



U.S. DEPARTMENT OF ENERGY
SOLAR DECATHLON

2011

Developing a Robust Workforce:

Tools and Resources to Enhance
Training in the Residential Energy
Retrofit Industry



The WAP National T&TA Plan

Weatherization Assistance Program

National Weatherization Training & Technical Assistance Plan



December 2009

- ARRA increased T&TA funds from 10% to 20%
- \$1 Billion/ \$5 Billion T&TA
- The Weatherization Assistance Program National Weatherization Training and Technical Assistance Plan is the plan for \$138.5 M



Quality Work = Sustainability

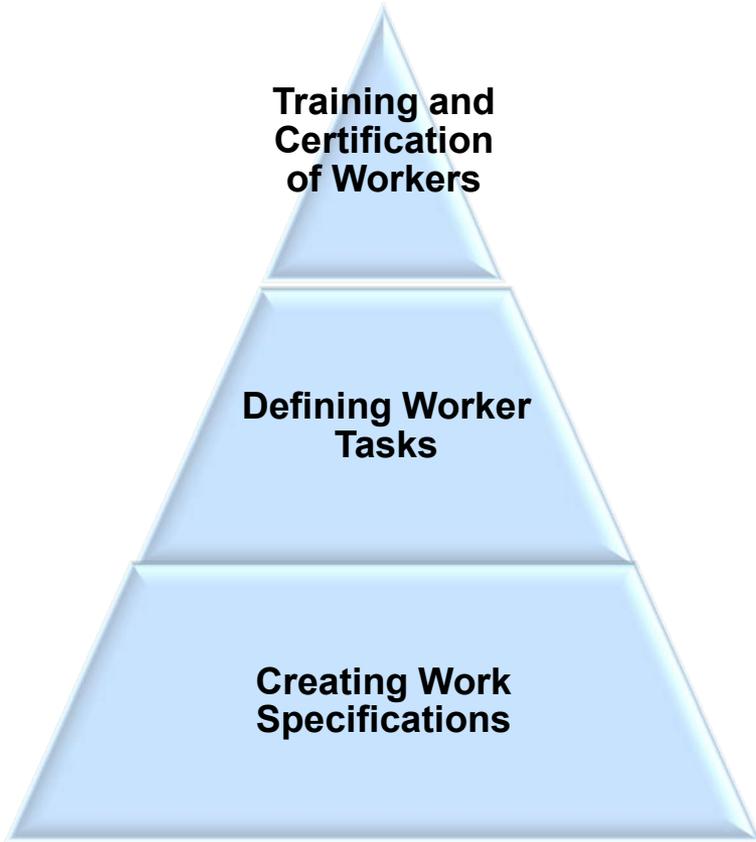
- The T&TA Plan is building tools and resources to ensure that the WAP is able to produce high quality work and demonstrate that quality to stakeholders.
- The Weatherization Assistance Program has 30 years of building science expertise and energy retrofit work behind it. It is the largest group of experts in home energy upgrades in the country.
- By utilizing the expertise of the WAP program, the DOE is seeking to lay the foundation for a robust private market for home energy upgrades.



Framework for Sustainability

Professional Workers/

Quality Work



Market Expansion

- Multifamily
 - Energy Audit Tool
 - Standard Work Specifications
 - Weatherization Innovation Pilot Program
- Private Market Integration
 - Better Buildings
 - Building America
 - Energy Star
- Healthy Homes
 - Wx Plus Health
- Regulatory Changes
 - Grant to Loan
 - Appendix A

Quality Work / Qualified Workers

- Guidelines for Home Energy Professionals
 - Standard Work Specifications
 - Job Task Analysis
- Training Program Accreditation
- Worker Certification
- Training Resources and Tools
 - WAP Standardized Curriculum
 - National Weatherization Training Platform
 - WAP Training Centers
 - National Audit Tools- Multi-Family/Healthy Homes

Voluntary national guidelines to support *quality work* and a *skilled workforce* in the Weatherization Assistance Program and private residential energy efficiency upgrade industry

- **Developed by industry**, facilitated by NREL and EERE
- Second Round Public Comment Fall 2011



Four Components





Benefits of Guidelines

Help increase the quality of work performed
and enhance the skills of the workforce
involved in the home energy retrofit industry...



Description

Techniques, methods, or processes believed to be the most efficient and effective way of meeting the Standard Work Specifications (SWS)

Sets of guidelines or rules that govern work procedures and often invoke SWS and technical standards

Define the minimum requirements for high-quality work and conditions needed to achieve desired outcomes

Define safety, materials, installation, and application standards relevant to residential retrofits

Best Practices

Work Protocols

Standard Work Specifications*

Technical Standards*

Developed by

Companies, retrofit crews, or individuals

Retrofit program administrators or individual companies

Technicians and retrofit industry representatives (including building trades, manufacturers, and building scientists)

Industry or third-party standards development organizations, such as ASHRAE, ASTM, and BPI

Retrofit Work Pyramid

Standard Work Specifications

- Define the minimum requirements for high-quality work and the conditions necessary to achieve the desired outcomes of a given energy efficiency retrofit measure
- Standard Work Specifications are outcome driven, but not prescriptive
- When applicable, SWS are based on existing technical standards
- Fill a critical niche in the “standards landscape”
- Work specifications = setting the bar for quality work

Technical Standards

- Define the safety, materials, installation, and application standards, codes, and regulations applicable to residential energy efficiency retrofits
- Developed by government, industry, or third-party standards development organizations
- Examples
 - ASHRAE 62.2 (Ventilation for Acceptable Indoor Air Quality)
 - ASTM E1186 – 03 (Standard Practices for Air Leakage Site Detection)
 - OSHA 1926.28 (Safety and Health Regulations for Construction; Personal Protective Equipment)
- Workforce Guidelines for Home Energy Upgrades will contain a Technical Standards Reference Guide for industry



Topic: Attic

Subtopic: Knee Walls

12) **Detail Name:** Preparation for Batt Insulation

Desired Outcome:

- Airtight cavity and properly insulated knee wall

Row	Title	Specification(s)	Objective(s)
1	Knee wall prep for batts	All knee walls will have a top and bottom plate or blockers installed using a rigid material All joints, cracks and penetrations will be sealed in finished material including interior surface to framing connections	Eliminate bending or movement that may result in air leakage Prevent air leakage through the top or bottom of the knee wall
2	Installation	Insulation will be installed using one of the following methods: New batts will be installed All existing batted insulation will be adjusted to ensure it is in full contact with the interior cladding and top and bottom plates	Eliminate misalignment of existing insulation
3	Backing knee wall	If rigid material is used, material will be installed to cover 100% of the surface of the knee wall If foam sheathing is used, sheathing will be listed for uncovered use in an attic, or covered with a fire barrier	Prevent insulation settling or movement

