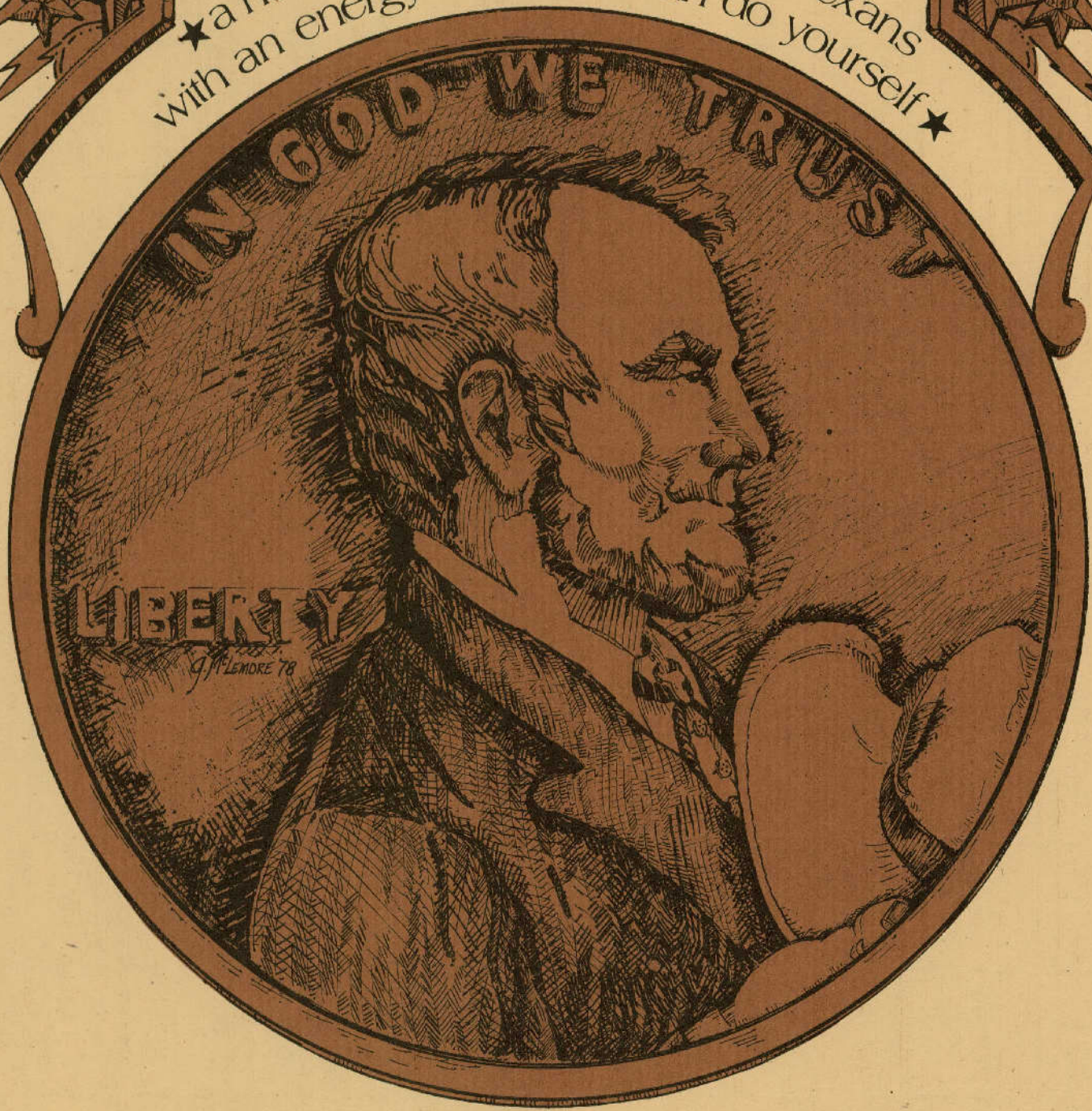
Saving Energy is Saving Money

★a home improvement guide for Texans with an energy audit you can do yourself★



PREFACE

The text of this book was prepared with the support of a grant from the U. S. Department of Energy to the Texas Governor's Office of Energy Resources. It is intended to inform Texas consumers of the wide range of ideas, products and services of potential assistance in saving energy and saving money in the home. References to specific products and services should not be construed as endorsements. It is hoped that this book will be useful as you explore your many options and opportunities for conserving energy.

SAVING ENERGY IS SAVING MONEY

Published in cooperation with the
Texas Governor's Office of Energy Resources,
7703 North Lamar, Suite 502
Austin, Texas 78752

Public Utility Commission of Texas
and the U. S. Department of Energy

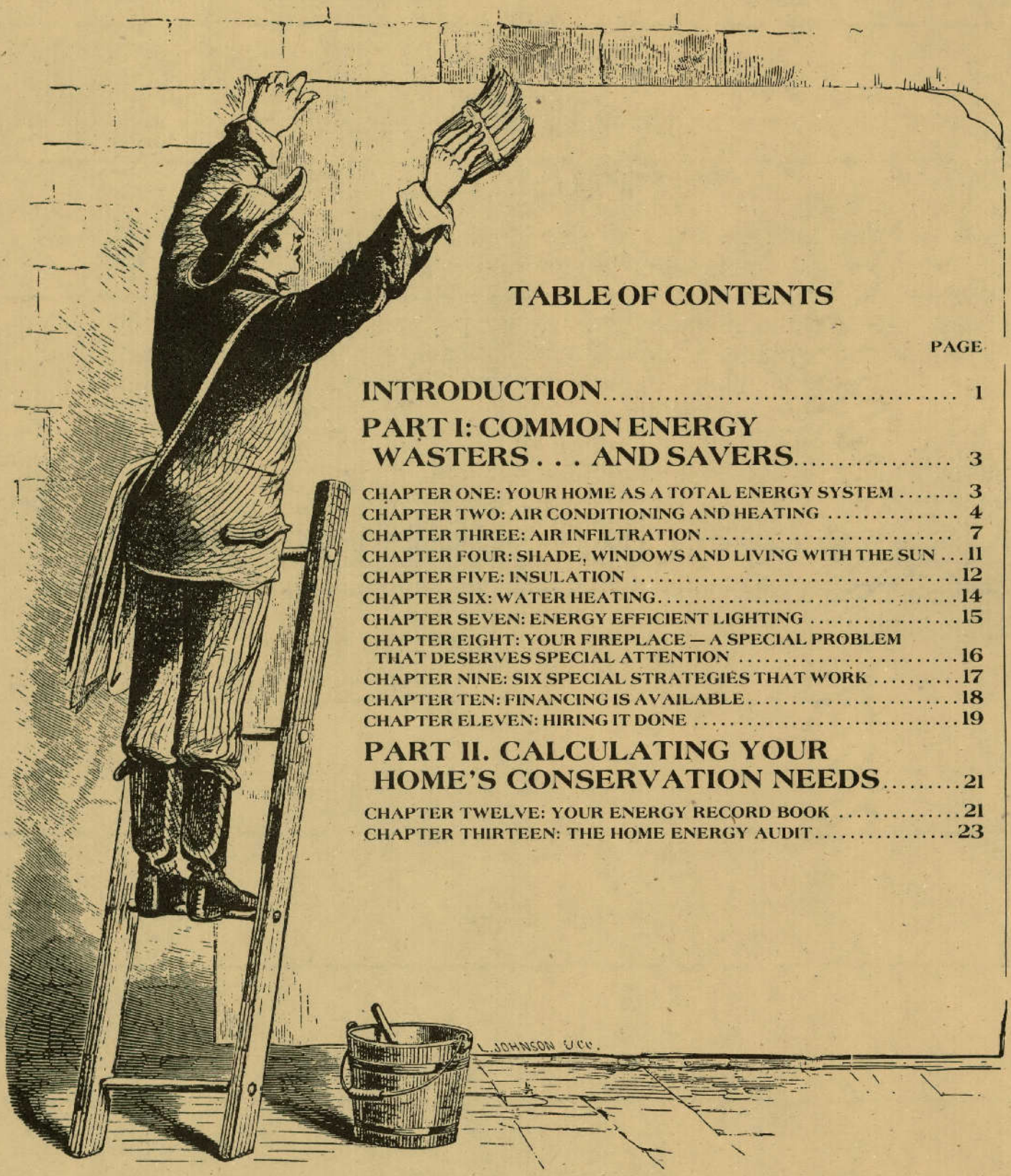
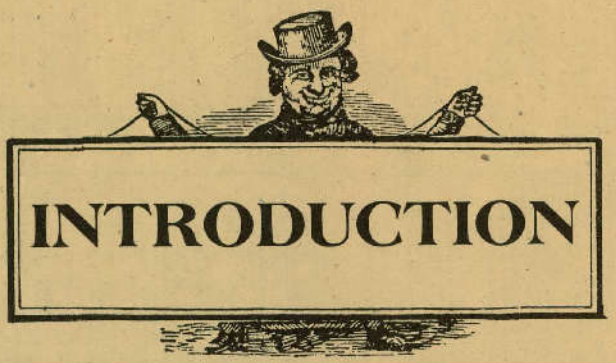


TABLE OF CONTENTS



INTRODUCTION

The Fastest Growing Expense

Saving energy to save money is what this book is all about.

Nationwide, there has been a 16.2 percent annual rate of increase in utility costs since 1973. That's roughly double the level of inflation.

In many parts of Texas, cost increases have been even greater. The home utility bill has become the single fastest growing expense for the average family. For some Texans, utility bills during peak periods are actually exceeding monthly mortgage payments.

Although the era of cheap energy is at an end, you can, to a great degree, control the amount of energy you use in your home and thus help control your monthly utility bills. Simple and effective methods for saving energy are presented in this book. They make sense and they can save you money; but that's not all they have to offer . . .

Consider Your Personal Comfort

Even before energy prices began to skyrocket you could find Texans who insulated their homes, installed storm windows and took other measures which resulted in energy savings. In those days, however, their main purpose often wasn't to save energy or money — although certainly there were some savings. Before energy became so expensive, the main purpose was often personal comfort.

It's a fact that a well-insulated, weather-tight home offers greater comfort, quiet and livability.

That hasn't changed.

Life Cyle Cost:
The Total Cost of Home Ownership

If you think of your basic monthly obligation as being "Principal, Interest, Taxes and Insurance (PITI)," then you are leaving out something very important: the cost for "utilities" which are necessary if you are to live in your home comfortably.

YOUR BASIC MONTHLY OBLIGATION:
Principal, Interest,
Taxes, Insurance. . . . . and Utilities

Life cycle costs are the total costs of home ownership for the life of your home. Included are not only the principal, interest, taxes and insurance, but also your utilities and the costs of general maintenance and upkeep.

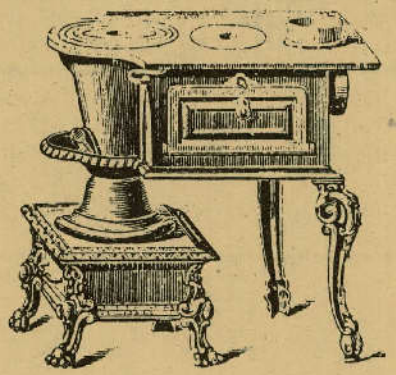
Energy conserving home improvements can substantially reduce your utility costs. And energy efficient appliances and equipment offer another bonus: since they generally feature better design and manufacture, they should last longer.

Rising Energy Costs and the Resale Value of Your Home

Until recently, energy prices had little impact on construction practices. As an example, almost half of the homes in Texas today were built without ceiling insulation. Homes constructed before 1950 were built when there was no way to know that in the future mechanical air conditioning would be added.

If your current monthly utility bill is $50 and utility costs double, you pay $100. If they double again, you pay $200. But if you start out today with a monthly bill of $200, when they double you'll pay $400. And when they double again, you'll have a monthly utility bill of $800. That might not happen. But many experts think it will.

Today, home buyers consider the cost of utilities when they compare homes in established neighborhoods with those being built in new developments. The trend in new housing developments is clearly toward building "energy efficient homes," which are marketed on the basis of increased comfort and lower utility bills. Home buyers are learning that the new energy efficient homes offer a variety of energy and dollar saving features, such as increased insulation, high-efficiency equipment and appliances,



storm windows and doors, water flow restrictors, efficiently-designed fireplaces, strategically placed windows and automatic setback thermostats. Energy conserving extras were once difficult to sell because, for the most part, they are "invisible" and tend to increase the initial cost of the home. Today, however, potential home buyers are asking for them.

Look in your newspaper to see if builders in your local area are marketing their new homes on the basis of energy efficiency. If they aren't yet, they soon will be because all across Texas builders have been attending workshops to learn about new and more energy efficient construction techniques. And their trade associations have been developing and distributing handbooks on special energy efficient building practices.

Whatever the special benefits of older homes in established neighborhoods, few of them today can compete where energy efficiency is concerned. In residential housing, energy efficiency has never been as important a marketing factor as it is now. And it's not as important today as it will be a year or two from now. To protect and enhance property values in this changing market and to reduce monthly operating costs, owners of existing homes will need to do something about the inefficiency of their homes.

Yesterday's home may be obsolete on tomorrow's energy efficient market.

Will Energy Conserving Home Improvements Mean My Home Will Appreciate Faster in Value?

No one can promise you that it will appreciate in value at all. Real estate prices depend on a great variety of factors such as location, business and employment conditions, and the size, condition and attractiveness of your home.

Energy efficiency can mean that your home will continue to provide comfort and convenience while it uses much less energy. Rising energy prices could then become a factor favorably affecting the resale value of your home. That will happen if energy prices continue to climb to the point where owners of inefficient homes have trouble affording the costs of operating their heating and cooling equipment.

A Home Energy Audit You Can Do Yourself

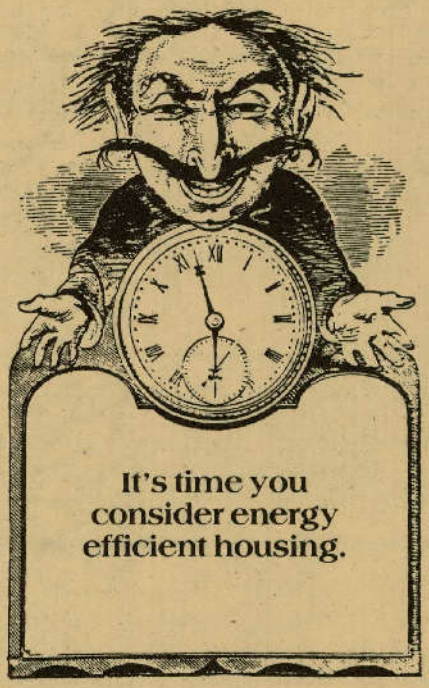
There is a great deal you can do to save energy and money in your present home. By carefully reading this book and following through on its recommendations, you can achieve substantial savings.

But consider this important principle before you proceed with any major energy conserving home improvement: the more expensive a particular energy conserving improvement will be, the more caution you should exercise to be sure the benefits are worth the costs.

Why pay $5,000 to save energy with a particular home improvement if another improvement would enable you to save about the same amount of energy with an investment of only $50? It is very important that you look before you leap; that you take the time to consult with experts; and that you always get more than one bid before you hire a contractor.

