Final Inspector

Section 1: Introduction to Quality Control

Quality Control Inspections- Interim Inspections-Final Inspections

Learning Objectives

By attending this session, participants will be able to:

- Discuss the historical perspective of the Weatherization Assistance Program (WAP)
- Name characteristics of the client base served by the program
- Recognize that building science guides the selection of measures installed with program dollars.
- Describe the principles of cost-effectiveness and the savings-to-investment ratio (SIR)
- Recognize modern weatherization measures

Supplemental Materials

Handouts & Resources

Energy Auditing Quiz.

Energy Auditing Quiz Answer Key.

Section 2: House as a System

Learning Objectives

By attending this session, participants will be able to:

- Discuss the potential for interaction among building components and mechanical systems.
- Give examples of how air sealing a home can negatively affect indoor air quality.
- Recognize typical air leakage sites and know how to deal with them.

Final Inspector

Key Terminology

Aldehydes

Backdraft

Bypass

Carbon monoxide (CO)

Chimney chase

Dropped soffit

Indoor air quality (IAQ)

Spauling

Stack effect

Vapor retarder

Supplemental Materials

Handouts & Resources

House as a System Quiz.

House as a System Quiz Answer Key.

Lstiburek, Joseph, and John Carmody. "Fundamentals of Moisture in Houses." *Home Energy* Nov./Dec. 1995. <www.homeenergy.org>.

McWilliams, Jennifer A., and Iain S. Walker. "Retrofitting Residential HVAC Systems." *Home Energy* Jan/Feb. 2005. <www.homeenergy.org>.

Partnership for Advancing Technology in Housing (PATH). *Your House is a System: Tips for the Handy Homeowner* Jan. 2006. <www.pathnet.org>.

Prowler, Don. "Mold and Moisture Dynamics." Rev. Heinz Trechsel. WBDG.org. National Institute of Building Sciences. <www.wbdg.org>.

Van der Meer, Bill. "Avoiding Moisture Problems." *The Weatherization Training Center Technical Update 1* (Feb. 2003)

Online Platform Lessons

Use these online interactive training modules as prerequisites before students attend the course or as in-class computer lab sessions. Users must first create an account at www.nterlearning.org to access the lesson.

c- 5.1 Understanding Effective R-Value https://www.nterlearning.org/web/guest/course-details?cid=247

i- 3.1 Basics & Modes of Heat Transfer https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.2 Moisture https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.3 Driving Forces, Airflow & Stack Effect https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.4 Building Envelope, Thermal Envelope, Pressure Boundary & Conditioned Space https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.5 House as a System - Part 1 https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.6 House as a System - Part 2 https://www.nterlearning.org/web/guest/course-details?cid=249

Classroom Props & Activities

Pressure House: Illustrate the interrelationships of home mechanical systems, air-tightness, and connectivity to the basement (or crawlspace), attic, or garage as they relate to pressure differences, energy efficiency and IAQ issues.

Class Overview

- Use the presentation and class discussion to teach students that each house is a system of interrelated components.
- Have students discuss the problems that can arise if:
  - A home with no exhaust fans or with kerosene space heaters is air sealed (moisture issues).
  - An older furnace is replaced with a 90+ direct vent appliance, orphaning the water heater (backdrafting).
- Introduce the concept of mounting savings.
  - Air sealing and insulating reduce load on heating and cooling appliances, making it possible to downsize equipment. Smaller equipment costs less to purchase and operate.
  - By sealing the ducts, we get conditioned air where it belongs, reducing the need for extra space heaters in rooms far from the heating source.
  - Air sealing and insulating the attic prevents warm, moist air from escaping, reducing residents' heating bills and preventing ice dams and the costly repairs associated with them.

Section 3: Regulations and Standards

Learning Objectives

By attending this session, participants will be able to:

- List selection criteria for weatherization measures.
- Recognize Appendix A as a tool for materials selection.
- Identify DOE rules and guidance.
- Locate resources for residential building, electrical, and mechanical codes.
- Discuss the application of codes in weatherization.
- Locate resources for worker safety requirements.
- Explain the differences between incidental repairs and health and safety (H&S) measures.
- Describe DOE rules and guidance as they apply to incidental repairs and H&S measures.

Key Terminology

American Gas Association (AGA)

American National Standards Institute (ANSI)

Accredited Standards Committee (ASC)

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

Appendix A

ASHRAE 62.2 – 2010 (or most current)

Carbon monoxide (CO)

Certified renovator

Cubic feet per minute (CFM)

Decommissioning

Discount rate

Energy conservation measures (ECM)

Fuel escalation rate

Grantee

Ground fault circuit interrupter (GFCI)

Health and safety (H&S)

I-Codes

Incidental repair

International Association of Plumbing and Mechanical Officials (IAPMO)

International Codes Council (ICC)

International Residential Code (IRC)

Knob and tube wiring

Lead-safe weatherization (LSW)

Manufactured Home Energy Audit (MHEA)

Material safety data sheets (MSDS)

National Electric Code (NEC)

National Energy Audit Tool (NEAT)

National Fire Protection Association (NFPA)

NFPA 31, "Standard for the Installation of Oil-Burning Equipment"

NFPA 54, "National Fuel Gas Code"

NFPA 211, "Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances"

Occupational Safety and Health Administration (OSHA)

Personal protective equipment (PPE)

Present value (PV)

Savings-to-investment ratio (SIR)

Standards for conformance

Supplemental Materials

Handouts & Resources

"12 Steps to Lead Safety." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Applicable Codes Handout.

Appropriate ASHRAE guidelines.

Code of Federal Regulations, Title 10 – Energy, Part 440 – Weatherization Assistance for Low-Income Persons (10 CFR 440). <http://www.waptac.org/Rules-and-Regulations/Federal-Regulations.aspx>.

Code of Federal Regulations, Title 10 – Energy, Part 440 – Weatherization Assistance for Low-Income Persons (10 CFR 440), Appendix A. <http://www.waptac.org/Rules-and-Regulations/Federal-Regulations.aspx>.

MSDS for two-part foam.

National Institute for Occupational Safety and Health website. <www.cdc.gov/niosh>.

Regulations and Standards Quiz.

Regulations and Standards Quiz Answer Key.

Savings-to-Investment Ratio calculator with PV function.

Savings-to-Investment Ratio Worksheet.