Specification(s)	Objective(s)
All knee walls will have a top and bottom plate or blockers installed using a rigid material	Eliminate bending, sagging or movement that may result in air leakage
All joints, cracks and penetrations will be sealed in finished material including interior surface to framing connections	Prevent air leakage through the top or bottom of the knee wall ³³
Insulation will be installed using one of the following	Create an air barrier

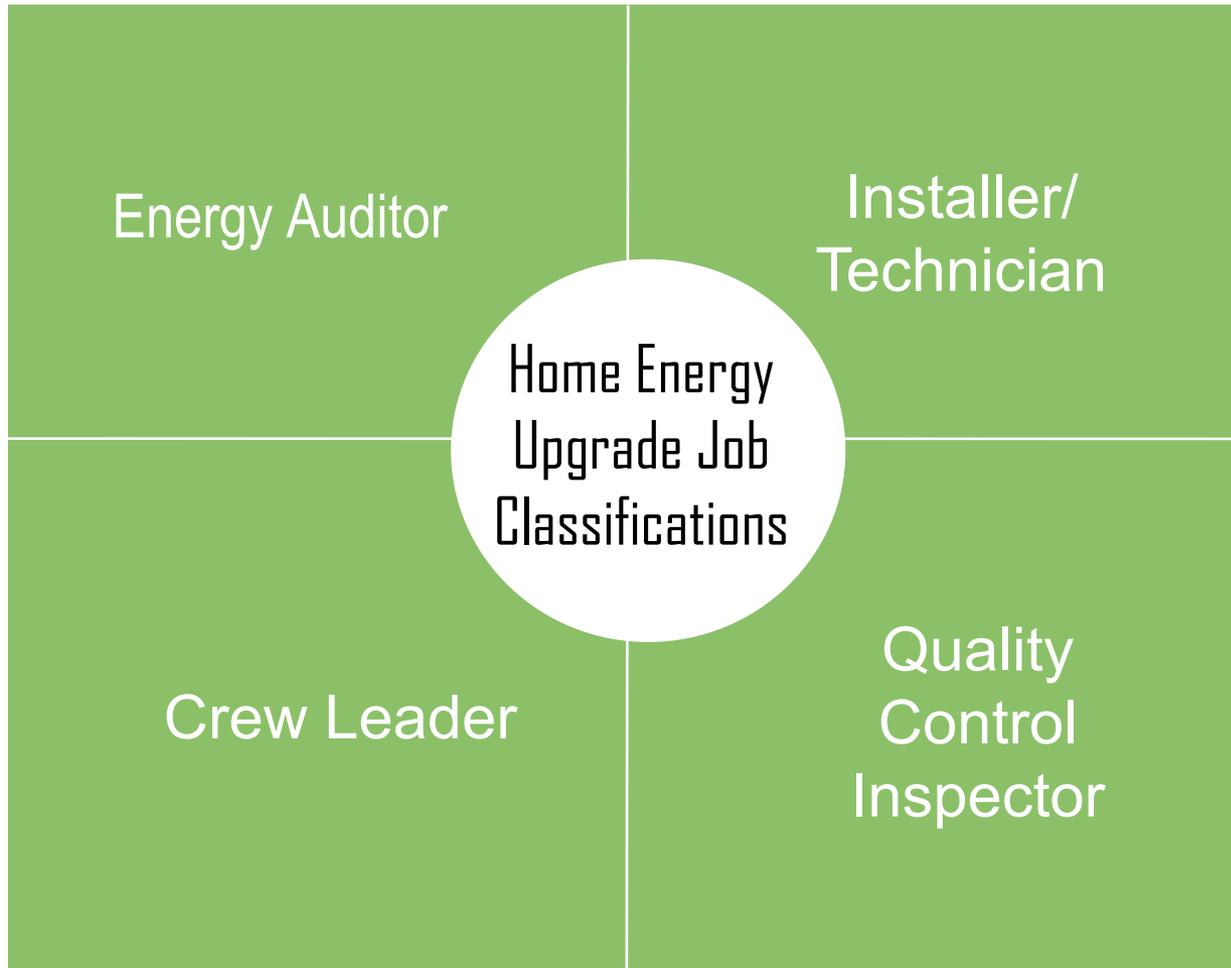
Draft SWS: Attic Insulation Prep Detail-Knee Wall

³³ ASTM E1186 - 03(2009)

Job Task Analysis

- Identifies and inventories a job's critical tasks.
- A formal process for determining and cataloguing *what a worker does*.
- Tasks are classified as either *cognitive* (mental) or *psychomotor* (physical) skills, and as *critical*, *very important*, and *important* for job performance.
- *Examples*: set up blower door, run test in accordance with ASTM E779, record results of blower door test in diagnostic software, etc.





