BLOWER DOOR FOR RESIDENTIAL TESTING

A BASIC BLOWER DOOR SYSTEM INCLUDES THREE COMPONENTS:

1. A calibrated fan
2. Door panel system
3. A pressure measurement device (manometer).

HOW THEY WORK:

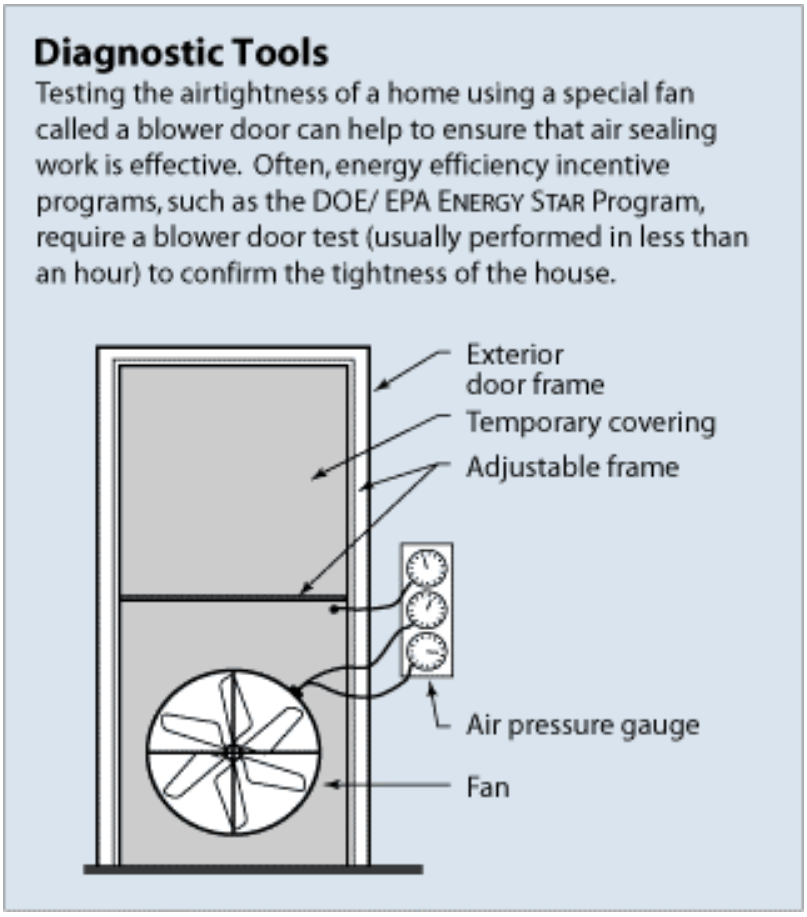
A blower door is a powerful fan that mounts into the frame of an exterior door. The fan pulls air out of the house, lowering the air pressure inside. The higher outside air pressure then flows in through all unsealed cracks and openings. A smoke pencil may be used to detect air leaks. These tests determine the air infiltration rate of a building.

THERE ARE TWO TYPES OF BLOWER DOORS:

UNCALIBRATED - Uncalibrated blower doors can only locate leaks in homes. They provide no method for determining the overall tightness of a building.

CALIBRATED - The calibrated blower door's data allow the auditor to quantify the amount of air leakage and the effectiveness of any air-sealing job.

It is important that auditors use a calibrated door. This type of blower door has several gauges that measure the amount of air pulled out of the house by the fan.



BLOWER TEST SETUP AND TEST PROCEDURES

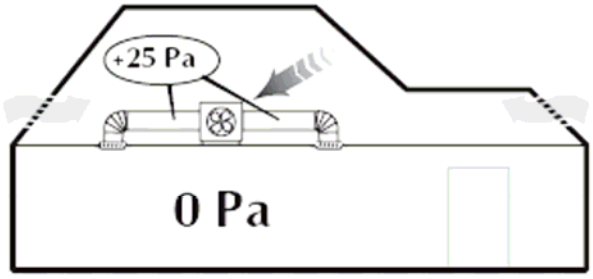
TEST SETUP:

1. The blower door fan is temporarily sealed into an exterior doorway using the door panel system.
2. Every door and window must be closed tightly so that air flowing through them does not affect the test, while all interior doors should be left open.
3. HVAC balancing dampers and registers are not to be adjusted.
4. Fireplaces and other operable dampers should be closed.
5. All mechanical exhaust devices in the home, such as bathroom exhaust, kitchen range hood or dryer, should be turned off.
6. Dampers should be closed.
7. All pilot lights should be turned off, in a safe manner.
8. There should be no open flames anywhere indoors.
9. Ashes in fireplaces or stoves should be removed so they do not get sucked into the building.
10. Pressure tubing is used to measure the fan pressure, and it is also run to the exterior of the building, so that the indoor/outdoor pressure differential can be measured.
11. The exterior pressure sensor should be shielded from wind and direct sunlight.
12. The test begins by sealing the face of the fan and measuring the baseline indoor/outdoor pressure differential.
13. The average value is to be subtracted from all indoor/outdoor pressure differential measurements during the test.

