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Mobile Home Energy Savings

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MOBILE HOME ENERGY SAVING PLAN

7-15-83



KEEP COMFORT UP

and COSTS DOWN





Mobile Homes

This book deals with conservation and wise energy management as it relates to mobile homes. If you would like all of the conservation opportunities in your home explained in detail, contact your local utility for a home energy audit. Many Montana utilities offer audits free of charge. You may also be eligible for an interest-free loan from your utility to finance the weatherization improvements identified in the audit.



NOTE: It is important to note that even if you take all the actions suggested, your total savings will not necessarily equal the sum of the savings suggested for the individual actions. For example, wrapping a hot water tank with insulation and lowering the tank thermostat setting will not save you the sum of the savings projected for each of these individual actions.

The Department of Natural Resources and Conservation is not responsible and disclaims liability for any results or lack of results that may or may not accrue from the adoption of or failure to adopt any of the suggestions set forth in this brochure.

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Foreword

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Do you live in a mobile home? Are you thinking about buying one in the future? If the answer to either of the questions is "yes," this booklet is for you! We hope you'll find the information both informative and useful.

How energy efficient is a mobile home? We find two basic categories: homes built before 1976 and homes built after 1976. What's so magical about 1976? As of June 15, 1976, all mobile homes manufactured in the United States **must** meet the U.S. Department of Housing and Urban Development's (HUD) Mobile Home Construction and Safety Standards Code. As a result, mobile homes built after 1976 are usually much more energy efficient. But, that doesn't mean you don't have any work to do in the area of conservation if you have a newer home. There are still many ways you can reduce the amount of energy you use.

We have designed this booklet to help meet the needs of **all** mobile home owners. The major part of the book deals with weatherizing your home. Next is a look at life-style and how your energy use habits can make a big difference in the amount of energy you use. We've also included information on buying a new mobile home and consumer awareness tips.

Remember, **you** are the key to conserving energy. Do everything you can to make your **home** more energy efficient. **Then**, do everything you can to make **yourself and your family** more energy efficient.

Was your mobile home built before 1976? If so, it could very well be that you have a home that uses more energy than it should. Chances are, it's not only eating a hole in your pocketbook but it's leaving you cold in the process. Does it seem that no matter how much heat you put into your home, you feel cold drafts at every turn?

Well, cheer up...help is on the way! There **are** ways you can make your home more energy efficient and at the same time feel more comfortable at lower temperature settings.

Leveling

The first thing you need to do is make sure your home is level and blocked.

Frost heaves and vibration can open energy-wasting cracks around windows and doors in homes that aren't set on solid foundations. Windows and doors may also be out of square and hard to close tightly on houses that need leveling.

Since foundation work is difficult and dangerous, you may want a professional to do the job for you. See page 56 for some suggestions on selecting a contractor. And then **check each year to see if your home needs to be relevelled.**

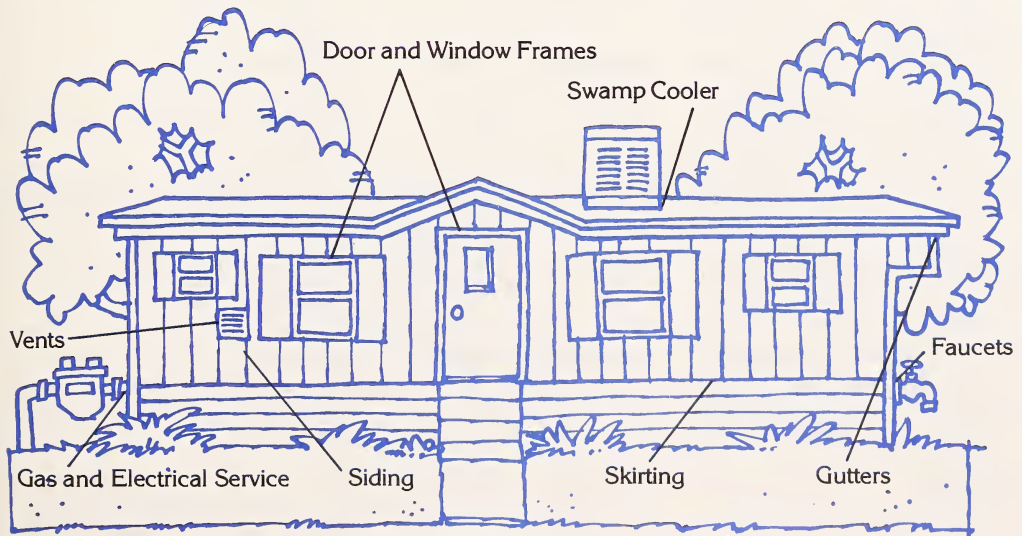
Stop Air Infiltration

Next check your home—**inside and out**—for places where cold air is coming in. The best time to do this is on a windy day when you can actually **feel** the air moving as well as see cracks and holes.

Places to check for air infiltration include: around door and window frames, seams and screws in the siding, joints, moldings, splash panels, vents and fans, wheel housing, gutters, exterior water pipes or faucets, ductwork, skirting, air conditioners or swamp coolers and gas and electrical

service entrances. Don't forget to check the interior of your home, too. Can you feel air movement around the windows and doors or air coming through the electrical wall outlets or light switch plates?

There are three things you can easily do to improve energy efficiency and stop air infiltration: **caulk, weatherstrip and install gaskets behind all electrical wall outlets and light switch plates.** A big plus is that these steps are all **inexpensive** to do—especially when you look at the amount of energy you will save. They will usually pay for themselves in energy savings within one year.



Making Your Mobile Home More Energy Efficient

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Caulking

Caulking is a compound used for filling cracks, holes, crevices and joints both on the inside and outside of your home. Caulking should be applied where any two different non-moving materials meet, because different materials expand and contract at different rates.

To caulk these areas, you will only need a few simple tools.

Try to choose a mild day to tackle this project. The outside temperature should be above 40° for the caulking to be applied correctly. So, **plan to caulk during the spring, summer or fall for best results.**

Before every heating season, go around your home for a general maintenance check. You will not only find areas that need to be caulked, but also other energy saving repairs that need to be made.

You will find a variety of caulking compounds on the market that will vary greatly in cost, durability, and ease of application. A few of the more common ones are listed in the following chart.

These and other various caulking compounds are available from hardware stores, lumber yards or conservation centers.

Remember—you get what you pay for! You may decide that you will

be better off in the long run by investing a little more money in a caulking compound that will last several years longer. Be sure that the caulking compound you select will remain elastic after it dries. This allows expansion and contraction of the different materials' parts as well as normal movement and settling of your mobile home.

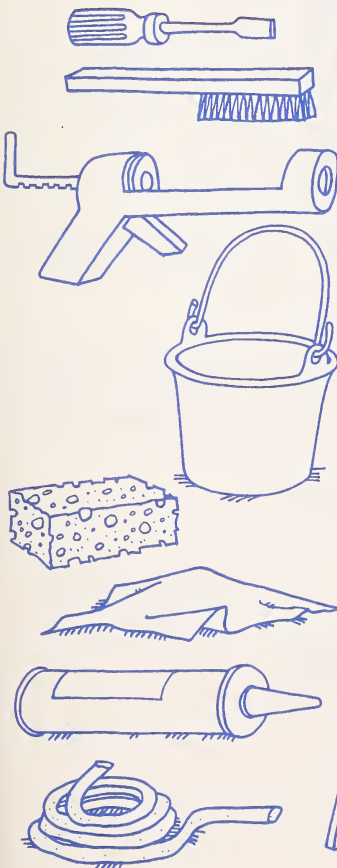
Because of its durability and reasonable cost, we recommend a good quality grade of acrylic latex caulk for the interior of the home and areas that don't move and shift a great deal. Silicone may be the best buy for the exterior because it has a lot of elasticity. Doing a good job is as important as using a good product!

Caulking Compound	Durability	Elasticity	Cost	Comments
Oil based	1-5 years	poor	low	Very low elasticity, suitable for interior use.
Acrylic latex	10-15 years	fair-good	moderate	Easy to apply, water clean-up, paintable, use outdoors only
Butyl rubber	4-10 years	fair	high	Difficult to apply, solvent clean-up.
Polyurethane	20 years	excellent	high	Solvent clean-up, excellent elasticity, adheres well to most surfaces, unpleasant odor indoors.
Silicone	20 years or more	excellent	high	Check to see if paintable. Colors may be available in some areas.

How to Caulk

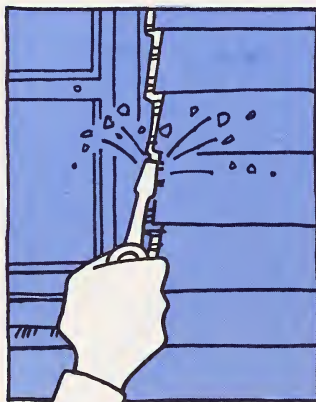
Tools: 1" scraper or screwdriver
wire brush
caulking gun
water container
cloth
ladder

Materials: caulking compound (Average: 1/2 cartridge per window filler material (used to fill large cracks before caulking) such as backer rod or scraps of insulation.



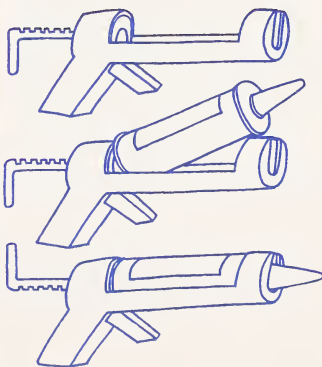
Procedure:

1. Preparation: Clean all surfaces before caulking. Remove loose paint, dirt and grease. This insures good adhesion. Make sure the surface is dry before you begin caulking. If you are replacing or repairing old caulking, remove as much of the old material as possible.



2. Fill wide or deep cracks with filler material.

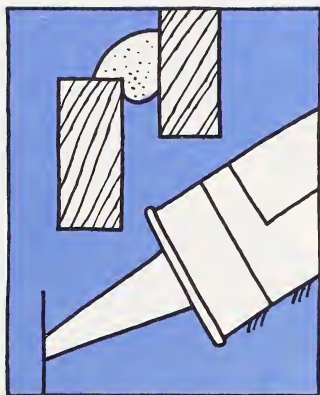
3. Read the instructions on the caulking tube very carefully!



4. Load the gun: Turn the plunger rod teeth face up and pull back as far as you can. Insert the cartridge in the opening and press the nozzle into the slot. Turn the rod teeth face down and push the plunger until the teeth engage.

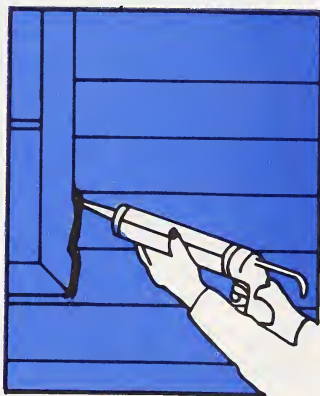
Making Your Mobile Home More Energy Efficient

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5. Open the tube: Cut off the tip of the tube with a sharp knife at a 45° angle. The amount of the tip of the tube you cut off will determine whether you have a thin, medium or heavy bead. Use a long nail to break the inner seal and plug the nozzle when not in use.

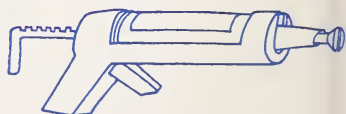
6. Apply the caulking compound: Hold the gun at a 45° angle to the surface (tilted in the direction of the movement) and squeeze the trigger to keep the caulk flowing evenly. The trick is to finish a seam in one stroke without stopping. Make sure the caulking completely fills the cracks.



7. Disengage the plunger on the caulking gun by twisting the plunger and pulling it back. This will stop the flow of caulk. Plug the end of the tube with a nail or screw.

8. Clean Up! Clean all tools immediately after you have finished. For acrylic latex caulk, use water.

Note: All windows should be caulked to reduce air infiltration, including storm windows on the outside. But, if the inside window is completely sealed, drain holes must be provided in the storm sash for condensation of moisture to evaporate or drain away.



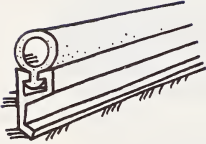

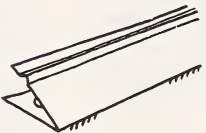
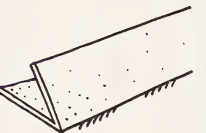

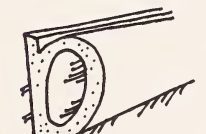
Weatherstripping

“Weatherstripping” is a narrow strip of metal, vinyl, rubber or foam that provides an air-tight seal between the frame and the moving parts of doors and windows. Weatherstrip windows and doors on sides,

tops and bottoms.

Check your home for existing weatherstripping. If you have some, check its condition to see if it needs to be replaced. If you can feel a draft coming in around your doors and windows, or you can see light coming in, weatherstripping is needed.

There are several types of weatherstripping available at hardware stores, lumber yards or energy conservation centers. New products frequently appear on the market. **Check all options before you buy.** In most cases, we recommend one of the following types:

Weatherstripping		Durability	Comments
Rolled vinyl with rigid metal backing		5 years and up	Must make contact for proper seal. Visible when installed. May become brittle with age.
Foam rubber		1-2 years	Easy to apply. Short life span.
Thin spring metal		5 years and up	May lose some flexibility with time and therefore, lose its sealing ability. Can generally be resprung with a screwdriver.
Spring plastic (vinyl)		5 years and up	Easy to apply. Works well on metal casement windows.
Fin seal (nylon brush with thin plastic strip down the middle)		5 years and up	Used to replace worn weatherstripping on aluminum horizontal sliding windows and sliding glass doors.
E.P.D.M. Rubber		5 years and up	Easy to apply. Compresses easily to fill gaps. Resists sunlight discoloration, water absorption and freezing.

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To install weatherstripping, follow the manufacturer's instructions. Don't forget to weatherstrip the exterior door thresholds. Door sweeps, door shoes, and vinyl bulb thresholds are among the easiest to install to make your existing doors tight. Weatherstrip windows and doors leading to enclosed patios.

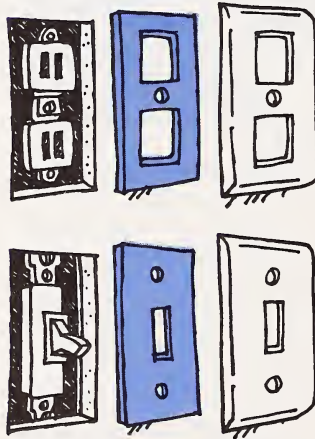
It is very important that you caulk and weatherstrip BEFORE you make any other improvements to the windows. Other improvements will NOT be effective if you still have air leaking in around your windows.

Outlet and Switch Plate Gaskets

The third low-cost procedure is the installation of insulating gaskets behind **all** outlets and light switch plates. Air leaks into the electrical outlets on outside walls and out of electrical outlets on inside walls.

To install:

1. Turn off the electricity at the circuit breaker.
2. Remove the screws holding the wall outlet or switch plate.
3. Place insulating gasket behind the plate.
4. Reattach the plate and turn the power back on.



How To Improve Windows and Doors

Now that you've reduced the air infiltration **around** windows and doors by caulking and weatherstripping, it's time to stop the heat lost **through** the windows and doors.

Windows

Replace broken glass.

Many times broken glass in mobile home windows is difficult to replace because the windows may be "non-standard" in size and structure. Some are made with adjustable glass louvers to control ventilation and require special treatment because of their fittings. New windows should be properly installed.

Storm windows or double glazed windows

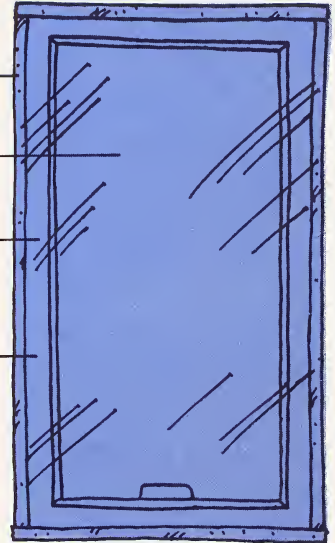
have been required on all mobile homes built since June, 1976. If your home does not have either of the above, you should consider one of the following suggestions.

In all cases, the quality of the installation is the most important aspect. If you install plastic correctly, it can be as effective as any other option. The main purpose of adding glass or plastic is to **trap** air and make a dead air space between the layers. "Storm windows" can be installed either inside or out, depending on the materials you choose. These "storm window" treatments are listed in order of least expensive to most expensive.

1. Plastic Sheeting taped to the window frame on the inside of your home is the most economical insulation for your window. It may be the best solution for jalousie windows (those with adjustable glass louvers) as well. Choose clear, 6 mil thick polyethylene plastic. You can buy this at lumber yards or hardware stores by the roll or purchase a plastic painter's "drop cloth." Tape the plastic to the frame all the way around the window, creating an air space between the glass and the plastic. Don't leave any gaps in the tape that would let air in between the plastic and the glass. **Test the tape on the wall first before using it to make sure it doesn't leave a gummy residue or remove the paint.**

Tape —
Plastic —
Frame —

The plastic extends over the window frame and is taped securely all the way around the edge of the plastic leaving **no** gaps. Check under the inside of the window sill for caulking.