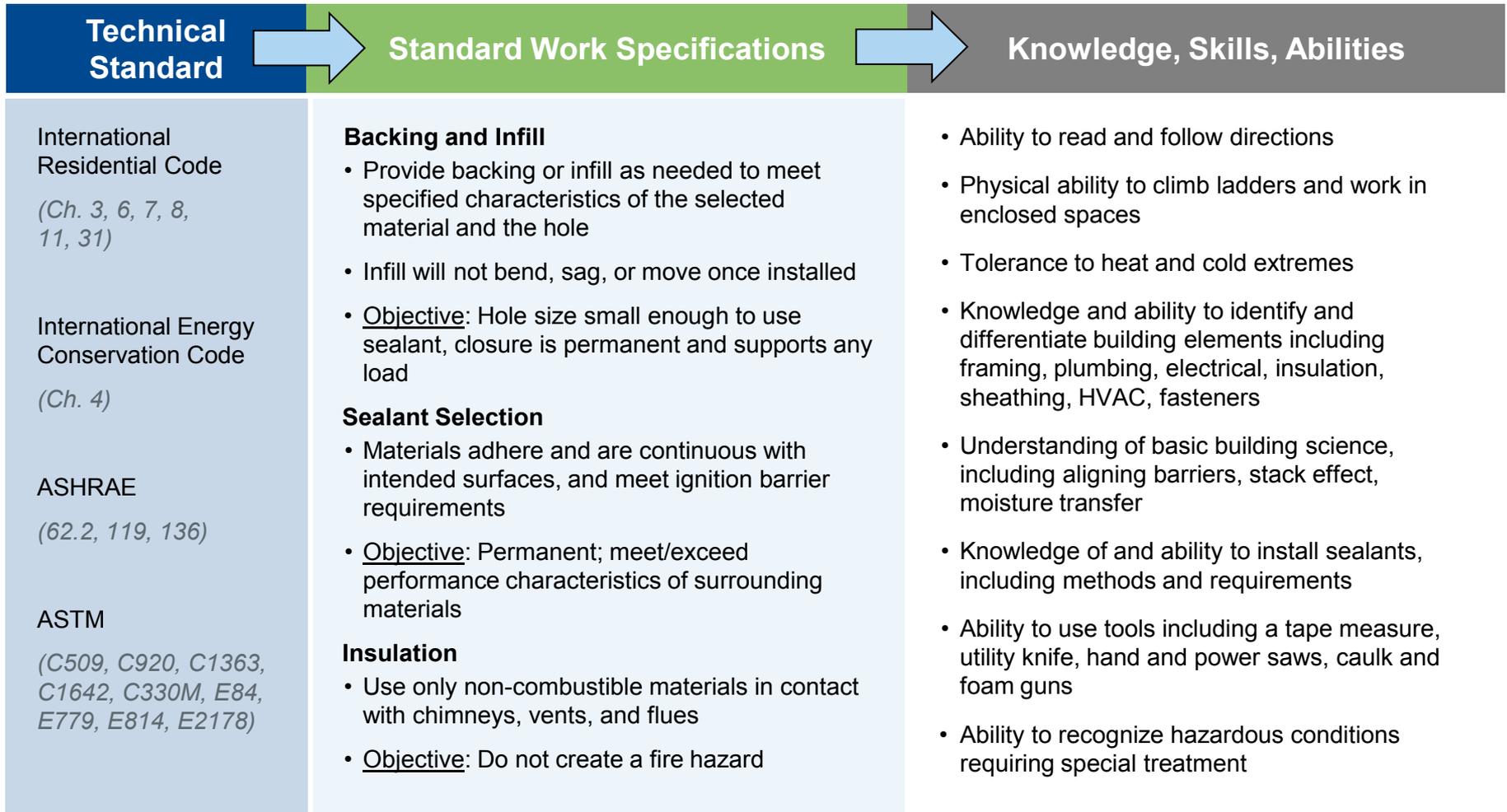
Four Home Energy Retrofit Job Classifications

Essential KSAs

- Identify the minimum *knowledge, skills, and abilities* that workers should possess to perform high-quality work
- Each Job Task has a corresponding set of essential KSAs
- Examples:
 - Demonstrate ability to blow insulation at appropriate air pressure and material quantity...
 - Demonstrate ability to prioritize air sealing measures to inhibit moisture migration...
 - Demonstrate knowledge of basic building science, including aligning barriers, stack effect, moisture transfer...



Attic Air Sealing: Penetrations



Building Markets on Quality

- Markets are driven by consumer confidence
- WAP's long history and extensive expertise support the development of consumer confidence
- Market rate programs can rely on the technical expertise within the WAP program to set standards for work quality and quality assurance
- WAP has a skilled workforce ready and able to transition into the middle-income market
- Common standards and certifications across markets and programs will ensure that the workforce is able to deliver a consistent product that consumers can trust
- WAP has spent 30+ years developing quality standards - a resource that can be utilized by all energy efficiency programs
- Standard Work Specifications (SWS) are outcome driven, but not prescriptive (*not protocols or best practices*)

Standard Work Specifications = setting the bar for quality work



U.S. DEPARTMENT OF ENERGY

SOLAR EDUCATION Next Steps

Time to shine.

National Workforce Certification Training Program Accreditation

Accreditation

- Is given to the **Training Program**
 - (Weatherization Training Center or other qualified program)
- Verifies that the Training Program meets a standard in both its operations as well as facilities



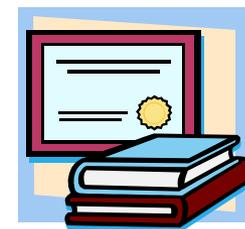
Certification

- Is given to individuals (**worker**)
- Certifies that an individual has the knowledge, skills, and abilities to perform a certain job.
- Is issued by an independent third party



Credential (generic term)

- Careful! - Can be a “Certificate for Completion” or License, or degree, or full Certificate



DOE is building toward full Wx worker certification

Training: Key Challenges

Proliferation of training and certificate programs for WAP and the Home Performance workforce

– industry, labor, government, educational institutions, NGOs

1. Major infusion of Federal and State training dollars with no standards
2. No objective measure (3rd party assessment) of training program effectiveness
3. No uniform way for workers seeking training to assess the quality of the program or provider

Solution: Training Program Accreditation



- Voluntary, third-party assessment of training provider quality
- Interstate Renewable Energy Council (IREC)
 - Currently accredits solar training programs
- ISPQ International Standard 01022
- IREC will use the *DOE Job Task Analysis and Knowledge, Skills, and Abilities* as the foundational document for accreditation

What is Accreditation Based On?