U.S. Department of Energy. Weatherization Assistance Program. "WPN 09-6 Lead Safe Weatherization (LSW) - Additional Materials and Information." 22 Jan. 2009. <www.waptac.org>.

U.S. Department of Energy, Seattle Regional Office and Energy OutWest. *Energy OutWest Weatherization Field Guide*. 2005. Copyright Saturn 2009. <www.azcommerce.com>.

U.S. Department of Energy, Weatherization Assistance Program, Midwest Regional Field Office. *Midwest Weatherization Best Practices Field Guide.* May 2007. <www.karg.com>.

U.S. Department of Energy, Weatherization Assistance Program. *Southeast Weatherization Field Guide*. 2002. Copyright Saturn 2002.

U.S. Department of Energy. Hot Climate Initiative. *Combustion Appliance Safety & Efficiency Testing*.

U.S. Department of Energy. Memorandum. "Knob-and-Tube Wiring: Revised Policy Superseding Guidance of 7/25/83 and 7/13/88." Oct. 21, 1988.

U.S. Department of Energy. Weatherization Assistance Program. "WPN 02-6 Weatherization Activities and Federal Lead-Based Paint Regulations. Attachment B: Lead Paint Decision Chart." 12 July 2002. <www.waptac.org>.

U.S. Department of Energy, Weatherization Assistance Program, *WPN 11-6. Health and Safety Guidance*. January 12, 2011. <www.waptac.org>.

U.S. Department of Energy, Weatherization Assistance Program, *WPN 12-1. Program Year 2012 Weatherization Grant Guidance*. January 31, 2012. <www.waptac.org>. *[Note: Use most recent program year guidance.]*

U.S. Department of Energy, Weatherization Assistance Program, *WPN 12-9. Incidental Repair Measure Guidance*. June 27, 2012. <www.waptac.org>.

U.S. Department of Energy, Weatherization Assistance Program, *WPN 12-9. Incidental Repair Measure FAQ*. June 27, 2012. <www.waptac.org>.

U.S. Department of Labor. Occupational Safety and Health Administration. "Fall Protection Tips QuickCard™." <www.osha.gov>.

Online Platform Lessons

Use these online interactive training modules as prerequisites before students attend the course, or as in-class computer lab sessions. Users must first create an account at www.nterlearning.org to access the lesson.

a- 8.2 ASHRAE 62.2 https://www.nterlearning.org/web/guest/course-details?cid=248

Relevant Standard Work Specifications

1.000 Health & Safety
3.000 Air Sealing
4.0000 Insulation
4.9901.1 Insulation – General Information on SPF
6.9901 Ventilation – Codes and Standards, Supplemental Ventilation Information

Classroom Props and Activities

Exercise: Compare Simple Payback and Simple SIR

- Discuss simple payback as it relates to SIR. Simple payback provides auditors with an estimate of whether a measure is close to cost-effective. SIR calculations using present value and fuel escalation rates are more accurate and must be applied within WAP.

- Conduct simple payback calculations on the board for the class to follow along. Assume replacing a refrigerator costs $300 and saves $25 dollars per year in electricity. The refrigerator has a simple payback of 12 years. Plugging those same numbers ($300 cost, $25 annual savings, and 12-year life) into a simple SIR calculation returns a value of exactly 1.

- Display the SIR Calculator spreadsheet tool. Input a variety of utility rates, installation costs, and estimated savings to illustrate how these factors influence SIR.

Exercise: What is Required?

While monitoring or inspecting, students may have to determine whether measures were installed in accordance with local codes. Slides 36 through 41 illustrate common weatherization work order requests. Distribute the Applicable Codes Handout. Divide the class into groups of three or four students. For each slide, give the groups 5 to 10 minutes to decide which codes/rules apply. Have students list any required actions and any needed calculations to size installed measures or equipment. Have each group list its answers on a flip chart. Compare answers and decide as a class on the correct response(s) to each situation.

Suggested responses:

Slide 36: Work order says, "Insulate over knob and tube wiring."

The NEC requires that all wiring junction boxes, not just knob and tube, be flagged before insulating over them.

NEC 394.12 specifically forbids enveloping knob and tube wiring with thermal insulation.

DOE policy allows insulating around knob and tube wiring if certain conditions are satisfied:

- All affected live knob and tube wiring is visually examined to see that it is in good condition and tested to see that the circuit voltage drop is less than 10%.
- The circuit breaker or fuse controlling the circuit is matched to the wire gauge.
- Correct amperage "S" type fuses are installed if the fuse panel has screw-in fuses.
- All affected circuits in walls are evaluated, not just visible wiring in attics or elsewhere.

Slide 37: Work order says, "Add attic venting as necessary."

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The International Residential Code 2012 requirement for attic venting states:

Minimum net free ventilating area shall be 1/150 of the area of the vented space. Exception: The minimum net free ventilation area shall be 1/300 of the vented space provided one or more of the following conditions are met:

- In climate zones 6, 7, and 8, a class I or II vapor retarder is installed on the warm-in-winter side of the ceiling.

- At least 40% and not more than 50% of the required ventilating area is provided by ventilators located in the upper portion of the attic or rafter space.

Assuming this home is in a northern climate and has a class I or II vapor barrier, we follow the 1/300 rule.

Sloped ceiling area is included in the attic floor area for this calculation.

Existing ventilation:

Three 8 ft. x 26 ft. ceiling sections = 624 sq. ft./300 sq. ft. = 2.08 sq. ft. net free vent area required.

(12 in. x 18 in.)/2 [screening blocks 1/2 of the free vent area] x 2 vents =
2 x (1 ft. x 1.5 ft.)/2 = 1.5 sq. ft. net free vent area existing.

0.58 sq. ft. additional net free vent area is needed.

Choices faced by auditor and installers:

Add one 8 in. x 10 in. vent to each end = 2 vents x (0.67 ft. x 0.83 ft.)/2 =
0.56 sq. ft. added net free vent area.

Replace existing vents with 12 in. x 24 in. vents = 2 x (12 in. x 24 in.)/2 =
2 x (1 ft. x 2 ft.)/2 = 2 sq. ft. net free vent area.

Replace existing vents with 14 in. x 24 in. vents = 2 x (1.17 ft. x 2 ft.)/2 = 2.34 sq. ft. net free vent area.

