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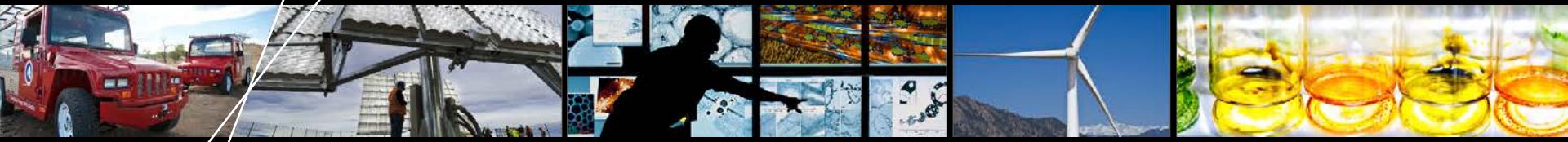
WIPP Weatherization: Common Errors and Innovative Solutions



Amy Hollander – National Renewable Energy Laboratory

April 30th, 2013

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Field Case Studies for Home Energy Upgrades

Home Energy Upgrades

- Common errors
  - Sample photos
- Good quality solutions
  - Best practices

EERE Guidelines for Home Energy Professionals

- Standard Work Specifications
- Certification
- Training

Technologies Covered

Air Sealing

- Diagnosing with tools
  - Blower Door and Infra Red
  - Air Sealing Trouble Spots
- Penetrations
- Rim Joist Sealing
- Crawl Space Treatments
- Ducts
- Attic Penetrations

Insulation & Venting

- Attic Insulation
  - Complexities of Insulation
- Wall Insulation
- Basement Insulation
  - Rim Joist
- Pipe Insulation
- Venting
  - Crawlspace Treatment
  - Dryer Ventilation
  - Bath Ventilation

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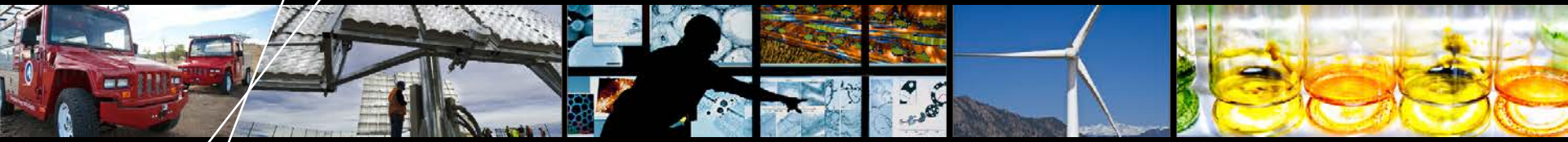
Air Sealing



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Blower Door and Infrared Diagnostics

- A blower door lowers the house pressure, allowing for leak detection
- Simultaneously an infrared camera detects air leakage one cannot feel

19 Air Sealing Trouble Spots

1. Air Barrier and Thermal Barrier Alignment
2. Attic Air Sealing (top plates and wall to ceiling connections)
3. Attic Kneewalls
4. Shaft for Piping or Ducts (openings from attic to conditioned space)
5. Dropped Ceiling/Soffit
6. Staircase Framing at Exterior Wall
7. Porch Roof
8. Flue or Chimney Shaft
9. Attic Access
10. Recessed Lighting
11. Ducts
12. Whole-House Fan
13. Exterior Wall Penetrations
14. Fireplace Wall
15. Garage/Living Space Walls
16. Cantilevered Floor
17. Rim Joists, Sill Plate, Foundation, Floor
18. Windows & Doors
19. Common Walls Between Attached Dwelling Units