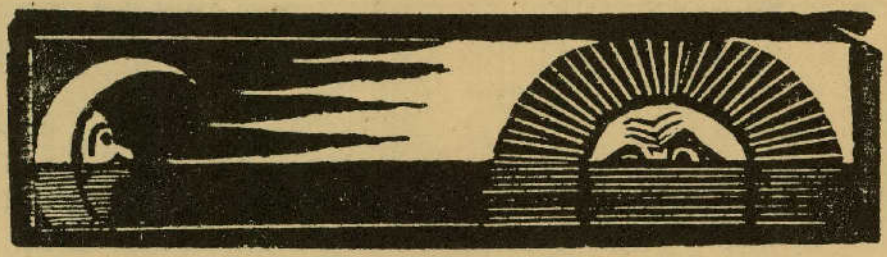
To help you evaluate some of the more expensive improvements, a "home energy audit" is included in Chapter Thirteen. Use it. A home energy audit is a simple step-by-step worksheet. You provide the basic information and perform the calculations. With the results, you can carefully evaluate energy saving investments. The worksheet takes into account details and circumstances of your own home, climate and local energy costs.

Four particular improvements were chosen for the home energy audit: attic insulation, wall insulation, floor insulation and storm windows. These improvements can best be made after there has been a thorough decision-making analysis. ★ ★ ★



PART I

COMMON ENERGY WASTERS . . . AND SAVERS



CHAPTER ONE

YOUR HOME AS A TOTAL ENERGY SYSTEM

Everything Is Connected to Everything Else

Your home is a complex total energy system because all of its parts are interrelated. Your home's insulation, for example, will affect the size of the heating and cooling equipment needed for your climate. The quality, placement and size of your windows will determine how much heat gain will occur in your home through the changing seasons due to solar radiation. The location of your washing machine can add (or help you avoid adding) heat and humidity to your home.

But we're leaving out one of the most important elements: you, the home's occupants. Your lifestyle, the ways in which you decide to manage or waste energy, will play an important part in determining your home's total energy consumption.

In the sections that follow, we'll look at some of the elements of your home as a total energy system. We'll present a number of energy saving opportunities, but before going further, it would be a good idea to take a look at just how a home in Texas uses energy. That will help in understanding how to save it.

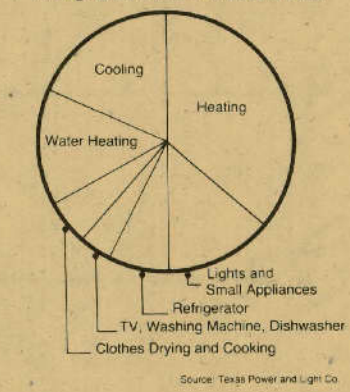
How Energy is Used in the Home

No two homes use energy exactly alike. Usage patterns vary with the home's construction and condition, its occupants, the climate, the seasons, the relative costs of energy, and with countless other factors.

Presented on this page are pie charts illustrating energy use patterns within homes in the State of Texas. While your particular ways of using energy may differ, the following patterns are not at all unusual. ★ ★ ★

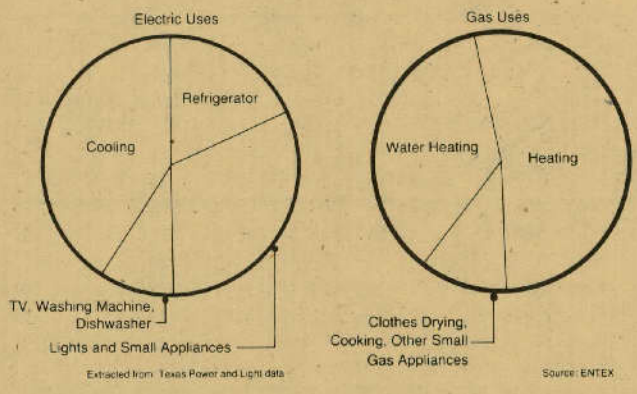
Distribution of energy uses
All Electric and Gas/Electric Homes

Average Electric Uses—All-Electric Home



Source: Texas Power and Light Co.

Average Gas and Electric Uses—Gas/Electric Home



Extracted from Texas Power and Light data

Source: ENTEX

CHAPTER TWO

AIR CONDITIONING AND HEATING

Deciding to Air Condition

Air conditioning is a decision that directly affects your individual or family finances. Most Texans don't really have a choice about whether to heat their homes, but in making the decision to air condition, you do have alternatives. And no matter what you decide, exploring your alternatives is well worth the effort.

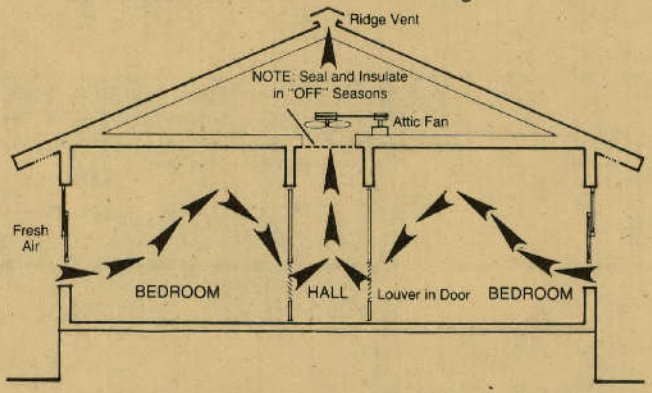
Five Alternatives to Whole-House Central Air Conditioning

If you have decided to air condition, you still have at least five alternatives to whole-house central air conditioning. Even if your air conditioning equipment is already in place, these alternatives are worth considering for possible modifications or additions to your home, especially when it is time for replacement:

1. You can decide to centrally air condition only a part of your home — perhaps two or three rooms — without providing for even the occasional air conditioning of the remainder.
2. You can decide to centrally air condition using "zones" so that you can at any time air condition one or more portions of the whole house, leaving the remainder temporarily without air conditioning. Zones can also be used for heating if you have rooms only occasionally occupied.

   For best results, the interior walls of your home between zones should be insulated and made weather-tight, just as though they were outside walls. Separate mechanical systems may also be required and a heating and air conditioning contractor should be consulted.

   In spite of added initial costs, zoning your central system can be very effective as an energy and money saver because it gives you control over the square footage you actually heat or cool, as well as the flexibility to heat or cool the whole house when desired.
3. Window air conditioners are an old and reliable way to provide cooling for one or more zones of your home.
4. In areas of Texas where high humidity is not a problem, evaporative coolers can also be used effectively in zoned cooling. They use much less energy than any type of air conditioner, but you should consult your local utility representative or contractor to see if they are appropriate for your area.
5. Another alternative to the high energy consumption of air conditioning is the use of an attic fan to cool your home. Normally, a house holds heat so that a lag occurs between the time when the outside air cools after sunset on a summer night and the time when the interior of the home cools. An attic fan speeds up the cooling of the house by pulling air in through open windows, up through the attic and out. Attic fans can be installed in older homes, providing at least a warm weather substitute for air conditioning.



Understanding Equipment Efficiency: The Energy Efficiency Ratio

The more efficient an air conditioner is, the higher its EER (Energy Efficiency Ratio). This is true for both central and window air conditioning units. *High EER units are normally more expensive than low EER units, but in the long run, the total cost is less because your utility bills are lower. The big difference in air conditioning units is how much they cost to operate.*

EER represents the amount of heat that one watt of electricity will remove from the air in one hour. It's figured by dividing the number of BTU's of heat removed per hour by the number of watts needed to provide the cooling.

Suppose a 36,000 BTU/hr. (three-ton) air conditioning unit requires 6,000 watts to operate. It would have an EER of 6.0 (36,000 ÷ 6,000 = 6.0). Another three-ton air conditioning unit requires only 4,300 watts to operate. It would have an EER of 8.4 (36,000 ÷ 4,300 = 8.4). *The unit with the higher EER (8.4) needs 28.5% less energy to do the same cooling job.*

An EER of 7.0 is the minimum acceptable for air conditioning in Texas — but if you truly desire to save energy and money, an EER between 8.0 and 10.0 is recommended.

But Central Air Conditioning Is No More Efficient Than Its Air Delivery System . . .

If your home has central air conditioning or central heating, it has an air delivery system known as its "ductwork." Ductwork is the network of air flow passages through which the conditioned air moves to the outlets located throughout your home. You may find it under the house, or in your attic or in the "furr downs" (low areas) in your ceilings.

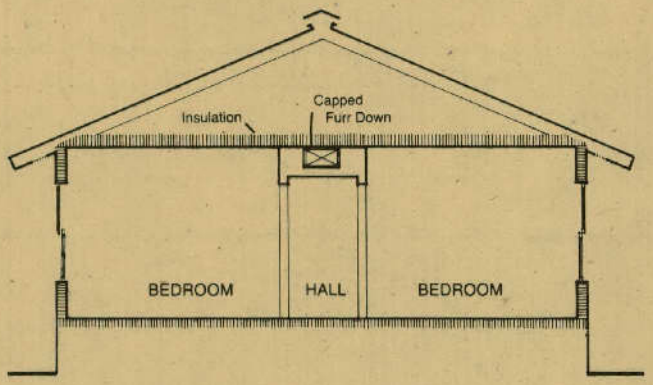
Ductwork presents very important requirements for both air filtration control and insulation. Basically, since you are paying to heat or cool the air, you don't want it to leak out of the ducts before

you can deliver it to your living areas, and you don't want the lining of the ductwork to become much hotter or cooler than the air you are trying to move. That's why you want the ductwork to be well insulated and tightly taped or sealed at all joints and insulation seams.

The ends of the ductwork should be joined tightly to the outlets in your ceiling, walls or floor, and the joints between the ductwork and the interior surfaces of your home should be taped or sealed beneath the register cover. It's a good idea to remove the cover from one of your registers and take a look for yourself at how the ductwork is attached. Check to see that all avenues have been blocked so that air won't leak back into the attic or under the house.

Leaks in ductwork are particularly wasteful because they occur before you receive the benefits of air you are paying to heat or cool.

If your home does have ductwork in furr downs, one more thing should be checked. Look to see that the top of each furr down has been capped off and insulated — so that when viewed from the attic, you can see the entire attic floor bridging the furr downs has been covered with insulation. Otherwise your furr downs may be creating large, uninsulated surfaces within the walls of your home, and they are doing a poor job of protecting your ductwork as it delivers the air you've paid to heat or cool.



Controlling Your Thermostat: Nothing Else So Easy Pays So Well

It is becoming more and more expensive to maintain the temperature levels we became accustomed to in times of cheap energy. Try thinking of a comfortable thermostat setting for summer as being the highest temperature at which you are not uncomfortable. By dressing appropriately, many families have found that they can be comfortable at thermostat settings of 78° or even 80° in summer and 65° in winter. To find your personal comfort settings, experiment. You can save 4% or more on your cooling costs for each degree that you turn your thermostat up in summer and similar savings can be realized in winter for each degree that you turn your thermostat down.

Added savings are possible if you adjust your thermostat settings to use less energy during periods when you will be asleep or away from home. Special "setback thermostats" are available to do this automatically. These are sophisticated control devices which are extremely cost-effective when compared to normal, constant temperature operation. The automatic thermostat timers can do one thing you can't do for yourself — they can adjust the temperature back to your personal comfort level before you wake up in the morning, or before you return home from work.

The dramatic effect of thermostat settings can easily be demonstrated.

Monthly Air Conditioning Costs
(Monthly energy costs at 78° were assumed in both examples — costs at other thermostat settings are relative)

Temperature	Example 1 Monthly Bill	Example 2 Monthly Bill
78°	$20.00	$60.00
77°	22.80	68.40
75°	28.40	85.20
73°	34.00	102.00
71°	39.60	118.30

Air Circulation and Personal Comfort

It costs a great deal less to move air than it does to cool or heat it. Fans, especially ceiling fans, can be used to great advantage with air conditioning systems. By using fans to keep air in motion, personal comfort can be easily achieved with the thermostat at higher settings — even in excess of 80°. The ceiling fan can even be of value in winter, since heat rises and a ceiling fan operating at low speed may actually aid in redistributing heated air. This requires experimentation and may or may not work for you.

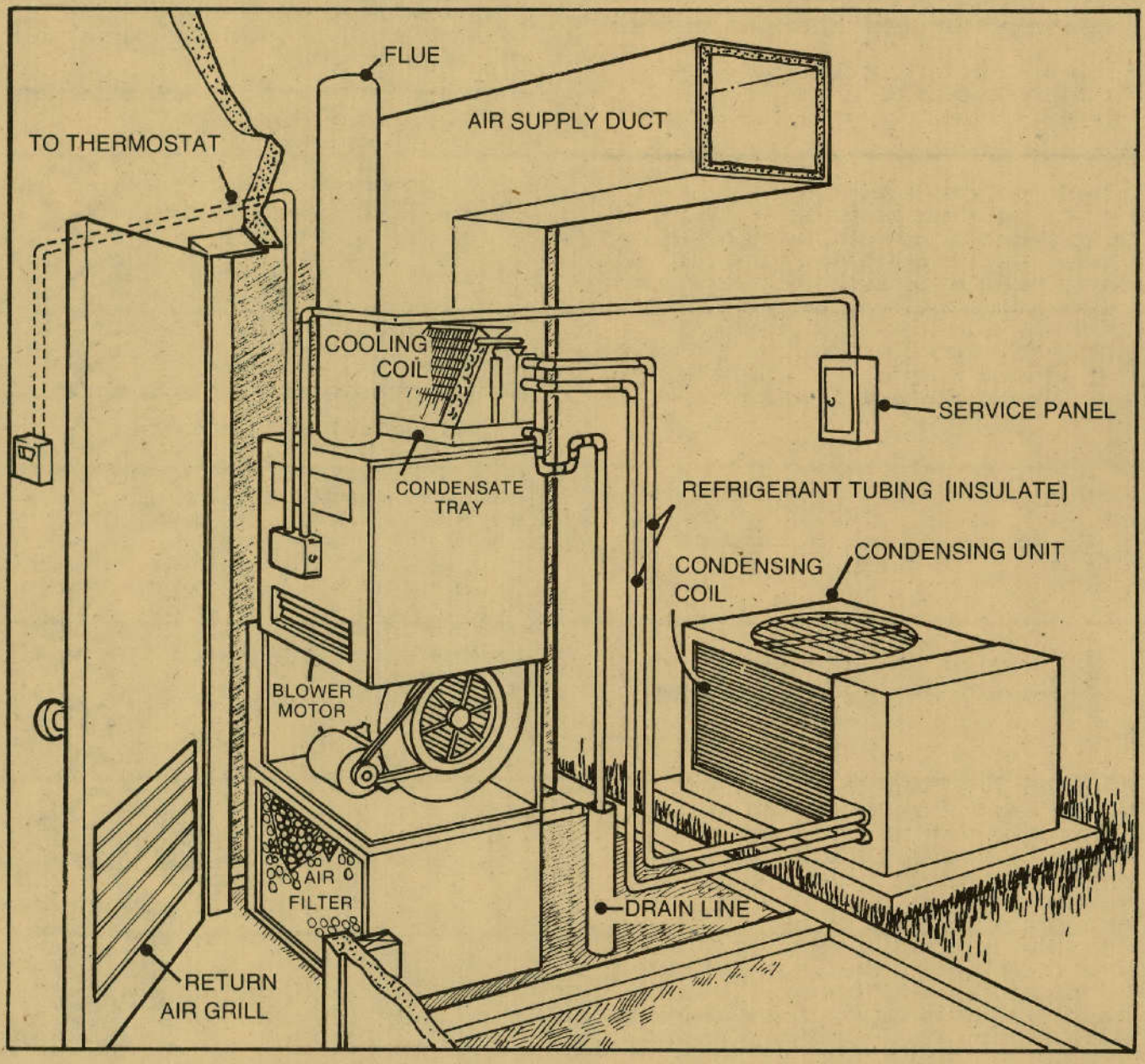
Controlling Internal Sources of Heat

Fifty years ago no one was air conditioning. No one knew how. The spread of mechanical air conditioning came much later — in the years since World War II.

