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MATERIALS, EQUIPMENT, PROPS, & TOOLS

INSTRUCTOR’S GUIDE

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1. COURSE OVERVIEW

ABOUT THIS INSTRUCTOR'S GUIDE

This guide presents Learning Objects for this 3-day class in addition to specific tools, materials, and props necessary to conduct the class. The course meets the IREC air sealing requirements for Weatherization Installers.

TARGET AUDIENCE

It is anticipated that the participants will have varied experiences and knowledge of weatherization materials, tools, and techniques. Both novice and seasoned Installers have actively engaged in this class.

Participants in this course should be able to:

- Lift and operate weatherization equipment (>50 lbs)
- Safely use common hand tools
- Be willing to learn how to use weatherization related power tools.

Prerequisite for this course include the following:

- none

LEARNING OBJECTIVES

By attending this session, participants will be able to:

1. Identify typical construction details that lead to gaps in pressure and thermal boundaries and know how to treat them.
2. List the various tools and materials used in air-sealing and attic preparation.
3. Select appropriate tools and materials to air-seal building simulation props. Props are pressure tested to check air tightness.
4. Outline the process for insulating attics with loose-fill insulation on both horizontal and vertical surfaces.
5. Set-up and demonstrate the use of an insulation blowing machine.
6. Dense-pack a test wall & blow loose fill insulation in a simulated attic
7. Discuss safety concerns related to wiring.

MATERIALS AND EQUIPMENT NEEDED

SAFETY EQUIPMENT

EQUIPMENT	DISTRIBUTION
Goggles	1 per 1 student (1:1)
Leather gloves	1 set:1
Disposable latex gloves	4 sets:1
Mask (replace often)	1:1 per task
Booties	1:1 per site
Tyvek suit	1:1 per task
Confined space fan	1 per site (seasonal)
First Aid Kit	1 per site
MSDS	1 per site
Non-contact voltage tester	2 per site
Personal CO Meter	1:1
Combustion CO Meter	1 per site

INSTRUCTIONAL EQUIPMENT

EQUIPMENT	DISTRIBUTION
5 sets air-sealing props	1:1
Prop-dependent pressure test fans & base	2:5
Blower door fan, frame, tarp	3:5
Manometer	3:5
Spare manometer tubes	1:5
Calculator	1:1
Tape Measure (25')	1:1
Clipboard	1:1
Hammer (16oz.)	1:1
Caulk gun	1:1
Foam gun Pro	2:5
Metal snips	1:1
Drywall saw	1:1
12" Carpenter square	1:1
36" metal ruler	1:1
Utility knife	1:1
Putty knife 3"	1:1
Putty knife 1.5"	1:1
Phillips screwdriver	1:1

Flathead screwdriver	1:1
Staple gun (standard & stitch) & staples	2:5
Window Scraper	1:1
Paintbrush 1"	1:1
Paintbrush 2"	1:1
Carpenter pencil	1:1
Wiping rags	Lab inventory
Shop Vac with HEPA filter	1:site
Flashlight	1:1
Mirror	2:5
Garden rake / broom	1 site
Misc. Power tools, accessories, etc.	
Rechargeable drill	Lab Inventory
Extra (charged) batteries	"
Drill bits	"
Portable generator	"
Insulation machine, clamps, hoses, etc.	"
Insulation test box	"
Wood boring bits	"
Reciprocating saw	"
Circular saw	"
Nail gun	"
Ladders and/or scaffolding	"
Pry bars	"
Extension cords	"
Misc. Weatherization Materials	
Mesh tape	Lab Inventory
Joint Compound	"
16 ga. Galvanized stock	"
Duct mastic	"
Self-taping screws	"
Silicone caulk	"
Hi-temp caulk	"
Cleaning supplies (acetone, window cleaner,...)	"
Garbage bags	"
Misc. drywall screws	"
5/8" drywall	"
1/2" drywall	"
House wrap	"
'Blue' board	"
OSB or plywood	"
Flexmend	"
6 mil plastic sheeting	"
Construction adhesive	"

Spray adhesive	“
Lath or furring strips	“
Loose-fill insulation	“
Insulation stuffing tool	“
Putty tape	“
Elastomeric roof coating	“
Multi-purpose tool for siding removal	“
Garden rake	“
Cleaning supplies (acetone, window cleaner,...)	“
Weatherstripping (doors & windows)	“
1-part foam (cracks; windows & doors)	“

SCHEDULE

The listed times are approximates and should be verified during classroom preparation. The class size and student to instructor ratio can have a great impact upon time estimates. The amount of material to be covered along with the hands-on lab activities imply either small class sizes or multiple instructors.

