

Building Energy Asset Score: Building Upgrade Guide¹

ENVELOPE

Infiltration

Air leakage, or infiltration, is the unintentional or accidental introduction of outside air into a building. Buildings may conduct whole-building pressurization testing in accordance with ASTM E779 or ASTM E1827 to determine an air leakage rate. Actions taken to lower the air leakage rate in the building thermal envelope is desired for energy efficiency and may even be required by code. For example, ASHRAE Standard 90.1-2004 uses an infiltration rate of 1.8 CFM/ft², and the Passive House Standard has a value of 0.08 CFM/ft².

Asset Score Report Recommendation: Add air barrier to reduce building air leakage

Cost: \$\$

There are several areas for potential air leakage in a building, including windows, doors, and walls. Since air leakage paths are driven by the fact that warm air rises, the location between ceilings (unconditioned attics) and conditioned spaces, are the largest area (square footage) of potential heat loss. Adding a continuous air barrier in such areas of a building's envelope can greatly reduce building infiltration.

A continuous air barrier is defined as a combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope. As outlined in the ASHRAE Advanced Energy Design Guide for Small to Medium Office Buildings, an air barrier system should have the following characteristics:

- It should be continuous, with all joints made airtight.
- Air barrier materials used in frame walls should have an air permeability not to exceed 0.004 cfm/ft² under a pressure differential of 0.3 in. w.c. (1.57 lb/ft²) when tested in accordance with ASTM E 2178 (ASTM 2003).
- The system should be able to withstand positive and negative combined design wind, fan, and stack pressures on the envelope without damage or displacement and should transfer the load to the structure. It should not displace adjacent materials under full load.
- It should be durable or maintainable.
- The air barrier material of an envelope assembly should be joined in an airtight and flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of these assemblies and components due to thermal and moisture variations, creep, and structural deflection.

¹ The complete Asset Score Building Upgrade Guide is available at:

https://buildingenergyscore.energy.gov/assets/energy_asset_score_recommendations_guide.pdf

- Connections should be made between the following:
 - Foundation and walls
 - Walls and windows or doors
 - Different wall systems
 - Wall and roof
 - Wall and roof over unconditioned space.
 - Walls, floors, and roof across construction, control, and expansion joints
 - Walls, floors, and roof to utility, pipe, and duct penetrations

 - All penetrations of the air barrier system and paths of air infiltration/exfiltration should be made airtight.
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