

# 2008 Insulate Colorado Program

Insulation Contractor Seminars

April 2008

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Governor's Energy Office

[www.colorado.gov/energy](http://www.colorado.gov/energy)



Governor's  
Energy Office

# Before We Begin

- Sign-In Sheet
- Restrooms
- Break (as needed)
- Cell Phones (off or vibrate) take calls outside



# Today's Discussion:

- Introductions
- Colorado's New Energy Economy
- Program Overview
- Technical Review
- Rebate Forms & Contractor Signatures
- Questions & Discussion



# Introductions

- Who Are You?
- Your Company or Agency?
- What Do You Do?
- Insulation Experience?
- Retrofit or New Construction?



# The New Energy Economy

- Governor Ritter's Executive Order in April 2007 Brings a New Challenge to the Colorado State Energy Office
  - Advance Both Energy Efficiency Practices and Renewable Energy Technology in All Sectors Across Colorado
- Governor's Energy Office (GEO) Established in April 2007
- New Energy Staff Joins the GEO in 2007 to Launch 2008 Programs



# The New Energy Economy

- Energy Policy, Legislation, Resources & Funding
- Commercial & Public Buildings
- Income-Based Energy Services
- Electric & Gas Utilities
- Greening Government
- Renewable Energy
- Colorado Carbon Fund
- Residential Energy



# The New Energy Economy

## Legislation and Policy

*2007 Legislative Session is "Greenest" in Colorado's History*

- Double to Renewable Portfolio Standard (10% to 20% by 2020)
- Create the Clean Energy Fund (~\$7 Million)
- Wind for Schools Program, Energy Codes, State LEED Buildings, Etc ...



# The New Energy Economy

## Greening Government

State Government Is Tasked to “Lead by Example”

to Achieve Gov. Ritter’s “Greening Government” Executive Orders Goals:

- 20% reduction in paper use
- 10% reduction in water use
- 25% reduction in petroleum use
- 20% reduction in energy use

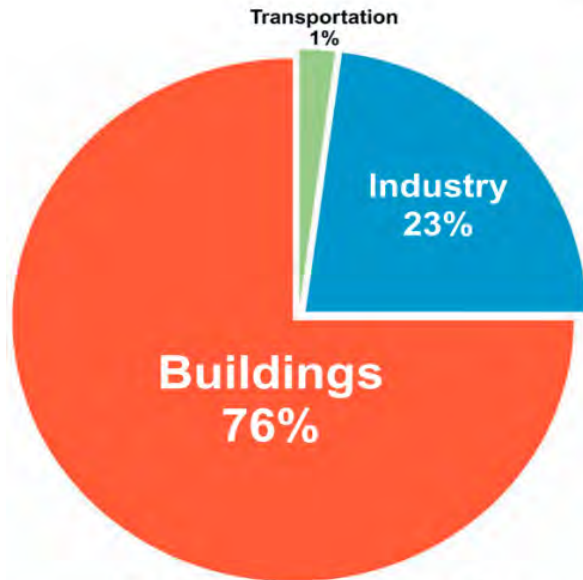




# The New Energy Economy

- Why Buildings?

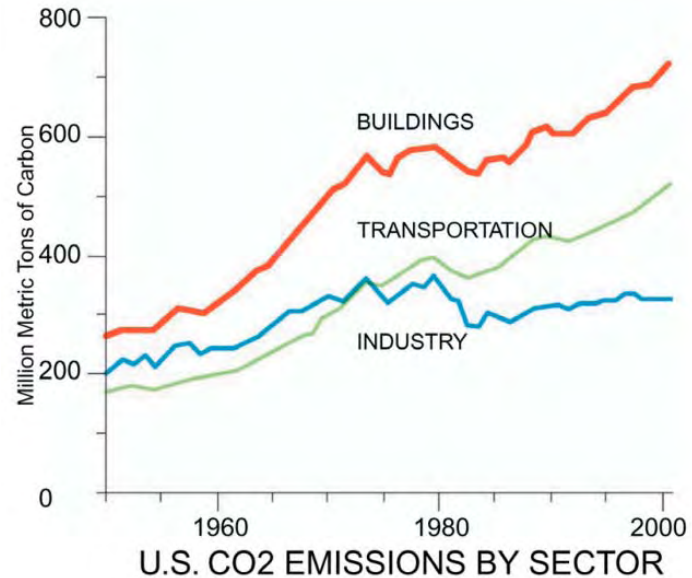
- 76% of All Power Plant Electricity Is Used to Operate Buildings



U.S. Energy Consumption

- Why Buildings?

- Buildings Account for 50% of All Greenhouse Gas Emissions



U.S. CO2 EMISSIONS BY SECTOR

Source: U.S. Energy Information Administration statistics



Governor's  
Energy Office

# The New Energy Economy

## Commercial Buildings

- New Construction
  - High Performance Design - SB 51
  - LEED Design Assistance grants
  - Major Focus on New Public Schools (LEED for Schools)
- Existing Buildings
  - Performance Contracting
  - State buildings utility bills management system



# The New Energy Economy

## 2008 Residential Programs

- New Construction
  - Colorado ENERGY STAR New Homes
  - HB 1146: Code Training & Support
- Existing Homes
  - Insulate Colorado



# Insulate Colorado

- Program Overview
  - Partnerships with Cities, Counties & Utilities
  - Turnkey Rebate Program for Existing Home Attic & Exterior Wall Insulation
    - 20% of Job Cost, Up to \$300 (whichever is less)
  - Matching Grants for Local Implementation
    - Dollar for Dollar Match (up to \$25k)



# Insulate Colorado

- Implementation Model Overview
  - Homes Insulated to IECC 2006 Levels
  - No DIY, Must Use Eligible Contractor
  - Homeowner Must Submit Invoice Copy with Rebate Form to City or County
  - Measure and Verification Audit Program
  - State Sponsored Marketing Campaign



# Insulate Colorado

- Objective Overview
  - Improve the Energy Efficiency of Existing Colorado Homes
  - Support the CO Insulation Contractor Industry
  - Bring 3000+ Under-Insulated CO Homes Up to IECC 2006 Recommended Levels



# Insulate Colorado

- Program Guidelines
  - Homeowners Must Live in Participating Jurisdiction
  - Only Contractors That Complete This Course May Qualify Homeowners For Local Rebates
  - Insulation MUST Be Installed to R-Value That Meets or Exceeds the Climate Zone's IECC 06 Minimum R-value for Attics & Walls



