

MN 2000 MISC-1978

# Residential Energy Consumer Education



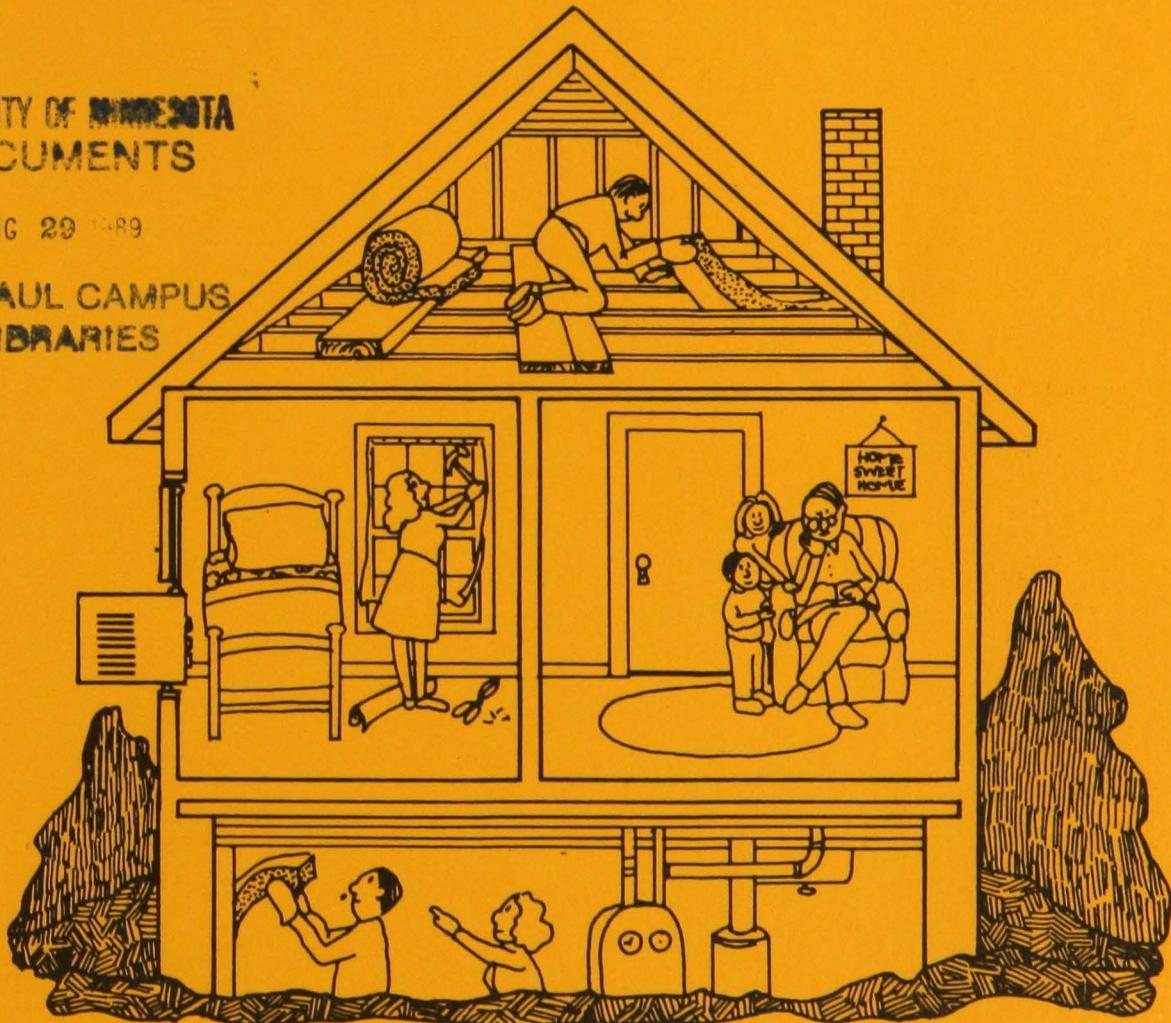
Agricultural Extension Service  
University of Minnesota  
St. Paul, MN 55108

# Home Insulation

UNIVERSITY OF MINNESOTA  
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# How To Do It\*

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# PART 3: HOW TO DO IT

This part is divided into sections, each one treating an energy-saving step—13 in all. A section works like this:



## First, how hard is it ?



Should you do it yourself? – a quick rundown to help you decide whether you can handle it yourself or if you need the services of a professional.

## Then, how to get it done



If you're doing it yourself:  
 Tools you'll need  
 Safety items to include  
 What kind of materials

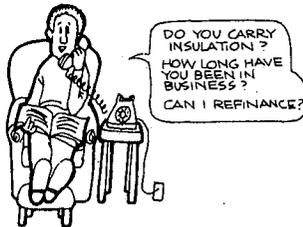
How much material  
 Getting it done, step by step

OR if you want to hire a contractor to do it, how to make sure he does the job right.

What kind of materials  
 How much material  
 R-Value

Signing a contract  
 What to check

## Last, more information you may need



Some general information that could be helpful:

Buying Insulating Materials  
 Choosing a Contractor  
 Getting Financing

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# CAULK THE OPENINGS IN YOUR HOME

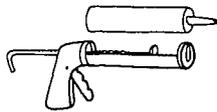


## AN EASY DO-IT-YOURSELF PROJECT

Caulking should be applied wherever two different materials or parts of the house meet. It takes no specialized skill to apply and a minimum of tools.

### Tools

1. Ladder
2. Caulking gun
3. Caulking cartridges
4. Oakum, glass fiber strips, caulking cotton, or sponge rubber
5. Putty knife or large screwdriver



### Safety

You'll need to use a ladder to reach some of the areas which need to be caulked. Be sure you use it safely.

Level and block the ladder in place. Have a helper hold it if possible.

Don't try to reach that extra little bit — get down and move the ladder.

Carry your caulking gun with a sling so that you can use both hands climbing the ladder.

### Materials

#### What you'll need

Caulking compound is available in these basic types:

1. Oil or resin base caulk; readily available and will bond to most surfaces — wood, masonry and metal; not very durable but lowest in first cost for this type of application.
2. Latex, butyl or polyvinyl based caulk; all readily available and will bond to most surfaces, more durable, but more expensive than oil or resin based caulk.
3. Elastomeric caulks; most durable and most expensive; includes silicones, polysulfides and polyurethanes; the instructions provided on the labels should be followed.
4. Filler; includes oakum, caulking cotton, sponge rubber, and glass fiber types; used to fill extra wide cracks or as a backup for elastomeric caulks.

**CAUTION:** Lead base caulk is not recommended because it is toxic. Many states prohibit its use.

### Where a house needs to be caulked

1. Between window drip caps (tops of windows) and siding.
2. Between door drip caps and siding.
3. At joints between window frames and siding.
4. At joints between door frames and siding.
5. Between window sills and siding.
6. At corners formed by siding.
7. At sills where wood structure meets the foundation.
8. Outside water faucets, or other special breaks in the outside house surface.
9. Where pipes and wires penetrate the ceiling below an unheated attic.
10. Between porches and main body of the house.
11. Where chimney or masonry meets siding.
12. Where storm windows meet the window frame, except for drain holes at window sill.
13. And if you have a heated attic; where the wall meets the eave at the gable ends.

### How much

Estimating the number of cartridges of caulking compound required is difficult since the number needed will vary greatly with the size of cracks to be filled. Rough estimates are:

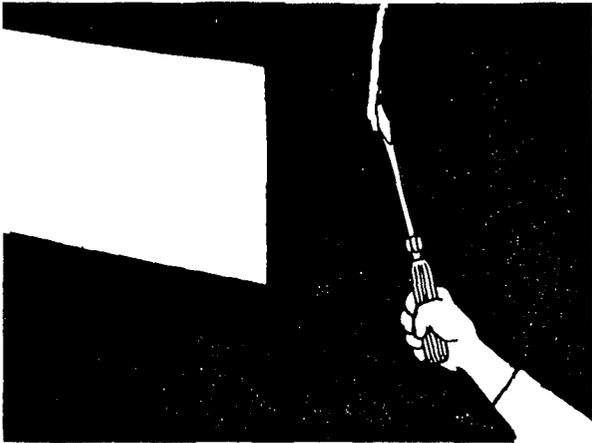
1/2 cartridge per window or door

4 cartridges for the foundation sill

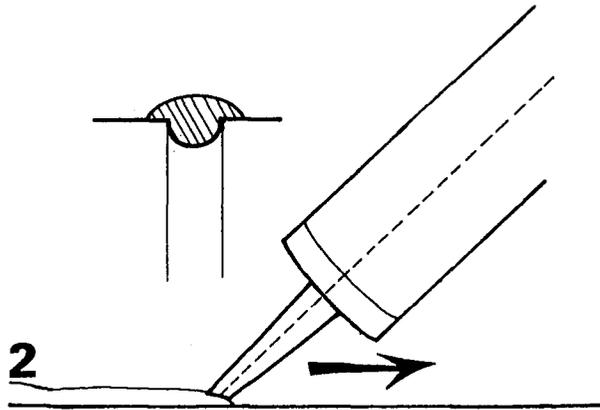
2 cartridges for a two story chimney

If possible, it's best to start the job with a half-dozen cartridges and then purchase more as the job continues and you need them.

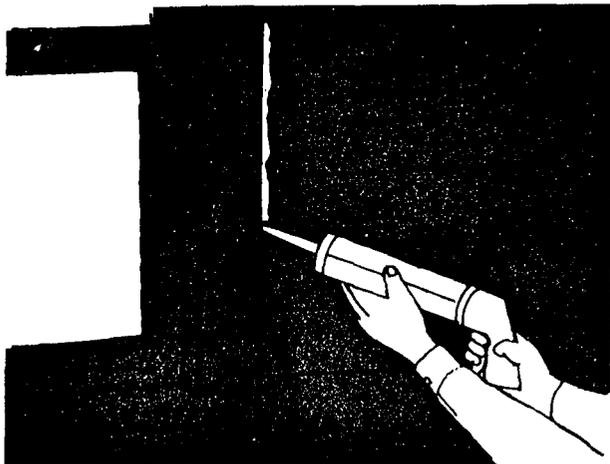
# Installation



Before applying caulking compound, clean area of paint build-up, dirt, or deteriorated caulk with solvent and putty knife or large screwdriver.



2  
Drawing a good bead of caulk will take a little practice. First attempts may be a bit messy. Make sure the bead overlaps both sides for a tight seal.

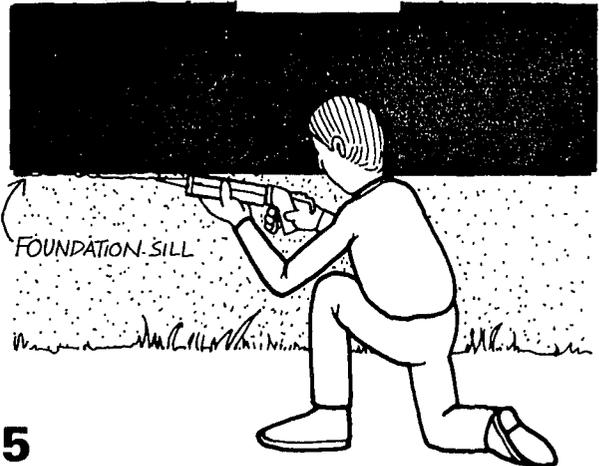


A wide bead may be necessary to make sure caulk adheres to both sides.



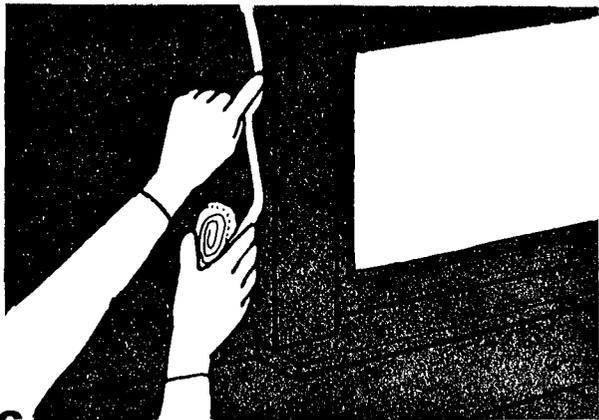
4

Fill extra wide cracks like those at the sills (where the house meets the foundation) with oakum, glass fiber insulation strips, etc.)



5

In places where you can't quite fill the gaps, finish the job with caulk.



6

Caulking compound also comes in rope form. Unwind it and force it into cracks with your fingers. You can fill extra long cracks easily this way.

# WEATHERSTRIP YOUR WINDOWS

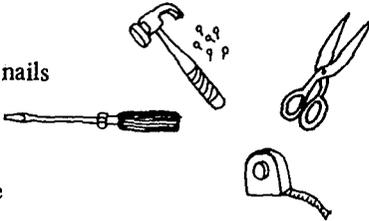


## AN EASY DO-IT-YOURSELF PROJECT

Weatherstripping windows can be accomplished by even the inexperienced handyman. A minimum of tools and skills is required.

### Tools

1. Hammer and nails
2. Screwdriver
3. Tin snips
4. Tape measure

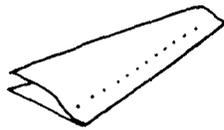


### Safety

Upper story windows may be a problem. You should be able to do all work from inside, but avoid awkward leaning out of windows when tacking weatherstripping into place. If you find you need to use a ladder observe the precautions on page 32.

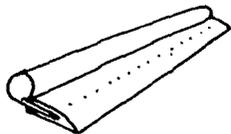
### Materials

#### What you'll need



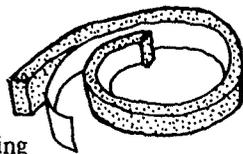
Thin spring metal

Installed in the channel of window so it is virtually invisible. Somewhat difficult to install. Very durable.



