MODULE OVERVIEW

This module provides a brief history of the millwright trade and describes the work performed by millwrights today. It covers career opportunities, safety practices, and the attitudes and work habits that are important to success in the craft.

PREREQUISITES

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

OBJECTIVES

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

1. Describe the types of work performed by millwrights.
2. Identify career opportunities available to millwrights.
3. Explain the purpose and objectives of an apprentice training program.
4. Explain the responsibilities of a millwright.
5. Explain the importance of safety in relation to millwrights.
6. Explain the role of NCCER in the training process.

PERFORMANCE TASKS

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

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
- Job announcements for millwrights from newspapers or other resources
- NCCER Apprentice Training Recognition Forms
- Copy of an employee manual
- OSHA Safety and Health Standards for the Construction Industry
- Basic millwright tools
- Module Examinations*

* Located in the Test Booklet.

SAFETY CONSIDERATIONS

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

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. 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 5 hours are suggested to cover Orientation to the Trade. You will need to adjust the time required for hands-on activity and testing based on your class size and resources.

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<thead>
<tr>
<th>Topic</th>
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<tbody>
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<td><strong>Session I. Orientation to the Trade</strong></td>
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<tr>
<td>A. Introduction</td>
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<td>B. History of the Millwright Trade</td>
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<tr>
<td>C. Coordinating with the Construction Industry</td>
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<tr>
<td>D. Millwright Career Paths</td>
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<tr>
<td>E. Responsibilities of the Employee</td>
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<td><strong>Session II. Professional Relations, Tools, Training, Review, and Module Examination</strong></td>
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<tr>
<td>A. Human Relations</td>
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<td>B. Employer and Employee Safety Obligations</td>
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<td>D. Your Training Program</td>
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<td>E. Review</td>
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<tr>
<td>F. Module Examination</td>
<td></td>
</tr>
<tr>
<td>1. Trainees must score 70 percent or higher to receive recognition from NCCER.</td>
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<tr>
<td>2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.</td>
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</tbody>
</table>
MODULE OVERVIEW
This module introduces the various hand tools used in the millwright trade. It explains basic hand tool safety and the methods for selecting, inspecting, using, and maintaining the tools.

PREREQUISITES
Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Millwright Level One, Module 15101-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Explain the purpose of each of the tools commonly used by millwrights.
2. Explain how to maintain each of the tools used by millwrights.
3. Demonstrate the proper use of selected millwright tools.

PERFORMANCE TASKS
Under the supervision of the instructor, the trainee should be able to do the following:
1. Demonstrate the use and care of the following millwright hand tools:
   - Strap wrench/chain wrenches
   - Spanner wrenches
   - Taper gauges
   - Pipe and tubing cutters
   - Honing stones
   - Putty knives/scrapers
   - Drift pins
   - Diagonal cutters
   - Tin snips
   - Taps and dies
   - Thread gauges
   - Scribers
   - Tension meters
   - Sheave gauges
   - Cylinder hones
   - Gear pullers
   - Packing pullers
   - Reamers
   - Inspection mirrors
   - Retaining ring pliers
   - Spiral screw extractors
   - Tap extractors
   - Mallets
   - Alignment pins

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
- Pictures of various tools (optional)
- Damaged or unsafe tools
- Assorted diameters of pipe
- Strap wrench/chain wrenches
- Spanner wrenches
- Taper gauges
- Pipe and tubing cutters
- Honing stones
- Putty knives/scrapers
- Drift pins
- Barrel pins
- Soft steel
- Diagonal cutters
- Tin snips
- Taps and dies
- Thread gauges
- Scribers
- Tension meters
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 hand tools. Emphasize basic hand tool safety.

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. 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 2 1/2 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 *Millwright Hand Tools*. 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>
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<tbody>
<tr>
<td><strong>Session I. Introduction, Safety, Maintenance, Wrenches and Other Tools</strong></td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Hand Tools Safety</td>
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<tr>
<td>C. Use and Care of Tools</td>
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<td>D. Wrenches</td>
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<td>E. Taper gauges</td>
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<tr>
<td>F. Laboratory – Trainees practice using and caring for tools discussed in this session. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Sessions II and III. Cutting and Other Tools</strong></td>
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<tr>
<td>A. Pipe and Tubing Cutters</td>
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<td>B. Honing Stones</td>
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<td>C. Putty Knives/Scrapers</td>
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<td>D. Drift Pins</td>
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<tr>
<td>E. Mallets</td>
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</tbody>
</table>

* Located in the Test Booklet.
F. Diagonal Cutters
G. Tin Snips
H. Taps and Dies
I. Thread Gauges
J. Scribers

K. Laboratory – Trainees practice using and caring for tools discussed in this session. This laboratory corresponds to Performance Task 1.

