LESSON

Air Sealing Method: Introduction to Insulation

BIG IDEA(S)

Air sealing and insulation aid in the control of air movement.

OBJECTIVES

Students will:

- Review their understanding of infiltration, exfiltration, and ventilation as a base for air sealing techniques
- Describe the main categories of air sealing materials and insulation
- Identify specific materials and insulation for specified criteria of air and heat leakage jobs
- Understand the health and safety hazards of air sealing and insulation materials and the PPE needed when using them

BRIGHT SOLAR FUTURES

WEATHERIZATION

TOPIC OF STUDY

Weatherization

90 MINUTES

TASK LIST SUBCATEGORY

804 Identify infiltration and exfiltration points

806 Understand weatherization task including air sealing and insulation

810 Use energy efficiency industry vocabulary

OVERVIEW

A healthy house has some infiltration and exfiltration of air, or "breathing." Too many air leaks can cause moisture and dust to enter. A house that is too tight will be humid and may have moisture problems. Weatherization requires the knowledge to diagnose what the leakage problems are and to choose the proper air sealing or insulation materials. Air sealing and insulation are often needed to stop air movement. It is also critical to understand the properties of all materials to employ proper PPE.

KEY TERMS

Thermal envelope: the part of the house that separates the "conditioned" from the "unconditioned" space.

Air barrier: parts of the exterior wall that resists air infiltration or exfiltration

Building cavities: empty space inside wall, floors, or ceilings and between the outside shell (bricks, sheathing, etc.) and the interior walls. Older houses usually have no insulation in this space.

Natural ventilation: no use of mechanical or electrical equipment e.g. opening a door or window

STANDARDS

PA/SDP

3.2.10.B3. Explain how heat energy will move from a higher temperature to a lower temperature until equilibrium is reached. Analyze the processes of convection, conduction, and radiation between objects or regions that are at different temperatures.

3.4.10.B2. Demonstrate how humans devise technologies to reduce the negative consequences of other technologies.

CC.3.5.9-10.A. Reading Specific Anchor (Key Ideas and Details): Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

NGSS

NGSS HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

INSTRUCTIONAL

TEXT/REFERENCES

Energy Conservation Handbook. pp. 28-31, 47-54

MATERIALS NEEDED

Content:

- Caulk gun ready for a sealing task; materials for demo seal
- One part expanding spray foam for a cross section showing a gap to be filled
- Other examples of materials available on display and places to use them (virtual presentation or on site walk-about)
- Opportunities for students to practice (optional)

Technology: Computer with internet access for viewing videos

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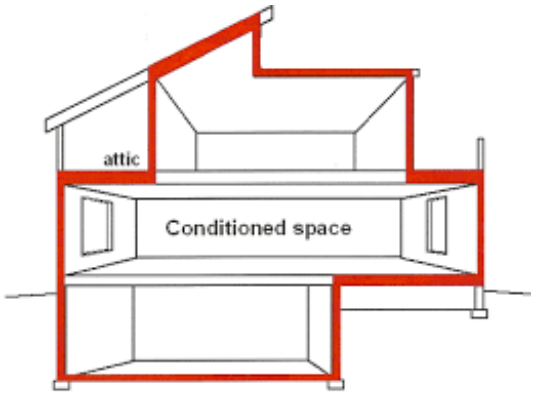
IMPLEMENTATION (LESSON PLAN)

1. Review: Air Barriers, Building Envelope

   Air within the envelope of a building is subject to air infiltration, exfiltration and the three modes of heat transfer: conduction, convection and radiation. Insulating materials address heat transfer through all three modes; however, the benefits can be lost, sometimes completely, if air infiltrates the envelope. Combined with other classes of insulation, such as spray foam, batt and rigid board insulation, air barriers can provide a solution—plus additional thermal performance (R-value) for homes and commercial buildings when installed facing an enclosed air cavity and/or air film.



2. View a short video that shows some of the ways homes can we weatherized as part of the WAP program. https://www.youtube.com/watch?v=-YHg0fK4XY4
3. Debrief
   a. *What locations were seen as the most important to weatherize?*
   b. *What materials were installed?*
4. Weatherization Materials (*Energy Conservation Handbook*, pp. 47-54). Review materials. Choose a few to demo that there is time for and the most commonly used. Use video to get an overview: https://www.youtube.com/watch?v=PYOhxK0yauE
   a. Introduce:
      i. The primary materials used in weatherization.
      ii. What they are used for
      iii. How to apply them
      iv. Safety considerations for each one

IMPLEMENTATION (LESSON PLAN) - CONTINUED

5. Sample Demo: Applying caulk. https://www.osha.gov/Publications/OSHA3514.html How many students have already used a caulk gun? What are some possible challenges. What safety precautions were taken or not taken. If live demo rather than video, break down in safety, prep, application, cleanup.
6. Introduce MSDS: Materials Safety Data Sheets for sample products that you will demonstrate and choose the appropriate PPE, in this case for caulking. Review with students. https://media.toolboxsupply.com/media/downloads/12658/10612180.pdf
7. Caulk (or other weatherproofing material) student hands-on: provide materials and PPE for students. Organize in groups of two or three. Each group debriefs when practice is completed.

RESOURCES/LINKS

Spray Foam Insulation

https://www.youtube.com/watch?v=TdlSYMuwq-I

Different types of spray foam

https://www.youtube.com/watch?v=tmaWC7ZkVi8

OSHA Brief: Hazard Communication Standard: Safety Data Sheets: Good for teacher background but way too technical for students at this point. May be revisited in year 2 or 3. Focus on MSDS for specific products demonstrated.

https://www.osha.gov/Publications/OSHA3514.html

Weatherize with Caulk and Weather Strip

https://www.nrel.gov/docs/fy01osti/28039.pdf

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