Module Overview

This module covers the selection and installation of various types of insulating materials in walls, floors, and attics. It also covers the uses and installation practices for vapor barriers, waterproofing materials, and building wraps.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed *Fundamentals of Weatherization*, and *Weatherization Technician Level One*, Module 33102-10.

Objectives

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

1. Describe the requirements for insulation.
2. Describe the characteristics of various types of insulation material.
3. Calculate the required amounts of insulation for a structure.
4. Install selected insulation materials.
5. Describe the requirements for moisture control and ventilation.
6. Install selected vapor barriers.
7. Describe various methods of waterproofing.
8. Describe air infiltration control requirements.
9. Install selected building wraps.

Performance Tasks

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

1. Install blanket insulation in a wall.
2. Install a vapor barrier on a wall.
3. Install selected building wraps.

Materials and Equipment

- Markers/chalk
- Pencils and scratch paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Appropriate personal protective equipment
- Flexible insulation
- Loose-fill insulation
- Rigid or semi-rigid insulation boards
- Reflective insulation
- Hand or power stapler and staples
- Calculator
- Samples of various vapor barrier materials
- Samples of various waterproofing materials
- Soffit baffles
- Wire mesh (if needed)
- Tape measure
- Utility knife or shears
- Pencil
- Prepared wall for insulation, vapor barriers, and building wraps
- Copies of the Quick Quiz*
- Module Examinations**
- Performance Profile Sheets**

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

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module may require trainees to visit construction sites. Ensure that they are briefed on site safety procedures. This module requires trainees to install insulation materials. Ensure that they are properly briefed on the use of all tools and personal protection necessary to handle insulation materials.

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 7½ hours are suggested to cover Thermal and Moisture Protection. 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; Thermal Insulation</strong></td>
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<tr>
<td>A. Introduction</td>
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<tr>
<td>B. Thermal Insulation</td>
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<tr>
<td>C. Insulation Installation Guidelines</td>
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<tr>
<td>D. Laboratory</td>
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</tr>
<tr>
<td>Have trainees practice installing blanket insulation in a wall. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Session II. Moisture Control; Air Infiltration Control</strong></td>
<td></td>
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<tr>
<td>A. Moisture Control</td>
<td></td>
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<tr>
<td>B. Laboratory</td>
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<tr>
<td>Have trainees practice installing a vapor barrier on a wall. This laboratory corresponds to Performance Task 2.</td>
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<tr>
<td>C. Waterproofing</td>
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<tr>
<td>D. Air Infiltration Control</td>
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<tr>
<td>E. Laboratory</td>
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<tr>
<td>Have trainees practice installing selected building wraps. This laboratory corresponds to Performance Task 3.</td>
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</tbody>
</table>
Session III. Review and Testing

A. Module Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
Module Overview

This module provides an overview of the materials and techniques commonly used for constructing and finishing wood or masonry structures. Included are descriptions of the tools and procedures used to install fasteners and anchors in wood, masonry, and drywall. Power tools commonly used for running cable are also described.

Prerequisites

Prior to training with this module, it is recommended that the trainee shall have successfully completed Fundamentals of Weatherization.

Objectives

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

1. Describe the composition and uses of the common types of residential building materials.
2. Identify the major structural components of a residential building.
3. State the major steps in the construction of a frame residence.
4. Explain common terms used in residential construction.
5. Describe how cable is run within a building.
6. Select the appropriate drill bits and bore openings in lumber and masonry.
7. Cut plywood with a jig saw or reciprocating saw.
8. Select and install appropriate fasteners and anchors in the following:
   - Wood
   - Masonry
   - Drywall

Performance Tasks

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

1. Select the appropriate drill bits and bore openings in lumber and masonry.
2. Cut plywood with a jig saw or reciprocating saw.
3. Select and install appropriate fasteners and anchors in the following:
   - Wood
   - Masonry
   - Drywall

Materials and Equipment

Pencils and scratch paper
Whiteboard/chalkboard
Markers/chalk
Multimedia projector and screen
Desktop or laptop computer
Appropriate personal protective equipment
Rulers or measuring tape

Samples of typical construction materials:
- Dimension lumber
- Plywood and building boards
- Engineered wood products
- Concrete blocks
- Building brick
Components of a wood framing system or an illustration of a framing system
Operator’s manuals for selected power tools
Power screwdriver
Drill
Selection of drill bits and hole saws

(continued)
Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. This module requires the trainees to use power tools for cutting and drilling. Brief trainees on shop safety procedures and point out fire extinguishers, first aid stations, and other emergency equipment. Review basic electrical safety and power tool safety. Emphasize the use of personal protective equipment. This module may require that the trainees visit job sites. Ensure that trainees are briefed on job-site safety policies prior to any site visits.