Making Your Mobile Home More Energy Efficient

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2. Commercially made plastic inside storm windows may be used on mobile homes. A piece of rigid plastic is cut to fit inside a plastic frame. The frame may be opened to allow the plastic to be removed and stored for the summer. The plastic frame remains in place inside the window frame. Other brands use magnetic tape to hold the plastic in place. Kits are available at hardware stores, lumber yards or conservation centers. Follow the manufacturer's instructions for installation. This type of storm window may be a good choice if:

- a. The skin (siding) will not allow an outside storm window to be sealed properly, or
- b. the cost of outside storm windows is higher than inside storm windows.

Holes may be cut for jalousie window handles and then sealed with tape. Or, handles may be removed from jalousie or crank windows for the time you have the inside storm windows in place. The plastic may be removed and stored for the summer while the frames are left in place.

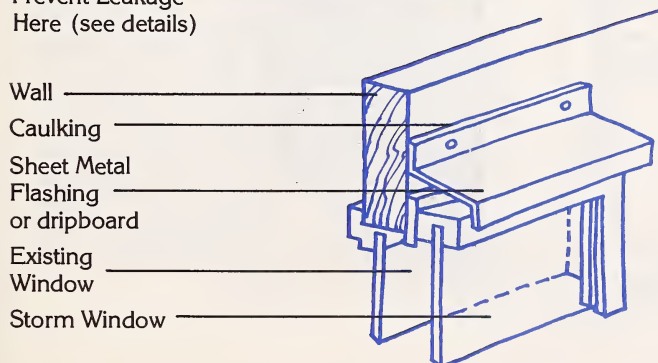
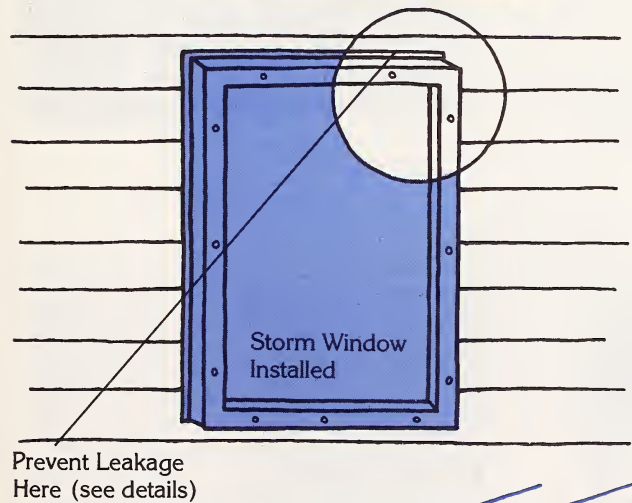
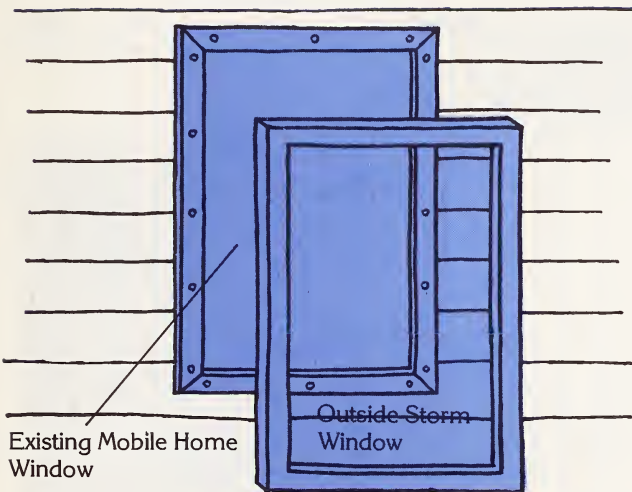


The plastic frame snaps open and shut for easy insertion of plastic.

Example of the rigid plastic window. A plastic frame is applied with adhesive strip to the existing window opening and a heavy piece of plastic is fit into this secondary window frame. It may be removed by opening the snap-together frame for cleaning purposes or ventilation.

Glass storm windows may also be placed on the inside of the window using a wood or metal frame. You can have these windows made or make them yourself.

3. Outside Storm Windows may be available from the mobile home manufacturer, depending on the age of your mobile home. Check with a franchised dealer or with a mobile home parts dealer. Be sure that installation instructions are included. A dripboard or flashing should be included at the top of the storm window to prevent leaks between the storm and prime windows.



This type of storm window is durable, but the cost may be much higher than other options listed previously. There may also be a long waiting period in ordering these windows, depending on the age of your home.

NOTE: Windows are often used as fire escapes and can't be permanently locked. Any inside or outside storm window must allow free access to the outside. Be sure that everyone in your home knows how to remove the window in case of fire. Windows designated as fire escapes by the manufacturer usually have two to four large red latches.

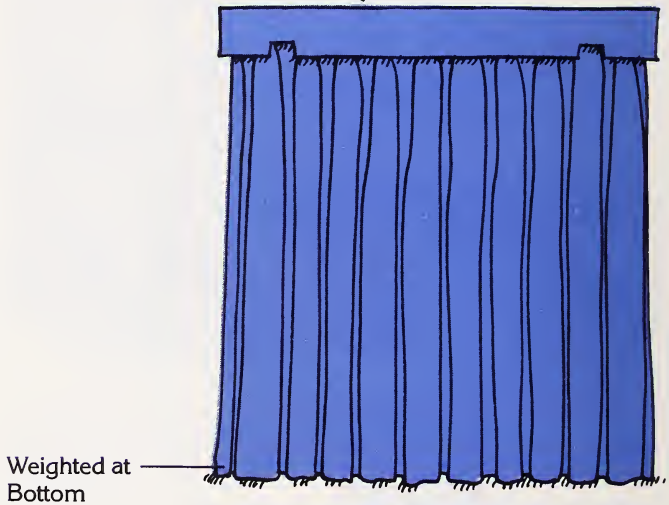
Ventilation may also be needed, so a few storm windows should be made so they can be removed to allow fresh air when needed.

4. Another option may be to replace your windows with new prime windows that are double or triple glazed if they are in very bad shape. Again, this is dependent on availability and cost of the windows.

Making Your Mobile Home More Energy Efficient

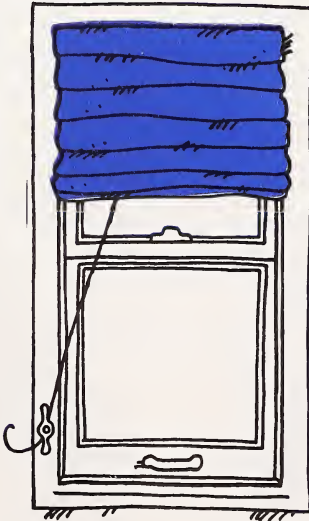
5. Other inside thermal treatments for your windows may be a big help in stopping cold drafts. There are many choices available for you to buy or make yourself. These include: cornice boards, insulating Roman shades and window stuffers. Try these on a few windows before doing all of the windows. North side windows should be taken care of first. Be sure that the treatment completely seals the window from air movement.

Cornice Board — prevents air leakage around top of drapery and cold air moving from the window into the room.

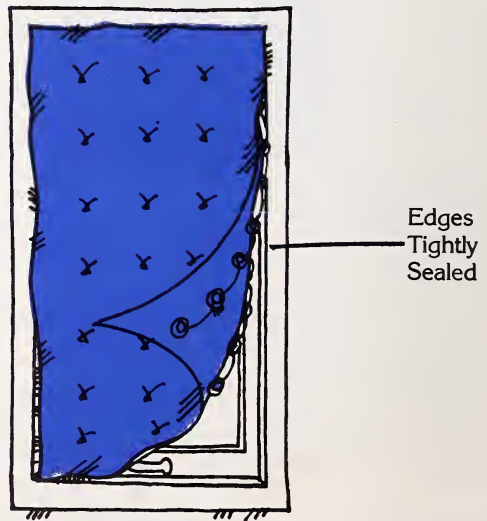


Insulating Roman Shade

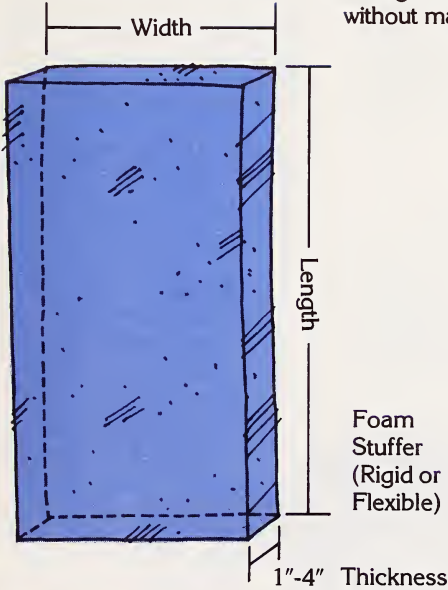
Open



Closed



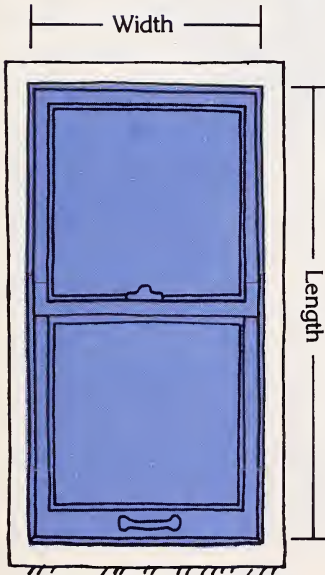
Removable Foam Window Stuffer



NOTE: Some mobile home windows are not deep enough to use a window stuffer without major design changes.

6. During the summer, your mobile home may be very uncomfortable because of heat buildup from the sun shining in through the windows. Interior shading, such as closed draperies, roller shades or venetian blinds will help. But, exterior shading—movable roller shades or sun screen, reflective film or exterior shutters will be more effective. Awnings may also be used for shading. Awnings should be light in color. Any exterior shading used during the summer should be removable during the winter to let the sunshine in to warm your home.

Some insulating foams are not recommended for use inside living areas. If you're in doubt about a particular product, check with your local building code office.



Making Your Mobile Home More Energy Efficient

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Doors

Make sure that your home is properly blocked and leveled. If you still have gaps between the exterior door and frame, the door should be weatherstripped. Caulk all gaps and cracks between the frame and the siding.

Most older mobile home doors are made of metal and are generally not insulated. You will usually only find a stiff cardboard filler between two sheets of metal. If possible, replace this type of door with a solid core or insulated door without windows.

You may also want to consider adding a vestibule to cut down on the heat lost through the door as well as when the door is opened and closed. Vestibules or air-lock entries have proven especially cost-effective on mobile homes in Montana.



Vestibule

Siding

When you take the time to make a thorough inspection of your home, you may be surprised at the shape of the siding on your home. Any gaps or holes in the siding allow air to come into your home. This causes your heating costs to soar and creates uncomfortable drafts.

To take care of the problem, refasten all loose siding and caulk if necessary. Repair any holes or tears and replace missing or badly damaged siding. Replacement exterior panels are available. For more information, contact a franchised dealer or mobile home parts dealer. Be sure to stop air coming into your home around faucets,

pipes, utility entrances and other holes by stuffing scraps of insulation into the gaps and then caulking where possible.

During the inspection of the outside of your home, check the condition and placement of the gas connectors and electric cables going into your home. They should not be exposed to children, pets or subject to other hazardous conditions. Check local building codes and park regulations for proper installations.

Roofing

Look for the same types of problems on your roof as you did with the siding. Holes or damaged roofing material should be repaired or replaced and loose roofing material re-attached. The entire roof should also be coated and sealed with a fiberized aluminum roofing sealant applied with a stiff bristled brush. This helps waterproof and soundproof the roof. Light colored materials are available to help reduce overheating in the summer. If new roofing is needed, you may want to consider asphalt or fiber glass shingles.

Skirting

“Skirting” is the material used to enclose the space between the mobile home and the ground. Most mobile home parks require skirting for two major reasons: 1) it gives the home a more attractive appearance, and 2) it serves as a windbreak to help prevent damage to the mobile home in severe winds. Skirting helps reduce the chances of frozen pipes and can be important in terms of energy conservation. It stops a lot of the air infiltration and air movement under the home, thereby making the area under the mobile home much warmer.



Making Your Mobile Home More Energy Efficient

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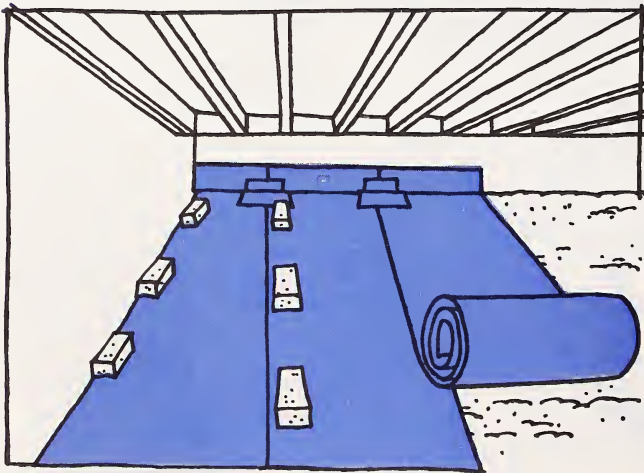
Before skirting is installed, the home should be properly anchored, leveled and blocked. The two materials involved in skirting are the sheathing or covering used and the framing to which the sheathing is

attached. A wide variety of materials are used in just as wide a price range. Sheathing materials used range from fiberboard to plywood to steel, aluminum or polyethylene panels. The most common is the embossed aluminum that

matches the siding. If you can easily get under the home, insulation batts can be attached using specially made clips. The framing materials usually used are wood, steel or aluminum. Whatever you choose, the materials should be **fireproof, moisture proof** and installed according to local codes.

Because of possible moisture problems, it's a good idea to cover the ground under your mobile home with a vapor barrier. Use either a 6-mil polyethylene plastic sheeting or 15 pound or 30 pound asphalt roll roofing material. Overlap the seams of the material at least twelve (12) inches and weight it down with sand, bricks or other material.

If you already have skirting, check for bent, damaged or missing skirting and repair or replace where necessary.



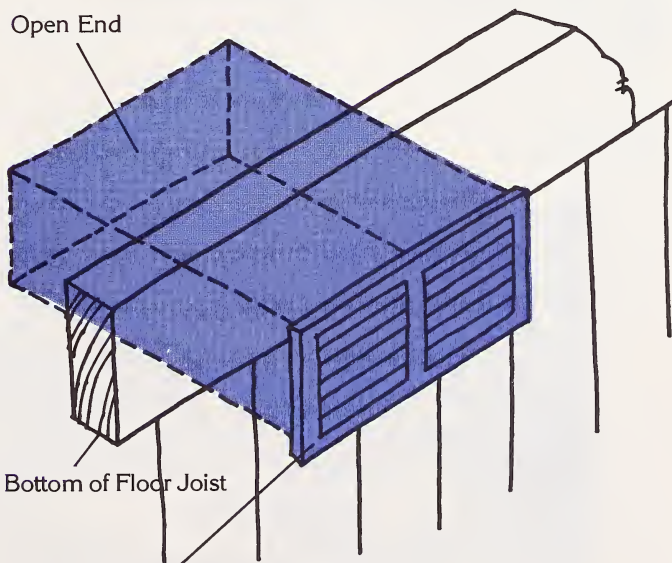
In many mobile homes, fresh air for combustion for gas burning appliances is drawn from underneath the home. Because fresh air is important for combustion and reduces moisture problems, most skirting is vented. In our dry climate, you may be able to close off the vents and insulate the skirting to keep the area under your home warmer. **This can be done only if a vapor barrier (plastic ground cover) is laid down on the ground beneath your home and you provide fresh air for your gas burning appliances through a duct that extends from outside the skirting to your gas appliances.**

You MUST have approval from your local building inspector and obtain a permit to do this. You must meet the requirements of the Uniform Mechanical Code or other governing building code for the size of the vent or duct opening. The building inspector will, in most cases, be very willing to help you size the duct and will help in drawing up plans for bringing in outside air.

Once you have met all the code requirements for proper outside air and have obtained a permit, you can proceed with insulating the skirt. You may elect to insulate with batts or blankets or with rigid board insulation. If you choose the rigid board, care must be taken to install it in accordance with local building codes and fire regulations.

WARNING: Some mobile home parks in our area may be located on or near landfills. Care should be taken as you could have a potentially dangerous situation if your mobile home is on a landfill and

you insulate the skirting and close off the vents. Methane gas generated from the landfill could be escaping and collecting beneath your home. If it builds up under your home in the skirted area and has no means of escape through vents, an explosion could occur. THEREFORE IT IS EXTREMELY IMPORTANT TO CHECK WITH YOUR LOCAL BUILDING INSPECTOR TO SEE IF YOU ARE ON A LANDFILL BEFORE YOU APPLY FOR A PERMIT AND INSULATE THE SKIRTING.



Louvered Grille with back side flush with sidewalls.
(Size louvers to the required open free area.)