Rolled vinyl

With or without metal backing. Visible when installed. Easy to install. Durable.



Foam rubber with adhesive backing

Easy to install. Breaks down and wears rather quickly. Not as effective a sealer as metal strips or rolled vinyl.

Never use where friction occurs.

### How much

Weatherstripping is purchased either by the running foot or in kit form for each window. In either case you'll have to make a list of your windows, and measure them to find the total length of weatherstripping you'll need. Measure the total distance around the edges of the moving parts of each window type you have, and complete the list below:

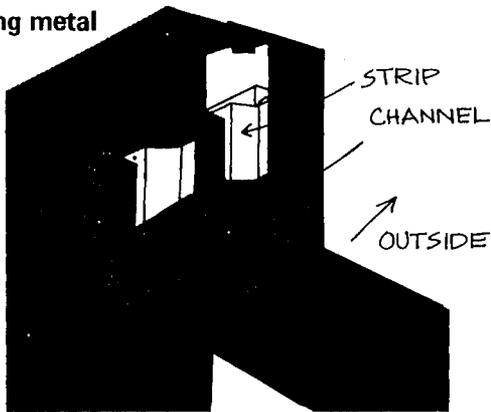
Type	Size	Quantity	X length req'd	= Total
1. Double-hung 	1	( )	X ( )	=
	2	( )	X ( )	=
	3	( )	X ( )	=
2. Casement 	1	( )	X ( )	=
	2	( )	X ( )	=
	3	( )	X ( )	=
3. Tilting 	1	( )	X ( )	=
	2	( )	X ( )	=
	3	( )	X ( )	=
4. Sliding pane 	1	( )	X ( )	=
	2	( )	X ( )	=
	3	( )	X ( )	=

Total length of weatherstripping required \_\_\_\_\_

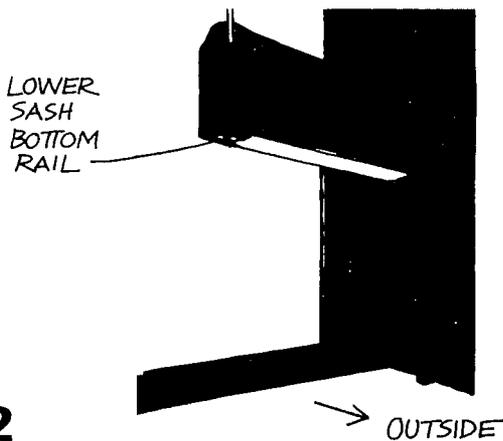
Be sure to allow for waste. If you buy in kit form, be sure the kit is intended for your window type and size.

# Installation

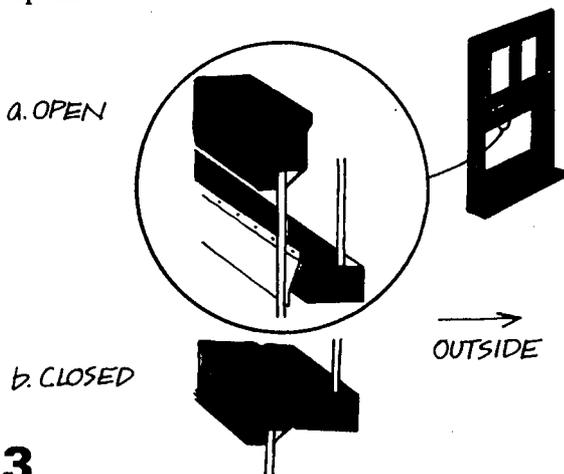
## Thin spring metal



**1** Install by moving sash to the open position and sliding strip in between the sash and the channel. Tack in place into the casing. Do not cover the pulleys in the upper channels.

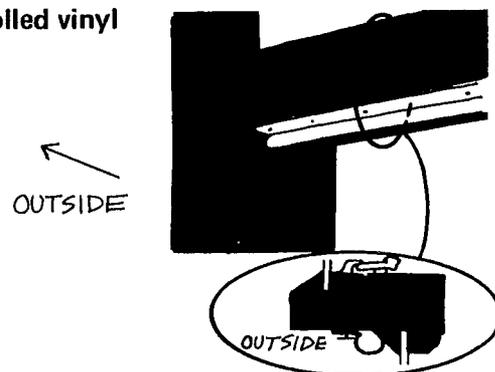


**2** Install strips the full width of the sash on the bottom of the lower sash bottom rail and the top of the upper sash top rail.

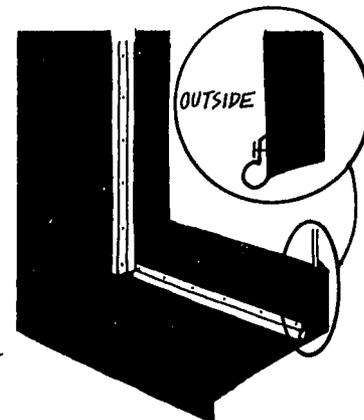


**3** Then attach a strip the full width of the window to the upper sash bottom rail. Countersink the nails slightly so they won't catch on the lower sash top rail.

## Rolled vinyl

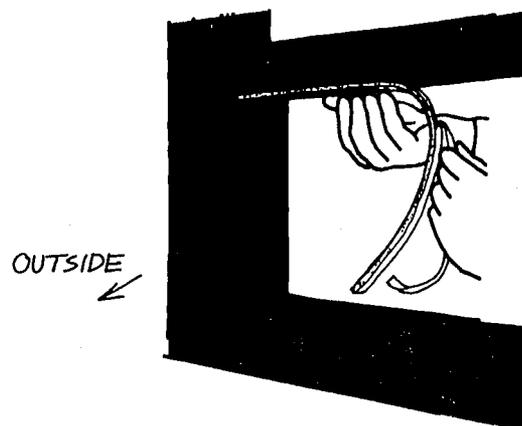


**1** Nail on vinyl strips on double-hung windows as shown. A sliding window is much the same and can be treated as a double-hung window turned on its side. Casement and



**2** tilting windows should be weatherstripped with the vinyl nailed to the window casing so that, as the window shuts, it compresses the roll.

## Adhesive-backed foam strip



Install adhesive backed foam, on all types of windows, only where there is no friction. On double-hung windows, this is only on the bottom (as shown) and top rails. Other types of windows can use foam strips in many more places.

# WEATHERSTRIP YOUR DOORS



## AN EASY DO-IT-YOURSELF PROJECT

You can weatherstrip your doors even if you're not an experienced handyman. There are several types of weatherstripping for doors, each with its own level of effectiveness, durability and degree of installation difficulty. Select among the options given the one you feel is best for you. The installations are the same for the two sides and top of a door, with a different, more durable one for the threshold.

### The Alternative Methods and Materials

#### 1. Adhesive backed foam:

##### Tools

Knife or shears,  
Tape measure

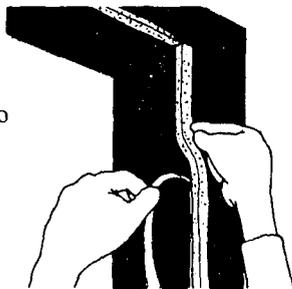


TOP VIEW



**Evaluation** — extremely easy to install, invisible when installed, not very durable, more effective on doors than windows.

**Installation** — stick foam to inside face of jamb.



#### 2. Rolled vinyl with aluminum channel backing:

##### Tools

Hammer, nails,  
Tin snips  
Tape measure



TOP VIEW



**Evaluation** — easy to install, visible when installed, durable.

**Installation** — nail strip snugly against door on the casing



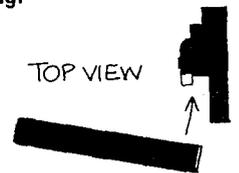
#### 3. Foam rubber with wood backing:

##### Tools

Hammer, nails,  
Hand saw,  
Tape measure



TOP VIEW



**Evaluation** — easy to install, visible when installed, not very durable.

**Installation** — nail strip snugly against the closed door. Space nails 8 to 12 inches apart.



#### 4. Spring metal:

##### Tools

Tin snips  
Hammer, nails,  
Tape measure



TOP VIEW



**Evaluation** — easy to install, invisible when installed, extremely durable.

**Installation** — cut to length and tack in place. Lift outer edge of strip with screwdriver after tacking, for better seal.

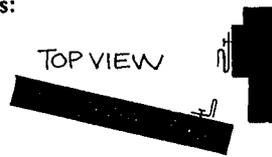


Note: These methods are harder than 1 through 4.

### 5. Interlocking metal channels:

#### Tools

Hack saw,  
Hammer, nails,  
Tape measure



**Evaluation** — difficult to install (alignment is critical), visible when installed, durable but subject to damage, because they're exposed, excellent seal.

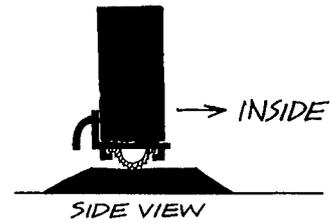
**Installation** — cut and fit strips to head of door first: male strip on door, female on head; then hinge side of door: male strip on jamb, female on door; finally lock side on door, female on jamb.



### 8. Door Shoes:

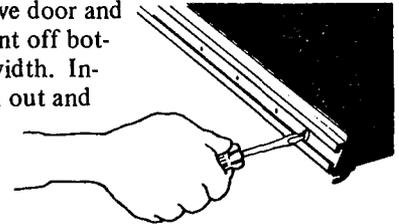
#### Tools

Screwdriver,  
Hack saw,  
Plane,  
Tape measure



**Evaluation** — useful with wooden threshold that is not worn, very durable, difficult to install (must remove door).

**Installation** — remove door and trim required amount off bottom. Cut to door width. Install by sliding vinyl out and fasten with screws.



### 6. Fitted interlocking metal channels: (J-Strips)



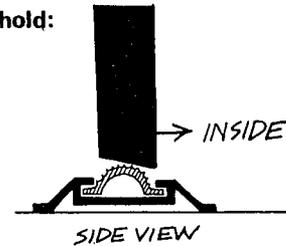
**Evaluation** — very difficult to install, exceptionally good weather seal, invisible when installed, not exposed to possible damage.

**Installation** — should be installed by a carpenter. Not appropriate for do-it-yourself installation unless done by an accomplished handyman.

### 9. Vinyl bulb threshold:

#### Tools

Screwdriver,  
Hack saw,  
Plane,  
Tape measure



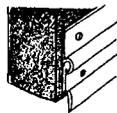
**Evaluation** — useful where there is no threshold or wooden one is worn out, difficult to install, vinyl will wear but replacements are available.

**Installation** — remove door and trim required amount off bottom. Bottom should have about 1/8" bevel to seal against vinyl. Be sure bevel is cut in right direction for opening.

### 7. Sweeps:

#### Tools

Screwdriver,  
Hack saw,  
Tape measure

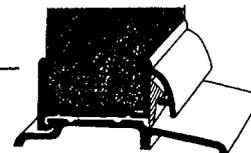


**Evaluation** — useful for flat thresholds, may drag on carpet or rug.

**Installation** — cut sweep to fit 1/16 inch in from the edges of the door. Some sweeps are installed on the inside and some outside. Check instructions for your particular type.

### 10. Interlocking threshold:

INSIDE ←

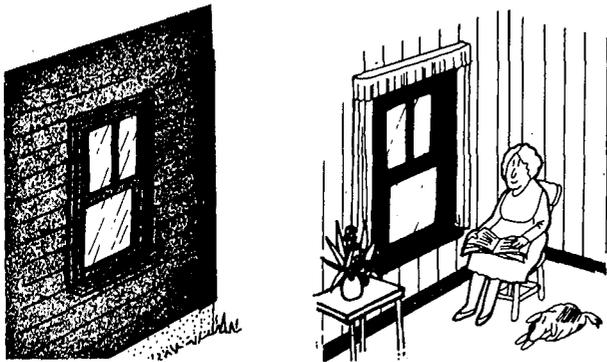


**Evaluation** — very difficult to install, exceptionally good weather seal.

**Installation** — should be installed by a skilled carpenter.

# INSTALL PLASTIC STORM WINDOWS

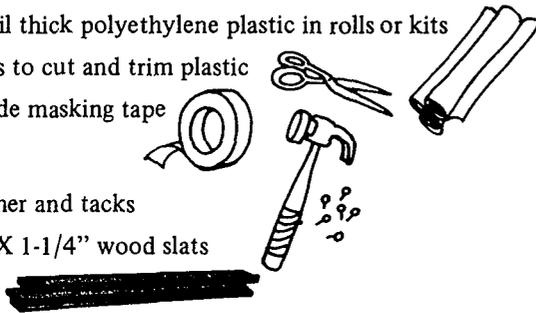
## AN EASY DO-IT-YOURSELF PROJECT



Tack the plastic sheets over the outside of your windows or tape sheets over the inside instead of installing permanent type storm windows.

### Tools & Materials

1. Six-mil thick polyethylene plastic in rolls or kits
  2. Shears to cut and trim plastic
  3. 2" wide masking tape
- OR
3. Hammer and tacks
  4. 1/4" X 1-1/4" wood slats



### Installation

Measure the width of your larger windows to determine the width of the plastic rolls to buy. Measure the length of your windows to see how many linear feet and

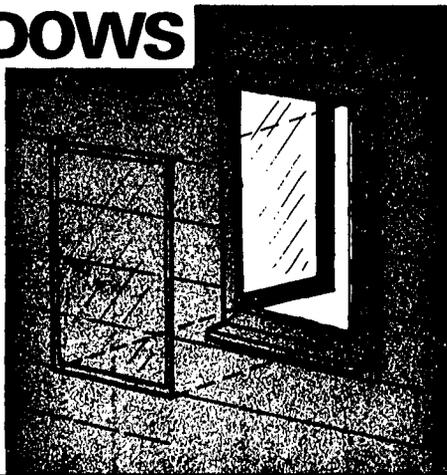
therefore how many rolls or the kit size you need to buy.

