Energy Conservation in the Home

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

SECO FACT SHEET **NO. 9**

HIGHLIGHTS

- **Heating and cooling are biggest portion of your energy bill**
- **Insulation saves energy and money**
- **Air leaks waste energy**
- **Overhangs are effective solar load reducers**
- **Choose high efficiency appliances**
- **Venting the attic saves cooling energy**

SUMMARY

Heating and cooling a home in Texas accounts for about 50% of all annual energy expense (See Fig. 1). Saving energy is far easier and cheaper than producing it. In the home, simple things like caulk, insulation and weather stripping can save homeowners large amounts of money while reducing the need for expensive fossil fuels.

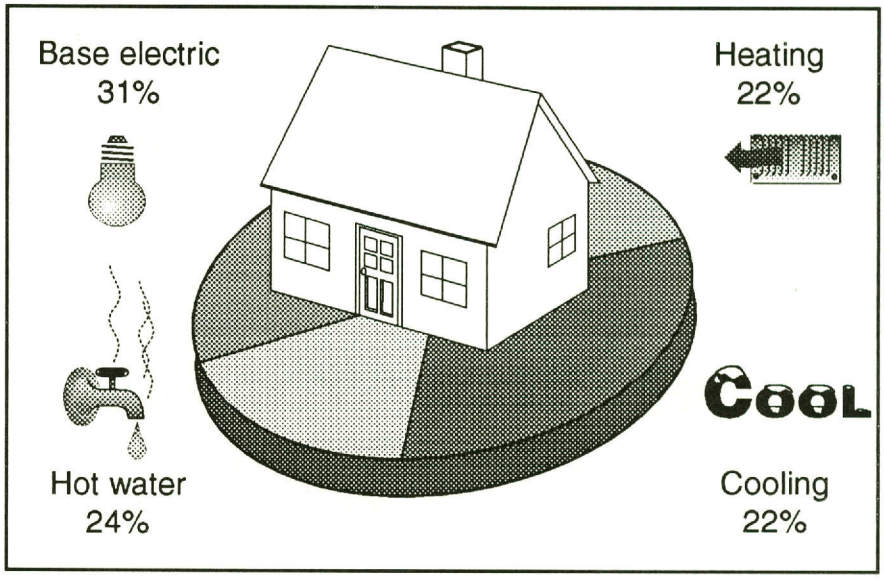

Fig. 1. *Energy Distribution in Typical Texas Home: 45% for heating and cooling, 24% for heating water, 31% for base electric use (fridge 10%, cooking 5%, clothes dryer 5%, other 11%)*

INSULATION

Whether it is made of fiberglass, shredded newspapers, or foam, insulation is one of the best investments a homeowner can make. By installing proper insulation – at least R-30 in the ceilings, R-15 in the walls and R-11 in the floor – homeowners can reduce the transfer of hot or cool air from inside the home to the outside. Insulation is most easily installed when a home is being built. For existing homes, the easiest and most effective place to add extra insulation is in the attic. If your home has less than 3 inches of insulation in the attic, extra fiberglass batts can be laid on top of the existing insulation or additional material can be blown into the attic. (See Table 1 for specific R-values in three different Texas climate zones.) Don't forget to put insulation around the attic ducts and hot water pipes. This will save heating and cooling energy in the ducts and could help prevent pipes from freezing and bursting in the winter.

SEALING

Whether the season is winter or summer, air leaks waste energy and can account for nearly half of all heating and cooling costs. Outside air can enter the home wherever different materials meet, such as the