This brings up the next topic of discussion—insulation. Let's take a closer look.

Making Your Mobile Home More Energy Efficient

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Insulation

If your home was built after 1976, you should have enough insulation in the ceiling, walls and floor. If you have an older model mobile home, your chances of having an adequate amount of insulation are very slim.

Insulation works by resisting the flow of heat directly through materials. The measure of this resistance is called the “**R**” value. The higher the R-value, the better the material’s resistance to the flow of heat.

Now that we see how insulation works, let’s see how it applies to your home. **If your mobile home is not adequately insulated, should you reinsulate?** There is a great deal of controversy and concern over this question.

Proper amounts of insulation definitely reduce your home’s heat loss. But there are some factors that may affect whether or not you choose to add more insulation or reinsulate your mobile home:

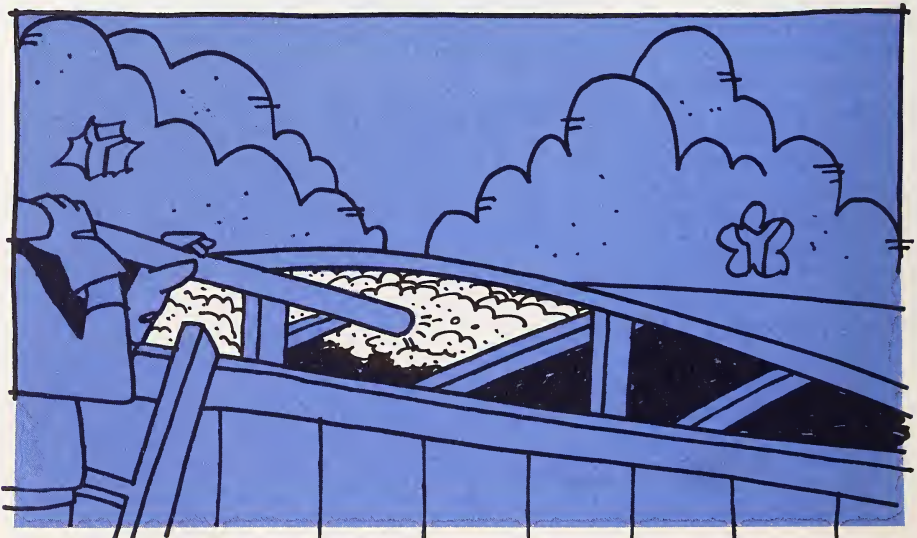
1. Be aware that there could be a potential structural problem with your home if extreme care is not taken.
2. Reinsulating your home may be a costly investment.

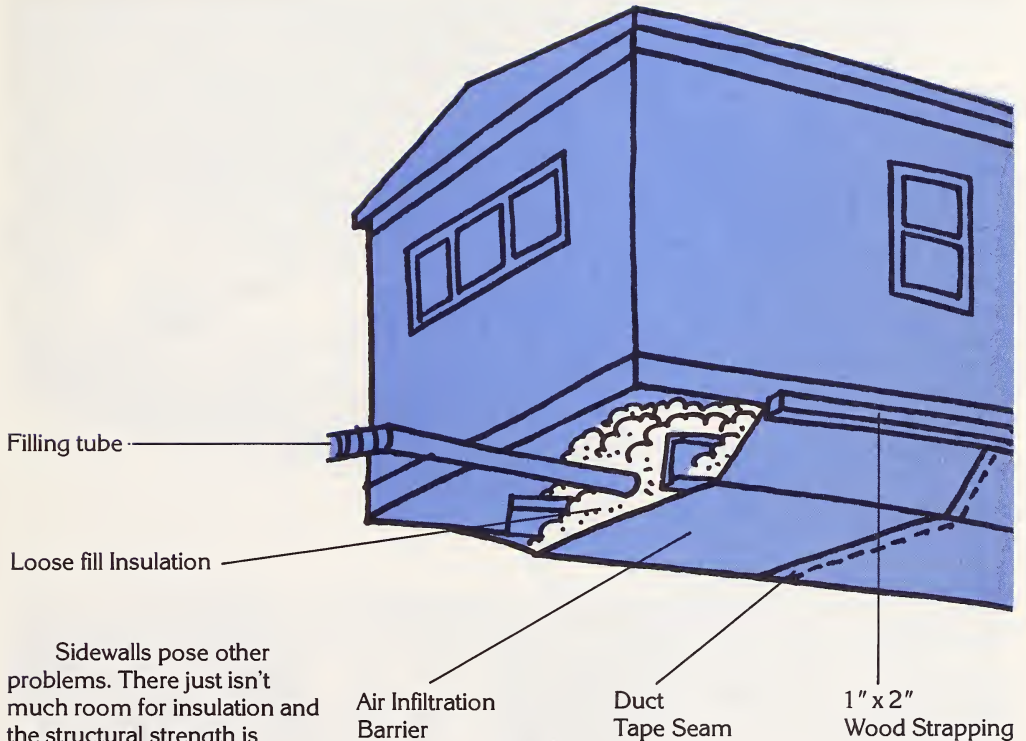
There are basically three options available to you:

1. “blowing in” insulation into the roof and sidewall cavities,
2. removing the siding and roof and adding insulation and reattaching old siding, or
3. installing insulation and new siding directly over the old exterior and constructing a new roof.

Blown-In Insulation

If insulation is blown in, several points must be considered. The ceiling area can be insulated by drilling holes through the roof or lifting up sections of the roof and using fill tubes to install insulation in the cavity. This may be an acceptable method for double-wide homes because the pitched roof should have enough space and is usually vented. However, there should be no signs of water damage. Single-wide mobile homes could pose a problem. If the 6”-8” cavity is pumped full of insulation and there is no ventilation, moisture condensation could occur. A vapor barrier should be in place.





Sidewalls pose other problems. There just isn't much room for insulation and the structural strength is limited. **If insulation is blown in the sidewalls, it is possible for bulging to occur. If you choose this method, it is very important that you contract with an insulator who has had experience insulating mobile homes and will guarantee in writing that no structural damage will occur as a result of insulation.**

If insulation is blown into the floor area, it should be done only if the home will not be moved in the future. The insulation job may not hold up if the home is moved.

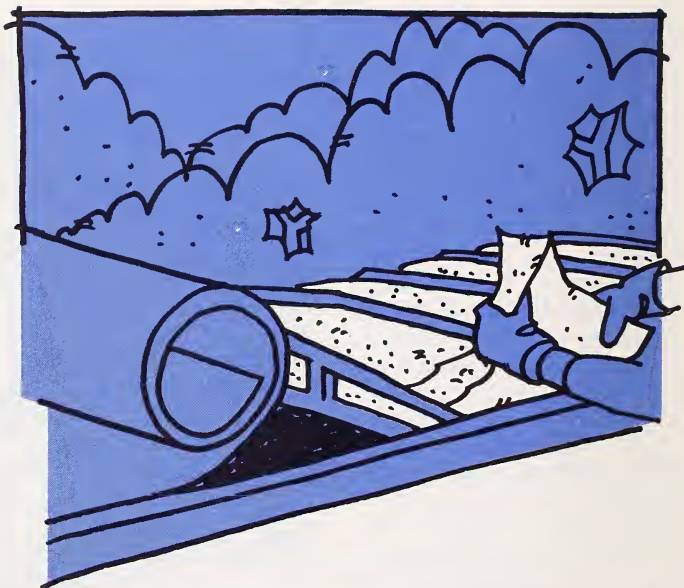
Making Your Mobile Home More Energy Efficient

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Removing Siding and Reinsulating

Another option is to remove existing siding and roofing and add insulation. The staples, screws and bolts are removed, one section at a time. According to a specific plan, the roof skin is unrolled and any existing insulation removed. The vapor barrier is repaired or replaced, insulation is added and the roof skin reattached and the roof resealed.

In reinsulating the sidewalls, the panels are taken down, new insulation is added and the outside skin is reinstalled.



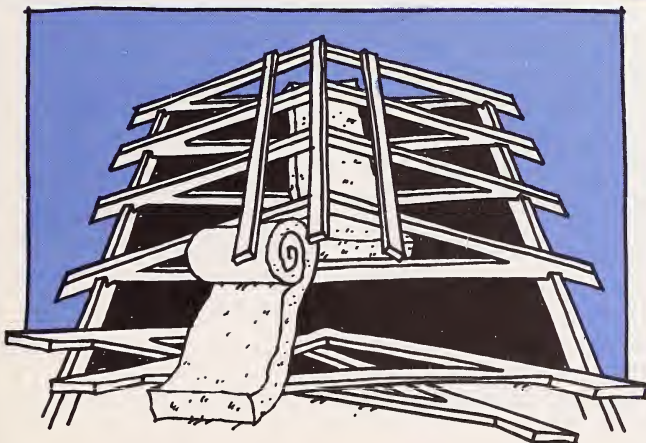
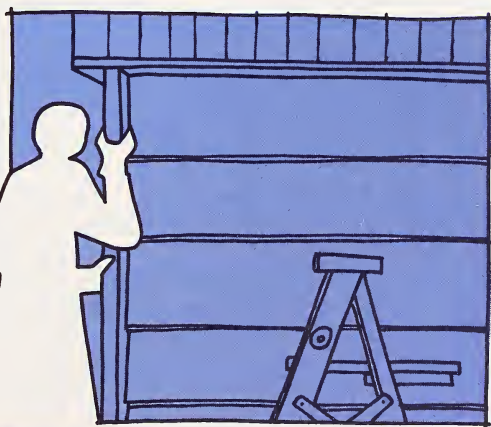
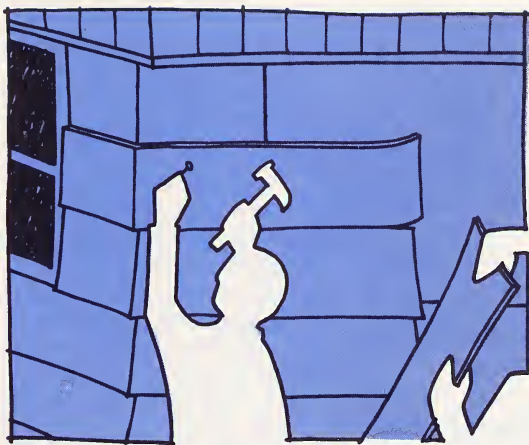
The main disadvantage of this method is that, once again, structural damage could occur. It may be very difficult to reinstall the panels and to return the roof to its original position.



Installing Insulation Over Existing Exterior

This method may be the best technical answer for retrofitting an older mobile home. But the current costs may not make it possible to recover your costs through savings on your utility bill, particularly if you can't do it yourself and contractor costs are added.

In a nutshell, this system uses special trim and fasteners in combination with an insulating backer board to improve the mobile home. The insulation and siding are installed directly over the old exterior. Following that, a new roof is constructed and insulated. Additional roof support to avoid overloading with snow is usually needed.



The home is resided after the application of an insulation board. Corner posts are put over the sheathing, and residing started from the bottom. The old exterior is left in place. After residing, a pitched roof is added. Trusses are built in a jig, the roof cavity insulated, and exterior plywood seals the cavity. Trusses must be engineered by a qualified professional.

Insulating the Floor or Skirting

As mentioned earlier, insulating under the floor area or insulating the skirting may be the most practical option. If possible, and code permits, insulate the skirting and bring in outside air for combustion for your natural gas appliances. If the skirting **must** be ventilated, the floor can be insulated.

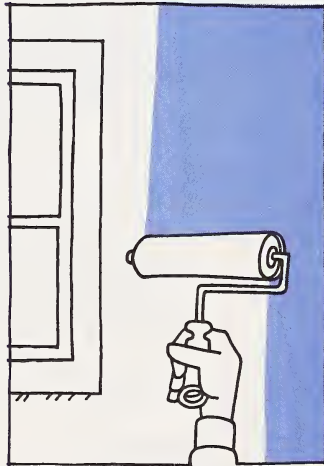
Vapor Barriers

By reducing the air leakage in your home through caulking, weatherstripping, insulating and adding storm windows, the humidity level in your home increases.

It is possible that over a period of time, this moisture may reduce the effectiveness of insulation and cause damage to other building materials. The effectiveness of insulation that becomes wet decreases much the same way socks lose their warmth when they become wet on a cold day.

A **vapor barrier** will prevent damage to insulation and building materials that can be caused by moisture. To be effective, a vapor barrier must have a high resistance to the flow of moisture. The quality of a vapor barrier is determined by its perm-rating. **The lower the perm-rating of a material, the better its resistance to moisture penetration.**

Materials that can be used as vapor barriers include polyethylene plastic, low perm-rated paints, a laminated asphalt-covered building paper, vinyl wall coverings and foil-type wallpapers. **In many cases, on a retrofit basis, the only practical way to add a vapor barrier to a wall or ceiling is to use a low-perm rated paint.** A low-perm rated paint should be one that has a perm rating of **one** or less.



Apply a Vapor Barrier Paint

If there is no insulation, you can buy batt or blanket insulation with attached foil or kraft-faced vapor barriers.

The vapor barrier should be installed on the warm side of your insulation—the side closest to your living space.

Ventilation

Adequate ventilation is also very necessary in your home. If you do a great deal of laundry, cooking or other moisture producing activities, excessive condensation can cause damage to paneling, paint and other interior materials if ventilation is not provided.

Heating System

Your heating system is your home's biggest energy user. On the average, space heating accounts for almost 60% of the energy we use in our homes. So, it makes sense to operate your heating system as efficiently as possible.

There are many factors that affect the amount of energy you use for heating. These include: the weather conditions, the thermal efficiency of your home, the efficiency of your heating system, your life-style and habits, the "thermal" comfort needed by the people in your home, the orientation of your house to the sun and the relative humidity.

The majority of the heating systems found in mobile homes are gas forced air systems.

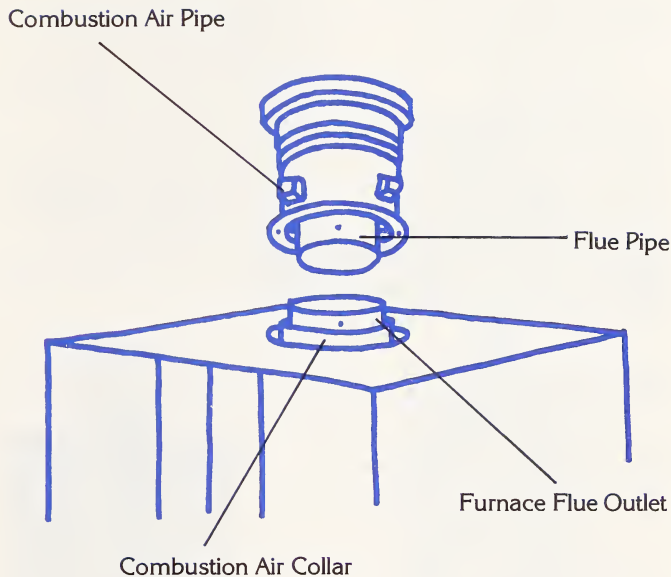
Safety

Before we get into the operation and maintenance of your heating system, you should be aware of this important safety point.

Heating systems using fossil fuels, such as natural gas, obtain heat through combustion. This type of system mixes air and gas and ignites the mixture in the combustion chamber thereby producing heat. The heat is transferred through the walls of the combustion chamber to a distribution system and the by-products of combustion (carbon dioxide, water vapor and other waste products) are expelled to the outside through the venting system.

To have “complete” combustion, enough fresh air must be supplied. If there isn’t enough fresh air for combustion, it is possible for harmful carbon monoxide to be produced. Carbon monoxide is a toxic gas which has no odor, color or taste and is highly toxic even in very small amounts.

As you “tighten up” your mobile home to reduce heat loss you may reduce this necessary amount of air for combustion. There must be enough air for the flame to burn.



You will need to make sure that you have enough air for your furnace to operate properly. In most older mobile homes, air for combustion is drawn from beneath the home. If the home is skirted, it should be vented properly to make sure there is enough available fresh air. If you decide to insulate the skirting and seal the vents, you **must** provide air to the gas appliances through correctly sized duct work. This must be approved by your local building inspector. See the “Skirting” section for more details.

Many newer furnaces have sealed combustion units. These units have a venting system using two vents in one pipe which extends through the ceiling—a pipe within a pipe. The exterior pipe brings in fresh outside air for combustion. The inner pipe (flue) is the exhaust pipe for the products of combustion to escape to the outdoors. Make sure both pipes are properly connected. Even though air is not drawn through the floor for the furnace, combustion air for the gas water heater may be, and proper venting of the skirt or ducting is necessary for the water heater.

Basically, your heating system includes:

1. The **furnace** to produce the heat,
2. The **heat distribution system** (the ducts and plenum) to move the heated air throughout the home, and
3. The **thermostat** to maintain the desired temperature and activate the furnace when heat is needed.

The Furnace

Your furnace should operate as efficiently as possible. In other words, you want to get the most heat you can from the energy used.

You may want to have a qualified serviceman check to see if your furnace is properly sized for this altitude and for your particular home. If your furnace is over-sized, you could be wasting energy.

