes.
   b. Describe the gas-metal and gas-tungsten arc welding processes.

**Performance Tasks**

**Performance Task 1 (Learning Objective 2)**
- Match cutting torch tips to their applications.

**Performance Task 2 (Learning Objectives 3 and 6)**
- Use either an oxyfuel cutting outfit or arc welder to do one or more of the following:
  - Set up an oxyfuel cutting torch and cut a piece of mild steel.
  - Set up an electric arc welder and weld two pieces of mild steel.

**Teaching Time: 20 hours**
(Eight 2.5-hour Classroom sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

**Prerequisites**
*Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three*
Before You Begin
As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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

Safety Considerations
This module requires that trainees work with welding and cutting equipment. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

Classroom Equipment and Materials
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Carpentry Level Four PowerPoint® Presentation Slides
Computer
Copies of the Module Examination and Performance Profile Sheets
Vendor-supplied videos/DVDs showing oxyfuel cutting or arc welding (optional)
TV/DVD player

Equipment and Materials for Laboratories and Performance Testing
Personal protective equipment:
- Ear plugs
- Face shield
- Fire-resistant clothing
- Hard hat
- Leather gauntlet-type gloves
- Non-mesh cap
- Safety glasses
- Safety goggles with light tint
- Safety shoes
- Welding hood with tinted lens (shade 9-14)

Air-carbon arc-cutting machine and accessories
- Check valves
- Chipping hammer
- Container for cutting (optional)
- Container for welding
- Cutting torch tips
- Cylinder cart
- Electrode holder
- Electrodes
- Files
- Flashback arrestors
- Friction lighter
- Fuel gas cylinder
- Fuel gas regulators
- Full-face, supplied-air respirator (SAR)
- Gas-metal arc-welding (GMAW) machine and accessories
- Gas-tungsten arc-welding (GTAW) machine and accessories
- Hoses
- Manufacturer and supplier catalogs containing oxyfuel cutting equipment and supplies
- Manufacturer catalogs (including welding cables)
- Oxyfuel cutting torch
- Oxygen cylinder
- Oxygen regulators
- Photograph of SMAW setup
- Photograph of transformer welding machine
- Plasma arc-cutting setup and accessories
- Samples of good and bad cuts
- Set of construction drawings with welding notations
- SMAW welding machine (transformer welding machine, transformer-rectifier welding machine, or engine-driven generator and alternator)
- Soapstone marker
- Thin and thick steel samples
- Tip cleaners
- Tip drills
- Torch wrench
- Weld samples of stringer and weave beads

Welded assemblies
Welding cables
Wire brushes
Workpiece clamp

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


There are a number of online resources available for trainees who would like more information on oxyfuel cutting and arc welding. A search for additional information may be assigned as homework to interested trainees.
Session Outline for 27407-14

INTRODUCTION TO OXYFUEL CUTTING AND ARC WELDING

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

SESSION ONE
Session One introduces oxyfuel cutting safety, equipment, and accessories.
1. Show Session One PowerPoint® presentation slides.
2. Discuss the safety precautions for oxyfuel cutting.
3. Explain and demonstrate how to safely cut containers.
4. Identify the components of an oxyfuel cutting outfit, and discuss their functions.

SESSION TWO
Session Two introduces the setup and operation of an oxyfuel cutting outfit.
1. Show Session Two PowerPoint® presentation slides.
2. Explain and demonstrate how to set up oxyfuel cutting equipment.
3. Explain and demonstrate how to use oxyfuel cutting equipment.

SESSION THREE
1. Session Three introduces arc welding safety and types of arc welding machines.
2. Show Session Three PowerPoint® presentation slides.
3. Discuss the safety rules for arc welding.
4. Identify types of arc welding machines.

SESSION FOUR
Session Four introduces welding cables, accessories, and electrode selection.
1. Show Session Four PowerPoint® presentation slides.
2. Describe the cables and accessories used for arc welding machines.
3. Identify the types of arc welding electrodes, and interpret the electrode classification markings.
4. Discuss factors to consider when selecting electrodes.

SESSION FIVE
Session Five introduces the setup and operation of arc welding equipment.
1. Show Session Five PowerPoint® presentation slides.
2. Describe how to set up and use arc welding equipment.
3. Explain how to strike an arc.
4. Describe how to restart and terminate a weld.