In the last fifty years something else has happened: something that actually works against air conditioning equipment and makes it work harder and cost more to run. There has been a steady rise in the use of heat and humidity-producing appliances within the home.

We pay not only for the energy to run our household appliances, labor saving devices and gadgets; we also pay for the additional energy to run our air conditioners to remove the heat and humidity they create. Average heat gain due to sources within our homes has risen an incredible ONE THOUSAND FIVE HUNDRED (1,500) PERCENT since 1930.

Regular maintenance with your central air/heating system is essential to its efficiency. Check the points below with those listed on the facing page.



The additional heat and humidity actually help you in winter as a supplement to your heating system. But it pays to be consistent the year round, which means that you should try to limit your use of heat and humidity-producing appliances in air conditioned rooms.

And remember to turn out the lights. For the average incandescent light bulb in common use today, only 10% of the electrical energy going into the bulb is turned into light. *Approximately 90% of the electrical energy that enters your light bulb becomes heat added directly to your living space.* If you are air conditioning, your unit has that much more work to do, and it costs you that much more to stay comfortable.

Schedule Regular Maintenance

A central air conditioning or heating system will operate more efficiently and last longer with regular maintenance. You should form the following habits:

1. Clean or replace the air filter at the central unit or on the return air grill of the system at least once a month, more often if you are finding it caked and matted during your monthly inspections. A dirty filter causes an air conditioning or heating unit to use more energy and to work harder, increasing the possibility of an expensive breakdown. You can clean permanent metal filters with water or compressed air. Throw-away filters can be cleaned with a vacuum, or simply replaced. Never operate your unit without a filter.
2. Check the outside condenser coil regularly for obstructions or dirt which can restrict air flow. Clean when needed. Your outside unit should be shaded in a way that does not restrict air flow around the unit. The cooler the air that flows through the condenser coils, the more efficiently your unit will operate.
3. Once every two years inspect and clean the inside cooling coil of the air conditioner to aid efficient operation of the system.
4. Have your entire air conditioning and heating system inspected at least once a year by a professional. As part of this preventive maintenance program, the following items should be inspected: (1) refrigerant levels and line insulation, (2) electrical connections, (3) belt tension, (4) motor lubrication, (5) the evaporator and condensor coils, (6) burner adjustment and (7) the thermostatic controls.

While the professional is there, bring out this book and ask for on-the-spot advice on the best ways for you to take care of regular maintenance items #1 through #3 above. A professional examining your particular system may have additional suggestions you can follow to save energy and money. Ask to be shown where you can squirt a little oil to keep your equipment running smoothly between service calls. The money you spend on routine annual maintenance will be more than recovered on your cooling and heating costs, and through the longer life of your equipment. ★ ★ ★

CHAPTER THREE

AIR INFILTRATION

Probably Your Biggest Home Energy Problem

Air infiltration is the uncontrolled movement of air into or out of a home. It is caused by a number of factors such as wind action, pressure differences caused by operation of your forced-air heating and cooling system — even the operation of fireplaces.

If warm air penetrates air conditioned space, then heat and humidity must be removed (at your expense) to maintain comfort levels. If cold air is penetrating warm space, then it must be heated to maintain a constant inside temperature.

Small air leaks add up. *Most Texas homes have the potential for air infiltration in one hour's time equal to two or four times the total volume of their interiors.* What this means is they are leaking like sieves.

One misconception is that air infiltration can be remedied by applying attic and wall insulation. The truth is, air infiltration can account for 30 percent of the load on heating and cooling systems even in a well insulated house.

As an illustration, let's take the case of a standard home of 1,580 square feet with a ceiling height of eight feet. Its volume would be 8 × 1,580 = 12,640 cubic feet. Let's assume this home has an air infiltration rate of only twice the home's volume per hour, or two air changes per hour. (Most homes in Texas are much worse.) Two air changes per hour equals 2 × 12,640 cubic feet, which is 25,280 cubic feet. That's the air infiltration for one hour.

The air infiltration for a single day would be 25,280 cubic feet per hour × 24 hours, or a total of 606,720 cubic feet of air!

It's a little difficult to grasp what a number that large means. So let's compare it to the Goodyear blimp. The Goodyear blimp has a total volume of 202,000 cubic feet. *It would take three Goodyear blimps to equal the volume of air infiltration moving through our sample home in a single day — a home of 1,580 square feet with a relatively moderate rate of air infiltration.*

Your cooling and heating systems work to maintain thermostat settings in spite of air infiltration occurring on that incredible scale each day. In many cases they are able to do the job and keep you comfortable. But you pay for that. Every utility bill includes the price of air infiltration.

Where Does Air Infiltration Occur?

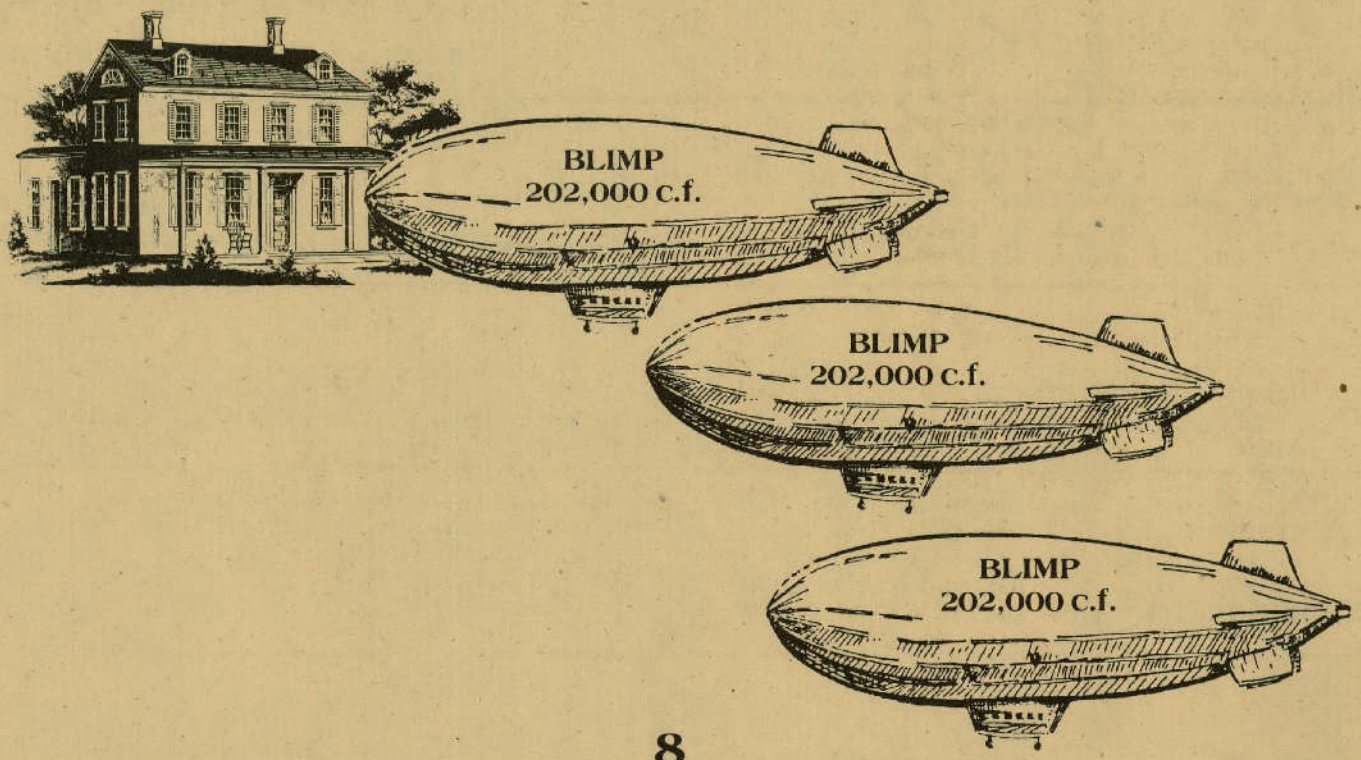
Recently, Texas Power and Light Co., in conjunction with Texas A&M and Princeton Universities, tested 50 homes in the Dallas area to pinpoint sources of their air infiltration. The results are shown in the pie chart on the facing page.

Two surprising findings emerged from the Dallas study. The first was that leakage under the sole plate is typically the largest source of air infiltration, contributing an average of 25%. (The sole plate, which is also known as the base plate, is the bottom 2×4 or 2×6 in your home's wall construction.) Air comes in under the sole plate, past the sheetrock and woodwork to enter your home. The builder of a new home can easily keep this problem from arising by using caulking and other sealants during construction. But in existing homes, removing the baseboards to take care of the problem is a substantial project and may cause extensive damage if not done properly. The time to work on this problem may be just before you are planning to repaint interior walls and woodwork.

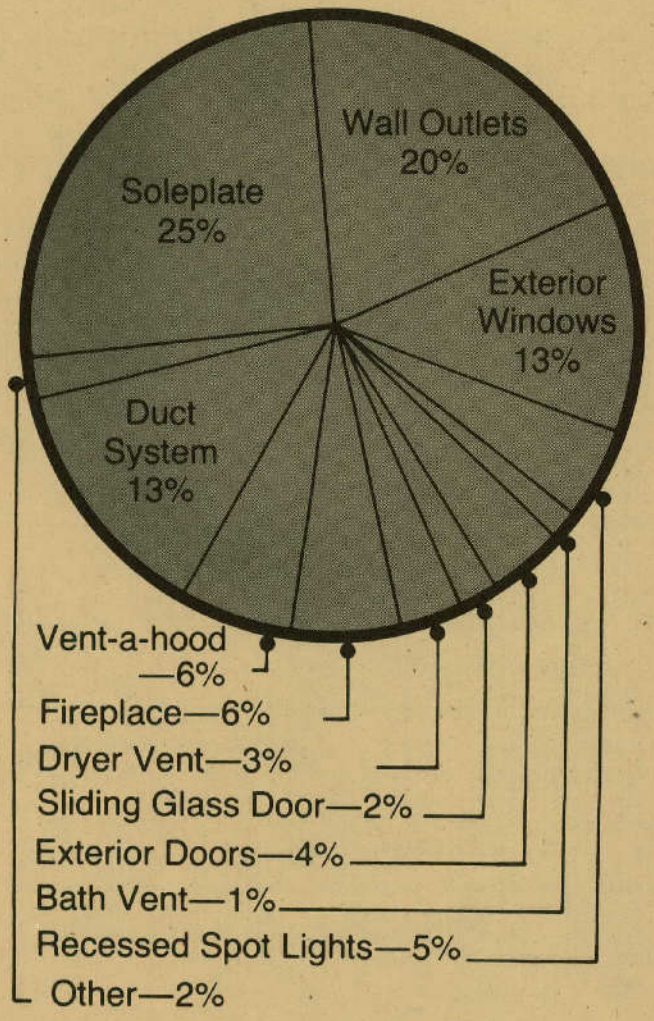
The second surprising finding was that wall outlets are responsible for a great deal of air infiltration in Texas homes, an average of 20% in the 50 homes studied. This is more than for doors and windows combined! Air follows the wiring through the studs and cavities of your walls, and moves in and out of your home through the plug and switch plates. *This is true of wiring on both exterior and interior walls.* The problem is easily taken care of with caulking and sealants during construction, but some simple remedies are also available for owners

Window and Door Frame Weatherstripping

Type	Application	Cost and Durability	Comments
Foam Rubber	Top and bottom of windows; sides and top of door	Least expensive; lasts 1 to 2 years.	Will not take friction; easy to install; can lose resilience; invisible after installation.
Rolled Vinyl	Sides, top and bottom of windows; sides and top of door.	Moderate cost, lasts indefinitely.	More difficult to install than foam; visible after installation.
Spring Metal	Sides, top and bottom of windows; sides and top of door.	Most expensive, lasts indefinitely.	Gives best seal; invisible after installation; tedious to install.



Air Leakage Test Results for Average Home of 1,728 Sq. Ft.



Source: Texas Power and Light Co.

of existing homes. A number of manufacturers produce inexpensive gaskets pre-cut to fit behind your switch and plug plates. Most houses could be done completely for $5 or less. You would simply *turn off your electrical power, at the fuse or breaker box,* unscrew your switch and plug plates and place the gasket material in the proper alignment. For $5 and one hour of your time, you might consider trying these new products.

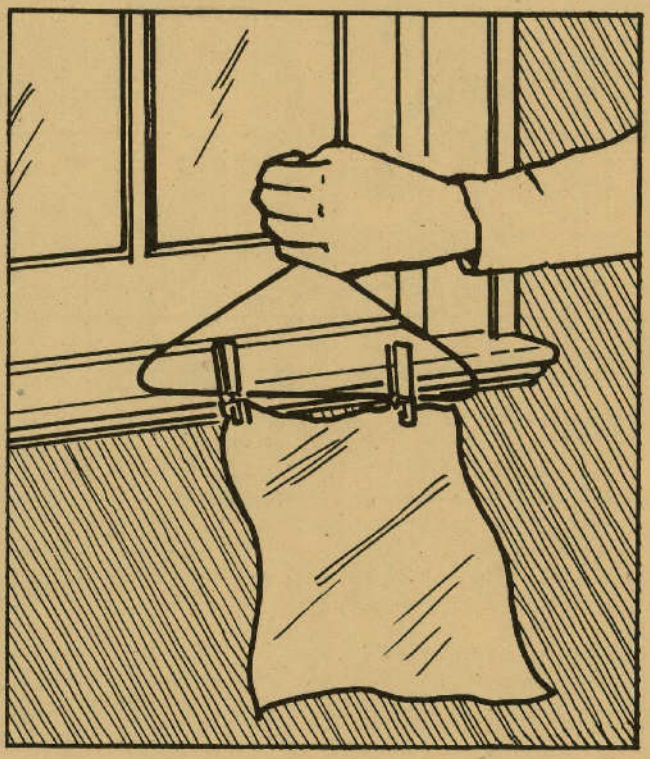
The Draft Gauge

Do members of your family occasionally complain about drafts? Here's a simple item you can make to accurately pinpoint the source.

It's called a draft gauge and all you need is a metal clothes hanger, a plastic bag (or a piece of light tissue paper), a pair of scissors and two clothes pins.

Cut the plastic bag down each side and wrap one end over the cross-bar of the clothes hanger. Use the clothes pins to fasten the bag to the bar.

To check for drafts, hold the gauge steady by the handle of the hanger with the plastic bag close to the edge of the frame. If any breeze is moving in or out, the plastic will show you where a better seal is needed. Use the gauge on all suspected areas. You'll be surprised to discover how many spots need caulking or weatherstripping.



What To Do About It:
Details Make All the Difference

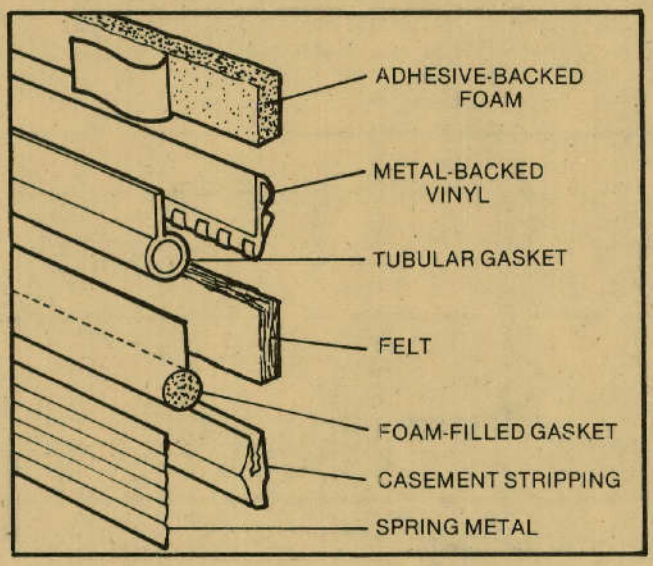
How small an opening can air move through? The details that should concern you are just exactly that small. *A tiny 1/16 inch crack along the sides and top of a typical doorway is equal in surface area to a 4 × 4* inch hole. Air infiltration cannot and should not be completely stopped in a home, but it can and should be *controlled.*

Weatherstripping and Caulking

One of the most cost-effective home improvements is weatherstripping. Weatherstripping is important in

the same way as a seal around your refrigerator or oven door. It prevents air infiltration through the fittings around doors and window sashes.