Attach to the inside or outside of the frame so that the plastic will block airflow that leaks around the moveable parts of the window. If you attach the plastic to the outside use the slats and tacks. If you attach it to the inside masking tape will work.

Inside installation is easier and will provide greater protection to the plastic. Outside installation is more difficult, especially on a 2 story house, and the plastic is more likely to be damaged by the elements.

Be sure to install tightly and securely, and remove all excess — besides looking better, this will make the plastic less susceptible to deterioration during the course of the winter.

# INSTALL SINGLE PANE STORM WINDOWS



## CONTRACTOR ASSEMBLY DO-IT-YOURSELF INSTALLATION

Storm window suppliers will build single pane storm windows to your measurements that you then install yourself. Another method is to make your own with aluminum do-it-yourself materials available at most hardware stores.

### Installation

Determine how you want the windows to sit in the frame. Your measurements will be the outside measurements of the storm window. Be as accurate as possible, then allow 1/8" along each edge for clearance. You'll be responsible for any errors in measurement, so do a good job.

When your windows are delivered, check the actual measurements carefully against your order.

Install the windows and fix in place with moveable clips so you can take them down every summer.

### Advantages and Disadvantages

Single pane storm windows aren't as expensive as the double-track or triple-track combination windows (see page 40). The major disadvantage of the single pane windows is that you can't open them easily after they're installed.

### Selection: Judging Quality

**Frame finish:** A mill finish (plain aluminum) will oxidize quickly and degrade appearance. Windows with an anodized or baked enamel finish look better.

**Weatherstripping:** The side of the aluminum frame which touches the window frame should have a permanently installed weather strip or gasket to seal the crack between the window and the single pane storm window frames.

# INSTALL COMBINATION STORM WINDOWS



## CONTRACTOR INSTALLED

Triple track, combination (windows and screen) storm windows are designed for installation over double hung windows. They are permanently installed and can be opened any time with a screen slid into place for ventilation.

Double-track combination units are also available and they cost less. Both kinds are sold almost everywhere, and can be bought with or without the cost of installation.

---

## Installation

You can save a few dollars (10% to 15% of the purchase price) by installing the windows yourself. But you'll need some tools: caulking gun, drill, and screw driver. In most cases it will be easier to have the supplier install your windows for you, although it will cost more.

The supplier will first measure all the windows where you want storm windows installed. It will take anywhere from several days to a few weeks to make up your order before the supplier returns to install them.

Installation should take less than one day, depending on how many windows are involved. Two very important items should be checked to make sure the installation is properly done.

Make sure that both the window sashes and screen sash move smoothly and seal tightly when closed after installation. Poor installation can cause misalignment.

Be sure there is a *tightly* caulked seal around the edge of the storm windows. Leaks can hurt the performance of storm windows a lot.

**NOTE:** Most combination units will come with two or three 1/4" dia. holes (or other types of vents) drilled through the frame where it meets the window sill. This is to keep winter condensation from collecting on the sill and causing rot. Keep these holes clear, and drill them yourself if your combination units don't already have them.

## Selection: Judging Quality

**Frame finish:** A mill finish (plain aluminum) will oxidize, reducing ease of operation and degrading appearance. An anodized or baked enamel finish is better.

**Corner joints:** Quality of construction affects the strength and performance of storm windows. Corners are a good place to check construction. They should be strong and air tight. Normally overlapped corner joints are better than mitered. If you can see through the joints, they will leak air.

**Sash tracks and weatherstripping:** Storm windows are supposed to reduce air leakage around windows. The depth of the metal grooves (sash tracks) at the sides of the window and the weatherstripping quality makes a big difference in how well storm windows can do this. Compare several types before deciding.

**Hardware quality:** The quality of locks and catches has a direct effect on durability and is a good indicator of overall construction quality.

# INSTALL COMBINATION STORM DOORS



## NORMALLY CONTRACTOR INSTALLED

Combination (windows and screen) storm doors are designed for installation over exterior doors. They are sold almost everywhere, with or without the cost of installation.

---

### Installation

You can save a few dollars (10% to 15% of the purchase price) by installing doors yourself. But you'll need some tools: hammer, drill, screw driver, and weatherstripping. In most cases, it will be easier to have the supplier install your doors himself.

The supplier will first measure all the doors where you want storm doors installed. It will take anywhere from several days to a few weeks to make up your order before the supplier returns to install them. Installation should take less than one-half day.

Before the installer leaves, be sure the doors operate smoothly and close tightly. Check for cracks around the jamb and make sure the seal is as air-tight as possible. Also, remove and replace the exchangeable panels (window and screen) to make sure they fit properly and with a weather tight seal.

### Selection: Judging Quality

**Door finish:** A mill finish (plain aluminum) will oxidize, reducing ease of operation and degrading appearance. An anodized or baked enamel finish is better.

**Corner joints:** Quality of construction affects the strength and effectiveness of storm doors. Corners are a good place to check construction. They should be strong and air tight. If you can see through the joints, they will leak air.

**Weatherstripping:** Storm doors are supposed to reduce air leakage around your doors. Weatherstripping quality makes a big difference in how well storm doors can do this. Compare several types before deciding.

**Hardware quality:** The quality of locks, hinges and catches should be evaluated since it can have a direct effect on durability and is a good indicator of overall construction quality.

**Construction material:** Storm doors of wood or steel can also be purchased within the same price range as the aluminum variety. They have the same quality differences and should be similarly evaluated. The choice between doors of similar quality but different material is primarily up to your own personal taste.

# BUYING INSULATION

From the pages in Part 3 that deal with insulating your house you can get a good idea of what your choice of insulating materials is (see "Materials" at the beginning of each how-to section), how many square feet you need, and whether you need a vapor barrier with your insulation. There are three more things you need to know before you buy:

1. **What the R-Value of the insulation should be** – your money's worth in insulation is measured in R-Value. R-Value is a number that tells you how much resistance the insulation presents to heat flowing through it. The bigger the R-Value, the better the insulation. This page lists recommended R-Values for the different parts of the house.

2. **What kind of insulation to buy** – pages 43 and 44 will help you choose the right kind of insulation for the job you want to do.

3. **How thick your insulation should be** – For the R-Value and type of insulation you're going to buy, look at the table at the bottom of page 44 – it'll tell you how many inches of each type of insulation it takes to achieve the R-Value you need.

**NOTE:** If you have a choice of insulating materials, and all your choices are available in your area, simply price the same R-Value for both, and get the better buy. Pay more only for more R-Value.

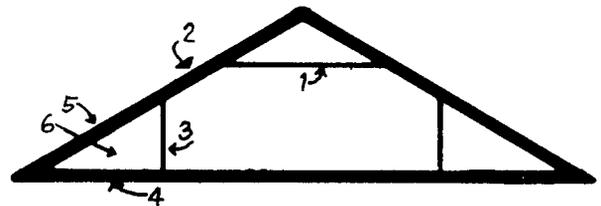
## 1. What the R-Value of the insulation should be:

### UNFINISHED ATTIC, NO FLOOR

Batts, blankets or loose fill in the floor between the joists:

THICKNESS OF EXISTING INSULATION		Minimum	Recommended
0"		R-30	R-38
0"-2"		R-22	R-30
2"-4"		R-19	R-22
4"-6"		R-11	R-19

### FINISHED ATTIC



1. Attic Ceiling – see the table at the left under Unfinished Attic, No Floor.
2. Rafters – contractor fills completely with blow-in insulation.
3. Knee Walls – Insulate (5), Outer Attic Rafters instead.
4. Outer Attic Floors – Insulate (5), Outer Attic Rafters instead.
5. Outer Attic Rafters – Add batts or blankets: If there is existing insulation in (3) and (4), add R-11. If there is no existing insulation in (3) and (4), add R-19.
6. End Walls – Add batts or blankets, R-11.

### UNFINISHED ATTIC WITH FLOOR

#### A. Do-it-yourself or Contractor Installed:

**Between the collar beams** – follow the guidelines above in Unfinished Attic, No Floor.

**Rafters and end walls** – buy insulation thick enough to fill the space available (usually R-19 for the rafters and R-11 for the end walls).

## B. Contractor Installed

Contractor blows loose-fill insulation under the floor. Fill this space completely — see page 42 for the R-Value you should get.

**FRAME WALLS** — contractor blows in insulation to fill the space inside the walls. See page 42 for the R-Value you should get.

**CRAWL SPACE** — R-11 batts or blankets against the wall and the edge of the floor.

**FLOORS** — R-11 batts or blankets between the floor joists, *foil-faced*.

**BASEMENT WALLS** — R-7 batts or blankets between wall studs. Note: Use R-11 if R-7 is not available.

## 2. What kind of insulation to buy:

**BATTS**— glass fiber, rock wool



**Where they're used to insulate:**

unfinished attic floor  
unfinished attic rafters  
underside of floors

best suited for standard joist or rafter spacing of 16" or 24", and space between joists relatively free of obstructions

cut in sections 15" or 23" wide, 1" to 7" thick, 4' or 8' long

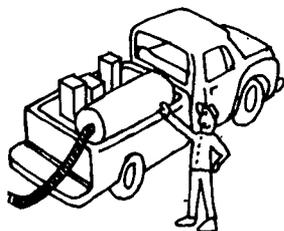
with or without a vapor barrier backing — if you need one and can't get it, buy polyethylene except that to be used to insulate the underside of floors

easy to handle because of relatively small size

use will result in more waste from trimming sections than use of blankets

fire resistant, moisture resistant

**FOAMED IN PLACE**— ureaformaldehyde



**Where it's used to insulate:**

finished frame walls  
unfinished attic floor

moisture resistant, fire resistant

may have higher insulating value than blown-in materials

more expensive than blown-in materials

quality of application to date has been very inconsistent — choose a qualified contractor who will guarantee his work.

**BLANKETS**— glass fiber, rock wool



**Where they're used to insulate:**

unfinished attic floor  
unfinished attic rafters  
underside of floors

best suited for standard joist or rafter spacing of 16" or 24", and space between joists relatively free of obstructions

cut in sections 15" or 23" wide, 1" to 7" thick in rolls to be cut to length by the installer

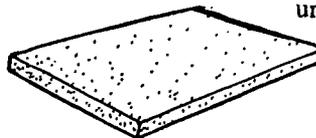
with or without a vapor barrier backing

a little more difficult to handle than batts because of size

fire resistant, moisture resistant

**RIGID BOARD**—

extruded polystyrene bead board (expanded polystyrene) urethane board, glass fiber



**Where it's used to insulate:**

basement wall

**NOTE: Polystyrene and urethane rigid board insulation should only be installed by a contractor. They must be covered with 1/2" gypsum wall-board to assure fire safety.**

extruded polystyrene and urethane are their own vapor barriers, bead board and glass fiber are not.

high insulating value for relatively small thicknesses, particularly urethane.

comes in 24" or 48" widths

variety of thicknesses from 3/4" to 4"

**LOOSE FILL (poured-in)**— glass fiber, rock wool, cellulosic fiber, vermiculite, perlite



Where it's used to insulate:  
unfinished attic floor

vapor barrier bought and applied separately

best suited for non-standard or irregular joist spacing or when space between joists has many obstructions

glass fiber and rock wool are fire resistant and moisture resistant

cellulosic fiber chemically treated to be fire resistant and moisture resistant; treatment not yet proven to be heat resistant, may break down in a hot attic; check to be sure that bags indicate material meets Federal Specifications. If they do, they'll be clearly labelled.

cellulosic fiber has about 30% more insulation value than rock wool for the same installed thickness (this can be important in walls or under attic floors).

vermiculite is significantly more expensive but can be poured into smaller areas.

vermiculite and perlite have about the same insulating value.

*all* are easy to install.

**LOOSE FILL (blown-in)**— glass fiber, rock wool, cellulosic fiber



Where it's used to insulate  
unfinished attic floor  
finished attic floor  
finished frame walls  
underside of floors

vapor barrier bought separately

same physical properties as poured-in loose fill.

Because it consists of smaller tufts, cellulosic fiber gets into small nooks and corners more consistently than rock wool or glass fiber when blown into closed spaces such as walls or joist spaces.

When any of these materials are blown into a closed space enough must be blown in to fill the whole space.

### 3. How thick your insulation should be:

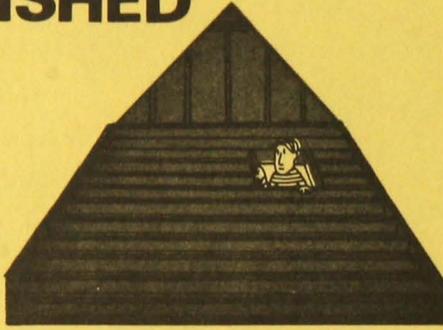
Get the R-Value you need from page 42, and the type of insulation you need from this page and the one before. Use the table below to find out how thick the insulation you buy should be:

#### TYPE OF INSULATION

		BATTS OR BLANKETS		LOOSE FILL (POURED-IN)				
		glass fiber	rock wool	glass fiber	rock wool	cellulosic fiber		
R-11		3½"-4"	3"	5"	4"	3"	R-11	
R-19		6"-6½"	5¼"	8"-9"	6"-7"	5"	R-19	
R-22		6½"	6"	10"	7"-8"	6"	R-22	
R-30		9½"-10½"*	9"*	13"-14"	10"-11"	8"	R-30	
R-38		12"-13"*	10½"*	17"-18"	13"-14"	10"-11"	R-38	

\* two batts or blankets required.