SESSION SIX
Session Six introduces weld beads and welding symbols.
1. Show Session Six PowerPoint® presentation slides.
2. Identify types of weld beads.
3. Explain how to create a fillet weld.
4. Identify various welding symbols.
### Session Seven

Session Seven introduces additional cutting and welding processes.

1. Show Session Seven PowerPoint® presentation slides.
2. Describe and demonstrate the plasma and air-carbon arc cutting processes.
3. Describe and demonstrate the gas-metal and gas-tungsten arc welding processes.

### Session Eight

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

1. Have trainees complete the Module Examination. Any outstanding performance testing must be completed during this session.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
## Materials Checklist for Module 27407-14, Introduction to Oxyfuel Cutting and Arc Welding

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th>Air-carbon arc cutting machine and accessories</th>
<th>Check valves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear plugs</td>
<td>Chipping hammer</td>
<td>Container for cutting (optional)</td>
</tr>
<tr>
<td>Face shield</td>
<td>Container for welding</td>
<td>Cutting torch tips</td>
</tr>
<tr>
<td>Fire-resistant clothing</td>
<td>Cylinder cart</td>
<td>Electrode holder</td>
</tr>
<tr>
<td>Hard hat</td>
<td>Electrodes</td>
<td>Files</td>
</tr>
<tr>
<td>Leather gauntlet-type gloves</td>
<td>Flashback arrestors</td>
<td>Friction lighter</td>
</tr>
<tr>
<td>Non-mesh cap</td>
<td>Fuel gas cylinder</td>
<td>Fuel gas regulators</td>
</tr>
<tr>
<td>Safety glasses</td>
<td>Full-face, supplied-air respirator (SAR)</td>
<td>Gas-metal arc-welding (GMAW) machine and accessories</td>
</tr>
<tr>
<td>Safety goggles with light tint</td>
<td>Gas-tungsten arc-welding (GTAW) machine and accessories</td>
<td>Hoses</td>
</tr>
<tr>
<td>Safety shoes</td>
<td>Manufacturer and supplier catalogs containing oxyfuel cutting equipment and supplies</td>
<td>Manufacturer catalogs (including welding cables)</td>
</tr>
<tr>
<td>Welding hood with tinted lens (shade 9–14)</td>
<td>Oxyfuel cutting torch</td>
<td>Oxygen cylinder</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Oxygen regulators</td>
<td>Photograph of SMAW setup</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td>Photograph of transformer welding machine</td>
<td>Plasma arc-cutting setup and accessories</td>
</tr>
<tr>
<td>Pencils and paper</td>
<td>Samples of good and bad cuts</td>
<td>Set of construction drawings with welding notations</td>
</tr>
<tr>
<td><strong>Carpentry Level Four</strong></td>
<td><strong>PowerPoint® Presentation Slides</strong></td>
<td>Soapstone marker</td>
</tr>
<tr>
<td><strong>TV/DVD player</strong></td>
<td>Thin and thick steel samples</td>
<td>Tip cleaners</td>
</tr>
<tr>
<td><strong>Computer</strong></td>
<td>Tip drills</td>
<td>Torch wrench</td>
</tr>
<tr>
<td>Copies of the Module Examination and performance profile sheets</td>
<td>Weld samples of stringer and weave beads</td>
<td>Welded assemblies</td>
</tr>
<tr>
<td></td>
<td>Welding cables</td>
<td>Wire brushes</td>
</tr>
<tr>
<td></td>
<td>Workpiece clamp</td>
<td></td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 27409-14 describes the planning process that precedes the start of work on a construction site, including environmental considerations, personnel issues, access roads, traffic control, permits, site safety, utilities, and crane-related concerns.

### Objectives

**Learning Objective 1**

1. Describe stormwater protection and erosion and sedimentation control.
   - a. Describe environmental concerns and the role of federal, state, and local regulations in environmental issues.
   - b. Identify ways to prevent erosion and sedimentation.
   - c. Identify methods used to mitigate subsurface water problems at a work site.

**Learning Objective 2**

2. List items that need to be addressed in the site utilization plan.
   - a. Explain how to set up a construction site.
   - b. Explain how to handle natural vegetation and spoils.
   - c. Describe the placement of utilities on a construction site.

**Learning Objective 3**

3. Identify methods to ensure site safety and security.
   - a. Describe methods used to ensure site safety, including construction signs, barricades, and traffic control.
   - b. Describe methods used for site security.

### Performance Tasks

This is a knowledge-based module; there are no performance tasks.