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 12½ hours are suggested to cover Wood and Masonry Construction Methods. 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>
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<td><strong>Session I. Introduction; Building Materials</strong></td>
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<td>A. Introduction</td>
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<td>B. Building Materials</td>
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<td>1. Gypsum Board</td>
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<td>2. Masonry Materials</td>
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<td><strong>Session II. Wood Frame Construction</strong></td>
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<td>A. Sills</td>
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<td>B. Floor Construction</td>
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<td>C. Wall Construction</td>
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<td>D. Ceiling Construction</td>
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<td>E. Roof Construction</td>
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<td>F. Plank-and-Beam Framing</td>
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<td>G. Wall Framing in Masonry</td>
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<tr>
<td>H. Walls Separating Occupancies</td>
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</table>
Session III. Fasteners and Anchors
   A. Screws
   B. Nonthreaded Fasteners
   C. Screw Anchors
   D. Hollow-Wall Anchors

Session IV. Tools
   A. Guidelines for Using All Power Tools
   B. Drilling Tools
   C. Cutting Tools
   D. Stud Finders

Session V. Laboratories; Review and Testing
   A. Laboratory
      Have trainees practice selecting the correct drill bits and boring openings in lumber and masonry. This laboratory corresponds to Performance Task 1.
   B. Laboratory
      Have trainees practice cutting plywood with a jig saw or reciprocating saw. This laboratory corresponds to Performance Task 2.
   C. Laboratory
      Have trainees practice installing fasteners and anchors in wood, masonry, and drywall. This laboratory corresponds to Performance Task 3.
   D. Module Review
   E. Module Examination
      1. Trainees must score 70 percent or higher to receive recognition from NCCER.
      2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
   F. Performance Testing
      1. Trainees must perform each task to the satisfaction of the instructor to receive recognition from the NCCER. If applicable, proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.
      2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.
Sealing the Building Envelope
Annotated Instructor’s Guide

Module Overview
This module explains how to seal the envelope of a home to prevent air from entering and leaving the home, and how to add insulation to reduce heat loss and heat gain. Sealing the building envelope and adding insulation results in a more comfortable home that uses less energy for heating and cooling.

Prerequisites
Before you begin this module, it is recommended that you successfully complete Fundamentals of Weatherization and Weatherization Technician Level One, Modules 33102-10 and 27203-07.

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

1. Identify and select the caulking and insulating materials needed for specific applications.
2. Describe and demonstrate how to reduce air infiltration by application of caulks and other materials.
3. Describe and demonstrate how to correct heat losses and heat gains by applying insulation materials to uninsulated areas of the building envelope such as finished exterior walls.
4. Describe the tools and materials used to patch drywall.
5. Describe and demonstrate how to install weatherstripping around exterior doors.

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

1. Select and apply caulks and other sealants to correct air infiltration.
2. Select and apply insulation to correct heat loss and/or heat gain in the building envelope.
3. Install weatherstripping around exterior doors.
4. Install drywall patches.

Materials and Equipment

<table>
<thead>
<tr>
<th>Markers/chalk</th>
<th>Utility knife</th>
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<tbody>
<tr>
<td>Pencils and scratch paper</td>
<td>Putty knife</td>
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<tr>
<td>Whiteboard/chalkboard</td>
<td>Replacement glass</td>
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<tr>
<td>Weatherization Technician Level 1</td>
<td>Glazier’s points</td>
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<tr>
<td>PowerPoint® Presentation Slides</td>
<td>Glazier’s putty</td>
</tr>
<tr>
<td>Multimedia projector and screen</td>
<td>Assorted screwdrivers</td>
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<tr>
<td>Desktop or laptop computer</td>
<td>Foam gaskets for electrical outlets</td>
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<tr>
<td>Appropriate personal protective equipment</td>
<td>Drywall</td>
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<tr>
<td>Rigid foam board insulation</td>
<td>Drywall tape</td>
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<tr>
<td>Flexible insulation</td>
<td>Drywall joint knife</td>
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<tr>
<td>Spray foam insulation</td>
<td>Drywall compound</td>
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<td>Loose-fill insulation</td>
<td>Drywall screws</td>
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<tr>
<td>Loose-fill insulation machine</td>
<td>Furring strips</td>
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<tr>
<td>Assorted caulks, sealants, and weatherstripping</td>
<td>Module Exam*</td>
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<tr>
<td>Caulking gun</td>
<td>Performance Profile Sheets*</td>
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<tr>
<td>Tape measure</td>
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</tbody>
</table>

