# Auditor’s Toolbox

# Weatherization Energy Auditor Single Family

Learning Objectives

By attending this session, participants will be able to:

* Identify the necessary auditing tools, equipment, and their use.
* Explain the purpose of various tools used by auditors.
* 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)

Infrared (IR) imager

Knob and tube wiring

Manometer

Pascal (Pa)

Pressure pan

Psychrometer

Relative humidity (RH)

Savings-to-investment ratio (SIR)

Watt meter

Zonal pressure diagnostics (ZPD)

**Supplemental Materials**

Handouts & Resources

Auditor Tool and Equipment List.

Auditor’s Toolbox Quiz.

Auditor’s Toolbox Quiz Answer Key.

Bacharach, Inc. “Instruction Manual (for applicable tool)” <http://www.mybacharach.com/technical-information.htm>.

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 EnergySept./Oct. 2008. <www.homeenergy.org>.

Equipment Calibration Schedule.

Shadish, Bill. “Give a Hand to Audits.” Home EnergyMay/June 2008. <www.homeenergy.org>.

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

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

Steiner, Cal. “Moisture, Leaks, and Pressures in Mobile Homes.” Home Energy 2 Mar. 2006. <www.homeenergy.org>.

The Energy Conservatory. “Minneapolis Duct Blaster Operation Manual (Series B Systems).” The Energy Conservatory. <www.energyconservatory.org>.

The Energy Conservatory. “Procedure for Field Calibration Check of Digital Pressure Gauges.” The Energy Conservatory. Jan. 2007. <www.energyconservatory.org>.

The Energy Conservatory. "Operation and Maintenance Tips for Energy Conservatory Test Instruments." The Energy Conservatory. Oct. 2004. <www.energyconservatory.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. “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).

Other Handouts (located in resource folder)

* Auditor Tool and Equipment List
* Equipment Calibration Schedule

Classroom Props & Activities

* Blower door with manometer
* Pressure pan
* Duct blaster
* Exhaust fan flow meter and/or flow hood
* Telescoping ladder
* Bore scope
* 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
* 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 CFM50. 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 auditor interpreting the data. The auditor’s toolbox helps the auditor accurately measure existing conditions, which the auditor must then evaluate for cost-effective improvements.
* Discuss the various pieces of equipment that make performing effective energy audits 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.