Which is correct? Adding the 8 in. x 10 in. vents is the least expensive way to satisfy the code requirement, but it is usually cosmetically unacceptable.

Replacing the existing vents with 12 in. x 24 in. vents creates a net free vent area that's slightly under the code, but it's probably close enough for most authorities.

Replacing the existing vents with 14 in. x 24 in. vents creates a net free vent area that's slightly over the code. It's the safe choice.

Slide 38: Work order says, "Replace bedroom window."

2006 & 2009 IRC 310.1.2 & 3 require a minimum 20 in. wide by 24 in. high, 5.7 sq. ft. clear opening area, or 5.0 sq. ft. with direct grade-level access for upper-story bedroom egress windows, including habitable attics. Note: 24 in. x 20 in. = 3.34 sq. ft., meaning at least one dimension must be greater than the code minimum.

27 in. x 44 in. = 1,188 sq. in./144 sq. in. = 8.25 sq. ft., but the existing window is single hung, allowing only half the opening or 4.125 sq. ft.

Q: Is the replacement window "grandfathered?"

A: No. It must be an egress window.

A casement window is the easy answer, but it won't match the building style or appearance.

The pictured double-hung unit is acceptable because both sashes tilt in, allowing almost the full sash area to be free of any obstruction.

For a home built before 1978:

- Installers must be lead-safe certified by EPA and work must be supervised by a certified firm. This must be documented in the client file.
- Lead-safe work practices must be used.

Slide 39: Work order says, "Replace attic hatch."

2009 IRC 807.1 requires a minimum rough opening of 22 in. x 30 in. if the attic is larger than 30 sq. ft., and requires a minimum of 30 in. of headroom between the hatch opening and roof framing at least at one point.

For a home built before 1978:

- Installers must be lead-safe certified by EPA and work must be supervised by a certified firm. This must be documented in the client file.
- Lead-safe work practices must be used.

Slides 40, 41: Work order says, "Install new bath fan and control."

The NEC applies. All wiring must be done by a licensed electrician.

Legally, a resident homeowner can wire his own home. Over the years, some Community Action Agency employees and contractors have convinced homeowners to "twist the screws and wirenuts" to save a few dollars. DO NOT DO THIS! The potential liability risks are too high.

For homes built before 1978:

- Installers must be lead-safe certified by EPA and work must be supervised by a certified firm. This must be documented in the client file.
- Lead-safe work practices must be used.

How do you determine the fan installed is acceptable? What is the appropriate fan CFM?

ASHRAE 62.2-2010: Bath fan must be rated at 100 CFM. If used to satisfy indoor air quality, ventilation must provide 7.5 CFM/person (occupancy determined by number of bedrooms plus 1) plus 1% of the conditioned floor area in sq. ft.

[7.5 CFM x (3+1)] + [0.01 x (12 ft. x 20 ft. + 16 ft. x 8 ft. + 16 ft. x 26 ft. + 16 ft. x 26 ft.)] = (7.5 x 4) + [0.01 x (240 sq. ft. + 128 sq. ft. + 416 sq. ft. + 416 sq. ft.)] = 30 + 0.01 x 1,100 sq. ft. = 30 + 11 = 41 CFM

The fan should be set to deliver 41 CFM continuous, 20.5 CFM, ½ hour on, and ½ hour off.

Ask students to volunteer similar situations they regularly encounter, describing what code issues they encounter, what is usually done, and why.

Class Overview

Before beginning the section, ask students what they think the measure selection guidelines for WAP are. Keep a running list.

- Deliver the presentation to the class. This presentation focuses as much on pointing out resources as on providing new content. If you have Wi-Fi access, use the links in the PowerPoint presentation to show the websites listed. Distribute handouts when prompted in the speaker notes and for the class exercise.
- Use the presentation to introduce the guidelines for selecting and installing measures. Note if certain things mentioned by the students are not required or if restrictions apply that students did not mention.
- Reference weatherization program notices that define or explain health and safety measures and incidental repairs. Discuss how those should be incorporated into a weatherization project.
- Lead a class discussion using slides 22–30 on whether the pictured scenarios qualify as incidental repairs or health and safety measures or could possibly be classified as either.

Section 4: Purpose of Monitoring and Inspecting

Learning Objectives

By attending this session, participants will be able to:

- Explain the purpose and importance of monitoring and inspecting weatherized units as part of the Weatherization Assistance Program.
- Describe the U.S. Department of Energy's monitoring requirements.
- Discuss the different types of monitoring.
- Differentiate between monitoring and inspecting.

Key Terminology

American Recovery and Reinvestment Act (ARRA)

Appendix A

Grantee

Health and safety (H&S)

Inspecting

Monitoring

National Energy Audit Tool (NEAT)

Project officer

Priority list

Quality assurance

Quality control

Subgrantee

Technical monitoring

U.S. Department of Energy (DOE)

Weatherization Assistance Program Assistance Center (WAPTAC)

Weatherization Program Notice (WPN)

Supplemental Materials

Handouts & Resources

Code of Federal Regulations, Title 10 – Energy, Part 440 – Weatherization Assistance for Low-Income Persons (10 CFR 440). <http://www.waptac.org/Rules-and-Regulations/Federal-Regulations.aspx>.

Code of Federal Regulations, Title 10 – Energy, Part 440 – Weatherization Assistance for Low-Income Persons (10 CFR 440), *Appendix A*. <http://www.waptac.org/Rules-and-Regulations/Federal-Regulations.aspx>.

"Consumer Education Series: Lighting 101." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Purpose of Monitoring and Inspecting Pre-Training Quiz and Key.

Purpose of Monitoring and Inspecting Quiz.

Purpose of Monitoring and Inspecting Quiz Answer Key.

U.S. Department of Energy. Weatherization Assistance Program. *WPN 11-6 Weatherization Health and Safety Guidance.* Jan. 12, 2011. <www.waptac.org>.

U.S. Department of Energy. Weatherization Assistance Program. *WPN 12-1 Program Year 2012 Weatherization Grant Guidance.* January 31, 2012. <www.waptac.org>.

Weatherization Assistance Program Monitoring Plan.