# Insulate Colorado

- Program Guidelines (continued)
  - Rebate Forms Must be Properly Filled Out By Homeowner AND Contractor
  - Completed Rebate Forms AND all Required Documentation Mailed to the Local Participating Government
  - Homeowner Will Be Eligible to Receive up to 20% of Total Cost Job Cost or \$300 max. (whichever is less)





# Insulate Colorado

- Program Guidelines (continued)
  - Rebates Will be Awarded To Homeowners on First Come, First Served Basis, Until the Funding is Exhausted
  - Only Attic and Exterior Wall Insulation Work Will Qualify, (and Air Sealing Measures)
  - Existing Homes Only, No New Construction
  - Homeowners Should Contact Local Government to Ensure Availability of Funds



# Insulate Colorado

- Program Guidelines (continued)
  - Homeowner Submits The Following
    - Completed Homeowner Rebate Form
    - Copy of the Insulation Contractor's Itemized Invoice
    - Copy of the Insulation Card



# Insulate Colorado

- Program Guidelines (continued)
  - Recommended IECC 2006 R-Values Vary By County (see Rebate Form):

County	Ceiling Insulation	Wood Framed Wall Insulation
Climate Zone A	R-38	R-13
Climate Zone B	R-38	R-19*
Climate Zone C	R-49	R-19*
Climate Zone D	R-49	R-21*

\* = Or insulation sufficient to fill the framing cavity, R-13 minimum for 2x4 wall cavity



# Insulate Colorado

- Timelines & Rollout
  - Matching Grants for Cities & Counties
    - Application Was Available Through Jan 2007
    - Awards Made March 2008
  - Contractor Seminars
    - April 2008
  - Rebate Availability with Governor Kick-Off and Public Marketing Campaign
    - April 2008 - Dec 2008 (or funds are depleted)



# Insulate Colorado

## Participating Jurisdictions

- Arvada
- CRC with Boulder County (Boulder, Longmont, Lyons, Louisville, Superior, Nederland, Jamestown, Lafayette)
- CORE with Aspen, Basalt, Carbondale & Glenwood Springs
- Summit County (Frisco & Breckenridge)
- CESC with Denver

## Participating Jurisdictions

- Cortez
- ORE with Mt. Crested Butte & Crested Butte
- Eagle County (Vail)
- San Miguel County (Telluride & Mt. Village)
- 4 CORE with La Plata County (Durango & La Plata Electric)
- Chaffee County
- Colorado Springs Utilities

Check [www.colorado.gov/energy](http://www.colorado.gov/energy) for full list



Description of Insulation Installed and Air Sealing Installed (Must Be Completed)

Where Installed	Type of Insulation	Number of Inches Existing Prior to New Installation	Existing R-Value (see Worksheet below)	Number of Inches Installed	Square Feet of Area	Total R-Value Installed	Air Sealing Completed in Area
Attic							
Exterior Walls							



Rebate Calculations

- A. Total Cost of Attic Insulation Work \$ \_\_\_\_\_
- B. Total Cost of Exterior Wall Insulation Work \$ \_\_\_\_\_
- C. Total Cost of Air Sealing Measures \$ \_\_\_\_\_
- D. Sum Cost (A.) + (B.) + (C.) = \$ \_\_\_\_\_
- E. Multiply (D.) x 0.20 = \$ \_\_\_\_\_

Total REBATE Requested, enter \$300 or value in (E), whichever is less: \$ \_\_\_\_\_

By my signature, I am confirming that the information entered is accurate to the best of my knowledge. (Both Contractor and Homeowner signatures are required.)

Contractor \_\_\_\_\_ Date \_\_\_\_\_

Homeowner \_\_\_\_\_ Date \_\_\_\_\_

Optional Insulation Calculation Worksheet

Evaluating the R-Value of Insulation in Existing Homes (includes effects of aging and settling)

R-Value Table (from www.coloradoenergy.org)

Insulation Type	R-Value Per Inch of Thickness
Rberglass Batt	3.1 to 4.3
Rberglass Blown (attic)	2.2 to 4.3
Rberglass Blown (wall)	3.7 to 4.3
Rock Wool Batt	3.1 to 4.0
Rock Wool Blown (attic)	3.1 to 4.0
Rock Wool Blown (wall)	3.1 to 4.0
Cellulose Blown (attic)	3.1
Cellulose Blown (wall)	3.7
Vermiculite	2.1

1. Use this formula to estimate the R-Value of your existing insulation:

$$\frac{\text{_____}}{\text{(Thickness in Inches)}} \times \frac{\text{_____}}{\text{(R-Value per Inch)}} = \frac{\text{_____}}{\text{(Estimated Total R-Value)}}$$

2. Use this formula to estimate needed R-Value of Insulation:

$$\frac{\text{_____}}{\text{(Recommended R-Value)}} - \frac{\text{_____}}{\text{(Existing R-Value)}} = \frac{\text{_____}}{\text{(R-Value Needed)}}$$

3. Use this formula to estimate how many inches of insulation to add (to obtain recommended R-Value):

$$\frac{\text{_____}}{\text{(R-Value Needed)}} \div \frac{\text{_____}}{\text{(R-Value per Inch)}} = \frac{\text{_____}}{\text{(Estimated Inches Needed)}}$$

# 2008 Insulate Colorado

"Supporting residential energy efficiency is a significant component of Colorado's New Energy Economy. Insulation and air sealing can help homeowners save energy, save money and increase the comfort of their homes."

*Bill Ritter Jr.*  
Governor Bill Ritter, Jr.