A common practice is to use the first hour of each morning to cover the Powerpoint slides. At the conclusion of these information sessions, pre-assigned groups can either work on air-sealing props, sheet rock repair, etc., while another group is working with a second instructor in the field utilizing the insulation blowing machine, drilling and probing walls, etc. Be sure to allot time for breaks (see Section 4 for Agenda).

CLASSROOM PREPARATION CHECKLIST

✓	TASK
	Test computer, projector, internet access
	Test Powerpoint slides
	Gather equipment for in-class demonstration

2. RESOURCES

HANDOUTS AND INTERNET RESOURCES

Air Sealing and Insulation Professional:

1. Handbook
2. Syllabus
3. Rubrics
4. Instructors Guide (this document)

Instructors are encouraged to use a variety of web-based videos. Of particular help is WxTV (<http://wxtvonline.org/episodes/>). As of February 2013, there are 59 episodes. Suitable topics for this course include their videos about insulation preparation, dense-packing, baseload, and mobile home weatherization techniques.

RELEVANT STANDARD WORK SPECIFICATIONS / TEXTS

1. New Mexico EnergySmart Technical Standards: Mortgage Finance Authority (<http://www.nmmfa.org/nm-energysmart>)
2. *Air Sealing & Insulation Professional Handbook* : New Mexico EnergySmart Academy
3. Weatherization Assistance Program – Technical Assistance Center: The WAPTAC website contains a ‘virtual’ library of all rules, regulations, policies and procedures required by DOE's weatherization program. The site is a central repository for presentation materials, photos and videos of work in progress, site demonstrations, news articles, and other documentation to support WAP operations. WAPTAC.org serves as the institutional memory of the Program. <http://www.waptac.org/>
4. *Insulate and Weatherize; Build Like A Pro*: Harley, B.; The Taunton Press, Newtown, CT. 2012
5. *Residential Energy*: Krigger, J., Dorsi, C.; Saturn Resource Management, Helena, MT. 2012

CLASSROOM PROPS AND HANDS-ON ACTIVITIES

See the Equipment Lists beginning on page 3 above.

The Rubric document shows various props to be weatherized. Some of the props are actually pressure tested. The *Checklist*, included in the *Air Sealing and Insulation Handbook* and as a separate single-page document with the course materials, is split into two sections. The Checklist is included below with a red 'circle' around the props to be weatherized and pressure tested. (This Checklist is turned in at the conclusion of the class.) The last item, Dense-pack test box, will be discussed at the end.

The Checklist:

Name: _____ Date: _____

AIR SEALING & INSULATION REQUIREMENTS CHECKLIST:

Directions: Each student must demonstrate each of the following items and have it confirmed by the instructor before the end of class on Day 3. Failure to complete this checklist will result in a "non-pass" for the course. Remove your checklist and turn it in to the instructor before leaving on Day 3.

Note: All work on props requires appropriate selection of PPE and materials.

		Instructor Sign-off
☐	Complete all Handbook Exercises	_____
☐	Drywall patch / repair	_____
☐	Wall drilling & probe	_____
☐	Roof & Soffit prop	_____
☐	Duct Sealing prop	_____
☐	Window & Door installation prop	_____
☐	Loose-fill insulation prop	_____
☐	Window Pane replacement / cut glass	_____

The following props must be air-sealed and pressure tested:

☐	Attic hatch	_____
☐	Non-IC Recessed light	_____
☐	Exhaust fan & new duct	_____
☐	Large Hole	_____
☐	PVC Vent Stack	_____
☐	Large hole with flue pipe	_____
☐	PVC pipe over joists	_____
☐	Balloon frame opening	_____
☐	Dense-pack test box _____ Pounds.	_____
I used: ☐ Fiberglass ☐ Cellulose		

In the photograph below are two examples of the props to be air sealed and pressure tested: the Large hole with flue pipe (to the left) and the PVC Vent Stack prop on the right. Both have been inserted into what the manufacturer calls a *Work Box*.

