

HELP YOUR BUILDING WITHSTAND THE WEATHER

How building owners can find long-term savings by using blower door and fan tests to add energy-efficient measures to their facilities.

BY FRANK SPEVAK

Images courtesy of The Energy Conservatory.

It is the dead of winter—10°F degrees outside, with a relentless wind spreading the chill. All people want to do is get indoors and crank up the thermostat. But what if their apartment is drafty and constantly letting in cold air? They continue to turn up the furnace, putting more and more money into heating the building.

Unfortunately, this only covers up draft and does not fix the problem. The root of the issue is small cracks and holes in the building's exterior that let warm, conditioned air escape and cold air enter the structure. Until a contractor seals these holes, tenants will continue to combat the cold by turning up the heat, at a costly sum for facility managers. This same principle applies to retaining cold air and keeping out hot air. This situation calls for an air-tightness test with a blower door and fan to weatherproof buildings and keep conditioning air costs down.

Blower doors and fans play an important role in the building and home performance industry because they help builders, designers, architects and owners develop energy-efficient buildings. However, many people never work directly with blower doors and fans, making them a complex tool to understand. Learning the basics of blower doors, including what they are and why they are important will help facility managers plan for energy-efficient measures that save money in the long run.





» A contractor performing a blower door test.

Fan and blower door basics

A blower door is a tool that energy raters use during an airtightness test to determine how well a building retains conditioned air. With this knowledge, they can better estimate the cost of energy to operate the building and identify where air is escaping and seal up any holes in the building.

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Each blower door is comprised of a blower-door fan, a frame and a nylon panel. It is placed in the doorway of an existing structure to properly measure pressure across a building envelope, as well as the pressure generated by the fan. The building envelope includes all of the elements, structural and non-structural, that hold up a building, such as the walls, studs, insulation, drywall and exterior siding.

Blower doors include a variable speed fan, a built-in flow measuring sensor and a pressure gauge, which is the device used to translate air pressure measured in the flow sensor into a numerical value. To set up a blower door test, one or more fans can be temporarily sealed into an exterior doorway. The fan within the blower door is the mechanism responsible for generating air pressure differences between indoors and outdoors by drawing air out of the building or blowing air into it. This causes air to be forced through all holes in the building envelope. Energy raters locate these air-leakage sites using methods such as theatrical fog, infrared thermography or hot wire anemometers.

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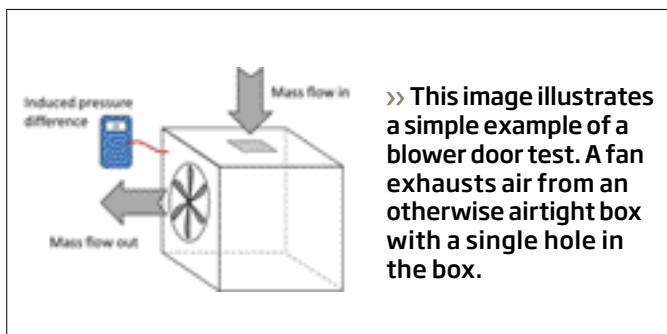
Blower door tests also help building owners comply with increasingly strict energy codes set by the International Energy Conservation Code.

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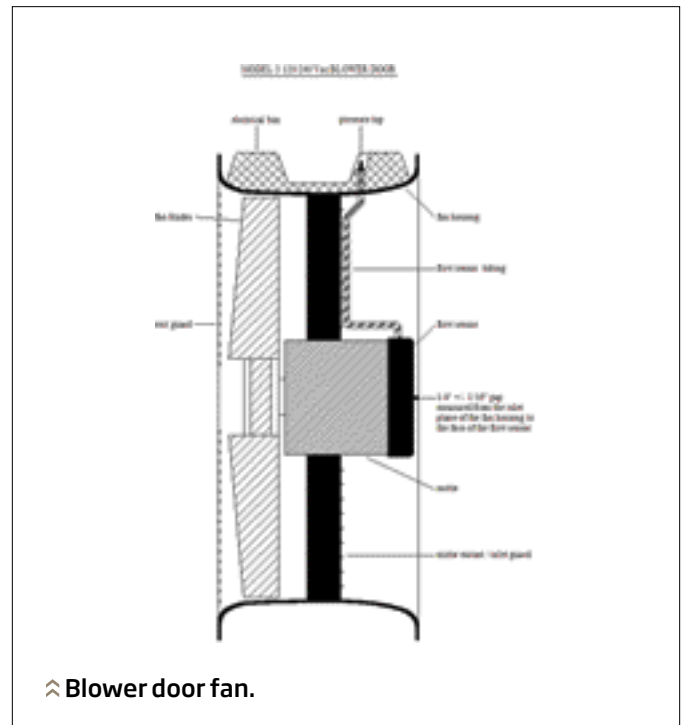
Help save building owners money

Blower door tests help resolve issues caused by unplanned air flows, such as one room that is always freezing. They quantify the air tightness or leakiness of a structure to help balance the size of a conditioning mechanism and fan to the size of a building.