2006 IECC Recommended R-Value (recommended by county)

Climate Zone	Ceiling Insulation	Wood Framed Wall Insulation
All Counties in IECC Climate Zone A	R-38	R-13
All Counties in IECC Climate Zone B	R-38	R-19*
All Counties in IECC Climate Zone C	R-49	R-19*
All Counties in IECC Climate Zone D	R-49	R-21*

\* Or insulation sufficient to fill the framing cavity. R-13 minimum for 2x4 wall only

Supported in Partnership with the



**Governor's Energy Office**  
A key to Colorado's New Energy Economy

# Technical Review

## ➤ Safety

- Confined spaces
- Occupied Homes
- Pre-Lead Notification ('78 & older)

## ➤ Thermal Boundary

- Defining T-boundary
- Pressure boundary
- Aligning the two

# Technical Review

## Attics

- Prep & Air-Sealing
  - Air-Sealing techniques
  - Penetrations and by-passes
  - Heat sources
- Installation Procedures
  - Install techniques
  - Alternative methods
  - Tips & Tricks



# Technical Review

## Walls

- Working in Occupied Homes
- Lead Safe Work
- Prep & Sealing
- Dense Pack Insulation
- Tips, Tools & Equipment

# Confined work space



Step carefully! Stay on 2x's  
Use planks for extra support

# In our program we require use of Personal Safety Equipment



# Thermal Boundary

- What is it?
- How to define it
- Pressure Boundary
- Aligning the two



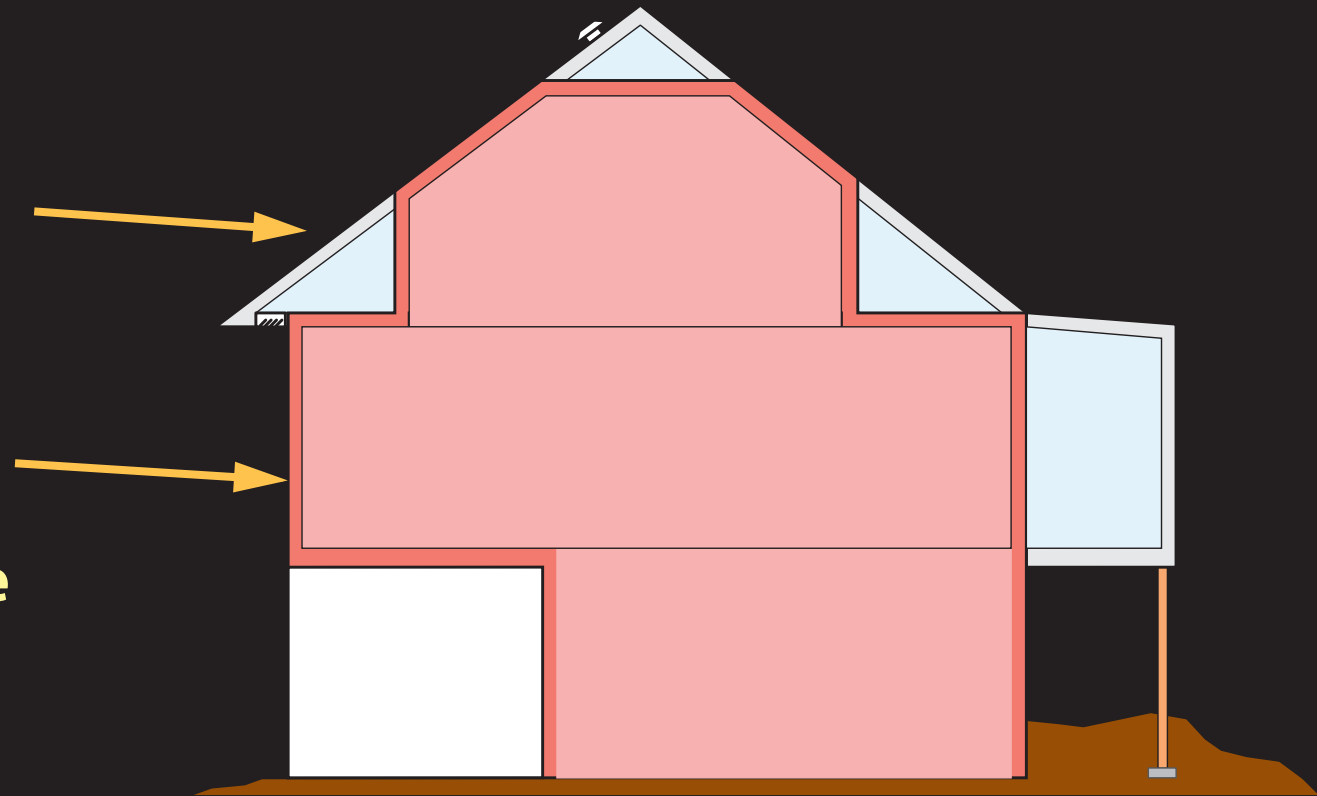
# Where to Install Insulation

**Insulation and air barrier should be located adjacent to one another**

*Insulation + air barrier = thermal boundary*

**Thermal boundary hard to define here**

**Thermal boundary easier to define here**





# LOCATING AIR LEAKS

More than any other time of year, you notice your home's air leaks in the winter. Most people call these air leaks "drafts." 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 significantly 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 illustrations on Page 1.3 and 3.1 show warm air leaving (red arrows) the house through the attic and cold air being pulled into the house (blue arrows). 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.

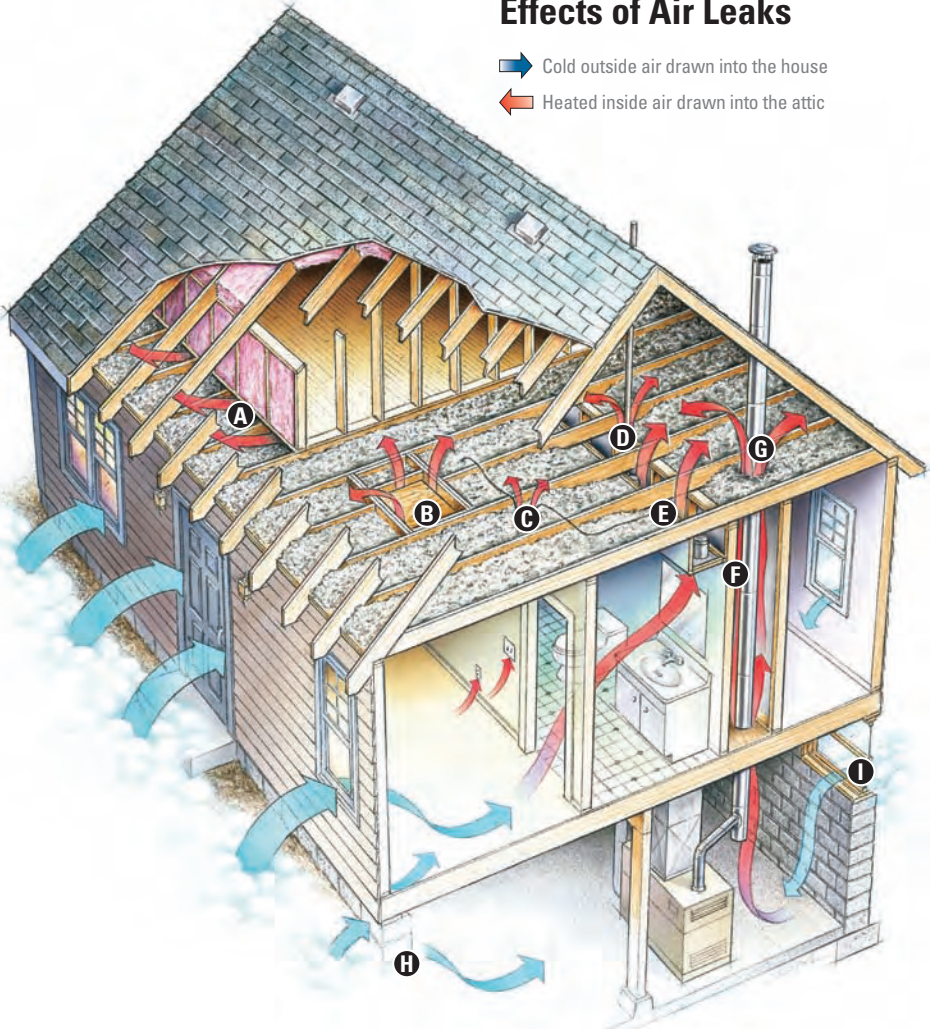
If you are not familiar with some of the terms in this guide, check our glossary inside the back cover.