# INSULATE YOUR UNFINISHED ATTIC



## AN EASY DO-IT-YOURSELF PROJECT

Install batts or blankets between the joists or trusses in your attic

OR

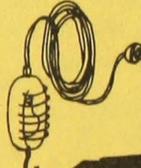
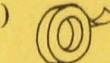
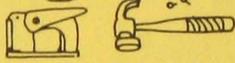
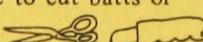
Pour in loose fill between the joists or trusses

OR

Lay in batts or pour in loose fill over existing insulation if you've decided you don't have enough already. *Don't* add a vapor barrier if you're installing additional insulation.

**NOTE:** If your attic has trusses in it, this section still applies – the insulation goes in the same place, but job is more difficult.

### Tools

1. Temporary lighting 
2. Temporary flooring 
3. Duct or masking tape (2" wide) 
4. Heavy duty staple gun and staples, or hammer and tacks 
5. Heavy duty shears or linoleum knife to cut batts or blankets and plastic for vapor barrier 

### Safety

1. Provide good lighting
2. Lay boards or plywood sheets down over the tops of the joists or trusses to form a walkway (the ceiling below won't support your weight).
3. Be careful of roofing nails protruding through roof sheathing.
4. If you use glass fiber or mineral wool, wear gloves and breathing mask, and keep the material wrapped until you're ready to put it in place.

### Materials

#### What you'll need

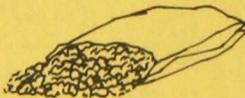
Batts, glass fiber or rock wool



Blankets, glass fiber or rock wool



Loose fill, rock wool, cellulosic fiber, or vermiculite



Vapor barriers



#### How much

(a) Accurately determine your attic area.

If necessary, divide it into rectangles and sum the areas.

$$\begin{array}{r} \text{_____} \times \text{_____} = \text{_____} \\ \text{_____} \times \text{_____} = \text{_____} \\ \text{_____} \times \text{_____} = \text{_____} \\ \text{Total} = \text{_____} \end{array}$$

(b) Insulation area =  $(.9) \times (\text{total}) = \text{_____}$

(c) Vapor barrier area (see if you need one – page 52).

1. Batts or blankets with vapor barrier backing – use insulation area.

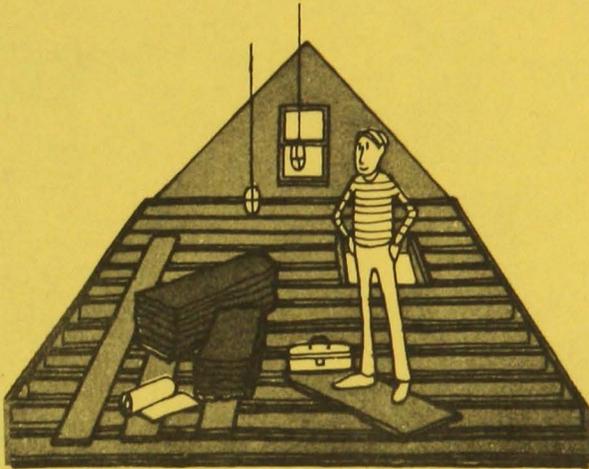
2. Polyethylene (for use with loose fill, or if backed batts or blankets are not available) – use insulation area, but plan on waste since the polyethylene will be installed in strips between the joists or trusses, and you may not be able to cut an even number of strips out of a roll.

(d) Insulation thickness – see page 42. If page 42 calls for R-30 or more, you may be adding two layers of insulation. Lay the first layer between the joists, and the second layer across the joists. (This is very difficult with trusses – lay the second layer parallel to the trusses, or even better, – use loose fill.) Figure attic area for the second layer.

# Installation

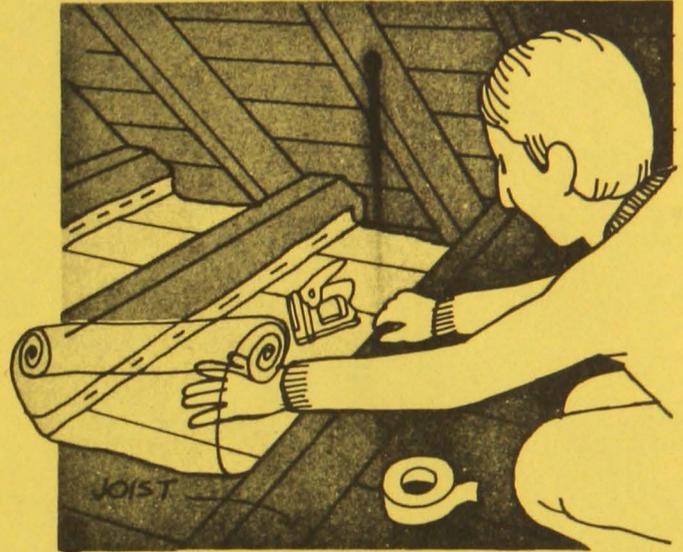
## Preparation

Put in temporary lighting and flooring, check for leaks and check need for ventilation and vapor barrier (see page 52). Seal all places where pipes or wires penetrate the attic floor. **NOTE:** Some manufacturers may recommend using polyethylene in a continuous sheet across the joists or trusses. If you aren't adding insulation that covers the tops of these framing members with at least 3½" of insulation, laying a continuous sheet may cause condensation along them; lay strips as shown instead.

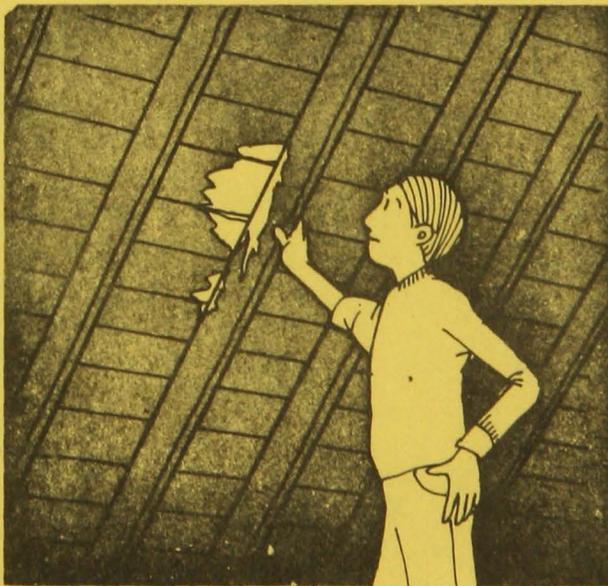


1

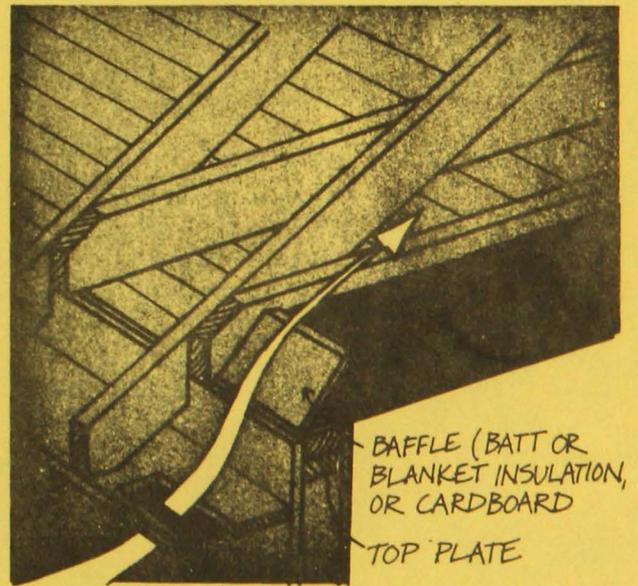
Install temporary flooring and lights. Keep insulation in wrappers until you are ready to install. It comes wrapped in a compressed state and expands when the wrappers are removed.



Install separate vapor barrier if needed (see page 52). Lay in polyethylene strips between joists or trusses. Staple or tack in place. Seal seams and holes with tape. (Seams may be overlapped 6" instead.)



Check for roof leaks, looking for water stains or marks. If you find leakage, make repairs before you insulate. Wet insulation is ineffective and can damage the structure of your home.



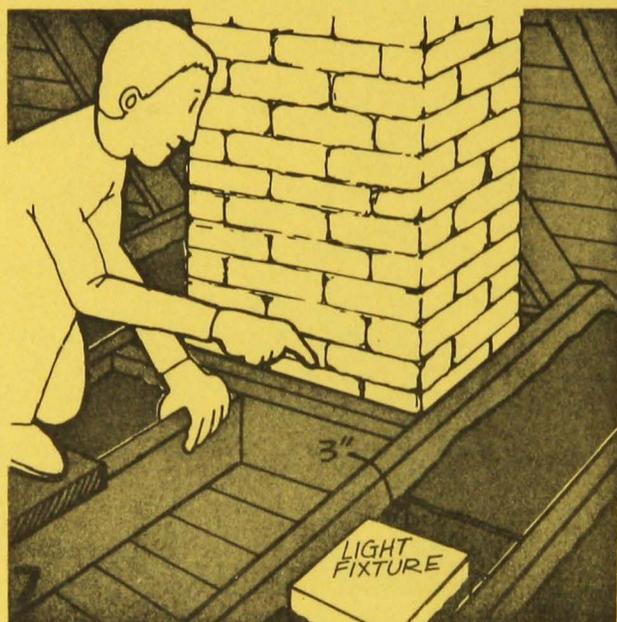
If you're using loose fill, install baffles at the inside of the eave vents so that the insulation won't block the flow of air from the vents into the attic. Be sure that insulation extends out far enough to cover the top plate.

## Installing the insulation

Either lay in batts or blankets between the joists or pour in loose fill. If you're using batts or blankets with a vapor barrier, place the barrier on the side toward the living area.

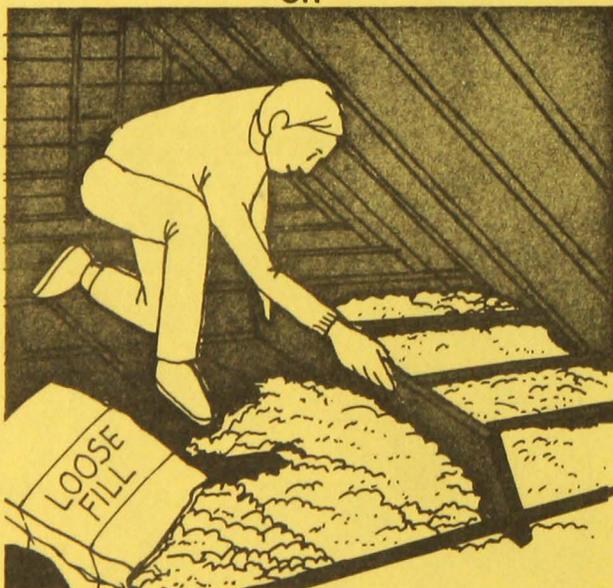


Lay in blankets or batts between joists or trusses. (Note: batts and blankets are slightly wider than joist spacing so they'll fit snugly). If blankets are used, cut long runs first to conserve material, using leftovers for shorter spaces. Slide insulation under wiring wherever possible.



The space between the chimney and the wood framing should be filled with *non-combustible* material, preferably unfaced batts or blankets. Also, the National Electric Code requires that insulation be kept 3" away from light fixtures.

OR



Pour in loose-fill insulation between the joists up to the top of the joists. Use a board or garden rake to level it. Fill all the nooks and crannies but don't cover recessed light fixtures or exhaust fans.



Cut ends of batts or blankets to fit snugly around cross bracing. Cut the next batt in a similar way to allow the ends to butt tightly together. If page 42 calls for an R-Value that requires a second layer, place it at **right angles** to the joists.

# INSULATE YOUR UNFINISHED FLOORED ATTIC



## TWO OPTIONS AVAILABLE

1. **CONTRACTOR INSTALLED:** blow-in insulation under the flooring and between the joists.
2. **DO IT YOURSELF OR CONTRACTOR:** install batts between the rafters, collar beams, and the studs on the end walls.

## CONTRACTOR INSTALLED

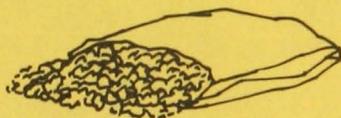
### Types of materials contractors use

#### Blow-in insulation

glass fiber

rock wool

cellulosic fiber



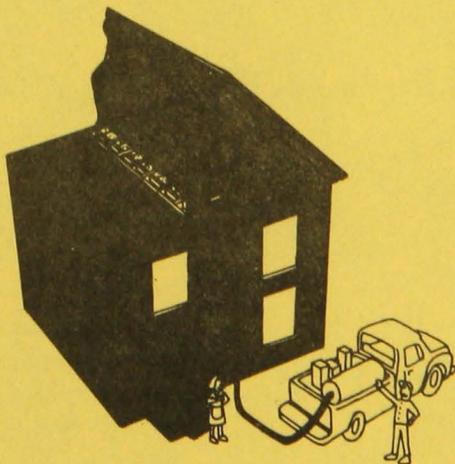
### Preparation

Do you need ventilation in your attic? See page 52.

Check for roof leaks, looking for water stains or marks. If you can find any leaks, make repairs before you insulate. Wet insulation is useless and can damage the structure of your house.

### What your contractor will do

The insulation is installed by blowing the insulating material under air pressure through a big flexible hose into the spaces between the attic floor and the ceiling of the rooms below. Bags of insulating material are fed into a blowing machine that mixes the insulation with air and forces it through the hose and into place. Before starting



the machine, the contractor will locate the cross bracing between the joists in the attic. He'll then remove the floor boards above the cross bracing and install the insulation by blowing it in on each side of the cross bracing to make sure there are no spaces left unfilled. Since there's no effective way to partially fill a space, all of the spaces should be completely filled to ensure proper coverage. Normally the job will take no longer than a day.

