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Table 1. Methods for Improving the Energy Efficiency of Room Air Conditioners

Technological Improvements	Increase in Energy Efficiency Ratio*
30% increase in frontal coil (heat exchanger) area	8%
45% increase in frontal coil (heat exchanger) area	11%
Addition of one extra row of refrigerant tubing in frontal coil	10%
Addition of two extra rows of refrigerant tubing in frontal coil	16%
20% increase in coil fin density	16%
Improved coil fin design (modified fin pattern)	11%
Improved refrigerant tubing heat transfer	8%
15% more efficient compressor	8%
Use of variable speed compressor	10%– 40%

Source: "Hungry Cooling: Room Air-Conditioners," *Appliance Efficiency 3*, no. 3, (1999) p. 6–10.
*Energy Efficiency Ratio = cooling capacity of air conditioner in watts/electrical input power in watts

mented in 2003; the second by 2010 at the latest. The technical changes needed to improve the efficiency of room air conditioners are well understood (see Table 1).

—Mary James

Mary James is editor/publisher of Home Energy.

For more information:

For more information on the standards, see the DOE Web site at: http://home.doe.gov/news/releases99/novpr/pr99312.htm. Or, call (202)586-5806.

(Circle No. 13 on Reader Request Card)

Insulating an Attic Access

"It's like cutting a hole in your umbrella, then walking outside in the rain." That's how Mike Barcik, a research engineer here at the Southface Energy Institute, explains the energy penalty of leaky, uninsulated attic access openings.

The majority of builders that we work with at Southface, who range from high-end custom builders to affordable housing groups such as Habitat for Humanity, install reasonable levels of attic insulation. After all, the minimum levels mandated by most state energy codes are fairly rigorous. However, putting an access hole through the attic insulation—measuring nearly 10 ft^2 in some homes—can significantly reduce energy performance.

Barcik has first hand experience with the problems of attic access openings, both pull-down stairs and scuttle holes (or hatchways). Many weekends he can be found on a Habitat for Humanity construction site, where one of his favorite projects is to seal and insulate the attic access opening. In fact, he has even developed an insulating box for attic pull-down stairs that Habitat volunteers fabricate from scrap pieces of rigid board insulation.

Types of Access

It is important to ensure that the attic access opening does not breach the house's air barrier and thermal boundary. For most homes with attics, the ceiling drywall or plastic vapor barrier forms the air barrier. Loose-fill or batt insulation rests on the ceiling (the attic floor). The approach to an energy efficient attic access opening is similar to that of the rest of the building envelope: First stop air leaks, then insulate.

Scuttle Holes

While weatherstripping the attic access door may seem like a simple task, the standard approach is often ineffective. The door must compress against the weatherstripping to ensure an airtight seal—not always an easy task if the trim pieces that support the door are uneven, or if the door is warped. Use

either drywall or a piece of plywood heavy enough to resist warping for the door. Weatherstripping can be installed on the supporting trim pieces or on the room side of the door.

To insulate the door for a scuttle hole, simply attach pieces of rigid foam insulation with glue (duct sealing mastic works great) or nails to the attic-side of the door. Five one-inch thick pieces of extruded polystyrene—pulled from the waste pile, cut to size, and glued to the door— provide an R-25 door. Batt insulation can also be glued to the door. One nice touch, required by many energy programs, is to line the outer edge of the scuttle hole with batt insulation to prevent loose-fill from falling in people's faces when they go into the attic.

"First stop air leaks, then insulate."

Pull-Down Stairs

The rough opening for a pull-down stair should be treated like a rough opening for a window or door. Air can leak through the gap between the ceiling framing and the frame for the door. Use caulk, foam backer rod, or spray foam sealant to seal the rough opening. If using spray foam, make certain the expanding foam does not bow the wood frame for the door. It is also smart to caulk the trim to the ceiling drywall.

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The pull-down stair is insulated, in order to maintain the R-value of the attic insulation.

Most pull-down doors are held against their framing by metal springs. However, the weight of a pull-down door can cause the springs to sag over time, creating gaps between the house and attic. Also, many doors are made from thin plywood that can warp and can make it difficult to create an air-tight seal.

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An insulated attic maintains a continuous thermal boundary accross the ceiling.

Barcik recommends using a simple slide latch or window lock to hold the door tightly against the weatherstripping. Opening the latch may require standing on a small step stool. However, you can also use the wire loop on the end of a mop to hook over the latch and open the door while standing flat footed on the floor below.

The wood for a pull-down door provides less than R-1 of insulation, so it is important to insulate over the stairs. There are several commercially available insulating boxes that fit over the stairs and are lightweight so that the home owner can easily push them aside when going into the attic.

—Dennis Creech

Dennis Creech is executive director at Southface Energy Institute, a nonprofit organization that offers training and technical assistance on sustainable energy and environmental technologies.

For more information:

Southface Energy Institute has developed a simple set of plans for fabricating a box from rigid insulation board. Details for the plans, as well as tips for sealing and insulating other attic access openings, are available in a free factsheet, "Attic Access," available from the Department of Energy's Office of Building Technology, State and Community Programs at 1000 Independence Ave. SW, Rm. EE-40, Washington, DC 20585-0121. Tel: (202) 586-1510; Fax: (202) 586-5145; Web site: www.eren.doe.gov/building.

The factsheet is one in a series being developed for DOE by Southface and Oak Ridge National Laboratory.

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