Class Overview

- Begin the training session by asking if anyone is a monitor or inspector or if they are training to become one.
- Conduct a question and answer session prior to beginning the PowerPoint presentation to assess what the class already knows about the purpose of monitoring, and then focus the lesson to fill the knowledge gaps.
- Start the PowerPoint presentation by emphasizing the learning objectives of this training. For each section of the presentation (technical performance, accountability, and consistency):
  - Read the definition.
  - Solicit initial thoughts about each section from the group and write them on the board.
  - Show the slides for each sub-section, noting the examples listed on the slides.
  - If you have a live Internet connection, go to the website http://waptac.org/ and open the tab on rules and regulations. Project the pages related to 10 CFR 440, Appendix A, Weatherization Program Notices (WPNs) listed in the resources above. These may be available as hard copies for students, but these days it's probably more important to have someone know how to be able to find these resources as they need them rather than reading them from cover to cover in class. Point to some of the salient features of each rule and regulation as you browse the WAPTAC website.

- At the conclusion of the session, review the quiz from the beginning to show trainees how much they learned.

Section 5: Desk Monitoring

Learning Objectives

By attending this session, participants will be able to:

- Identify applicable DOE regulations.
- Discuss basic fiscal requirements about procurement.
- Establish a paper trail from purchase order to final inspection.
- Interpret an agency's typical file structure.
- Identify anomalies to know what to flag for on-site visits.
- Practice completing typical file review forms.

Key Terminology

Title 10 CFR 440

Title 10 CFR 600

Community action agency (CAA)

Desk monitoring

Lead-safe weatherization (LSW)

On-site monitoring

Supplemental Materials

Handouts & Resources

Abridged, highlighted 10 CFR 440 handout.

Blank file review forms.

Desk Monitoring Quiz.

Desk Monitoring Quiz Answer Key.

Sample client file(s).

Classroom Props & Activities

Exercise – Sample File Review

Distribute the sample client files and the file review form. Have students review files and fill in the forms. Do everyone's answers match? What is missing? Lead a discussion about what works and what doesn't work in those client files.

Class Overview

- Field staff members can grow restless in a lecture setting. Make the class as interactive as possible by encouraging trainees to share relevant "war stories" during the presentation. Expand on any stories that offer an opportunity to illustrate how file review discoveries led to improvements (e.g., more training, better recordkeeping). Note the question and answer prompts italicized in the speaker's notes, and use them to keep the class lively and interesting.
- While projecting the slide entitled "10 CFR 440," distribute the abridged, highlighted 10 CFR 440 handout.

Section 6: Inspector's Toolbox

Learning Objectives

By attending this session, participants will be able to:

- **Identify the necessary inspection tools, equipment, and their use.**
- **Explain the purpose of various tools used by inspectors.**
- **Discuss the importance of following manufacturer's recommendations for care and maintenance of tools and equipment.**

Key Terminology

Blower door

Borescope

British thermal unit (BTU)

Calibration

Carbon monoxide (CO)

Combustion appliance zone (CAZ)

Dry bulb

Infrared (IR) imaging

Knob and tube wiring

Manometer

Pascal (Pa)	Subcooling
Pressure pan	Superheat
Psychrometer	Watt meter
Relative humidity (RH)	Wet bulb
Savings-to-investment ratio (SIR)	Zonal pressure diagnostics (ZPD)

Supplemental Materials

Handouts & Resources

CO Hot Pot: Instructions for making and using a CO Hot Pot: <www.karg.com/cohotpot.htm>.

Collins, Maureen. "IR – Worth a Thousand Words." Home Energy Sept./Oct. 2008. <www.homeenergy.org>.

Equipment Calibration Schedule.

Inspector's Toolbox Quiz.

Inspector's Toolbox Quiz Answer Key.

Snell, John. "Breakthroughs in Infrared Cameras." Home Energy Jan./Feb. 2006. <www.homeenergy.org>.

Snell, John. "Infrared Thermography: (Nearly) A Daily Tool." Home Energy Mar./Apr. 2008. <www.homeenergy.org>.

U.S. Department of Energy. Seattle Regional Office and Energy Out West. "Measuring and Evaluating System Airflow." ***Energy Out West Weatherization Field Guide*****. 2005. Saturn 2009. <www.azcommerce.com>**

Maintenance, Testing, and Calibration Instructions

Bacharach, Inc. "Instrument Maintenance." <www.bacharach-training.com/InstrumentMaint/instrumentmaintenance.htm>.

The Energy Conservatory. "Operation and Maintenance Tips for Energy Conservatory Test Instruments" (Oct. 2004).

The Energy Conservatory. "Procedure for Field Calibration Check of Digital Pressure Gauges" (January 2007).

Whole House Weatherization Equipment List.

Classroom Props & Activities

- Blower door with manometer
- Pressure pan
- Digital thermometer
- Duct blaster
- Exhaust fan flow meter and/or flow hood
- Telescoping ladder
- Borescope
- Infrared imager
- Selection of various types of moisture meters
- Smoke generator (e.g., Wizard Stick)
- Combustion analyzer
- Gas leak detector
- Electrical circuit tester and voltage detector
- Watt meter
- Sling psychrometer
- Moisture meter
- Other equipment where applicable

Classroom Activity: Demonstrate the use of as many test instruments as possible. Pass instruments around so students can handle and use them. If feasible, set up a blower door in the classroom and get CFM_{50}. Show smoke. Run the infrared camera and blower door together to demonstrate how the blower door affects the IR pattern. If you have the technical capacity, show a real-time IR scan of the classroom on screen. Offer possible explanations of what is seen with methods to resolve any questionable interpretations.

Have an interactive session towards the end of the presentation to allow students the opportunity to talk about specialized tools or equipment they have discovered or developed.

Class Overview

- Remind students that the "high-tech" tools like instant-print-out combustion analyzers and infrared cameras are only as good as the inspector interpreting the data. The inspector's toolbox helps the inspector accurately measure existing conditions, which the auditor must then evaluate for cost-effective improvements.
- Discuss the various pieces of equipment that make performing effective inspections a safe and rewarding job. Stress the benefits of having the right tools for the job and of keeping tools well organized to prevent loss and damage.
- Stress the importance of adhering to a maintenance schedule for equipment as recommended by the manufacturer.

- Encourage feedback throughout the presentation.

Section 7: Building Assessment

Learning Objectives

By attending this session, participants will be able to:

- Explain the concepts of the air barrier and thermal boundary.
- Recognize whether appropriate energy-saving measures were installed.
- Determine whether there were missed opportunities for energy saving measures.
- Evaluate whether energy-related repairs and health and safety measures were justified.
- Judge whether installed measures meet weatherization program specifications and standards for quality workmanship.