There are several different types of weatherstripping to choose from: *metal strips, tubular gaskets, reinforced gaskets, reinforced felt, nonreinforced felt, rigid strips, foam strips and door bottom stripping.* Prices for these materials range from 4 to 40 cents a running foot. Ask at your hardware store which kinds are best for the type of doors and windows in your home. You can install weatherstripping yourself with simple hand tools.



Information Taken From:
ENERGY CONSERVATION & YOU
a housing energy primer,
by United States League of Savings Assoc., 1978

If you add up all the cracks around the windows, doors and other openings in your home and put them together, the total area could be as big as an open window. You can seal those cracks by caulking and weatherstripping.

Outside air can also leak in through cracks in the exterior "shell" of your home. Caulking should be applied to seal cracks where different materials such as brick and siding join, where pipes and wires enter the house and where the putty has deteriorated around window panes. A close inspection of the condition of the exterior surface of your home will show you where caulking is needed.

Before you start you will need a caulking gun and a putty knife. You will also need several tubes of caulking. One tube is enough to do 1½ average-sized windows. It's a good idea to buy initially what you think will do half of the job. Then, when you have some experience, go back and purchase the rest of what you will need.

To get started, use the putty knife to scrape and clean areas of paint build-up, dirt or deteriorated caulking. Then, slowly use the caulking gun to apply the compound for a continuous seal.

Use High Quality Materials

Caulking and weatherstripping come in a variety of qualities for a wide range of prices. You should buy, whenever possible, the best professional grades available. The longer life of more durable materials more than makes up for their extra cost. For example, a tube of the cheapest caulking may pay for itself in six months through utility savings, but if it dries up and cracks open in eight months, you are right back where you started. Buy quality products and they will remain useful long enough to pay for themselves again and again. ★ ★ ★

Caulking Compounds

Type	Cost	Ease of Application	Weather Resistence	Effective Life (Years)	Paintable	Adherence to: Wood	Metal	Water-base Paint	Oil-Base Paint	Masonry
Oil base	Low	Good	Poor	2-3	Yes	Good	Good	Good	Good	Good
Acrylic latex	Moderate	Good	Good	10	Yes	Good	Good	Good	Good	Good
Butyl	High	Good	Fair	10	Yes	Good	Excellent	Do not use over paint		Good
Silicone	Very high	Good	Excellent	20	No	Excellent	Excellent	Excellent	Excellent	Excellent

CHAPTER FOUR

SHADE, WINDOWS AND LIVING WITH THE SUN

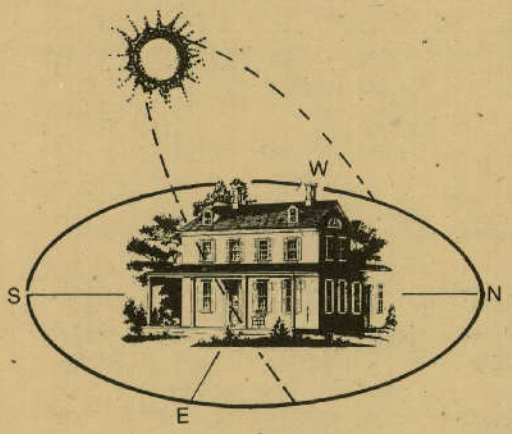
The Importance of Shade

Your home will be easier and less expensive to cool if it is shaded from the sun. The east and west sides are where most of the heat comes through. Shading those sides will result in a smaller air conditioning bill and a cooler home. Anything that stops the sun before it reaches the glass is at least two times better than blinds and curtains on the inside.

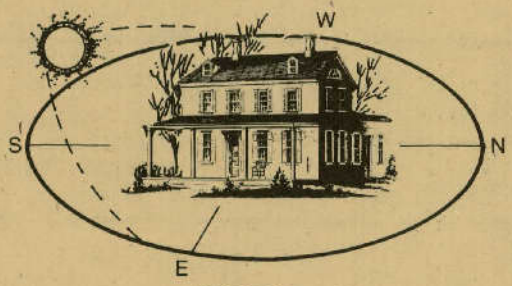
You should also shade the south side of your home in summer. If possible, protect the south side from the summer sun in a way that will allow radiant heat to enter during the winter when the sun is lower in the sky.

If the roof overhang on your home doesn't protect the windows from the summer sun, consider awnings. If you are not able to install them yourself, call two or three contractors for estimates.

Other remedies are trees and vines that shade in summer and lose their leaves in winter. Like a proper roof overhang or well-designed awnings, they'll keep the sun out in summer and let it back in for the winter months.



SUMMER



WINTER

Reflective Window Surface

The use of reflective surfaces provides an important alternative to shading. You can purchase do-it-yourself kits for reflective window coatings or films. But you should consider their use carefully. The warmth from solar radiation in winter may be an asset you won't want to give up through the use of a year-round reflective surface.

Manufacturers are also producing a replacement for window screen wire. The replacement is a perforated plastic material with a reflective coating for the outside. Basically the idea is the same as with the reflective window coatings — to block some of the sun's rays from entering your home. But reflective screen materials offer one advantage: screens can be removed for winter when insects are not a problem and the sun's warmth works to your benefit.

Caution:

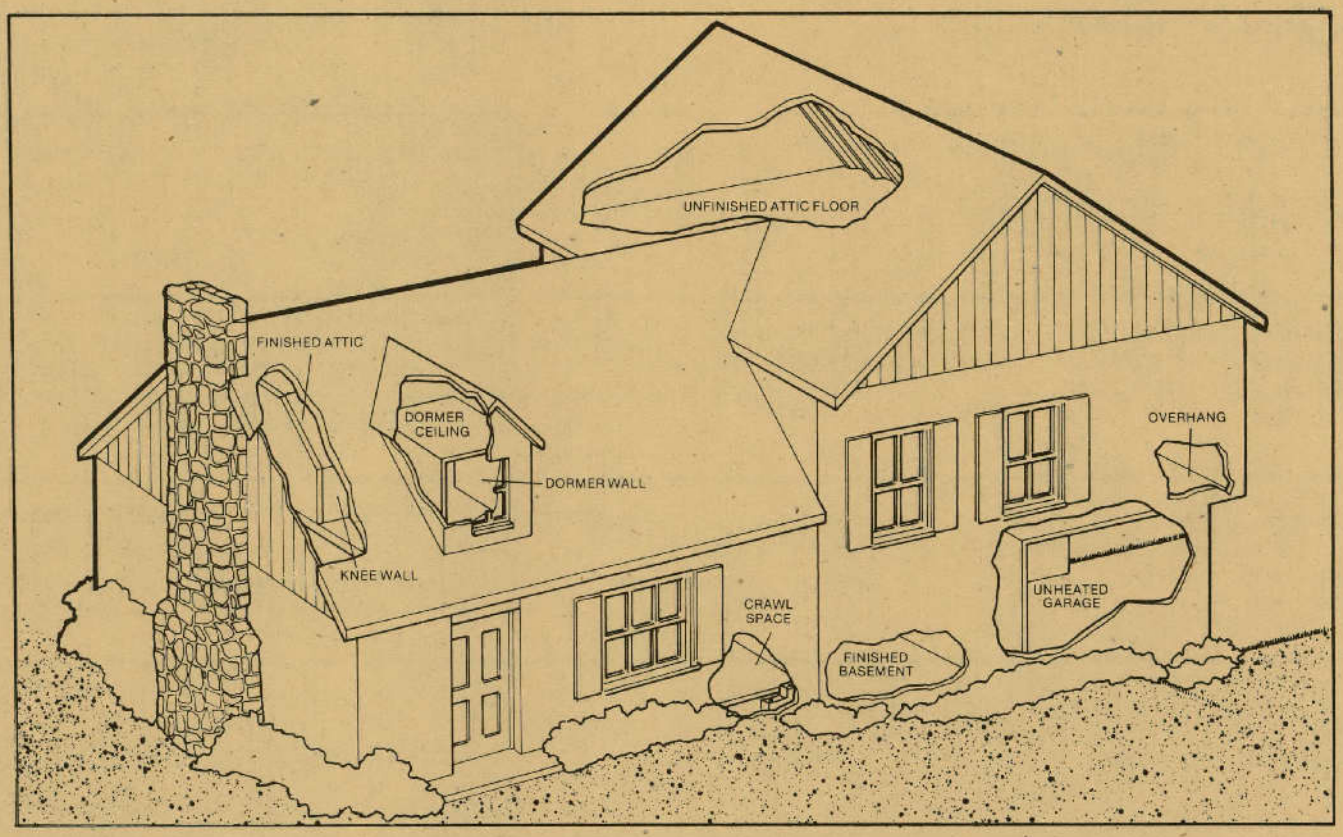
If you have storm windows or two panes of glass, do not put a reflective coating or film on the inside piece of glass. Much of the reflected heat from it would be trapped between the two panes, and would eventually radiate into your air conditioned space. Glass breakage would also be a possibility under extreme heat conditions.

Storm Windows

Windows have not yet been devised which have the insulating value of properly constructed walls. Even when shaded, single pane glass allows approximately 15 times more heat to move through your home than would flow through a comparable area of well-insulated wall.

You can, however, improve substantially on the performance of ordinary single pane windows. By installing storm windows and doors, you can cut the heat flow through these areas in half. They provide a blanket of still air space between the new and old window or door and reduce air infiltration. Depending on size and quality, commercially manufactured windows can be installed for $25 to $75 each; storm doors from $45 to $250 (based on July, 1978 prices). Because this investment can be fairly substantial, a calculation worksheet is provided in Chapter Thirteen to help you compare the costs and benefits of adding storm windows and doors. Or, call your local utility. They can make recommendations which take into account local conditions and experience.

Low-cost storm windows and doors can be made by wrapping your existing screens with polyethylene film. Use duct tape to hold the plastic in place and provide a weather-tight seal. Overall this do-it-yourself method is not quite as effective as good quality commercial products. On the other hand, you can do all of the doors and windows in a 1200 square foot house for under $15. ★ ★ ★



The most critical places to insulate in your home are indicated by the illustration above.

CHAPTER FIVE

INSULATION

What It Does

Insulation keeps a home cooler in summer and warmer in winter. In winter, for example, uninsulated homes lose more than twice as much desirable heat as insulated ones. Good insulation is permanent, requires virtually no maintenance and will keep your family comfortable year after year.

To understand how insulation works, it is important to realize that heat flows from warm areas to cool areas. In summer this "heat flow" moves into the living spaces of your home through walls and ceilings next to garages and attics, as well as those directly adjacent to the outdoors. Insulation guards against this heat transfer by blocking the flow of heat.

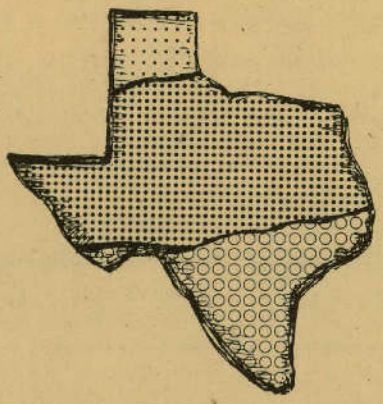
R-Value: The True Measure of Insulation

The effectiveness of your home's insulation depends on its resistance to heat flow — its R-value — rather than just on its thickness. Different insulating materials have different R-values per inch of thickness and therefore different thicknesses are required to do the same job. Among the variety of insulation materials available on the market today, R-values range between 2½ and 5 per inch of thickness — a possible difference of approximately 100%. The larger the R-value, the more the resistance to heat flow and the better the insulation. A chart has been included in Chapter Thirteen to help you buy insulation with R-value in mind.

How Much is Enough?

Experts tend to disagree on the question of how much insulation is the right amount. What they do agree on is the overall importance of insulation. ***No one recommends less than R-19 for the ceiling and R-11 for the walls in Texas.*** If you are about to insulate, you should install at least that much. ***At the other end of the scale, there is no need in Texas for more than R-30 for the ceiling and R-19 in the walls.*** The reason there are no higher recommendations for Texas climates is the "law of diminishing returns" — after you already have so much insulation, adding more just doesn't do you much good. In other words, beyond a certain point, the costs of adding more insulation simply won't be justified by the additional benefits.

If you need assistance in deciding how much



These R-Values correspond approximately to current recommendations of the National Bureau of Standards.

These R-Values are a broad generalization of insulation practices, and individual cases should be based on specific building conditions and utility costs.

insulation you should have, you may want to call your local electric or gas utility. Most Texas utilities will make recommendations regarding the cost effectiveness of insulation R-values. Their recommendations can take into account local climatic conditions and energy costs. Calculation work sheets for attic, wall and floor insulation have also been provided in Chapter Thirteen. Using them can help you make the most of your energy efficiency investment.

Without Insulation, Your Attic Could Be The Most Expensive Room In Your House.

When You Insulate, Controlling Moisture is Important

When you insulate, it is important to provide adequate safeguards to protect your home from moisture build-up which can reduce the insulating value and cause mold growth, paint peeling and structural decay.

Moisture control is very simple. It is accomplished by the use of adequate ventilation and vapor barriers (often plastic sheeting). But the particular ways in which ventilation and vapor barriers should be used vary according to climate. Humidity is an extremely important factor. What works in El Paso might very well be disastrous if applied in Beaumont, and vice versa. If you are planning to install your own insulation, you should call your utility for advice on proper methods for controlling moisture in your local area.

One Clear-Recommendation

Installing attic insulation where there was none will pay for itself, through lower cooling and heating costs, more quickly than almost any other major improvement. In many situations in Texas, bringing an uninsulated attic up to R-19, and doing the work yourself, will return your money in lower cooling and heating costs within the first year. Calculations by Houston Lighting & Power Company, published during the summer of 1978, predicted a payback period of less than 10 months for do-it-yourself homeowners in the Houston area. Adding insulation to your uninsulated attic is a good investment. Use the calculations worksheets at the end of this book to prove it to yourself.

A Close Question

Installing insulation on top of existing insulation is a close economic question that requires some analysis because the law of diminishing returns begins to come into play. Generally, the more insulation you already have, the longer it will take for any additional insulation to pay for itself through utility savings.

First, use the table below to determine the R-value of insulation now in your home. If you currently have less than R-11 attic insulation, you should perform the calculations in Chapter Thirteen. Adding more insulation may be especially practical for you.