Source: Building America Air Sealing Guide

Air Sealing Opportunities

Electrical Penetrations

Flue Penetrations

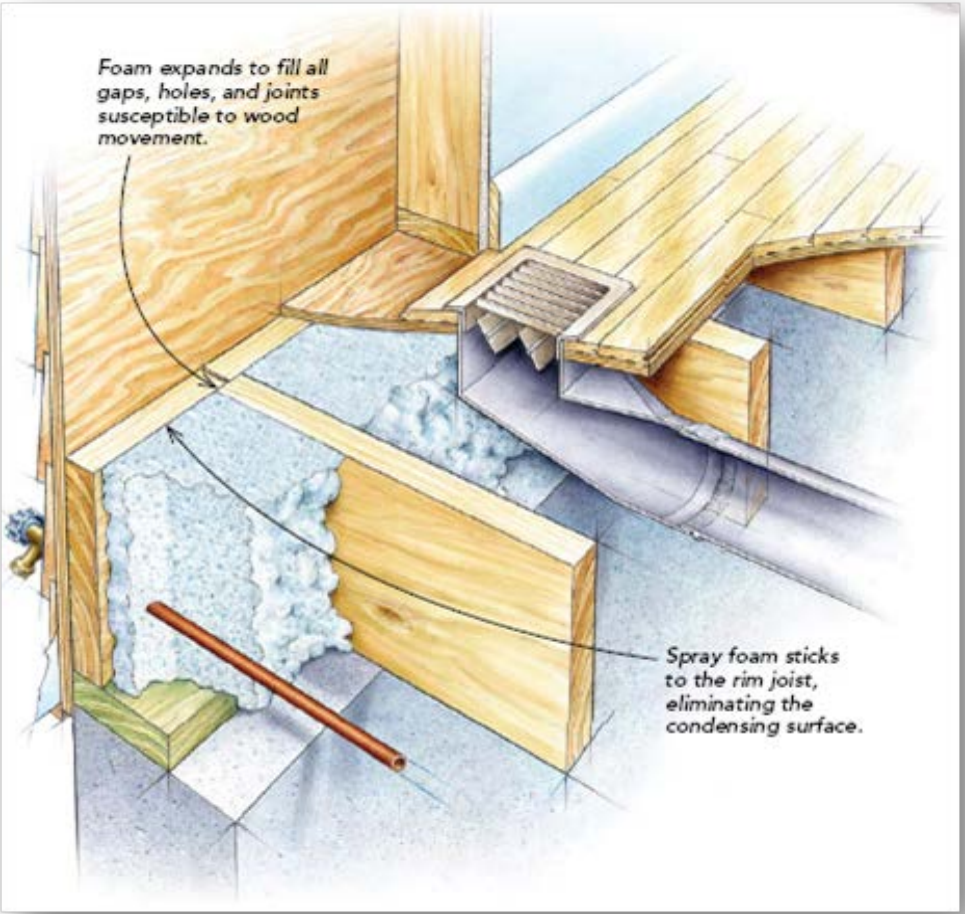
Plumbing Penetrations

Penetration Sealing

Unsealed Penetrations

Well-sealed penetrations and bypasses

Rim Joist Sealing



Well-sealed combustion intake through rim joist

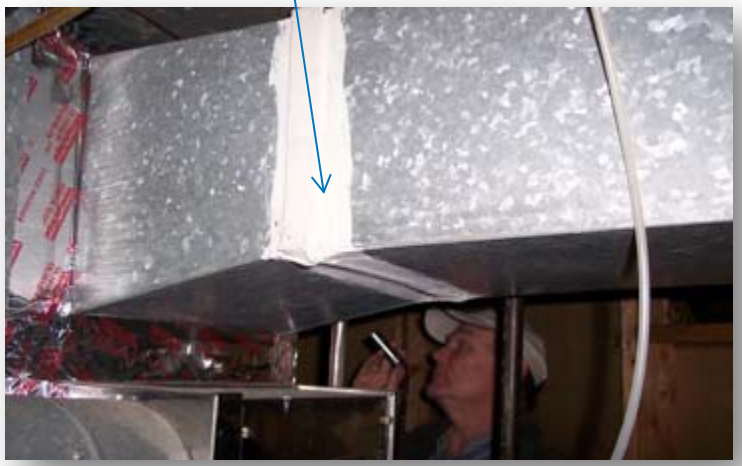
Duct Sealing

Heating ducts in the attic are nicely insulated but not air sealed.