Key Terminology

Action levels
Air barrier
Balloon framing
Band joist
Base load
Cantilever
Carbon monoxide (CO)
Combustion appliance zone (CAZ)
Compact fluorescent light (CFL)
Condensation
Conductive heat loss
Cubic feet per minute (CFM)
Decommission
Dense-pack insulation
Dropped soffit
Health and safety (H&S)
Indoor air quality (IAQ)
Infrared (IR)
Infrared imaging
Infrared thermography
International Residential Code (IRC)
Knee wall
Knob and tube wiring
Loose-fill insulation
Manual J
Mud sill

National Electrical Code (NEC)

National Fire Protection Association (NFPA)

Net free area (NFA)

Parts per million (ppm)

Pascals (Pa)

Pull-down staircase

R-value

Savings-to-investment ratio (SIR)

Shading coefficient (SC)

Solar absorption

Solar exposure

Solar film

Solar gain

Solar reflectance

Thermal boundary

Tuck-under garage

U-factor

Vapor retarder

Vent

Vermiculite

Weatherization Program Notice (WPN)

Window film

With reference to (WRT)

Zonal pressure diagnostics (ZPD)

Supplemental Materials

Handouts & Resources

Armanda, Larry. “Ventilation Strategies in Weatherization.” *WTC Technical Update* 1.8 (2006). Weatherization Training Center at Pennsylvania College of Technology. <www.pct.edu>.

Attic Air Sealing Video.

Attic Insulation Certificate.

Beers, Jonathan. “Dryer Venting.” *Home Energy* Nov./Dec. 2003: 14-16.

“Blower Door Basics: Part 1 - Prep and Setup.” WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

“Blower Door Basics: Part 2 - The Test Process.” WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

“Blower Door Basics: Part 3 - The Breakdown.” WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Bohac, David. “Zone Pressure Diagnostics.” *Home Energy* May/June 2002: 32-37. <www.homeenergy.org>.

"Boiler Basics: Part 1 - Combustion Air and Drafting." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Boiler Basics: Part 2 - Clean, Test, and Tune." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Boiler Basics: Part 3 - External Components." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Boles, Bill. "Missteps with Mold." *Home Energy* 19 June 2006. <www.homeenergy.org>.

Building Assessment Quiz.

Building Assessment Quiz Answer Key.

CO Probe Locations Illustration.

Fisette, Paul. "Q&A: Causes of Attic Mold." Journal of Light Construction Nov. 2004. <www.jlconline.com>.

Fisette, Paul. "Q&A: Roof Venting in a Wet Climate." Journal of Light Construction Feb. 2011. <www.jlconline.com>.

Florida Solar Energy Center. "Window Orientation and Shading." 2007. <www.fsec.ucf.edu>.

"Gas Furnace Basics: Part 1 - Initial Assessment." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Gas Furnace Basics: Part 2 - Testing the Unit." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Gas Furnace Basics: Part 3 - Troubleshooting High CO." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Gas Furnace Basics: Part 4 - Cleaning and Final Assessment." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Health and Safety Series: Getting Started." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Health and Safety Series: Mold and Moisture." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Heating Basics: A Tour of 9 Systems." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Indiana Community Action Association. INCAP Daily Safety Test-Out Procedure Summary Sheet <www.incap.org>.

La Rue, Jim. "A Conditioned Crawlspace Checklist." *Home Energy* May/June 2004: 24-26. <www.homeenergy.org.>

Moore, Alex. “Loose-Fill Insulation Coverage Chart.”

National Fire Protection Agency. “Combustion Clearance Tables.” <www.nfpa.org>.

Quality Control Checklist handout.

Quality Control Inspector Pilot Exam Certification Scheme Handbook. BPI/NREL Certifications. BPI, Inc. April 4, 2012. <www.bpi.org>

Refrigerator Info Toolkit.

Sample Quality Assurance Form.

Sample Technical Field Rating Sheet.

Sterner, Tamasin. “Cooling Measures.” In *Winter Relief Assistance Program Standards*. Pennsylvania Power & Light. 2007.

Turk, Brad. “Crawlspaces, Considering the Options.” *Home Energy* May/June 2004: 30-33. <www.homeenergy.org>.

U.S. Department of Energy. Energy Efficiency and Renewable Energy. “Combustion Equipment Fact Sheet.” Oct. 2000.

U.S. Department of Energy. Hot Climate Initiative. *Air Sealing.*

U.S. Department of Energy. Hot Climate Initiative. *Combustion Appliance Safety & Efficiency Testing.*

U.S. Department of Energy. Hot Climate Initiative. *Dense-pack Sidewall Insulation.*

U.S. Department of Energy. Weatherization Assistance Program. “WPN 11-6 Health & Safety Guidance.” 12 Jan 2011 <www.waptac.org>.

U.S. Department of Labor. Occupational Safety and Health Administration. “Mold Fact Sheet.” 2005. <www.osha.gov>.

Van der Meer, Bill. “Air Leakage in Recessed Lighting.” *Builder Brief* (BB0502). Undated. Pennsylvania Housing Research Center, Penn State University. <www.engr.psu.edu>.

Van der Meer, Bill. “Air Sealing with Two Part Foam.” *WTC Technical Update* 1.4 (2003). Weatherization Training Center at Pennsylvania College of Technology. <www.pct.edu>.

Van der Meer, Bill. “Avoiding Moisture Problems.” *WTC Technical Update* 1.1 (Feb. 2003). Weatherization Training Center at Pennsylvania College of Technology. <www.pct.edu>.

Water Heater Info Toolkit.

Weatherization Assistance Program Standardized Curriculum. “Blower Door Basics.” Oct. 2011. PowerPoint presentation.