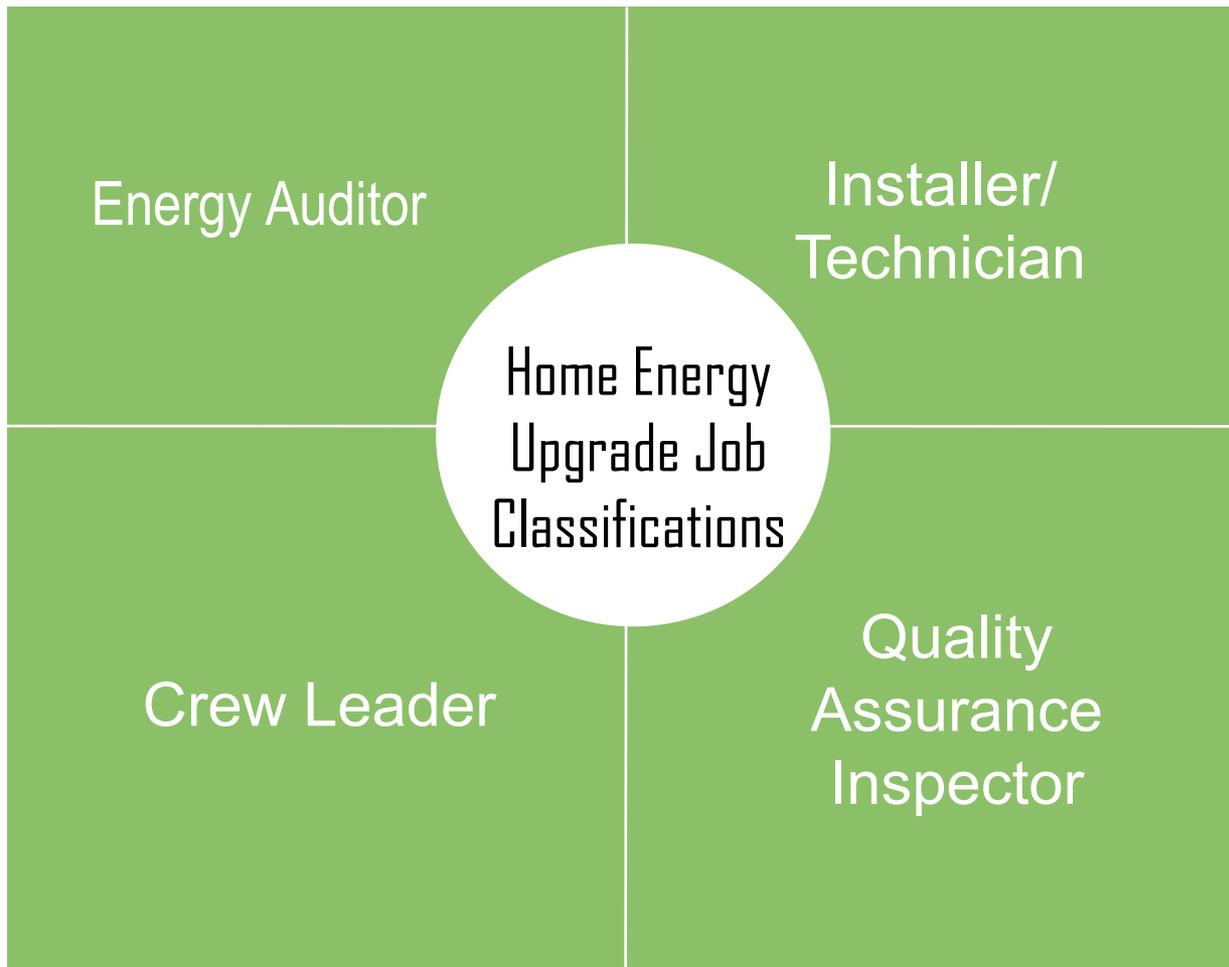
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- *Example*: An Auditor needs to be able to:
 - set up blower door
 - run test in accordance with ASTM E779,
 - record results of blower door test in diagnostic software, etc.





Four Home Energy Upgrade Job Classifications



Credentialing Single Family: Key Challenges

1. Lots of different credentials
 - Certifications and certificates galore
 - Credentials are not always transferable across programs and geographies (impedes mobility)
 - What's a worker or a consumer to do?
2. Competencies (Job Tasks and KSAs) upon which certifications are built are all different and in need of strengthening
3. Certification exams need to better assess field capabilities
4. Many credentials are too expensive and are not always available in all locations

Developing the Standard Work Specifications: Multifamily

- Collaboration between industry, labor and the building trades, and the DOE, HUD, USDA, and EPA
 - Continue collaboration with EPA on Protocols
- National Renewable Energy Lab, Advanced Energy, Association for Energy Affordability, Weatherization Assistance Program, Industry
- Will follow a process similar to the Single Family SWS development
- Multifamily is unique in that individual trade workers often play a larger role
- Overall Goal: Industry acceptance and market transformation!

Overall Goals

- Build on the work and experience of the Guidelines for Home Energy Upgrade Professionals: Single Family
- Define Multi-Family building types
- Assess existing standard and resources for inclusion and reference in the SWS
- Fill gaps in existing materials through collaboration of market players
- Define professional job positions that will utilize the SWS



Weatherization Training Centers



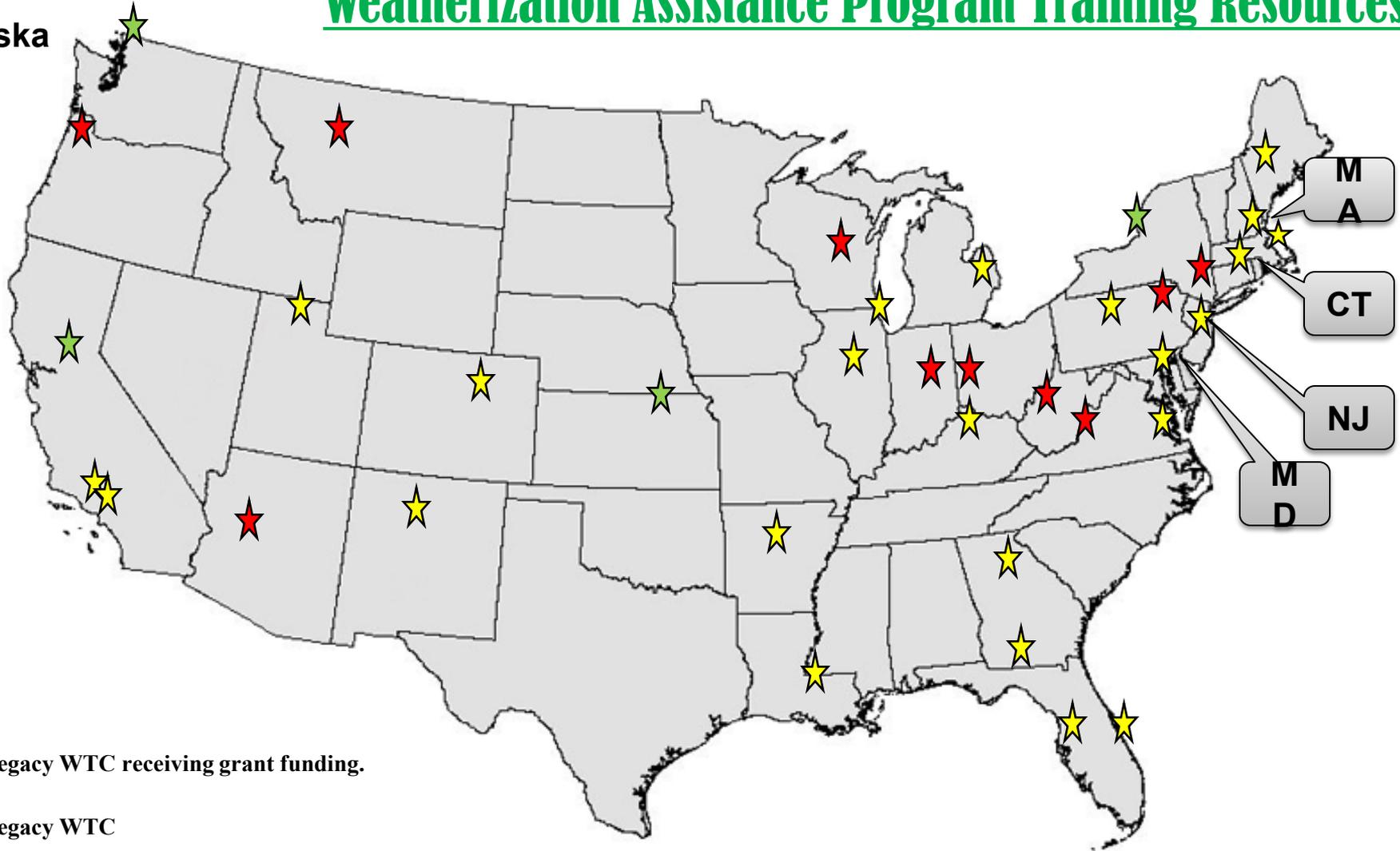
Weatherization Training Centers At a Glance:

