



Retrofit Installer / Shell

Lesson Plan

Learning Objectives

By attending this session, participants will:

- Be exposed to all the requirements needed to function as a Retrofit Installer/ Shell in the DOE Weatherization Program, including but not limited to:
 - Maintaining safety by adhering to a code of conduct and professionalism, following the work rules of the local jurisdiction, and proper handling of materials, equipment and tools according to manufacturer specifications.
 - Preparing for the job in advance by participating in training, and gathering the appropriate materials, supplies and tools for the job.
 - Preparing and maintaining tools and materials on-site with correct set-up procedures.
 - Preparing and maintaining the job site by participating in any job site safety meetings, as well as implementing safety protocol, utilizing interior and exterior protective barriers and reporting any pre-existing conditions not in the weatherization work scope.
 - Implementing the appropriate work scope measures. This includes: locating and accessing specific work areas; installing shell air sealing measures; sealing and insulating duct work; doing all necessary preparation measures for and installing loose-fill insulation in attics and other appropriate locations; preparing for and installing foundation insulation; installing or patching moisture barriers; identifying mechanical systems; installing dense pack insulation in sidewalls or other appropriate locations; installing windows and doors; identify electrical and plumbing installation needs; identifying and installing roofing and flashing as needed; doing a daily safety test out procedure to ensure combustion appliance safety after work measures are installed; cleaning as work proceeds; addressing deviations from the prescribed work scope.
 - Wrapping up at the work site by picking up tools and materials, cleaning up and participating in crew debriefing.
- Learn how to put together all the information learned in this and other classes in order to perform proper installation of shell weatherization measures as called for on the weatherization audit work order.
- Have an opportunity to get hands on experience on a site built home as part of the class, with supervision and guidance by experienced trainers.



Supplemental Materials

Handouts & Resources

Indiana WX Field Guide	Home Energy's – Consumer Guide to Insulation	Site-built work order	Mobile home work order
Indiana Energy Conservation Code	Pressure Testing Insulation Blower & Hoses	Math Pre-Test	Vent Fan List
Closed Crawlspaces Do Double Duty	Conditioned Crawlspaces Checklist	Crawlspaces Solutions	Regal Blue Coverage Chart
Estimating Insulation Material	DSTO Form	Insulation Practice Test	Avoiding Moisture Problems
Crawlspaces- Considering the Options	Air Sealing Homes in Weatherization	Installing the B.D. for De-Pressurization Testing	

Classroom Props

Plexiglas Pressure House	Air Sealing Material Samples	Insulation Material Samples	Blower Door
Calibrated Pressure Pan	Personal Protective Equipment	Wall Insulation Tubes	Wall Drilling Bits
Draft gauge	Digital manometer	Windy Day kit	Various Caulk Samples
Foam Kit Samples	Telescoping Ladder	Siding Removal Tools	



Hands On Props and Activities

Field day: Class will perform installation measures on a home in the field. Material requirements, specifications and installation techniques for the entire work scope will be developed in the classroom.

Hands On Field Props

Power Tools	Blower Door and DG-700 Manometer	Appropriate ladders	Safety equipment
Protective gear: suits, gloves, respirators, glasses...etc.	Pressure Pan	Appropriate forms	Infrared camera
Insulation Blower, wall tubes, wall drilling bits	Lighting, visqueen, tarps, etc.	Air sealing materials, reflectix, caulk, one & two part foams	Generator and Extension Cords

Key Terminology

Retrofit Installer	Lead Safe Weatherization	Moisture	Combustion safety	Durability
Energy efficiency	Comfort	Health and safety	Furnace	Water heater
Vent	Blower Door	Ducts	Air sealing	Insulation
Cellulose	Foam Insulation	Fiberglass	R-Value	U-Value
Dense pack	MSDS	GFCI	NEAT	MHEA
Personal Protection Equipment (PPE)	Neutral pressure plane	Crawl-spaces	Combustion Appliance	Pressure differentials
Condensation	Lead	Lead safe work	"Worst Case"	Draft pressure
Foundations	Windows	Doors	EPA	Mold
IR	CFM	ASHRAE 62.2	MVR	Priority list
Retrofit	Pressure boundary	Thermal boundary	Pressure pan	Personal Fall Arrest System
EPA	Pressure boundary	Vapor barrier	Building science	SIR
Glazing	Low-E window	Asbestos	Knob & Tube Wiring	Double-insulated Tools