A gas forced air furnace consists of:

1. the heat exchanger,
2. burners
3. cabinet forming the enclosure
4. blower and motor
5. air filter

The Distribution System

The gas forced air furnace is a system within a system; a box within a box. When the thermostat calls for heat, a signal activates the controls to start the burner.

The heat exchanger is enclosed within the cabinet and separates the flame and combustion products from the room air. The combustion of the natural gas and air takes place within the metal walled heat exchanger. The products of this combustion are then exhausted to the outside through the vent pipe.

When the air surrounding the heat exchanger reaches a preset temperature, the electrically powered blower comes on. Air from inside the house is pulled into the furnace cabinet through the grille on the door of the furnace. The air then passes through a filter and is circulated over the outside surfaces of the heat exchanger. The heat is transferred to this circulated air **through** the heat exchanger walls and **does not** come in contact with the fuel or the products of combustion. The heated air circulating around the heat exchanger is then forced out of the furnace by a blower through the ductwork, out the registers and into the home.

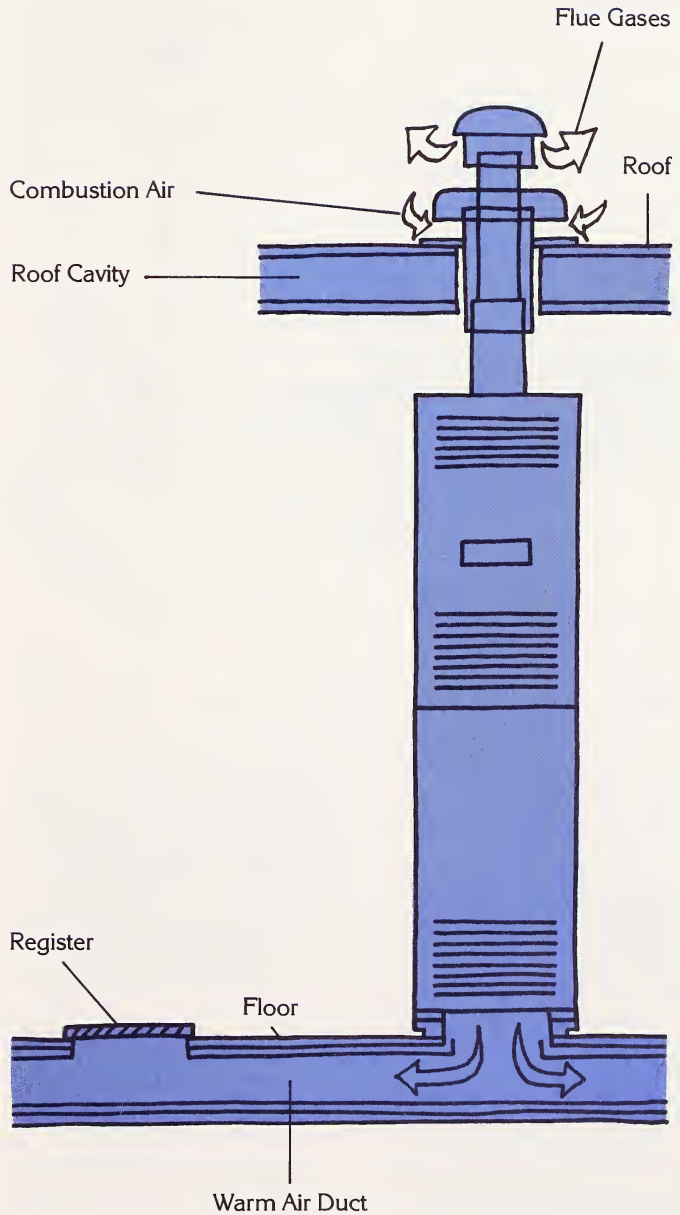


Combustion air is drawn into the heat exchanger from outside the home.

Single-wide mobile homes have one long heating duct extending the length of the home. Holes are cut in the ductwork and registers placed over the holes to allow for heat in each room. Double-wide mobiles have two long ducts plus a cross-over heat duct connecting the two main runs.

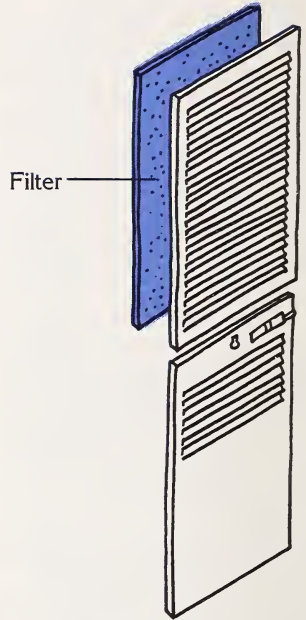
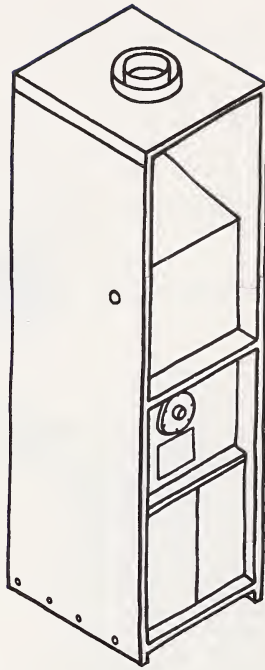
The interior doors on a mobile home are cut so there is a gap of several inches between the door and the floor. This allows the cooler room air to be drawn back to the furnace where it is reheated.

When the desired room air temperature is reached, the thermostat signals the **burners** to shut off. The process is repeated when the thermostat calls for heat again.



Maintenance

It is very important to maintain your gas forced air heating system properly and regularly for it to operate efficiently and safely. You can do many of the maintenance procedures yourself. You may, however, want to consult a heating contractor if you are unsure of your ability to safely perform some of the procedures.



Safety

There are some very important safety considerations when operating and maintaining your gas forced air system.

1. BEFORE DOING ANY WORK ON YOUR FURNACE, TURN THE ELECTRIC POWER TO THE FURNACE OFF.

2. Never store combustible products (paint, old cleaning clothes, etc.) near the furnace or water heater or under your home.

3. Be sure that there is adequate air for combustion available. If you are unsure whether or not you have enough, consult a heating contractor.

1. Filters—are probably the most neglected item in furnace maintenance. They are used to reduce the amount of dust and dirt in the home. A clogged or dirty filter will reduce the amount of air flow over the heat exchanger. This reduced air flow causes the furnace to run longer in order to supply enough warm air into the house. The filter should be **checked monthly** by holding it toward the light. If it is dirty, it should be replaced or cleaned. Each manufacturer has a filter designed especially for each furnace. Most mobile home furnaces have washable sponge-like filters. If your furnace does not have a filter,

you can purchase one at a mobile home repair/service store. Again, buy the one designed for your furnace.

2. The blower and blower compartment should be cleaned thoroughly of all lint and dust at least once a year.

3. The blower and blower motor must be lubricated at least once a heating season or per manufacturer's recommendations. Lubrication will reduce wear and noise in the blower compartment. Be careful not to over-oil the motor. Two to three drops of the correct weight oil will do the job. Check the manufacturer's

recommendations. Some blowers and motors have sealed bearings, in which case no lubrication is necessary.

4. If the blower is belt driven, the **belt** should be checked for wear and tension. If the belt is too tight, it puts too much tension on the blower bearings and can wear out the motor. Adjust only enough to prevent the belt from slipping.

5. The **burner** and **pilot** should be clean. If they aren't, call a qualified serviceman.

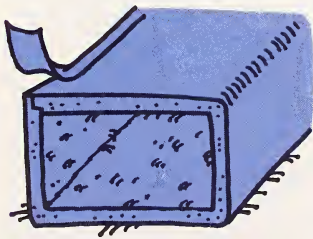
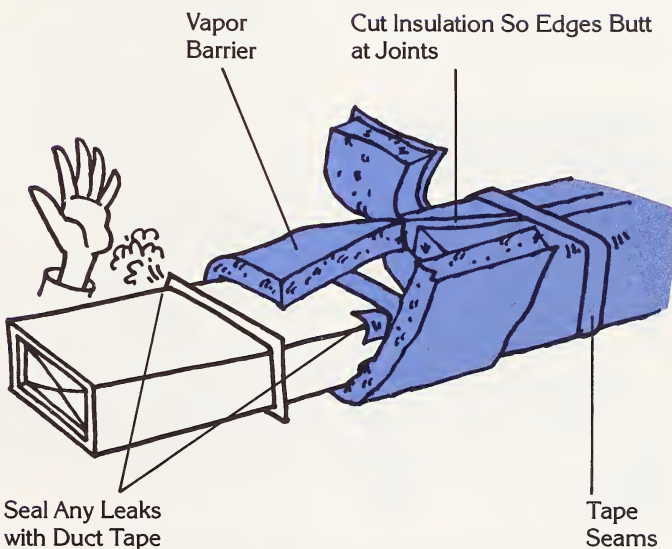
6. The **vent** should be clean and free of rust.

7. Make sure the **distribution system** is working properly. Adjust the vents in each room for good warm air distribution. Check to be sure the vents aren't covered with carpeting or furniture.

8. If you have a double-wide mobile home, check to see that the cross-over duct connecting the two main ducts is connected properly and is strapped up off the ground. If not, you can strap it up using one inch (1") perforated steel banding screwed in place. Be sure there are no kinks in the duct that would restrict proper air flow.

9. If the heat ducts are exposed and easy to get to, you may want to consider insulating them. First of all, repair any leaks in the distribution system with duct tape. Then insulate the heat duct. You can wrap batt

insulation around the heat ducts and seal with duct tape. If the batt insulation has a vapor barrier, it should be on the outside.



Mobile home duct board is also available. It is 5/8" thick with a vapor barrier on the outside surface. Joints are made using 2-1/2" wide pressure sensitive aluminum tape.

10. The pilot light may be turned off to save gas during the summer. You will save money, however, only if your local utility relights the pilot for you in the fall free of charge or you can do the job yourself. The instructions are usually on or near the furnace. If you must hire a serviceman to relight the pilot, the service charge may offset the gas savings.

Heating System Thermostat Settings

What about setting the thermostat back to a lower temperature? Will this save energy? Should you set it back permanently, or just set it back at night?



First of all, **permanent setback** (setting the thermostat temperature back to a lower setting and leaving it there) will **always** save energy. There are some drawbacks to **extreme** setback.

Elderly individuals and those with poor health should not set the thermostat down below 68°F. Hypothermia, a lowering of body temperature and slow-down of bodily functions, could result if the temperature is too low.

A good rule of thumb is to set the temperature as low as you can and still be comfortable. Don't forget to add additional layers of clothing so you can be comfortable at lower temperatures.

The savings potential is very different between permanent and temporary setback. For **permanent** setback, there is a potential energy savings of 1-2% per degree setback.

Temporary day or night setback (turning the temperature down at night or when no one is at home) can save energy with most types of heating systems. **Temporary setback is not recommended for electric heat pumps or homes on the demand energy electric rate** (unless a specially designed thermostat is used).

Now, what about **automatic clock thermostats**? Will they help save energy? Clock thermostats will save energy by automatically turning the thermostat down and up on a pre-set schedule. An advantage is that your home will be warm when you get up. But, if you can train yourself to manually turn the thermostat down, you will save the cost of the clock thermostat plus the energy saved.

The thermostat should **not** be located by a direct source of heat (i.e., heating vent, lamp, stereo, television or sunlight). In many mobile homes, the thermostat is located in the hallway. Because of air movement you may not be getting an accurate reading. Relocate the thermostat, if possible, to an interior wall in the living room.

Cooling System

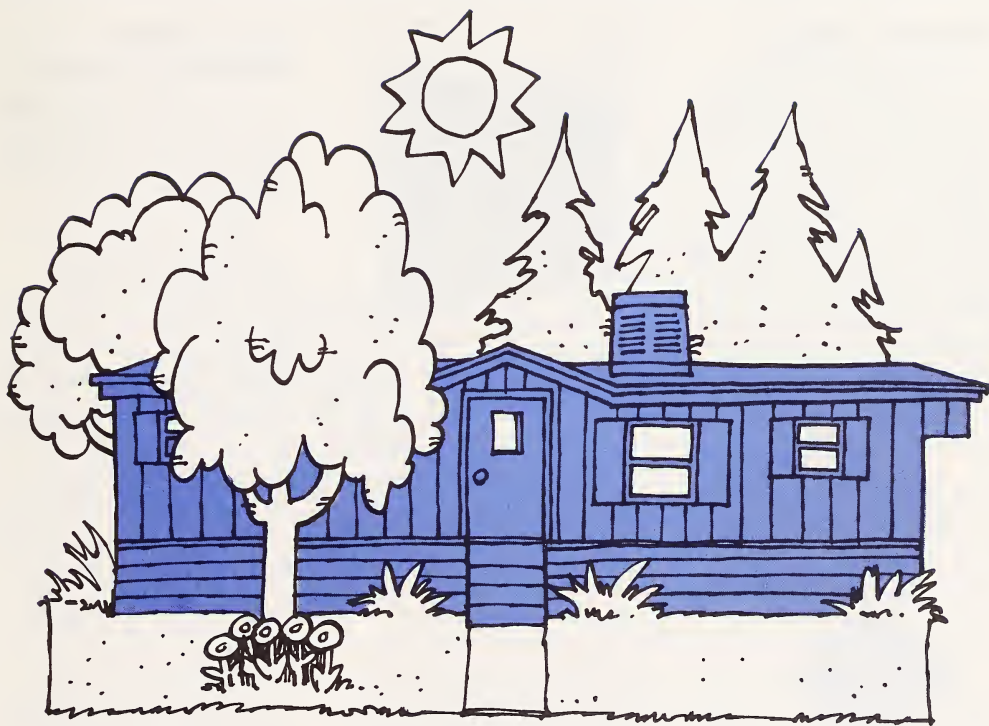
There are several things you can do to help cool your home **without** using any energy at all! Let's look at those first, and then we'll get into other methods of cooling.

1. Weatherization

(caulking, weatherstripping, insulation, etc.) is important in keeping your home cool in the summer as well as warm in the winter.

2. Use effective **window**

shading, both inside and outside. (See the "Windows" section of this booklet.) **Whatever option you choose for shading of your windows for summer, remember to select shading that you can remove during the winter to take advantage of the warm sunshine to help heat your home.**



3. Your mobile home park probably encourages you to plant trees, shrubs and flowers to keep your lawn area looking attractive. You might as well take advantage of the opportunity and use **landscaping** to your benefit.

Effective landscaping is one of the most important ways of keeping your home cool. Keep in mind that you don't want landscaping to get in the way of the sun in the winter, though!

How do you accomplish both? Plant tall deciduous trees (those that lose their leaves during the winter) on the west, east and south sides of your home. If you can only plant a few at a time, plant those on the west side first to give you the most benefit in the summer. The deciduous trees will reduce solar heat gain of the walls, windows and the roof during the summer. In winter, the leafless trees will let in the sunshine to warm your home. Trees planted on the south side of your home should be tall and slender and planted close to the home.

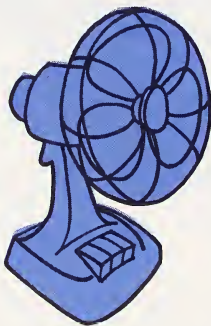
Shrubs and vines also help prevent summer heat gain in your home. Vines grown directly on east and west walls or on trellises in front of the wall cut down on heat from early morning and late afternoon sun.

To create a wind break in the winter, plant evergreen trees and shrubs on the north side of your home.

4. Open the north and south windows during the evening to create a breeze through your home.

Portable Fans

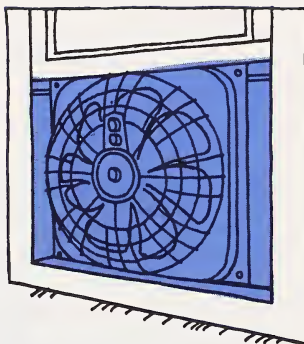
Using portable fans is one of the most economical ways of mechanically cooling your home. Small fans that have either a stationary or an oscillating (rotating) head cool you by evaporating moisture from your skin. A box or window fan circulates air if used inside the room or ventilates the room if placed in a window.



Oscillating Fan



Box Fan



Window Fan

To cool one room or a small space quickly with a window fan, set the fan controls to blow in cool outside air. To cool a large area, open at least one window in each room you want cooled. **Set the fan control to exhaust warm inside** air to the outside. Open windows that provide the largest air sweep between the open windows and the one in which the fan is operating. The windows that are the farthest distance from the fan should be opened the widest. Close all other windows and doors to rooms that don't need to be cooled. If you only want to cool one room, just open the windows in that particular room.

Evaporative (Swamp) Coolers

The most common type of cooling system found in mobile homes in our area is the evaporative or swamp cooler.

An evaporative cooler produces cool air by combining the natural process of water evaporation with a simple air moving system. If you've ever been swimming on a windy day, the coolness you've felt when you get out of the water is the coolness which occurs with the evaporation of water.

In an evaporative cooler, fresh outside air is filtered through a water saturated pad, cooled by evaporation and circulated by a blower. This constantly moving air helps push heat out along with stale air, smoke, odors and pollution.

