

SEALING ATTIC HATCHES

Research points to some surprising recommendations for attic hatch installation—thin is not in.

**BY IAN SHAPIRO AND
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Attic hatches are a common source of air leakage from homes. This leakage contributes to energy losses, and to the formation of ice on roofs in northern climates, as the warm attic melts snow on the roof above.

The International Energy Conservation Code (IECC) requires that all sources of air leakage through a building's thermal envelope in new construction be air sealed. This includes attic hatches. But unfortunately, most attic hatches in existing buildings do not have gasketed doors or caulked frames.

Attic hatches are commonly constructed simply by laying a piece of plywood on a frame formed by wood molding (see Figure 1). This plywood is frequently thin, to make it easy to open the hatch door by pushing it up and out of the way. In a survey of several attic hatches, we found plywood thicknesses ranging from $3/16$ inch to $3/4$ inch. All of these hatches leaked, as evidenced by the accumulation of dust deposited by leaking air.

In order to understand air leakage through attic hatches in existing buildings, and to come up with some solutions, Taitem Engineering (where Ian Shapiro is president and Timothy Lambert was an intern in 2007) performed leakage testing on a typical residential attic hatch. We tested a variety of gasketing configurations and attic hatch door thicknesses. Results show that air leakage depends heavily on the thickness—or in other words,



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on the weight—of the attic hatch door. In fact, we found that the weight of the attic hatch door has more of an impact on air leakage than gasketing.

Test Approach

The test rig that we used consisted of eight pieces (see Figure 2):

- The upper chamber was made of foam board insulation.
- The exhaust fan was a single-speed, stock-style model.
- The flow damper, which was fastened to the discharge of the

exhaust fan, was made of plastic.

- The hatch frame was constructed of 2 x 4s, with a 24-inch square inside dimension.
- The hatch frame held the attic hatch door, with four pieces of $3/4$ -inch plywood secured around the lower rim to act as rests.
- The shroud was made of 3-mil low-density polyethylene, which was sealed and trimmed to fit the frame. The shroud was also sealed to the upper rubber edge of the balometer.

Typical Attic Hatch

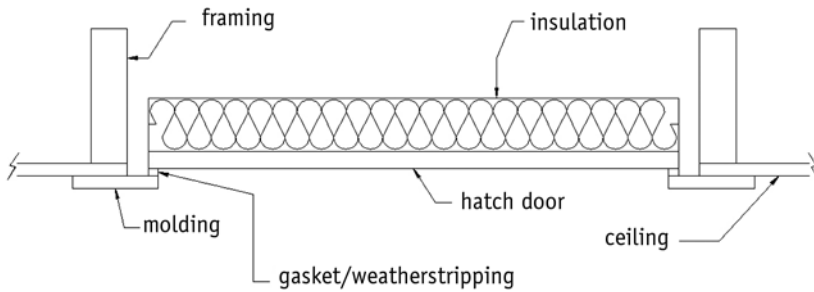


Figure 1. Attic hatches are commonly constructed simply by laying a piece of plywood on a frame formed by wood molding

Attic Hatch Test Stand

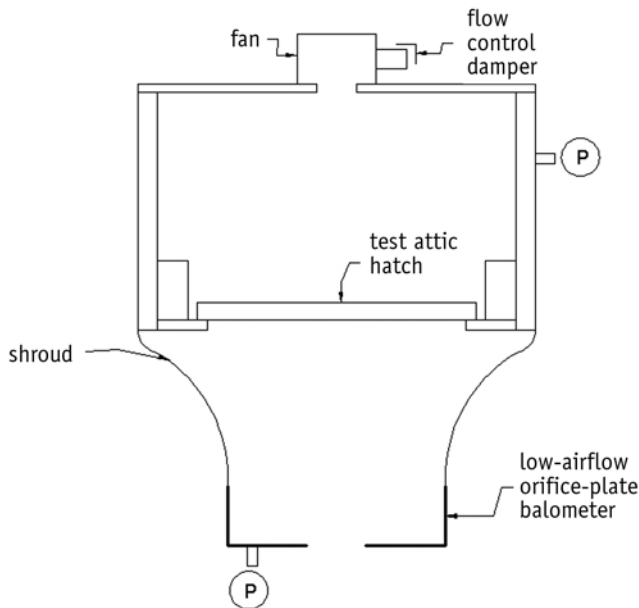


Figure 2. A digital micromanometer was used to measure both the air flow (by measuring the pressure across the balometer orifice plate), and separately, to measure the pressure drop across the attic hatch door.

We conducted the tests on the sealed hatches by first sealing the hatch with $\frac{5}{16}$ -inch-thick gasketing. Tests were run at different air flows in each configuration, by dampering the air flow at the fan.

Best Sealing Strategies

We found that the thicker hatch doors consistently leaked less air than the thinner doors, both for configurations with gasketing and for those without it (see Figures 3 and 4). In fact, the $\frac{3}{4}$ -inch-thick hatch door without gasketing had less leakage than the $\frac{3}{16}$ -inch and $\frac{1}{2}$ -inch hatch doors with gasketing. Gasketing with a thin hatch door is relatively ineffective. But gasketing reduces air leakage significantly when it is used in combination with a thick attic hatch door—one that provides a good seal around the gasket. We found that the best performance (lowest air leakage) was provided by a thick attic hatch door used in combination with a gasket.