## Common Household Air Leaks

- A** Behind Kneewalls
- B** Attic Hatch
- C** Wiring Holes
- D** Plumbing Vent
- E** Open Soffit (the box that hides recessed lights)
- F** Recessed Light
- G** Furnace Flue or Duct Chaseways (the hollow box or wall feature that hides ducts)
- H** Basement Rim Joists (where the foundation meets the wood framing)
- I** Windows and Doors

## Effects of Air Leaks

-  Cold outside air drawn into the house
-  Heated inside air drawn into the attic



# Attics

- Seal the big holes first
- Look for leakage indicators
- Bypasses
- Isolate heat sources
- Baffles for ventilation
- Installation

# SEALING ATTIC AIR LEAKS

## Plug the Big Holes First

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, dropped soffits (dropped-ceiling areas), and behind or under attic kneewalls. Look for dirty insulation—this indicates that air is moving through it. 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 (photos 1-3) (If you have recessed "can" lights in your open soffits, please read about them on Page 2.2 before proceeding).

### 1. CREATE STUFFED BAGS



Cut a 16 inch long piece from a batt of unfaced fiberglass insulation and fold it into the bottom of a 13-gallon plastic garbage bag.

### 2. PLUG OPEN STUD CAVITIES



Fold the bag and stuff it into the open stud cavity. Add more insulation to the bag if it doesn't fit tightly. Plug all open stud spaces, then cover the soffit (photo 3, Page 1.7).

### 3. COVER DROPPED SOFFITS



After removing insulation from a dropped soffit, cut a length of reflective foil or other blocking material (rigid foam board works well) a few inches longer than the opening to be covered. Apply a bead of caulk or adhesive around the opening. Seal the foil to the frame with the caulk/adhesive and staple or nail it in place, if needed.

### 4. SEAL BEHIND KNEEWALLS



Cut a 24 inch long piece from a batt of fiberglass insulation and place it at the bottom of a 13-gallon plastic garbage bag. Fold the bag over and stuff it into the open joist spaces under the wall (a piece of rigid foam board sealed with spray foam also works well for covering open joist cavities). Again, cover with insulation when you're done.

## If You Have a Finished Attic, Seal Behind the Kneewalls

Finished rooms built into attics often have open cavities in the floor framing under the side-walls or kneewalls. Even though insulation may be piled against or stuffed into these spaces, they can still leak air. Again, look for signs of dirty insulation to indicate air is moving through. You need to plug these cavities in order to stop air from traveling under the floor of the finished space (photo 4).

**Caution:** Some attics have vermiculite insulation, which may contain asbestos, a health hazard. Vermiculite is a lightweight, pea-size, flaky gray mineral. Don't disturb vermiculite insulation unless you've had it tested by an approved lab to be sure it doesn't contain asbestos. Contact your local health department for the name of an approved lab.



# SEALING ATTIC AIR LEAKS

## Furnace Flues Require Special Sealing Techniques

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 1 inch of clearance from metal flues (2 inches from masonry chimneys) to any combustible material, including insulation. Photos 5 and 6 show how to seal this gap with lightweight aluminum flashing and special high-temperature (heat-resistant) caulk. Before you push the insulation back into place, build a metal dam (photo 7) to keep it away from the pipe. Use the same technique for masonry chimneys.

**Caution:** Furnace flues (the pipe that removes your furnace exhaust) can be very hot.

### 5. CUT ALUMINUM FLASHING



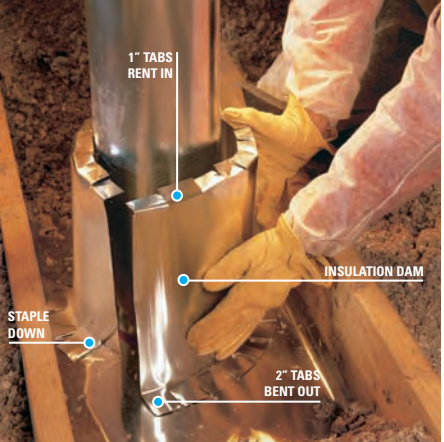
Cut aluminum flashing to fit around the flue. For round flues, cut half circles out of two pieces so they overlap about 3 inches in the middle. Press the flashing metal into a bead of high-temperature caulk and staple or nail it into place. If there's no wood, staple or nail it directly to the drywall, but be sure not to staple or nail through the drywall.

### 6. SEAL WITH SILICONE CAULK



Seal the gap between the flue and metal flashing with special high-temperature caulk. Don't use spray foam.

### 7. FORM AN INSULATION DAM



Form an insulation dam to prevent insulation from contacting the flue pipe. Cut enough aluminum from the coil to wrap around the flue plus 6 inches. Cut slots 1 inch deep and a few inches apart along the top and bend the tabs in. Cut slots about 2 inches deep along the bottom and bend out the tabs. Wrap the dam around the flue and secure the bottom by stapling through the tabs. Now put insulation back right up against the dam.