### What you should check

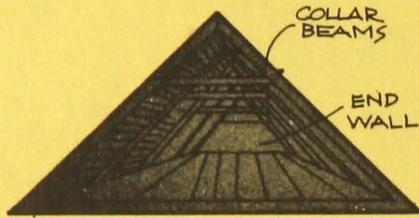
First be very careful about choosing a contractor. See page 64 for advice on how to make a selection.

Before you sign an agreement with your contractor, decide how much and what kind of insulation you're buying and make sure it's included in the contract. Insulation material properly installed will achieve a single insulating value (R-Value) for the depth of your joist space. You should agree on what that insulating value is with the contractor, before the job begins. Next check a bag of the type of insulation he intends to use. On it, there will be a table which will indicate how many square feet of attic floor that bag is meant to cover while achieving the desired insulating value. The information may be in different forms (number of square feet per bag or number of bags per 1000 square feet), so you may have to do some simple division to use the number correctly. Knowing this and the area of your attic, you should be able to figure out how many bags must be installed to give you the desired R-Value. This number should be agreed upon between you and the contractor before the job is begun. While the job is in progress, be sure the right amount is being installed. There's nothing wrong with having the contractor save the empty bags so that you can count them (5 bags more or less than the amount you agreed on is an acceptable difference from the estimate).

After the job is finished, it's a good idea to drill 1/4" diameter holes in the floor about a foot apart. This will help prevent condensation from collecting under the floor in winter.

# DO-IT-YOURSELF

Install batts or blankets in your attic between the rafters and collar beams, and the studs on the end walls.



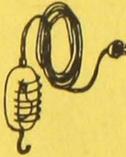
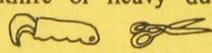
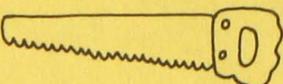
This measure will involve installing 2x4 beams which span between each roof rafter at ceiling height, if your attic doesn't already have them. This gives you a ventilation space above for the insulation (see page 52).

**NOTE:** The materials, methods, and thicknesses of insulation are the same for both do-it-yourself and contractor jobs. For advice on choosing a contractor, see page 64.

## Safety

1. Provide good lighting
2. Be careful of roofing nails protruding through the roof sheathing
3. If you use glass fiber or mineral wool, wear gloves and a breathing mask and keep the material wrapped until you're about to use it

## Tools

1. Temporary lighting 
2. Heavy duty staple gun and staples 
3. Linoleum knife or heavy duty shears to cut the insulation 
4. Duct or masking tape (2" wide) 
5. Hammer, nails (only if you're putting in collar beams) 
6. Power or hand saw (only if you're putting in collar beams) 

## Materials

### What you'll need

Buy either batts or blankets, made out of glass fiber or rock wool.

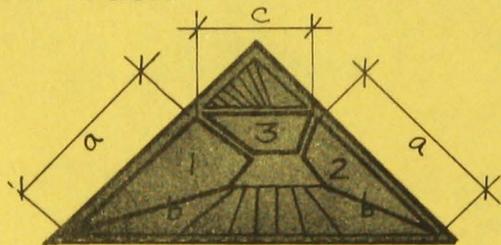
Do you need insulation with an attached vapor barrier? Follow the guidelines on page 52.

**Exception:** For the area between the collar beams, if you're laying the new insulation on top of old insulation, buy insulation without a vapor barrier if possible, or slash the vapor barrier on the new insulation.

### How Thick?

1. For the area between the collar beams, follow the guidelines on page 42. ("Existing insulation" means either insulation between the collar beams or in the attic floor.)
2. For the rafters and end walls, buy insulation that's thick enough to fill up the rafter and stud spaces. If there's some existing insulation in there, the combined thickness of the new and old insulation together should fill up the spaces.

### How much

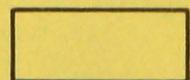


1. Figure out the area you want the insulation to cover between your rafters and collar beams (shown above). In general, figure each area to be covered, and add the areas up. If your attic is like the one shown, measure distances a, b, and c, enter them below, and do the figuring indicated (the .9 allows for the space taken up by rafters or collar beams.):

$$\frac{\text{distance a}}{\text{distance a}} \times \frac{\text{distance b}}{\text{distance b}} \times .9 = \text{Area 1}$$

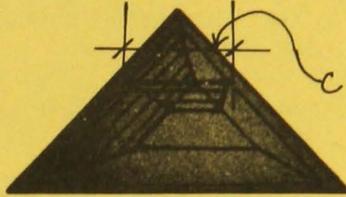
$$\frac{\text{distance a}}{\text{distance a}} \times \frac{\text{distance b}}{\text{distance b}} \times .9 = \text{Area 2}$$

$$\frac{\text{distance b}}{\text{distance b}} \times \frac{\text{distance c}}{\text{distance c}} \times .9 = \text{Area 3}$$

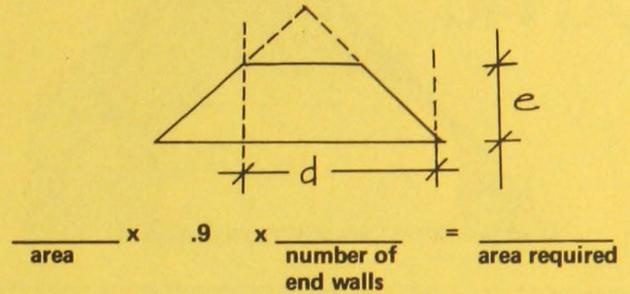


total area of insulation needed for rafters collar beams.

- Calculate the length of 2x4 stock you'll need for collar beams. Measure the length of span you need between rafters (c) and count the number of collar beams you need to install. Multiply to get the length of stock you need. You can have the lumber yard cut it to length at a small charge. If you cut it yourself, allow for waste. If you plan to finish your attic, check with your lumber yard to make sure 2" X 4" 's are strong enough to support the ceiling you plan to install.



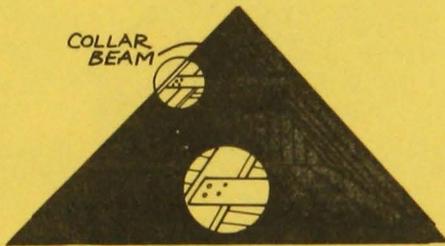
- Figure out the area of each end wall you want to insulate. Measure (d) and (e) and multiply to determine the area. Multiply by (.9) to correct for the space taken up by the studs, then multiply by the number of end walls.



## Installation

### Preparation

Check for roof leaks, looking for water stains or marks. If you can find any leaks, make repairs before you insulate. Wet insulation is useless and can damage the structure of your house. Determine your need for more ventilation by referring to page 52. Put up your temporary lights and:

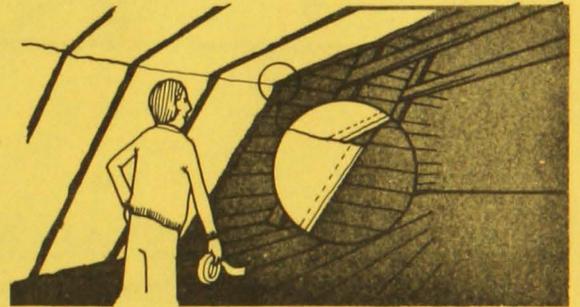


- Install 2x4 collar beams spanning from rafter to rafter at the ceiling height you want. Every pair of rafters should have a collar beam spanning between them.

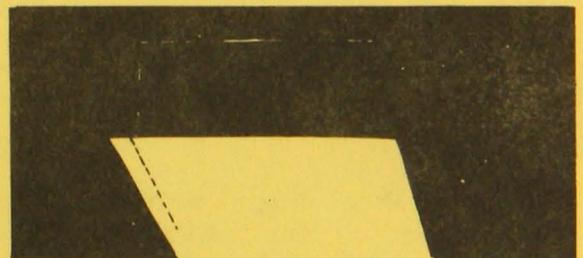
**Note:** If you're installing new insulation over existing insulation:

**Between the Rafters and Between the End Wall Studs,** cut the old insulation loose where it has been stapled, push it to the back of the cavities, and slash the old vapor barrier (if any) before you lay the new insulation over it.

**Between the Collar Beams,** lay the new insulation above the old. Lay it over the tops of the collar beams in an unbroken layer at right angles to the beams. Use insulation that does not have a vapor barrier for this part of the job. If you can't get insulation without a vapor barrier, slash the vapor barrier before laying it down, so that moisture won't get trapped in the insulation.

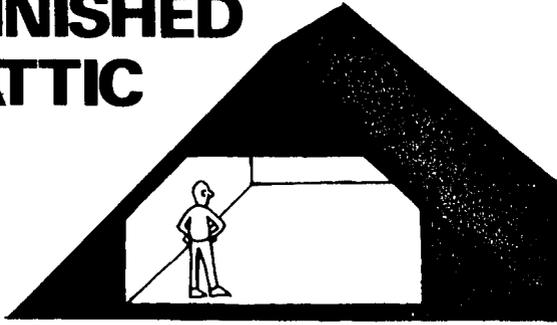


- Install batts or blanket sections in place between the rafters and collar beams. Install with the vapor barrier on the inside, the side toward you. Don't try to use a continuous length of insulation where the collar beams meet the rafters. It will only result in gaps that are very hard to fill. Install batts in the end walls the same way. Be sure to trim carefully to fit the angles on the end walls.



- Install batts or blanket sections by stapling the facing flange to the *edge* of the rafter or collar beam. Don't staple to the outside of the rafters; the vapor barrier will have a break at every rafter; and you may compress the insulation against the sheathing, reducing its insulating value.

# INSULATE YOUR FINISHED ATTIC

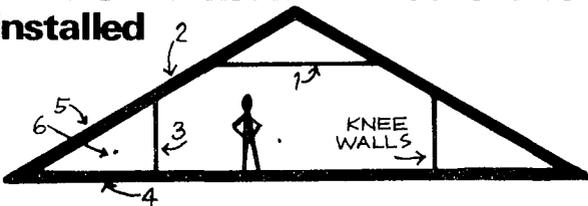


## TWO OPTIONS AVAILABLE

(and worth considering if there's under 4 inches of insulation already there.)

1. **Contractor Installation:** insulation blown into the ceiling, sloping rafters and outer attic floors; batts installed in the knee walls.
2. **Do-it-yourself:** installation of batts, blankets or loose fill in all attic spaces you can get to.

### Where the insulation needs to be installed



- |                  |                           |
|------------------|---------------------------|
| 1. Attic Ceiling | 4. Outer Attic Floors, or |
| 2. Rafters       | 5. Outer Attic Rafters    |
| 3. Knee Walls    | 6. End Walls              |

## CONTRACTOR INSTALLED Types of materials contractors use

### Blown-in insulation

- glass fiber
- rock wool



### Batts or blankets

- glass fiber
- rock wool



## Preparation

How thick should the insulation be? See page 42.

Check your need for ventilation and a vapor barrier. See page 52.

Check for roof leaks, looking for water stains or marks. If you can find any leaks, make repairs before you insulate. Wet insulation is useless and can damage the structure of your house.

## What your contractor will do

Your contractor will blow insulation into the open joist spaces above your attic ceiling, between the rafters, and into the floor of the outer attic space, then install

batts in the knee walls. If you want to keep the outer attic spaces heated for storage or any other purpose, you should have the contractor install batts between the outer attic rafters instead of insulating the outer floors and knee walls.



Page 48 describes how blown-in insulation is installed under an unfinished attic floor. This process is much the same for open joists with no floor over them. Pages 49-50 describe the right way to install batts.

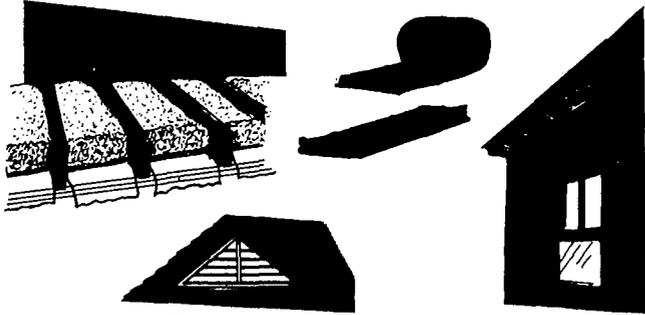
## DO-IT-YOURSELF

You can insulate wherever you can get into the unfinished spaces.

Installing insulation in your attic ceiling is the same as installing it in an unfinished attic. Look at pages 45-47 to see how this is done.

If you want to insulate your outer attic spaces yourself, install batts between the rafters and the studs in the small triangular end walls. Look at page 50 to see how to do this.

# DO YOU NEED A VAPOR BARRIER OR MORE VENTILATION IN YOUR ATTIC?



## CONTRACTOR INSTALLED OR DO-IT-YOURSELF

Whenever you add insulation to your house, you should consider the need for a vapor barrier or more ventilation where you're doing the work.

A vapor barrier will prevent water vapor from condensing and collecting in your new insulation or on the beams and rafters of your house.

Added ventilation will remove water vapor before it gets a chance to condense and will also increase summer comfort by cooling off your attic.