### Teaching Time: 7.5 hours

(Three 2.5-hour Classroom sessions)

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

### Prerequisites

Core Curriculum, Carpentry Level One, Carpentry Level Two, and Carpentry Level Three

### Before You Begin

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

Using your access code, download the Module Examinations from www.nccerirc.com. The passing score for submission into NCCER's Registry is 70 percent or above for the Module Examination.
Safety Considerations
This module requires that trainees working with and around earthmoving equipment. Safety is paramount in the carpentry trade and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

Classroom Equipment and Materials
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
*Carpentry Level Four PowerPoint® Presentation Slides
Computer
Copies of the Module Examination
Vendor-supplied videos/DVDs showing site preparation (optional)
TV/DVD player

Equipment and Materials for Laboratories and Performance Testing
Examples of signs found at construction sites
Newspaper or Internet articles that discuss construction environmental concerns
Sample permits
Samples of different types of soil
Stormwater pollution prevention plan
Waste items from a construction site

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


OSHA standard *CFR 29 Part 1926, Safety and Health Regulations for Construction.*


*Standards for Construction Site Fire Safety.* UN-024-2/6. [www.unidocs.org](http://www.unidocs.org)


There are a number of online resources available for trainees who would like more information on site preparation. A search for additional information may be assigned as homework to interested trainees.
The lesson plan for this module is divided into three 2.5-hour sessions. Each session includes 10 minutes for administrative tasks and one 10-minute break.

**SESSION ONE**

Session One introduces stormwater protection, erosion and sediment control, and setting up construction sites.

1. Show Session One PowerPoint® presentation slides.
2. Discuss how stormwater runoff is prevented through the implementation of a stormwater pollution prevention plan (SWPPP).
3. Explain how erosion and sediment is controlled on a construction site.
4. Discuss the proper set up of construction sites, including utilities and material storage.

**SESSION TWO**

Session Two introduces the handling of natural vegetation, spoils, and soil, as well and site safety and security.

1. Show Session Two PowerPoint® presentation slides.
2. Explain how to handle natural vegetation and spoils.
3. Identify methods to ensure site safety and security.

**SESSION THREE**

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

1. Have trainees complete the Module Examination.
2. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
# Materials Checklist for Module 27409-14, Site Preparation

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
<td>Examples of signs found at construction sites</td>
</tr>
<tr>
<td>None</td>
<td>Sample permits</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td>Stormwater pollution prevention plan</td>
</tr>
<tr>
<td>Markers/chalk</td>
<td></td>
</tr>
<tr>
<td>Pencils and paper</td>
<td></td>
</tr>
<tr>
<td><strong>Carpentry Level Four PowerPoint® Presentation Slides</strong></td>
<td></td>
</tr>
<tr>
<td>TV/DVD player</td>
<td></td>
</tr>
<tr>
<td>Computer</td>
<td></td>
</tr>
<tr>
<td>Copies of the Module Examination</td>
<td></td>
</tr>
<tr>
<td>Vendor-supplied videos/DVDs showing site preparation <em>(optional)</em></td>
<td></td>
</tr>
</tbody>
</table>

To the extent possible, and as required for performance testing, provide a selection of the tools listed for each session; alternatively, photos may be used to teach tool identification.
Module 9 (46101-11) teaches the skills needed to become an effective crew leader. It will help a crew leader who wants to become more effective, as well as a crew member who aspires to become a crew leader. The module covers basic leadership skills, safety, and project control.

## Objectives

### Section One
1. Describe the opportunities in the construction and power industries.
2. Describe how workers’ values change over time.
3. Explain the importance of training and safety for the leaders in the construction and power industries.
4. Describe how new technologies are beneficial to the construction and power industries.
5. Identify the gender and minority issues associated with a changing workforce.
6. Describe what employers can do to prevent workplace discrimination.
7. Differentiate between formal and informal organizations.
8. Describe the difference between authority, responsibility, and accountability.
9. Explain the purpose of job descriptions and what they should include.
10. Distinguish between company policies and procedures.

### Section Two
1. Describe the role of a crew leader.
2. List the characteristics of effective leaders.
3. Be able to discuss the importance of ethics in a supervisor’s role.
4. Identify the three styles of leadership.
5. Describe the forms of communication.
6. Describe the four parts of verbal communication.
7. Describe the importance of active listening.
8. Explain how to overcome the barriers to communication.
9. List ways that leaders can motivate their employees.
10. Explain the importance of delegating and implementing policies and procedures.
11. Distinguish between problem solving and decision making.