Nominal R-Values for Various Thicknesses of Insulation (in inches)

	Batts or Blankets		Loose and Blown Fill*				
R-Value	glass fiber	rock wool	glass fiber	rock wool	cellulose fiber	vermiculite	perlite
R-11	3½ in.	3 in.	5 in.	4 in.	3 in.	5 in.	4 in.
R-13	4	3½	6	4½	3½	6	5
R-19	6	5	8½	6½	5	9	7
R-22	7	6	10	7½	6	10½	8
R-26	8	7	12	9	7	12½	9½
R-30	9½	8	13½	10	8	14	11
R-33	10½	9	15	11	9	15½	12
R-38	12	10½	17	13	10	18	14

*The R-Value for urea-formaldehyde foam is 4.2 per inch of thickness. However, a recent bulletin (Use of Materials Bulletin No. 74, Sept. 15, 1977) from the Department of Housing and Urban Development (HUD) indicates that the effective R-Value of this type of fill is only 3.3 per inch when installed, due to a 6 percent average linear shrinkage. Therefore, urea-formaldehyde foam in a 3½ inch wall cavity would have an R-Value of 10.5.

Making Up for Past Mistakes

Adding more insulation to correct the defects of an earlier insulation job is highly recommended. For example, you may find one or two insulation batts missing from your attic because years ago an installer ran out of material just before the job was complete. Or, you may find that a furr down area in your ceiling was left uninsulated. Finishing an earlier insulation job by completing the coverage, or capping-off a furr down, will be very cost-effective if you do the work yourself.

CHAPTER SIX

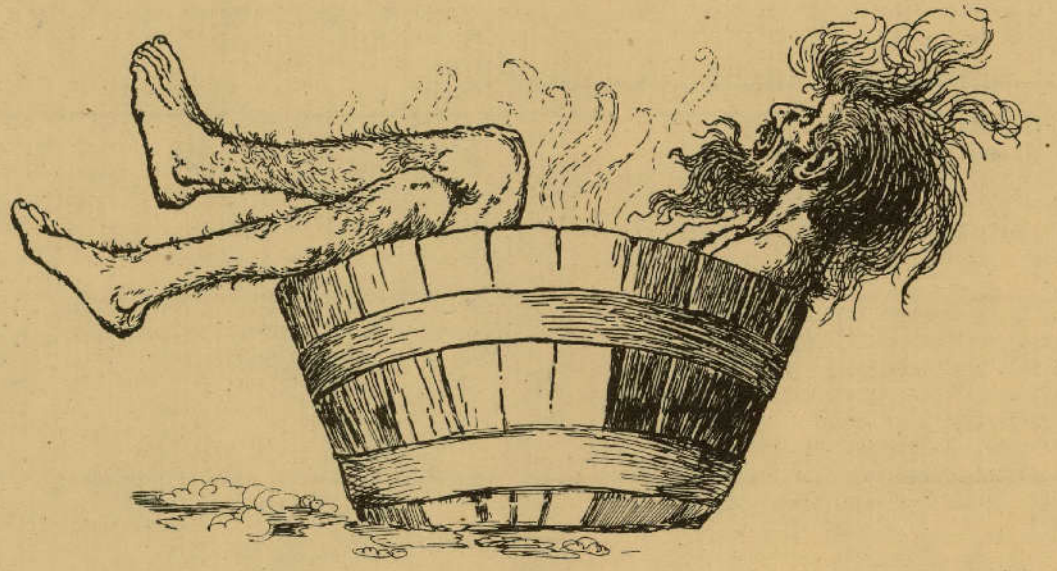
WATER HEATING

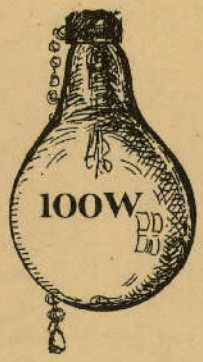
Next to heating and air conditioning, the biggest single use of energy in Texas homes is for water heating. Water heating can account for 15 to 20 percent of your home's annual energy bill. This may sound high, but consider the ways hot water is used — showers and baths, shaving, washing clothes, dish washing, general cleaning and food preparation. Together, these operations require large quantities of hot water all year long.

To save energy and money you don't have to resort to cold showers:

1. Reset the temperature on your hot water heater to "low" (120°F) unless you have a dishwasher that does not have a booster heater. If you have a dishwasher and it does not have a booster heater you should set the water heater at medium (140°F). If you find that at the new setting your water heater is not keeping up, readjust it slightly.
2. Repair all leaky water faucets, especially hot ones. One dripping faucet can waste 2,400 gallons of hot water per year — water you paid to heat.
3. Check to see how well your water heater is insulated. Place your hand on the side of the tank. If it is warm, heat that should remain inside is being lost and the water heater is working more than it should. Insulating your water heater reduces the rate of heat loss, which reduces the energy required to keep the water hot. You can purchase a kit with do-it-yourself instructions for insulating your water heater.
4. Check the hot water pipe coming from your water heater: if it is not insulated, it should be. Heat will escape from the pipe and the water delivered to your faucet will not be as hot as it should be. And when the hot water faucet is turned off, what's left in the pipe will cool quickly, often before it's needed again. Do-it-yourself kits are on the market and are easy to use.
5. You can help your water heater operate more efficiently by draining rust and sediment from the tank. Each month you should open the drain valve at the base of the tank and drain a couple of gallons of water. Removing sediment in this way will extend the life of the tank and its heating elements.
6. Another option for cutting water heating costs is the "heat recovery device." This equipment takes waste heat from the refrigerant as it enters the condensing coil of your central air conditioning unit and uses it to assist your standard water heater. Using this unit, homes tested in the Beaumont area have experienced a 50 percent reduction in the amount of energy it takes to heat their water.
7. If you shower rather than bathe, consider installing a flow restrictor in the pipe at the shower head. These inexpensive, easy-to-install devices restrict the flow of water from 8 gallons per minute down to 4 gallons per minute while maintaining the shower's rinsing action.
8. Just remembering that you pay to heat water will save you money, because you save energy every time you use cold water instead of warm, or warm instead of hot. ★ ★ ★

Installing insulation on a gas water heater should be done with extreme care to avoid placing insulation in areas of flame exposure, or on the top of the heater. It is recommended that homeowners use one of the special do-it-yourself kits and carefully follow the specific instructions for gas water heaters.





CHAPTER SEVEN

ENERGY EFFICIENT LIGHTING

In order to compare the energy efficiency of various light sources, some sort of unit of measure is needed similar to the "miles per gallon" rating for automobiles. Fortunately, such a unit of measure is already in common use today. The unit of measure is "lumens per watt." The more lumens per watt produced by your light bulb, the more efficient it is at turning electricity into light. All of the information you need to compare light bulb efficiencies is printed on the package labels.

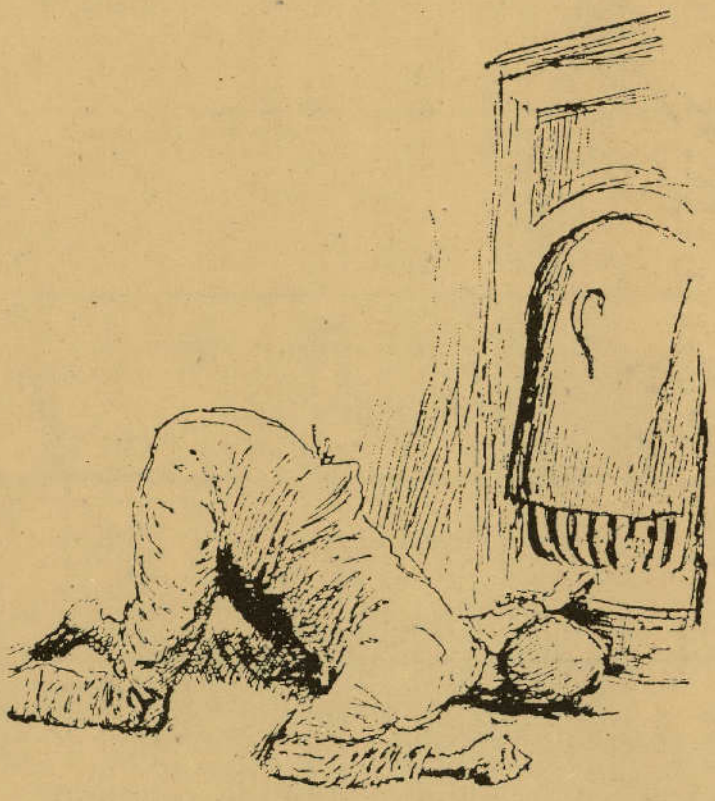
Most people buy light bulbs by the watt. But watts are only a measure of the amount of electricity going into the bulb. Lumens measure actual light output and are marked on the bulb package. Bulbs of the same wattage often give out different amounts of light. To see how efficient a bulb is, divide the lumens by the watts. For example, to find the efficiency of a 100-watt bulb with an output of 1710 lumens:

$$\frac{\text{1710 lumens}}{\text{100 watts}} = \text{17.1 lumens per watt}$$

Of course, lumens per watt is only one factor to consider in lighting your home. As an example, using an extremely efficient 150 watt bulb would be wasting energy if a 60 watt bulb would do the job. And no light bulb will add to the energy efficiency of your home unless you use it only when the light is useful.

If you are about to add or replace a light fixture, you can save energy and money by installing a new fluorescent fixture. A 25-watt fluorescent bulb gives off as much light as a 100-watt incandescent bulb, but uses one-fourth as much energy. ★ ★ ★

Remember to turn off lights. For the standard incandescent light bulb in common use today, only 10% of the electrical energy going into the bulb is turned into light. ***Approximately 90% of the electrical energy that enters a light bulb becomes heat added directly to your living space.*** If you are air-conditioning, your unit has that much more work to do, and it costs you that much more to stay comfortable.



There are a number of other equipment options which can help turn your fireplace into an energy asset:

1. If you are having a fireplace added to your home, be sure to include an operable "outside air intake" to the firebox. This vent allows the fireplace to pull its combustion air from outside your home, instead of from your living area. It should be closed, along with the damper, whenever the fireplace is not in use. In many cases it is possible to add an outside air intake to your existing fireplace. Call local fireplace dealers to see if they are carrying these new products. (Note: many older fireplaces were constructed with an ash box at the back of the firebox, opening to the outside. If your fireplace has an outside ash box, keeping it clean can provide a satisfactory source of outside air.)
2. Install a glass front on your fireplace to shut off most of its access to air from your living area. This will increase the draw of air from the outside vent. And the glass front will actually help the fireplace radiate heat into your home.
3. If you are having a fireplace built, consider including air circulation features in your fireplace designed to vent warm air around the firebox and into the room or, through ductwork, to the whole house.

If you consider fireplace efficiency an important factor, you can do a lot to control your utility bills for years to come. ★ ★ ★

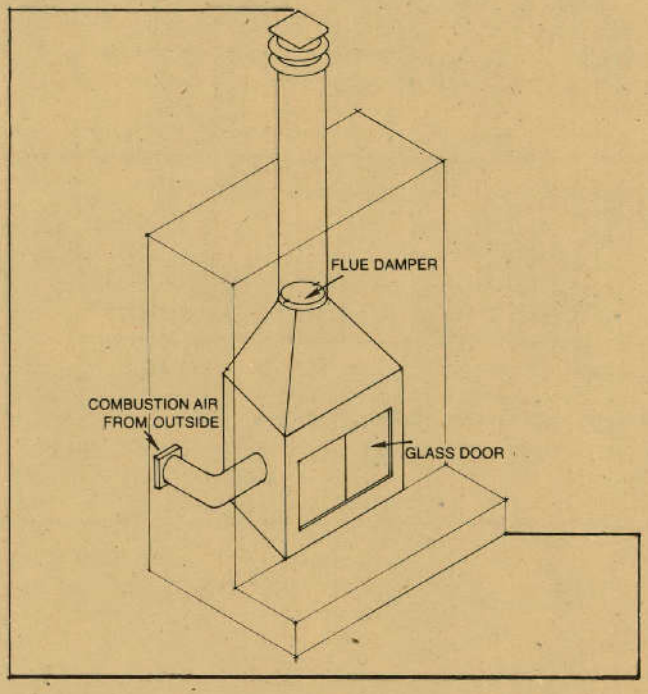
CHAPTER EIGHT

YOUR FIREPLACE: A SPECIAL PROBLEM THAT DESERVES SPECIAL ATTENTION

There is one energy waster so devastating it deserves special attention. It is the fireplace constructed without a tight-fitting damper.

Fireplaces are used in many areas of Texas. They can be beautiful and can add a great deal of charm and value to a home. But *without a high quality damper, a fireplace can destroy the effectiveness of both your heating and air conditioning systems — no matter how well built your home may otherwise be.* Unless the damper is securely closed at all times when the fireplace is not in use, air you have paid to heat or cool will be drawn continuously up the chimney. It can actually be much worse than a constantly open window.

If you have this problem, consult experts about correcting it. Adding a damper to an existing fireplace isn't easy, but it can pay for itself again and again through savings on your heating and cooling bills.

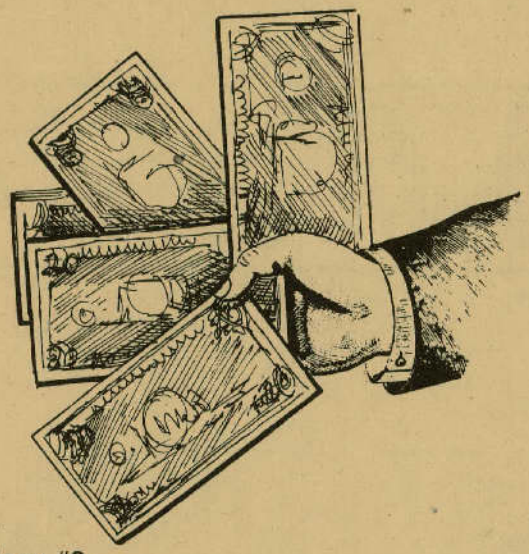


CHAPTER NINE

SIX SPECIAL STRATEGIES THAT WORK

Strategy #1:
Free and Easy
There is no doubt that the way to get the most benefit for the least cost is to follow the strategy of first doing all of the free things you can to produce energy savings. Here are some of the opportunities that cost nothing but add up to big savings:

* Manage your household thermostat to use less energy.
* Turn down your water heater temperature.
* Limit your use of heat and humidity-producing appliances in air conditioned rooms.
* Clean filters and condenser coils regularly.
* Use outside shading and drapes, shutters or blinds to block out summer sun.



Strategy #2:
The One Hundred Dollar Investment
You invest money to make money, and that's what this strategy is about. Decide what you are willing to invest and see how far you can stretch your budget to improve the efficiency and lower the utility costs of your home. Take an hour to inspect your home carefully to see what it needs. Here's a sample budget for a family willing to invest $100.

Efficiency Item	Cost
* 15 tubes of high quality caulking @ $4	$60
* 1 caulking gun	2
* high quality weatherstripping (3 doors @ $10)	30
* electrical wall plate gaskets (pkg of 24)	3
* large roll of duct tape for leaks in ductwork	5
TOTAL INVESTMENT	$100

REMEMBER — before you spend a lot of money on energy conserving home improvements, it makes sense to do the things that cost nothing or next to nothing. Strategies #1 and #2 make sense as your first steps toward energy efficiency. And it is very important that you use them to complement and enhance the effectiveness of any larger investments in energy conservation you may be planning.

Strategy #3:
Not Missing an Opportunity
All of us are in this for the duration; the problem of rising energy costs shows no sign of going away. One strategy that will save you money for years to come is to include energy efficiency as a significant consideration in all decisions about future appliance and equipment purchases. Over the next few years the cumulative effect of your purchasing decisions could mean substantial savings on your monthly utility bills. As an example, you may have to pay $40 or $50 extra to buy an energy efficient refrigerator instead of the standard model, but in the next ten years the added expense will be made up several times through utility savings. On the other hand, if you buy the standard model refrigerator today, it's a decision you'll pay extra for every month for as long as you operate it.

