# A DIY GUIDE TO INSULATION AND AIR SEALING

Requirements and Guidelines for Self-Installers

focus on energy®
Partnering with Wisconsin utilities

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# HIRE A TRADE ALLY CONTRACTOR OR DIY?

Installing attic insulation and sealing air leaks is one of the most cost-effective ways to improve the comfort and energy efficiency of your home. This may be a project you can do yourself if your attic is accessible and not too difficult to move around in. They can usually be completed in a day or two, and provide benefits for years to come. But if you find any of the conditions listed here when you inspect your attic, we recommend hiring a contractor to fix these problems before proceeding.

## SEE IF YOU QUALIFY

**How do you heat your home?**

### Other (propane, oil, wood, biomass, etc.)

Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

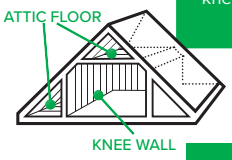
### Natural gas or electric

**Does your heating utility participate in FOCUS ON ENERGY®?**

NO → Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

YES

**Is your attic floor horizontal and open?**
(No floored attics—closed cavity, sloped attics, or knee walls, vertical walls with one side touching the interior heated part of the house)




NO → Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

YES

**Is there more than 600 square feet of attic?**

NO → Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

YES


**Does your insulation cover your attic joists?**

YES → Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

NO

## DIY SAFETY

YES



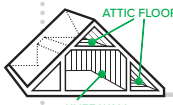
**Does your home have knob and tube wiring (pre-1930), asbestos or vermiculite insulation?**

NO → Unfortunately, you don't qualify for DIY rebates, but insulation and air sealing may still be a good idea.

YES

Unfortunately, you do not qualify for a DIY rebate. For your safety, please hire a participating Trade Ally contractor at **focusonenergy.com/findatradeally**.

## IS DIY A GOOD FIT?




**Does your home have any of the following?**

- Difficult attic access and limited space
- Wet or damp insulation.
- Moldy or rotted attic rafters or floor joists, or black areas on roof decking, indicating moisture problems.
- Kitchen, bathroom, or clothes dryer vents that exhaust directly into the attic space instead of outdoors.
- A history of ice dams in the winter.
- Little or no attic ventilation.
- Recessed can lights.
- Knee walls.
- Floored attics.
- Heating and cooling ducts in the attic.
- Complex attics or rooflines.

NO → **YES, DIY IS AN OPTION**

YES → Unfortunately, you do not qualify for a DIY rebate. These issues are better addressed by a participating Trade Ally contractor at **focusonenergy.com/findatradeally**.

# HOW TO PARTICIPATE

1. Confirm your eligibility (see eligibility infographic on page one).
2. Follow this installation guide.
3. Buy supplies as directed.
4. Draw a sketch of your attic space.
5. Do air sealing work.
6. Insulate.
7. Take pictures of installed insulation (not required for contractor installations).
8. Fill out online application and upload receipts and post-project inspection photos (required).
9. Allow 8–10 weeks for payment.

## Pictures Required for Your Rebate

1. Sketch or drawing of your attic layout.
2. One picture of each of the following if present in your attic:
   a. Wire or pipe penetration sealing.
   b. Attic top plate sealing (where the wall meets the ceiling).
   c. Weatherstripping on attic hatch, stairwell door, or scuttle.
   d. Insulation on attic hatch, stairwell door, or scuttle.
   e. Chimney sealing (if applicable).
   f. Recessed lights sealing (if applicable).
3. Two “after pictures” of the attic (one in each direction). Not required if installed by a contractor.
4. Final picture: Closer view of insulation depth marker (blown insulation) or tape measure (batts) showing total depth of insulation now present. Not required if installed by a contractor.

PRO TIP: Follow this guide in order. Always air seal before you insulate. It will be an easier, cleaner process and you will be less likely to degrade your new insulation by stepping on or disturbing it.

# SAFETY

## Is This a Good Idea?

This list of considerations is not exhaustive. Focus on Energy is not responsible for damages to person or property related to installing insulation or air sealing work. Pursue this measure with proper safety equipment and at your own risk. If you're unsure about your ability to pursue this work safely, consider finding a Trade Ally contractor at **focusonenergy.com/findatradeally**.

Please review the safety considerations in our DIY eligibility infographic on page one to see if your home is a good fit.

## Safety Equipment Needed

1. Safety glasses, gloves, and dust mask/protective face mask (a respirator or N95 face mask is recommended).
2. Flashlight or portable safety light.
3. Boards to walk on, if needed.
4. Hard hat or cap to protect head from roofing nails.

## Tips and Safety Advice

1. To reduce trips into and out of the attic, gather all your tools and supplies before you begin.
2. Use a drop light to make sure the work area is well lit, and always keep a flashlight handy.
3. Take precautions to avoid a dangerous working environment in your attic.
   a. During hot weather start working early, as attics heat up as the day moves on.
   b. Drink plenty of water.
   c. Set a schedule with breaks to avoid overheating.
4. Wear a lightweight disposable coverall, gloves, and hat, to keep itchy and irritating insulation off your skin.
5. Wear kneepads for attics that require crawling.
6. Watch out for nails pointing up through the ceiling or down from roof deck.
7. Walk on joists or trusses not exposed ceiling drywall or insulation, to avoid falling through the ceiling. You can use plywood or lumber laid across joists to create a platform to work from.


PRO TIP: Time out your project. Expect to do the air sealing on one day and the insulation on another day to avoid fatigue and ensure proper installation.

## Other Considerations

Sealing your home may trap indoor air pollutants such as carbon monoxide (CO), radon, and volatile organic compounds, which can require additional ventilation fans to maintain safe air quality, and repairs to reduce or eliminate the sources of the pollutants. Here are some things to consider before starting your home sealing project.

### Radon

Radon is a colorless, odorless gas that, in high enough concentrations, has been shown to cause lung cancer. More information about the health risks associated with radon can be found at **epa.gov/radon**. If you live in a high radon area, consider contacting a contractor to perform a radon test and install radon mitigation systems before sealing your home. See the Environmental Protection Agency's Consumer Guide to Radon Reduction for details and learn more at **dhs.wisconsin.gov/radon**.

## Vermiculite

Check your attic for major safety issues first. With proper personal protective equipment (i.e., N95 dust mask, gloves, eye protection, dust suit), examine your insulation down to the drywall in several areas to rule out the presence of vermiculite insulation, which may contain asbestos. If vermiculite is found, see **zaitrust.com** for resources on testing and possible funds for removal/replacement. Also see Wisconsin Department of Health asbestos remediation contractors at **dhs.wisconsin.gov/asbestos/contractors** or find a Trade Ally contractor at **focusonenergy.com/findatradeally** who can have it remediated properly.