Session IV. Equipment Disassembly and Other Tools
A. Tension Meters
B. Sheave Gauge
C. Cylinder Hones
D. Gear Puller
E. Packing Pullers
F. Reamers
G. Inspection Mirrors
H. Retaining Ring Pliers

I. Laboratory – Trainees practice using and caring for tools discussed in this session. This laboratory corresponds to Performance Task 1.

Session V. Extractors, Other Tools, and Review
A. Spiral Screw Extractors
B. Tap Extractors
C. Feeler Gauges
D. Alignment Bars
E. Sleeve Bars

F. Laboratory – Trainees practice using and caring for tools discussed in this session. This laboratory corresponds to Performance Task 1.

G. Review

Session VI. Module Examination, and Performance Testing
A. 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.

B. 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 identifies the various types of fasteners used by millwrights and describes the applications and installation procedures for these fasteners.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Millwright Level One, Modules 15101-06 and 15102-06.

OBJECTIVES

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

1. Identify and explain the use of threaded fasteners.
2. Identify and explain the use of non-threaded fasteners.
3. Identify and explain the use of anchors.
4. Select the correct fasteners and anchors for given applications.
5. Install fasteners and anchors.

PERFORMANCE TASKS

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

1. Install threaded fasteners.
2. Install non-threaded fasteners.
3. Install fasteners in hardened concrete.
4. Tighten bolts in sequence using proper torque.

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
- Various types of screws and bolts
- Various types of nuts
- Several types of washers
- Torque wrench
- Retaining rings
- Key
- Motor
- Pin fasteners
- Taper, spring, and cotter pins
- Pop rivets
- Rivet gun
- Eye bolts
- Inserts
- One-step anchors
- Wedge anchors
- Stud bolt anchors
- Sleeve anchors
- Hammer-set anchors
- Threaded rod anchors
- Lead or caulk-in anchors
- Single- and double-expansion anchors
- Manufacturer’s literature on anchors
- Masonry anchors
- Two-part epoxy anchor
- Collection of odd screws, bolts, and fasteners
- Thread gauges
Micrometers  
Gypsum wallboard (optional)  
Plywood (optional)  

Weights or other loads  
Module Examinations*  
Performance Profile Sheets*

* Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires trainees to use hand and power tools. Emphasize basic tool safety.

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. 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 10 hours are suggested to cover Fasteners and Anchors. 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>
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<td>A. Introduction</td>
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<td>B. Thread Standards</td>
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<td>C. Bolt and Screw Types</td>
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<td>D. Nuts</td>
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<td>E. Washers</td>
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<tr>
<td>F. Installing Threaded Fasteners</td>
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<tr>
<td>G. Laboratory – Trainees practice installing threaded fasteners and tightening bolts in sequence using proper torque values. This laboratory corresponds to Performance Tasks 1 and 4.</td>
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<tr>
<td>Session II. Non-threaded Fasteners</td>
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<td>A. Retainer Fasteners</td>
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<td>B. Keys</td>
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<td>C. Pin Fasteners</td>
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<tr>
<td>D. Blind/Pop Rivets</td>
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<tr>
<td>E. Laboratory – Trainees practice installing non-threaded fasteners. This laboratory corresponds to Performance Task 2.</td>
<td></td>
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</tbody>
</table>
Session III. Anchors and Other Fastening Mechanisms, and Review
   A. Eye Bolts and Inserts
   B. Mechanical Anchors
   C. Laboratory – Trainees practice installing fasteners in hardened concrete.
      This laboratory corresponds to Performance Task 3.
   D. Epoxy Anchoring Systems
   E. Review

Session IV. Module Examination, and Performance Testing
   A. 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.
   B. 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.
Basic Layout
Annotated Instructor’s Guide

MODULE OVERVIEW

This module covers the basic tools and the methods used for layout of various lines, angles, circles, and arcs. It includes instructions for base line layout using the arc method and 3-4-5 method.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum: Millwright Level One, Modules 15101-06 through 15103-06.