### Section Three
1. Explain the importance of safety.
2. Give examples of direct and indirect costs of workplace accidents.
3. Identify safety hazards of the construction industry.
4. Explain the purpose of OSHA.
5. Discuss OSHA inspection procedures.
6. Identify the key points of a safety program.
7. List steps to train employees on how to perform new tasks safely.
8. Identify a crew leader’s safety responsibilities.
9. Explain the importance of having employees trained in first aid and cardiopulmonary resuscitation (CPR).
10. Describe the indications of substance abuse.
11. List the essential parts of an accident investigation.
12. Describe ways to maintain employee interest in safety. Distinguish between company policies and procedures.

### Section Four
1. Describe the three phases of a construction project.
2. Define the three types of project delivery systems.
3. Define planning and describe what it involves.
4. Explain why it is important to plan.
5. Describe the two major stages of planning.
6. Explain the importance of documenting job site work.
7. Describe the estimating process.
8. Explain how schedules are developed and used.
9. Identify the two most common schedules.
10. Explain how the critical path method (CPM) of scheduling is used.
11. Describe the different costs associated with building a job.
12. Explain the crew leader’s role in controlling costs.
13. Illustrate how to control the main resources of a job: materials, tools, equipment, and labor.
14. Explain the differences between production and productivity and the importance of each.

### Performance Tasks

**Performance Task 1 (Section Four)**
- Develop and present a look-ahead schedule.

**Performance Task 2 (Section Four)**
- Develop an estimate for a given work activity.
Teaching Time: 20 hours
(Eight 2.5-Hour Classroom Sessions)
Session time may be adjusted to accommodate your class size, schedule, and teaching style.

Prerequisites
The prerequisites for this module are dependent upon the structure of the specific craft training program in which trainees are specifically enrolled.

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

Using your access code, download the written examinations and performance profile sheets from www.nccerirc.com. The passing score for submission into NCCER’s Registry is 70% or above for the written examination; performance testing is graded pass or fail.

Safety Considerations
This module should be conducted in a classroom or conference room environment. Therefore, no special safety precautions are required.

Classroom Equipment and Materials
Whiteboard/chalkboard
Markers/chalk
Pencils and paper
Carpentry Level Four
PowerPoint®
Presentations
DVD player
LCD projector and screen
Computer
Internet access during class (optional)
A drawing marked to show as-built changes.
Copies of the Module Examination and Performance Profile Sheets
Additional Resources

This module presents thorough resources for task training. The following resources are suggested for further study.

_Aging Workforce News, [www.agingworkforce-news.com](http://www.agingworkforce-news.com)._  
American Society for Training and Development (ASTD), [www.astd.org](http://www.astd.org).  
Architecture, Engineering, and Construction Industry (AEC), [www.aecinfo.com](http://www.aecinfo.com).  
CIT Group, [www.citgroup.com](http://www.citgroup.com).  
National Association of Women in Construction (NAWIC), [www.nawic.org](http://www.nawic.org).  
National Center for Construction Education and Research, [www.nccer.org](http://www.nccer.org).  
National Institute of Occupational Safety and Health (NIOSH), [www.cdc.gov/niosh](http://www.cdc.gov/niosh).  
NCCER Publications:  
- _Your Role in the Green Environment_  
- _Sustainable Construction Supervisor_  
Occupational Safety and Health Administration (OSHA), [www.osha.gov](http://www.osha.gov).  
Society for Human Resources Management (SHRM), [www.shrm.org](http://www.shrm.org).  
United States Census Bureau, [www.census.gov](http://www.census.gov).  

There are a number of online resources, including video, available for trainees who would like more information on crew leadership. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos before using them to ensure their suitability. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Instructors are also encouraged to locate additional audiovisual aids available on the internet, make personal videos, and take photos related to the relevant trade and add them to the PowerPoint® presentations throughout the program.
Session Outline for 46101-11

**FUNDAMENTALS OF CREW LEADERSHIP**

The Lesson Plan for this module is divided into eight 2.5-hour sessions. This time includes 10 minutes for administrative tasks and a 10-minute break per session.

### Session One

Session One introduces the trainees to the basic elements of leadership. It covers an overview of industry and the need for a trained workforce; gender and cultural issues; and the structure and dynamics of business organizations.