Strategy #4:
When Adding a Room to Your Home
If you are adding on a room you should consider this two part strategy:

1. Build the add-on to be extremely energy efficient, with good insulation, air infiltration controls, adequate sun controls and other measures discussed in this book.
2. At the same time, make substantial energy conserving improvements to your present home.

By making your home energy efficient, it is possible to add new rooms without increasing the size of your heating and cooling equipment. The money you save by not having to pay for new heating and cooling units will help pay for the energy saving improvements to your present home. And savings on your utility bill will help meet your monthly loan obligation. A good heating and air conditioning contractor should be consulted regarding the modifications necessary for your ductwork to serve your expanded home.

Strategy #5:
Instead of Adding a Room to Your Home
If you are thinking about adding more living area, you should consider an attractive screened porch as a possible alternative. In many areas of Texas, screened porches are enjoyable six months or more each year. Initial construction costs are substantially less than for comparable enclosed living areas. And heating and cooling costs through the years will be an easy-to-live-with . . . zero.

Strategy #6:
Replacing Air Conditioning and Heating Equipment

If you need to replace air conditioning or heating equipment, be sure that you consider not only high efficiency equipment, but also adding insulation, air infiltration controls and other energy savers to your home at the same time. The extra improvements will mean that the new equipment will have less work to do and you may be able to heat and cool your home with a smaller unit. The savings due to smaller equipment size can help pay for the energy-conserving home improvements.

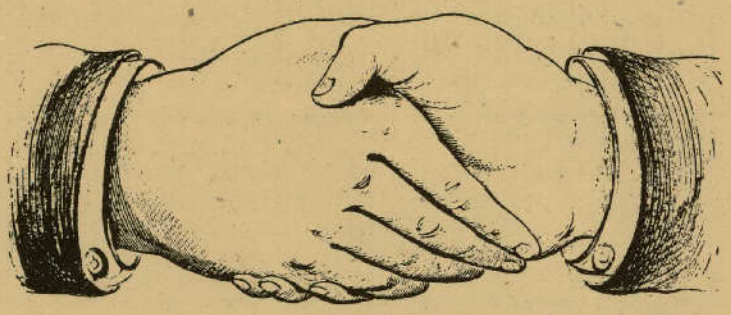
★ ★ ★

CHAPTER TEN

FINANCING IS AVAILABLE

Energy Conservation Loans

In Texas, financing is readily available for energy-conserving home improvements. This creates a significant opportunity for homeowners because a well-planned home improvement produces savings on utility bills which can be a substantial help in meeting your monthly loan payments. Long after the loan has been repaid, energy conserving home improvements will continue to save on the rising costs of living — putting money in your pocket.



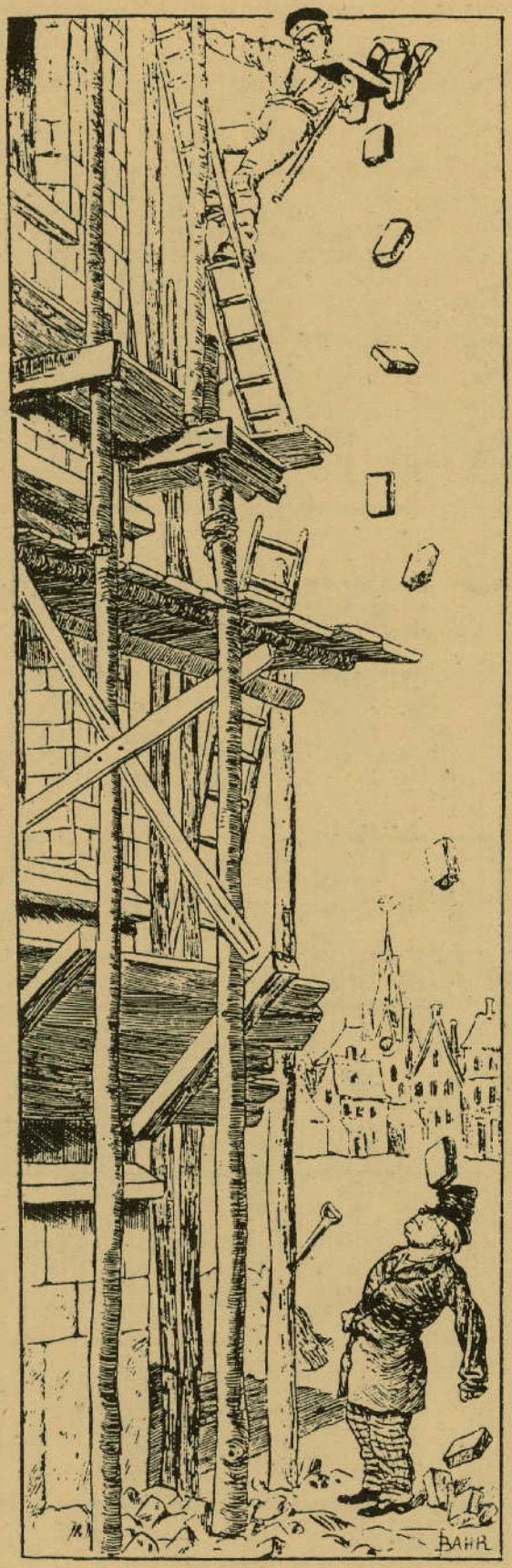
Innovative Programs Emerging

In January, 1978, the Public Utility Commission of Texas began holding a series of workshops across the State for officials from banks, credit unions, savings and loans and electric and gas utilities. Participants in the workshops explored a wide variety of alternatives for assisting consumers with energy-conserving home improvements.

Lenders are willing to make energy conservation loans for a number of reasons. Because they are themselves consumers, lenders are aware of the difficulties which we all face in meeting utility bills. As lenders, they know that property which is not energy efficient will be less valuable on tomorrow's market. They also know that rising energy costs will make it more difficult for borrowers to repay loans. In short, energy conservation is an area where public needs and private interests begin to merge in seeking a common goal — maintenance of a comfortable way of life in Texas.

You may have noticed that energy efficiency is being included in the advertising and promotional efforts of lending institutions in your area. Many lenders are developing special energy conservation loan programs to call attention to the opportunities described in this book. Others are making free energy conservation literature available to customers through their lobbies, or referring customers to their utility companies for advice. At least one lender (in the Houston area) has offered reduced interest rates to customers who will use the money for energy conserving home improvements.

Lenders are also beginning to reconsider their loan practices in light of rising energy costs. They are starting to evaluate methods for including utility costs in eligibility tests for a mortgage loan. They are looking at ways to adjust real estate appraisal procedures in order to reflect changes in residential market values due to the presence or absence of energy efficient features. ★ ★ ★



CHAPTER ELEVEN

HIRING IT DONE

If you decide to hire a contractor, there are some things you should know about finding the right person for the job. The majority of contractors take pride in their business, and are conscientious and honest. But you should still spend some time and effort in making your choice, and once the choice is made, in clearly defining the job.

In recent years there have been occasional problems of fraud, misrepresentation and product safety in contracting for insulation. For this reason, the information in this chapter deals specifically with hiring an insulation contractor. The general underlying principles may be of help to you, however, in contracting for any energy-conserving home improvement.

Where to Start Looking

1. Yellow Pages under "Insulation Contractors — Cold and Heat." Don't be suspicious of the small operation — even just a carpenter and his helper. You're doing a relatively small project and often the person in small business will give you an excellent job.
2. Your local utility. Many utilities in Texas are preparing lists of insulation contractors.
3. A friend. Word of mouth is often the best method of finding out who is doing good quality work at reasonable price. But question your friend closely. And ask to inspect the work for yourself.

From these sources, draw up a list of three or four contractors to contact.

How to Select Your Contractor

Obtain cost estimates from at least three different contractors. Make sure you describe the same job each time and remember to consider quality as well as price.

When you talk to a contractor, talk in terms of R-values. Remember that R-values are determined by both the type of material and the thickness, not thickness alone. You might want to review Chapter Five.

Deal with each contractor on the basis of your obtaining, upon completion of the job, a signed certification of the R-value actually installed. Make this clear when you ask for the estimate.

If a contractor won't deal with you in R-values, go to someone else.

Ask whether your insulation carries the approval of the Underwriters Laboratory and is fire and vermin resistant. Ask to see the product label.

Make sure the contractors carry insurance for any injury to workers or your home.

Ask the contractor for references, including satisfied customers. Check them out. Try to see some of the work for yourself.

Check with the local Better Business Bureau to find out if any complaints have been filed against the contractors you are considering. Another place to check is the State Attorney General's Office of Consumer Protection in Austin at (512) 475-3288 to learn about any complaints filed there.

Remember that complaints are in themselves no proof of wrongdoing. The number of complaints may simply be one of many factors you will want to consider. The records you will be asking about are public information to which you have the right of access.

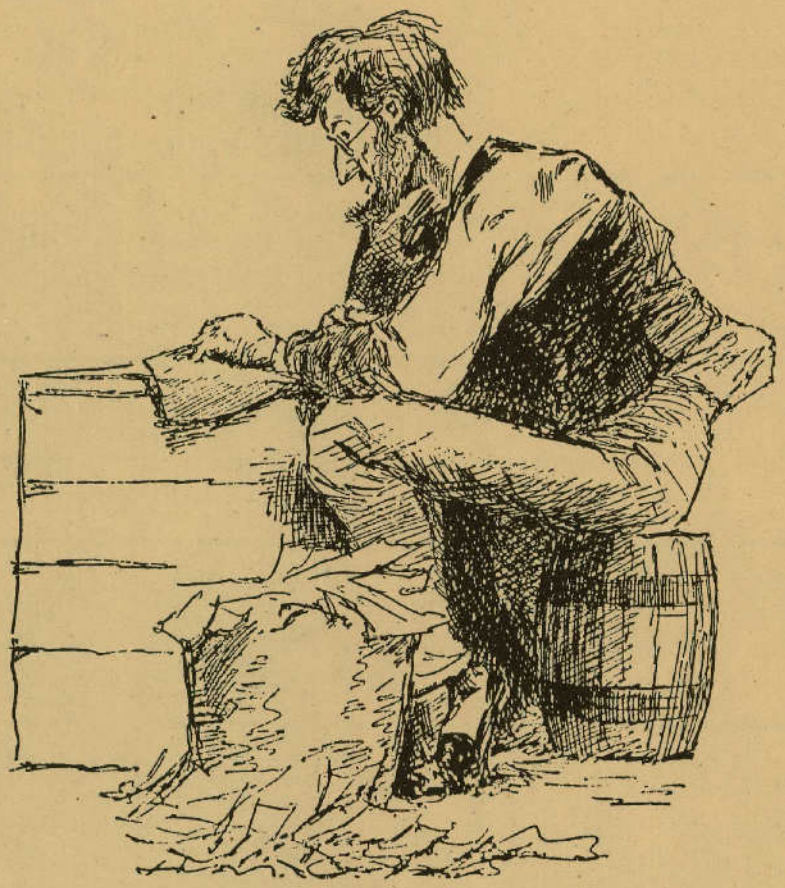
Once You've Selected a Contractor — Put it In Writing

Check the contract carefully to see that it accurately describes the work to be done, any promises made and the warranty. If you've been told that your utility bills will be cut by a specified amount (say one-third to one-half), be sure you get that in writing, along with a description of what the contractor will do if the guaranteed savings are not reached.

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

Get a contract that states the following:

1. That the R-value of the insulation is certified and that the work is guaranteed.
2. That the contractor will provide both labor and materials.
3. That the contractor agrees to maintain required insurance coverage, including worker's compensation.
4. That there will be complete cleanup and removal of all waste material by the contractor.
5. That the contractor agrees to secure all necessary permits and to comply with all applicable codes.
6. That payment is scheduled on satisfactory completion of the work. On a large home improvement job, payment may need to be in installments that match the progress of the work, with an amount, usually 10 percent, withheld pending final approval of the job by the owner.
7. Starting and completion dates that are clear and acceptable. ★ ★ ★



PART II:

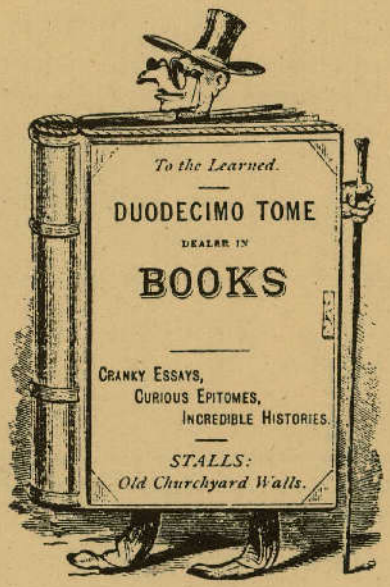
CALCULATING YOUR HOME'S CONSERVATION NEEDS

CHAPTER TWELVE

YOUR ENERGY RECORD BOOK

Being successful in budgeting finances starts with routinely keeping a record of expenditures. The same holds true for achieving success in your energy budget. The key to getting the most out of this book is maintaining a record of energy expenditures and setting energy conservation goals for yourself and your family. (A simple chart is provided on the following page for you to use.)

As you form the habit of keeping energy records, you should be able to see your progress. The energy conservation recommendations in this book were written with Texas conditions and with the needs of Texas consumers in mind. ★ ★ ★



THREE-YEAR
HOME ENERGY USE RECORD

Legend:

* Use this column to record natural gas, propane, or butane usage. For natural gas, units should be expressed in MCF = 1,000 cubic feet. For butane or propane, use "gallons."

KWH = Kilowatt hours of electricity (see bill)

Year 1:_____ (Preceding Year)

	Electricity		Gas *		Total Energy Costs (Electric and Gas)
	KWH Used	Total Cost	MCF Used	Total Cost	
Jan					
Feb					
Mar					
Apr					
May					
Jun					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Yearly Totals					

Energy Conservation Measures Taken During the Year:

Date: Action:

_____ _____

_____ _____

_____ _____

Year 2:_____

	Electricity		Gas *		Total Energy Costs (Electric and Gas)
	KWH Used	Total Cost	MCF Used	Total Cost	
Jan					
Feb					
Mar					
Apr					
May					
Jun					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Yearly Totals					

Energy Conservation Measures Taken During the Year:

Date: Action:

_____ _____

_____ _____

_____ _____

Year 3:_____

	Electricity		Gas *		Total Energy Costs (Electric and Gas)
	KWH Used	Total Cost	MCF Used	Total Cost	
Jan					
Feb					
Mar					
Apr					
May					
Jun					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Yearly Totals					

Energy Conservation Measures Taken During the Year:

Date: Action:

_____ _____

_____ _____

_____ _____

CHAPTER THIRTEEN

THE HOME ENERGY AUDIT

Introduction
This Home Energy Audit Section is designed to help you, the Texas homeowner, make rational decisions about energy conservation. For an energy conservation measure to be cost-effective, the money spent for purchase and installation must be recoverable from the savings on your utility bills within a desired payback period. By working through the four easy-to-follow worksheets in this section, you will be able to assess the desirability of some of the more expensive energy conserving measures.

Step No. 1 —
The Homeowner's Worksheet
The first step is to survey the existing condition of your home. The Homeowner's Worksheet shows you how to gather the information about your home that you will need to complete the worksheets that follow. By taking a careful look at your home you should be able to spot energy conservation opportunities.

Step No. 2 —
Thermal Savings Worksheet
Using the information that you gathered for the Homeowner's Worksheet, the second step is to determine what the thermal effects are for the energy conserving measures that you wish to consider. The end result of the Thermal Savings Worksheet is the Thermal Savings Factor which is a measure of the reduction in consumption (in thermal terms) attributable to the energy-conserving measures you wish to consider.