OBJECTIVES

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

1. Identify layout tools and explain their uses.
2. Lay out base lines using the arc method.
3. Lay out base lines using the 3-4-5 method.
4. Scribe straight lines.
5. Scribe perpendicular lines to base lines using a square.
6. Scribe perpendicular lines to an edge using a combination square.
7. Scribe angled lines using a combination square and a protractor.
8. Scribe circles using dividers and trammel points.
9. Scribe perpendicular lines from base lines using dividers and reference points.
11. Divide a line into equal parts.
12. Divide a circle into equal parts.
13. Lay out equipment locations.

PERFORMANCE TASKS

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

1. Lay out perpendicular lines from a reference line using the:
   • Arc method
   • 3-4-5 method
2. Scribe the following:
   • Straight lines
   • Perpendicular lines to a base line using a square
   • Perpendicular lines to an edge using a combination square
   • Angled lines using a combination square
   • Angled lines using a protractor
   • Circles and arcs using dividers
   • Perpendicular lines from base lines using dividers
   • Perpendicular lines from reference points using dividers
4. Divide lines into equal parts.
5. Divide circles into equal parts.
6. Lay out equipment locations.
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
- Scribers
- Steel rules
- Steel squares
- Combination sets
- Protractors
- Dividers
- Trammel points
- Prick punch sets
- Center punch sets
- Transfer punch sets
- Straightedges
- Compasses with lead or lead pencil holder (optional)
- Large sheet metal piece for each pair of trainees
- 4' × 4' sheet of masonite or one-side sanded plywood for each pair of trainees (optional)
- 4' × 8' sheet of masonite board or one-side sanded plywood for each pair of trainees (optional)
- Equipment layout drawing and building floor blueprint with dimensions and marked reference points (optional)
- Photographs of installation with close-up photographs of reference points and equipment mounting (optional)
- Tools for measuring equipment elevation (optional)
- Module Examinations*
- Performance Profile Sheets*

* Located in the Test Booklet.

SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module may require trainees to visit industrial sites. Ensure that all trainees are briefed on site safety policy and have appropriate personal protective equipment.

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. 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 20 hours are suggested to cover Basic 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>
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<tbody>
<tr>
<td>Session I. Introduction and Layout Tools</td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Identification of Layout Tools</td>
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</tbody>
</table>
Session II. Laying Out Base Lines
   A. Arc Method
   B. 3-4-5 Method
   C. Laboratory – Trainees practice the arc and 3-4-5 method of laying out base lines. This laboratory corresponds to Performance Task 1.

Session III. Scribing Straight Lines and Perpendicular Lines
   A. Scribing Straight Lines
   B. Scribing Perpendicular Lines to a Base Line Using a Square
   C. Scribing Perpendicular Lines to an Edge Using a Combination Square
   D. Laboratories – Trainees practice scribing straight and perpendicular lines. These laboratories correspond to portions of Performance Task 2.

Session IV. Scribing Angled Lines and Circles Using Squares, Protractors, and Dividers
   A. Scribing Angled Lines Using a Combination Square
   B. Scribing Angled Lines Using a Protractor
   C. Scribing Circles and Arcs Using a Divider
   D. Laboratories – Trainees practice scribing of angled lines, circles, and arcs. These laboratories correspond to portions of Performance Task 2.

Session V. Scribing Circles and Perpendicular Lines Using Trammel Points and Dividers
   A. Scribing Circles and Arcs Using Trammel Points
   B. Scribing Perpendicular Lines From Base Lines Using a Divider
   C. Scribing Perpendicular Lines From a Reference Point Using a Divider
   D. Laboratories – Trainees practice scribing of circles, arcs, and perpendicular lines. These laboratories correspond to portions of Performance Task 2.

Session VI. Bisecting Angles, Dividing Lines, and Dividing Circles Using Dividers
   A. Bisecting Angles Using a Divider
   B. Dividing Lines Into Equal Parts Using a Divider
   C. Dividing Circles Into Equal Parts Using a Divider
   D. Laboratories – Trainees practice bisecting angles and dividing lines and circles into equal parts. These laboratories correspond to Performance Tasks 3, 4, and 5.