## Identifying Attic 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

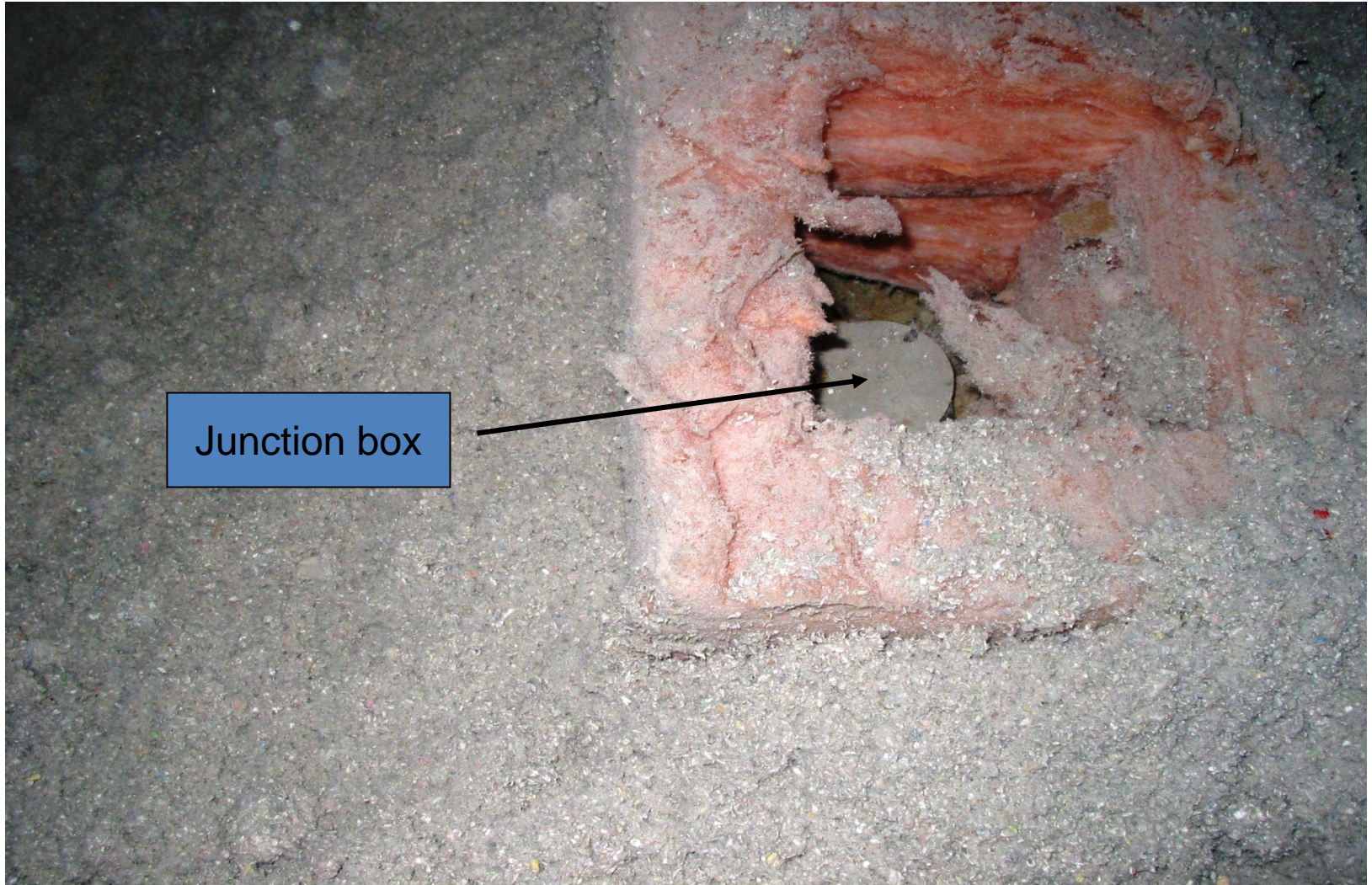
# Isolate Heat Sources



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# R-30 batt used to Isolate





# Knob & Tube wiring Isolated with batts







## SEALING ATTIC AIR LEAKS

### Complete the Job by Sealing the Attic Hatch or Door

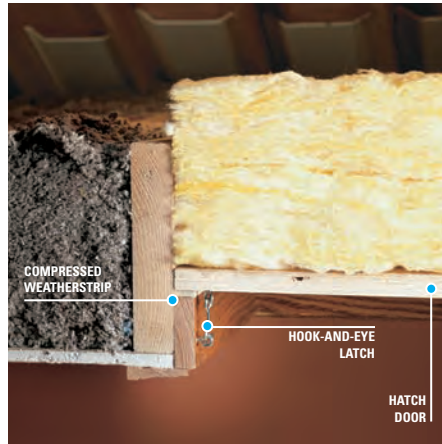
Finish up by sealing the access hatch with self-sticking weather stripping (photos 11 and 12). If your hatch rests directly on the moldings, add 2-1/2 inch wide stops around the opening. The stops provide a wider surface for attaching the weatherstrip and a space to mount hook-and-eye fasteners. Position the screw eyes so the weatherstrip is slightly compressed when the hooks are latched. Cut a piece of fiberglass or rigid foam board insulation the same size as the attic hatch and nail or glue it to the back of the hatch. If you have pull-down attic stairs or an attic door, these should be sealed in a similar manner: weatherstrip the edges and put a piece of rigid foam board insulation on the back of the door. Treat the attic door like a door to the outside. Pre-made insulated attic stair covers are also available from local home improvement centers or on the Web.

#### 11. WEATHERSTRIP THE DOOR



Weatherstrip the attic access hatch or door. Cut 1x3 boards to fit the perimeter of the opening and nail them on with 6d finish nails. Apply self-adhesive foam weatherstrip tape to the top edge of the stop.

#### 12. ATTACH FASTENERS



Attach hook-and-eye fasteners to the attic door and stops. Position the eyes so that the weatherstrip is compressed when you latch the hooks.

## ADDITIONAL SOURCES OF AIR LEAKS

### If Your Heating and Cooling Ducts Are in Your Attic, Seal Them While in the Attic

Leaky and poorly-insulated ducts (especially in attics) severely compromise the performance of your heating and cooling equipment. Sealing and insulating your ducts can increase the efficiency of your heating and cooling system by 20% and greatly increase air flow.