Online Platform Lessons

Use these online interactive training modules as prerequisites before students attend the course or as in-class computer lab sessions. Users must first create an account at www.nterlearning.org to access the lesson.

a- 2.0 Visual Assessment https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.1 Exterior Walkaround https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.2 Interior Walkaround https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.3 Attic Assessment https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.4 Basement/Crawl Space Assessment https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.5 Furnace Inspection https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.6 Water Heater Inspection https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.7 Building Measurements https://www.nterlearning.org/web/guest/course-details?cid=248

a- 2.8 Gas Leak Detection https://www.nterlearning.org/web/guest/course-details?cid=248

a- 4.1 Combustion Safety Testing - Gas Range https://www.nterlearning.org/web/guest/course-details?cid=248

a- 5.1 Evaluating Attic Insulation https://www.nterlearning.org/web/guest/course-details?cid=248

a- 7.1 Target Air Leakage Reductions https://www.nterlearning.org/web/guest/course-details?cid=248

a- 7.2 Room Pressure Tests, Thermal Boundary and Add-a-Hole ZPD Case Study https://www.nterlearning.org/web/guest/course-details?cid=248

a- 8.3 Mechanical Ventilation https://www.nterlearning.org/web/guest/course-details?cid=248

a- 9.1 Measuring Duct Leakage with a Blower Door https://www.nterlearning.org/web/guest/course-details?cid=248

a- 9.2 Pressure Pan Testing https://www.nterlearning.org/web/guest/course-details?cid=248

Final Inspector

a- 9.3 Dominant Duct Leakage https://www.nterlearning.org/web/guest/course-details?cid=248

a- 9.4 Duct-Blower Leak Testing https://www.nterlearning.org/web/guest/course-details?cid=248

a- 9.5 Duct Induced Room Pressure Imbalance
https://www.nterlearning.org/web/guest/course-details?cid=248

c- 4.1 Daily CAZ Testing https://www.nterlearning.org/web/guest/course-details?cid=247

c- 4.2 Combustion Safety Testing: Water Heater and Furnace/Boiler
https://www.nterlearning.org/web/guest/course-details?cid=247

c- 10.1 Identifying Heating Equipment https://www.nterlearning.org/web/guest/course-details?cid=247

c- 10.2 Identifying Hot Water Systems https://www.nterlearning.org/web/guest/course-details?cid=247

c- 10.3 Identifying Combustion Exhaust
https://www.nterlearning.org/web/guest/course-details?cid=247

c- 10.4 Identifying Cooling Equipment https://www.nterlearning.org/web/guest/course-details?cid=247

i- 3.4 Building Envelope, Thermal Envelope, Pressure Boundary & Conditioned Space
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 3.7 Building Variations (Animated Glossary)
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.0t Blower Door Basics https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.1.1 Setting up a Blower Door Part 1
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.1.2 Setting up a Blower Door Part 2
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.1.3 Setting up a Blower Door Part 3
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.2 Preparing for a Blower Door Test
https://www.nterlearning.org/web/guest/course-details?cid=249

i- 7.3 Blower Door Test Procedures
https://www.nterlearning.org/web/guest/course-details?cid=249

Final Inspector

i- 7.4 Interpreting CFM50 Readings
https://www.nterlearning.org/web/guest/course-details?cid=249

Relevant Standard Work Specifications

1.105.1 - Combustion Worker Safety
1.110.1 - Material Selection, Labeling, and Material Safety Data Sheets (MSDSs)
1.200 - Combustion Safety Testing
1.300 - Safety Devices
1.401.1 - Air Sealing Moisture Precautions
1.402.1 - Crawl Spaces - Drainage
1.403 - Vapor Barriers
1.500 - Radon
1.600 - Electrical
1.700 - Occupant Education & Access
1.702 - Installed Equipment
3.000 - Air Sealing
4.000 - Insulation
5.000 - Heating and Cooling
6.000 - Ventilation
7.8001.1 - Refrigerator and Freezer Replacement
7.8003.1 - Lighting Upgrade
7.8101.1 - Shower Head and Faucet Aerator
7.8102 - Installation and Replacement
7.8103 - Maintenance Inspection

Classroom Props & Activities
Sample Site Monitoring Quality Assurance Form

- Acquaint students with the quality assurance (QA) form they will be using during a planned field trip.
- Focus on the information being requested.
- Tell students that filling in the blanks in order is usually most efficient.
- Instruct students to fill the appropriate check box or blank. (If it's filled in, you know you've evaluated it!) Empty spaces indicate further searching is needed. If a field is not applicable, write 'N/A.'
- Use the notes sections to provide more detail on what was done, or not done, in the home.
- The completed form should accurately reflect what was done to the home.

Remember: A completed QA form should be able to stand on its own; that is, any reasonably competent person should be able to determine from the form what was done to the dwelling.

Hands-On Activities

Class Field Trip

Plan to take the class to a home that has been completed by a local weatherization agency. The purpose is to conduct a full quality assurance assessment. Work with the local agency to identify a homeowner who is willing to have an inspection performed by a group of students under the direction of a knowledgeable instructor.

The agency may not be able to provide you with detailed information from the client file such as client information, inventory records, or measure justification. It will, however, be likely to give you a summary of the measures installed. Focus attention on whether measures appear to have been installed according to specifications and that quality workmanship was employed. If the agency can provide the individual audit report or priority list and other measure-related documents from the client file, consider using it for the “Desk Monitoring” section of this curriculum.

The house should be a typical single-family home, ideally with an operating forced-air furnace, an attic, and a basement or crawl space. Other features, such as an attached garage or additions, are desirable. Visiting a completed mobile home would also be interesting.

Before the visit, spend about 45 minutes to an hour in the classroom reviewing the sample QA form to make sure everyone understands how to use it. Review the Field Guide for the QC Inspector field exam, pointing out the various diagnostic tests required by that job category. Use this as a checklist for the activities to perform at the home.

Plan to spend two to three hours in the home conducting a visual assessment and diagnostic tests. Provide students with QA forms, flashlights, measuring tapes, and clipboards with paper, pencils, and copies of the field guide list of tasks.

Plan to take digital pictures. Allow students to disperse into small groups and regroup periodically to assess their progress, discuss findings, and watch or take part in activities such as duct leakage testing, blower door testing, infrared scanning, or zonal pressure diagnostics. Students should discuss negative findings with the instructor only and away from clients entirely.

After the field visit, reassemble in the classroom and let the students share their observations. The instructor should facilitate a discussion of the relative importance of each

piece of data and how that data will ultimately fit into a fully documented QA assessment. Show the photos taken at the site to enhance the discussion of specific features observed at the home.

Divide the class into groups to reach consensus about major categories of weatherization measures, including heating system improvements, attic measures, and health and safety measures. Have each group designate one person to report its findings to the class. Allow 10 minutes per group for reporting, then discuss as a whole. To enhance the discussion, project digital images onto a screen showing weatherization details or special features of the home.

