

WHOLE BUILDING AIRTIGHTNESS TESTING

A Guide for General Contractors



Whole building airtightness testing has been an available compliance path for air barriers for years under the IECC and ASHRAE code standards, but it was rarely selected. Now, some jurisdictions, such as the State of Washington, require airtightness testing for all new commercial projects. Further, some Owners are selecting Whole building airtightness testing as a part of performance verification parameters. Therefore, it is important for all those on the Project Team, including General Contractors and their subcontractors, to understand the process.



Understanding the Process

Despite its increasing adoption, whole-building airtightness testing remains unfamiliar to many professionals across the country. Since this test typically occurs near the end of a project, contractors are often concerned about passing it and explaining potential failures to owners. In some jurisdictions, a failed test means no occupancy permit or

other significant financial penalties making it crucial for contractors to understand the testing process and its implications.

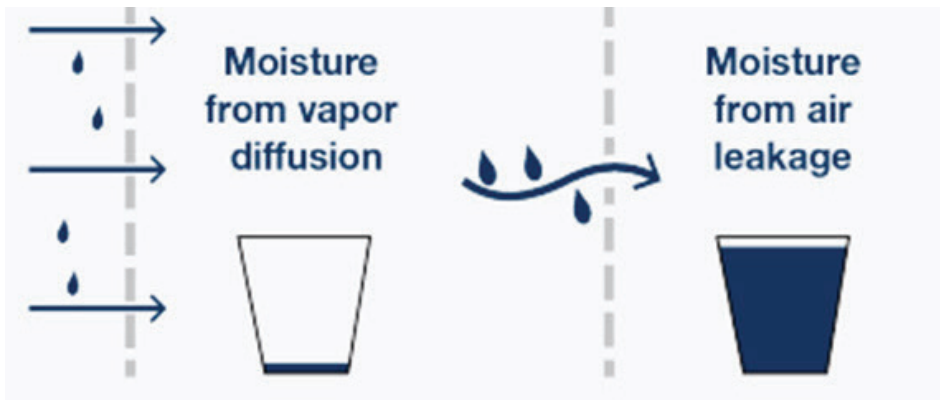


The Impact of Air Leakage

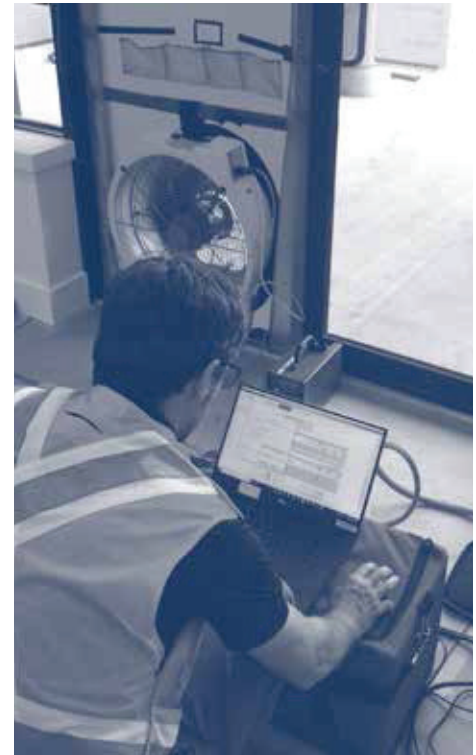
Building science has long emphasized the importance of air barriers and airtight construction. Excessive air leakage can lead to:

- Higher energy costs
- Moisture-related problems, including mold, rot and corrosion
- Health and comfort issues such as poor air quality, odors, pollutant transport, and thermal discomfort
- Poor acoustics

Air barriers play a vital role in ensuring a high-performance building enclosure across all climate zones.



Moisture is transferred by air leakage at a much larger rate than diffusion



Test in process



Why Testing is Essential

Many assume that specifying a continuous air barrier ensures airtightness. However, multiple trades contribute to the air barrier system, assembling various materials, components, and accessories on-site. These elements include roofing, doors, glazing, and air barrier membranes on walls.



Variety of air barrier materials and assemblies

Testing is the only way to quantitatively verify the effectiveness of the complete air barrier system. As such, whole building airtightness testing should be the final step in an air barrier quality assurance program.



