



BLOWER DOOR TESTING (ASTM E779/E1827/E1186) PERFORMANCE ASSURANCE

ZERO/SIX CONSULTING, LLC

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BLOWER DOOR TESTING

Building energy performance can be improved if it can be measured. Commercial and residential buildings account for 40% of the total U.S. energy consumption. Lighting and HVAC systems have been rapidly improving efficiency in recent years, but the total system to achieve energy savings also includes the building envelope. The main inefficiency in the building envelope can be attributed to air leakage, which dramatically increases heating and cooling costs, and can cause undesirable air moisture imbalances. Z6 Commissioning’s passion to deliver assurances on all facets of airtightness evaluation has expanded to include Blower Door testing. Given the potential blower door testing offers for improved understanding of HVAC equipment loads and the management of IAQ and condensation risks, as well as energy savings, it makes increasing sense to test whole buildings of all sizes for airtightness and to take steps to address any and all air leakage Issues.

Looking towards the future, it’s clear the building industry is moving forward on requiring airtightness compliance with mandatory air leakage statements in the latest building codes and energy programs, and because building owners are looking for optimized building design. These include buildings that cost less due to lower energy

consumption, are more comfortable, provide better indoor air quality, and lower the risk of moisture damage. With our distinctive background in building performance testing, we believe airtightness testing via the blower door method is a critical part of any building energy audit and code compliance. Information about airtightness, specifically with quantitative information, is useful for the following reasons:

- Air leaking out of the enclosure causes energy to be consumed when lost air is conditioned air.
- Airtightness testing will identify that a building might be much leakier than expected.
- Leaking air into the building enclosure allows for condensation, both obvious and hidden. Hidden condensation within assemblies causes performance problems that do not reveal themselves until the damage is done.
- Air leakage sites become a portal for exchanging conditioned air for polluted unconditioned outdoor air for untested buildings.

“The average home has enough air leakage to add up to a two-foot-square hole. That’s like leaving a medium-sized window wide open 24 hours a day.

- Energy Saver, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy (DOE)

WHAT IS BLOWER DOOR TESTING?

An air blower door test is conducted throughout the entire building and measures the number of air changes per hour based on the standards established for the climate zone in which the building is located. The test is conducted by inserting a calibrated fan into an airtight shroud installed over an exterior door opening and creating a vacuum over the entire structure. Test equipment then measures the airflow (how much air is moved into the building) and the corresponding pressure difference acting across the building enclosure. If the measured airflow exceeds the standard, due to higher outside air pressure flowing in through unsealed cracks and openings, the entire structure then undergoes a forensic investigation. The use of certified thermography equipment and technicians displays leaks in living color. Sometimes it’s possible to literally feel, see or hear where air is coming into the

building. When not as obvious, heatless smoke tools are also used to verify leak locations are due to outside air infiltration rather than internal mechanical systems.



TESTING FOR MODERN BUILDINGS



Airtightness is not just about walls, doors, and windows. In modern buildings, air leakage can happen through mechanical systems, grills and openings. Airtightness targets are useful during the design process for new buildings as well as retrofits—they establish quantitative expectations for a very important aspect of building enclosure performance and provide a key input into the mechanical designer’s load and energy calculations. Airtightness tests should therefore be an important part of the construction process since they provide confirmation that those targets are met. If timed properly, they can also afford the opportunity to address problems before it is too late.



THE ANALYTICS OF AIR TIGHTNESS TESTING



Airtightness testing can also be used diagnostically. For new construction, you should typically do a test as early as possible in the construction process so that if the building fails, remedial work can be undertaken to find the cause and fix it. Similarly, if you are about to do a major energy efficiency retrofit—replace windows, add insulation or take other substantive steps—it is usually advisable to do a test before you get too far into the design of the retrofit.

Testing should be done as part of the assessment of the existing building to compile data on how much and where the building is leaking. The results allows for better decision making in determining how much effort should be spent on air tightening versus how much effort should be spent on, for example, insulation or new windows.

Establishing the proper building tightness using blower door testing can help:

- Reduce energy consumption due to air leakage
- Determine how much mechanical ventilation might be needed to provide acceptable indoor air quality.
- Avoid moisture condensation problems
- Avoid uncomfortable drafts caused by cold air leaking in from the outdoors





WHY Zero/Six Consulting?

Z6 is accredited to the highest possible standard of this testing through the ANAB/ILAC ISO/IEC 17025 standards organization. This accreditation reinforces our commitment to adhering to the ASTM E779/E1827/E1186 (Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door) standards for all blower door testing. This allows Z6 to provide the building owner with an ISO/IEC accredited report that determines a building's airtightness. ISO/IEC 17025 accreditation requires an audited adherence to the highest international standards in the industry, as well as, provides evidence of integrity and impartiality in all testing procedures undertaken.



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