Session VII. Locating Equipment
   A. Laying Out Equipment Locations
   B. Laboratory – Trainees practice laying out an equipment location. This laboratory corresponds to Performance Task 6.

Session VIII. Review, Module Examination and Performance Testing
   A. Review
   B. Module Examination
      1. Trainees must score 70 percent or higher to receive recognition from NCCER.
      2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
   C. Performance Testing
      1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
      2. Record the testing results on Craft Training Report Form 200, and submit the results to the Training Program Sponsor.
MODULE OVERVIEW

This module identifies and describes gaskets and O-rings, along with their uses. It provides information for laying out, cutting, and installing gaskets. It also provides information for removing and installing O-rings.

PREREQUISITES

Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Millwright Level One, Modules 15101-06 through 15104-06.

OBJECTIVES

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

1. Identify the various types of gaskets and explain their uses.
2. Identify the various types of gasket materials and explain their applications.
3. Lay out, cut, and install a flange gasket.
4. Describe the use of O-rings.
5. Explain the importance of selecting the correct O-ring for an application.
6. Select an O-ring for a given application and install it.

PERFORMANCE TASKS

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

1. Perform a takeoff from a flange for a gasket.
2. Lay out the gasket on gasket material.
3. Cut the inside and outside diameters for the gasket.
4. Cut the bolt holes.
5. Install the gasket and flange bolts.
6. Tighten the flange bolts.

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
- Assorted gaskets
- Gasket manufacturer’s literature including color coding chart
- Pump manufacturer’s literature specifying replacement gaskets
- Samples of some of the more common gasket materials
- Hand tools for measuring and cutting gaskets
- Dividers
- Scribers
- Steel rules
- Adjustable gasket cutters
- Hole punch sets
- Mallets
- Compasses with an ink pen holder and ink pens with silver or white ink
- Gasket materials or old rubber inner tubes that can be cut up as substitute gasket material
- Old appliances, pumps, or valves with O-ring seals
- Sheet metal
- Tin snips
- Bluing
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 work with equipment and cut gaskets. Ensure that all trainees are briefed on hand tool safety and have 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 Gaskets and O-Rings. 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>
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<td>A. Introduction</td>
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<tr>
<td>B. Types of Gaskets</td>
<td>____________</td>
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<tr>
<td>C. Gasket Materials</td>
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<tr>
<td>Session II. Fabricating Gaskets</td>
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<tr>
<td>A. Laying Out a Gasket</td>
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<tr>
<td>B. Laboratory – Trainees practice performing a takeoff, layout, and cutout of flat flange gasket. This laboratory corresponds to Performance Tasks 1, 2, 3, and 4.</td>
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<tr>
<td>C. Tracing a Gasket</td>
<td>____________</td>
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<tr>
<td>D. Machine Gaskets</td>
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</tbody>
</table>

* Located in the Test Booklet.
Session III. Installing Gaskets and O-Rings

A. Installing Gaskets
B. Laboratory – Trainees practice performing installation of a flat flange gasket. This laboratory corresponds to Performance Tasks 5 and 6.
C. O-Rings
D. Laboratory – Trainees practice removing and installing an O-ring.

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.
Oxyfuel Cutting
Annotated Instructor’s Guide

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

PREREQUISITES
Prior to training with this module, it is recommended that the trainee shall have successfully completed Core Curriculum; Millwright Level One, Modules 15101-06 through 15105-06.

OBJECTIVES
Upon completion of this module, the trainee will be able to do the following:
1. Identify and explain the use of oxyfuel cutting equipment.
2. Set up oxyfuel cutting equipment.
3. Light and adjust an oxyfuel torch.
4. Shut down oxyfuel cutting equipment.
5. Disassemble oxyfuel equipment.
7. Perform oxyfuel cutting:
   • Straight line and square shapes
   • Piercing and slot cutting
   • Bevels
   • Washing
8. Operate a motorized, portable oxyfuel gas cutting machine.

Performance Tasks
Under the supervision of the instructor, the trainee should be able to do the following:
1. Set up, ignite, and shut down oxyfuel equipment.
2. Use oxyfuel equipment to cut a shape from thick steel.
3. Use oxyfuel equipment to perform washing.
4. Perform a pressure drop test.