VERMICULITE

## Mildew and Pests

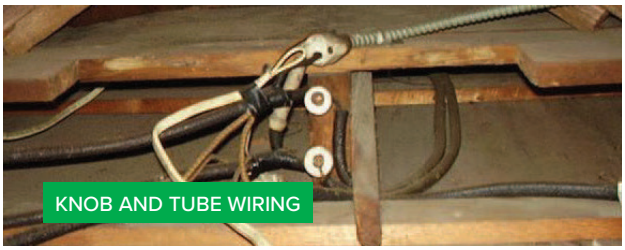
If mildew is present greater than 10 square feet, consult a professional to have it remediated.

MILDEW

Look for signs of animal or pest infestation, like compressed insulation, nesting, or droppings. Refer to licensed animal or pest control to deal with any active infestation or live animals.

## Knob and Tube Wiring

Identify if knob and tube wiring is present and have it removed or de-energized by a licensed electrician before any work begins.



KNOB AND TUBE WIRING

## Lead Paint

In any home built before 1978, it is possible that lead paint was applied to some or all surfaces. While most of the work in the attic is unlikely to contain potential lead-containing materials, if lead exposure is a concern in your household, it is recommended you work with a licensed professional Trade Ally to have it addressed safely. See **dhs.wisconsin.gov/lead/contractor**.

## Combustion Safety

Do you have appliances that use oil or gas? Consider hiring a Trade Ally contractor to test that they're properly drafting combustion gases before and after sealing your home. Sealing in some cases can cause naturally venting combustion appliances to back-draft gases into your home, creating unsafe conditions.

## Carbon Monoxide

Ensure a CO detector is present on all heated floors of your home, including any basement bedrooms. More information is available here: **docs.legis.wisconsin.gov/statutes/statutes/101/I/149**. CO detectors will often be combined with smoke detectors in one product, offering easy maintenance.

## Attic and Fresh Air Ventilation

In the winter, a well-ventilated attic with natural airflow is important for preventing harmful ice dams, and in the summer it protects roof shingles and removes moisture. The most common mistake homeowners make when installing insulation is to block the flow of air at the eaves. Never cover attic soffit vents with insulation—use rafter vents and soffit vents to maintain airflow.

1. Maintaining an acceptable level of indoor air quality involves ensuring that there is enough fresh air supplied to a home by some method to meet the needs of occupants and replacing the air exhausted to remove indoor air pollutants (see Combustion Safety, page four). The quantity of fresh air required is generally calculated based on some combination of house volume and/or occupancy. In some cases, maintaining good indoor air quality requires addressing other issues such as asbestos, mold, lead paint, or radon, and then adding mechanical ventilation at the calculated rate once these issues have been successfully remediated. Focus on Energy recommends using a professional Trade Ally contractor when these conditions are present to ensure adequate ventilation and remediation of the safety hazard. Install continuous or intermittent mechanical ventilation when required by these standards or notification provided in writing to the homeowner.
2. If planning on replacing or adding a bath fan to your home, refer to the chart, right. Calculate the number of bedrooms and house square footage to find a minimum fan air flow in cubic feet per minute (CFM). Fans should be located near moisture sources, namely showers in bathrooms. Bath fans must be vented to outside.

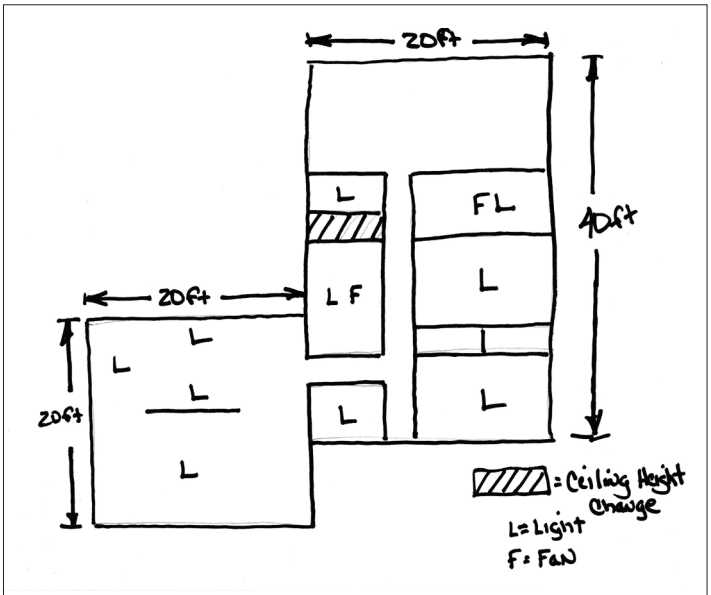

BATH FAN VENTED TO OUTSIDE

| Floor Area, sq. ft. | Mechanical Ventilation Requirements, CFM<br>Bedrooms | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| < 500 | 30 | 38 | 45 | 53 | 60 |
| 501–1,000 | 45 | 53 | 60 | 68 | 75 |
| 1,001–2,000 | 60 | 68 | 75 | 83 | 90 |
| 1,501–2,500 | 75 | 83 | 90 | 98 | 105 |
| 2,001–2,500 | 90 | 98 | 105 | 113 | 120 |
| 2,501–3,000 | 105 | 113 | 120 | 128 | 135 |
| 3,001–3,500 | 120 | 128 | 135 | 143 | 150 |

3. Bath fans can be noisy, which can discourage use. Be sure to choose a quiet fan (with a sone rating of < 10) to encourage use.
4. Kitchen exhaust fans should be rated for air flow of at least 25 CFM continuous or 125 CFM intermittently. Fans rated at 400 CFM or higher require additional fresh air from outside the home. Exhaust fans need be vented to outside to remove pollutants from the home.

# PREPARATION

1. A good way to start home sealing is to make a quick sketch of your home's floor plan. This sketch will serve as a reference point once you get into the attic and will help you locate areas of leakage. In your sketch, make note of:
   a. Areas where the ceiling drops to meet kitchen cabinets, bathroom cabinets, the bathtub, or slanted ceilings over stairways. These are called dropped soffits.
   b. Where walls (interior and exterior) meet the ceiling. These are called top plates.
   c. Overhead lights or fans.
   d. Other things to consider are plumbing penetrations, chimneys, or flues, and wiring penetrations. Locate these on your sketch and see the relevant sections in this guide for steps to seal them.
   e. These areas can connect the attic to a wall cavity or directly into the home and can be sources of air leaks. Tape or staple your map in the attic to help guide you as you work.




ATTIC SKETCH OF MEASUREMENTS

2. Prepare the attic by moving any stored items out of the way. Gather all your tools and supplies before you begin, and be sure that the work area is well-lit. A headlamp frees up your hands to work. Make a list of anything you need to get started. Check out our Materials lists on page seven.
3. Be sure that your bath fans are vented to the outside.
4. Remove any items or trash from the attic to ensure safer navigation. If doing a blown type of insulation, be sure to properly install your depth markers to ensure you add enough insulation.
5. Prepare to get dirty: the entire process of sealing your attic will be easier if you take the time and effort to wear the right gear. Wear knee pads to help prevent pain associated with crawling around in the attic. Additionally, a lightweight disposable coverall or long sleeves and pants, gloves, and hat can keep itchy and irritating insulation off your skin.