Class Overview

- Deliver the PowerPoint presentation. Focus on a systematic approach for performing inspections on homes and what inspectors should be looking for when conducting a building assessment.
- The PowerPoint presentation follows the sequence of categories on the sample QA form. These are associated with specific slides and are queued up in the speaker notes. Have students keep the QA form handy throughout the presentation.
- There are infinitely more possible scenarios that will manifest themselves in the field than those discussed in this presentation. Feel free to insert additional pictures and encourage students to share their experiences.
- Introduce students to the key elements of a complete QA building assessment, including:
    - Inspection protocol
    - Installed measures
    - Insulation levels
    - Selection of materials
    - Accounting for materials
    - Health and safety issues
- Use the presentation to introduce the concept of air barriers and thermal boundaries, reinforcing what's inside and what's outside the boundaries.

Section 8: Interpreting Infrared

Learning Objectives

Final Inspector

By attending this session, participants will be able to:

- Explain the benefits and limitations of infrared (IR) thermography.
- Interpret infrared images as they relate to weatherization opportunities.
- Demonstrate how to assess the quality of weatherization measure installation using IR images.
- Utilize IR imaging in conjunction with the blower door to track infiltration and guide air sealing activities.

Key Terminology

Infrared (IR) thermography

Supplemental Materials

Handouts & Resources

Collins, Maureen. “IR – Worth a Thousand Words.” *Home Energy* Sept./Oct. 2008. <www.homeenergy.org>.

Interpreting Infrared Quiz.

Interpreting Infrared Quiz Answer Key.

“IR Basics.” WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

Snell, John. “Breakthroughs in Infrared Cameras.” *Home Energy* Jan./Feb. 2006. <www.homeenergy.org>.

Snell, John. “Infrared Thermography: (Nearly) A Daily Tool.” *Home Energy* Mar./Apr. 2008. <www.homeenergy.org>.

Snell, John. “Infrared Thermography: What Works, What Doesn’t Work.” *Home Energy* May/Jun. 2010. <www.homeenergy.org>.

Classroom Props & Activities

Infrared camera set up with live feed to a monitor or projector.

Class Activity

Run an infrared camera and blower door together to demonstrate how the blower door affects the IR pattern on exterior walls and the ceiling of the classroom. Then allow as many students as possible to use the imagers.

Encourage students to work to adjust control settings, switch from black and white to color images, and offer interpretations about what they are seeing.

Dark streaks evident in the wall cavities or ceiling on a cold winter day (light streaks in summer) are indirect evidence of cool air circulating in those cavities. Offer possible explanations of what is seen along with offering guidance to resolve any erroneous interpretations.

Class Overview

- Students can grow restless in a lecture setting. Make the class as interactive as possible by encouraging students to share their experiences during the presentation. Note the question and answer prompts italicized in the speaker's notes of the PowerPoint presentation, and use them to keep the class lively and interesting.
- Demonstrate the use of as many IR imagers as possible. If technical capacity is present, show a real-time IR scan of the classroom on screen. Pass imagers around so students can handle and use them. If feasible, set up a blower door in the classroom and get CFM50. Show smoke and IR scans and how they reveal the air leakage.

Section 9: In-Progress Monitoring and Inspecting

Learning Objectives

By attending this session, participants will be able to:

- Explain the benefits of performing in-progress inspections and who performs them.
- Verify appropriate measures are being installed correctly.
- Describe the importance of ensuring safe work practices are being observed.
- Discuss the need to ensure equipment is up to date, inspected, and functioning properly.

Key Terminology

American Recovery and Reinvestment Act (ARRA)

Call-back

Grantee

Health and safety (H&S)

In-progress units

Final Inspector

Inspector

Lead-safe weatherization (LSW)

Material safety data sheet (MSDS)

Monitor

Occupational Safety and Health Administration (OSHA)

Personal protective equipment (PPE)

Subgrantee

Weatherization Program Notice (WPN)

Supplemental Materials

Handouts & Resources

"12 Steps to Lead Safety." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"A Look Inside a Wall: Dense Packing." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Accessing Stucco Walls for Dense Packing." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Additional Siding Removal." Weatherization Tech Exchange. Energy Center of Wisconsin. <www.ecw.org>.

"Behind the Walls." Weatherization Tech Exchange. Energy Center of Wisconsin. <www.ecw.org>.

Blowing Machine Checklist and Inspection Log.

"Consumer Education Series: Lighting 101." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Dense Packing Exterior Walls with Cellulose from the Interior." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Duct Sealing." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

"Health and Safety Series: Respirators and Personal Protective Equipment." WxTV. Montana Weatherization Training Center. <www.wxtvonline.org>.

In-Progress Monitoring and Inspecting Quiz.

In-Progress Monitoring and Inspecting Quiz Answer Key.

"Interior Drilling and Blowing." Weatherization Tech Exchange. Energy Center of Wisconsin. <http://www.ecw.org/wxdensepackinsulation>.

"Introduction and the Evaluation Process." Weatherization Tech Exchange. Energy Center of Wisconsin. <www.ecw.org>.

Krendl Machine Company. "Blower Maintenance Guide."

Quality Control Checklist handout.

Sterner, A. Tamasin. “On-the-Job Mentoring.” *Home Energy* Sept./Oct. 2009. <www.homeenergy.org>.

Thomson, Jeff, Bob Pfeiffer, Suzanne Harmelink, and Martha Benewicz. “Pressure Testing Insulation Blower and Hoses.” WI Weatherization Program (Dec. 1999).

U.S. Department of Energy. Hot Climate Initiative. Air Sealing.

U.S. Department of Energy. Hot Climate Initiative. Combustion Appliance Safety & Efficiency Testing.

U.S. Department of Energy. Hot Climate Initiative. Dense-pack Sidewall Insulation.Bacharach, Inc. “Instrument Maintenance.” <www.bacharachtraining.com>.

U.S. Department of Energy. Weatherization Assistance Program. “WPN 10-1. Program Year 2010 Weatherization Grant Guidance.” December 18, 2009. <www.waptac.org>.

The Energy Conservatory. “Procedure for Field Calibration Check of Digital Pressure Gauges” (January 2007).

The Energy Conservatory. “Operation and Maintenance Tips for Energy Conservatory Test Instruments” (Oct. 2004).