We measured some air leakage even with the best-performing (thickest) hatch door used in combination with the best gasket. To ensure airtightness, further steps are required. These might include

- installing a latch, to ensure compression of the gasket, and to avoid mispositioning the attic hatch door;
- caulking the molding that is used to support the attic hatch door; and
- using a prefabricated gasketed attic hatch door.

We made an interesting note when observing the test results for the $\frac{3}{16}$ -inch hatch without weatherstripping. The air flow increases with little increase in pressure. This may be because the hatch is being lifted off its frame by the air pressure of the test, especially at higher pressures. This

- The balometer is a device for measuring low flow air, using an orifice plate.
- A digital micromanometer was used to measure both the air flow (by measuring the pressure across the balometer orifice plate), and separately, to measure the pressure drop across the attic hatch door.

The molding and frame around the attic hatch was air sealed, to prevent leakage through the frame from affecting test results.

We tested three thicknesses of attic hatch door:

- a thin door, $\frac{3}{16}$ inch thick;
- a medium door, $\frac{1}{2}$ inch thick; and
- a thick door, $\frac{3}{4}$ inch thick.

All three of these doors were made of plywood.

We conducted our tests on unsealed hatches and on sealed hatches. We conducted the tests on the unsealed hatches without gasketing, laying the hatch door loosely in the hatch frame.

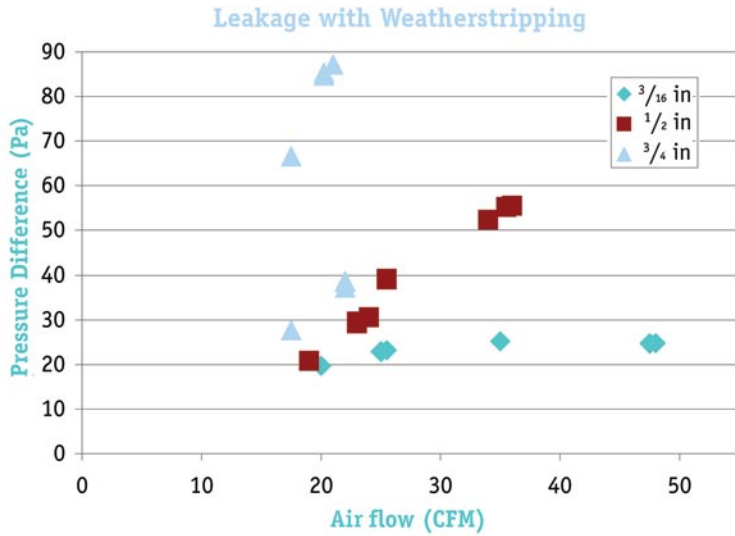


Figure 3. We found that the best performance (lowest air leakage) was provided by a thick attic hatch door used in combination with a gasket.

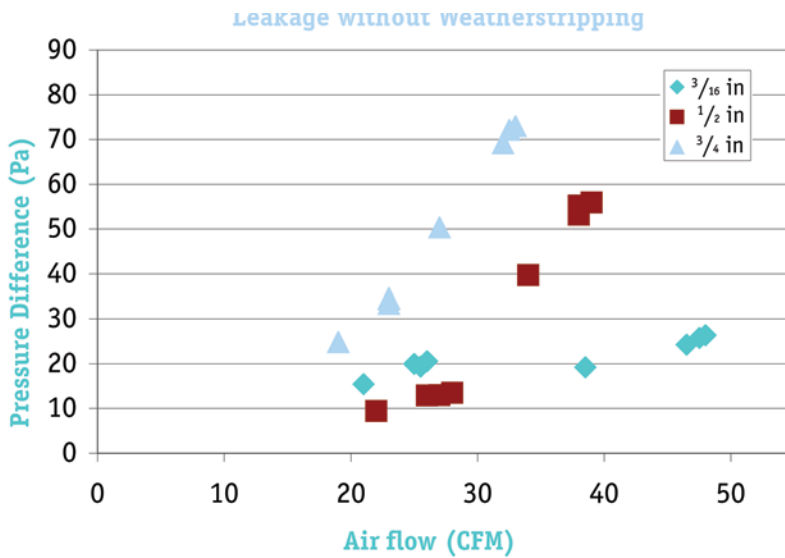


Figure 4. The thicker hatch doors consistently leaked less air than the thinner ones, for configurations with gasketing and without it.

observation points to another cause for concern for lighter hatch doors and hatch doors that are not secured with a latch. The hatches may lift off, especially in taller buildings where stack effect comes into play. This may give false readings of house air leakage during blower door tests.

Based on our study, we would make the following recommendations:

- Attic hatches should be gasketed.
- If loose (gravity-held) plywood hatch doors are used, they should be a minimum of 3/4 inches thick.

If other hatch materials are used, they should be of equivalent weight and strength, to prevent bowing and to ensure that the gasketing is sufficiently compressed.

- The IECC might be revised to ensure an adequate seal—for example, by compression of gasketing—preferably by requiring that attic hatches be latched.
- The molding that is used to support attic hatch doors provides another path for air leakage and should be caulked.

We believe these recommendations would lead to energy savings, many fewer ice dams in cold climates, and more comfortable homes.



Ian Shapiro, PE, founded Taitem Engineering in 1989. Prior to that, he worked for seven years at Carrier Corporation in Syracuse, New York. Since he founded Taitem Engineering, he has worked on over 150 design projects, published several articles, and given workshops on energy and ventilation.

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