

1. Conduct whole house blower door depressurization test

- Set up the building for a standard blower door depressurization test.
- Turn the air handler fan off, open all registers and remove all HVAC filters including remote filters.
- Temporarily seal all exterior combustion air intakes and ventilation system air intakes that are connected to the duct system.
- Depressurize the building by 50 Pa With Respect To (WRT) outside.
- Record whole house CFM50, and turn off the blower door.

2. Conduct envelope only blower door depressurization test

- Tape off all supply and return registers with DuctMask™ Temporary Register Sealing Tape or use paper and high quality painters masking tape. Be sure to include any ventilation system supply and return registers that are connected to the forced air duct system.
- Depressurize the building to 50 Pa WRT outside with the blower door.
- Record envelope only CFM50.

3. Measure pressure in duct system with registers taped off

- With the building still depressurized to 50 Pa WRT outside, measure the pressure in the taped off duct system WRT the building. This measurement can be taken at the return or supply plenum using a static pressure probe, or at a supply or return register by punching a small hole through the sealing tape and inserting a pressure tap or hose.

4. Calculate duct leakage to the outside

- Using the pressure measured in number 3, look up the appropriate correction factor using the table below. This correction is needed to account for any underestimation of duct leakage due to connections between the duct system and the building.
- Calculate: Duct leakage to outside = (whole house CFM50 - envelope only CFM50) x subtraction correct factor (SCF)

House to Duct Pressure (taped off)	Subtraction Correction Factor (SCF)
50	1.00
49	1.09
48	1.14
47	1.19
46	1.24
45	1.29
44	1.34
43	1.39
42	1.44
41	1.49
40	1.54
39	1.60
38	1.65
37	1.71

House to Duct Pressure (taped off)	Subtraction Correction Factor (SCF)
36	1.78
35	1.84
34	1.91
33	1.98
32	2.06
31	2.14
30	2.23
29	2.32
28	2.42
27	2.52
26	2.64
25	2.76
24	2.89
23	3.03

House to Duct Pressure (taped off)	Subtraction Correction Factor (SCF)
22	3.18
21	3.35
20	3.54
19	3.74
18	3.97
17	4.23
16	4.51
15	4.83
14	5.20
13	5.63
12	6.12
11	6.71

Uncertainty of duct leakage measurements using blower door subtraction

Because blower door subtraction involves subtraction of two separate blower door test results (using the same blower door), the accuracy of the duct leakage estimate using this technique is a function of the repeatability of the blower door measurements. The example below shows how repeatability errors can affect the accuracy of blower door subtraction test results.

Assume you conducted a blower door subtraction test with the following results:

- Whole house CFM50 = 3,000
- Envelope only CFM50 = 2,750
- House to duct pressure during envelope only measurement = 45 Pascals
- Correction factor = 1.29

The estimated duct leakage would be $(3,000 - 2,750) * 1.29 = 322$ cfm

On a day with only slight wind, our experience is that the repeatability of manual blower door test is about +/- 3% of the unsealed whole house CFM50 value when using the same gauges for both tests. For the example above, a repeatability error of 3% means we have an error of approximately +/- 90 CFM50 ($0.03 \times 3,000$ CFM50) in our leakage estimate. We must also apply the correction factor calculated above to the 90 CFM50 error which increases the error to +/- 116 CFM50 (90×1.29). Thus our final duct leakage estimate is 322 CFM50 (+/- 116 CFM50). This means the actual leakage in the duct system is somewhere between 206 CFM50 and 438 CFM50, a fairly wide variation in test results.

In very windy weather, repeatability error for a manual blower door test will increase to much larger than the 3% shown here.