

16. Multifamily Building Tightness Testing

Performing a **blower door test** to determine building envelope tightness is fairly straightforward for a single family home. Multi-family buildings present a more significant challenge since a typical blower door test will measure leakage to the adjacent spaces as well as leakage to the outside. From an energy perspective, it is leakage to the outside that is of concern. As discussed below, there are methods to eliminate leakage to adjacent spaces but they are more time consuming and require additional test equipment.

The basic blower door setup procedures are the same for a multi-family building as for a single family house with the exceptions noted below. An important concept to keep in mind is that if the pressure is the same on both sides of a wall, ceiling, or floor, then there will be no air movement through that assembly even if gaps and openings exist. For that reason pressurizing a space adjacent to the unit being tested to the same pressure with reference to the outside will eliminate air leakage through those assemblies from the test results.

Multifamily Building Tightness Testing

The basic blower door test on a single family home measures only the leakage through the exterior envelope, which is all leakage to the outside. This leakage includes leakage through ducts located outside the thermal envelope. In multifamily buildings a simple one fan blower door test on a single unit will measure leakage to the outside and leakage to the adjacent spaces.

There are several methods used to measure air leakage from multifamily buildings. The *compartmentalization test* is similar to a single-family home test. A single blower door is used to test one unit and the result will include air leakage to adjacent spaces. This is the simplest and most commonly used method. However if the construction of interior walls, ceiling, and floor are not relatively tight the leakage could exceed the code maximum.

Another option is the *whole-building test*. This test measures only leakage to the outside but usually requires multiple blower door fans and multiple operators. On very large buildings this can be prohibitive. Because all spaces in the building are under the same pressure, inter-unit leakage is negated. Factors such as building height, design, stage of construction, and weather on the testing day can make a whole-building test difficult.

Another method is a *guarded* blower door test, which also requires multiple blower doors and experienced technicians. It aims to measure exterior envelope leakage by manipulating inter-compartment pressures with multiple fans. It's called a guarded test because it uses secondary "guard" blower doors placed in the spaces adjacent to the target unit. These are maintained at the same test pressure as the target unit with reference to outside, which neutralizes any inter-unit leakage. The result is that only exterior leakage is recorded from the target unit. By moving the doors around a building like a tic-tac-toe board, the exterior leakage of all the spaces can be isolated and recorded. Refer to *RESNET Guidelines for Multifamily Ratings* for more information.