Step No. 3 —
Dollar Savings Worksheet
The third step is to convert the reduction in consumption into a dollar savings figure. The end result will be the estimated savings on your utility bills that the energy-conserving measure will produce in one year.

The accuracy of the dollar savings figure is dependent on individual energy use patterns and, for this reason, cannot be guaranteed. However, under normal conditions these calculations should provide you with a reasonably accurate means of assessing energy savings.

Step No. 4 —
Payback Period Worksheet
The final step is to determine the payback period. The payback period is the number of years that it will take an energy-conserving measure to "pay for itself." After an energy-conserving measure has been in effect for its payback period it will generate "profits" in the form of savings on your utility bills.

★ ★ ★

HOMEOWNERS WORKSHEET
SURVEY OF EXISTING CONDITIONS

1. Location: _____

   Indicate the city in which you live. From table No. 1 find the heating and cooling degree hours for your city. If your city is not listed use the city that is closest.

   Heating Degree Hours _____

   Cooling Degree Hours _____

2. What kind of heat do you have in your home?
   - ☐ Natural Gas
   - ☐ Electric Furnace
   - ☐ Heat Pump
   - ☐ Butane
   - ☐ Propane

3. How do you cool your home?
   - ☐ Evaporative Cooler, Window Fans or Attic Fans
   - ☐ Central Air Conditioning or Heat Pump
   - ☐ Window Unit Air Conditioner
   - ☐ None

4. What is the unit cost of the type(s) of fuel you use?

   a. Natural Gas

   If your home uses natural gas for heating, determine what your cost is in dollars per 1,000 cubic feet ($/MCF). To determine your cost look at your monthly gas bill for the "consumption" column and divide the total dollar amount of your bill by that number. Remember that the cost needs to be in $/1,000 cubic feet; so, if the consumption units on your bill are given in dollars per 100 cubic feet ($/CCF) you will have to multiply the unit cost you just found by 10.

   Date of Bill: _____

   Total $ Amount of Bill: _____

   Consumption: _____
   MCF or CCF (Multiply unit cost by 10 to convert to $/MCF)

   Unit Cost: _____

   b. Electricity

   If your home has air conditioning or an electric furnace or heat pump determine what your cost is in dollars per kilowatt hour ($/KWH). To determine your cost look at your monthly electricity bill for the "consumption" column and divide the total dollar amount on your bill by that number.

   Date of Bill: _____

   Total $ Amount of Bill: _____
   Consumption: _____ KWH
   Unit Cost: _____ $/KWH

5. a. What kind of exterior doors does you home now have?
   - ☐ Solid Wood or Hollow Core Wood
   - ☐ Wood Door with Storm Door
   - ☐ Sliding Glass Patio Door (enter as window in #6.b. below)

b. Determine the total area of your exterior doors. Multiply the number of exterior doors by 20 (sq. ft. door) to get the total area.

_____(No. of Doors) x 20 = _____ Sq. Ft. of Exterior Doors

6. a. What kind of windows does your home now have?
   - ☐ Standard — Single Pane
   - ☐ Insulated — Double Pane
   - ☐ Standard with Storm Window

   b. Determine the total area of your windows, multiply the height (in feet) by the width for each of your windows and add together to find the total area of windows.

Number	X	Height	X	Width	=	Sq. Ft. ___
_____	X	_____	X	_____	=	_____
_____	X	_____	X	_____	=	_____
_____	X	_____	X	_____	=	_____

Total Sq. Ft. _____
Of Windows

7. What is the size of your home?
   a. Determine the total floor area of your home by multiplying its length by its width.

Length	X	Width	=	Area in Sq. Ft.
_____	X	_____	=	_____
_____	X	_____	=	_____
_____	X	_____	=	_____
		Total Floor Area	=	_____

   b. Ceiling area will be the same as the floor area for single story homes.
   c. Determine the area of your exterior walls by multiplying the length of the wall by its ceiling height. Having determined the gross-area, subtract the total area of your doors and windows to find your total wall area.

Length	X	Height	=	Area
_____	X	_____	=	_____
_____	X	_____	=	_____
_____	X	_____	=	_____
		Gross Area	=	_____
		Subtract Total Area of Doors and Windows	–	_____
		Total Wall Area	=	_____

8. How is your home constructed?
   a. Floors:
      ☐ Concrete Slab on Grade
      ☐ Wood Floors Over an Unvented Crawl Space
      ☐ Wood Floors Over a Vented Crawl Space
   b. Ceilings:
      ☐ Attic Space Above Ceiling
      ☐ No Attic Space (or Flat Roof)
   c. Exterior Walls:
      ☐ Solid Masonry
      ☐ Wood Frame with Wood Siding
      ☐ Wood Frame with Masonry Veneer

9. Determine the Existing Level of Insulation in Your Home.

To determine the "R" value of your existing insulation you will have to determine what kind of insulation it is and its thickness. For attic and floors over crawl spaces the measurement of insulation thickness is relatively simple. However, for exterior walls you may have to estimate. To determine if you have insulation in your exterior walls, turn off the power at the circuit breaker to an electrical outlet switch on an exterior wall, remove the switch plate or outlet cover and look into the crack between the outlet box and the interior wall surface. You should be able to see if the wall is insulated. If you are unable to determine what kind of insulation you have in your attic, floors, ducts or walls by looking at it, take a small sample of it to an insulation supplier and ask for help in identifying it.

Type of Insulation	"R" Value Per Inch
Rockwool:	
Loose fill	2.8
Blankets	3.7
Glass Fiber:	
Loose fill	2.2
Blankets	3.1
Cellulose:	
Loose fill	3.7

"R" value per inch of thickness for different types of insulation.

Having determined the type and thickness of your existing insulation, you can calculate its "R" value. From the table, determine the "R" value per inch for the type of insulation that you have in your home. Multiply that number by the thickness to get the "R" value for your existing level of insulation and record those values in the spaces provided below.

Location	Type of Insulation		"R" Value Per Inch		Thickness		"R" Value of Existing Insulation
Attic:	_____	at	_____	×	_____	=	_____
Walls:	_____	at	_____	×	_____	=	_____
Floors:	_____	at	_____	×	_____	=	_____
Example:	Rockwool Blankets	at	3.7	×	5"	=	18.5

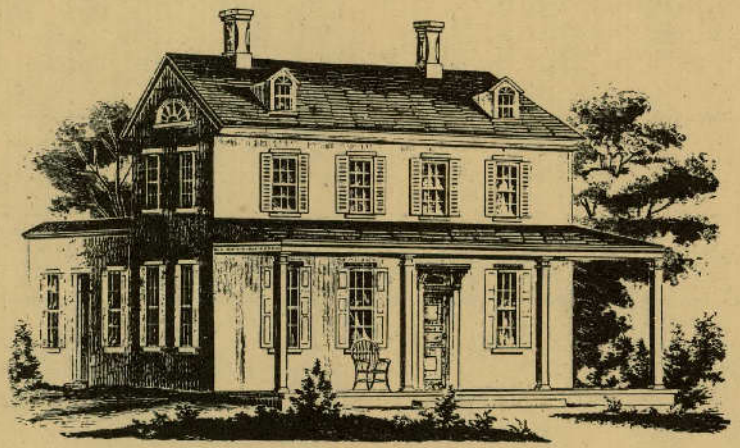
10. Determine the efficiency of your air conditioning system by determining its energy efficiency ratio (EER). The EER rates the efficiency of air conditioners by comparing its cooling output (in BTU's) to the electricity needed to produce it (in watts). If the EER for your unit is not on the metal nameplate on the side of your unit, write down the model number and manufacturer, call a local supplier of that unit and ask for the information. If you are unable to obtain the EER for your unit, use 5.0 as an estimate.

$$\text{Air Conditioner EER} = \frac{\text{BTUH (on nameplate)}}{\text{WATTS (on nameplate)}} = \_\_\_\_\_$$

TABLE NO. 1

Location	Heating Degree Hours (65° Base)	Cooling Degree Hours (80° Base)
Abilene	62640	9984
Amarillo	100392	3552
Austin	41688	11064
Brownsville	15600	13920
Corpus Christi	22320	12120
Dallas	54960	12432
Del Rio	36552	16752
El Paso	64272	5424
Fort Worth	57168	10632
Galveston	29376	8184
Houston	34416	8400
Laredo	21024	22728
Lubbock	85080	3552
Lufkin	46560	7248
Midland	62904	6624
Port Arthur	36432	7608
San Angelo	53760	11640
San Antonio	37680	11304
Victoria	29448	10656
Waco	49392	12672
Wichita Falls	69696	13536

Source: Data Processing Division, ETAC/USAF, Air Weather Service (MAC), Asheville, North Carolina

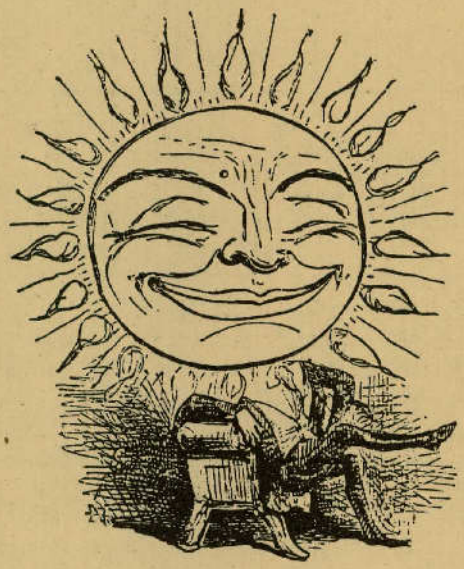


THERMAL SAVINGS WORKSHEET

		Area In Sq. Ft.		Multiplier From Table #2		Thermal Savings Factor
Windows:						
Existing Type	_____,	_____	x	_____	=	_____
Proposed Type	_____,	_____	x	_____	=	_____
Subtract Proposed from Existing					=	_____
Doors:						
Existing Type	_____,	_____	x	_____	=	_____
Proposed Type	_____,	_____	x	_____	=	_____
Subtract Proposed from Existing					=	_____
Ceilings:						
Existing Insulation Level	_____,	_____	x	_____	=	_____
Proposed Insulation Level	_____,	_____	x	_____	=	_____
Subtract Proposed from Existing					=	_____
Floors: (Omit if concrete slab on grade)						
Existing Insulation Level	_____,	_____	x	_____	=	_____
Proposed Insulation Level	_____,	_____	x	_____	=	_____
Subtract Proposed from Existing					=	_____
Walls:						
Existing Insulation Level	_____,	_____	x	_____	=	_____
Proposed Insulation Level	_____,	_____	x	_____	=	_____
Subtract Proposed from Existing					=	_____
Total Thermal Savings Factor						_____

TABLE NO. 2

	Heat Transmission Multiplier
Glass:	
Standard-Single Glazing	1.13
Insulating-Double Glazing	.78
Storm Window	.67
Doors:	
Solid Wood or Hollow Core	.55
Wood with Storm Door	.34
Floors: Over Unvented Crawl Space (add to heating total only)	
No Insulation	.270
With R7 Insulation	.093
With R11 Insulation	.073
With R13 Insulation	.060
With R19 Insulation	.046
With R22 Insulation	.039
Floors: Over Vented or Open Crawl Space	
No Insulation	.374
With R7 Insulation	.103
With R11 Insulation	.073
With R13 Insulation	.064
With R19 Insulation	.046
With R22 Insulation	.041
Ceilings: With attic	
No Insulation	.598
With R4 Insulation	.176
With R7 Insulation	.114
With R11 Insulation	.079
With R19 Insulation	.048
With R22 Insulation	.042
With R26 Insulation	.036
With R30 Insulation	.032
Ceilings:No Attic	
No Insulation	.470
With R4 Insulation	.160
With R5 Insulation	.130
With R7 Insulation	.109
With R11 Insulation	.076
With R19 Insulation	.047
With R26 Insulation	.035
With R30 Insulation	.031
Walls:	
No Insulation — Solid Masonry	.389
No Insulation — Wood Siding	.320
No Insulation — Brick Veneer	.240
With R5 Insulation	.128
With R7 Insulation	.109
With R11 Insulation	.075
With R13 Insulation	.065
With R16 Insulation	.054
With R19 Insulation	.047
With R24 Insulation	.038



DOLLAR SAVINGS WORKSHEET

1. Thermal Savings Factor
   From Thermal Savings Worksheet _____

2. Heating Degree Hours
   From Homeowners Worksheet (#1) _____

3. Unit Price of Fuel Used For Heating
   In $/MCF for Gas or $/KWH for Electricity _____

4. Multiply Line #1 X Line #2 X Line #3 _____

5. Adjusted Heating Efficiency Factor[1] _____
   Select the adjusted efficiency factor for the type of furnace that you have.

Natural Gas	600,000
Electric Furnace	3,070
Propane	55,200
Butane	61,200
Heat Pump	5120-9556[2]

6. Dollar Savings for Heating
   Divide Line #4 by Line #5 _____

7. Thermal Savings Factor
   (Same as Line #1 above) _____

8. Cooling Degree Hours
   From Homeowners Worksheet _____

9. Unit Price of Fuel
   In $/KWH _____

10. Multiply Line #7 X Line #8 X Line #9 _____

11. EER of Air Conditioning Unit X 1000
    See Homeowners Worksheet (#10) _____

12. Dollar Savings for Cooling
    Divide Line #10 by Line #11 _____

    Total Dollar Savings
    Add Lines #6 + #12 _____

[1] The "Adjusted Heating Efficiency Factor" is derived by multiplying the BTU/Heat Unit by the "assumed effective seasonal efficiency." The figures given are taken from Table 17 (page 56) of "Designing, Building and Selling Energy Conserving Homes" published in 1978 by the National Association of Homebuilders.

[2] The efficiency of a heat pump (Seasonal Performance Factor (SPF) for heating and EER for cooling) is dependent on the location and on the specific equipment used. The SPF range for Texas is 1.5 to 2.8. If you have a heat pump and do not know its seasonal performance factor call the local supplier (in the yellow pages under air conditioning) and ask him to help you determine the SPF and the EER for your unit. The Adjusted Efficiency Factor can then be determined by multiplying the SPF x 3413 (BTU/KWH).

PAYBACK PERIOD WORKSHEET

1. Cost of Energy Conserving Measures
   Contractor's Bid or Estimate of Do-It-Yourself Costs _____

2. Total Dollar Savings
   From Dollar Savings Worksheet _____

3. Payback Factor
   Divide Line #1 by Line #2 _____

4. Adjusted Payback Period
   From Table below _____

Using the Payback Chart

At the present time a 10% per year increase in utility costs is anticipated. This means that assuming consumption remains constant you should expect next year's utility bills to be 10% higher than this year and so on for years to come. The Payback Period Chart takes this into consideration as well as the effects of borrowing money to implement the energy conserving measure. If you are borrowing money to install an energy conserving measure select the column that comes closest to the interest rate that you will be borrowing the money for (for example; use the 7% column for a mortgage loan of 6¾%, or 18% column if you are using a charge card). By reading down the appropriate column until you come to the number closest to the "Payback Factor" and then across to the Payback period scale, you will be able to determine how long it will take for an E. C. M. to pay for itself.

NOTE: If you are not going to borrow money to pay for the energy conserving measure but are going to withdraw money from a savings account, use the column that comes closest to the interest rate that your money would have earned had it remained in your savings.