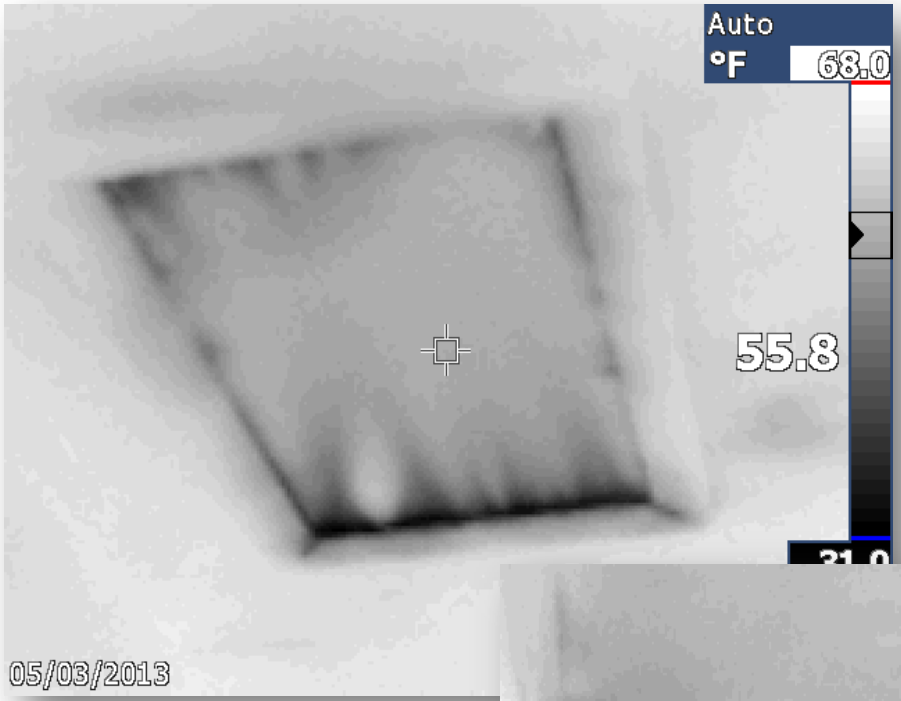
HVAC Duct Sealing

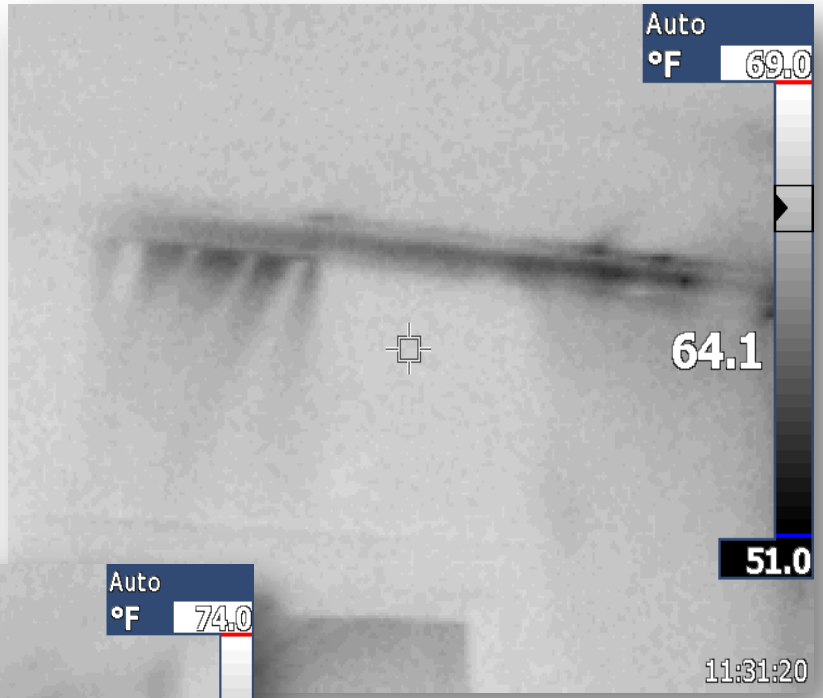
Use mastic or mesh tape, not aluminum tape