Opening windows and doors can control the movement of cooled air to rooms where cooling is desired. The evaporative cooler makes efficient use of evaporation by controlling the amount of water used, spreading it evenly and providing a steady, cooled air stream throughout your home. The air travels through your home and then must be vented out through open windows or doors.



Summer Maintenance

Before summer begins, you should thoroughly check and service your evaporative cooler, or have a qualified serviceman do it for you.

1. Remove the cooler cover, wash it thoroughly and allow to dry; then fold it carefully and place it in a bag for storage.

2. Remove the panels which hold the filter pads, set them on the ground and thoroughly hose them down. The filter pads should be inspected and checked for odor. They are easily replaced, and can be purchased from a mobile home parts and supplies

store or a hardware store. Check the pads during the cooling season and replace if needed. You can also buy chemicals in chunk or rock form to use in your unit to prevent fungus or mold, minimize mineral deposits and act as a water freshener.

3. Clean all debris from the cooler cabinet, reservoir pan and recirculating pump. Also, clean the oval-shaped screen, which sits around the base of your recirculating pump. If you don't have a screen, they are inexpensive to buy. All scratches, bare metal and rust should be covered with a suitable protective paint with an aluminum based roof coating

paint. Paint around the base of your cooler where it attaches to the home to seal any possible leaks.

4. Carefully inspect all fittings, tighten where necessary and lubricate the blower motor and blower shaft. Apply two or three drops of oil to each oil cup on the cooler motor and fill the oil cups on the blower shaft bearings. **DO NOT OVER OIL.** Most recirculating pump motors are equipped with sealed bearings, and do not require oiling.

5. Inspect the recirculating pump, the fittings and plumbing for leaks.

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Winter Maintenance

The water to your evaporative air cooler should be turned off and the water line completely drained and blown out. Remove the water from the cooler reservoir and dry this area thoroughly. The cooler should be protected with a cover for the winter. The cover can be purchased from most mobile home supply stores. It protects the cooler and **helps** prevent heat loss from your home and cold air and moisture from entering through the cooler side panels. A canvas cover may be used or you may wrap the cooler in 10 ml plastic and **thoroughly** secure it with tape.

The cover above does not stop heat loss through the cooler. You should also insulate the ductwork on the inside of your home. In winter when the cooling system is not in use, remove the room grilles, put insulation in plastic bags and plug the opening. Replace the grille. This will keep cold air from coming into your home.

Air Conditioners

Refrigerated air conditioning is the most expensive way of cooling your home because it uses the most energy.

If you have an air conditioning unit, the following tips will help you operate your unit more efficiently.

- 1. Use your air conditioner only when necessary!** When in use, set the thermostat setting as high as possible (78° or higher).
- 2. Clean the condenser** (the outside unit) each year. Make sure it is free of dirt, leaves, grass, etc.
- 3. Keep the fins and coils** free of dust with your vacuum and soft brush attachment.

4. Check the filter once a month and clean or change it as needed.

5. Don't run the air conditioner when you are gone.

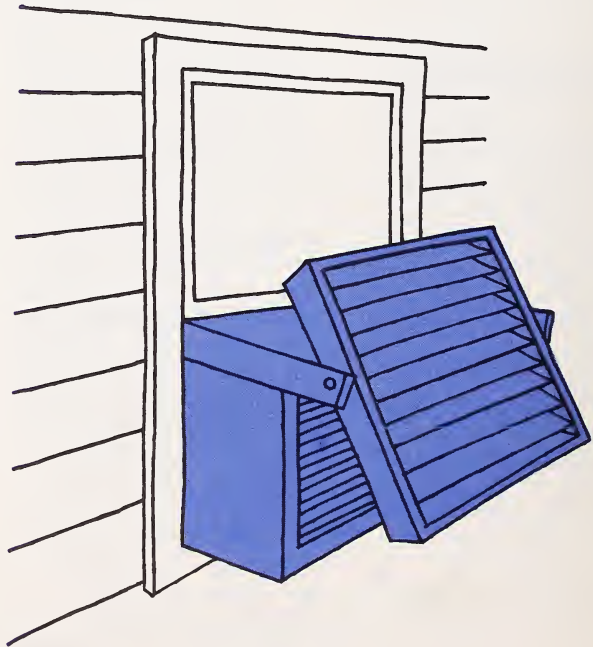
6. Keep windows and doors closed when your cooling system is on.

7. Have your unit serviced at least once a year.

8. Shade your air conditioner to increase its efficiency.

9. For winter, insulate between your air conditioning unit and the house if possible.

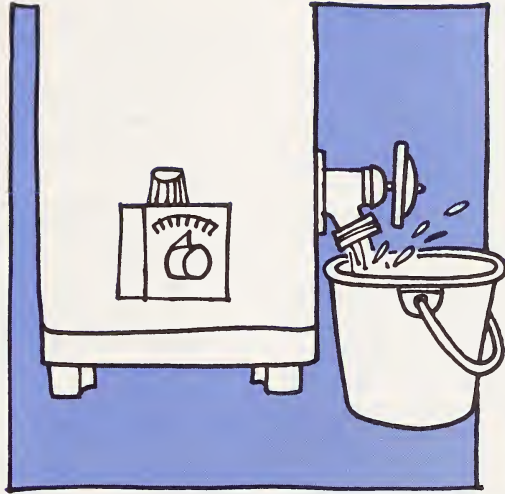
Remember, try the cooling methods that require little or no energy first before deciding whether or not refrigerated air conditioning is needed.



Water Heating System

Your water heater is probably the second largest energy using appliance in your home.

Your furnace uses the most energy. So, once you've done all you can to make sure your furnace operates efficiently, the next step is to take a close look at your water heating system. This includes the tank, the room where the tank is located, and the water pipes.



The Water Heater

The most common type of water heater found in mobile homes is one fueled by natural gas. You may, however, have an electric model. Let's look at both types and how you can make your water heater more efficient.

Gas Water Heaters

1. As with any gas-burning appliance, it is necessary to provide your gas water heater with enough fresh air for proper combustion. Combustion air for your water heater probably comes from beneath the floor. **Improper combustion can produce carbon monoxide which can result in an unsafe condition.**

2. The floor area around the base of your gas water heater should be kept clear of any materials. This is necessary to make sure the combustion air openings to the burner remain unobstructed and for safety reasons.

3. The vent on your gas water heater is designed to carry products of combustion from the water heater out of your home. Have your water heater checked by a qualified contractor, if you have any concerns.

4. To maintain the efficiency and increase the life of your gas water heater, it is important to get rid of the mineral deposits that can settle at the bottom of the tank. To do this, you should drain a bucketful of water from the drain valve at the bottom of the water heater tank about once a month.

This practice should only be done if your water heater is less than one year old or if you have been draining a bucketful regularly. Water heaters that have not been drained regularly may have drain valves that have become clogged and will not close once opened. **If the drain valve does not open easily, do not force it open.**

Electric Water Heater

1. **Turn off the electricity** to the water heater at the fuse box or circuit breaker before you do any repair work or make adjustments to your electric water heater.

2. For information on draining your electric water heater, see the previous section on gas water heaters.

Insulating Your Water Heater

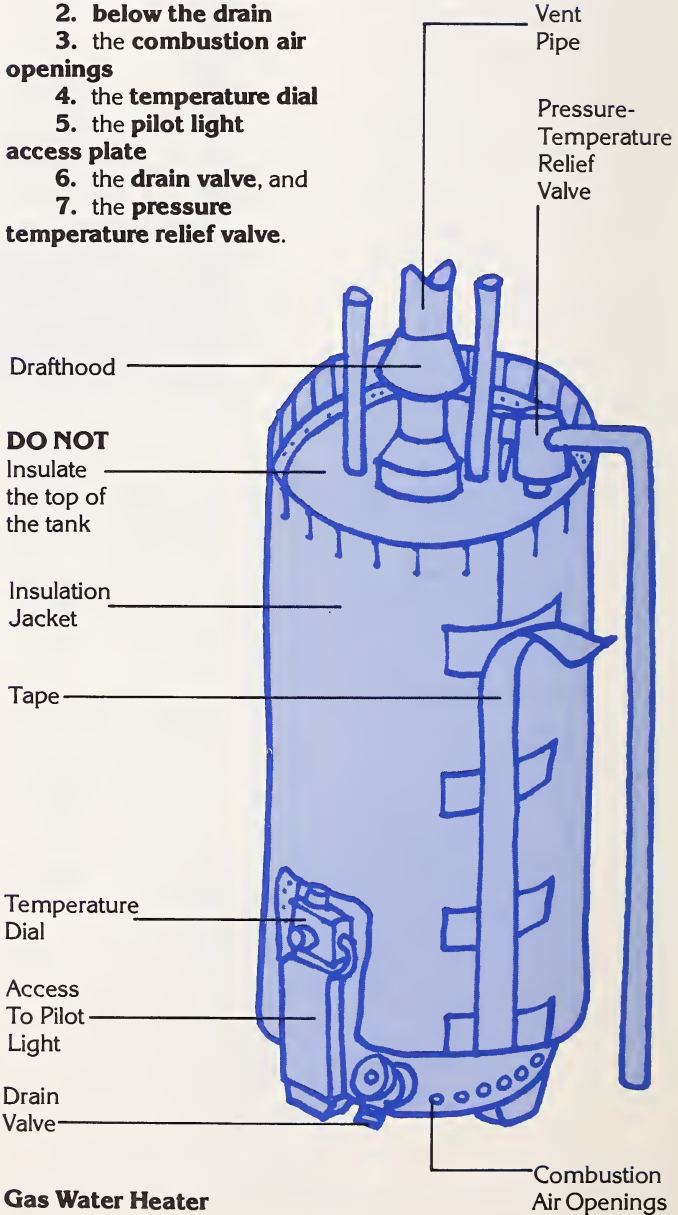
Your water heater loses heat through the tank. Insulating your tank will help keep the heat where it belongs and will improve your water heater efficiency. Water heaters are built with some insulation around the tank. But, **you can save energy by adding another layer of insulation to the exterior surface of your water heater tank.** Keep in mind if your water heater is a newer conservation model, chances are it is already adequately insulated.

You can buy and install a ready-made water heater insulation kit. The kit consists of a blanket of insulation and comes with "do-it-yourself" instructions. These kits are available at hardware stores, building supply stores and conservation centers.

Insulate your gas or electric water heater as shown in these illustrations. **Caution: Improper installation can cause serious safety problems.** It is very important to cut openings in the insulation to allow certain areas to breathe.

For **GAS** water heaters. You must **NOT** cover the following areas:

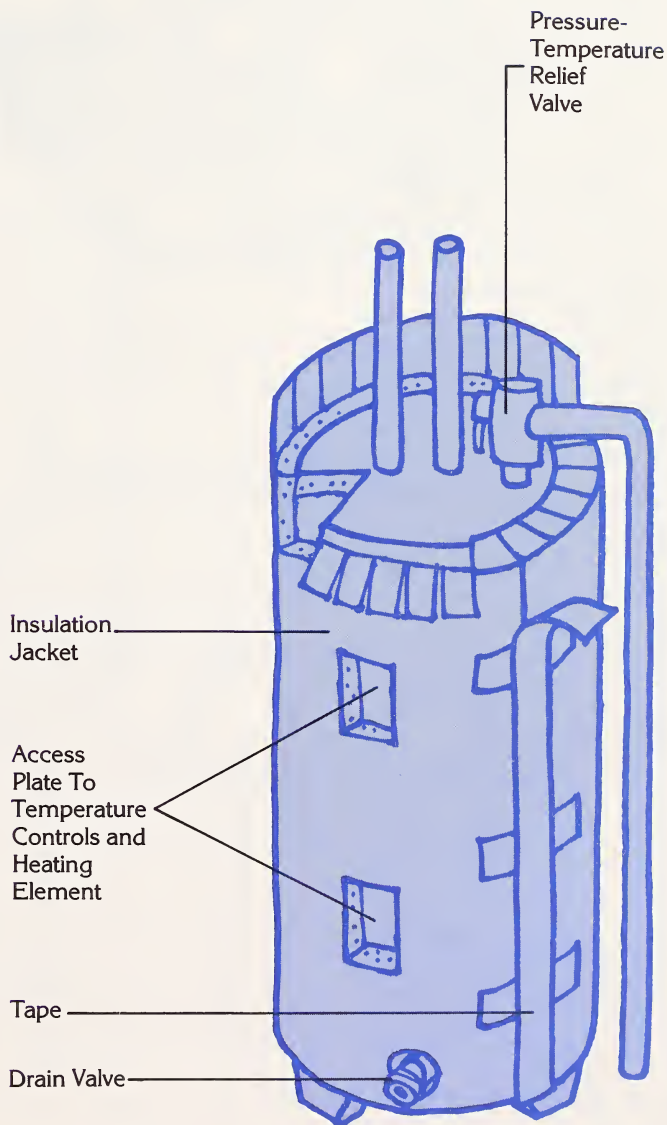
1. the **top of the tank**
2. **below the drain**
3. the **combustion air openings**
4. the **temperature dial**
5. the **pilot light access plate**
6. the **drain valve**, and
7. the **pressure temperature relief valve.**



Gas Water Heater

For **ELECTRIC** water heaters, you must **NOT** cover the following areas:

1. **access panels to the temperature controls,**
2. **the drain valve,**
3. **the operating instructions.**
4. **and the pressure temperature relief valve.**



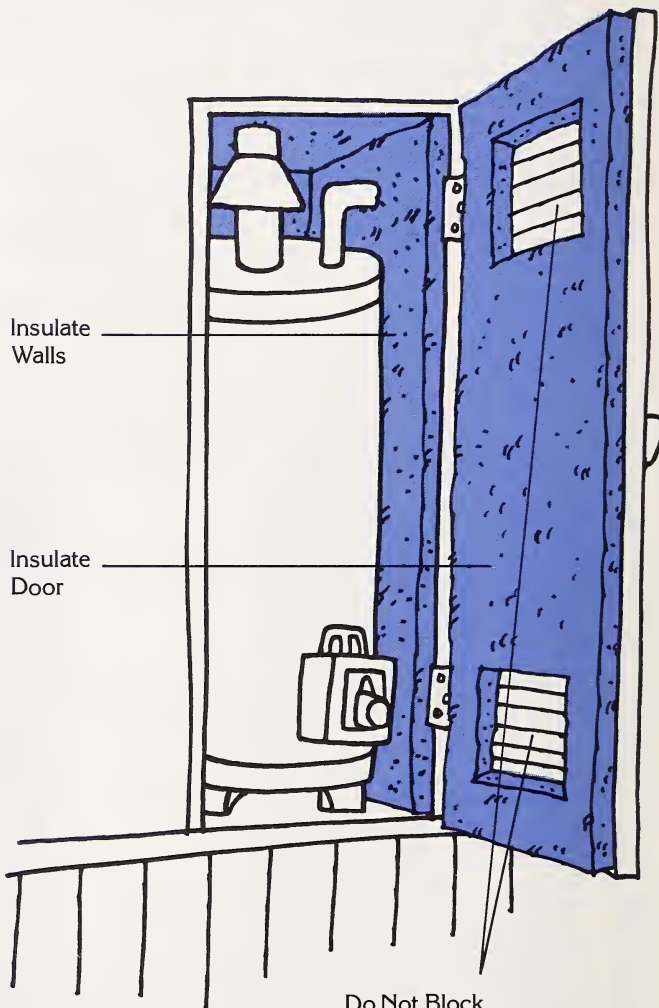
Electric Water Heater

The Water Heater Room

The access door to your water heater may be on the outside of your home. In addition to insulating your tank, it's probably a good idea to insulate the small compartment where the water heater is located if possible.

Before doing so, check to see if the holes where the pipes enter your home are oversized. Cold air could be rushing in through these gaps. Stuff insulation scraps around the pipes to close off these holes. Also, check to see if the bath tub is exposed directly to the cold air from the water heater room. Insulate under the bath tub if necessary.

Once you've stopped the direct air flow into your home, then insulate the water heater room and exterior door with batt insulation. If the water heater draws it's air for combustion through the access door, **do not** block the vents in the door.



Do Not Block
Combustion Air Vents

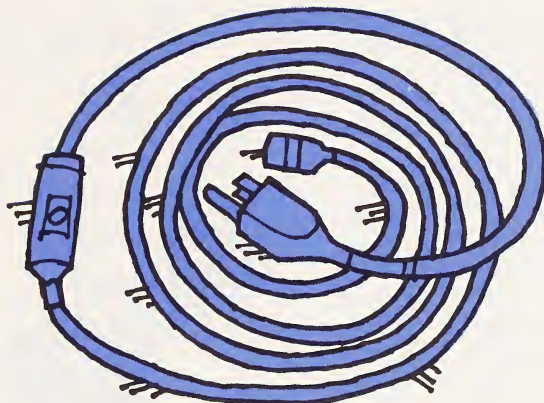
The Water Pipes

Now, look at all of the exposed water pipes. Are they insulated? They should be for two reasons. **The first is to protect the water inlet side from freezing. The second is to reduce heat loss from the hot water pipes.**

Skirting your mobile home will help, but more protection is usually needed. In our area, this protection includes both the addition of heat tape and insulation from the ground hook-up to the mobile home.