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

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Trainees may be exposed to hazardous materials and may be required to work with certain materials such as insulation and/or sealants that require special protective equipment. Make sure that all trainees are briefed on appropriate safety procedures.

Additional Resources

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


Teaching Time for This Module

An outline for use in developing your lesson plan is presented below. Note that each Roman numeral in the outline equates to one session of instruction. Each session has a suggested time period of 2½ hours. This includes 10 minutes at the beginning of each session for administrative tasks and one 10-minute break during the session. Approximately 25 hours are suggested to cover Sealing the Building Envelope. 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.

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<thead>
<tr>
<th>Topic</th>
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<tr>
<td>A. Introduction</td>
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<td>B. Safety</td>
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<tr>
<td>C. Finding Air Leaks and Inadequate Insulation</td>
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<td>Session II. Materials Used to Seal the Building Envelope</td>
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<td>A. Types of Insulation</td>
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<td>1. Flexible Insulation</td>
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<td>2. Rigid Foam Board</td>
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<td>3. Loose-Fill Insulation</td>
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<td>4. Spray-in-Place Insulation</td>
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<td>5. Spray Foam Insulation</td>
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<td>B. Caulks and Sealants</td>
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<td>D. Vapor Barriers</td>
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<td>Sessions III-IV. Sealing the Building Envelope, Part One</td>
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<td>A. Sealing the Basement or Crawlspace</td>
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<td>1. Sealing Register Boots</td>
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<td>B. Sealing Exterior Walls, Doors, and Windows</td>
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<tr>
<td>1. Sealing Cracks Around Door and Window Frames</td>
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<tr>
<td>2. Sealing Loose-Fitting Windows and Doors</td>
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<tr>
<td>3. Repairing Broken Windows</td>
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<tr>
<td>4. Sealing Electrical Outlets and Light Switches</td>
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<tr>
<td>5. Insulating Exterior Walls</td>
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</table>
Sessions V-VI. Sealing the Building Envelope, Part Two

A. Sealing and Insulating the Attic
   1. Sealing the Attic Access Opening
   2. Sealing Attic Vent Baffles and Exterior Top Plate
   3. Sealing Balloon Frame Walls
   4. Sealing Dropped Soffits
   5. Sealing Duct Boots
   6. Sealing Electrical Boxes
   7. Sealing Exhaust Fans
   8. Sealing Kneewalls
   9. Sealing Masonry Chimneys
  10. Sealing Metal Furnace Vents
  11. Sealing Plumbing Vents
  12. Sealing Recessed Can Lights
  13. Sealing Top Plate Joints
  14. Insulating the Attic

B. Roofs and Energy Efficiency

Sessions VII–VIII. Laboratories

A. Laboratory
   Have trainees practice applying caulk and other sealants. This laboratory corresponds to Performance Task 1.

B. Laboratory
   Have trainees practice installing flexible, rigid foam board, and spray foam insulation. This laboratory corresponds to Performance Task 2.

C. Laboratory
   Have trainees practice installing weatherstripping. This laboratory corresponds to Performance Task 2.

Session IX. Patching Drywall

A. Patching Drywall

B. Laboratory
   Have trainees install patches in drywall. This laboratory corresponds to Performance Task 4.

Session X. Review and Testing

A. Module Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER.
   2. Record the training results on Training Report Form 200, and submit the results to the Training Program Sponsor.
Insulating Pipes, Ducts, and Water Heaters
Annotated Instructor’s Guide

Module Overview
This module explains how to insulate water pipes, forced-air ducts, and water heaters as part of a home weatherization. The emphasis is on how adding insulation to these components reduces heat loss and heat gain and results in a home that uses less energy.