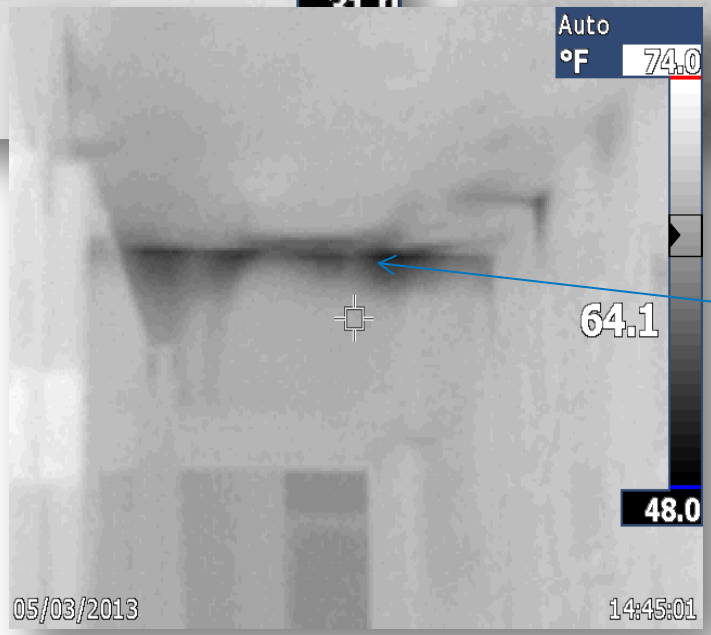
Mesh Tape & Mastic



Attic Access and Top Plate Penetrations

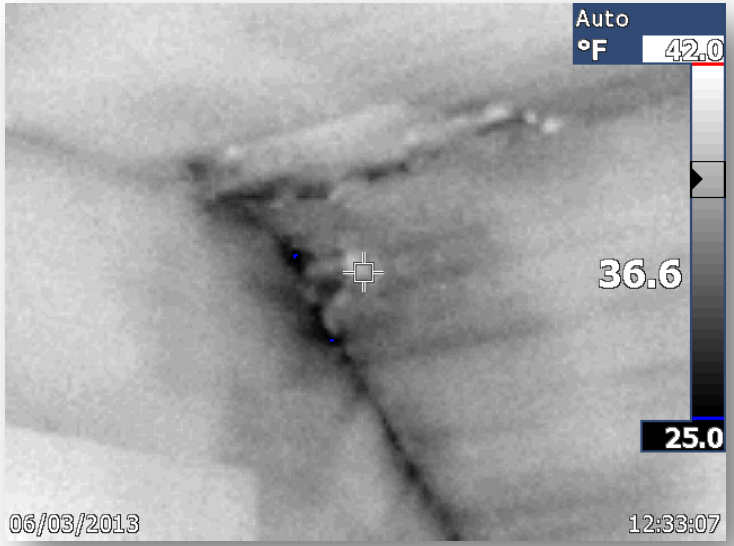


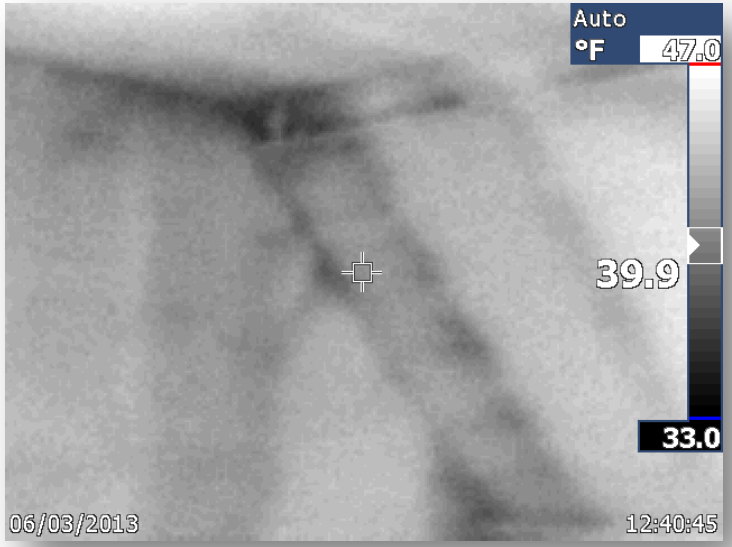




Attic top plate not sealed

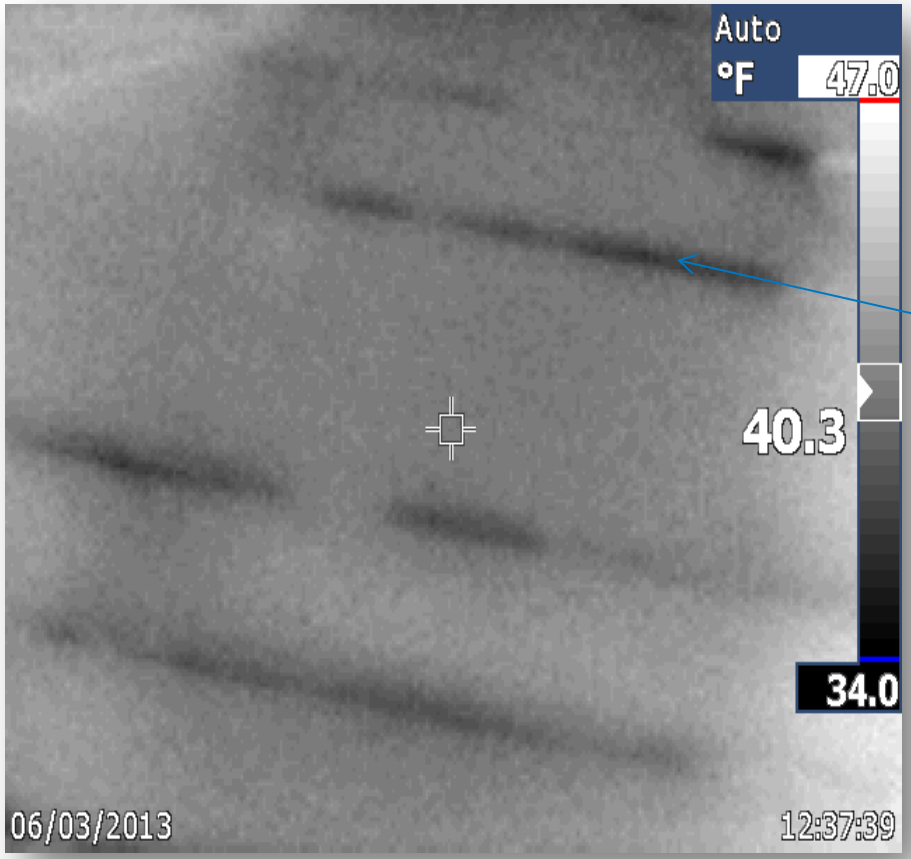
Attic Penetrations





Weatherization crews should have accessed the slopes and top of the attic space in both these areas.

Attic Floor to Sidewall Penetrations



Interstitial pathways: The floor connects to the outside through sidewalls, and needs sealing through dense-pack cellulose technologies. The leaks are the dark lines in the photograph.

