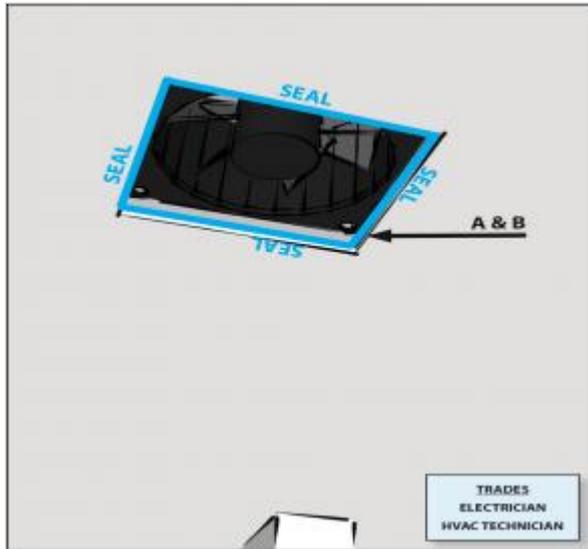


# Air Sealing Bathroom and Kitchen Exhaust Fans

Last Updated: 03/14/2016

## Scope



Air seal around kitchen and bathroom exhaust fans to keep conditioned air from leaking into unconditioned space.

Air seal around kitchen and bathroom exhaust fans to keep conditioned air from leaking into unconditioned space.

- Using a saw, cleanly cut all a hole in the ceiling drywall no more than 1 inch larger in diameter than the fan box.
- Seal holes in the fan housing with caulk, sealing putty, or metal tape.
- Install the fan then seal around the fan with caulk or canned spray foam.
- Seal the exhaust duct to the fan box with approved metal tape or mastic.
- Seal around the exterior fan duct vent with caulk or a pre-made exterior wall gasket.
- If duct vents through the roof, install flashing around the vent that is properly integrated with roof paper and roofing material.
- Do not vent exhaust fans into the attic.

See the [Compliance Tab](#) for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.

## Description

Exhaust fans are typically installed in bathroom ceilings and in kitchen range hoods, or sometimes kitchen ceilings or walls, to provide spot ventilation. Generous holes are often cut in the ceiling drywall for installation of bath exhaust fans and kitchen exhaust fan ducts, leaving gaps where the fan box or duct is installed. While these gaps may be covered by decorative trim in the case of the exhaust fan box or be hidden in cabinets in the case of range hood exhaust fan ducts, those coverings will not stop air leaks. When the drywall is not sealed to the edges of the exhaust fan box or ducting, a considerable amount of conditioned air can leak through these gaps and into unconditioned attic space. The boxes themselves can also be leaky. Pressure and temperature differences between conditioned and unconditioned spaces encourage this air flow. These air leaks represent energy losses; they could also potentially allow warm, moisture-laden air into unconditioned attics where it can condense on cold surfaces, creating moisture problems. Air barriers need to be continuous to be effective; this means sealing all penetrations in exterior walls, ceilings, and floors adjoining unconditioned spaces.

Be sure to schedule sealing around exhaust fans and ducts after fans and drywall have been installed. Responsibility for sealing air leaks around exhaust fans and ducts should be included in the contract for the appropriate trade, depending on the workflow at a specific job site.

**Figure 1** - The gap around this kitchen exhaust duct represents a significant source of air leakage to the unconditioned attic 

## How to Air Seal Holes around the Kitchen Exhaust Duct

1. Cut openings for the duct that are no bigger than needed to fit the exhaust duct through the ceiling or top of the kitchen cabinet. Make clean, even cuts.
2. After the exhaust duct is installed, air seal with caulk between the duct and drywall from the room side. If gaps are larger than a ¼ inch, use canned spray foam that is carefully applied. Do not use pieces of fibrous insulation; this insulation does not air seal. If gaps are larger than one inch, they can be sealed from the attic side with air-blocking material such as rigid foam that is cut to fit and sealed in place with caulk or spray foam.
3. Use caulk or pre-made exterior wall gaskets to air seal the exterior fan duct vent to the exterior wall. Ensure that exterior gaskets are properly integrated with the housewrap.