- Check the duct connections for leaks by turning on your heating and cooling system fan and feeling for leaks—seal the joints with mastic or foil tape (household duct tape should not be used).
- Pay special attention to all the duct penetrations going through the attic floor. Seal these with foam.
- Ducts should also be insulated—if your ducts are uninsulated or poorly insulated (i.e., you see gaps or torn insulation), seal them first, then add insulation to keep the air in your ducts at your desired temperature as it moves through the system. Use duct insulation material rated at least R-6.

### Materials Checklist for Attic Duct Sealing

- Duct sealant (mastic) or metal-backed (foil) tape
- Duct insulation material rated at least R-6
- Zip ties to hold duct insulation in place
- Gloves, safety glasses, mask, flashlight

**NOTE: Duct sealant, also known as duct mastic, is a paste which is more durable than foil duct tape. It is available at home improvement centers. Traditional grey duct tape fails quickly and should not be used.**

**Caution: Check for Carbon Monoxide to keep your house safe. After making energy improvements that result in a tighter house, there can be an increased opportunity for CO to build up if your gas-burning appliances are not venting properly. Have your heating and cooling technician check your combustion appliances (gas- or oil-fired furnace, water heater, and dryer) for proper venting. For additional information on Indoor Air Quality (IAQ) issues related to homes such as combustion safety, indoor air contaminants, and proper ventilation, visit [www.epa.gov/iaq/homes/hip-front.html](http://www.epa.gov/iaq/homes/hip-front.html).**

# ADDING ATTIC INSULATION

## Installing Rafter Vents

To completely cover your attic floor with insulation out to the eaves you need to install rafter vents (also called insulation baffles). Complete coverage of the attic floor along with sealing air leaks will ensure you get the best performance from your insulation. Rafter vents ensure the soffit vents are clear and there is a channel for outside air to move into the attic at the soffits and out through the gable or ridge vent (see Attic Air Flow graphic on Page 4.5).

To install the rafter vents, staple them directly to the roof decking. Rafter vents come in 4-foot lengths and 14-1/2 and 22-1/2 inch widths for different rafter spacings.

Rafter vents 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 (see Page 4.5). A piece of rigid foam board placed on the outer edge of the top plate works very well for this.

### 3. PLACE RAFTER VENTS



Place rafter vents in between the rafters where the ceiling meets the floor.

Photo courtesy of Doug Anderson

### 4. ADD INSULATION



Add insulation around the rafter vent and out to the edge of the attic floor.

Photo courtesy of Doug Anderson

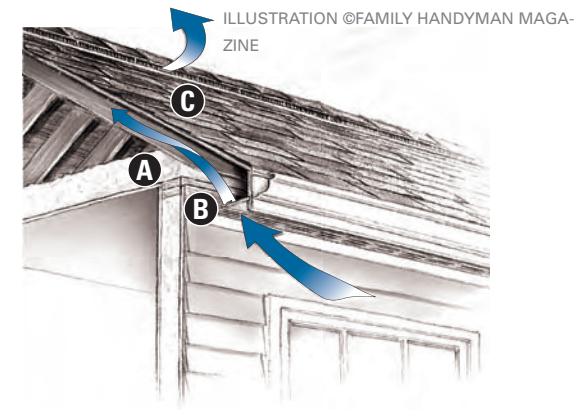
#### 4.4 ADDING ATTIC INSULATION

## Attic Air Flow

The outside air flows through the soffit, along the rafter vent and out through the gable or ridge vent.

- A** RAFTER VENT
- B** SOFFIT VENT
- C** RIDGE VENT

**NOTE: Gable vent not shown in this diagram.**



For additional information on Indoor Air Quality (IAQ) issues related to homes such as combustion safety, indoor air contaminants, and proper ventilation, visit: <http://www.epa.gov/iaq/homes/hip-front.html>.

## GLOSSARY

**ENERGY STAR** – ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency. To learn more about the wide variety of energy-efficient ENERGY STAR products and processes visit <http://www.energystar.gov>.

**Seal and Insulate with ENERGY STAR** – A process recommended by the ENERGY STAR Program for improving the envelope of a home to make it more comfortable and energy-efficient. The process includes sealing air leaks and adding insulation where cost-effective.

**Air Duct** – A hollow conduit or tube (square or round) that circulates air from a forced-air heating and/or cooling system to a room (supply duct) or returns air back to the main system from a room (return duct).

**Air Leak** – A hole, crack, or gap where air can leak in or out of a house. Air leaks can make a home feel drafty or uncomfortable and waste energy (See Page 1.3).

**Gable Vent** – A screened vent installed at or near the peak of a roof gable that allows warm attic air to escape.

**Insulation** – A material that is designed to slow down the flow of heat in or out of a building structure.

**Joist** – A beam used to support floors or roofs (See Page 3.2).

**Kneewall** – A short wall in a room with a sloped ceiling. It is usually formed when the room ceiling follows the roof line of a house (See Page 1.3).

**Rafter Vent** – A vent leading from the soffit into the attic through the space between the attic rafters. This vent allows air to correctly flow past insulation into the attic space (See Pages 4.4 or 4.5).

**Recessed "Can" Light** – A metal light fixture (or can) that is in-set into the ceiling. These fixtures can be a big source of air leaks when installed in the upper floor of a home (See Pages 1.6 and 4.3).

**Ridge Vent** – A screened vent installed along the top ridge of a roof that allows warm attic air to escape (See Page 4.5).

**Sill Plate** – A wood plank that lays flat on top of a concrete or masonry foundation or wall that supports a floor or ceiling joist (See Page 3.2).

**Soffit** – The underside of a building overhang, beam, or arch, especially the underside of a stair or roof overhang (See Page 4.5).

**Soffit Vent** – A screened vent in a house soffit that allows air to flow into the attic or the space below the roof sheathing. This helps keep the attic cool in the summer and allows moisture in the attic to evaporate (See Page 4.5).

#### 4.5 ADDING ATTIC INSULATION

# ADDING ATTIC INSULATION

## A Note about Natural 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 (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). Proper insulation and air sealing also keeps attics cold in winter by blocking the entry of heat and moist air from below. 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 insulation will resist heat transfer into the house. 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 (See Pages 4.4 and 4.5).

