

# Building as a System

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## Mechanical Systems - Multifamily

### Learning Objectives

By attending this session, participants will:

- Be introduced to the concept of a building as a system.
- Understand the location and function of the building envelope.
- Be able to identify common sources of building heat loss and gain.
- Learn some common energy hogs in multifamily buildings.

### Key Terminology

Conduction

Domestic Hot Water (DHW)

Infiltration

Make-up air

Stack effect

Thermal boundary

### Supplemental Materials

#### Handouts & Resources

Airseal and Insulation Diagram Knee Wall House.

Christian, Jeffrey, and Jan Kosny. "Wall R-Values that Tell It Like It Is." *Home Energy* Mar./Apr. 1997. [www.homeenergy.org](http://www.homeenergy.org).

DOE. Hot Climate Initiative. *Air Sealing*.

ENERGY STAR. *Do-It-Yourself Guide to Sealing and Insulating*. 6 Aug. 2009. [www.energystar.gov/index.cfm?c=diy.diy\\_index](http://www.energystar.gov/index.cfm?c=diy.diy_index).

Grandma's House video.

Piper, James. "Building Envelopes: Component Inspections and Replacement." *Facilities.net*. Sept. 2010. [www.facilitiesnet.com/windowsexteriorwalls/article/Building-Envelopes-Minimize-Air-Water-Leaks--11997](http://www.facilitiesnet.com/windowsexteriorwalls/article/Building-Envelopes-Minimize-Air-Water-Leaks--11997)

Van der Meer, Bill. "Air Sealing with Two-Part Foam." *The Weatherization Training Center Technical Update* 1. Oct. 2003.

### **Classroom Props & Activities**

**House of Pressure:** Use the House of Pressure to illustrate the interrelationships of home mechanical systems, air tightness, and connectivity to the basement or garage, especially as they relate to energy efficiency and IAQ issues.

### **Class Overview**

- Use the presentation and class discussion to teach students that each building is a system of interrelated components.
- Have students discuss the problems that can arise if:
  - A building with no exhaust fans or with kerosene space heaters is air sealed. (This leads to moisture issues.)
  - An older furnace is replaced with a 90+ direct vent appliance, orphaning the water heater. (This leads to 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.
  - Sealing ducts gets conditioned air where it belongs, reducing the need for space heaters in rooms far from the heating source.
  - Air sealing and insulating the attic prevent warm, moist air from escaping, reducing residents' heating bills, and preventing ice dams and the costly repairs associated with them.