# MATERIALS

Products recommended in this guide are for informational and example purposes only. Focus on Energy does not endorse any brands or products, but recommends certain types of sealants or materials for certain applications to maximize safety and quality installation. For a full list of safety equipment, please refer to the Safety section on page three.

## Materials and Tools You May Need

- Scissors.
- Tape measure.
- Drop cloths.
- Utility knife.
- Heavy duty staple gun and staples.
- Screws and drill/driver.
- Tin snips.
- Large bucket to haul materials.
- Small broom for dusting off air sealing sites.
- One-part closed cell foam in cans. Get several cans of this expanding spray foam insulation for filling larger gaps (1/4 inch to three inches).
    a. NOTE: Two-part foam kit is not recommended for home usage. Visit **focusonenergy.com/findatradeally** for qualified spray foam installers.
- Foam applicator gun (this is highly recommended for working on your sill boxes).
- Spray bottle with water (for prepping surfaces before one-part foam).
- Caulk gun (dripless options are cleaner).
- Silicone or acrylic latex caulk for sealing small holes (1/4 inch or less).
- High-temperature caulking (American Society for Testing and Materials (ASTM) E136 for oil or wood flues and 500° F room temperature vulcanizing (RTV) silicone for gas flues) to seal around flues and chimneys.

HIGH-TEMPERATURE CAULKING FOR OIL AND WOOD FLUES

- Batt or roll of unfaced fiberglass insulation and large garbage bags (for stuffing in dropped soffits).
- Roll of reflective foil insulation or other blocking material such as drywall or pieces of rigid foam insulation to cover soffits, open walls, and larger holes.
- Roll of 14-inch wide aluminum flashing to keep insulation away from the flue pipe.
- Foam board.
- Screw-on weatherstripping, often found in door sealing kits.

SCREW-ON WEATHERSTRIPPING

- Foil tape.
- Sheetrock/wall board/drywall/gypsum board.
- Insulation depth markers or rulers.
- Batt or blown-in insulation sufficient to meet area coverage and R-value need.

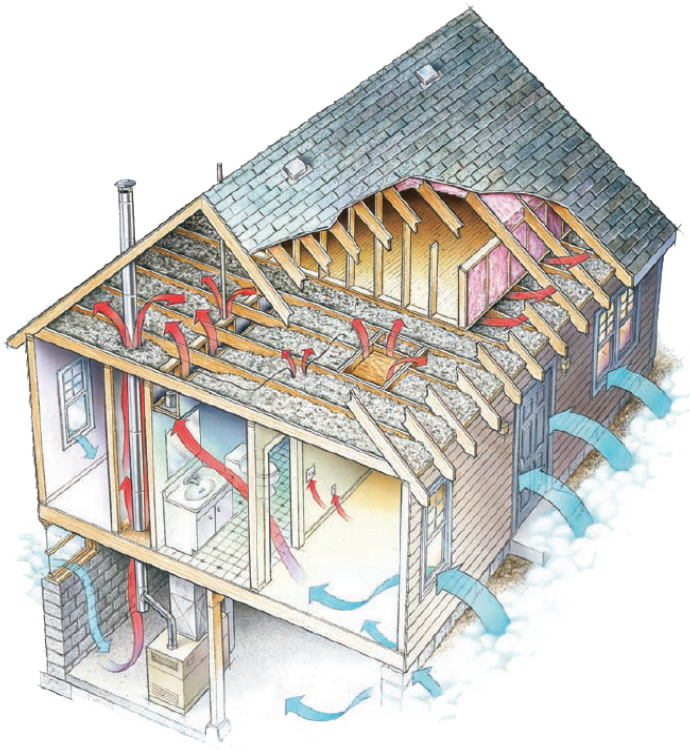
PRO TIP: A foam applicator gun can be helpful in ensuring a solid adhesion between the foam and the surface, as well as wasting less foam. These applicator guns are available at some retailers and most insulation distributors. If you use a foam applicator gun, be sure the foam you buy has a top that fits your foam gun (the foam cans with straw applicators do not generally fit foam applicator guns).

# PROJECT: ATTIC AIR SEALING

## Why Air Sealing?

The winter is when you are most likely to notice your home's air leaks. You may feel these drafts around windows and doors, and think these leaks are your major source of wasted energy. In most homes, however, the most significant air leaks are hidden in the attic and basement. These are the leaks that raise your energy bill and make your house uncomfortable.

In cold weather, warm air rises in your house, just like it does in a chimney. This air, which you have paid to heat, is just wasted as it rises up into your attic and sucks cold air in all around your home—around windows, doors, and through holes into the basement. The illustration here shows warm air leaving the house through the attic and cold air being pulled into the house. Locating these leaks can be difficult because they are often hidden under your insulation. This guide will help you find these leaks and seal them with appropriate materials.



Even if you have enough insulation in your attic, sealing attic air leaks will enhance the performance of your insulation and make for a much more comfortable home.

Think of your house like a windbreaker: the walls keep the wind out, but if there are holes it will not work effectively. While a windbreaker will keep you warm in some cases, you often will need an additional buffer from the elements. Think of the insulation in your home like the sweater you wear under a windbreaker. The sweater helps keep your inside temperature consistent and the windbreaker keeps the environment from stealing your body heat.

## Common Air Leak Locations

- Attic access hatches.
- Wiring holes/penetrations.
- Plumbing vent.
- Open soffits (the box that hides recessed lights).
- Recessed lights.
- Furnace flue or duct chaseways (the hollow box or wall feature that hides ducts) and may lead down to the furnace room.
- Basement sill boxes or rim joists (where the foundation meets the wood framing).
- Windows and doors.

# Air Sealing Your Attic

Even though most of the gaps spilling warm air into your attic are buried under insulation, you might be able to find evidence of these gaps. Look for areas where the insulation is darkened. This is the result of filtering dusty air from the house. In cold weather, you may also see frosty areas in the insulation caused by warm, moist air condensing and then freezing as it hits the cold attic air. In warmer weather, you will find water staining in these same areas. Although the insulation is dirty, it is still okay to use: there is no need to replace the insulation. After sealing the areas, move the insulation back into place.