## A Note about Attic Fans

Attic fans are intended to cool hot attics by drawing in cooler outside air from attic vents (soffit and gable) and pushing hot air to the outside. However, if your attic has blocked soffit vents and is not well-sealed from the rest of the house, attic fans will suck cool conditioned air up out of the house and into the attic. This will use more energy and make your air conditioner work harder, which will increase your summer utility bill. You don't want your unfinished attic cooled by your air conditioner. To prevent this, follow the air sealing and insulation strategies in this guide and make sure the attic is well-ventilated using passive vents and natural air flow.

### 4.2 ADDING ATTIC INSULATION



Use a blowing machine to blow in loose fill insulation.

Photo courtesy of Green Fiber

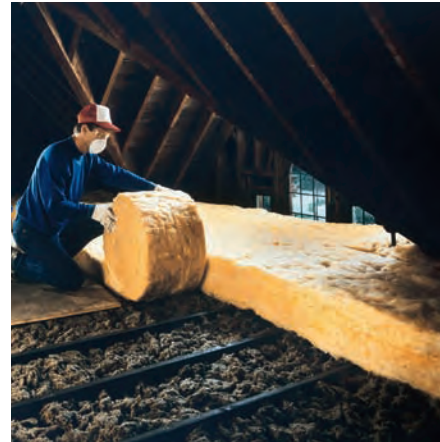
## Add the Right Kind of Insulation

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.

## Doing the Job

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 perimeter toward the attic opening. Never lay insulation over recessed light fixtures or soffit vents. Keep all insulation at least 3 inches away from “can” lights, unless they are rated IC (Insulated Ceiling). If you are using loose fill insulation, use sheet metal to create barriers around the openings. If using fiberglass, wire mesh can be used to create a barrier.

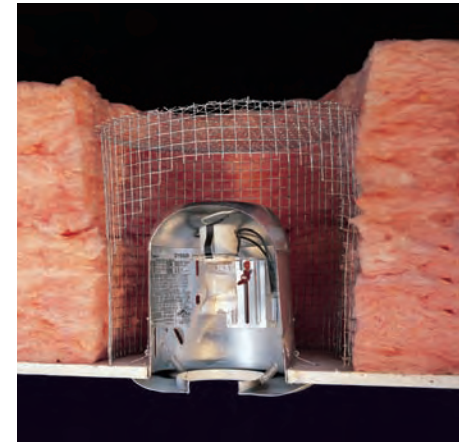
### 1. LAY FIBERGLASS ROLLS



Layer fiberglass roll insulation perpendicular to the joists.

Photo courtesy North American Insulation Manufacturers Association

### 2. CREATE A BARRIER



Use sheet metal or wire mesh to help create a barrier around fixtures or vents.

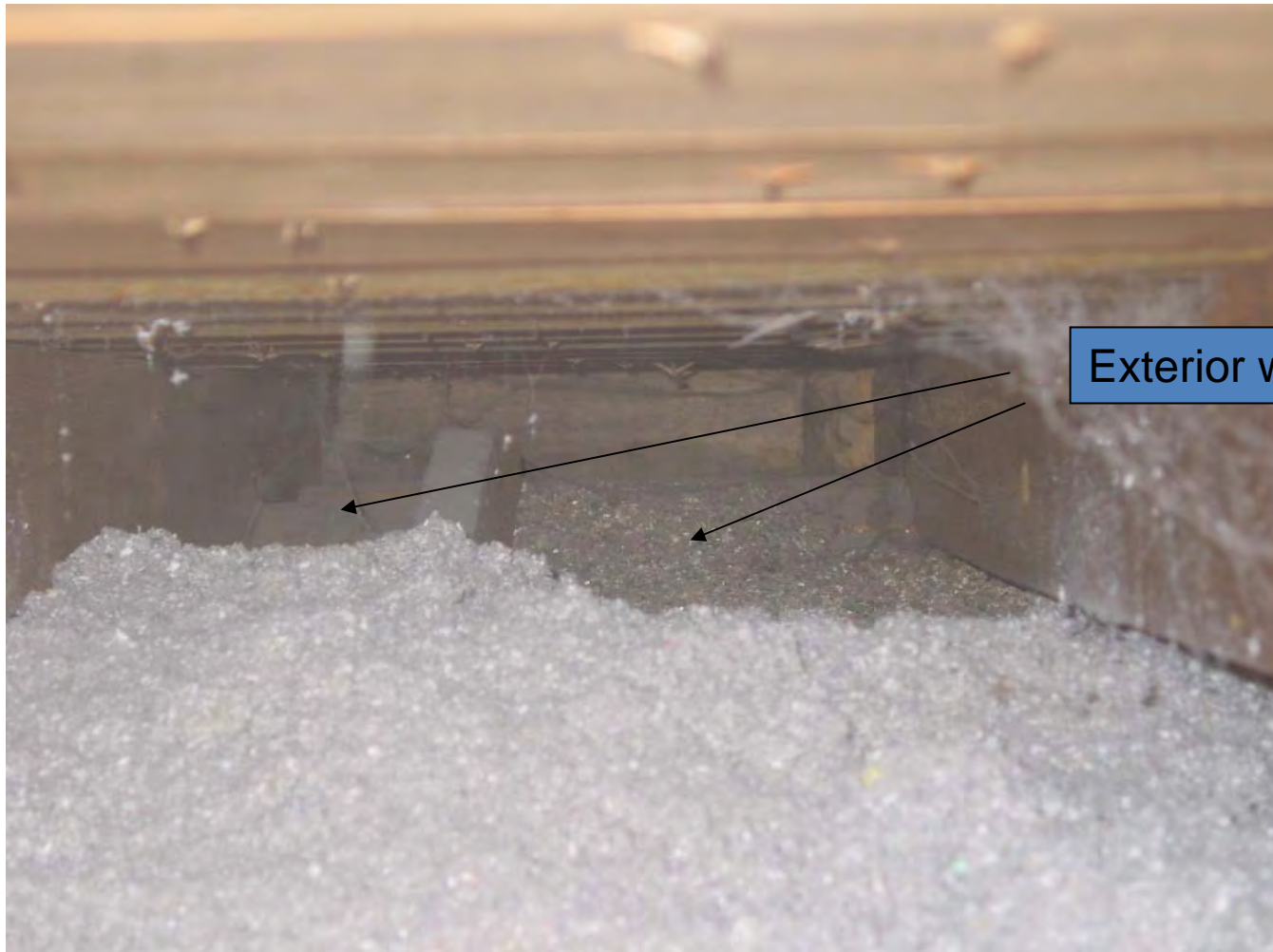
### 4.3 ADDING ATTIC INSULATION



# Proper R-values



# Avoid tapering at eaves



Exterior wall top plate



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# Walls

- Retrofit Wall Insulation
- Lead Safe Work
- Set up & Prep
- Installation
- Tips, Tricks, Tools & Equipment





# Retrofit Insulation



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Respect the homeowners  
possessions even when working  
outside



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# Pre-Lead Notification

- When disturbing painted surfaces in homes 1978 and older occupants must receive Lead Paint education material

<http://www.epa.gov/lead/pubs/leadpdfs.pdf>



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# Lead Safe Work Practices

Plastic to catch debris



Drill Shroud



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# Lead Safe Work Practices

Encapsulate your work area



Portable HEPA vac & drill shroud



# Working in Occupied Homes



# Set up



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# Wall prep under sinks...