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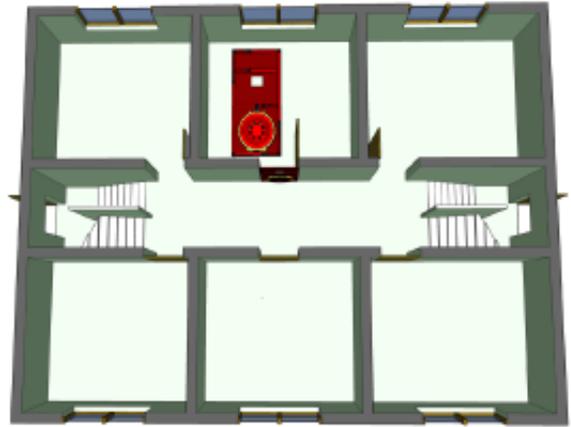
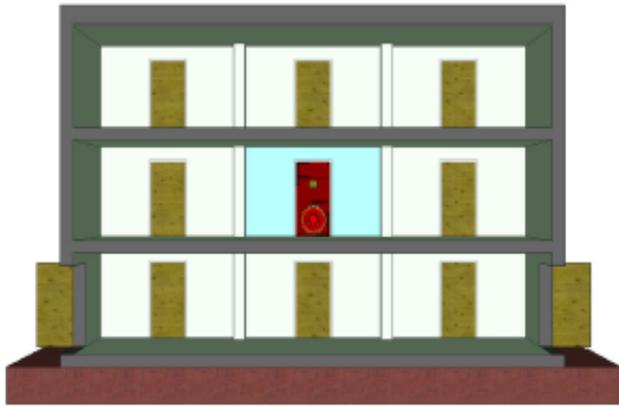
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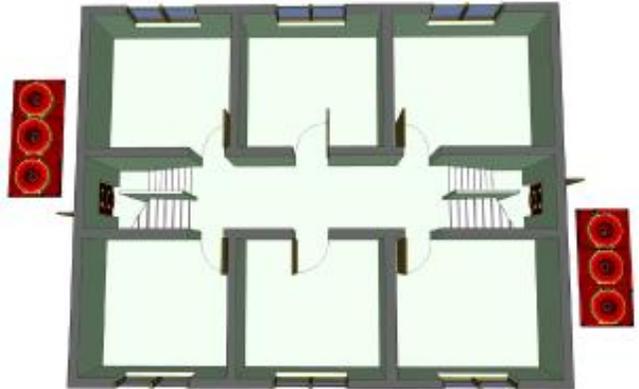
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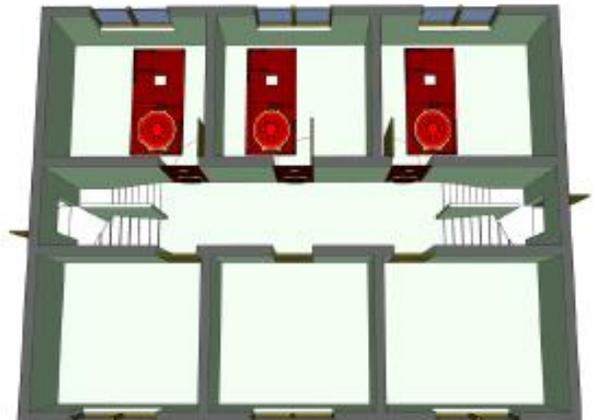
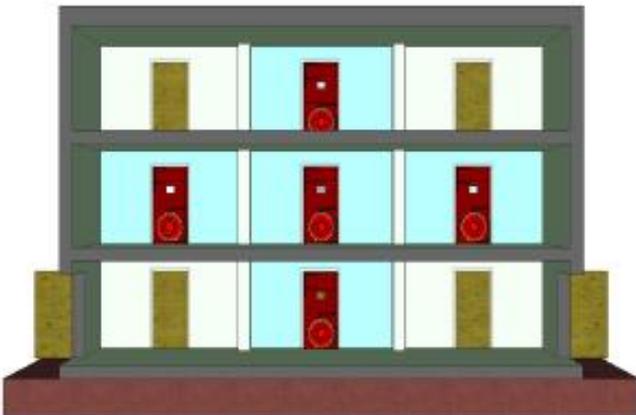
Energy Code Reference Guide



Multifamily Compartmentalization Test Diagram



Multifamily Hole Building Test Diagram



Multifamily Adjacent Spaces Guarded Test Diagram



Plan Review

There are no plan review requirements for building tightness testing. It should be noted that in addition to the building tightness test, the building must comply with Table R402.4.1.1 Air Barrier and Insulation Installation Table. Building designers may specify a building tightness tighter than required by the energy code. The plan reviewer should note this value for reference when the written test report is submitted.

Inspection

The primary responsibility of the code official is to review the written report that is signed and submitted by the technician conducting the test. The local code official determines who is qualified to conduct the test so the technician's qualifications should also be verified. There is no information about the character of the written report provided by the IECC but asking that basic information about house identification, technician identification, test conditions, equipment used, and results will help verify the test's validity. An example test recording form is shown on the next page.

Code References

Note: There is no additional information given for testing multifamily buildings.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 3 air changes per hour in Climate Zone 5. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weather stripping or other infiltration control measures;
2. Dampers, including exhaust, intake, makeup air, backdraft and flue dampers, shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open;
4. Exterior openings for continuous ventilation systems and heat recovery ventilators shall be closed and sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

Resources

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RESNET Guidelines for Multifamily Ratings,

http://www.resnet.us/professional/standards/Adopted_RESNET_Guidelines_for_Multifamily_Ratings_8-29-14.pdf