MATERIALS AND EQUIPMENT LIST

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overhead projector and screen</td>
<td></td>
</tr>
<tr>
<td>Transparencies</td>
<td></td>
</tr>
<tr>
<td>Blank acetate sheets</td>
<td></td>
</tr>
<tr>
<td>Transparency pens</td>
<td></td>
</tr>
<tr>
<td>Whiteboard/chalkboard</td>
<td></td>
</tr>
<tr>
<td>Markers/chalk</td>
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<tr>
<td>Pencils and scratch paper</td>
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<tr>
<td>Appropriate personal protective equipment,</td>
<td></td>
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<tr>
<td>including: Safety goggles, Face shields,</td>
<td></td>
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<tr>
<td>Welding helmets, Ear protection, Welding cap</td>
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<tr>
<td>Leather jacket</td>
<td></td>
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<tr>
<td>Leather pants or chaps</td>
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<tr>
<td>Gauntlet-type welding gloves</td>
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<tr>
<td>Respirators</td>
<td></td>
</tr>
<tr>
<td>ANSI Z49.1-1999</td>
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<tr>
<td>OSHA 29 CFR 1910.146</td>
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<tr>
<td>Brass valves</td>
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<tr>
<td>MSDS for cutting products</td>
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<tr>
<td>Oxygen cylinder with cap</td>
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<tr>
<td>Fuel gas cylinder with cap</td>
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<tr>
<td>Regulators (oxygen and fuel gas)</td>
<td></td>
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<tr>
<td>Hose set</td>
<td></td>
</tr>
<tr>
<td>One-piece cutting torch</td>
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</tbody>
</table>
SAFETY CONSIDERATIONS

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires that the trainees operate oxyfuel cutting equipment. Ensure that trainees are briefed on fire and shop safety policies prior to performing any work. Emphasize the special safety precautions associated with the use of cylinders and oxyfuel cutting equipment.

ADDITIONAL RESOURCES

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


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 Oxyfuel Cutting. You will need to adjust the time required for hands-on activity and testing based on your class size and resources. Because laboratories often correspond to Performance Tasks, the proficiency of the trainees may be noted during these exercises for Performance Testing purposes.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Planned Time</th>
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<tbody>
<tr>
<td>Session I. Introduction, Safety, and Oxyfuel Cutting Equipment</td>
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<tr>
<td>A. Introduction</td>
<td></td>
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<tr>
<td>B. Oxyfuel Cutting Safety</td>
<td></td>
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<tr>
<td>C. Oxyfuel Cutting Equipment</td>
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</tr>
<tr>
<td>1. Cylinders, Regulators, and Hoses</td>
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<tr>
<td>2. Cutting Torch, Tips, and Tip Equipment</td>
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<tr>
<td>3. Friction Lighters</td>
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</tbody>
</table>
4. Cylinder Cart
5. Soapstone Markers
6. Specialized Equipment

Session II. Setting Up Oxyfuel Equipment
A. Setting Up Oxyfuel Equipment
   1. Cylinders
   2. Hoses and Regulators
   3. Torches and Tips
   4. Purging and Testing
B. Laboratory - Trainees practice setting up oxyfuel equipment.
C. Laboratory - Trainees practice performing a pressure drop test. This laboratory corresponds to Performance Task 4.

Session III. Torch Operations
A. Controlling the Oxyfuel Torch Flame
B. Shutting Down Oxyfuel Equipment
C. Laboratory - Trainees practice setting up, igniting, and shutting down oxyfuel equipment. This laboratory corresponds to Performance Task 1.
D. Disassembling Oxyfuel Equipment
E. Changing Empty Cylinders
F. Laboratory - Trainees practice disassembling and changing empty cylinders on an oxyfuel cutting outfit.

Sessions IV and V. Performing Cutting Operations, Testing, and Review
A. Performing Cutting Procedures
B. Portable Oxyfuel Cutting Machine Operation
C. Laboratory - Trainees practice cutting a shape from thick steel. This laboratory corresponds to Performance Task 2.
D. Laboratory - Trainees practice washing with an oxyfuel cutting torch. This laboratory corresponds to Performance Task 3.
E. Review

Session VI. Module Examination, and Performance Testing
A. 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.
B. 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.