# Look for alternative ways...



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# Up through bottom plate



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# Having the right equipment



# Properly Fill-out Certificate & Post



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# Insulate Colorado

- Homeowner Forms
  - Homeowner Rebate Form Review
  - Insulation Contractor Invoice
  - Insulation Card





# Insulate Colorado

## Homeowner Rebate Form

- Available From Local Government/Partner
- 2 Sides
- Completed By Homeowner
- All Sections MUST Be Completed
- Submitted to Local Government/Partner for Payment
- Requires BOTH Contractor and Homeowner Signatures



# Insulate Colorado

## Homeowner Rebate Form (continued)

- Homeowner Name & Mailing Info
- Contractor Company Name & Contact Info
- Home Info
  - Single-family, Sq. Ft., Heating & Cooling Systems
- Insulation Work (Attic & Exterior Wall)
  - Existing R-Values & Added Amount
  - Air Sealing Completed (yes or no)
- Itemized Cost Information
  - Attic Work
  - Exterior Wall Work
  - Air Sealing
- Signatures



Description of Insulation Installed and Air Sealing Installed (Must Be Completed)

Where Installed	Type of Insulation	Number of Inches Existing Prior to New Installation	Existing R-Value (see Worksheet below)	Number of Inches Installed	Square Feet of Area	Total R-Value Installed	Air Sealing Completed in Area
Attic							
Exterior Walls							



Rebate Calculations

- A. Total Cost of Attic Insulation Work \$ \_\_\_\_\_
- B. Total Cost of Exterior Wall Insulation Work \$ \_\_\_\_\_
- C. Total Cost of Air Sealing Measures \$ \_\_\_\_\_
- D. Sum Cost (A.) + (B.) + (C.) = \$ \_\_\_\_\_
- E. Multiply (D.) x 0.20 = \$ \_\_\_\_\_

Total REBATE Requested, enter \$300 or value in (E), whichever is less: \$ \_\_\_\_\_

By my signature, I am confirming that the information entered is accurate to the best of my knowledge. (Both Contractor and Homeowner signatures are required.)

Contractor \_\_\_\_\_ Date \_\_\_\_\_

Homeowner \_\_\_\_\_ Date \_\_\_\_\_

Optional Insulation Calculation Worksheet

Evaluating the R-Value of Insulation in Existing Homes (includes effects of aging and settling)

R-Value Table (from www.coloradoenergy.org)

Insulation Type	R-Value Per Inch of Thickness
Rberglass Batt	3.1 to 4.3
Rberglass Blown (attic)	2.2 to 4.3
Rberglass Blown (wall)	3.7 to 4.3
Rock Wool Batt	3.1 to 4.0
Rock Wool Blown (attic)	3.1 to 4.0
Rock Wool Blown (wall)	3.1 to 4.0
Cellulose Blown (attic)	3.1
Cellulose Blown (wall)	3.7
Vermiculite	2.1

1. Use this formula to estimate the R-Value of your existing insulation:

$$\frac{\text{_____}}{\text{(Thickness in Inches)}} \times \frac{\text{_____}}{\text{(R-Value per Inch)}} = \frac{\text{_____}}{\text{(Estimated Total R-Value)}}$$

2. Use this formula to estimate needed R-Value of Insulation:

$$\frac{\text{_____}}{\text{(Recommended R-Value)}} - \frac{\text{_____}}{\text{(Existing R-Value)}} = \frac{\text{_____}}{\text{(R-Value Needed)}}$$

3. Use this formula to estimate how many inches of insulation to add (to obtain recommended R-Value):

$$\frac{\text{_____}}{\text{(R-Value Needed)}} \div \frac{\text{_____}}{\text{(R-Value per Inch)}} = \frac{\text{_____}}{\text{(Estimated Inches Needed)}}$$

# 2008 Insulate Colorado

"Supporting residential energy efficiency is a significant component of Colorado's New Energy Economy. Insulation and air sealing can help homeowners save energy, save money and increase the comfort of their homes."

*Bill Ritter Jr.*  
Governor Bill Ritter, Jr.



2006 IECC Recommended R-Value (recommended by county)

Climate Zone	Ceiling Insulation	Wood Framed Wall Insulation
All Counties in IECC Climate Zone A	R-38	R-13
All Counties in IECC Climate Zone B	R-38	R-19*
All Counties in IECC Climate Zone C	R-49	R-19*
All Counties in IECC Climate Zone D	R-49	R-21*

\* Or insulation sufficient to fill the framing cavity. R-13 minimum for 2x4 wall only

Supported in Partnership with the



**Governor's Energy Office**  
A Growing Colorado's New Energy Economy

# Insulate Colorado

## Contractor Invoice

- Homeowner Pays Contractor in Full
- Submits A Copy of Invoice to Local Partner with Completed Rebate Form
  - Itemize Invoice (by work completed)
    - Rebate Only Good For Attic & Exterior Wall Work



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## Insulation Card

- Submits A Copy of Insulation Card to Local Partner with Completed Rebate Form
  - Total Square Footage
  - Installer Name, Signature, Date
  - Company Name
  - R-value Added
  - Inches of Insulation Added



# Insulate Colorado

Complete (and current) List of All Participating Partners/Local Governments, Rebate Forms and Eligible Contractor Companies Will Be Posted on [www.colorado.gov/energy](http://www.colorado.gov/energy)

Program Kick Off Scheduled for April 22



# Insulate Colorado

Thank you!

Questions?

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