Introduction to Heating System Sizing

Heating Systems for Energy Auditors and Inspectors

Learning Objectives

By attending this session, participants will gain an understanding of:

- The two main causes of heat loss in a dwelling: surface heat loss and air leakage heat loss.
- How to evaluate the heating system sizing calculations of system installers.
- The methods of heating system sizing used in *Manual J, Residential Load Calculation*.
- The disadvantages of oversizing a heating system.

Key Terminology

Air Changes per Hour (ACH)

Air Conditioning Contractors of America (ACCA)

Air leakage heat loss

British Thermal Unit (BTU)

British Thermal Units per Hour (BTUH)

Conduction

Convection

Cubic feet (ft3)

Cubic Feet per Minute (CFM)

Design Heat Load (DHL)

Exfiltration

Heat capacity of air

Infiltration

Internal gain

Lawrence Berkeley Laboratory (LBL) number

Manual J, Residential Load Calculation

National Energy Auditor Tool (NEAT)

N-factor

Pascal (Pa)

Radiation

R-value

Short cycling

Sizing multiplier

Solar gain

Surface heat loss

Thermal envelope

U-factor

Supplemental Materials

Handouts & Resources

Air Conditioning Contractors of America. *Manual J, Residential Load Calculation*. 7th ed. 1986.

Air-Conditioning, Heating, and Refrigeration Institute. *Directory of Certified Product Performance*. 2010. www.ahridirectory.org/ahriDirectory/pages/home.aspx.

Elite Software, "Jones Residence HVAC Load Calculations," Sample Design Heating Load Calculation Report, June 17, 2010, www.elitesoft.com.

Krigger, John T., and Chris Dorsi. *Residential Energy Cost Savings and Comfort for Existing Buildings*. 4th ed. New York: Saturn Resource Management, 2004, pp. 66-70, 274.

ORNL Building Envelopes Program Website: www.ornl.gov/sci/roofs+walls.

Wrightsoft, "Load Short Form: Entire House," Sample Heat Load Calculations, Nov. 24, 2010, www.wrightsoft.com.

Classroom Props & Activities

- Calculators.
- Paper.
- Pencils.

Calculations – Distribute calculators, paper, and pencils. Ask students to calculate heat loss based on the scenarios included in the presentation and hypothetical, locally relevant situations.

Class Overview

- Use the presentation, discussion, and handouts to introduce students to the key elements of heating system sizing.
- Discuss key terminology and make sure participants are familiar with the terms used in calculations, e.g., British thermal unit, ΔT, design heat load.
- Pause the presentation when you come to equations involving heat loss calculations and sizing requirements. Present examples as prompted in the speaker notes. Reinforce the math principles by copying the formula on a white board or flip chart. Use different values than those used in the speaker notes. Let the students solve equations on their own before you reveal the answers. Do the same for important concepts such as U-factor and R-value conversions, surface heat loss, air infiltration heat loss, volume measurements, and air leakage measurements.