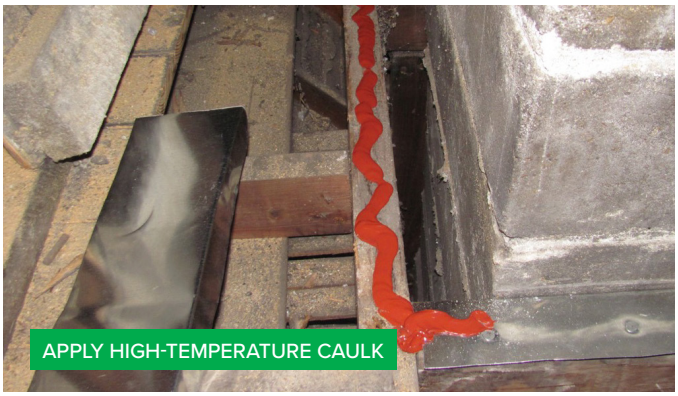
UNSEALED CHIMNEY FLUE

# Sealing Air Leakage Sites—Flues and Heat Sources

*(Including rangehoods and heaters on bath fans)*

A heat source is any penetration through the attic that has the potential to ignite combustible sealing materials. Examples of heat sources include recessed lights, metal flue pipes (furnaces, boilers, water heaters, and dryer vents), masonry chimneys, cooking stove/range hood exhaust vents and exhaust fans with heat lamps/electric heaters. You should always use special non-combustible materials to air seal heat sources. A range hood over the stove is a heat source. A fan in the kitchen ceiling that is not directly over the range/stove is not a heat source, so you can treat it like any non-heat source bath fan duct.

The opening around a furnace or water heater flue or chimney can be a major source of warm air moving in the attic. Because the pipe gets hot, building codes usually require three inches of clearance from metal flues and masonry chimneys to any combustible material, including insulation. The photo series right shows how to seal this gap with lightweight aluminum flashing and special high-temperature (heat-resistant) caulk.



APPLY HIGH-TEMPERATURE CAULK

PLACE ALUMINUM FLASHING OVER THE GAP AND SEAL REMAINING GAPS

## Identifying Attic Flues, Vents, and Pipes

| Flues/vents/pipes: | Made out of: | Seal around with: |
|---|---|---|
| Furnace/water heater | Galvanized metal | Aluminum flashing and high-temperature silicone caulk |
| Chimney | Masonry/metal | Aluminum flashing and high-temperature silicone caulk |
| Plumbing | Cast iron or PVC | Expanding foam or caulk, depending on size of gap |

## Chimney Flues and Vents

Apply the minimum 26-gauge sheet metal over any openings that cannot be bridged by the sealants. You should then seal gaps and leakage points around the sheet metal using the appropriate high-temperature sealant for a minimum distance of three inches from the heat source.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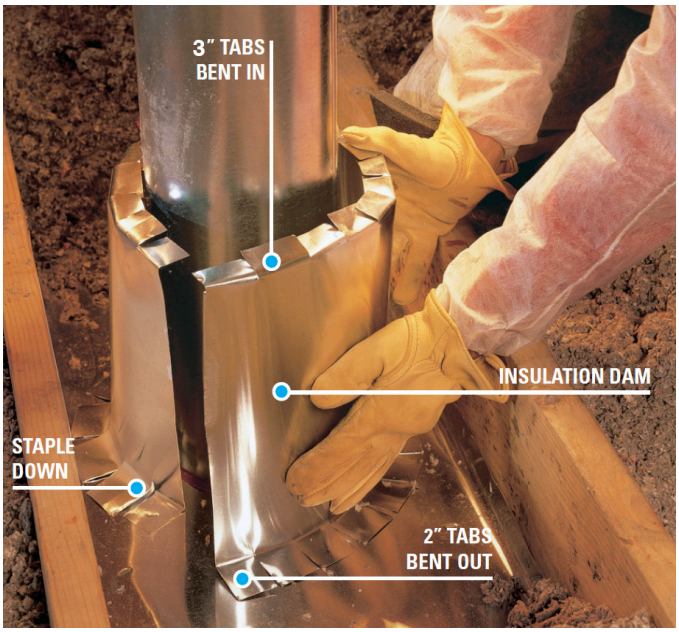


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NOTE: Fire-rated foam is not the same as temperature-rated caulk. Caulk that meets ASTM E136 for oil or wood flues, 500F RTV silicone for gas flues MUST be used here to avoid fire risk.

## Recessed Can Lights

Recessed can lights look great, but when they protrude into your attic space, they can make your home less energy efficient. These recessed lights in a one-story house or in the ceiling of a second-story create open holes into your attic that allow unwanted heat flow between conditioned and unconditioned spaces. In the summer, hot attic air can make the rooms warmer, and in the winter can lights draw warm air up into your attic. Both the warm air leakage and the heat from the lights can cause problems. In cold climates, the heat melts snow on the roof and forms ice dams (where water re-freezes at the roof edge). This is more likely to happen if the can light is close to the roof deck. Recessed can lights in bathrooms also cause problems when warm, moist air leaks into the attic and causes moisture damage.

## Recessed Can Lighting—Two Options Are Available:

**1.** Replace lighting fixture with an insulated ceiling airtight (ICAT)-rated light and seal the opening where the fixture housing and ceiling meet. Do not seal or plug holes, gaps, and openings on the recessed light housing with any material.


**2a.** Build an airtight enclosure over it. The enclosure must be made of cement board or drywall (gypsum board) and held together with foil tape. This enclosure must maintain a minimum clearance of three inches to any part of the fixture and the top of the enclosure cannot be covered with insulation. Reference the instructions on page 12 to learn how to make recessed light enclosures.

**2b.** Alternately a premade recessed light can cover that meets the ASTM E-84 standard. An example that meets this standard are the covers offered by Tenmat (see manufacturer installation instructions). The cover cannot be covered with insulation. Do not seal or plug holes, gaps, and openings on the recessed light housing with any material.