- 39 Centers Nationwide in 29 States
- Hands-on, skills based training to workers, auditors, inspectors and administrators program
- Coursework built on the Weatherization Assistance Program's Standardized Training Curriculum and Core Competencies
- Supported by a network of over 1000 local agencies
- Backed by Training and Technical Assistance support from the national Weatherization Assistance Program
- Third-party accreditation and worker certification coming-soon.



Weatherization Assistance Program Training Resources

 **Alaska**



 Legacy WTC receiving grant funding.

 Legacy WTC

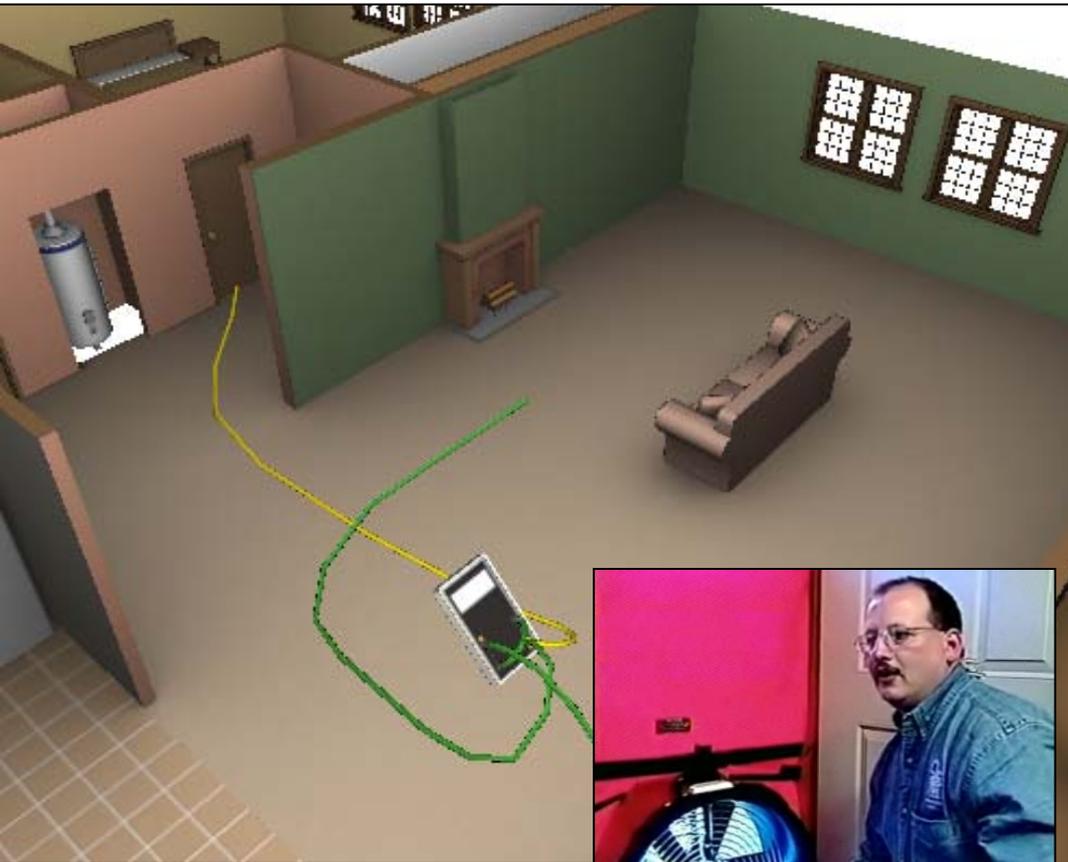
 2010 WTC Grant Recipient

Weatherization Assistance Program: Standardized Training Curriculum

- Weatherization Installer/Technician Fundamentals
- Weatherization Installer/Technician Intermediate
- Weatherization Installer – Mobile Homes
- Crew Chief
- Energy Auditor – Single Family
- Energy Auditor – Multifamily
- Technical Monitor/ Inspector
- Heating Systems for Energy Auditors – Single Family
- Multifamily – HVAC
- Train the Trainer
- Weatherization Program Manager