PAYBACK CHART AT 10% FUEL COST INCREASE

Interest Rates

Payback Period in Years	6.0	7.0	8.0	8.5	9.0	9.5	10.0	18.0
2	1.92506	1.89842	1.87243	1.85967	1.84707	1.83462	1.82281	1.6492
3	2.494922	2.8955	2.8434	2.81794	2.79286	2.76816	2.74383	2.39895
4	4.02039	3.93001	3.8429	3.80051	3.75888	3.718	3.67784	3.12114
5	5.14388	5.00642	4.87518	4.8116	4.74934	4.68836	4.62863	3.81834
6	6.32336	6.12946	5.94472	5.85562	5.7686	5.68836	5.60058	4.49769
7	7.56586	7.30416	7.05625	6.93717	6.82121	6.70826	6.59822	5.1658
8	8.87681	8.53589	8.21474	8.06113	7.91195	7.76702	7.6262	5.82882
9	10.2626	9.83038	9.4255	9.23263	9.04581	8.86481	8.68939	6.49253
10	11.7301	11.1938	10.6941	10.4571	10.2281	10.0068	9.79286	7.16242
11	13.2866	12.6327	12.0267	11.7403	11.4644	11.1984	10.9419	7.84375
12	14.9402	14.1541	13.4295	13.0884	12.7606	12.4454	12.1422	8.54164
13	16.6994	15.7656	14.9094	14.5079	14.123	13.7538	13.3995	9.26112
14	18.5734	17.4753	16.4737	16.0059	15.5584	15.1302	14.7202	10.0072
15	20.5722	19.2921	18.1304	17.5897	17.0739	16.5814	16.1109	10.7848
16	22.7065	21.2253	19.8878	19.2676	18.6771	18.1148	17.5788	11.5991
17	24.9881	23.2851	21.7549	21.0479	20.3764	19.7382	19.1313	12.4552
18	27.4294	25.4826	23.7417	22.9401	22.1805	21.4602	20.7765	13.3584
19	30.0442	27.8295	25.85	24.9541	24.0989	23.2897	22.5232	14.3144
20	32.847	30.3386	28.1167	27.1006	26.1419	25.2365	24.3807	15.3289

The sample worksheets on these two pages are reduced versions of those on previous pages. Keep in mind that they are filled out here as examples only.

HOMEOWNERS WORKSHEET
SURVEY OF EXISTING CONDITIONS

1. Location: Dallas

indicate the city in which you live. From table No. 1 find the heating and cooling degree hours for your city. If your city is not listed use the city that is closest.

Heating Degree Hours 5496 0

Cooling Degree Hours 1243 2

2. What kind of heat do you have in your home?
   - ☑ Natural Gas
   - ☐ Electric Furnace
   - ☐ Heat Pump
   - ☐ Butane
   - ☐ Propane

3. How do you cool your home?
   - ☐ Evaporative Cooler, Window Fans or Attic Fans
   - ☑ Central Air Conditioning or Heat Pump
   - ☐ Window Unit Air Conditioner
   - ☐ None

4. What is the unit cost of the type(s) of fuel you use?

   a. Natural Gas

   If your home uses natural gas for heating, determine what your cost is in dollars per 1,000 cubic feet ($/MCF). To determine your cost look at your monthly gas bill for the "consumption" column and divide the total dollar amount of your bill by that number. Remember that the cost needs to be in $/1,000 cubic feet; so, if the consumption units on your bill are given in dollars per 100 cubic feet ($/CCF) you will have to multiply the unit cost you just found by 10.

   Date of Bill: Aug. '78

   Total $ Amount of Bill: $9.20

   Consumption: 4.0 MCF
   MCF or CCF (Multiply unit cost by 10 to convert to $/MCF)

   Unit Cost: $2.30 /MCF

   b. Electricity

   If your home has air conditioning or an electric furnace or heat pump determine what your cost is in dollars per kilowatt hour ($/KWH). To determine your cost look at your monthly electricity bill for the "consumption" column and divide the total dollar amount on your bill by that number.

   Date of Bill: Aug. '78

   Total $ Amount of Bill: $39.00

   Consumption: 1000 KWH

   Unit Cost: .039 $/KWH

5. a. What kind of exterior doors does you home now have?
   - ☑ Solid Wood or Hollow Core Wood
   - ☐ Wood Door with Storm Door
   - ☐ Sliding Glass Patio Door (enter as window in #6.b. below)

   b. Determine the total area of your exterior doors. Multiply the number of exterior doors by 20 (sq. ft. door) to get the total area.

   2 (No. of Doors) x 20 = 40 Sq. Ft. of Exterior Doors

6. a. What kind of windows does your home now have?
   - ☑ Standard — Single Pane
   - ☐ Insulated — Double Pane
   - ☐ Standard with Storm Window

   b. Determine the total area of your windows, multiply the height (in feet) by the width for each of your windows and add together to find the total area of windows.

Number	X	Height	X	Width	=	Sq. Ft.
	X		X		=	
	X		X		=	
	X		X		=	

Total Sq. Ft. Of Windows 215

7. What is the size of your home?

   a. Determine the total floor area of your home by multiplying its length by its width.

Length	X	Width	=	Area in Sq. Ft.
	X		=	
	X		=	
	X		=	

Total Floor Area = 1658

   b. Ceiling area will be the same as the floor area.

   c. Determine the area of your exterior walls by multiplying the length of the wall by its ceiling height. Having determined the gross-area, subtract the total area of your doors and windows to find your total wall area.

Length	X	Height	=	Area
	X		=	
	X		=	
	X		=	

Gross Area = 1457

Subtract Total Area of Doors and Windows − 255

Total Wall Area = 1202

8. How is your home constructed?

   a. Floors:
   - ☐ Concrete Slab on Grade
   - ☐ Wood Floors Over an Unvented Crawl Space
   - ☑ Wood Floors Over a Vented Crawl Space

   b. Ceilings:
   - ☑ Attic Space Above Ceiling
   - ☐ No Attic Space (or Flat Roof)

   c. Exterior Walls:
   - ☐ Solid Masonry
   - ☑ Wood Frame with Wood Siding
   - ☐ Wood Frame with Masonry Veneer

9. Determine the Existing Level of Insulation in Your Home.

To determine the "R" value of your existing insulation you will have to determine what kind of insulation it is and its thickness. For attic and floors over crawl spaces the measurement of insulation thickness is relatively simple. However, for exterior walls you may have to estimate. To determine if you have insulation in your exterior walls turn off the power at the circuit breaker to an electrical outlet switch on an exterior wall, remove the switch plate or outlet cover and look into the crack between the outlet box and the interior wall surface. You should be able to see if the wall is insulated. If you are unable to determine what kind of insulation you have in your attic, floors, ducts or walls by looking at it, take a small sample of it to an insulation supplier and ask for help in identifying it.

Type of Insulation	"R" Value Per Inch
Rockwool:	
Loose fill	2.8
Blankets	3.7
Glass Fiber:	
Loose fill	2.2
Blankets	3.1
Cellulose:	
Loose fill	3.7

"R" value per inch of thickness for different types of insulation.

Having determined the type and thickness of your existing insulation, you can calculate its "R" value. From the table, determine the "R" value per inch for the type of insulation that you have in your home. Multiply that number by the thickness to get the "R" value for your existing level of insulation and record those values in the spaces provided below.

Location	Type of Insulation		"R" Value Per Inch		Thickness		"R" Value of Existing Insulation
Attic:	F.G. Blankets	at	3.1	x	3.5	=	11
Walls:	"	at	3.1	x	3.5	=	11
Floors:	0	at		x		=	
Example	Rockwool Blankets	at	3.7	x	5"	=	18.5

10. Determine the efficiency of your air conditioning system by determining its energy efficiency ratio (EER). The EER rates the efficiency of air conditioners by comparing its cooling output (in BTU's) to the electricity needed to produce it (in watts). If the EER for your unit is not on the metal nameplate on the side of your unit, write down the model number and manufacturer, call a local supplier of that unit and ask him to help you. If you are unable to obtain the EER for your unit, use 5.0

Air Conditioner EER = $\frac{\text{BTUH (on nameplate)}}{\text{WATTS (on nameplate)}}$ = 6.5

THERMAL SAVINGS WORKSHEET

		Area In Sq. Ft.		Multiplier From Table #2			Thermal Savings Factor
Windows: Existing Type	Single	215	x	1.13	=	242.95	
Proposed Type	Storm	215	x	.67	=	144.05	
Subtract Proposed from Existing					=		98.90
Doors: Existing Type	Wood	40	x	.55	=	22	
Proposed Type	Storm	40	x	.34	=	13.6	
Subtract Proposed from Existing					=		8.40
Ceilings: Existing Insulation Level		1658	x	.079	=	130.98	
Proposed Insulation Level	R-19	1658	x	.048	=	79.58	
Subtract Proposed from Existing					=		51.40
Floors: (Omit if concrete slab on grade) Existing Insulation Level	Vented 0	1658	x	.374	=	620.09	
Proposed Insulation Level	R-11	1658	x	.073	=	121.03	
Subtract Proposed from Existing					=		499.06
Walls: Existing Insulation Level			x		=		
Proposed Insulation Level			x		=		
Subtract Proposed from Existing					=		
Total Thermal Savings Factor							657.76

PAYBACK PERIOD WORKSHEET

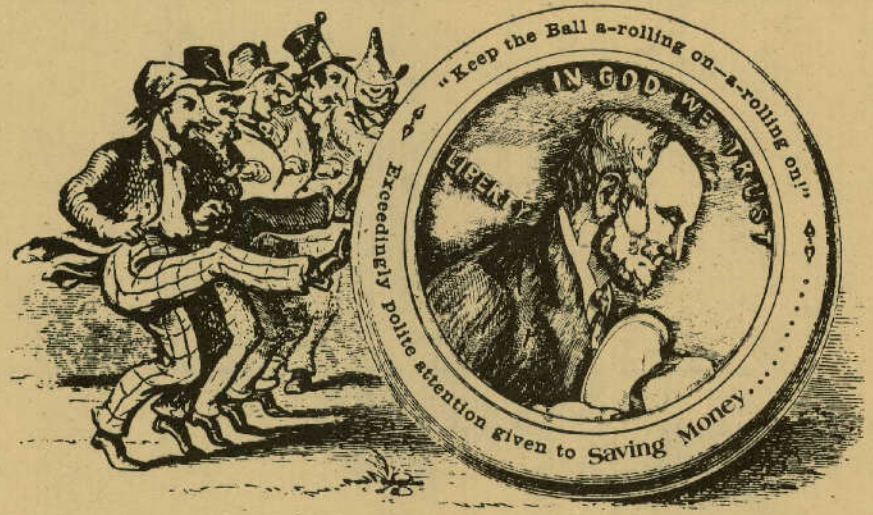
1.	**Cost of Energy Conserving Measures** Contractor's Bid or Estimate of Do-It-Yourself Costs	1350
2.	**Total Dollar Savings** From Dollar Savings Worksheet	$186.78
3.	**Payback Factor** Divide Line #1 by Line #2	7.23
4.	**Adjusted Payback Period** From Table below)	7yrs.

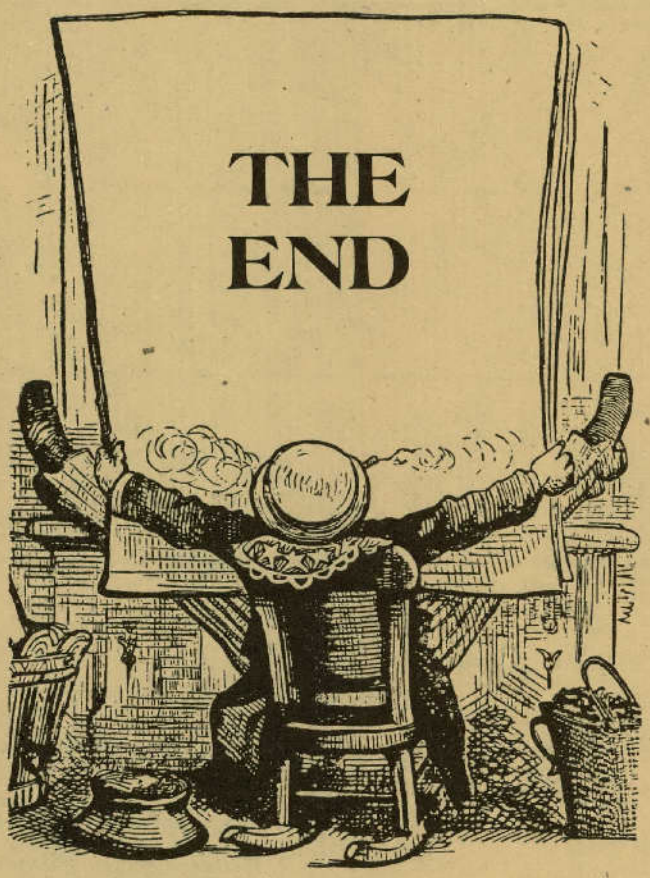
DOLLAR SAVINGS WORKSHEET

1.	**Thermal Savings Factor** From Thermal Savings Worksheet	654.75
2.	**Heating Degree Hours** From Homeowners Worksheet (#1)	54960
3.	**Unit Price of Fuel Used For Heating** In $/MCF for Gas or $/KWH for Electricity.	2.30
4.	**Multiply Line #1 X Line #2 X Line #3**	82,765,638
5.	**Adjusted Heating Efficiency Factor**[1] Select the adjusted efficiency factor for the type of furnace that you have. Natural Gas 600,000 Electric Furnace 3,070 Propane 55,200 Butane 61,200 Heat Pump 5120-9556[2]	600,000
6.	**Dollar Savings for Heating** Divide Line #4 by Line #5	$137.94
7.	**Thermal Savings Factor** (Same as Line #1 above)	654.75
8.	**Cooling Degree Hours** From Homeowners Worksheet	12432
9.	**Unit Price of Fuel** In $/KWH	.039
10.	**Multiply Line #7 X Line #8 X Line #9**	317454
11.	**EER of Air Conditioning Unit X 1000** See Homeowners Worksheet (#10)	6500
12.	**Dollar Savings for Cooling** Divide Line #10 by Line #11	$48.84
	Total Dollar Savings Add Lines #6 + #12	$186.78

[1] The "Adjusted Heating Efficiency Factor" is derived by multiplying the BTU/Heat Unit by the "assumed effective seasonal efficiency." The figures given are taken from Table 17 (page 56) of "Designing, Building and Selling Energy Conserving Homes" published in 1978 by the National Association of Homebuilders.

[2] The efficiency of a heat pump (Seasonal Performance Factor (SPF) for heating and EER for cooling) is dependent on the location and on the specific equipment used. The SPF range for Texas is 1.5 to 2.8. If you have a heat pump and do not know its seasonal performance factor call the local supplier (in the yellow pages under air conditioning) and ask him to help you determine the SPF and the EER for your unit. The Adjusted Efficiency Factor can then be determined by multiplying the SPF x 3413 (BTU/KWH).




THE
END

TAX CREDIT UPDATE

In the fall of 1978, Congress passed legislation creating income tax credits for individuals investing in energy-conserving home improvements and renewable energy sources for the home. For example, you are entitled to a credit of 15% of the first $2,000.00 you spend on components to conserve energy in your home. You may also receive an additional tax credit of 30% of the first $2,000.00 (and 20% of the next $8,000.00) for amounts you spend on solar, wind-powered or geothermal energy sources for your home. *Homeowners considering an investment based upon the tax credits should seek detailed information about the specific requirements before making any expenditure.* This information is now available (January 1979) from the Internal Revenue Service. Interested Texans should request Form 5695 ("Energy Credits") and Publication 530 ("Tax Information for Homeowners") by writing directly to:

I.R.S. Regional Office
FORMS DISTRIBUTION CENTER
P.O. Box 2924
Austin, Texas 78769

Technical assistance and graphic design:

PLANERGY, Inc., the planning and energy group
901 W. Martin Luther King Blvd. Austin, Texas 78701