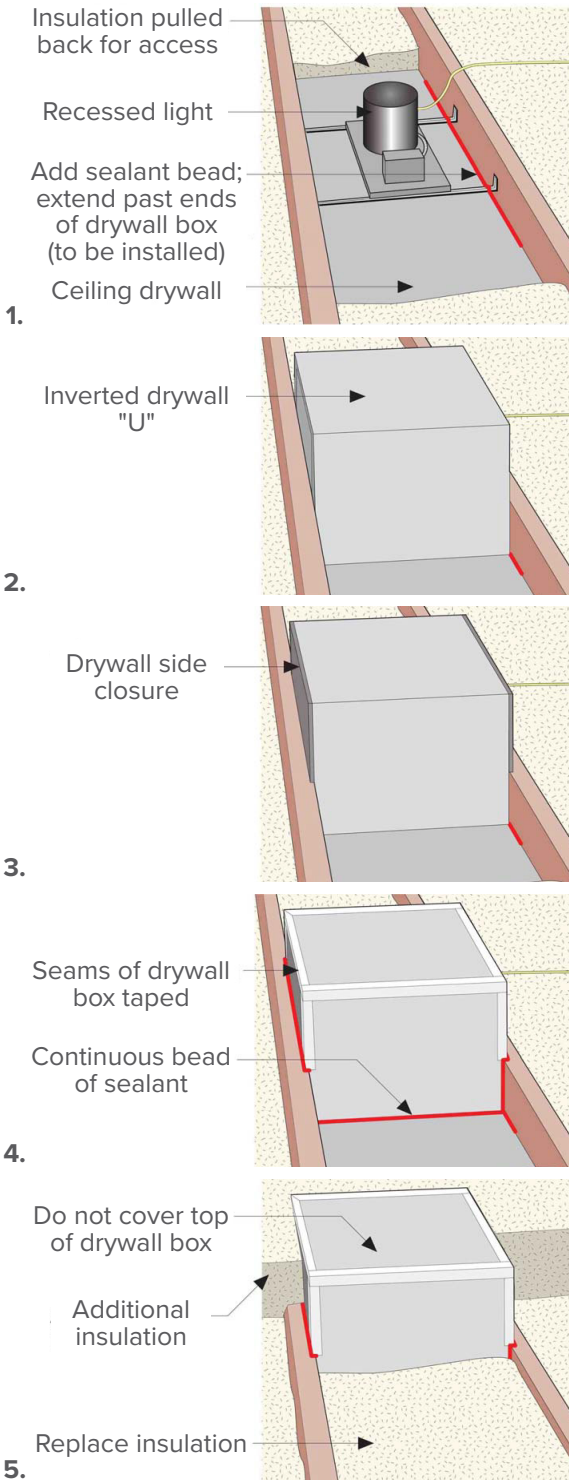

See ENERGY STAR® video for more installation illustrations with premade covers: **basc.pnnl.gov/videos/how-air-seal-attic-can-lights-rule-your-attic-energy-star**

## Recessed Can Light Sealing Options

| Option | Cost | Time (per light) | Difficulty |
|---|---|---|---|
| Replace fixture with ICAT-rated light | $$$$$ (recommend electrician replace the lights) | Per electrician estimate<br>If DIY, dependent on DIY skill and previous experience. | Easy for electrician, moderate DIY difficulty, especially if multiple lights |
| Build airtight enclosure | $$$$$ | 45–60 mins per light | Moderate, difficult if many fixtures to cover |
| Purchase premade enclosure | $$$$$ | 10–30 mins | Easy |

## Recessed Ceiling Light

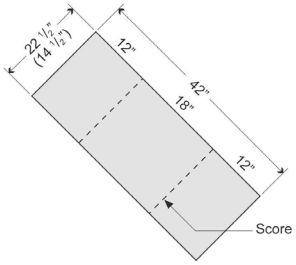
TASK: Control air leakage through the ceiling light, control air leakage between the ceiling light and drywall ceiling, and create an insulation shield (thermal block).



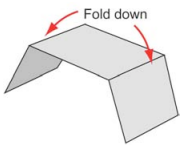

Steps:

- Expose ceiling drywall approximately 12 inches both sides of the recessed can. Add sealant at joist to drywall joint, extending past ends of drywall box (see below). [1]
- Precut 5/8 piece of drywall 42 inches long by 22 1/2 inch (for 24 inch o.c. ceiling joist spacing) or 14 1/2 inch (for 16 inch o.c. spacing). [A]
- Score back side of drywall stock at 12 inches from ends. [B] Break along scored lines and form an inverted “U” shape of ABM to keep insulation three inches from can. [2]
- Install drywall side closure. [3]
- Tape seams of drywall box and join to ceiling with sealant. [4]
- Replace bulb with compact fluorescent (CLF) bulb (less than 60 watts) to reduce heat build-up.

### Detail ready for insulation [5]




A.




B.

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## Bath Fans

### Bath Fans With Integrated Heating Units

For fans with a heater in the unit, you must treat it as a heat source, seal with high-temperature sealant and install a three-inch barrier around the bath fan to prevent insulation from coming in contact with the fan.

PRO TIP: For safety and maximum efficiency, replace bath fans with integrated heating units with a low-sone ENERGY STAR bath fan without a heating unit.

### Bath Fans With Incandescent Lights

If the bath fan has an incandescent light, seal according to recessed lighting strategies noted under can lights in 2a (replace with LED/compact fluorescent lamp (CFL)) lit fan, build a box or premade cover). Do not cover box with insulation.

BATH FAN SEALED

### Fans With Only LED/CFL Lights or No Lights

Exceptions can be made if it is a fixture designed to use only LED or CFL lighting. Seal the openings and perforations with silicone caulk. You can seal the gap between the ceiling and the fan housing with caulk or expandable foam.

OPEN CHASE

## Sealing Air Leakage Sites—Very Large Gaps

Don't worry about finding and sealing all the little holes in your attic; your biggest savings will come from plugging the large ones. Once in the attic, refer to your sketch to locate the areas where leakage is likely to be greatest: where walls (inner and outer) meet the attic floor and dropped soffits (dropped-ceiling areas).

DROPPED CEILING AND SOFFITS

Dropped soffits may be filled or covered with insulation and hard to see. Push back the insulation and scoop it out of the soffits. You will place this insulation back over the soffit once the stud cavities have been plugged and the soffits covered (see photos on page 14). (If you have recessed can lights in your open soffits, please refer back to them on page 11 before proceeding.)

## Plumbing Penetrations (Wet Walls)

A wet wall is a wall that has plumbing pipes running vertically through it to the attic space. It is the one that the waste vent comes through and goes to the roof. Usually, the top plate(s) of this wall have large openings (six inches or greater) that you need to bridge with a rigid, moisture-resistant material (foil-faced bubble wrap or foam board) and then seal with foam.

PLUMBING WET WALL SEALED WITH FIBERGLASS BATT BACKER AND ONE-PART FOAM




## Open Cavities (Spaces Above Walls)

Material selection is the most critical aspect of sealing large open attic chases. Materials that seal chases must be rigid enough to span the opening and support any insulation. For any span greater than 24 inches, framing members must provide support regardless of the material chosen. Choose a moisture-resistant backer (foil-faced bubble wrap or foam board) when exposure to moisture-laden air is likely, such as a bathroom wall. Whatever material you choose, you should cut it in a section large enough to span the chase and have enough overlap to securely fasten it to the surrounding framing. Use foam to seal any remaining gaps between the rigid material and the surrounding ceiling.




## Dropped Soffits

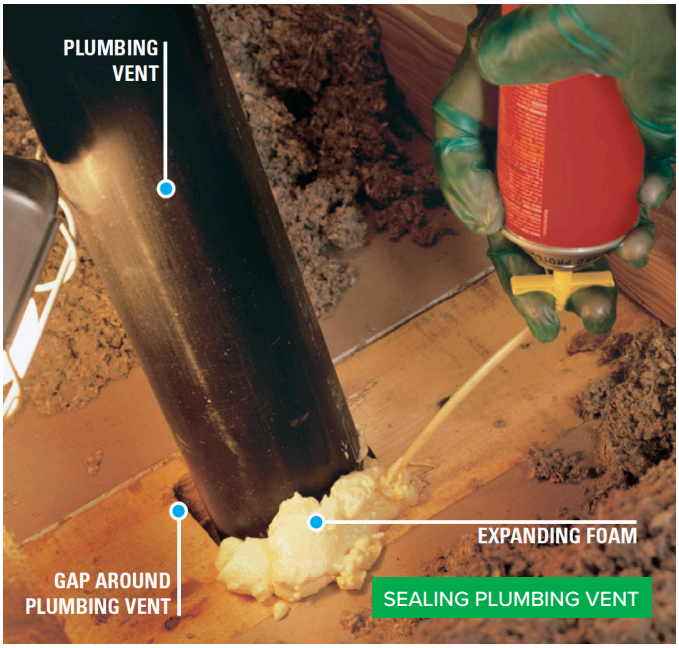
This attic detail most commonly occurs above bathrooms and kitchens. Wallboard is often excluded from areas above cabinets, bathtubs and/or showers, which results in open spaces that are open to wall cavities. Seal these open spaces from the attic using a rigid material, installing and sealing in line with the attic plane. If the dropped soffit or ceiling is above a bathroom or kitchen, use a moisture-resistant backer (foil-faced bubble wrap or foam board). The backer should bridge the span, leaving enough overlap at all edges to staple or screw the backer to the surrounding attic air barrier. Seal the edges and seams with one-part foam.

