# Identifying & Air Sealing the Building Envelope

# Weatherization Installer/Technician Fundamentals

Learning Objectives

By attending this session, participants will be able to:

* Differentiate between the thermal and pressure boundaries and describe the behavior and function of each.
* Summarize the basic principles of air leakage.
* Identify the proper location of the pressure and thermal boundaries.
* Identify common sites and signals of breaks in the pressure and thermal boundaries.
* Identify common air sealing materials and their characteristics.
* Explain what is meant by “inside” and “outside” in terms of an air barrier and how a blower door is used to determine that.
* Identify typical construction details that lead to gaps in pressure and thermal boundaries and know how to treat them.
* Describe treatment options for walk-up attics.

Key Terminology

Air barrier

Backdrafting

Carbon monoxide (CO)

Indoor air quality (IAQ)

Manual J

Pressure boundary

R-value

Thermal boundary

Thermal envelope

Zonal pressure diagnostics (ZPD)

Supplemental Materials

Handouts & Resources

Air Seal and Insulation Diagram Knee-Wall House.

Attic Air Sealing Prop Guide.

Christian, Jeffrey, and Jan Kosny. “Wall R-Values That Tell it Like it Is.” *Home Energy* Mar./Apr. 1997. <www.homeenergy.org>.

Lugano, Fred. “First Step in Cellulose Sealing: Spot the Style.” *Home Energy* May/June 1998. <www.homeenergy.org>.

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

U.S. Environmental Protection Agency. ENERGY STAR. “Do-It-Yourself Guide to Sealing and Insulating.” 6 Aug. 2009. <www.energystar.gov>.

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

On-line Platform Lessons

Use these on-line 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](http://www.nterlearning.org) to access.

i- 6.2 Air Sealing Basements and Crawl Spaces <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 6.3 Air Sealing for Separation: Garage, Porches, Between Occupancies <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.1.1 Setting Up a Blower Door Part 1 <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.1.2 Setting Up a Blower Door Part 2 <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.1.3 Setting Up a Blower Door Part 3 <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.2 Preparing for a Blower Door Test <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.3 Running a Blower Door Test v1 <https://www.nterlearning.org/web/guest/course-details?cid=2005>

i- 7.4 Interpreting CFM50 Readings <https://www.nterlearning.org/web/guest/course-details?cid=2005>

Relevant Standards Work Specifications

1.103 – Air Sealing – Safe Work Practices

3.1000 – Attics (All details within this topic)

3.1400 – Basements and Crawl Spaces (All details within this topic)

3.1500 – Attached Garages (All details within this topic)

**Classroom Props & Activities**

Various types of insulation with R-value indicated, such as:

* Loose-fill fiberglass
  + Cellulose
  + Rigid foam
  + Batts (faced and unfaced)

Air sealing equipment:

* + Spray foam
  + Weather stripping
  + Caulk (various kinds)
  + Cardboard or similar material
  + Aluminum coil stock
  + Attic hatch sealing kits

**Hands-On Props**

**Attic air sealing prop**

Break students into teams of two to four, depending on the size of the prop. Have them create a continuous air barrier using appropriate air sealing materials. The Attic Air Sealing Prop Guide can be used to guide this activity.

Class Overview

* Use the presentation to introduce the concept of air and thermal boundaries. Pass around or name various materials; ask if they are pressure barriers, thermal barriers, or both. Compare the two concepts to a windbreaker and sweater. A person out on a cool, windy day will be chilled in a sweater because there is no air barrier to stop the wind from carrying heat away.
* Demonstrate pressure diagnostics to reiterate the concept of “inside” and “outside” as they relate to thermal and air boundary locations.
* Using air sealing props, break students into groups and have them air seal the prop. Point out that air sealing should result in a continuous air barrier in full contact with the thermal barrier.
* Discuss various housing styles and the common trouble spots for alignment of the pressure and thermal boundaries. Encourage students to use problem-solving skills to determine how they would treat various trouble spots.