Home and building performance contractors conduct blower door tests for several reasons. During the construction phase of a building, they might perform a blower door test to help design a solution that allows for a building to efficiently retain conditioned air. This test also helps find air leaks during the installation of air barriers in buildings under construction. The construction phase of building is the optimal time to perform an air-tightness test with a blower door and fan because contractors have access to areas within the building envelope that are often sealed up once construction is complete.



Blower door tests also help building owners comply with increasingly strict energy codes set by the International Energy Conservation Code. Requirements for energy codes vary from state to state, but the overall trend is working toward more energy-efficient buildings, meaning higher standards for air tightness. Blower door tests are an essential aid in helping facility managers determine exactly how energy efficient their building is and where they could improve weatherization.



The biggest misconception about blower doors

At first glance, many people think a blower door unit is the same as a common box fan sold at a big box store. In reality, a blower door fan is a highly evolved fan that is scientifically designed and calibrated to facilitate pressure differences in building envelopes.

The blades on all fans create a circle, but a box fan is a square unit, which leaves a lot of open, empty space. This lets air move in uncontrolled directions through a box fan. On the other hand, the housing on a blower door fan is purposefully circular to create little space for air to move freely. The circular housing forces air through the blower door fan

in a controlled manner, and is key to managing pressure created in a blower door test to gain accurate measurements of air tightness.

Another difference between a box fan and a blower door fan is the distance between the tips of fan blades and the housing. On a box fan, the clearance can be as much as a couple of inches, which, similar to the square-shaped housing, lets air move through the fan in uncontrolled directions. When designing a blower door fan, the blade tip clearance to the housing is an absolute minimum. In a perfect world, the tip of fan blades would be only a millimeter away from the housing, therefore controlling nearly all air flow. In reality, manufacturers cannot do this for reasons such as variations in housing as it is molded, different lengths of fan blades as they are trimmed and varying techniques of fabrication. Blower door fans have a small gap between the tip of the fan blades and the housing, but decades of trial and error have allowed manufacturers to create an optimal fan to facilitate pressure differences.

The last major difference between a box fan and a blower door fan is the quality of the fan blades and housing. Store-bought fans are typically made with a flimsy material, while a blower door fan is constructed with high-impact resistant plastic and robust metal fan motor mounts. The housing and blades on a blower door fan are manufactured to be less susceptible to expansion and contraction than lower-quality box fan blades. These fans have the goal of capturing as much air as possible inside the housing of the blower door. Only when this happens is it possible to get an accurate reading of pressure differences in buildings.

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» Air tightness test using two Minneapolis Blower Doors.



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Blower doors and fans help buildings retain conditioned air, so less money goes toward heating and cooling costs.
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Manufacturers have tested dozens of fan designs over time to understand the relationship between how much air moves through the fan and the pressure difference across the fan. Each blower door is calibrated to have a very specific pressure measurement pickup area, called the flow sensor. By testing various fans with different flow plates, manufacturers developed a formula for the relationship of pressure to flow over a very wide range of use.

While commercial building decision makers do not need to perform blower door tests, understanding the benefits can lead to long-term cost savings. Blower doors and fans help buildings retain conditioned air, so less money goes toward heating and cooling costs. Using this test, energy raters can determine the air tightness of buildings, which helps contractors identify cracks that let air escape and seal up any holes so conditioned air remains at a comfortable temperature.

Although a blower door fan looks similar to a household box fan, it is specially manufactured to controllably force air through the fan, creating a pressure difference that can be accurately measured. As standards for sustainable buildings become stricter, blower door tests will play an increasingly important role in ensuring buildings are energy efficient. [🌐](#)

Frank Spevak has more than 30 years of experience in the HVACR industry with expertise in air- and pressure-measurement equipment. He is the Marketing and Sales Manager at The Energy Conservatory, a Minneapolis-based company known for manufacturing the Minneapolis Blower Door, the Minneapolis Duct Blaster and digital pressure gauges. For more information, email info@energyconservatory.com or visit energyconservatory.com.