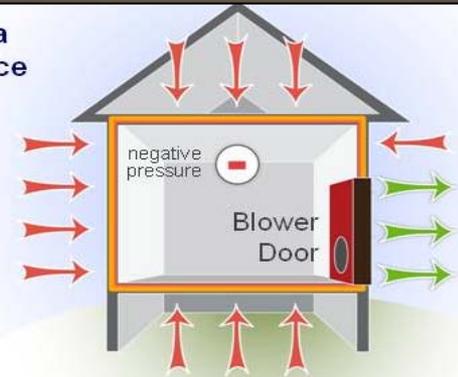


National Weatherization Training Platform



Use a Blower Door as a Controlled Driving Force

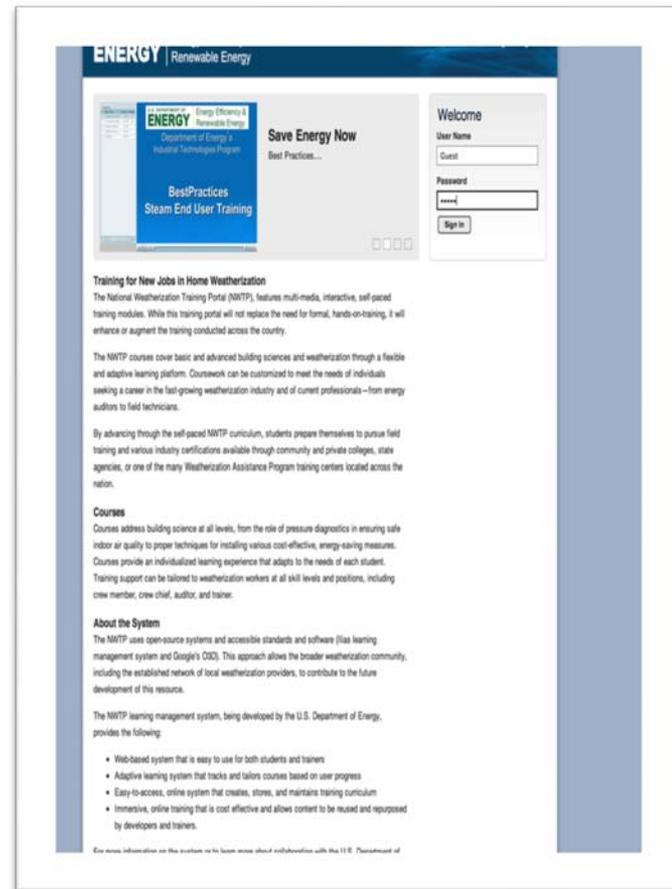
Using the blower door depressurizes the house drawing air through all the holes between inside and outside



What is NWTP?

The NWTP learning management system, being developed by the U.S. Department of Energy, provides the following:

- Web-based system that is easy to use for both students and trainers
- Adaptive learning system that tracks and tailors courses based on user progress
- Easy-to-access, online system that creates, stores, and maintains training curriculum
- Immersive, online training that is cost effective and allows content to be reused and repurposed by developers and trainers.



The screenshot shows the NWTP website interface. At the top, there is a navigation bar with the text "ENERGY | Renewable Energy". Below this, there is a main content area with a large blue banner on the left that reads "ENERGY Energy Efficiency & Renewable Energy Department of Energy's Industrial Technology Program BestPractices Steam End User Training". To the right of the banner, there is a "Save Energy Now" section with a "Best Practices..." link. On the far right, there is a "Welcome" section with a "User Name" field (containing "Guest"), a "Password" field (containing "****"), and a "Sign In" button. Below the banner and "Save Energy Now" section, there is a "Training for New Jobs in Home Weatherization" section with a sub-heading "The National Weatherization Training Portal (NWTP), features multi-media, interactive, self-paced training modules. While this training portal will not replace the need for formal, hands-on-training, it will enhance or augment the training conducted across the country." This is followed by a paragraph about the NWTP courses covering basic and advanced building sciences and weatherization through a flexible and adaptive learning platform. Below that is a "Courses" section with a sub-heading "Courses address building science at all levels, from the role of pressure diagnostics in ensuring safe indoor air quality to proper techniques for installing various cost-effective, energy saving measures. Courses provide an individualized learning experience that adapts to the needs of each student. Training support can be tailored to weatherization workers at all skill levels and positions, including crew member, crew chief, auditor, and trainer." This is followed by an "About the System" section with a sub-heading "The NWTP uses open-source systems and accessible standards and software (like learning management system and Google's GSS). This approach allows the broader weatherization community, including the established network of local weatherization providers, to contribute to the future development of this resource." Below that is another paragraph about the NWTP learning management system, being developed by the U.S. Department of Energy, provides the following:

- Web-based system that is easy to use for both students and trainers
- Adaptive learning system that tracks and tailors courses based on user progress
- Easy-to-access, online system that creates, stores, and maintains training curriculum
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 At the bottom of the page, there is a small line of text: "For more information on this system or to learn more about collaboration with the U.S. Department of Energy, please contact us at [redacted]@energy.gov".

Online Training System

- Continually improve content and keep it up-to-date
- Meaningful assessments through performance-based testing
- Continuous, unobtrusive evaluation of students
- Game like environments and simulations
- Open Source (free)
- Saves paper, gas & money!
- The NWTP is a *supplement* to a quality trainer and a well-equipped training center. It replaces neither.

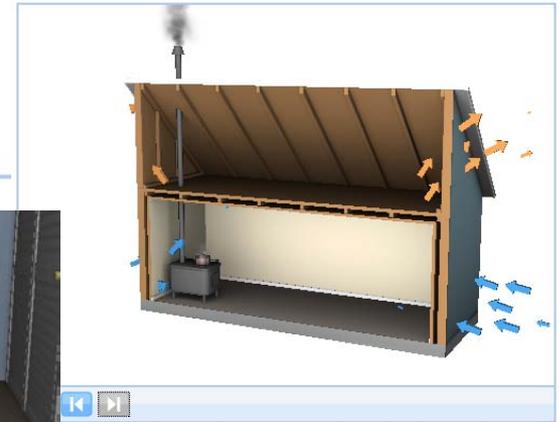


Sample Content

By reviewing this lesson, participants will:

- Know the proper location of thermal and air barriers
- Recognize the driving forces of air leakage
- Understand the connection between air leakage, energy waste, and moisture problems
- Understand how air ducts effect pressure balance within the home
- Understand the principle behind the blower door as a tool for measuring air leakage

Click on the arrow to hear the speaker notes.



Knowledge Check

Adding insulation to the attic does not affect the heating or cooling system.

- False
- True

Submit Answers

A house is a system of interdependent parts.

- False
- True

Submit Answers

Air sealing and insulating a home reduces the heating and cooling load.