Air Barrier	Thermal Boundary	Ventilation	Carbon Monoxide	Lighting
Relative Humidity	Crawl Space	Convection	Back-draft	Knob and tube
Exhaust fan	OSHA	Infiltration	Exfiltration	Attics
Indoor Air Quality	IC Rated	Dew Point	Evaporation	Saturation
Radiant barrier	Vapor retarder	Effective R-Value	Ambient	Grade
Moisture Meter	Respirator	Radon	Conduction	Radiation
Net Free Area	Air-flow	IAQ	Eave Chutes	Drainage Plane
Two-part Foam	One-part Foam	Expanding Foam	Board Feet	Cure
Non-Expanding Foam	Poly-urethane Foam	Domestic Hot Water Tank	Awning Window	Double-hung Window
Glazing	Casement Window	Direct Leakage	Indirect Leakage	Zone Pressure Diagnostics (ZPD)
HEPA Vacuum	Personal Protective Equipment (PPE)	Dept. of Energy (DOE)		



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Retrofit Installer / Shell Class Overview and Prerequisites

Overview

This class is intended to provide participants with the knowledge of the regulations covering, and the materials and methods required, for installing residential shell weatherization measures in the DOE National Weatherization Program. We will discuss all of the safety requirements, work preparation measures, materials and installation techniques and site clean-up issues involved in the shell retrofit process. This will be followed by a field visit to a site-built home to perform many or all of the measures. The goal of this class is to provide the knowledge basis for all technicians who will be involved in the installation of shell measures within the Indiana Weatherization Program. There are a few pre-requisite and additional classes recommended in addition to attending this session.

Recommended Prerequisites

Weatherization 101 – Introduction to Weatherization
(Included in Day 1)

Additional Recommended Classes

- OSHA 10 hour class
- Mold Awareness
- Lead Safe Work Practices
- Air Sealing Site Built Homes
- Insulating Site Built Homes
- Daily Safety Test Out Procedures
- Mobile Home Weatherization
- Introduction to Infrared Thermography
- Building Tightness Guidelines
- High Performance Insulation: Two-Part Spray Foam and High Density Cavity Insulation
- Understanding ASHRAE 62.2



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Class Content Summary

Participants will be provided with a copy of the Indiana Weatherization Field Guide

Day 1

- **Introduction: Weatherization 101**

Provided for class: Pamphlets – Indiana Weatherization Field Guide; Site-Built Work Order; Mobile Home Work Order; Math Pre-Test; Plexiglas Pressure House Prop;

Day 2

- **Maintain Safety**

Provided for class: Indiana Energy Conservation Code; Indiana Weatherization Policy and Procedure Manual (Section 600); Site-Built Work Order; Mobile Home Work Order; PPE Classroom Props; Telescoping Ladder Prop;

- ***Follow Work Rules of Jurisdiction***
- ***Handle Materials/Tools According to Manufacturer Specifications***
- ***Handle Tools According to Manufacturer Specifications***

- **Prepare for the Job**

Provided for class: Indiana Weatherization Field Guide; Site-Built Work Order; Mobile Home Work Order;

- ***Attend Training***
- ***Gather Materials/Supplies***
- ***Gather Tools***

- **Prepare and Maintain Tools and Materials On-Site**

Provided for class: Pressure Testing Insulation Machine and Hoses (Handout); Assorted Siding Removal Tools; Drill Shroud; Insulation Wall Tube Samples;

- ***Set-Up Tools***
- ***Set-Up Materials***

- **Prepare and Maintain Job Site**

- ***Job Safety Meeting***
- ***Safety Protocol***
- ***Protective Barriers***
- ***Pre-existing Conditions***



- *Protecting the Exterior Environment*

Day 3

- **Implement Work Scope**

Provided for class: Blower Door; DG-700 Micromanometer; Pressure Pan; Air Sealing Materials (Classroom Props); Digital Gauge Set-Up (Handout); Duct Sealing Materials;

- *Locate and Verify Access to Specific Work Sites*
- *Installing Air Sealing Measures*
- *Identifying mechanical systems*

Day 4

- **Implement Work Scope (Continued)**

Provided for Class: Insulation Classroom Props; Estimating Insulation Material (Handout); Regal Blue Coverage Chart; Crawlspace Solutions (Handout); Avoiding Moisture Problems (Handout); Key Junctions (Handout);

- *Testing and Sealing Ductwork*
- *Installing Loose Fill Insulation and General Insulation Overview*
- *Insulating Ducts Located Outside Thermal Boundary*
- *Installing/Patching Moisture Barriers*
- *Attic Preparation/vent fan upgrade or installation*
- *Installing Attic Insulation*
- *Installing High Density Sidewall Insulation*