TEST PROCEDURE:

1. The blower door fan is used to blow air into or out of the building, creating a positive or negative pressure differential between inside and outside.
2. This pressure difference forces air through all holes and penetrations in the building enclosure.
3. The tighter the building (e.g. fewer holes), the less air is needed from the blower door fan to create a change in building pressure.
4. Typically, only depressurization testing is performed, but both depressurization and pressurization are preferable.
5. Different values for blower door metrics are to be expected for pressurizing and depressurizing, due to the building envelope's response to directional airflow.
6. The smallest fan ring that allows the fan to reach the maximum target indoor/outdoor pressure differential should be used.
7. A multi-point test can be performed either manually or using data acquisition and fan control software products.
8. The manual test consists of adjusting the fan to maintain a series of indoor/outdoor pressure differentials and recording the resulting average fan and indoor/outdoor pressures.
9. Alternatively, a single-point test can be performed, where the blower door fan is ramped up to a reference indoor/outdoor pressure differential and the fan pressure is recorded.

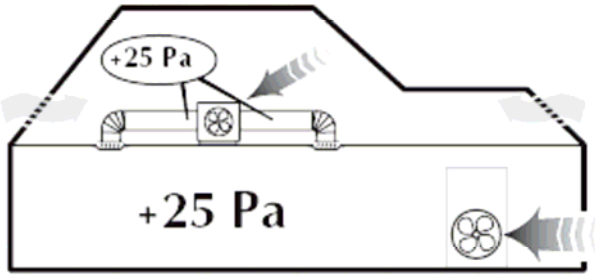
TESTING THE DUCT WORK SYSTEM



Duct pressure test - *total* - Pressurize ducts only

Duct pressure test - *total leakage*

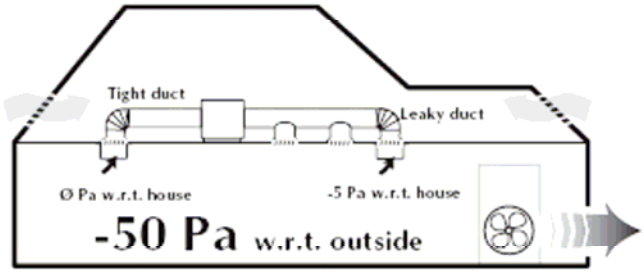
The duct pressure test machine is connected to the air handler to pressurize (or depressurize) the taped-over duct system to 25 Pascals. This is about the pressure that an HVAsC system normally experiences. The blower door is not used for this test. The ***Total*** CFM_{25} amount of duct leakage is determined.



Duct pressure test & blower door - *to outside* - Pressurize ducts and house

Duct pressure test - *leakage to outside*

Since some duct leakage may occur within the conditioned space and is not necessarily bad from an energy standpoint, an additional duct test is performed to measure *Leakage To Outside*. For this test, the blower door is used to pressurize the house to 25 Pascals and the duct pressure test pressurizes the ductwork to the same level. All duct leakage that is measured is lost to the outside, or unconditioned space, and represents heating or cooling energy that is directly wasted.



Blower door - *pressure pan* - Depressurize house

Blower door - *pressure pan*

The blower door can be a useful diagnostic tool in determining the relative amount of leakage in a particular duct run. For the ***Pressure Pan*** test, the duct system and blower door are set-up as in the *Untaped* test - no masking tape on any registers, house de-pressurized to -50 Pascals w.r.t. (with reference to) the outside. A highly accurate pressure gauge connected with a tube to a covering pan is placed over a single register and the pressure inside of that register is measured. If the particular duct run is fairly tight, the pressure inside the register will read close to the house pressure (say, -49 Pascals w.r.t. the outside, or -1 Pascal w.r.t. the house). If the duct run is excessively leaky or partially disconnected, the pressure inside the register will vary considerably from the rest of the house (say, -45 Pascals w.r.t. the outside, or -5 Pascals w.r.t. the house). A quick test of all registers will tell which have the leakiest duct runs. This method cannot be used to determine or quantify the duct leakage of a system.

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