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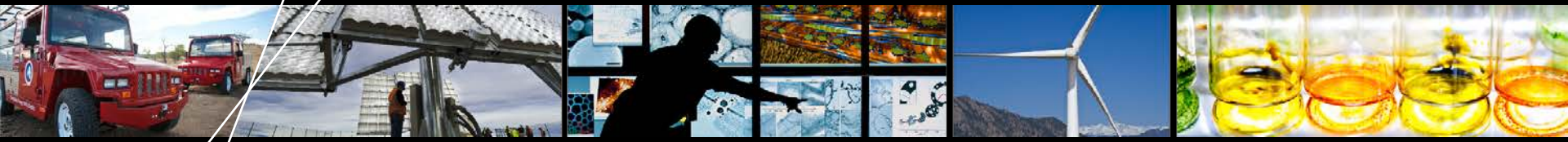
Insulation and Venting



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Cellulose Attic Insulation Blow

Quality Attic Insulation Installation

- Long lasting proof of R-50 insulation value
- Even coverage
- Proper material
- Air sealed
- Safety and access blocking

Importance of Level Attic Insulation

- Level insulation throughout the attic ensures a consistent R-value throughout the attic
- Post-insulation, the inspector may see wind washing from ventilation

Insulation

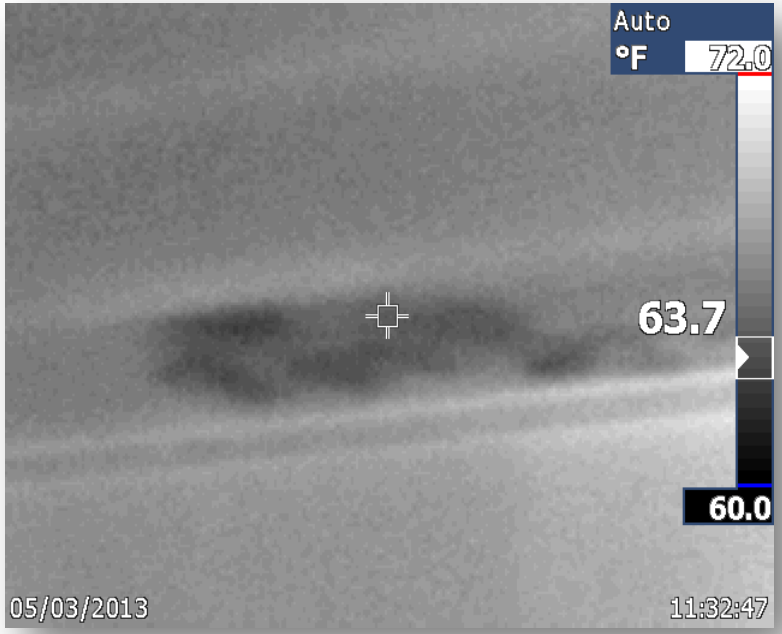
- Fiberglass in Attic?
  - Not ideal for attics
    - Attracts vermin
    - Not a recycled product
  - Best if used for weaker construction strength
    - Mobile home ceilings
    - Cathedral ceilings

Disturbed Insulation Causes Thermal Bridging

Foot Traffic Through Attic

- Ceiling joists not covered
- Uneven insulation leaves gaps and causes thermal bridging

Infrared camera shows leakage at ceiling (with disturbed insulation from worker footprints) which was not adequately restored before finishing the job.