Day 5

- **Implement Work Scope (Continued)**

Provided for Class: Crawlspaces-Considering the Options (Handout); Closed Crawlspaces Do Double Duty (Handout); A Conditioned Crawlspace Checklist (Handout); DSTO Form; Writing materials; Testing materials; Calculator; Practice Test-Insulation; DSTO-INCAA Video;

- *Identify plumbing installation needs*
- *Installing Foundation Insulation*
- *Door and Window Replacement/Repair*
- *Daily Safety Test Out*
- *DHW Insulation*
- *Identify/Install Roofing and Flashing Needs*

- **Insulation Practice Quiz**



- ***Correct and Discuss Quiz***

Day 6

- **Field Training Day**

Provided for Class – Tools, equipment, safety gear and all materials required for complete installation of weatherization measures as specified on a site-built house work order.

- ***Maintain Safety***
- ***Prepare for the Job***
- ***Prepare and Maintain Tools and Materials On-Site***
- ***Implement Work Scope***
- ***Wrap Up***



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Assessment Methodology

Overview

Due to the technical and changing nature of the Weatherization (Wx) Assistance Program, a high priority has been placed on the training (and assessment) aspects of the program. Working in conjunction with DOE's Weatherization Job Tasks Analysis, IHEDA, in cooperation with INCAA, has developed Indiana Wx Competency Standards. This Competency is a requirement to be able to work in the Indiana Wx Program. Becoming Indiana Wx Competent will require passing a written exam and a skills verification event. The skills verification event will be in addition to testing at the classroom level. There is an assessment process for each of the four Wx job classifications: Energy Auditor, Retrofit Installer (shell/mechanical), Crew Leader and Final Inspector.

Components

Retrofit Installer / Shell Class

In Class

- Participation
- Written test

In Field

- Participation
- Hand's on proficiency

Assessment Event

- Written test on Day 5 of class
- Hand's on proficiency (Scheduled separately with candidate following class completion and based upon having passed the written exam)
 - Student will be assessed while working on a weatherization client home
 - Student will be required to show competency in all work measures required in the Retrofit Installer / Shell job task analysis
- Assessment event is considered a field day extension of the Retrofit Installer/ Shell class and is individually scheduled by student with instructor/proctor

Scoring Requirements

- Scoring is pass/fail – there will be no provisional results
- 70% passing score for both written test and field portion of assessment
- Must be able to competently perform "Daily Safety Test Out" pressure diagnostics procedure regardless of overall score

Maintenance

- Competency designation will apply for three years



- An Annual Competency Maintenance training will be required
- 24 hours of continuing education in your job designation will be required

Retrofit Installer Technician Exam Blueprint

	Duties and Tasks	Final
A.	Maintain safety	19%
	Code of conduct	2%
	Professionalism skills	2%
1	Follow work rules of jurisdiction having authority	5%
2	Handle materials/equipment according to manufacturer specifications	5%
3	Handle tools according to manufacturer specifications	5%
B.	Prepare for the job (before arriving at job site)	6%
1	Attend training	2%
2	Gather materials and supplies	2%
3	Gather tools	2%
C.	Prepare and maintain tools and materials on-site	4%
1	Set up tools	2%
2	Set up materials	2%
D.	Prepare and maintain job site	11%
1	Attend job site safety meeting	1%
2	Implement safety protocol (rigging, ventilation, blocking)	3%
3	Use protective barriers (drop cloths)	2%
4	Report preexisting conditions (that are not in scope)	3%
5	Protect exterior environment	2%
E.	Implement work scope	56%
1	Locate specific work areas	3%
2	Verify access to work areas	3%
3a	Install air sealing measures	7%
3b	Install loose fill insulation	6%
3c	Install or patch moisture barriers	4%
3d	Rough in mechanical ventilation systems	3%
3e	Identify mechanical systems	3%
3f	Identify combustion appliance safety hazards	4%
3g	Install dense pack insulation	5%
3h	Install windows and doors	3%
3i	Install electrical (rough-in, fans)	2%
3j	Install plumbing installation needs	2%
3k	Identify/install roofing and flashing installation needs	3%
4	Clean as you go (organize)	4%
5	Address deviations from work scope	4%
F.	Wrap up	4%
1	Pick up tools and materials	1%
2	Clean up and close out	2%
3	Participate in crew debriefing (after action review, post construction job review)	1%
		100%