### What you need

If you're insulating your attic and:

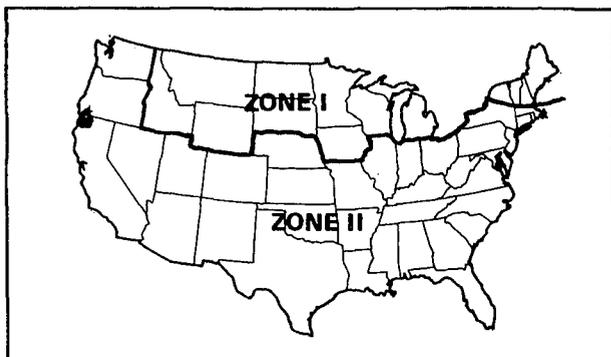
... you live in Zone I

1. Install a vapor barrier (unless you are blowing insulation into a finished attic)
2. Add ventilation area equal to 1/300 your attic floor area if:

Signs of condensation occur after one heating season

OR

You can't install a vapor barrier with your insulation



... if you live in Zone II and don't have air conditioning

1. Install a vapor barrier toward the living space if you are insulating a finished attic (with other attics a vapor barrier is optional).
2. Add ventilation area equal to 1/300 your attic floor area if signs of condensation occur after one heating season.

... you live in Zone II and have air conditioning

1. Install a vapor barrier toward the living space if you are insulating a finished attic (with other attics a vapor barrier is optional).
2. Add ventilation area equal to 1/150 your attic floor area.

### What should be installed

**Vapor barriers:** If you are installing batt or blanket insulation, and you need a vapor barrier, buy the batts or blankets with the vapor barrier attached. Install them with the vapor barrier side toward the living space.



If you are installing a loose fill insulation, lay down polyethylene (heavy, clear plastic) in strips between the joists first.



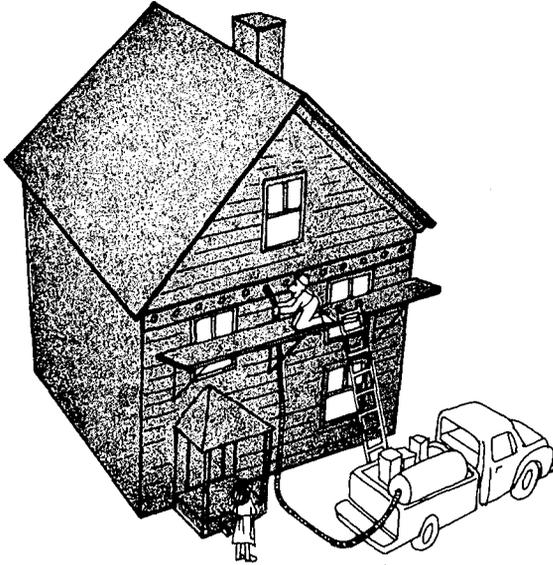
**Ventilation:** Install ventilation louvers (round or rectangular) in the eaves and gables (ridge vents are also available but are more difficult and costly to install in your house). The total open area of these louvers should be either 1/300 or 1/150 of your attic area (see "What You Need" above), and evenly divided between the gables and the eaves.



Ventilation louvers should be installed by a carpenter unless you are an experienced handyman.

Don't Block Ventilation Path with Insulation.

# INSULATE YOUR WOOD FRAME WALLS



## CONTRACTOR INSTALLED

Normally, insulating material is blown into the spaces in a wood frame wall through holes drilled from the outside or the inside. An alternate procedure uses plastic foam (ureaformaldehyde) to fill the stud spaces.

**NOTE:** Condensation in insulated walls may be a problem; see box on condensation, p.19.

## Types of materials contractors use

Blow-in insulation:

glass fiber

rock wool

cellulosic fiber



Foam-in insulation:

plastic foam installed as a foam under slight pressure which hardens to form insulation. Quality of application to date has been very inconsistent — ask your local HUD/FHA office to recommend a qualified installer.

## What your contractor will do

The contractor will measure the area you want insulated to determine how much material he will need and to estimate the cost. To install the insulation, the contractor must be able to get all the spaces in the wall. For each space he must drill a hole, usually in the outside wall, after removing the finished layer (usually clapboard or shingle). This always amounts to a lot of holes, but once the job is complete, a good contractor will leave no traces behind.

If you have brick veneer on the exterior, the procedure is much the same, except that it may be cheaper to do it from the inside.

Once the holes in the wall have been made your contractor is then ready to install the insulation. If the insulation is blow-in insulation he'll be following the process outlined on page 48. If he's using foam, he'll pump the foam into the wall spaces through a flexible hose with an applicator. With either method, each space will be completely filled, and the siding replaced.

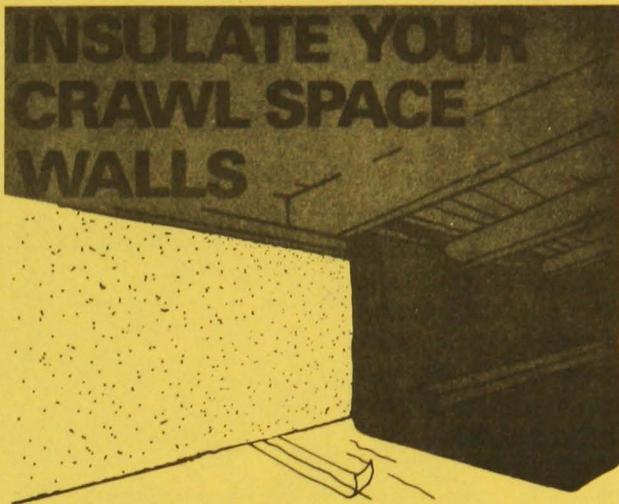
## What you should check

First be very careful about selecting a contractor. See page 64 for advice on how to make a choice.

Before you sign an agreement with your contractor, define what you're buying and make sure it's spelled out in the contract. Insulation material properly installed will add an R-Value of 8 for rock wool, 10 for cellulosic fiber, or 11.5 for ureaformaldehyde in a standard wood frame wall. You should agree on what that R-Value is with the contractor before the job begins. Next, check a bag of the type of insulation he intends to use (there will only be bags of mineral fiber or cellulosic fiber — there's no good way to check quantity with foam). On it, there will be a table which will indicate how many square feet of wall space that bag is meant to fill while giving your house the desired R value. The information may be in different forms (number of square feet per bag or number of bags per 1000 square feet), so you may have to do some simple division to use the number correctly.

Knowing this and the area of your walls, you should be able to figure out about how many bags should be installed to give you the desired R-value.

This number should be agreed upon between you and the contractor before the job is begun. While the job is in progress be sure the correct amount is being installed. There's nothing wrong with having the contractor save the empty bags so you can count them — 4 or 5 bags more or less than the amount you agreed on is an acceptable difference from the estimate.



## TWO OPTIONS AVAILABLE

(1) **Do-It-Yourself:** Install batt or blanket insulation around the walls and perimeter of your crawl space. Lay a plastic vapor barrier down on the crawl space earth.

(2) **Contractor Installed:** If your crawl space presents access or working space problems, you may want to consider having a contractor do the work for you. The contractor will probably follow a method similar to the do-it-yourself method described below. But if he suggests something different, have him price both methods and show you which is better. See page 64 for advice on how to select a contractor.

**NOTE:** The method of insulation shown here should not be used by residents of Alaska, Minnesota, and northern Maine. The extreme frost penetration in these areas can cause heaving of the foundation if the insulation method shown here is used. Residents of these areas should contact local HUD/FHA field offices for advice.

## Tools

1. Hammer and nails 
2. Heavy duty shears or linoleum knife 
3. Temporary lighting 
4. Portable fan or blower to provide ventilation 
5. Tape measure 
6. Duct or Masking Tape (2" wide) 

## Safety

1. Provide adequate temporary lighting
2. Wear gloves and a breathing mask when working with glass fiber or rock wool
3. Provide adequate ventilation
4. Keep lights, fan, and all wires well off wet ground

## Materials

### What you'll need

1. R11 (3-3½" thick) blankets of rock wool or glass fiber; without a vapor barrier



2. Six mil polyethylene plastic to lay on earth for vapor barrier (mil's are a measure of thickness)



3. 1/2" X 1-1/2" stock for nailing strips at the sill and at the band joist.



## How much

1. Determine area to be insulated; measure the length and average height of the wall to be insulated; add 3' to the height (for perimeter insulation) and multiply the two to find total insulation area

$$\begin{array}{r} \text{(length)} \times \text{(height} + 3') = \text{area} \\ \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} + 3' = \underline{\hspace{1cm}} \end{array}$$

2. Determine the area to be covered by the vapor barrier by finding the area of your crawl space

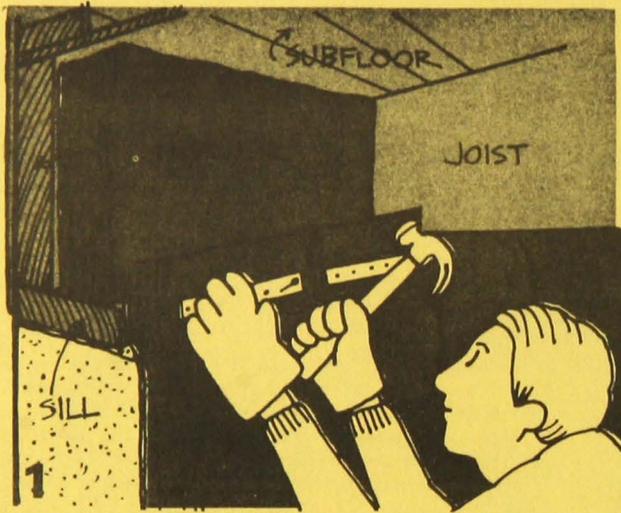
$$\begin{array}{r} \text{(length)} \times \text{(width)} = \text{area} \\ \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \end{array}$$

You may have to divide your crawl space into several rectangles — measure them and add up the areas.

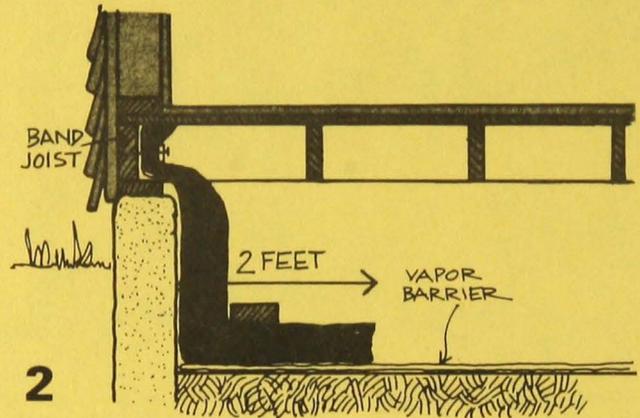
$$\begin{array}{r} \text{(length)} \times \text{(width)} = \\ \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \\ \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}} \\ \text{TOTAL} = \boxed{\hspace{2cm}} \end{array}$$

3. The total length of nailing strips required equals the length of wall to be insulated

# Installation



**Drawing 1:** Where the joists run at right angles to the wall, press short pieces of insulation against the Header — they should fit snugly. Then install the wall and perimeter insulation by nailing the top of each strip to the Sill using the 1/2" X 1-1/2" nailers. Make sure the batts fit snugly against each other, and that you cut them long enough to cover 2 feet of floor as in Drawing 2.



**Drawing 2:** Where the joists run parallel to the wall, you don't need the short pieces of insulation, just install the wall and perimeter insulation by nailing the top of each strip to the Band Joist, using the 1/2" X 1-1/2" nailers.

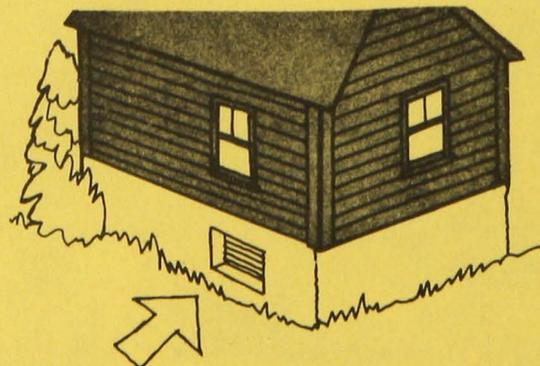
When all batts have been installed, lay down the polyethylene vapor barrier, tucking it under the batts all the way to the foundation wall. Tape the joints of the vapor barrier or lap them at least 6". Finally lay 2 X 4 lumber along the wall on top of the batts to weight the batts in place. (Rocks work well, too.) Plan your work to minimize stepping or crawling on the vapor barrier.

## VENTILATING YOUR CRAWL SPACE

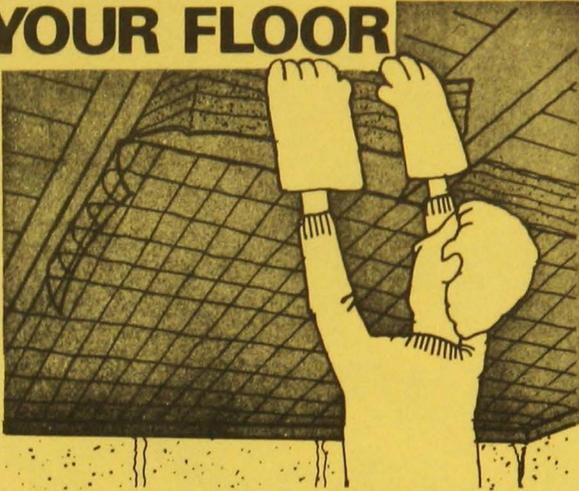
Even with a plastic vapor barrier on the floor, the air in your crawl space will be too damp if fresh air doesn't get in there from time to time. This will mean your new insulation will be wet, and it won't keep your house as warm. It will also mean that wooden members that hold up your house will be wet, and they'll rot. Proper ventilation will prevent both of these problems:

**1. If your crawl space is part of your forced-air heating system** (in other words, if air from your furnace moves through it), seal your crawl space as tightly as possible—the air moving through it from your furnace is enough ventilation in winter. If you have crawl space vents, keep them shut in winter, open in summer. If there are no vents, run the blower on your furnace 3 or 4 times during the summer to keep the air in the crawl space from getting too damp.