Online Platform Lessons

Use these online interactive training modules as prerequisites before students attend the course or as in-class computer lab sessions. Students must first create an account at www.nterlearning.org to access the lesson.

i- 7.5 Blower Door Guided Air Sealing https://www.nterlearning.org/web/guest/course-details?cid=249

Relevant Standard Work Specifications

1.000 - Health & Safety
1.200 - Combustion Safety Testing
1.401.1 - Air Sealing Moisture Precautions
1.402.1 - Crawl Spaces - Drainage
1.700 - Occupant Education & Access
3.000 - Air Sealing

Class Overview

- Begin the training session by asking students if they have conducted in-progress monitoring or inspection. If yes, ask those students to provide a brief overview of their experiences to the group.
- Ask why students think in-progress inspections are important and record the answers. As the slides reveal benefits of in-progress monitoring, check them off the list.
- Consider using props (e.g., blower door apparatus, insulation blower machine, pressure pan, gas leak detector, combustion appliance zone equipment) to conduct hands-on testing. The trainer can show students how to make sure the equipment is functioning properly and in accordance with WAP best practice specifications. (Note: If this is done in the Inspector's Toolbox section of the class, there is no need to repeat.)
- If possible, make props that have been "rigged" with problems. Try to vary the problems to prevent word spreading through the class about how to identify them. Students should identify the problems with each piece of equipment (e.g., insulation blower does not have enough pressure, blower door hose has slices in it, carbon monoxide draft analyzer is out of calibration). Ask students to examine each prop and take notes. Following this exercise, have students discuss their findings as a class.

Section 10: Report Writing

Learning Objectives

By attending this session, participants will be able to:

- Discuss the purpose of various reports.
- Describe the kinds of information to include in specific reports.
- Identify tips for writing a clear, concise, and useful report.
- Recognize and address patterns and trends.
- Explain how the tone of a report can affect worker morale and motivation.

Key Terminology

Call-back	Cubic feet per minute (CFM)
Community action agency (CAA)	DOE project officer (DOE PO)

Grantee
House as a system
Indoor air quality (IAQ)
Inspector
Monitor
Priority list
R-value
Savings-to-investment ratio (SIR)
Subgrantee
Technical field monitor
Training and technical assistance (T&TA)

Supplemental Materials

Handouts & Resources

Handout #1 – Pictures of attic hatches and Report A & Report B

Handout #2 – Pictures of whole-house fan covers

Handout #3 – Sample Report: Site Visits

Handout #4 – Sample Report Summary: Technical Evaluation

Report Writing Quiz.

Report Writing Quiz Answer Key.

Sample audit input report and recommended measures report.

Sample audit home diagram.

Sample monitoring reports 1 and 2.

Classroom Props & Activities

Exercise #1

Distribute Handout #1. Give students five minutes to read the reports. Note that both reports present the same information. Ask the following questions, recording class responses on a flip chart, whiteboard, or overhead:

Q: Which report will generate a more positive response?

A: Report B.

Q: Why?

A: It emphasizes positive statements throughout, provides clear instructions about what needs to be done and why, discusses things done right, and doesn't make derogatory remarks about the crew.

Q: Which statement in Report A has absolutely no place in a report of this type?

A: "It is apparent that the time spent to date trying to train these incompetents in weatherization technology has been totally wasted."

Discuss why.

If time allows, ask students to describe reports written about their work. As a class, discuss what the author did right and what they might have done better to elicit a more positive response from the recipient in each instance.

Exercise #2
Distribute Handout #2. Allow students 10 minutes to list good and not-so-good points about each pictured treatment, recommend training by position, and suggest training methods.

Whole house fan cover I:

- Good: Effective, inexpensive.
- Not so good: Not durable, one-time use only, appearance is unacceptable.
- Needed training: Auditor and crew chief need to be trained that installed measures must be durable (poly is not) and reusable (duct tape is one time use only) and must match the quality of the home. The installer needs training on using appropriate materials.

Whole house fan cover II:

- Good: Effective, inexpensive, fairly durable.
- Not so good: Duct tape will have to be replaced every time it is removed. The inconvenience will discourage reuse. The appearance is poor.

- Needed training: Auditor and crew chief need to be trained that installed measures intended for seasonal use must be reusable and must match the quality of the home. Installer needs training on using appropriate materials.

Whole house fan cover III:

- Good: Effective, relatively inexpensive, durable, convenient to remove and replace.
- Not so good: Appearance could be an issue in some homes. The auditor should clear the appearance with the homeowner.
- Needed training: Auditor may need training on choosing cosmetically acceptable measures.

Suggested training methods:

- Discuss training needs at periodic field staff meetings.
- Peer-to-peer training – Have the installers from Scenario III demonstrate methods to the installers from Scenarios I and II.

Exercise #3
Distribute Handout #3. Allow students 30 minutes to review the report, draft a summary of patterns and trends, and recommend necessary training by position. Keep a running list of patterns and trends on a flipchart, whiteboard, or overhead as students report their findings. Complete the outline and create a composite report and a training list as a group.

Trend:

- Underuse of infrared

Patterns:

- Dense-pack cellulose density not achieved
- Lack of attic air sealing
- Lack of attic duct sealing
- Building envelope poorly defined at furnace closets

Distribute Handout #4. Allow students five minutes to review it. As a group, discuss any differences between this report summary and the training list the class created based on Handout #3.

Hands-On Props & Activities

Site Inspection
Work with a local agency to bring students to a nearby completed or in-progress weatherized unit for a final inspection. Have half the students document the visit as a final inspection and the other half develop what they would include in a monitoring report. Is there a need for reworks? Are there any recommendations for follow-up training for the crew or auditor?
Are both groups in agreement? Have the students discuss the differences in how they approached their report writing.

If a site inspection is not possible, this exercise can be done using a video of an audit or final inspection, if one is available.

Note: If you were able to conduct a field-trip to practice hands-on building assessment as part of that lesson, use that home as the basis for students to draft reports.

Class Overview

If possible, provide sample reports before the training session, so trainees can review them prior to attending.

Review each report during or immediately following the appropriate section of the PowerPoint presentation. Lead discussions about:

- Good aspects of the report (i.e., content, format, style, language, diagrams, etc.).
- Bad aspects of the report (i.e., content, format, style, language, diagrams, etc.).
- What could have been added to the report?
- What might have been omitted from the report?