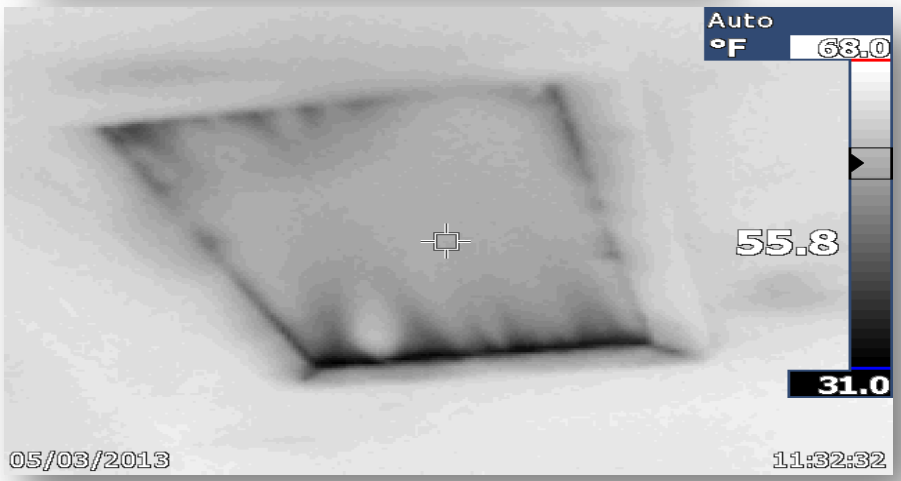


Cellulose Attic Insulation Blow

Poor Quality Cellulose Insulation Installation

- Existing insulation in partial attic is left piled up
- Uneven insulation reduces effectiveness and allows for thermal bridging

Attic Access Blocking



Attic Hatch

Wall Insulation - Blown

- Wall insulation should be pursued aggressively as it is usually the second or third most cost-effective upgrade
- Lead safe work practices are not a barrier

Wall Insulation - Blown

Lead Safe Work Practices

Worker has no protective equipment

Lead paint chips on ground

Basement Insulation Misguided

- Did not insulate and seal rim joist spaces
- Did not apply insulation flush with surface

- Large gaps compromise effectiveness
- Potential moisture problems due to rim joist space not air sealed

Pipe Insulation

- Misuse of duct tape
  - Good insulation coverage but…
  - Foil backed ultra grip tape is recommended

Crawl Space Treatment

The crawlspace vents are wide open, AND the ducts are delivering heated air, making it a conditioned space.

Crawlspace Vapor Barrier

A six millimeter poly or plastic should be applied to the ground for multiple benefits

- Vapor barrier
- Radon barrier
- Storage space - A plus for the homeowner

Dryer Venting

Kinked clothes dryer vent hose is a health and safety concern

Existing torn clothes dryer vent hose left unrepaired can create moisture problems

Bath Venting

New bathroom vent fan
properly installed and vented
through the attic

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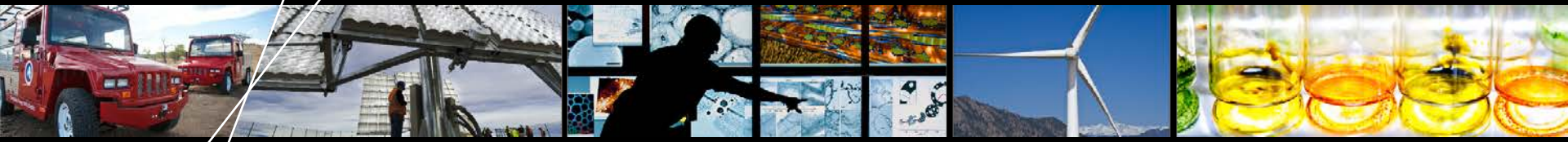
EERE Guidelines for Home Energy Professionals



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EERE Guidelines for Home Energy Professionals