- False
- True

Submit Answers

Leaky, recessed light fixtures can cause:

- All of the above
- Electrical problems
- Poor light quality
- Ice dams
- Furnace malfunction

Submit Answers

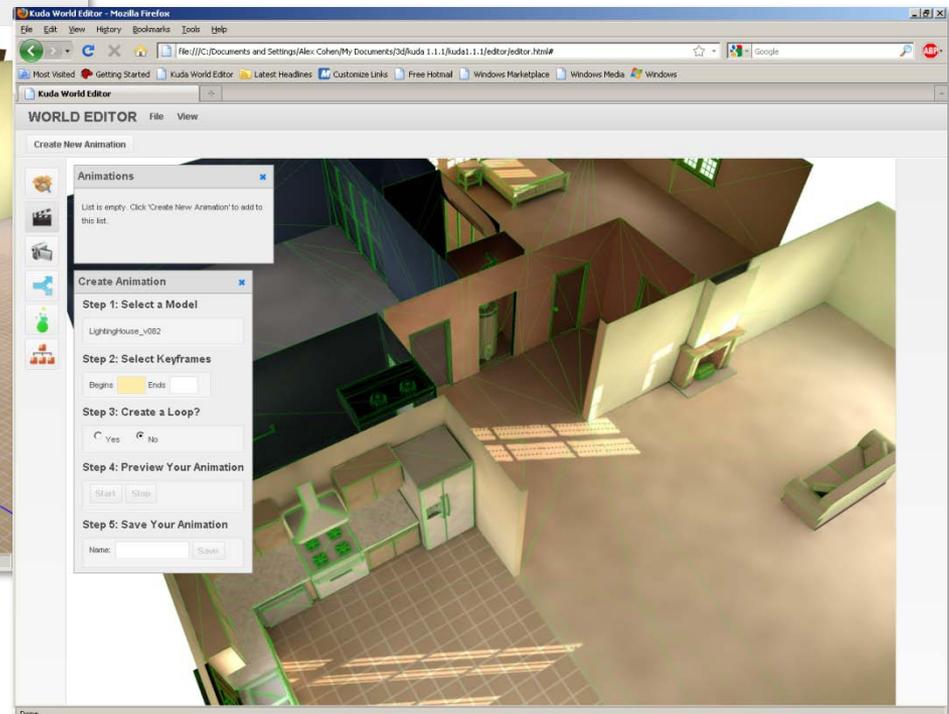
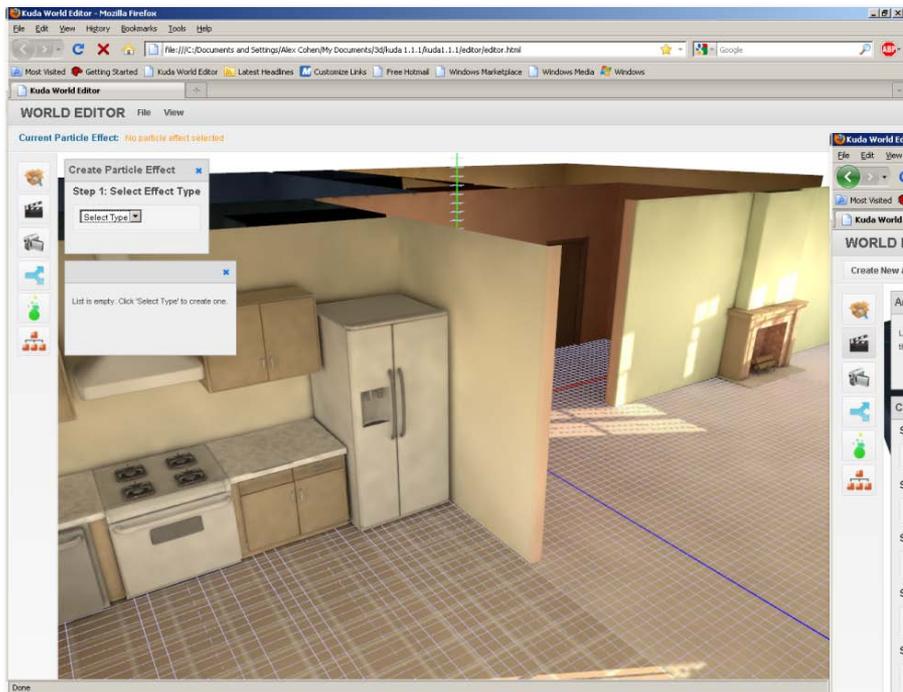
Weatherization affects:

- Only certain rooms of the home
- Just the windows and door
- Just the heating equipment
- The entire house as a system

Submit Answers

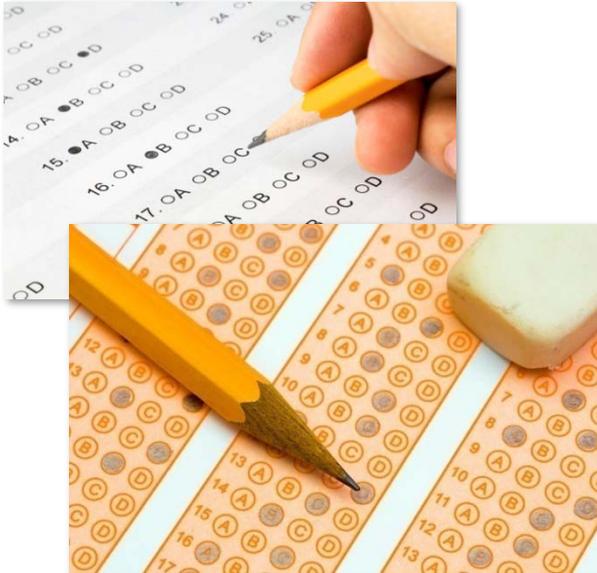
Authoring tool for 3D content creation

- Build 3D simulations without programming
- Runs in browser; no heavy downloads





Trading this....



Leaky, recessed light fixtures can cause:

- Electrical problems
- Ice dams
- Furnace malfunction
- All of the above
- Poor light quality

Submit Answers

For meaningful, performance-based assessment



Correctly install the proper type of wall joint to complete the structure.



