SEDAC
SMART ENERGY DESIGN ASSISTANCE CENTER

Smart Tips

BLOWER DOOR TESTING

History of Blower Door Testing

1977 — **First used** in Sweden as a window unit

1979 — **Migrated** to US at Princeton University for leakage research

Modified into a door frame due to higher door size standardization using a modified garage as a test building to work out calibration

1985 — Blower door sales alone reached $1.2M

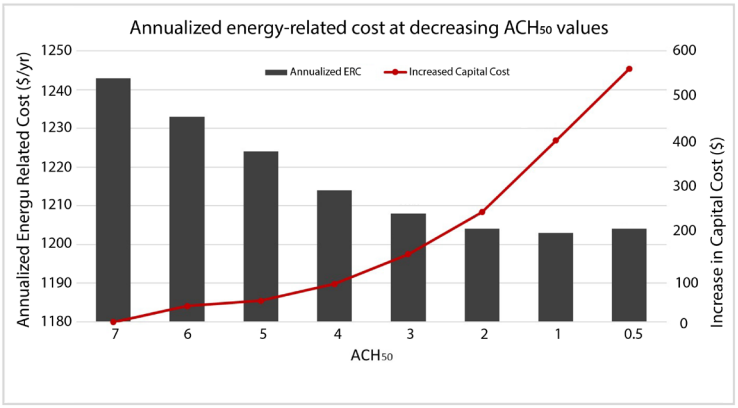
1986 — 13 blower door manufacturers with combined revenues of $10M per year

Today — Consolidated to 3 manufacturers, blowers used for **research, diagnostic testing**, and code compliance (energy and fire codes). Blower doors are more **portable and accessible** to field technicians and researchers.

Pressure Testing and Building Codes

Energy code requirements have been a large driver for the increase in blower door testing. Blower door testing became a compliance option for residential buildings in Illinois starting in 2010 with the state-wide adoption of the International Energy Conservation Code (IECC). The IECC first *required* pressure testing of residential buildings in 2012, combining visual inspection and pressure testing for compliance and mandating testing by an approved party, rather than making pressure testing optional. [2]

Current residential pressure testing has a requirement of 50 Pascals (3 ACH50) based on research by the Consortium for Advanced Residential Buildings and others that identified diminishing returns on energy savings for exponentially higher cost at about this leakage level. Higher costs are primarily associated with the addition of mechanical ventilation and advanced air sealing systems (spray or aerosolized air sealants).



* At 4 ACH or less, houses require mechanical ventilation, which is the main driver for higher costs, and also why energy savings flatten out. [3]

Pressure Testing Standards

For residential buildings:

- Pressure testing is standardized at 50Pa, simulating a 20 mph wind striking all walls at once.
- For low-rise residential, this provides enough pressure difference to provide accurate leakage results.

For commercial buildings:

- Testing is optional, but does have an applicable standard, requiring a pressure difference of 75Pa, or about a 25 mph wind pressure.
- For commercial buildings, leakage rates are commonly discussed in terms of flow per unit area, such as CFM per square foot of envelope area.

[1] https://homeenergy.org/show/article/year/1995/id/1171
[2] https://codes.iccsafe.org
[3] https://www.nrel.gov/docs/fy15osti/62748.pdf

Why Conduct Blower Door Testing?

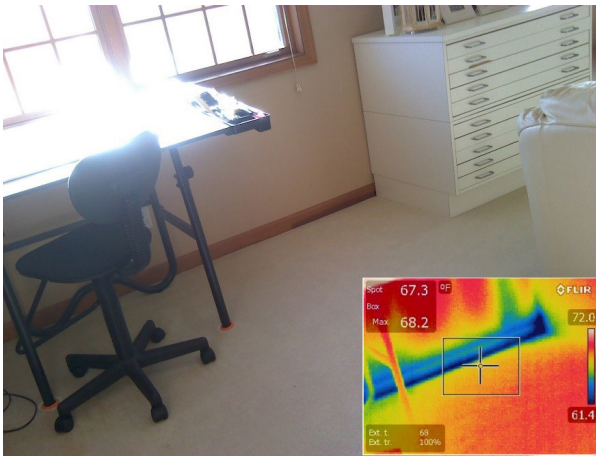


Figure 1. Floor-wall joint leakage (red is warm, blue is cold)

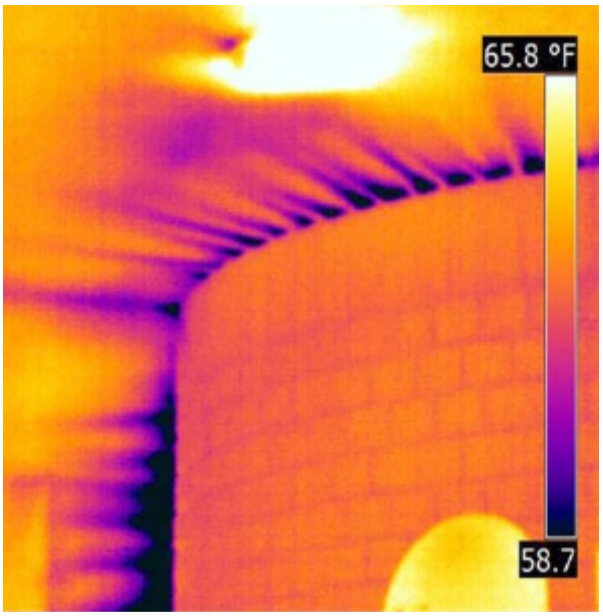


Figure 2. Masonry wall joint air leakage. [4]


Figure 3. large truck-mounted fans. [5]

[4] https://betterbuildingssolutioncenter.energy.gov/sites/default/files/Hidden_In_Plain_Sight.pdf

[5] https://contractors.efficiencyvermont.com/Media/Default/bbd/2017/docs/presentations/efficiencyvermont-keefe-airtightness-testing-of-larger-buildings.pdf

Locate existing air leakage

Blower door testing can uncover hidden openings in a building envelope that allow outdoor air leakage, leakage that could potentially lead to compromised indoor air quality and building degradation from moisture migration. In combination with infrared imaging, pressure testing of a home can reveal hidden pathways for air exchange between indoors and outdoors.

Identify leakage reduction potential

- Testing home air sealing before construction is completed can help builders find and correct issues before they become a problem for new homeowners, reducing call-backs.
- For homeowners, testing existing homes before renovation projects can help identify areas to target to reduce air leakage and improve comfort and efficiency.
- Many common leakage sites can be sealed by do-it-yourself projects without large capital costs, such as weather stripping attic access hatches, or caulking wall-to-floor joints or window frames.
- In existing homes, pressure testing in combination with thermal imaging can also help reveal air leaks, such as in Figure 1.

Demand growth for commercial buildings

While blower door testing in residential properties is required, small commercial is starting to see a similar trend in increased pressure testing, with similar benefits:

- Identifying leaks pre/post construction completion
- Confirming proper building assembly installations
- Improving comfort and indoor air quality

A single blower door fan can move about 5,300 to 5,600 cfm, enough to depressurize about 2,000 to 4,000 sq ft of space at typical leakage rates. Many blower door frames mount multiple fans to accommodate larger and/or leakier buildings. Some very large commercial leakage tests use large truck-mounted fans, as shown in Figure 3.

WHO WE ARE

The Smart Energy Design Assistance Center assists buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable. SEDAC is an applied research program at the University of Illinois at Urbana-Champaign.

In addition to Energy Code training and support, SEDAC services to save energy and money include:

Waste Water Energy Efficiency | Quick Advice Energy Assessments
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