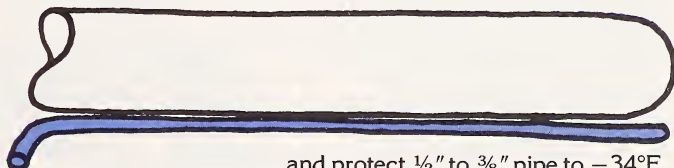
Heat Tape—Extreme care should be taken when using heat tape. **Follow the manufacturer's directions EXACTLY to minimize the danger of fire.** Look for heat tape with the following features:

1. thermostatically controlled
2. built-in breaker system (prevents fire in case of burn out)
3. water proof, insulated connections
4. grounded plug
5. copper, grounded braid (protects against abrasion and shock)
6. UL approved (Underwriter's Laboratory)



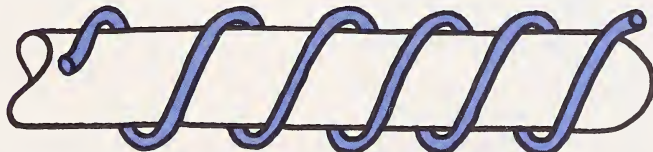
Installs two ways:

1. Place straight along pipe



and protect ½" to ¾" pipe to -34°F
¾" pipe to -32°F
1" pipe to -11°F

2. Spiral wrap 3 turns per foot and protect to -35°F



Approximately 1½ ft. of cable required per foot of pipe.

Calculations based on fiber glass insulation and outerwrap.

The installation of various types of heat tape varies, but there are some common points to keep in mind:

1. Start installing the heat tape below frost line. Tape the end of the cable to the pipe with friction tape. Spirally wrap around the pipe or apply

straight along the pipe according to the directions. Tape the heat tape to the pipe every four (4) inches as well as at both ends and on both sides of the thermostat. **DO NOT ALLOW THE CABLE TO OVERLAP OR TOUCH.**

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2. Place the thermostat parallel to and in contact with the surface of the pipe to accurately sense the pipe temperature. Most heat tapes begin heating at 35°F.

3. Next, apply insulation over the heat tape. Spirally wrap the pipe from end to end. Overlap the insulation 1" to make sure that both the pipe and cable are completely covered. Continue wrapping until the thermostat is also insulated.

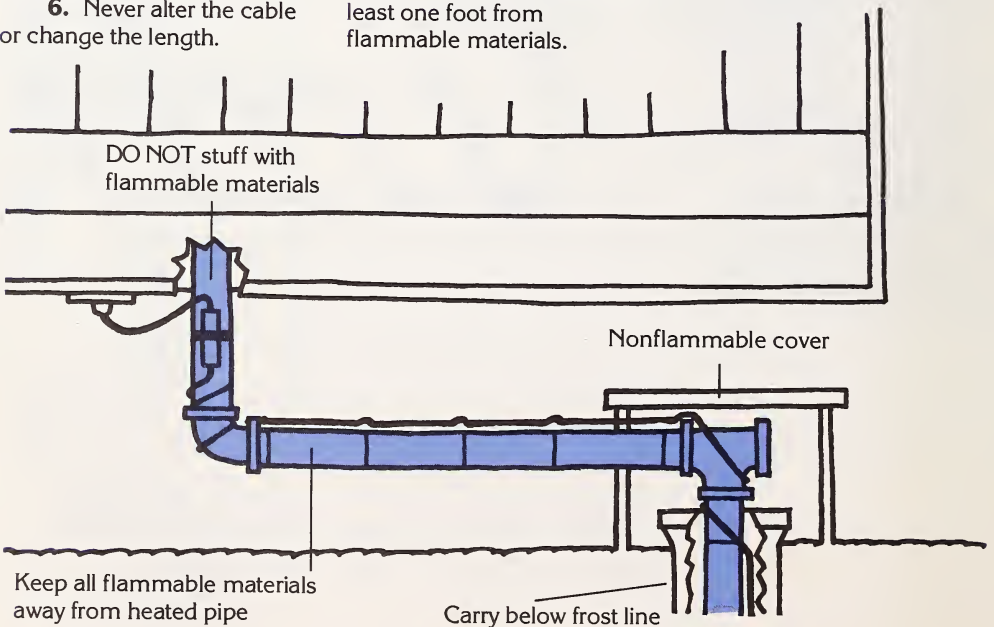
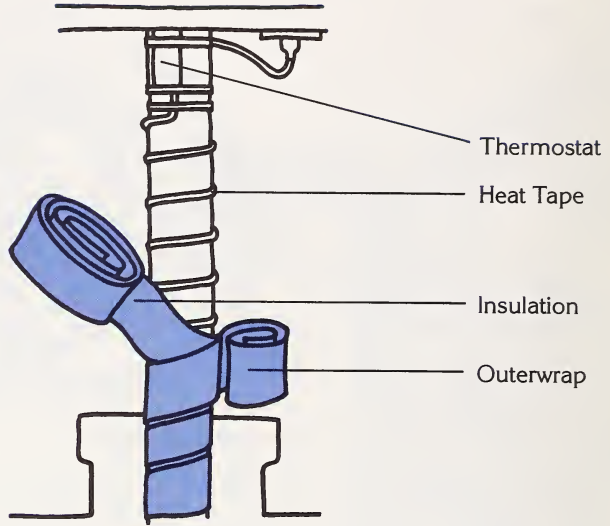
4. Apply outerwrap to protect the insulation from moisture. Wrap spirally, overlapping about 1/2 inch. Begin at the bottom so the outerwrap will shed water. Tape with friction tape.

5. Do **not** use heat tape on plastic pipes.

6. Never alter the cable or change the length.

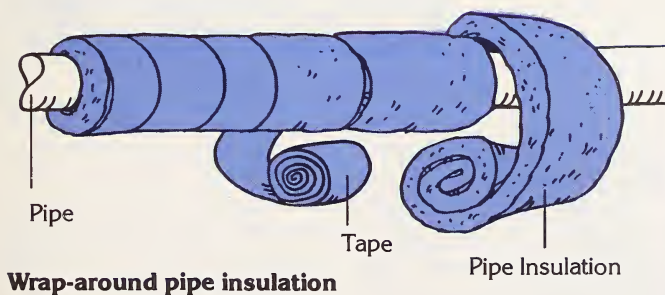
7. Do not use extension cords.

8. Keep heating cable at least one foot from flammable materials.

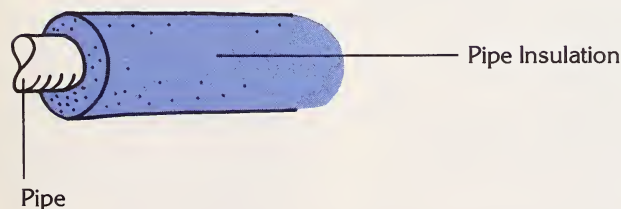


Insulation—All other exposed pipes (i.e., pipes in the water heater room) should be insulated to reduce heat loss from the tank to the faucet.

Before insulating you should repair any leaky pipes. Pipe insulation can usually be found in wrap-around insulation kits, flexible tubing, or rigid foam type. Make sure you choose the size that snugly fits your hot water pipes. You can purchase pipe insulation at hardware stores, building supply stores, plumbing firms and conservation centers.



Wrap-around pipe insulation



Foam pipe insulation

If you insulate your water heater and/or hot water pipes, make sure you save your sales receipts for Federal and State tax credits. See TAX CREDITS section.

Temperature Setting

The hot water temperature in your home may be higher than necessary. It wastes energy to maintain water that is hotter than necessary. Lowering the temperature of your hot water reduces the energy your water heater has to spend to heat water in the tank.

Most water heaters have settings ranging from 100°F to 160°F and are listed as “Low-Medium-High” or “Warm-Normal-Hot.” To determine the actual temperature of your hot water, let the hot water run for a few minutes from the tap that is closest to the water heater. Check the hot water temperature with a thermometer (usually a cooking thermometer will work).



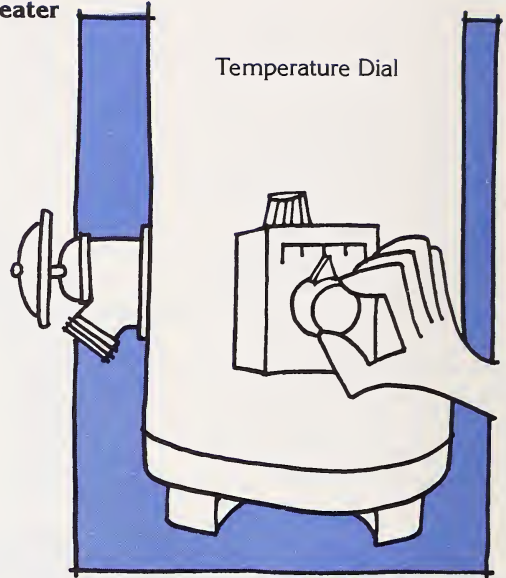
Thermometer

The hot water temperature you need for your household depends on a number of things. Some agencies recommend that the water heater temperature be set at 120°F. It is possible that some households can manage with a lower temperature, while others may need their water temperature higher than 120°F.

If you leave your home for two or more days, you can turn the water heater to the lowest setting if you have an electric water heater. If you have a gas water heater, turn the setting to "pilot."

As a rule of thumb, **you should adjust the temperature setting on your water heater as low as possible to still be able to maintain enough hot water for your needs and comfort.** If you lower your temperature setting and find there's not enough hot water to meet your household needs, you should turn the dial back up a little. **REMEMBER—the lower you set the temperature on your water heater, the more energy you'll save! Lower temperatures are also safer and fewer burns occur.**

Gas Water Heater



How to Lower Your Temperature Setting

Lowering the temperature setting on your water heater is very simple. The temperature dial on a **gas** water heater is located at the bottom of the water heater tank. To lower the temperature, just turn the temperature dial to the desired setting. Some water heaters have a cover over the dial and drain. This can be easily removed by lifting up and out.

To lower the temperature setting on your **electric** heater, follow these instructions:

1. TURN OFF THE ELECTRICITY to the water heater at the fuse box or circuit breaker.

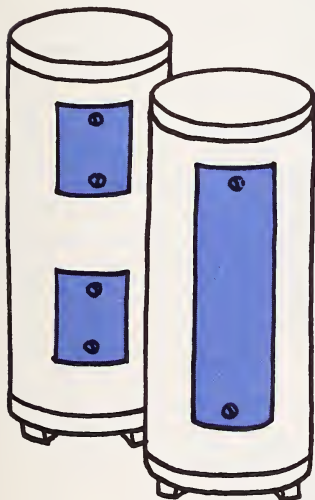
2. At the front of most electric water heaters there are one or two access panels that cover the temperature controls. **Unscrew access panels and remove them.**

3. Carefully part insulation so you can see the temperature dial. Depending on your particular water heater, you may have one or two temperature controls. If you have two controls (one under the top and one under the bottom panel), turn the temperature setting the same or set the top control slightly lower than the bottom control.

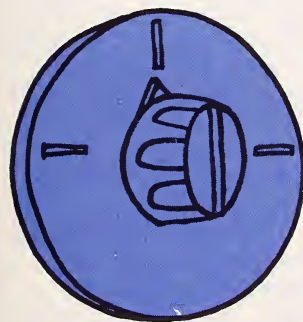
4. Using a screwdriver, **turn indicator to desired temperature setting.**

5. Carefully **replace insulation as you originally found it and screw access panels back on.**

6. **Turn on electricity to the water heater.**



Access Panels

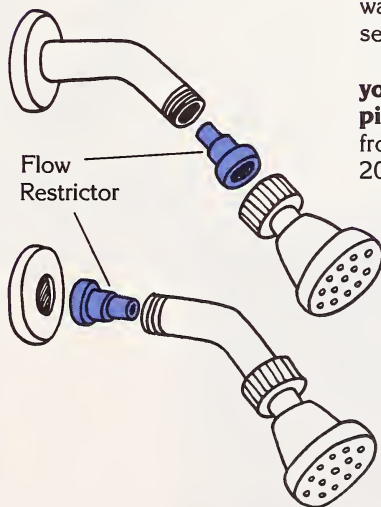


Temperature Dial

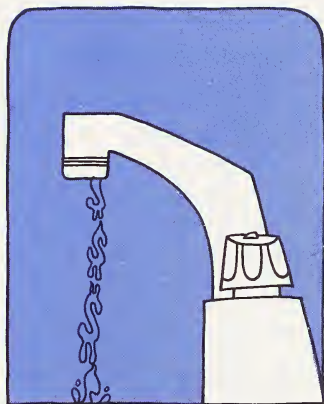
Using Hot Water Wisely

Wasted hot water is money down the drain! You may be wasting hot water every day in your household. You can save energy by following these energy conserving tips:

1. Install water flow restrictors in your showerheads to reduce the flow of water to three gallons or less per minute. **Showers** use less hot water than baths. (A typical shower uses 5-8 gallons of water per minute)



2. Use warm or cold water to wash your clothes and always use **cold water** to rinse. Adjust the water level to the amount of clothes you're washing.



3. Use your dishwasher only when it is full. If you wash dishes by hand, don't leave the water running to wash and rinse each dish separately.

4. Repair any leaks in your faucets and hot water pipes. One drip a second from your faucet can waste 200 gallons of water a month!

Portable Heaters, Woodburning Stoves and Fireplaces

Before you buy a portable heater, fireplace or woodburning stove, make sure it is approved for installation and/or use in a mobile home. Also, you must check with your local building inspector before installing a woodburning appliance. The inspector will have to approve the appliance and issue you a permit for installation.

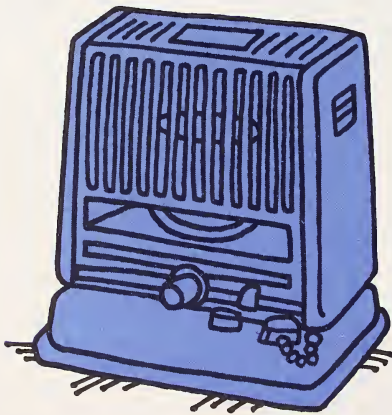
Portable Heaters

Portable heaters of all types are appearing on the market including electric box

or baseboard heaters, radiant quartz electric heaters and kerosene heaters. Portable heaters are typically used for spot heating and not for heating the entire home.

You should be aware that the use of kerosene heaters in residences is illegal in some areas. Check with your local building inspector to find out whether or not their use is legal where you live. If you do use a kerosene heater, remember:

- 1. Never** store the kerosene in or under your mobile home.
- 2. Kerosene heaters must have adequate ventilation** to operate safely. Whatever type of portable heater you choose, **always follow the manufacturer's instructions for proper and safe use.**



Woodburning Stoves

The burning, or combustion of wood uses a great deal of oxygen. In a standard wood-frame house, this oxygen is drawn in and replaced through cracks along the foundation and around windows and doors. But because mobile homes are so tightly constructed, a woodburning fire may be in competition with the furnace or the occupants for the available oxygen supply. For this reason, only stoves with a connection to provide outside air for combustion are approved for installation in mobile homes.

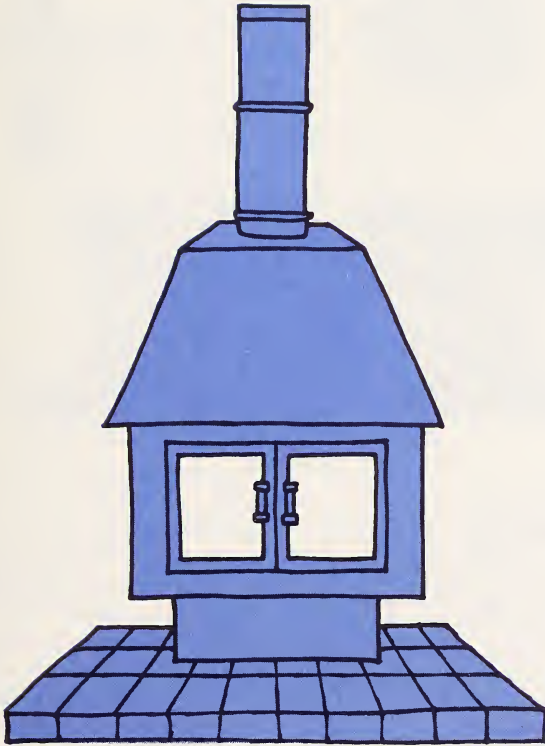
Many building codes will only allow the installation of stoves that have been tested and approved for mobile homes by the Underwriters Laboratory (UL), the International Conference of Building Officials (ICBO) or a nationally recognized testing agency. In addition to outside combustion air, heat shields are usually installed on these stoves so that they may be located closer to combustible materials. Stoves with circulating fans may do a better job of distributing the heat more evenly.

Always check with your local building inspector before you purchase a stove. And be sure to install and operate your stove according to manufacturer's specifications.