# Sealing Air Leakage Sites—Small or Medium Gaps

PRO TIP: One-part foams can stick better than caulks in the attic. Silicone does not always adhere well to dirty surfaces or acrylic. Also, one-part foam should be used after misting the surface with water to stick to the surface better.

## Small Gaps (3/8 Inches or Smaller)

- Use expanding foam or caulk to seal the openings around plumbing vent pipes and electrical wires (see photos on this page). Be sure to wear gloves and be careful not to get expanding foam on your clothes, as the foam is very sticky and nearly impossible to remove once it sets. When the foam or caulk is dry, cover the area again with insulation.







- All caulking materials should be rated for a minimum 20-year life (found on the tube label). Caulking used around chimneys should be rated for use against heat sources.

## Medium-Size Gaps (3/8 to 3/4 Inches)

- Use backers on medium-size gaps.
- Backing material may include: plywood, foam board, foil bubble wrap or similar (to block large bypasses), flashing materials (required for damming and to bridge gaps at chimneys and flues), wallboard, glass, or mineral fiber insulation as a backer for other sealants, backer rod (foam rope) as a backer for other sealants, six-mil (0.150 mm) polyethylene sheet, cellulose, or fiberglass insulation in dense-pack application, house wrap such as “Tyvek” or similar.
    a. Silicone caulk can span gaps of 3/8 inch or less, siliconized acrylic can span 3/16 or less. Using an appropriate backer, silicon can span a 1/2 inch gap, siliconized acrylic can span 3/8 inch.
- If gap is larger than 3/4 inches, see Sealing Air Leakage Sites—Very Large Gaps, page 13.

## Top Plates

SEALED TOP PLATE 2X4

At the top of most walls is a small gap between the drywall and the wooden stud it is nailed to. This is called the top plate. Most insulation can be pushed aside as you move along the top plates, spraying foam over and into this gap. If loose-fill insulation is present, it should be completely swept aside or vacuumed away to allow for proper foam adhesion to the material.

All top plates of the wall between the home and an attached garage should be air sealed. Then prioritize air sealing top plates, looking for medium gaps or indications of air leakage (dirty insulation). For best results, all top plates should be air sealed. If you have concerns about reaching all top plates in your attic, consult with a Trade Ally contractor at **focusonenergy.com/findatradeally**.

## Fill Holes With Caulk

Fill wiring and plumbing holes with expanding foam. Caulk around electrical junction boxes and cover or seal holes in box with caulk.

## Stuff Gaps With Insulation

If the space around your plumbing pipe is wider than three inches, you may need to stuff some fiberglass insulation into the space to serve as a backer for the expanding foam.

# Sealing Air Leakage Sites—Attic Access

Attic access from the living space to the attic is as important to seal and insulate as the rest of the attic. In general, there are three types of attic access: attic hatch, pull down stairs, and attic door.

## Attic Hatch

Loose hatches/scuttles will leak air all year long. Hot air will come down them during summer and travel up them during winter. Use a screw-on weatherstripping material, not adhesive strip type, and staple it evenly onto the hatch itself, or overlapping trim or wood stops that the hatch rests on. Build a 20-inch tall barrier around the entrance up into the attic. This will allow for future attic work and prevents loss of insulation falling through the opening while allowing for a consistent R-value right up to the box.




Using either long anchors or polyurethane construction adhesive, affix stacked levels of rigid insulation with an R-value equal to the level of the surrounding insulation. Do not seal the hatch shut using any method. Install screw eye hooks so that a slight compression of the weatherstripping occurs once they are hooked.

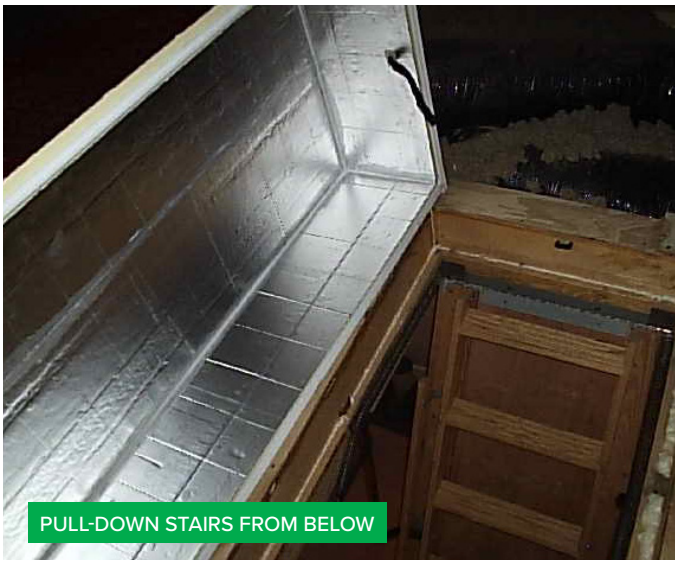
Finish up by sealing the access hatch with weatherstripping (photos below on this page). If your hatch rests directly on the trim, add wood stops to the sides of the framing. The stops provide a wider surface for attaching the weatherstrip and a space to mount hook-and-eye fasteners. Position the screw eyes so the weatherstrip is slightly compressed when the hooks are latched. Cut a piece of rigid foam board insulation the same size as the attic hatch and anchor it to the back of the hatch.

## Pull-Down Stairs

Pull-down stairs can be treated using a cover made or built with as much R-value as possible to allow for the stairs to still retract up. Seal all seams with glue or foil tape, and create a flat surface around the entire stair area to allow for a good airtight seal when the cover is in place. Again, use a fastening mechanism to tightly anchor the lid against the resting surface. Build or use materials light enough to be lifted out of place when attic access is necessary.

Attic pull-down stair covers are available for purchase online or at home improvement stores and can be used here.

PULL-DOWN STAIRS FROM INSIDE ATTIC



PULL-DOWN STAIRS FROM BELOW

## Attic Door

Weatherstrip doors between the living space and the attic space. Install screw-on weatherstripping that has either a wood or steel edge. The weatherstripping must form an airtight seal when the door is closed. Apply a small bead of caulk as necessary to prevent air leakage behind the weatherstripping. If necessary, install eye hooks or barrel bolts with sufficient tension to compress the weatherstripping.