1. Show the Session One PowerPoint® presentation.
2. Use the Kickoff Activity to get trainees engaged and give them an idea of what they will learn in this module.
3. Describe how to understand and motivate crew members.
4. Discuss the importance of gender and cultural issues in the workplace.
5. Describe the various types of organizational structures found in businesses.
6. Discuss the relationships of authority, responsibility, and accountability.

### Session Three

Session Three focuses on safety. It presents the role of the crew leader in maintaining crew safety. Trainees will learn the relationship between safety and cost and will learn to view safety from a leadership perspective. Included in this lesson are discussions of company and crew leader responsibility for safety and accident investigation, as well as methods of promoting safety among the workforce.

1. Show the Session Three PowerPoint® presentation.
2. Describe how safety issues can directly and indirectly affect a company’s cost of doing business.
3. Discuss OSHA inspections and penalties for safety violations.
4. Describe how an employer safety program is structured and the role of the crew leader in the program.
5. Explain how a crew leader is involved in day-to-day safety issues such as conducting safety training sessions and assisting in accident investigations.
6. Describe how crew leaders can promote safe work practices within their crews.

### Session Two

Session Two covers leadership skills. It focuses on the role of the crew leader and the transition from crew member. It discusses the characteristics of good leaders, leadership styles, and ethics. Key elements of this session are effective communication; motivating others; team building; delegating; and problem solving. A number of exercises will allow the trainees to test their leadership skills.

1. Show the Session Two PowerPoint® presentation.
2. Describe the qualities of an effective leader.
3. Discuss methods of communication and the importance of listening.
4. Describe how to motivate others.
5. Discuss the elements of team building and delegating.
6. Describe how to deal with problems on the job.
7. Discuss how to resolve special problems that often confront a crew leader.
**Session Four**

Session Four introduces the subject of project control. It deals with the fundamentals, including project phases, project scheduling, cost estimating, and planning. It introduces the trainee to the contractual aspects of a project and the steps in completing a project, from its initial concept through the final delivery. Trainees will learn how to estimate labor and materials.

1. Show the Session Four PowerPoint® presentation.
2. Describe the different types of contracts and the three phases of a project.
3. Explain how to estimate the manpower and materials required for a project.
4. Discuss the function of planning and the planning process.
5. Describe how to plan the various resources such as manpower, tools, equipment and materials required for a project.

**Session Five**

Session Five continues to focus on project control. It introduces trainees to various types of schedules and how they are used. Included in this session are discussions of project control methods related to cost and the crew leader’s role in controlling project cost. Also covered in this session are methods used in controlling labor, material, tools, and equipment on the job site.

1. Show the Session Five PowerPoint® presentation.
2. Discuss the different project scheduling methods.
3. Explain how to prepare project schedules.
4. Describe the tools and methods used to control project cost.
5. Describe the tools and methods used to control resources during a job.
6. Explain the difference between production and productivity and explain why these concepts are an important part of project planning and control.

**Sessions Six and Seven**

Sessions Six and Seven are laboratory sessions in which the trainees will practice the development of a project schedule and a cost estimate.

1. Note that there is no PowerPoint® presentation associated with this session.
2. Using an instructor-prepared scenario appropriate for the trade, trainees complete the tasks associated with Performance Tasks 1 and 2.

**Session Eight**

Session Eight is a review and testing session.

1. Review any material that has not been fully presented and answer any questions that the trainees may have.
2. Have the trainees complete the written examination. Any outstanding performance testing must be completed during this session as well.
3. Record the testing results on Training Report Form 200, and submit the report to your Training Program Sponsor.
### Materials Checklist for Module 46101-11, Fundamentals of Crew Leadership

<table>
<thead>
<tr>
<th>Equipment and Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Personal protective equipment:</strong></td>
</tr>
<tr>
<td>[None]</td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
</tr>
<tr>
<td>Markers/chalk</td>
</tr>
<tr>
<td>Pencils and paper</td>
</tr>
<tr>
<td><em>Carpentry Level Four Power-Point</em>© Presentations</td>
</tr>
<tr>
<td>DVD player</td>
</tr>
<tr>
<td>LCD projector and screen</td>
</tr>
<tr>
<td>Computer</td>
</tr>
<tr>
<td>Internet access during class (optional)</td>
</tr>
<tr>
<td>A drawing marked to show as-built changes.</td>
</tr>
<tr>
<td>Copies of the Module Examination and Performance Profile Sheets</td>
</tr>
</tbody>
</table>

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