

**BUILDING AMERICA  
ENERGY PERFORMANCE BRIEF****Improving Existing Homes:  
Improving Recessed  
Lighting****When to Do This**

When remodeling includes replacing ceiling fixtures or painting ceilings, or when adding insulation to the attic. Recommend that homeowner replace incandescent bulbs with compact fluorescents any time.

**Durability & Health**

Non-airtight recessed can fixtures can draw heated air into the attic in winter, carrying moisture that can condense in a cool attic. They can also allow hot attic air into the home in summer, pulling dust and insulation particles into the home.

If combustion appliances are present in the home, always conduct combustion safety testing before and after any air sealing measure.

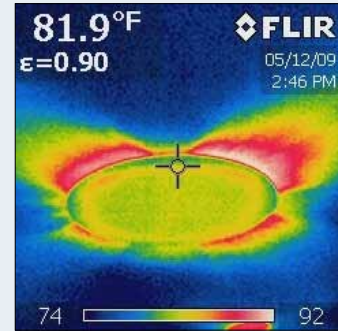
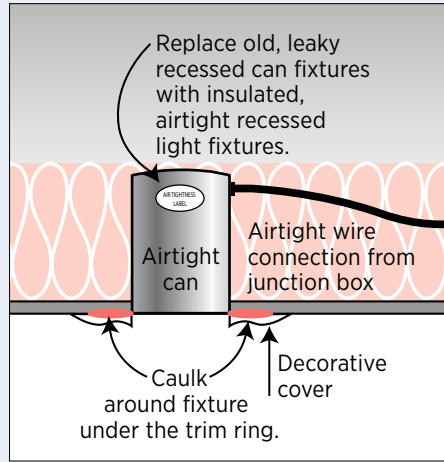
Do not let insulation come in contact with non-IC rated fixtures, due to the risk of fire.

Recessed downlights (also called can lights or high-hats) are the most popular lighting fixture installed in U.S. homes today. Unfortunately they can be a significant source of energy loss. Older model recessed can fixtures are energy intensive in three ways. If they are not approved for insulation contact, insulation has to be kept at least 3 inches from the fixture, leaving a square foot or more of uninsulated ceiling space. When the lights are turned on, the tube-shaped light fixtures heat up, and work like a chimney to pull conditioned air out of the living space into the attic, which is a waste of energy and can cause moisture problems in the attic. Many existing recessed can lights have incandescent bulbs that use 3 to 5 times the electricity of fluorescents and add to air-conditioning loads.

The best method for dealing with an old, non-airtight recessed can light is to replace the whole fixture with an insulation contact-rated, airtight (ICAT) fixture. Caulk around the fixture under the trim ring to ensure air tightness and install an ENERGY STAR-rated compact fluorescent or LED bulb that is designed for recessed can lights. Insulation can safely be laid on top of these ICAT-rated fixtures. Insulation-contact rated lights are indicated by an "IC" at the end of the model number. Another option might be to remove the can fixture, patch the ceiling, and install a surface-mounted fixture.

If the homeowner does not want to replace their non-ICAT rated recessed can lights, you can make the lights airtight by covering them from the attic side with a box made of rigid foil-faced foam or drywall. The box should be large enough to allow 3 inches of clearance on all sides of the fixture. It should be sealed in place to the ceiling drywall with spray foam, and covered with attic insulation.

**Studies Show** Old, recessed can lights are like a hole in the ceiling, only worse. Leaky recessed cans with incandescent bulbs can pull 3 to 5 times as much air as a hole in the ceiling the same size, thanks to the “stack effect.” The heat inside the can pulls air from the house up through the holes in the can into the attic (Source: McCullough and Gordon 2002).



This infrared camera image shows summertime attic heat leaking into the home around a leaky recessed can light.

## 2009 IECC/2009 IRC

*Code Requirement for New Construction and Additions*

Recessed lighting – Recessed light fixtures are airtight, IC rated, and sealed to drywall. Exception: fixtures in conditioned space.

## References

McCullough, Jeff J. and Kelly L. Gordon 2002. “High Hats, Swiss Cheese, and Fluorescent Lighting” *Proceedings of the 2002 ACEEE Summer Study*, prepared by Pacific Northwest National Laboratory. [www.aceee.org/conf/bldindex.htm](http://www.aceee.org/conf/bldindex.htm)

EPA. 2007. “A Do-it-Yourself Guide to Sealing and Insulating with ENERGY STAR<sup>®</sup> U.S. Environmental Protection Agency. [http://www.energystar.gov/ia/partners/publications/pubdocs/DIY\\_Guide\\_May\\_2008.pdf](http://www.energystar.gov/ia/partners/publications/pubdocs/DIY_Guide_May_2008.pdf)

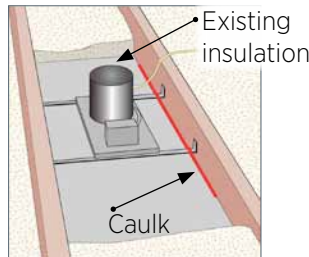
Lstiburek, Joseph. 2010. *Guide to Attic Air Sealing*. Prepared for U.S. Department of Energy by Building Science Corporation. <http://www.buildingscience.com/documents/guides-and-manuals/gm-attic-air-sealing-guide>.

## For More Information

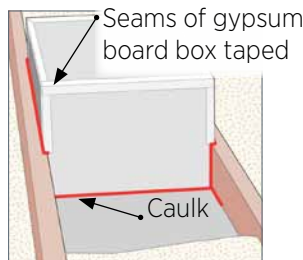
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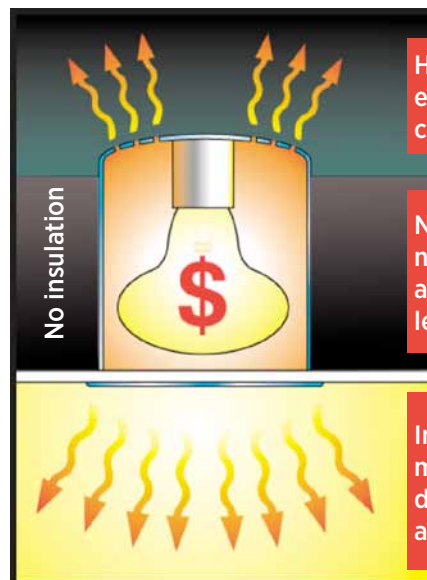
## How to Insulate and Air Seal Non-insulation Contact-rated, Non-airtight Recessed Can Lights.



- 1 Pull back any insulation around the fixture.
- 2 Caulk where the ceiling gypsum board meets the rafter on each side of the fixture.
- 3 Cut gypsum board or foil-faced rigid foam insulation to form a box. Seal box seams with metal tape or mastic.



- 4 Seal the box to the ceiling dry wall and rafters with caulk or spray foam.
- 5 Replace insulation and add insulation to cover the sides of the box (Source: Adapted from Lstiburek 2010).



Holes in the top of the recessed can encourage the stack effect, pulling conditioned air up into the attic.

Non-insulation contact-rated cans mean no insulation can touch the can, which allows heat transfer around the can. Air leaks around the rim add to heat loss.

Incandescent lamps use 3 to 5 times more energy than a compact fluorescent, don't last as long, and generate heat that adds to air-conditioning bills.