When air sealed, the prop and Work Box are placed on the pressure test 'bench'. The test bench fan can then depressurize each prop. Students can immediately see, via a smoke pencil, if their attempt at air sealing was successful.

Work Box

Large Hole and Flue Pipe (left) PVC Vent Stack (right)

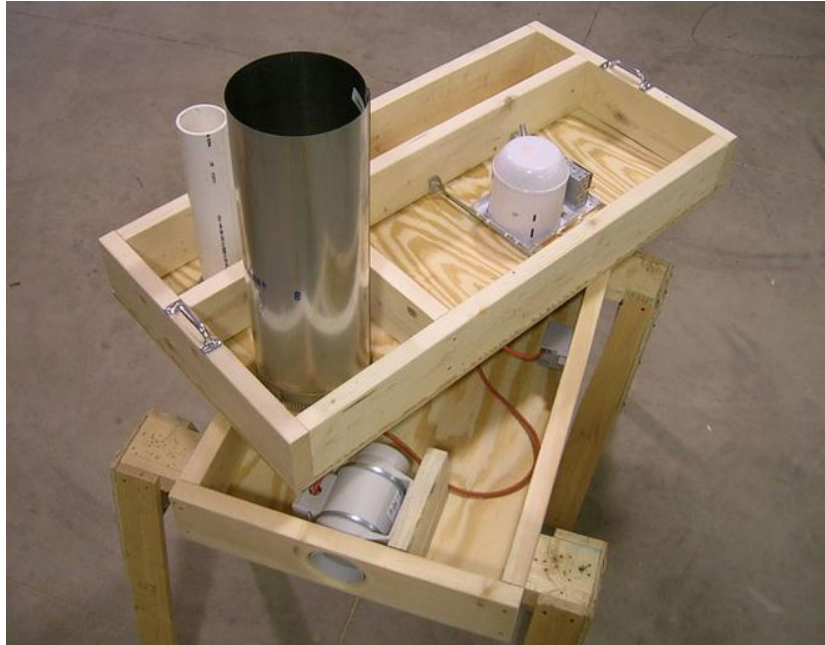


Pressure Test 'Bench'



The props used in this class can be seen online and are available to purchase at:
<http://www.everblue.edu/air-sealing-weatherization-kit-equipment-and-prop-list>

Two of the Rubrics show different table-top props; these 4-in-1 props are differentiated only by the fact one has a non-IC light can and one has a bath vent fan. (The non-IC version is shown below.) These props have their own pressure test bench which is shown under the prop below. (The smoke pencil would be used here too.)



Available at: <http://emcmt.com/training-tools/>

Here's one of the table-top props in the process of being weatherized:



One of the dense-packing activities involves Dense-pack test box. The rationale behind this test is related to the dense-packing requirement for proper material installations for cellulose (3.5 lbs/ft³) and fiberglass (2.2 lbs/ft³). Because we know the weight of the test box, and the volume is a known quantity, we know how much the box should weigh if it is dense-packed. By weighing and then opening the box to visually check their work, students get immediate feed back.



The checklist provides a space to enter the weight of the dense-packed box and a place to indicate the material used.

Near full-sized walls are dense-packed after these test boxes. The left photo shows a student attempting to dense-pack the portable wall. (Multiple holes have been drilled by the student to not only test the impact of different hole locations but also to probe the wall for obstructions.) The photo on the right shows one of the test blows.



Here is a student practicing their loose-fill cellulose technique. This prop doubles as a window and door installation prop too.



Here students are practicing their 'California Patch' technique for fixing damaged drywall. This is one of the non-pressure tests on the prop Checklist.



3. INSTRUCTION NOTES

The curriculum is intended to provide you with all the materials and guidance necessary to deliver a high-quality, effective training. Even so, there is no substitute for a knowledgeable, engaging instructor who has adequately prepared for the class. Follow these steps to ensure a successful training session:

Review and Revise

In preparation for delivering a given chapter, review all the materials provided to become familiar with the subjects being covered. Go through the Powerpoint presentations and add notes where you wish to expand upon certain topics or integrate learning activities not already included. Suggested talking points for the instructor are also located in the Notes Page section of each slide.