Fireplaces

Many newer mobile homes, particularly double-wide homes, have fireplaces. Like the stoves, fireplaces require a lot of oxygen for burning. This air usually comes from inside the home where it has already been heated by the furnace. For safety reasons, as discussed under stoves, **your fireplace should have the air needed by the fire for combustion ducted into the firebox from outside the mobile home.** This feature should also help increase the efficiency of your fireplace.

If you do have a fireplace, be sure to: 1. Always close the damper after the fire is out and keep it closed when the fireplace is not in use, and 2. use glass doors, particularly as the fire dies down to help cut down on the air from inside the house being drawn up the chimney.



Pedestal model with outside air entering through floor duct work.

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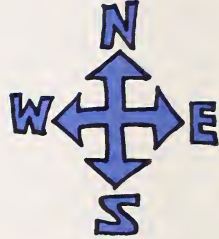
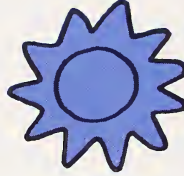
Solar

The sun may be one of your worst enemies in the summer if you live in a mobile home. It can turn your home into an oven in short order. But, the sun can be a real ally in helping to heat your home in the winter.

Color and Orientation

Some studies have shown that the color of a mobile home can make a slight difference in heating energy use. A dark mobile home, such as brown or dark green will absorb more of the sun's heat and therefore use less energy for heating than a light-colored mobile home, such as white or yellow. However, if a light color is used on the roof, cooling needs will be reduced.

If possible, you should place your home on the lot so it is on an east-west axis. The long side with the most windows should be facing south. In this way, your home can gain more passive solar energy. Only do this if little or no cost is involved, however, because the energy savings are relatively small for both color and orientation of the mobile home.



Windows

Windows let the sun's rays in and trap the heat inside your home. Windows on the north, east and west sides of your home are net heat losers in the winter, especially those on the north side. Double-glazed south facing windows that have been caulked and weather-stripped gain enough heat on sunny winter days to help reduce the amount of heat that must be supplied by your heating system.

During the winter, you should try to capture as much heat from the sun as you can from **south facing windows**. Open the draperies or remove other thermal window treatments on the south windows during sunlight hours and close them tightly to the

window when it is cloudy or when the sun goes down. Removing outside screens for the winter on south windows can increase your passive solar gain by 40% through these windows. Keep the draperies closed on the north side at all times. If someone is at home during the day, have them open the east and west side draperies when the sun is shining directly through the windows. If no one is home, keep them closed.

During the summer, you will want to keep the hot sun's rays out. So close the draperies during the day to keep your home cool. Exterior shading is much more effective than interior shading. See the Cooling Section for more information.

Solar Energy Systems

Before you consider adding a solar system to your home, you should do everything you can to weatherize your home and make it as energy efficient as possible. If you are still interested in solar energy at that point, you have to then consider three points: 1. Is it cost effective? 2. Is it technically and structurally possible with your particular home? 3. Will your park rules allow you to make changes to the exterior of your home?

Approach the purchase of a solar system like any major investment: Shop around, educate yourself fully, get several estimates from reputable dealers and then decide.

Solar systems are either active or passive.

Active Solar Systems

Active systems use fans, motors or pumps to move the solar energy collected to another location, such as the interior of the dwelling, a domestic hot water tank or storage. Active systems commonly use water or air for heat transport, although some newer systems use a refrigerant like freon. Purchase and installa-

tion prices vary widely and are not necessarily indicative of efficiency or savings to be realized from them. Liquid-based space heating systems have not proven to be cost effective in Montana's climate due to limitations on available sunshine and prohibitive first costs. Air-based systems are generally simpler mechanically if they do not include storage but may be just as expensive to install.

Passive Solar Systems

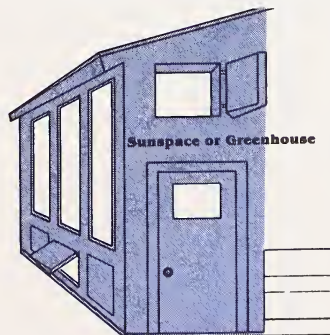
Passive solar energy systems are designed to use natural, non-mechanical forces to heat and cool homes with little or no use of electrical controls, pumps or fans. Passive systems allow for the collection of solar gain by using the house or part of the house as a collector.

Since passive systems normally are mechanical-

ly simpler than active systems, they are often less expensive to install and maintain than active systems. You may be able to build a passive system yourself from readily available and relatively inexpensive materials. Your local library probably has several books with detailed plans for passive solar greenhouses or hot water heaters. Write Energy Division, DNRC, Capitol Station, Helena Mt. 59620 for a copy of DNRC's "Solar Greenhouses Energy Pathfinder," a bibliography.

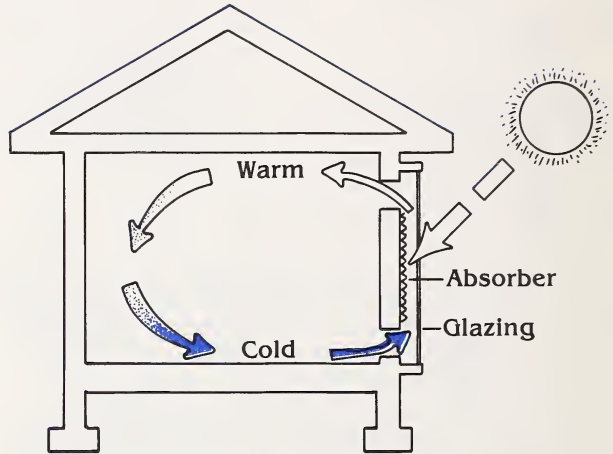
Three types of passive systems are considered here as examples: the attached sunspace, the passive vertical wall collector and the batch hot water heater.

1. Attached Sunspace or Greenhouse —This retrofit may exhibit special problems for mobile homes. A structure adequate to capture



and store heat is relatively heavy and therefore is most appropriate for permanent construction. Shading and orientation to south could be serious concerns in a mobile home park with small yards and restrictive rules about modifications. To be effective in collecting heat and to provide needed additional living space, the sunspace ideally should be built on an insulated foundation and finished inside. This can be done for less than new house construction but should be undertaken only if you don't plan to move your mobile home. The actual amount of heat produced in Montana's climate varies considerably east and west of the Divide but should be counted on for no more than about 20% of the annual heat load. However, the living space it provides is of high esthetic quality and may be the major value outweighing the relatively small solar fraction. If you decide to add on to your mobile home, a sunspace might be a logical choice.

2. Vertical Wall Collector — This design turns a portion of your south-facing wall into a



Vertical Wall Collector

solar collector to provide heat for the adjacent rooms. The collector consists of a flat, rectangular box covered with a glazing of glass or plastic. You will need a black metal absorber plate behind the glazing. Vents are cut through the wall at both the top and bottom of the collector. Sunlight passes through the glazing and heats the absorber plate. The plate heats the surrounding air, which rises and passes through the upper vent into the house. At the same time, the cool air from the house floor is drawn into the collector through the lower vent. That air warms up, rises and passes back into the house through the upper vent, creating a natural convection loop.

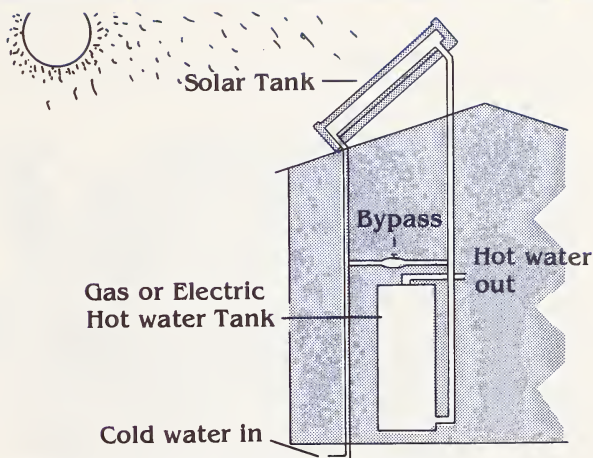
You can turn your passive vertical wall collector into an active solar system by adding ducts and fans to move the heated air to other parts of your home.

Since the vertical wall collector is mounted right on the wall, it doesn't take up any extra space and presents few problems if you decide to move your home. The vertical wall collector can be a low cost but effective do-it-yourself project. But since the temperature inside the collector can reach 250 degrees Fahrenheit, insulation, paints and framing materials should be carefully selected to avoid outgassing, breaking down and fire hazards.

3. Breadbox Water Heater

— Widely used in Europe and Japan, passive batch water heating systems are gaining popularity once again in this country. The breadbox heater, basically a black tank behind glazing, usually is plumbed right into the existing gas or electric water heating system. Whenever the solar tank cannot supply enough hot water, the gas or electric tank would automatically take over to heat the water. The solar section of the system can be drained in the winter if necessary to prevent freezing, although better units should not have this problem. Potential problems include structural overstress to the mobile home if the breadbox is placed on the roof without adequate bracing. Highly efficient commercial models are now available, and plans are available for relatively inexpensive do-it-yourself models.

Also, according to an October 1980 study, "Energy Conservation in Mobile Homes Through Retrofit Design Techniques and Improved Energy Utilization," conducted for the National Rural Electric Cooperative Association, active systems may not be workable because



Breadbox Water Heater

"the lightweight construction of mobile homes does not provide adequate support for active solar arrays. Even a small domestic hot water panel array of three or four collectors can impose a dangerous wind load if not properly anchored. If an active solar system is to be used, then the collectors should be provided with a support structure independent of the mobile home itself (carports, roof decks, additions to the home, or placed at ground level)."

New Passive Solar Homes

Several mobile home manufacturers are designing and constructing passive solar homes. This might be an option if you are thinking about buying a new mobile home.

Indoor Air Quality

If your home was built after 1976 or if you have weatherized your home to seal it up tightly, you may have an indoor air pollution problem.

Numerous pollutants are found in all types of homes. In leaky homes, the pollutants are flushed to the outdoors by fresh air which enters through all the cracks and holes. But in tight homes, the pollutants become trapped inside the home.

There are all types of pollutants, but the most harmful in mobile homes is usually formaldehyde. Formaldehyde is a bonding agent, fungicide and a preservative. It is found in plywood, particleboard, carpet backing, household disinfectants, hair spray, etc. Even small concentrations of formaldehyde gas can cause nausea, vomiting, drowsiness,

lung irritation, sore throat, headache and fatigue.

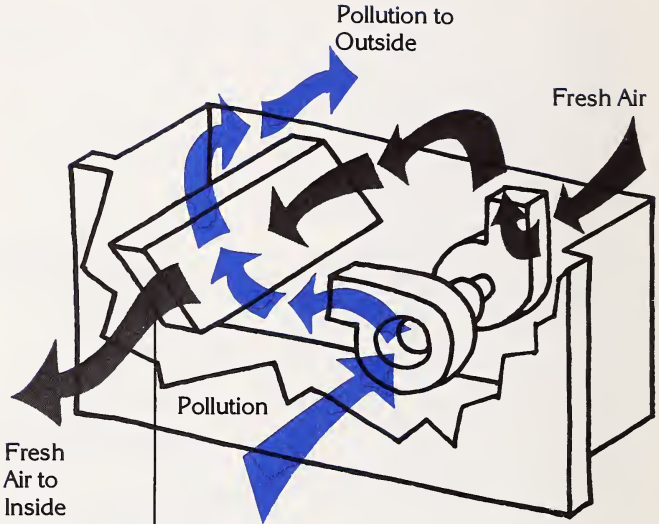
Another major pollutant may well be the exhaust products of your gas burning stove, especially if it doesn't have a hood that vents to the outdoors and has a continuously burning pilot light. Your gas furnace shouldn't be adding to the pollution problem in your home if it is operating properly. If there is a defect in the system—such as a cracked heat exchanger or a blocked vent—you could have problems. That's why it is **very** important for you to maintain your furnace properly and have it checked on a yearly basis.

Other pollutants are found in kitchen, bathroom and laundry cleaning products, cigarette smoke, paint thinners, insecticides, aerosol sprays and many other sources.

Is There a Solution to the Pollution Problem?

There are several things you can do. The first is to limit the use of as many of the pollutants as you can, or get rid of them altogether.

Good ventilation can help, too. But, if you open up your house to let the pollutants out, your heat goes out with them. If you've put a lot of time, money and effort



The fixed-type heat exchanger has no moving parts except the blowers

into making your home more energy efficient, it doesn't make a lot of sense to open the windows. But, on the other hand, it doesn't make sense to live in an unhealthy environment, either.

The answer in this case may be to install an **air-to-air heat exchanger**. It works by expelling room air to the outdoors and bringing in fresh air from outside. The heat in the outgoing room air is transferred to the incoming air—saving nearly all of the heat in the air.

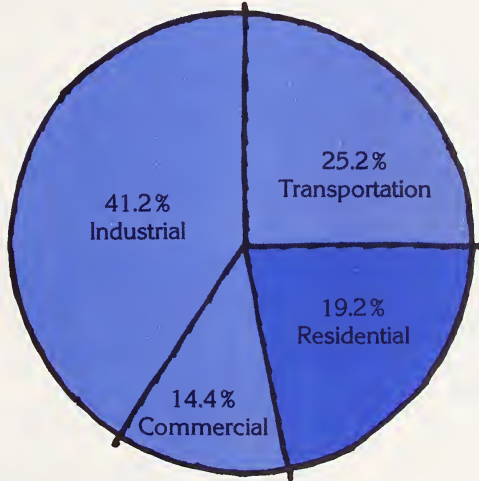
An air-to-air heat exchanger about the size of a window air conditioner should provide most of the necessary ventilation for a standard mobile home. It is installed in the window and should probably be located in the kitchen or living room. For more information, see the May/June 1982 edition of **Rodale's New Shelter** magazine or the March 1982 edition of **Solar Age** magazine. It may well be worth your money to invest in an air-to-air heat exchanger for the health of your family.

Your total utility bill depends not only on the current rate per kilowatt hour of electricity or hundred cubic feet of gas used, but also on other factors.

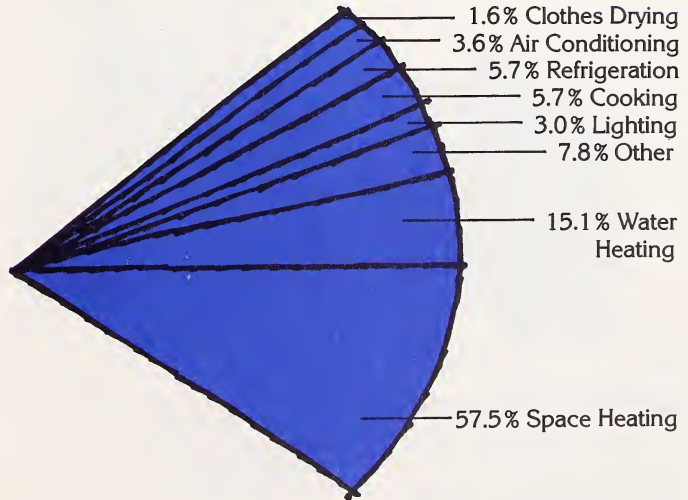
Your lifestyle and habits can make a big difference in the amount of energy you use. To save the most energy, begin conserving with large appliances such as your furnace or hot water heater. For example, using an electric blanket at night (or adding extra blankets) would cost less than keeping your thermostat at a higher setting. Also, a top priority might be to take shorter showers and conserve hot water whenever possible.

This energy consumption pie may give you a better idea of where your energy actually goes and help you decide where to conserve first.

The Energy Consumption Pie



Residential Energy Use*



*Source: Association of Home Appliance Manufacturers

Appliance Use

Every time you flip a switch, turn a knob or push a button on an appliance, it uses energy. Some, such as your refrigerator and freezer, use energy off and on twenty-four hours a day. **Every conservation practice you perform saves energy. If you try to conserve with all your appliances, the total amount of energy and money you save will make it worth your time and effort to do so.**



Refrigerator/Freezer

1. Open the doors only when necessary and for as short a time as possible to keep the cold air from escaping.

2. Keep the refrigerator at **34°-37°F** and the freezer at **0°-5°F** for most efficient operation.

3. Both the refrigerator and the freezer operate most efficiently when they are **full** but not overcrowded.

4. If you have a manual defrost freezer, **defrost** it on a regular basis. Don't allow the frost to build up to more than 1/4". Excessive frost makes your freezer work harder.



Range

When using the range top...

1. Match the **size of the pan** to the surface unit.

2. Start cooking most foods on a high setting and **reduce to a lower setting** as soon as the food begins to boil.

3. If you cook with gas, check the **flame** on your range. It should be blue in color. If it is yellow, it may need to be adjusted or the small holes in the burner may be clogged.

When using the oven...
1. Plan **complete oven meals** to get the most mileage out of the heated oven.

2. **Preheat** only when necessary and only for the recommended time.

3. **Avoid continually opening the oven door** to check on foods.



Washer and Dryer

For your washer...

1. Use **cold** or **warm water** whenever possible for washing and always use cold water during the rinse cycle.

2. **Wash full loads** or use the water level setting.