**2. All other crawl spaces** should have vents in them that can be opened in summer (to clear out the damp air), and closed **tightly** in winter to make the most of your new insulation. You can make a cover for them to install in winter. Note: Your furnace may get its combustion air from the crawl space. If so, some of the vents should be left open. Check with your local HUD/FHA office.



# INSULATE YOUR FLOOR



## TWO OPTIONS AVAILABLE

### 1. DO-IT-YOURSELF

Install batts or blankets between the floor joists by stapling wire mesh or chicken wire to the bottom of the joists and sliding the batts or blankets in on top of the wire. Place vapor barrier up.

The job is quite easy to do in most cases. If you are insulating over a crawl space there may be some problems with access or working room, but careful planning can make things go much more smoothly and easily.

Check your floor joist spacing – this method will work best with standard 16" or 24" joist spacing. If you have non-standard or irregular spacing there will be more cutting and fitting and some waste of material.

### 2. CONTRACTOR INSTALLED

See page 57.

## DO-IT-YOURSELF Tools

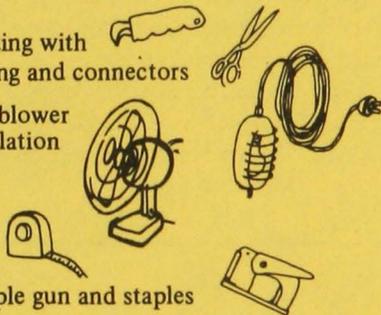
1. Heavy duty shears or linoleum knife

2. Temporary lighting with waterproof wiring and connectors

3. Portable fan or blower to provide ventilation

4. Tape measure

5. Heavy duty staple gun and staples



## Safety

1. Provide adequate temporary lighting
2. Wear gloves and breathing mask when working with glass fiber or rock wool
3. Provide adequate ventilation
4. Keep lights and all wires off wet ground

## Materials

### What you'll need

1. R11 (3"-3½") batts or blankets or rock wool or glass fiber, preferably with foil facing (See Installation).



2. Wire mesh or chicken wire of convenient width for handling in tight space.



## How much

Determine the area to be insulated by measuring the length and width and multiplying to get the area.

$$\begin{aligned} (\text{length}) \times (\text{width}) &= \text{area} \\ (\underline{\quad}) \times (\underline{\quad}) &= \underline{\quad} \end{aligned}$$

You may find it necessary to divide the floor into smaller areas and add them.

$$\begin{aligned} (\text{length}) \times (\text{width}) &= \text{area} \\ (\underline{\quad}) \times (\underline{\quad}) &= \underline{\quad} \\ (\underline{\quad}) \times (\underline{\quad}) &= \underline{\quad} \\ (\underline{\quad}) \times (\underline{\quad}) &= \underline{\quad} + \\ \text{total area} &= \underline{\quad} \end{aligned}$$

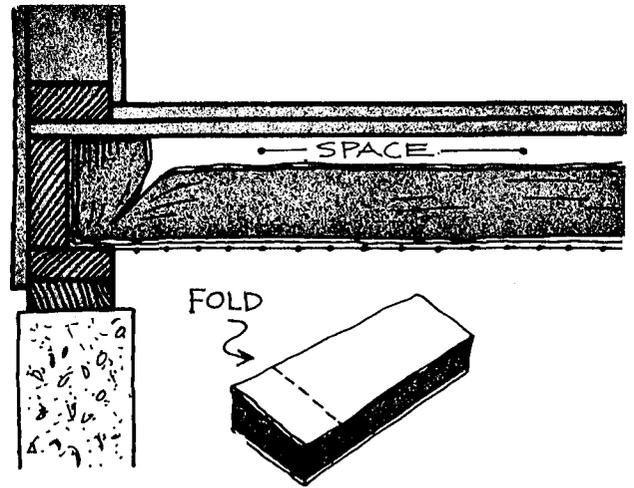
$$\begin{aligned} (.9)(\text{total area}) &= \text{area of insulation} \\ (.9)(\underline{\quad}) &= \underline{\quad} \end{aligned}$$

total area = area of wire mesh or chicken wire

# Installation



Start at a wall at one end of the joists and work out. Staple the wire to the bottom of the joists, and at right angles to them. Slide batts in on top of the wire. Work with short sections of wire and batts so that it won't be too difficult to get the insulation in place. Plan sections to begin and end at obstructions such as cross bracing.



Buy insulation with a vapor barrier, and install the vapor barrier facing up (next to the warm side) leaving an air space between the vapor barrier and the floor. Get foil-faced insulation if you can; it will make the air space insulate better. Be sure that ends of batts fit snugly up against the bottom of the floor to prevent loss of heat up end. Don't block combustion air openings for furnaces.

# INSULATE YOUR BASEMENT WALLS

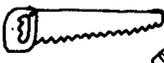
# A MODERATELY EASY DO-IT-YOURSELF PROJECT



Install 2" X 3" studs along the walls to be insulated. Add glass fiber blanket insulation between the furring strips and finish with wallboard or panelling.

**NOTE:** The method of insulation shown here should not be used by residents of Alaska, Minnesota, and northern Maine. The extreme frost penetration in these areas can cause heaving of the foundation if the insulation method shown here is used. Residents of these areas should contact local HUD/FHA field offices for advice.

## Tools

1. Saw 
2. Hammer, nails 
3. Heavy duty staple gun, or hammer and tacks 
4. Tape measure 
5. Linoleum-knife or heavy duty shears 
6. Level 
7. Small sledge hammer, masonry nails 

## Safety

1. Provide adequate temporary lighting
2. If you use glass fiber or rock wool, wear gloves and a breathing mask, and keep the material wrapped until you are ready to use it

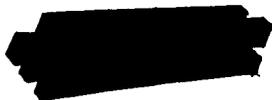
## Materials

### What you'll need

1. R7 (2-2½ inch) Batt or blanket insulation, glass fiber or rockwool, with a vapor barrier (buy polyethylene if you can't get batts or blankets with a vapor barrier)



2. 2" X 3" studs



3. Drywall or panelling



4. Waterproof paint, if necessary



### How much

1. Find the average height above the ground of the walls you intend to insulate and add two feet. Then measure the length of the walls you intend to insulate. Multiply the two figures to determine how many square feet of insulation is needed.

$$\begin{array}{l} \text{(height) X (length) = area} \\ \text{_____ X _____ = _____} \end{array}$$

2. Find the linear feet of studs you'll need by multiplying the length of the walls you intend to insulate by (6).

$$\begin{array}{l} \text{(6) X (length) = (linear ft.)} \\ \text{(6) X _____ = _____} \end{array}$$

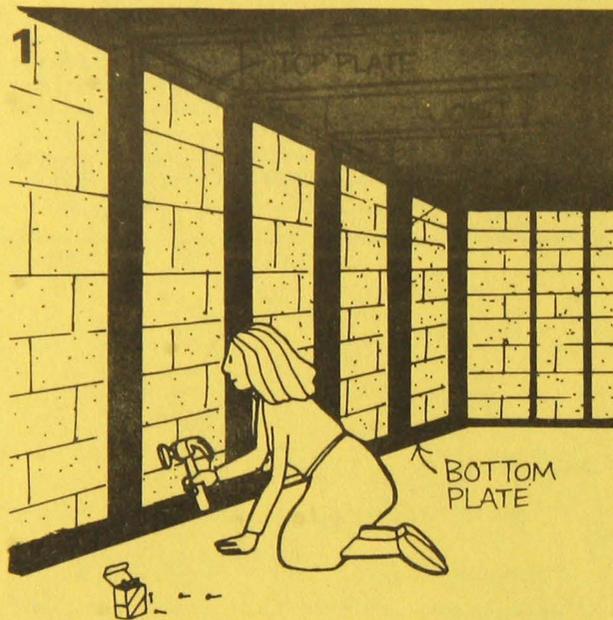
3. The area of wall covering equals the basement wall height times the length of wall you intend to finish.

$$\begin{array}{l} \text{(height) X (length) = area} \\ \text{_____ X _____ = _____} \end{array}$$

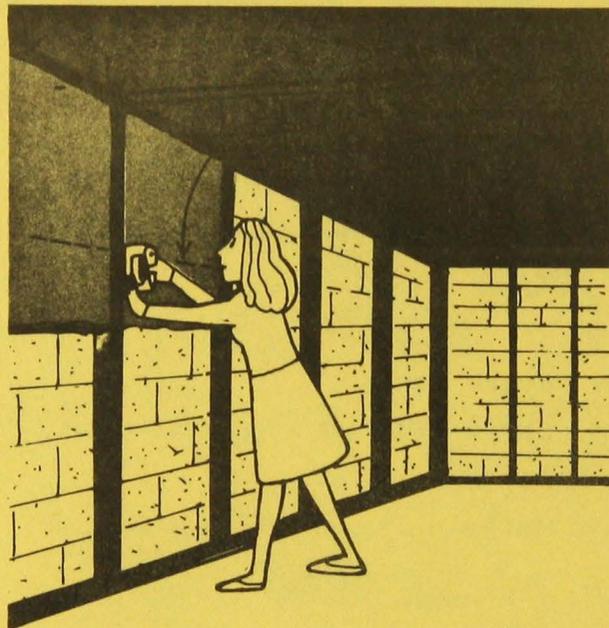
# Installation

## Preparation

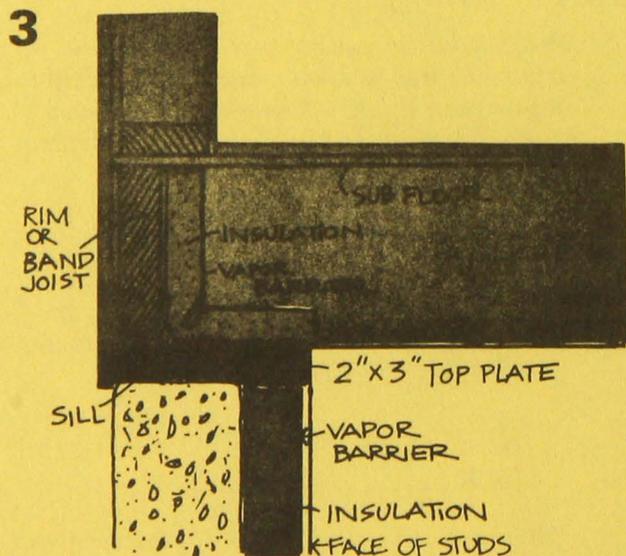
Check to see whether or not moisture is coming through your basement walls from the ground outside. If it is and your walls are damp, you should eliminate the cause of the dampness to prevent the insulation you're going to install from becoming wet and ineffective.



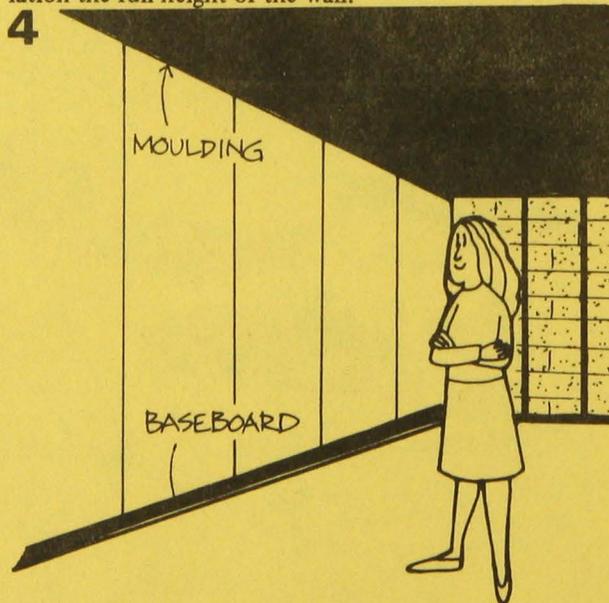
Nail the bottom plate to the floor at the base of the wall with a hammer and concrete nails. Install studs 16 or 24 inches apart after the top plate is nailed to the joists above. (Where the wall runs parallel to the joists, nail the top plate to the tops of the studs, and fasten the studs to the wall.)



Cut blankets into sections long enough to extend from the top plate to 2 feet below the ground line. Staple them into place between the studs, with the vapor barrier towards the living space. **NOTE:** in northern climates there will be added benefit to installing the insulation the full height of the wall.

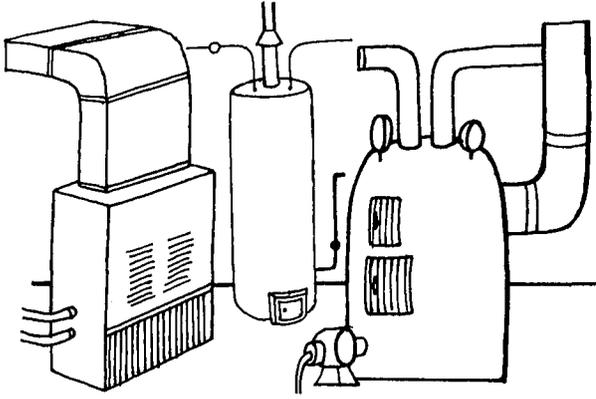


Install another small piece of insulation above the furring and against the sill to insulate the sill and band joist.



Install finish wall board or panelling over insulation and furring.

# SAVING ENERGY WITH YOUR HEATING, AIR CONDITIONING & WATER HEATING



## TWO OPTIONS AVAILABLE

1. **Routine Servicing** — your serviceman should check all your heating and cooling equipment and do any needed maintenance once a year.
2. **Repair or Replacement** — some of your heating and cooling equipment may be so badly worn or outmoded that it will pay you to replace it now and get your money back in a few years.