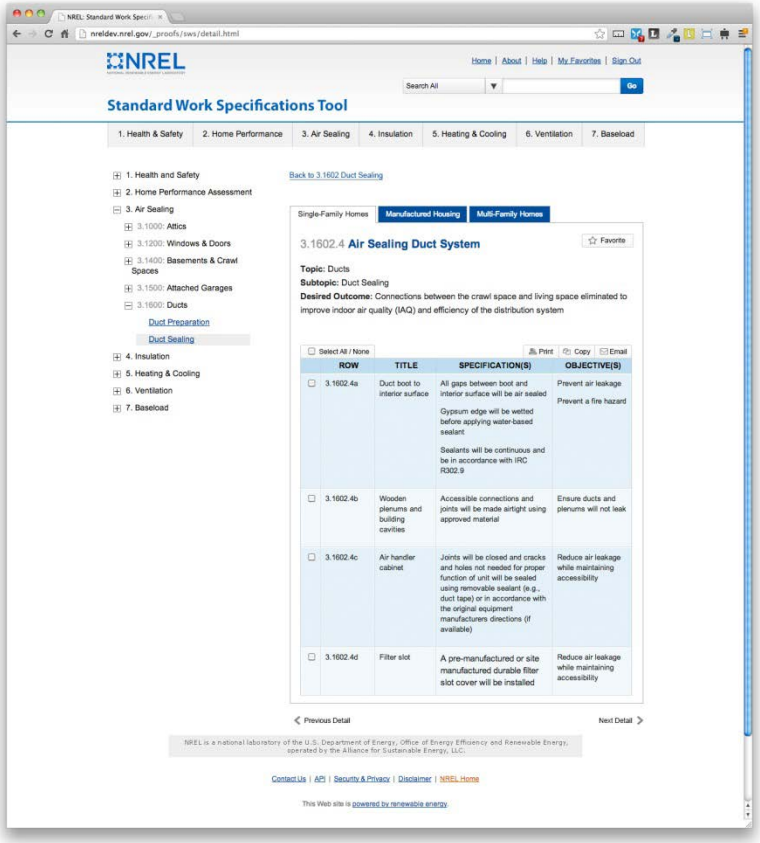
- Define quality work outcomes through **Standard Work Specifications**
- Provide weatherization workers with a logical progression for advancing their careers through **Home Energy Professional Certifications**
- **Streamline training** and certification options for home energy upgrade professionals

Goal: Collaborate with industry to develop the tools needed for a high-quality residential energy upgrade industry, supported by accredited training programs and a skilled and credentialed workforce.

Standard Work Specifications

Quality Work: Defined

- Standard Work Specifications (SWS)
  - Single-Family
  - Multifamily
  - Manufactured Housing
- Outcome-driven specifications
  - Increased production
  - Quality work defined
  - Safer work environment
- SWS Online Tool
  - Available now: sws.nrel.gov
  - Additional features to be released this summer



Home Energy Professional Certifications

- Competency-based certifications
- Supported by the U.S. Department of Energy
- Based on industry-developed JTAs/KSAs
- ANSI ISO 17024 accreditation
- Available through the Building Performance Institute, Inc.
- Summer 2013 national rollout
- Crosswalk of certifications also being developed

Quality Workers: Defined

Four Advanced Professional Certifications

- Energy Auditor
- Retrofit Installer Technician
- Crew Leader
- Quality Control Inspector

Resources

- WAP Curricula at WAPTAC
- National Training and Education Resource (NTER)
- Building America Air Sealing Guide
- Standard Work Specifications (SWS)
- Certification for Home Energy Guidelines

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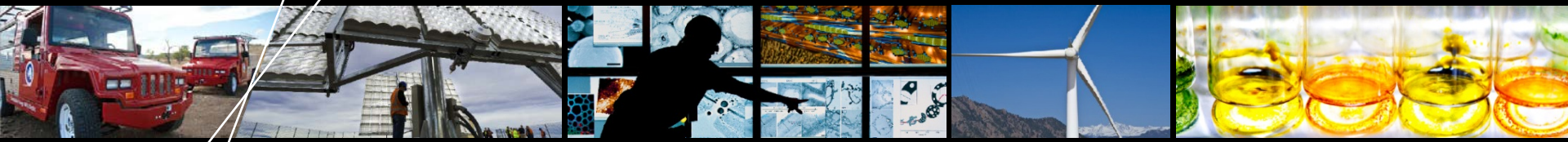

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