Use one of two types of sweeps on exterior doors, depending on frequency of door usage. For doors that have high usage, use a spring-loaded sweep that will only engage and contact the floor when the door is closed. For low-use doors, use either the spring-loaded sweep or a non-retracting sweep that always contacts the floor.

Insulate the door with foam board using either screws with two-inch washers that are long enough to penetrate through the foam board, or long anchors or polyurethane construction adhesive. Affix stacked levels of rigid insulation with an R-value equal to the level of the surrounding insulation without causing interference with the operation of the door.

ATTIC DOOR INSULATED

WEATHERSTRIPPING AND FASTENER

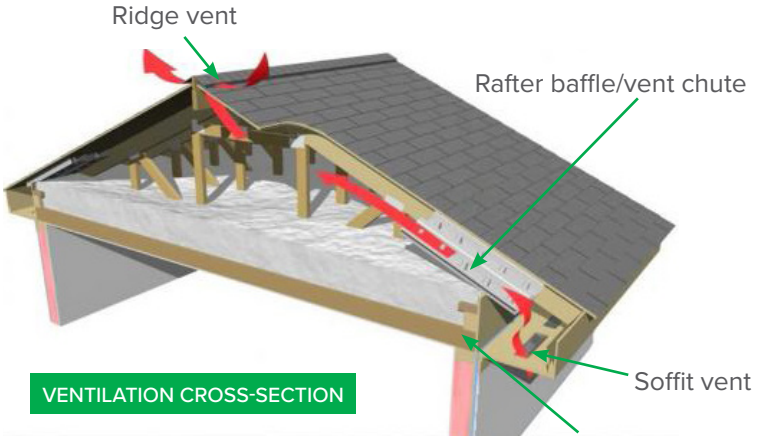
# PROJECT: ATTIC VENTILATION

## Why Attic Ventilation?

At first it may seem odd to add insulation for warmth and then purposely allow cold air to enter the attic through vents, but this combination is the key to a durable and energy-efficient home. Here's why: In the winter, allowing a natural flow of outdoor air to ventilate the attic helps keep it cold, which reduces the potential for ice damming. This is snow that melts off a roof from an attic that is too warm and then re-freezes at the gutters, causing an ice dam that can damage the roof. In the summer, natural air flow in a well-vented attic moves super-heated air out of the attic, protecting roof shingles and removing moisture. The most common mistake homeowners make when installing insulation is to block the flow of air at the soffit vents. Never cover attic soffit vents with insulation—use rafter baffles and soffit vents to maintain airflow.

## Have Enough Ventilation?

Building codes require that vented roofs have a specified amount of ventilation area. This is usually expressed as a ratio. For example, the International Residential Code (2015 IRC R806.1) requires that the total net free ventilating area should not be less than 1/300 of the area of the attic space to be ventilated. Free vent area is the total area of the actual holes in the vent—it does not include the area of the material of the vent itself. Ideally the venting should be split into both low (soffit/eave) and high places (ridge/roof) in the attic. Attic venting is often addressed when the home is roofed, or re-roofed, but it might be needed in your home. If you're concerned about having too little attic ventilation, contact a Trade Ally contractor.




VENTILATION CROSS-SECTION

## Installing Rafter Baffles

The end of each ceiling joist bay that connects to a soffit vent will need a baffle. When soffit vents are to be installed or already exist, install baffles in the space connected to the soffit vents in such a way that you can insulate the top plate. Where possible, provide a clearance of one inch from the top of the baffle to the underside of the roof sheathing in accordance with building code. To install the rafter baffles, staple them directly to the roof decking. Rafter baffles come in four-foot lengths and 14 1/2 and 22 1/2 inch widths for different rafter spacings. Rafter baffles should be placed in your attic ceiling in between the rafters at the point where your attic ceiling meets your attic floor. Once they are in place, you can then place the batts or blankets, or blow insulation, right out to the very edge of the attic floor.

NOTE: Blown insulation may require an additional block to prevent insulation from being blown into the soffit. This blocking should be permanent, mechanically fastened at sides and at bottom with staples. It should ensure the free movement of air through soffit vents into the attic, but not allow the air to "wind wash" (blow away) the insulation and reduce its effectiveness.

BAFFLE

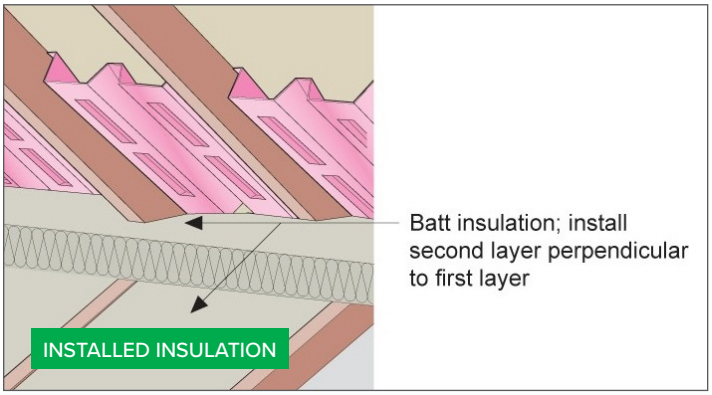
# PROJECT: INSULATION

## Insulation Methods

When adding additional insulation, you do not have to use the same type of insulation that currently exists in your attic. You can add loose fill on top of fiberglass batts or blankets, and vice-versa. If you use fiberglass over loose fill, make sure the fiberglass batt has no paper or foil backing; it needs to be "unfaced." If you choose to add loose fill, it may be wise to hire a professional, as the application requires the use of a blowing machine, although some home improvement stores offer rentals of this machine.

## Batt Installation

Laying fiberglass rolls is easiest for a DIY job. If you have any type of insulation between the rafters, install the second layer over and perpendicular to the first (again, the second layer of roll insulation should be unfaced, with no vapor retarder). This will help cover the tops of the joists and reduce heat loss or gain through the frame. Also, when laying down additional insulation, work from the outer perimeter of the attic back toward the attic access opening. Never lay insulation over recessed light fixtures, bath fans with heaters or soffit vents. Keep all insulation at least three inches away from all heat sources.




*Building America Solution Center*

PRO TIP: Don't try to compress, bend, or squash batts to fit around joists or obstructions. Use a utility knife to cut a slot for the obstruction and allow the batt to lay flat neatly.

Purchase unfaced batts (no paper on them) that help your attic meet between R-38, at minimum, and R-50, Focus on Energy recommended.

PRO TIP: Make sure the first layer of insulation is the height of the joists.

## Open Blow Insulation Installation

*Cellulose or fiberglass; does not need to match your existing insulation.*

Install loose-fill blown-in insulation according to manufacturer's specifications and recommended densities. All open blow attics must be installed to a level condition. Install insulation depth markers at one per every 300 square feet of attic area, with lettering at least one inch in size and with the lettering facing the access. This will help you know when you've covered the area sufficiently with insulation.