## Routine Servicing

A periodic checkup and maintenance of your heating and cooling equipment can reduce your fuel consumption by about 10 per cent. Locating a good heating/cooling specialist and sticking with him is a good way to ensure that your equipment stays in top fuel-saving condition. Your local fuel supplier or heating/cooling system repair specialist are the people to call — you can find them in the Yellow Pages under:

Heating Contractors  
Air Conditioning Equipment  
Furnaces-Heating

Electric Heating  
Oil Burner-Equipment  
and Service

Check out the people you contact with the Better Business Bureau and other homeowners in your area. Once you're satisfied you're in touch with a reputable outfit, a *service contract* is the best arrangement to make. For an annual fee, this gets you a periodic tuneup of your heating/cooling system, and insures you against repairs of most components. A regular arrangement like this is the best one — the serviceman gets to know your system, and you're assured of regular maintenance from a company you know.

In this section, there are lists of items your serviceman should check for each type of heating or cooling system. Some items may vary from brand to brand, but *go over*

*the list with your serviceman.* Also listed here are service items you can probably take care of yourself and save even more money. If you don't want to service your system yourself, *make sure* you add those items to your serviceman's list.

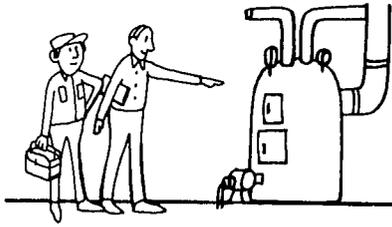
## Repair or Replacement

... of your equipment may be necessary.

When you are faced with major repairs, inevitably the question comes up: should we fix what we've got, or buy new equipment? It's an important question but not difficult to answer if you consider the right things:

1. Get several estimates — the larger the job the more estimates. The special knowledge of the equipment dealer and installer is most needed here — they'll study your house, measure the walls and windows, and should give you *written* estimates.
2. Check to see what your fuel costs are now. See page 25 to estimate your heating bill if it's mixed in with other utilities.
3. Ask each contractor who gives you an estimate to tell you how many years he thinks it will take before the amount you save by having the new system equals what you paid for it. Remember, fuel costs are going up.

# Furnace Maintenance



## OIL BURNER

### Every Year

- Adjust and clean burner unit
- Adjust fuel-to-air ratio for maximum efficiency
- Check for oil leaks
- Check electrical connections, especially on safety devices
- Clean heating elements and surfaces
- Adjust dampers and draft regulator
- Change oil filters
- Change air filter.
- Change oil burner nozzle
- Check oil pump
- Clean house thermostat contacts and adjust

There are several tests servicemen can use to check oil furnace efficiency:

**Draft Test** to see if heat is being lost up the chimney or if draft is not enough to properly burn your oil.

**Smoke Test** to see if your oil is being burned cleanly and completely.

**CO<sub>2</sub> test** to see if fuel is being burned completely.

**Stack Temperature Test** to see if stack gases are too hot or not hot enough.

## COAL FURNACE

### At the end of each heating season

- Adjust and clean stoker
- Clean burner of all coal, ash and clinkers
- Oil the inside of the coal screw and hopper to prevent rust

## GAS FURNACE (bottled, LP or natural)

### Every 3 Years

- Check operation of main gas valve, pressure regulator, and safety control valve

Adjust primary air supply nozzle for proper combustion  
Clean thermostat contacts and adjust for proper operation

See Draft Test and Stack Temperature Test above

## ELECTRIC FURNACE

Very little maintenance required. Check the manufacturers specifications.

# Heat Distribution Systems

Some items here you can do yourself to keep your system at top efficiency. For the ones you can't, check above on how to pick a serviceman. Note: except where it says otherwise, these are all once a year items.

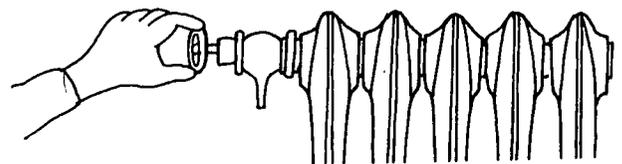
## HOT WATER HEATING SYSTEM

### Serviceman:

- Check pump operation
- Check operation of flow control valve
- Check for piping leaks
- Check operation of radiator valves
- Drain and Flush the boiler
- Oil Pump Motor

### You can do this yourself:

Bleed air from the system. Over time, a certain amount of air will creep into the pipes in your system. It will find its way to the radiators at the top of your house, and wherever there's air, it keeps out hot water. There's usually a small valve at the top of each radiator. *Once or twice a year* open the valve at each radiator. Hold a bucket under it, and keep the valve open until the water comes out. Watch out, the water is *hot*.



Draining and Flushing the boiler is also something you can do yourself. Ask your serviceman to show you how.

## FORCED HOT AIR HEATING SYSTEM

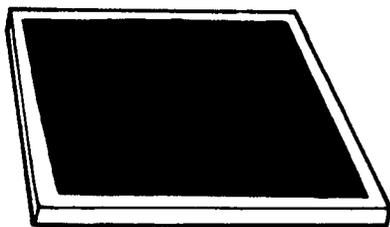
### Once a Year

### Serviceman:

- Check blower operation
- Oil the blower motor if it doesn't have sealed bearings.
- Check for duct leaks where duct is accessible.

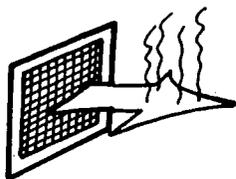
### You can do these yourself:

Clean or replace air filters — *this is important*, easy to do, and is something that needs to be done more often than it pays to have a serviceman do it. Every 30 to 60 days during the heating season you should clean or replace (depending on whether they're disposable) the air filters near the furnace in your system. Ask your serviceman how to do it, buy a supply, and stick to a schedule — you can save a lot of fuel this way.



Clean the fan blade that moves the air through your system — it gets dirty easily and won't move the air well unless it's clean. Do this every year.

Keep all registers clean — Vacuum them every few weeks. Warm air coming out of the registers should have a free path unobstructed by curtains or furniture.



## STEAM HEAT SYSTEM

With steam heat, if your serviceman checks your burner, (see Furnace Maintenance above) and the water system in your boiler, most of his work is done. There are two things you can do to save energy, though:

Insulate steam pipes that are running through spaces you don't want to heat.

Every 3 weeks during the heating season, drain a bucket of water out of your boiler (your serviceman will show you how) — this keeps sediment off the bottom of the boiler. If the sediment is allowed to stay there, it will actually *insulate* your boiler from the flame in your burner and a lot of heat will go up the chimney that would have heated your home.

## Whole-House Air Conditioning

### Once a Year

(Got room air conditioners?— many of these hints apply, ask your dealer about what you can do to your room air conditioners)

#### Serviceman:

Oil bearings on fan and compressor if they are not sealed

Measure electrical current drawn by compressor

Check pulley belt tension

Check for refrigerating fluid leaks and add fluid if needed

Check electrical connections

Re-adjust dampers — if your air conditioner uses the same ducts as your heating system, different settings are usually required for summer cooling than for winter heating.

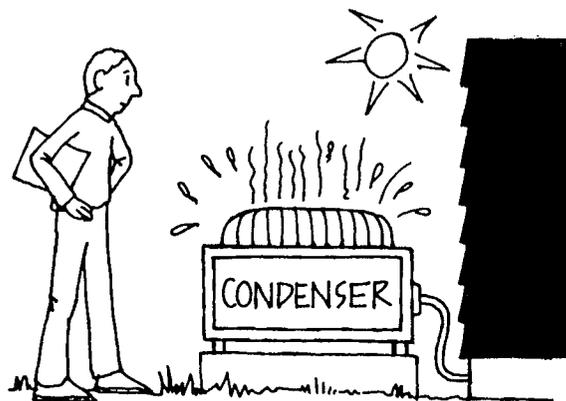
Flush evaporator drain line.

### You Can Do These Yourself

Clean or replace air filters — *this is important*, and if done every 30 to 60 days will save you far more money in fuel than the cost of the filters.

Clean the condenser coils of dust, grass clippings, etc.

**NOTE:** Your condenser is the part of your air conditioner that sits outside your house. It should be shaded — if it has to work in the sun it wastes a lot of fuel. When you shade it, make sure you don't obstruct the flow of air out and around it.



Buying a room air conditioner? — see Part 4.

# Water Heaters

Once a Year

**Serviceman:**

Adjust damper (for gas or oil)

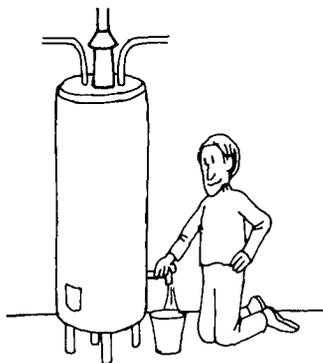
Adjust burner and clean burner surfaces (for oil)

Check electrodes (for electric)

De-lime tank

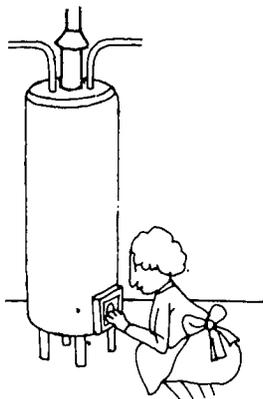
**You can do this yourself:**

Once or twice a year, drain a bucket of water out of the bottom of the heater tank – sometimes it's full of



sediment. The sediment *insulates* the water in the tank from the burner flame – *that* wastes energy.

**This is important:** Don't set your water heater any higher than you need to – your heater burns fuel

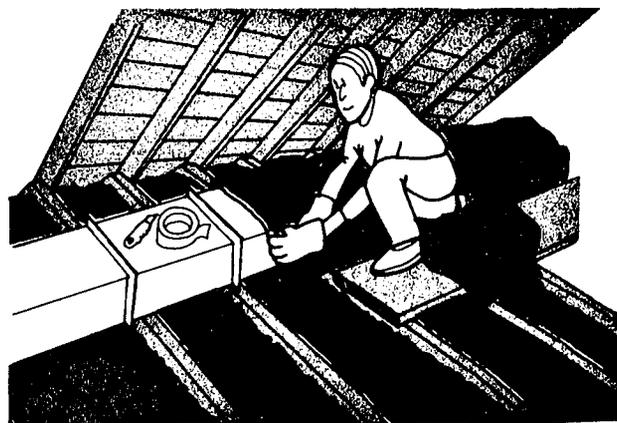


keeping your water hot when you're not using it – the higher you set it, the more it burns. If you've got a

dishwasher,  $140^{\circ}$  is high enough – if not,  $120^{\circ}$  is plenty. Depending on the type of fuel you use, this simple setback will save you \$5 to \$45 a year. (You say your heater says HIGH, MED, LOW? – Call your dealer and ask him which setting means 140 or 120 degrees.) Note: settings over  $140^{\circ}$  can shorten the life of water heaters, especially those that are glass-lined.

More about hot water conservation – See Part 4.

## Duct Insulation



If the ducts for either your heating or your air conditioning system run exposed through your attic or garage (or any other space that is not heated or cooled) they should be insulated. Duct insulation comes generally in blankets 1 or 2" thick. Get the thicker variety, particularly if you've got rectangular ducts. If you're doing this job at all, it's worth it to do it right. For air conditioning ducts, make sure you get the kind of insulation that has a vapor barrier (the vapor barrier goes on the outside). Seal the joints of the insulation tightly with tape to avoid condensation.

**NOTE:** Check for leaks in the duct and tape them tightly before insulating.

# CHOOSING A CONTRACTOR

If you decide that a particular home improvement you want to make should be done by a contractor, there are some things you should know about finding the right person for the job. The large majority of contractors take

pride in their business, are conscientious, and honest. But you should still spend some time and effort in making your choice, and once the choice is made, in clearly defining the job.

## 1. Where to start looking

Yellow Pages under "Insulation Contractors – Cold and Heat." Don't be suspicious of the small operation – even just a carpenter and his helper. You're doing a relatively small project and often the small business man will give you an excellent job.

Local Chapter of the National Association of Home Builders or Home Builders Association. They will be very helpful in recommending contractors.

Your banker. It's in his interest to recommend a man who will do a good job if he's loaning you the money to do the work.

Local government offices for government funded or non-profit operated home improvement assistance centers. They don't exist everywhere but the ones that do are interested in helping, and maintain files on contractors that they recommend.

From these sources, establish a list of three or four contractors from which to select.

## 2. How to select from your list

Ask each contractor for a list of past customers, and check their satisfaction with his work.

See how long each contractor has been in business – in general, the longer the better.

Call your local Better Business Bureau and ask if there have been any complaints against each of the contractors on your list.

Get estimates from each on any job you think will cost more than \$200.00.

## 3. Once you've selected a contractor – put it IN WRITING

Have him write up a specific contract for your job.

Check the contract carefully for work content and warranty. The best way to do this is to make a list of all the things you feel he should do in the course of the job (use the applicable Part III pages for assistance here). Then check what you know should be included against what's in the contract.

Sign the contract only when you are fully satisfied that it details everything you want done. Insisting on a detailed contract doesn't mean that you don't trust your contractor. But once you have a contract, each of you knows his limit of responsibility before the job begins.

# GETTING FINANCING

If you don't want to pay for your energy fix-up program out of your savings, and you want to get a much better interest rate than either a loan on your credit card or refinancing your present home mortgage will give you, try one of these:

### Where to Get Financing (and Information)

Commercial Bank  
Savings and Loan  
Mutual Savings Bank

### What Kind of Financing

1. Home Improvement Loan
2. FHA/HUD Title I

**NOTE:** Lenders are not allowed to charge fees of any kind of this type of loan, and the maximum permissible amount that can be made under Title I has just been increased from \$5,000 to \$10,000.

### How Long to Repay

2-4 years

12 years (this is a recent increase from 7 years)

Your Credit Union

Depends on the Credit Union, but usually includes Title I loans; see above.

Repayment time varies with the type of loan.