Where applicable, swap out graphics and photos with more regionally-specific images that will speak directly to the audience being trained.

Stock the Classroom and Lab

A suggested materials list has been included with this curriculum. If you are unfamiliar with certain props, practice beforehand to gain experience so you will deliver with confidence.

If hands-on props are to be used in the lab, use the photos as a guide and double check that you'll have all necessary materials on hand for students to work on the props.

Familiarize Yourself with the Supplemental Materials

Review the suggested articles, videos, and handouts to determine which you plan to use in the class. Determine where videos will be shown during the presentation.

Generate a Course Schedule

Once you are familiar with the materials, exercises, and classroom activities you will have students participate in, review the course schedule and time estimates for each. The topics are listed in what the authors considered a logical order for presentation, but feel free to move things around as needed to suit your audience.

This schedule serves two functions: it informs students what to expect of the course, and it helps keep instructors on track to cover all materials within the allotted time.

Prepare the Students

Set your students up for success by preparing them for the class. Inform them of the proper dress code (e.g., work clothes, if you are planning to get dirty), and send a list of materials they will need to bring—typically pen/pencil and calculator, but sometimes includes certain hand-tools depending on the training venue.

4. COURSE INSTRUCTION

AGENDA/SCHEDULE: DAYS 1-3

(Each day after class: 15-30 minutes is available for one-on-one sessions as needed)

DAY 1:

Introductions, course expectations	8:00-8:30am
Review: Health & Safety, Building Math, House as a System, Building Science, Common Pressure Boundary Problems	8:30-9:00am
<break>	9:00-9:10am
Review: Health & Safety, Building Math, House as a System, Building Science, Common Pressure Boundary Problems (<i>con't</i>)	9:10-10:10am
<break>	10:10-10:20am
Insulation and air-sealing tools and materials	10:20-11:20am
<break>	11:20-11:30am
Review air-sealing props and desired outcomes	11:30-12:00pm
<LUNCH> Early Return - instructor available for questions	12:00-1:00pm
Air-seal props; pressure testing	1:00-2:00pm
<break>	2:00-2:10pm
Air-seal props; pressure testing (<i>con't</i>)	2:10-3:10pm
<break>	3:10-3:20pm
Air-seal props; pressure testing (<i>con't</i>)	3:20-4:20pm
Clean-up lab; store completed props	4:20-5:00pm

DAY 2:

Day 1 Review	8:00-8:20am
HVAC problems, preparing for insulation, venting systems	8:20-9:20am
<break>	9:20-9:30am
HVAC problems, preparing for insulation, venting systems (<i>con't</i>)	9:30-10:00am
Continue air-sealing props	10:00-10:30am
<break>	10:30-10:40am
Insulation blowing machine; safety, operations & maintenance	10:40-11:40am
<LUNCH> Early Return - instructor available for questions	11:40-12:40pm
Insulation blowing machine: loose-fill prop	12:40-1:40pm
<break>	1:40-1:50pm
Insulation blowing machine: loose-fill prop (<i>con't</i>)	1:50-2:50pm
<break>	2:50-3:00pm

Mobile home construction & site visit	3:00-4:00pm
<break>	4:00-4:10pm
Mobile home construction & site visit (<i>con't</i>); complete course handbook exercises	4:10-5:00pm

DAY 3:

Review Day 2	8:00-8:20am
Base Load measures (CFL's, low-flow devices, water heater blanket installs, DHW pipe-wrap)	8:20-9:20am
<break>	9:20-9:30am
Base Load measures (<i>con't</i>)	9:30-9:50am
Insulation basics	9:50-10:30am
<break>	10:30-10:40am
Insulation blowing machine: hole drilling; dense-pack props	10:40-11:40am
<LUNCH> Early Return - instructor available for questions	11:40-12:40pm
Insulation blowing machine: hole drilling; dense-pack props (<i>con't</i>)	12:40-1:40pm
<break>	1:40-1:50pm
Insulation blowing machine: hole drilling; dense-pack props (<i>con't</i>)	1:50-2:50pm
<break>	2:50-3:00pm
Drywall repair	3:00-4:00pm
<break>	4:00-4:10pm
Drywall repair & lab clean-up	4:10-4:30pm
Complete Course Handbook / Class Evaluation	4:50-5:00pm