INSULATION DEPTH MARKER

Insulation in open blow areas will have minimum material count, per manufacturer's instructions, as follows: Thickness is average settled thickness. A blown insulation table and example is provided below.

Example: Let's assume you have R-15 existing insulation in your attic. To reach R-50 or greater, you need to add another R-35 minimum. According to this insulation brand's chart, your attic needs an additional 12 3/4 inches of insulation added. You'll need a certain number of bags to reach that 12 3/4 inches. If your attic is 1,000 square feet, you would need to add 17 bags of insulation to the existing insulation.

PRO TIP: When blowing insulation, you'll need to install all 17 bags, even though it may seem like you've added enough. If you don't add the specified number of bags, you won't achieve your desired insulation R-value.

## Attic Coverage Chart

| **R-VALUE (HR-SQ.FT.-°F/BTU)** TO OBTAIN INSULATION RESISTANCE (R) OF: | **MIN. INSTALLED THICKNESS (INCHES)** INSTALLED INSULATION SHALL NOT BE LESS THAN: | **SETTLED THICKNESS (INCHES)** EXPECTED THICKNESS AFTER LONG-TERM SETTLING HAS OCCURRED: | **MINIMUM WEIGHT PER UNIT AREA (POUNDS/SQ.FT).** WEIGHT PER SQ.FT. OF INSTALLED INSULATION SHALL NOT BE LESS THAN: | **BAGS PER 1,000 SQ.FT.** MINIMUM NUMBER OF BAGS PER 1,000 SQ.FT. OF NET AREA SHALL NOT BE LESS THAN: | **MAXIMUM NET COVERAGE (SQ.FT./BAG)** CONTENTS OF THIS BAG SHALL NOT COVER MORE THAN: |
|---|---|---|---|---|---|
| 13 | 4.75 | 4.75 | 0.180 | 5.5 | 182.9 |
| 19 | 6.75 | 6.75 | 0.266 | 8.1 | 124.2 |
| 22 | 7.75 | 7.75 | 0.311 | 9.4 | 106.3 |
| 26 | 9.00 | 9.00 | 0.368 | 11.2 | 89.6 |
| 30 | 10.25 | 10.25 | 0.428 | 13.0 | 77.0 |
| 38 | 12.75 | 12.75 | 0.555 | 16.8 | 59.5 |
| 44 | 14.75 | 14.75 | 0.662 | 20.1 | 49.8 |
| 49 | 16.25 | 16.25 | 0.747 | 22.6 | 44.2 |
| 60 | 19.50 | 19.50 | 0.940 | 28.5 | 35.1 |

*The manufacturer recommends that the insulation be installed at these minimum thicknesses and maximum coverages to provide the levels of insulation thermal resistance (R-value) shown.*

# PROJECT: SILL BOX SEALING AND INSULATION

Though you may not be able to see cracks in the rim joist cavities, it is best to seal up the entire perimeter of the square cavity between the ends of your basement's joists/support boards. Also, rim joist air sealing is especially important at bump out areas such as bay windows or that hang off the foundation.

NOTE: You should seal penetrations that go through the sill box to outside (i.e., cables, wiring, piping). But do not seal or insulate dryer or dryer vent cavities as this is a potential fire hazard.

## Preparation

1. Prepare the room by moving all furniture at least three feet from the walls.
2. Remove all debris and existing insulation from sill boxes to ensure a tight fit.
3. Wear gloves and long sleeve shirts or coveralls. Spray foam is extremely sticky and cannot be washed off. It will typically require time to wear off skin and may never fully come off clothing.
4. Collect appropriate sealing materials. Caulk is best for sealing gaps or cracks that are 1/4 inch or less. Use spray foam to fill gaps from 1/4 inch to about three inches.

**PRO TIP:** For block concrete walls, if the top of your foundation wall has openings, block (stuff) the void with fiberglass batt and foam over the batt.

## Air Sealing and Insulating Sill Boxes

Use these instructions for sealing the areas of your basement where the floor joists meet the wall, creating a series of small boxes along the wall. There are two methods you can use to seal and insulate these areas:

Method 1: Use caulk or one-part foam to seal edges of sill box then install batt insulation.

SILL BOX SEALED

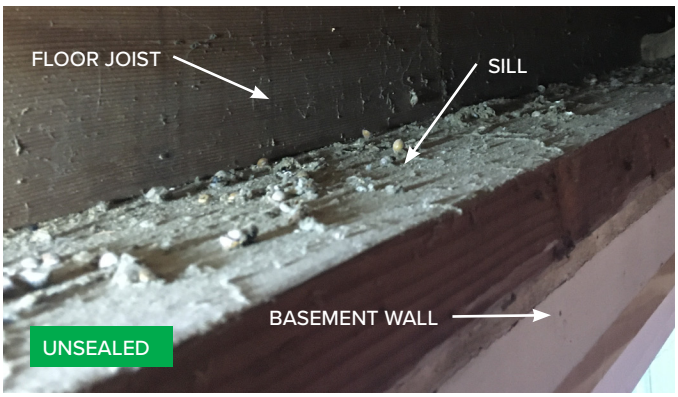
Method 2: Install foam board and caulk or seal edges of foam board. Insulation should be two inches thick (you can use two layers of one-inch thick insulation).

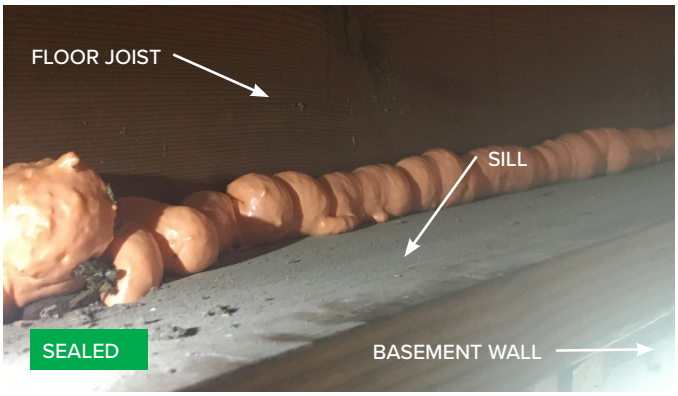
SEALED AND INSULATED WITH FOAM BOARD

# Air Sealing and Insulating Floor Joists on Wall Ends

Use these instructions for sealing the areas of your basement where the floor joists run parallel to the basement wall. There are three different scenarios you may encounter based on the length of your home:

- If you have clearance to work with, you can treat it as one large sill box, foaming the edges and insulating.
- If you can fit material but cannot seal the outside edge, fill the space with unfaced batt insulation or call a Trade Ally contractor (find one at **focusonenergy.com/findatradeally**).
- If you cannot fit a hand or material, call a Trade Ally contractor to seal these with two-part foam.




## Have Questions? We Are Here for You.

For more information on Focus on Energy rebates and Trade Ally contractors, call 800.762.7077 or visit **focusonenergy.com**.