**Figure 2** - How to air seal around the kitchen exhaust. 

## How to Air Seal the Bathroom Fan Housing

1. Cut openings in the ceiling that are no bigger than needed to fit the fan box. Make clean, even cuts in the drywall.
2. After the fan is installed, air seal with caulk between the fan housing and drywall from the room side before installing trim.
3. If gaps are larger than a ¼ inch, use canned spray foam carefully applied so that trim will fit over it.
4. If gaps are larger than a half inch, they can be sealed from the attic side with air blocking material such as rigid foam that is cut to fit and sealed in place with caulk or spray foam. Do not use pieces of fibrous insulation; this does not air seal.
5. Seal holes in the fan housing with caulk or metal tape.
6. Use caulk or premade exterior wall gaskets to air seal the exterior fan duct vent to the exterior wall. Ensure that exterior gaskets are properly integrated with housewrap.

## How to Create an Insulation Shield for the Exhaust Fan

The bathroom exhaust fan box may have air leaks and holes in the casing. You may want to cover the fan to stop air leaks and to allow you to install insulation over it.

**Figure 3** - uninsulated bath exhaust fan. 

1. Create a 5-sided box from a solid air barrier material such as rigid foam, gypsum board, or plywood. Tape the seams of the box with housewrap tape (not duct tape) or seal with mastic. Cut an access in the box for the exhaust duct.
2. Seal the box to the ceiling gypsum board and seal around the exhaust duct with caulk or canned spray foam.

**Figure 4** - Bath exhaust fan with rigid foam box. 

3. Cover the box with attic insulation.

**Figure 5** - Fully insulated bath exhaust fan. 

## Ensuring Success

Holes cut in the ceiling or wall for bathroom exhaust fan boxes and kitchen exhaust fan ducts should be visually checked to ensure that the opening around the fan box or exhaust duct is sealed with caulk or canned spray foam. An experienced technician can also check for air leaks with a smoke pencil or by feeling with the back of the hand. Air barrier effectiveness is measured at the whole-house level. Blower door testing, which is conducted as part of the whole-house energy performance test, may help indicate whether holes for exhaust fans in exterior walls or ceilings have been successfully sealed.

# Climate

No climate specific information applies.

# Training

## Right and Wrong Images



Display Image: [ES\\_TESRC\\_5.1.4\\_PG134\\_256b\\_102811\\_0.jpg](#)

Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

*Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.*



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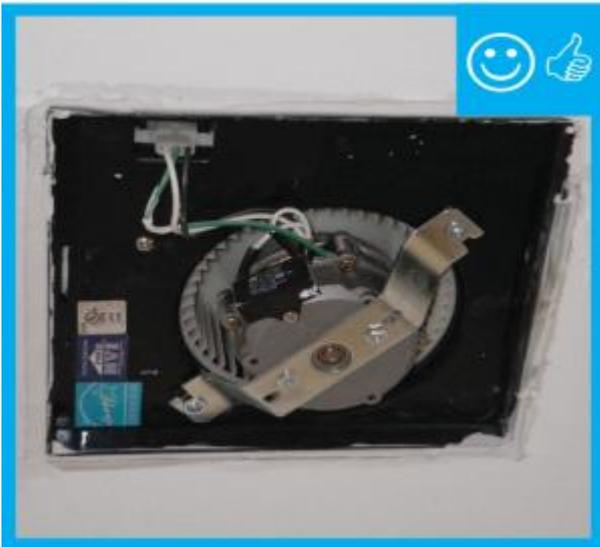
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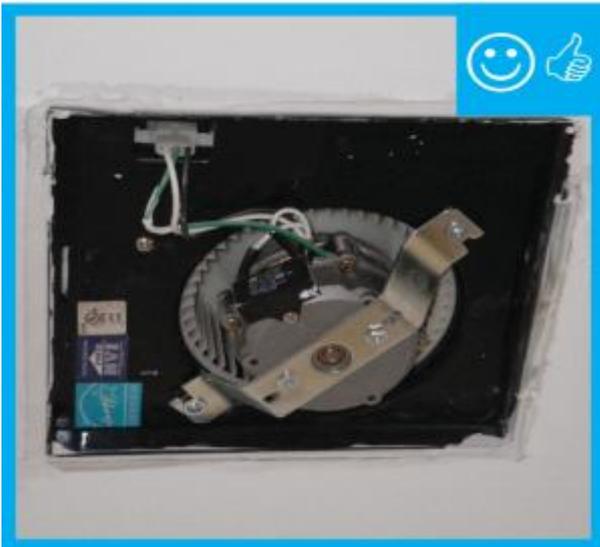
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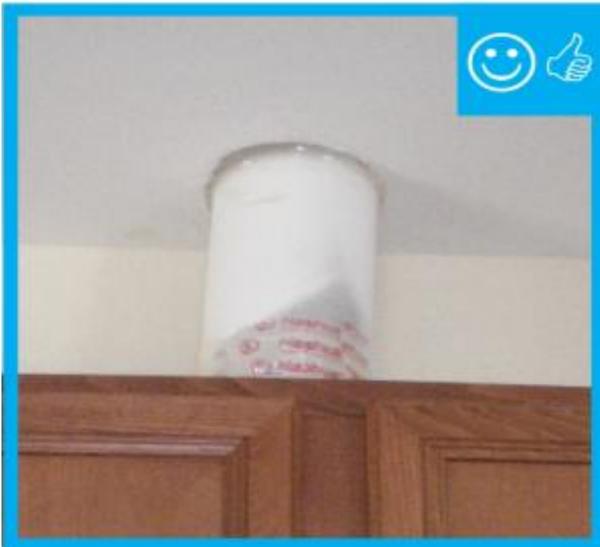
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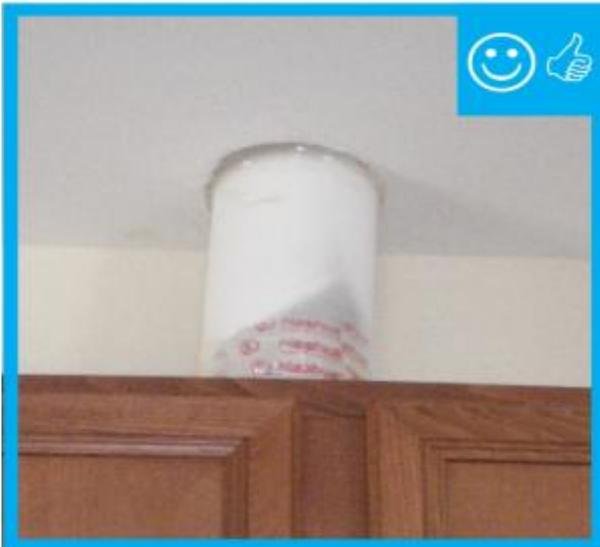
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# CAD