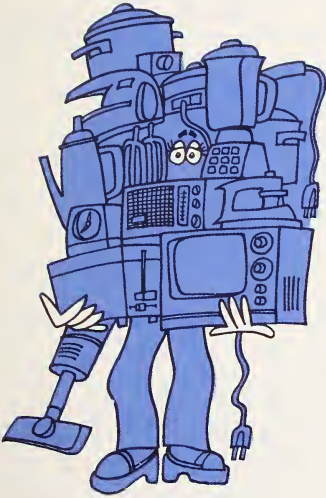
For your dryer...

1. **Shorten the drying time** whenever possible.

2. Dry **full loads**.

3. Keep the **lint filter** clean.

4. If you have a gas dryer, it **must be vented** to the outside for safety reasons.



Small Appliances

In most cases, small appliances are much more economical to use for the same tasks than larger appliances. So, get your toaster oven, toaster, electric skillet, slow cookers, etc. out of the cabinets and put them to use to save energy!

Lighting

If you will refer to the energy pie chart, you can see that lighting only accounts for a small percentage of the total energy you use in your home. But remember, every little bit helps. So use these tips to conserve energy with lighting.

1. Turn off your lights when they are not in use.
2. A solid state dimmer switch will reduce the energy used, prolong the life of the bulb and create the mood you want.
3. Lamp efficiency is measured in terms of lumens per watt. **Lumens** measure the amount of light and **watts** measure the amount of energy used. The more lumens produced per watt, the better the lamp. Compare **lumens per watt** before you buy.

4. Lower wattage lamps should be used for general lighting. Use higher wattage bulbs for tasks such as reading and sewing.

5. Use three-way lamps where you have varying lighting needs.

6. Keep lamps and lighting fixtures clean. Dirt can greatly reduce light output.

7. Use fluorescent lighting where possible. Fluorescent tubes deliver three to five times as much light for the same wattage as incandescent bulbs. They also last ten to twenty times longer.



Mobile Home Conservation Check List

	OK As Is	Needs Improvement
Your Home		
Leveling	_____	_____
Caulking	_____	_____
Weatherstripping	_____	_____
Outlet Gaskets	_____	_____
Storm Windows (glass or plastic)	_____	_____
Water Heater Insulation	_____	_____
Water Heater Room Insulation	_____	_____
Water Temperature Setting	_____	_____
Faucets		
Repair	_____	_____
Restrictors	_____	_____
Water Saving Shower Heads	_____	_____
Water Pipes		
Heat Tape	_____	_____
Insulation	_____	_____
Heating System		
Combustion Air	_____	_____
Furnace Filters	_____	_____
Furnace Maintenance	_____	_____
Distribution System	_____	_____
Thermostat Setting	_____	_____
Cooling System	_____	_____
Landscaping	_____	_____
Skirting		
Repair	_____	_____
Insulation	_____	_____
Siding		
Repair	_____	_____
Insulation	_____	_____
Roofing		
Repair and Seal	_____	_____
Insulation	_____	_____
Your Energy Use Habits		
Use of Passive Solar	_____	_____
Use of Major Appliances	_____	_____
Use of Lighting	_____	_____

All mobile homes built after June 15, 1976, must conform to the U.S. Department of Housing and Urban Development (HUD) Mobile Home Construction and Safety Standards Code. In other words, they **must** meet the HUD standards before they can be sold. This fact alone has been a big help in making mobile homes more energy efficient.

You still have to be an informed consumer, however. Even though there are standards set for insulation, storm windows, etc., the standards vary according to the area of the United States. Mobile homes built in the Southern U.S., for example, have different minimum requirements than homes built here because the climates are different.

So, before you buy a mobile home, be sure it was built to be used in this geographical area. The home **must** have a data plate permanently posted on the interior of the home. You will usually find it on a closet door, inside a closet or on the furnace room door. The data plate shows: the roof load, the wind load and the certification of the outdoor winter design temperature. You will find load zone maps on the data plate to help you see if everything is in order for your area.

Look for the following zones on the data plate:

1. Wind Zone—1
2. Roof Load (snow) Zone—**Middle**
3. Climate Zone—II



The data plate must also include the following **heating certificate**:

Heating Certificate

Home Manufacturer _____
 Plant Location _____
 Home Model _____
 (Include Winter Climate
 Zone Map.)
 This mobile home has been
 thermally insulated to
 conform with the requirements
 of the Federal Mobile Home
 Construction and Safety
 Standards for all locations
 within climate Zone _____.
 Heating Equipment
 Manufacturer _____.
 Heating Equipment Model
 _____.

The above heating
 equipment has the capacity to
 maintain an average 70° F
 temperature in this home at
 outdoor temperatures of
 _____ F.

To maximize furnace
 operating economy, and to
 conserve energy, it is
 recommended that this home
 be installed where the
 outdoor winter design
 temperature (97-1/2%) is not
 higher than _____ degrees
 Fahrenheit.¹

The above information
 has been calculated
 assuming a maximum wind
 velocity of 15 MPH at
 standard atmospheric
 pressure.

Many mobile home manufacturers will add more insulation to their homes than the HUD Standards require. Some manufacturers are going from 2"x4" construction to 2"x6" construction so more insulation can be added. Also solid core doors are being used instead of hollow doors which cuts down on heat lost through the door. Many manufacturers have an "energy saving option" which you may purchase. The insulation values for these homes are usually much higher than their standard models.

Before you sign a contract, make sure every detail is written in the contract!

The following are tips concerning selecting contractors, weatherization programs, codes, tax credits, and how to keep track of the energy you are using.

Selecting Contractors

If you select contractors to weatherize your home or to inspect and/or work on your heating system, follow these tips!

1. Get contractors' names from friends or neighbors who have had similar work done. **Be sure the contractors you are considering have had experience with mobile homes and are licensed if required in your area.**

2. Look under "Mobile Homes—Repairing & Service" in the Yellow Pages. Don't contract with people selling services door-to-door until you have checked to make sure the business is legitimate.

3. Get estimates from at **least three** contractors. The estimates should include, in detail, the work to be done.

4. Once you get the bids, ask the contractors for references from a few of their past customers and ask for their addresses and phone numbers.

5. If the contractor is going to work on your furnace, he must be a certified serviceman from the furnace manufacturer.

6. Check with the Better Business Bureau or the County Attorney's Office to see if any unresolved complaints have been made against the contractor you selected.

7. After you have chosen your contractor, a **contract** should be drawn up to include: all the specifications of the bid, the cost, the method of payment and the warranty. Both of you must sign the contract for it to be valid. Be sure each of you retains a copy.

Weatherization Programs

Low-income persons also may be eligible to receive help in weatherizing their homes. The Home Weatherization Program, offered through your local Human Resource Development Council (HRDC), will perform weatherization work on eligible households. An average of \$960 is normally spent on each home.

Contact your local HRDC directly to see if you are eligible for the Home Weatherization Program.

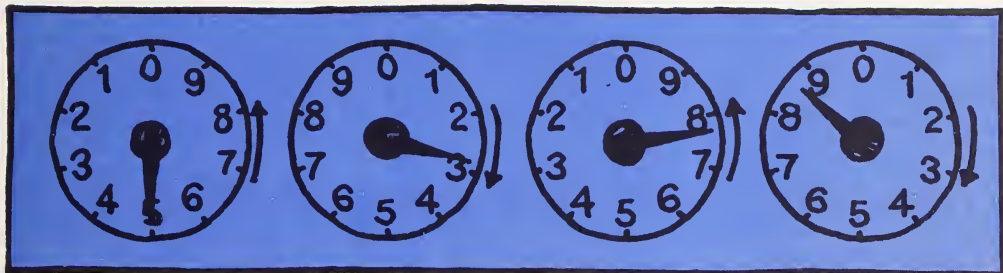
Codes

Codes governing what can and cannot be done vary from county to county and from city to city. Check with your local building inspectors for codes affecting you. (Look under the specific city or county government listing in the phone directory.) Remember, in most cases, you must have permits for major work done.

Tax Credits

Tax credits are available at the State and Federal level for many energy conservation measures such as insulation, storm or thermal windows, caulking and weatherstripping, automatic set-back thermostats, furnace modifications to improve efficiency, meters that display the cost of energy use, solar additions and others.

For more information, contact the Energy Division, Department of Natural Resources and Conservation, Capitol Station, Helena, MT 59620; 449-3940 or your local IRS office.



Your Meter

Read, Record, Reduce Electricity is

measured by the kilowatt hour. **Natural gas** is measured by the cubic foot. The amount of electricity or gas used in your home is recorded by separate meters.

To read a meter, record the numbers on the dial. If the pointer is not directly on a number, read the next smallest number.

The total reading on this meter is 5278.

To find out how much energy has been used in a month, read your meter today and again in 30 days. By subtracting the old number from the new number, you can find out how much energy was used during the month. Learn to conserve energy by reducing your consumption of KWH or MCF from month to month.

Your meter is read by your utility company meter reader approximately every thirty days.

American Gas Association Blue Star Seal—

Found on gas appliances as certification that the appliance meets appropriate safety requirements of the American National Standards Institute.

Backer Rod—A rod-shaped foam material used to fill large cracks as a backup before caulking is applied. It is available in various diameters and packaged like rope.

BTU (British Thermal Unit)—Standard measurement of heat; quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

Caulking—Compounds used for filling and sealing cracks to prevent air infiltration (or leakage) and moisture around windows, doors and any place where two different materials meet.

Collector—A device used to collect solar radiation (energy) and to convert it into useable heat.

Conduction—The movement of heat directly through a substance or from one substance to another (i.e. the transfer of heat directly from the heating element on an electric range to a metal saucepan).

Convection—The movement of heat by the actual movement of the heated gas or liquid (i.e. the heat you feel if you place your hand just above a hot cup of coffee).

Heat Gain—The heat which flows into or is released within a structure due to solar radiation or from internal heat sources such as appliances, lighting or heat given off by people.

Heat Loss—That heat that is transferred through a material in which energy is transmitted from molecule to molecule without displacement of the molecule.

Infiltration—Air leakage into the house through cracks and crevices. Since building products shrink over time, infiltration can be the cause of a major portion of your heating and/or cooling bills.

Insulation—A material having a relatively high resistance to heat flow and used principally to reduce the flow of heat.

KWH (Kilowatt hour)—The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit steadily for one hour.

MCF—1,000 cubic feet of gas; the common unit of gas volume. The amount of gas required to fill a volume of 1,000 cubic feet under stated conditions of temperature and pressure.

Radiation—The movement of heat through space without necessarily warming the air through which it travels (i.e. if you sit in front of a hot stove or fire you will feel the radiated heat).

Retrofit—A term used to describe the adding of an item or part to an already existing home or part of a home. In terms of insulation, retrofit means adding insulation to a home that has already been constructed.

R-Value—A number used to describe the resistance of a material to the flow of heat. The larger the R-value of a material, the higher the insulative value.

Siding—The material forming the exposed surface of the outside walls of the home.

Skirting—A material used to enclose the space between the mobile home and the ground.

Thermal Envelope—A term generally used when describing the walls, windows, doors, ceilings and floors of a structure. By improving the thermal envelope, you can increase your homes comfort and reduce the energy requirements needed for heating and cooling.

UL (Underwriters' Laboratories, Inc.)—Used on electric devices, systems and materials to designate that a product complies with UL's safety requirements and that it may be under one of several forms of UL follow-up service to determine manufacturers' continued compliance with requirements.

Vapor Barrier—A material used to prevent or reduce the transfer of water vapor from inside to outside (ex. plastic sheeting, foil, aluminum or vapor barrier paint).

Weatherstripping—A narrow strip of material used to reduce infiltration and exfiltration of air and moisture around window or door openings. Weatherstripping and caulking are generally your most cost effective conservation practices. Check their condition before every heating season.

For More Energy Information

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The Energy Division of the Department of Natural Resources and Conservation, working with the Montana Cooperative Extension Service, has set up 30 Energy Information Centers around the state. The centers offer over 50 free publications on energy conservation and renewable energy sources.

Energy Information Centers

Anaconda	Deer Lodge County Courthouse —2nd floor lobby	Havre	Hill County Courthouse —lobby
Billings	Yellowstone County Extension Office —Courthouse, Room 202	Helena	City/County Building —lobby
Bozeman	Gallatin County Courthouse —lobby	Kalispell	Flathead County Courthouse —3rd floor
Broadus	Powder River County Courthouse —July-September 1983, January-April 1984; Henry Malley Memorial Library —October-December 1983	Lewistown	Lewistown City Library —Adult Reading Room
Butte	Silver Bow Courthouse —lobby	Libby	Lincoln County Library City/County Complex —July-December
Cut Bank	Glacier County Public Library	Livingston	Livingston Public Library —January-April
Deer Lodge	Powell County Courthouse —lobby	Malta	Phillips County Library
Eureka	True Value Hardware	Miles City	Custer County Courthouse Entry
Forsyth	Rosebud County Courthouse —lobby	Missoula	City/County Library of Missoula
Glasgow	Valley County Courthouse —lobby	Plentywood	Sheridan County Courthouse —lobby
Glendive	Dawson County Courthouse —lobby	Polson	Lake County Courthouse —lobby
Great Falls	Cascade County Extension Office	Roundup	Musselshell County Courthouse —lobby
Hamilton	Ravalli County Courthouse	Ryegate	Golden Valley County Courthouse —lobby
Hardin	Big Horn County Courthouse —lobby-2nd floor	Shelby	Toole County Courthouse —lobby
		Sidney	Richland County Public Library —1st floor
		Wolf Point	Roosevelt County Courthouse —lobby

Among the topics covered by the publications are: solar-heated homes, energy-conserving window treatments, do-it-yourself home energy audits, using wood fuel and wind and small-scale hydroelectric systems.

The following publications are available at the Energy Information Centers or from the Energy Division, DNRC, Capitol Station, Helena, MT 59620:

Montana Energy Saving Handbook for Homeowners. This comprehensive handbook shows you how to insulate your home, maintain the heating system and do heat-loss calculations. It also includes step-by-step, illustrated directions for many other home energy-saving measures.

The Montana Renewable Energy Handbook. This handbook gives a thorough introduction to renewable energy systems. Solar, wind, hydro, biomass and geothermal technologies are explained with specific examples of their use in Montana.

The Montana Sunpower Series: Volume 1—Active Solar Homes. This book covers active solar space and hot water heating systems in Montana homes. It describes the basic principles of active solar heating, details system design and construction and presents comments and suggestions about system operation from Montanans who have installed active solar systems in their homes.

Volume II—Passive Solar Homes. This book includes a sampling of cost-effective passive solar homes and greenhouses that have been built in Montana. Building materials, construction techniques and system performance are discussed. Comments and suggestions for improving system performance from Montanans who own passive solar homes are also included.

Twelve Ways To Turn Down High Energy Bills. This brochure lists no-cost and low-cost steps you can take to reduce your energy bills.

Other Sources

Your city or county library offers a wealth of information on all energy subjects. The Montana Cooperative Extension Service office and your local utility can provide information on home energy conservation. Hardware stores and lumber suppliers can help explain the proper use and energy-saving potential of the many energy-savings products they sell.

Other Publications

The following publications maybe of particular interest to mobile home owners:

* **Warm Ideas for Mobile Homes**, a free, 16-page brochure from Montana Power Company, 40 East Broadway, Butte, MT. 59701.

* **An Energy Diet for Mobile Homes: An Owner's Guide to Saving Money**, a 24-page, \$2 booklet from the National Center for Appropriate Technology, P.O. Box 3838, Butte, MT. 59702.

* **Energy Conservation Ideas for Mobile Homes**, a 134-page, \$15 publication from the National Rural Electric Cooperative Association, 1800 Massachusetts Avenue, N.W., Washington, D.C., 20036.

* **Movable Insulation** by William K. Langdon, a 379-page guide to reducing heating and cooling losses through the windows in your home. The 1980 book is available for \$9.95 from Rodale Press, 33 East Minor St., Emmaus, PA 18049.

* **Mobile Home Owners Safety Guide, Woodstove Safety for Today's Mobile Home, Mobile Home Fireplaces: A Boon or a Bomb? and Keep Winter in its Place not Yours!** are free pamphlets from Public Relations Department, P.O. Box 2450, Grand Rapids, MI 49501

Do you live in a mobile home? Are you thinking about buying one in the near future? If so, this booklet is for you. It's distributed free of charge to Montana residents by the Montana Department of Natural Resources and Conservation Energy Division.

This booklet gives step-by-step instructions on ways you can make your mobile home more comfortable and more energy efficient. Many of the projects are things you can do yourself without spending a lot of money. "Mobile Home Energy Savings" shows you how to:

- **Keep your hot water pipes from freezing this winter**
- **Wrap your hot water heater with a blanket of insulation**
- **Stop drafts**
- **Get the most out of your swamp cooler**
- **Use vapor barriers to protect your insulation**
- **Landscape for shade and wind protection**
- **Skirt, side and insulate**
- **Maintain your furnace**
- **Select a contractor**
- **Use the sun for space and water heating**

free from



**Energy Division
Capitol Station
Helena, MT 59620**

**Montana Department of
Natural Resources and Conservation**

Four thousand copies of this publication were produced at a unit cost of \$.49 per copy, for a total cost of \$1,951.00, which includes \$1,551.00 for printing and \$400.00 for distribution.

October 1983