Audit Tools

Healthy Homes Electronic Assessment Tool

- Designed by ORNL in collaboration with HUD & DOE
- Performs whole-house health and safety audits including:
 - Site built single family
 - Mobile homes
 - Individual multifamily units
- Comprehensive checklist to identify potential H&S issues and recommend preventative and corrective measures
- Attempts to ensure health and safety of occupant and workers during and after weatherization
- Includes all the WAP health and safety and more
- Stand-alone module with potential for future efficiency audit integration
- Demo at <http://hyperion.ornl.gov/hud>



Multi-Family Audit Tool: ORNL and LBL Collaboration



Develop Small Multi-Family and Large Multi-Family Audit Tool and Programmatic Elements for the WAP

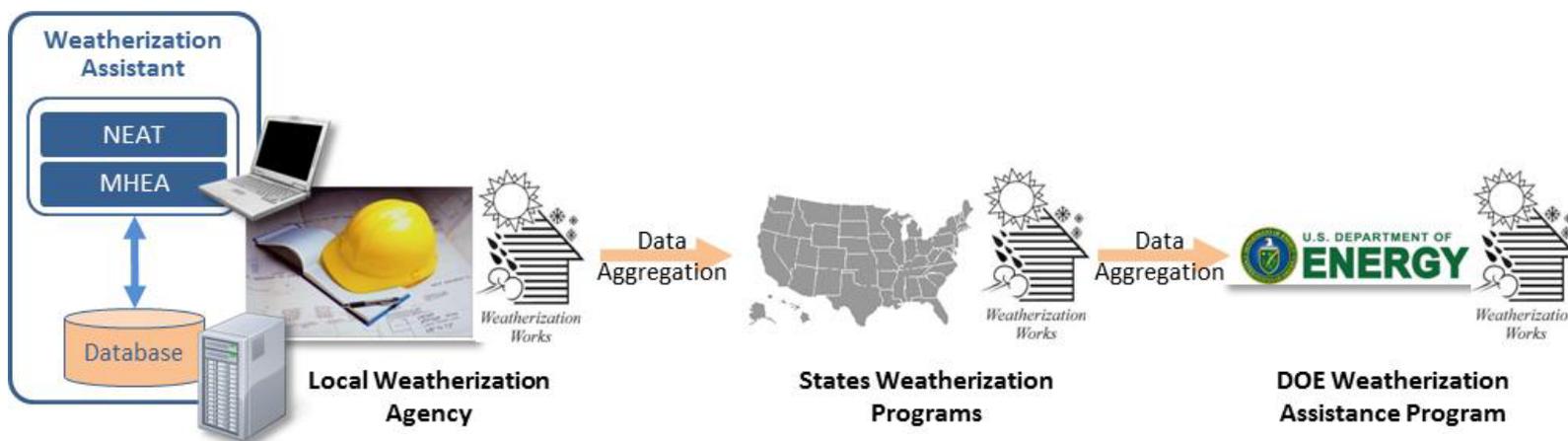


Add Multifamily HES Consumer (Home Owners) & HES Pro

The Multifamily Audit Tool will:

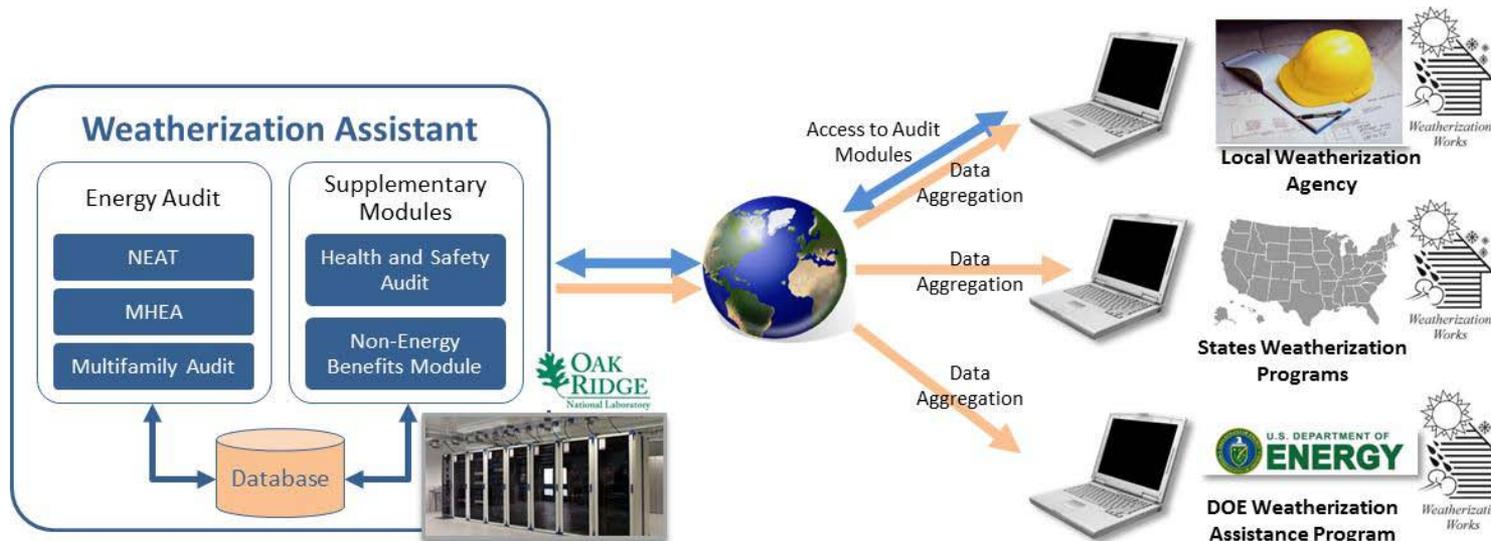
- Provide energy auditors with an improved energy simulation and weatherization measure selection tool for multifamily buildings
- Expand and enhance the energy auditing capabilities of auditors in multifamily buildings
- Provide a DOE-sponsored multifamily energy audit instrument to complement the single-family (NEAT) and mobile home (MHEA) energy audits already supported by DOE under the Weatherization Assistance
- Help improve retrofit work quality and provide a foundation for quality assurance
- Assist training providers in developing better training materials
- Increase workforce mobility up career ladders and across career lattices
- Build confidence among consumers, building owners, and the energy efficiency finance community

Weatherization Assistant — today



- NEAT and MHEA only — no multifamily-specific
- Locally run on PCs at agency level
- Aggregation to state level by agency

Weatherization Assistant — planned



- NEAT, MHEA, H&S, NEBs, new multifamily tool
- All run as Internet web service, secure servers
- Central data base



Some Primary Needs for New Tool

- Multiple zones and heating systems
- Improved methods of handling distribution systems
- Improved methods of handling impact of sensor location and controls
- Better handling of ventilation systems
- Rules-based savings estimation

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