Planning for Whole Building Testing

The objective of whole building airtightness testing is to measure total air leakage, meaning it must occur near the end of construction when the entire air barrier is complete. Larger and more complex buildings require more extensive planning and coordination. Key questions to address include:

- What test method will be used?
- When will testing take place?
- Will all air barrier work be completed beforehand?
- Are there temporary openings (e.g., material loading or power access) that need sealing before testing?
- Who is responsible for shutting down HVAC systems and closing dampers?
- Who will prepare the building (e.g., sealing exhaust fans, priming plumbing traps, propping open interior doors)?
- Who will restore normal building operations after testing?
- Will there be enough permanent power to run all test equipment?

- What defines a passing result?
- If excessive leakage is detected, how and when will it be addressed?
- What is the air barrier boundary to be tested is (ie, are garages or loading docks part of the test?)



Conducting the Test

During testing:

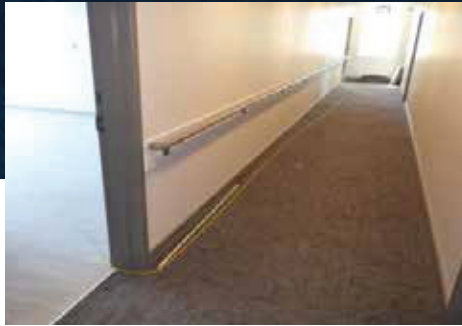
- All exterior doors and windows must be closed and latched.
- All HVAC systems must be shut down, and dampers must be closed or sealed per the test method.
- Exterior doors must remain closed, which effectively means the job site must be temporarily shut down, often requiring testing to take place during evenings or weekends.



Excessive air leakage can lead to higher energy costs, moisture-related problems, health and comfort issues, and poor acoustics - Laverne Dalglish, Executive Director of the Air Barrier Association



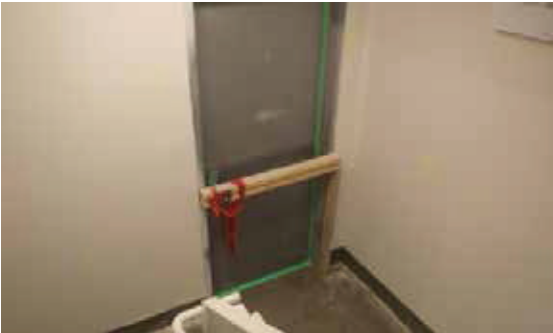
Mechanical Louver



Propping open of interior doors



HVAC equipment preparation of dampers



Exterior Door barred closed for test duration

A qualified testing agency can assist with planning, but at least one coordination meeting is recommended. More complex projects, particularly phased constructions or additions to occupied buildings, often require multiple planning discussions.

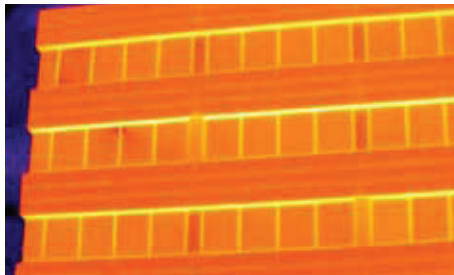


Detecting Air Leakage

Standard whole building airtightness test methods (ASTM E3158 and ASTM E779) measure overall air leakage but do not specify methods for locating leaks. If excessive leakage is detected, additional qualitative testing using ASTM E1186 provides various methods to pinpoint leakage pathways. Common diagnostic techniques include:

- Theatrical smoke testing combined with building pressurization
- Infrared thermography combined with building pressurization

Since blower doors and manometers used for quantitative testing are already set up, qualitative leak detection can be performed efficiently if needed.



Use of Infrared technology



Use of Theatrical smoke



Pass/Fail Criteria

While test methods determine how to measure air leakage, local jurisdictions set compliance thresholds based on adopted building codes, such as IECC or ASHRAE 90.1. For example:

- The **2024 IECC** requires air leakage below **0.35 cfm per square foot** of envelope area at **75 Pa** pressure for commercial buildings.
- **Washington State** enforces a stricter limit of **0.25 cfm per square foot**.

Know the requirements which your project require for a pass, as codes change and have exceptions. Requirements vary by climate zone, occupancy, floor area, etc. Additional voluntary programs, such as **Passive House** or **LEED**, may impose even stricter airtightness targets.

What Happens if a Building Fails?

A failed test may lead to further inspections and, in some cases, remedial work and retesting. The project team must clearly understand:

- The criteria for passing
- The steps required for corrective action
- The process for retesting if needed

Conclusion

Whole building airtightness is becoming an important part of modern building performance verification. Proper planning, coordination, and understanding of testing requirements will help contractors avoid costly delays and ensure successful project completion. As airtightness testing becomes more widely adopted, staying informed and proactive will be key to achieving compliance and delivering high-quality, energy-efficient buildings.