

Blower Door Basics

Train the Trainer

Learning Objectives

By attending this session, participants will:

- Name and understand the natural driving forces that cause pressure differences.
- Understand units of pressure and the measurement of air leakage.
- Be able to set up and operate a blower door to measure air leakage and conduct zonal pressure diagnostics.
- Understand the meaning and importance of minimum ventilation requirements (MVR).
- Be able to convert blower door readings to the total size of opening in square inches, and to cubic feet per minute (CFM) of air leakage under natural conditions.
- Understand the relationship between CFM_{50} , $CFM_{natural}$, and air changes per hour (ACH).

Key Terminology

Air Changes per Hour (ACH)

Building Tightness Limit (BTL)

Can't Reach Fifty (CRF)

Cubic Feet per Minute (CFM)

CFM_{50}

$CFM_{natural}$

Low-flow rings

Manometer

Minimum Ventilation Requirement (MVR)

N-factor

Pascals (Pa)

Stack effect

Wind effect

Winter mode

With Reference To (WRT)

Worst-case draft Combustion Appliance Zone (CAZ) testing

Supplemental Materials

Handouts & Resources

Area and Volume Calculation Worksheet

ASHRAE 62.1 worksheet

ASHRAE 62.2 checklist

Blower Door Target table

Bohac, David. "Zone Pressure Diagnostics." *Home Energy* May/June 2002. www.homeenergy.org.

Building Tightness Limits "Quick Sheet"

Manometer setup sheet

Anderson, Abba. "The History of the Blower Door." *Home Energy* Nov./Dec. 1995.
www.homeenergy.org.

Fitzgerald, Jim, Robert Nevitt, and Michael Blasnick. "User-Friendly Pressure Diagnostics." *Home Energy* Sept./Oct. 1994. www.homeenergy.org

Classroom Props & Activities

House of Pressure or Tell-Tale House – Use the house with the "blower door" running to illustrate how pressure varies from room to room within the house based on leaks and forced air systems.

ACH Demonstration

Materials – Two 2-liter bottles full of tap water, two different sizes of cups, somewhere to dump water.

Explain ACH and how it takes house size into account. Use the 2-liter bottles of water to represent how much air leaks through a house in one day. The different sized cups represent different sized homes. Pour water into the smaller cup, then dump it out. Continue until one bottle is empty. Have students keep track of how many "air changes" the "small house" experiences, then compare with the "large house" in the same way.

Hands-on Props

Blower door – Break students into teams of two to set up blower door and conduct zonal pressure diagnostics. Use any available space, including wall cavities, as applicable.

Class Overview

- Find out what level of experience students have with blower doors and teach to their level. Use the presentation as a framework for building an understanding in students of what is being measured with the blower door diagnostics and how that drives weatherization measures.
- Introduce air-sealing targets and minimum ventilation requirements. Begin by working through simple area calculations to refresh students' basic math skills. Use examples and worksheets to teach how ACH relates to building size and MVR. Distribute the applicable ASHRAE worksheet and work through sample problems as a class.
- Demonstrate blower door setup.
- Break up into groups of two and have students set up blower door and conduct zonal pressure diagnostics. Repeat key concepts like ACH, MVR, and air-sealing targets during this exercise, building on the concepts introduced during the presentation.