None Available

# Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

## [ENERGY STAR Certified Homes](#)

ENERGY STAR Certified Homes (Version 3/3.1, Revision 08), Rater Field Checklist

Thermal Enclosure System:

4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material):

4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed

ENERGY STAR Revision 08 requirements are required for homes permitted starting 07/01/2016.

## [DOE Zero Energy Ready Home](#)

Exhibit 1: Mandatory Requirements. Certified under ENERGY STAR Qualified Homes Version 3.

## [2009 IECC](#)

Table 402.4.2 Air Barrier and insulation Inspection Component Criteria, Shafts, penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed.\*

## [2012 IECC](#)

Table R402.4.1.1 Air Barrier and Insulation Installation, Shafts/penetrations: Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space are air sealed.

\*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

## [IECC 2015](#)

## More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

### Case Studies

None Available

### References and Resources\*

1. [Building America Best Practices Series Volume 12: 40% Whole-House Energy Savings in the Cold and Very Cold Climates](#)  
**Author(s):** Baechler, Gilbride, Hefty, Cole, Love  
**Organization(s):** PNNL, ORNL  
**Publication Date:** February, 2011  
*Guide describing measures that builders in the cold and very cold climates can take to build homes that have whole-house energy savings of 40% over the Building America benchmark with no added overall costs for consumers.*
2. [DOE Zero Energy Ready Home National Program Requirements](#)  
**Author(s):** DOE  
**Organization(s):** DOE  
**Publication Date:** August, 2015  
*Standard requirements for DOE's Zero Energy Ready Home national program certification.*
3. [ENERGY STAR Certified Homes, Version 3 \(Rev. 08\) National Program Requirements](#)  
**Author(s):** EPA  
**Organization(s):** EPA  
**Publication Date:** September, 2015  
*Document outlining the program requirements for ENERGY STAR Certified Homes, Version 3 (Rev. 08).*
4. [Guide to Attic Air Sealing](#)  
**Author(s):** Lstiburek  
**Organization(s):** BSC  
**Publication Date:** January, 2010  
*Fact sheet providing detailed information about air sealing attics.*
5. [Technology Fact Sheet - Air Sealing](#)  
**Author(s):** Southface Energy Institute, ORNL  
**Organization(s):** DOE  
**Publication Date:** November, 1999  
*Brochure with information for homeowners about the benefits of air sealing.*
6. [Thermal Enclosure System Rater Checklist Guidebook](#)  
**Author(s):** EPA  
**Organization(s):** EPA  
**Publication Date:** October, 2011  
*Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.*

\*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

### Contributors to this Guide

The following Building America Teams contributed to the content in this Guide.

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