Prerequisites
Before you begin this module, it is recommended that you successfully complete Fundamentals of Weatherization and Weatherization Technician Level One, Modules 33102-10, 27203-07, and 59102-10.

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

1. Describe the various ways that energy can be lost in a home.
2. Describe how to insulate water pipes to reduce heat loss.
3. Describe how to insulate a water heater to reduce heat loss.
4. Describe how to make simple duct repairs.
5. Describe how to seal air leaks in a duct system.
6. Describe how to insulate sheet metal ducts to reduce heat loss.

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

1. Insulate hot and cold water pipes.
2. Install an insulating blanket around a gas and/or electric water heater.
3. Repair simple damage to an air duct system.
4. Seal air leaks in an air duct system.

Materials and Equipment

- Markers/chalk
- Pencils and scratch paper
- Whiteboard/chalkboard
- Multimedia projector and screen
- Desktop or laptop computer
- Appropriate personal protective equipment
- Tape measure
- Utility knife
- Straightedge
- Rolled fiberglass pipe wrap
- Vapor barrier wrap
- Scissors
- Cord or string
- Foam pipe wraps
- Rigid fiberglass pipe insulation
- Water heater insulation kit
- Round sheet metal duct section
- Fiberglass ductboard section
- Flexible, insulated duct section
- Sheet metal screws
- Assorted screwdrivers
- Metal straps
- Mastic duct sealant
- Paint brushes
- Fiberglass mesh tape
- Fiberglass duct wrap
- Staple gun and staples
- UL181 tape
- 12-gauge solid wire
- Module Exam*  
- Performance Profile Sheets*

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

Ensure that the trainees are equipped with appropriate personal protective equipment and know how to use it properly. Trainees may be exposed to hazardous materials and may be required to work with certain materials such as insulation and/or sealants that require special protective equipment. Make sure that all trainees are briefed on appropriate safety procedures.

Additional Resources

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


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 *Insulating Pipes, Ducts, and Water Heaters*. 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.

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<tr>
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<td>A. Introduction</td>
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<td>B. Safety</td>
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<td>C. Insulating Water Pipes</td>
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<tr>
<td>1. Fiberglass Wraps</td>
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<td>2. Foam Wraps</td>
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<td>3. Pipe Insulating Materials for Hydronic Heating Systems</td>
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<tr>
<td>4. Installing Rigid Fiberglass Pipe Insulation</td>
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<td>5. Freeze Protection</td>
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<tr>
<td>D. Laboratory</td>
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<tr>
<td>Have trainees insulate water pipes. This laboratory corresponds to Performance Task 1.</td>
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<tr>
<td><strong>Session II. Insulating Water Heaters</strong></td>
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<td>A. Insulating Water Heaters</td>
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<tr>
<td>1. Water Heater Insulating Materials</td>
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<td>2. Insulating Electric Water Heaters</td>
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<td>3. Insulating Gas Water Heaters</td>
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<tr>
<td>B. Laboratory</td>
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<tr>
<td>Have trainees install an insulating blanket around a water heater. This laboratory corresponds to Performance Task 2.</td>
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</tbody>
</table>
Session III. Forced-Air Duct Systems; Repairing, Sealing, and Insulating Forced-Air Duct Systems

A. Forced-Air Duct Systems
   1. Duct Systems Used for Homes in Cold Climates
   2. Duct Systems Used in Warm Climates

B. Repairing, Sealing, and Insulating Sheet Metal Ducts
   1. Repairing Sheet Metal Ducts
   2. Sealing Sheet Metal Ducts
   3. Insulating Sheet Metal Ducts
   4. Repairing/Replacing Duct Insulation

C. Repairing and Sealing Ductboard

D. Repairing and Sealing Flexible Ducts

E. Laboratory
   Have trainees make simple duct system repairs and seal air duct leaks.
   This laboratory corresponds to Performance Tasks 3 and 4.

Session IV. Review and Testing

A. Module Review

B. Module Examination
   1. Trainees must score 70 percent or higher to receive recognition from NCCER.
   2. Record the testing results on Training Report Form 200, and submit the results to the Training Program Sponsor.

C. Performance Testing
   1. Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER.
   2. Record the training results on Training Report Form 200, and submit the results to the Training Program Sponsor.