RENEWABLE ENERGY
THE INFINITE POWER
OF TEXAS

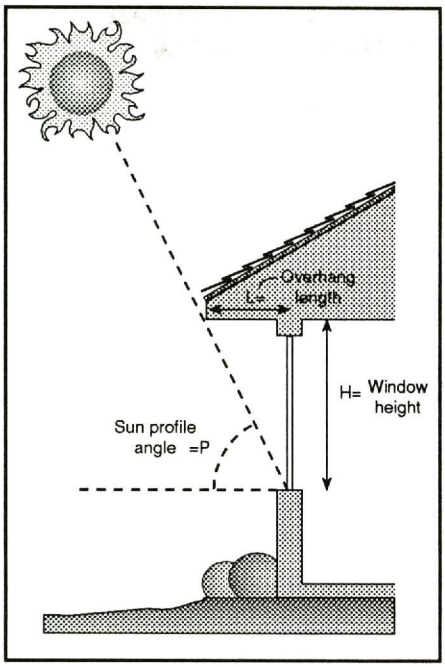

Fig. 2. *Sun Profile Angle Used to Size Overhang*

OPTIMUM INSULATION VALUES FOR NEW HOMES
Based on Climatic Factors and Fuel Costs

Optimum R-Value of Batt or Blown-In Insulation* (wall/ceiling)

Location	Using electric heat pump with electric rate of: 8¢/KWH	10¢/KWH	Using gas furnace with gas cost of: 50¢/ccf	80¢/ccf
Amarillo and Panhandle area	R24/R31	R27/R36	R20/R27	R25/R33
Dallas/Ft. Worth, Wichita Falls, El Paso, Texarkana	R22/R30	R25/R34	R19/R27	R22/R31
Corpus Christi, Houston, Mc Allen, San Antonio	R19/R29	R22/R33	R18/R29	R20/R30

* Summer air conditiong is electric-compressor type in all cases. Insulation value is assumed to be around R3.13 per inch thickness (typical of fiberglass and rock wool). Installed costs are estimated at 20¢ per square foot for R11 batts, 30¢ per square foot for R19 batts, 25¢ per square foot for R19 certified blown-in ceiling insulation, and 40¢ per square foot for R30 certified blown-in ceiling insulation. The financing term used is 15 years at 9.5 percent mortgage rate.

Table 1. *Optimum Insulation Values for New Homes*

junction between the door and the door jamb. Fortunately, sealing air leaks is an easy and inexpensive task that requires little or no special equipment. Caulk is one of the cheapest and most effective materials for saving energy and should be applied around every window and door frame. Every window and door frame should be inspected to make sure that it is properly weatherstripped. If not, many types of weatherstripping are available and can usually be installed in a matter of minutes. In new homes, a rope caulk should be placed under the sole plate where it meets the slab. In addition to doors and windows, homeowners should inspect every electrical outlet to see if there are any gaps that need to be filled. Foam insulation can be installed between the outlet and the cover plate to minimize the amount of air that can seep from the living space into the surrounding walls.

Finally, inspect the outside of the home and underneath the house. Check every place where electrical or plumbing connections enter into the home. If the holes are not already sealed, they can be sealed with caulk or expanding foam.

RADIANT BARRIERS AND SOLAR SHADING

Preventing the hot summer sun from entering the home during the summer isn't easy. But by installing radiant barriers and solar shades, homeowners can reduce the amount of sun-generated heat that enters the home. Radiant barriers are thin, reflective sheets that look somewhat like thick aluminum foil. They are usually applied to the underside of roof rafters or on top of the attic floor. Radiant barriers can reduce annual cooling bills by as much as 8 percent and are most easily installed in new construction, but can also be added to existing homes in some cases.

On south-facing walls, properly designed roof overhangs are an effective means to shade out sun in the summer while admitting it in the winter. (See Fig. 2) On east and west walls, solar screens are more effective, blocking up to 70 percent of the sunlight that would otherwise go into a building. The screens, which absorb and allow the heat to dissipate outside the home, can be used in almost any type of building and can be bought at many building supply stores for about $5 per yard. In addition, screens will not inter-

fere with ventilation, and they can be removed during the winter so the sun can be used to warm the house.

ENERGY EFFICIENT APPLIANCES

Appliances, particularly ones that are in continual use like the refrigerator, consume a great deal of energy over their lifetimes. By selecting the most efficient air conditioners, refrigerators, washing machines, lights and other appliances, homeowners can dramatically reduce their energy costs. Of course, higher efficiency appliances are initially more expensive than less efficient models, but they can quickly pay for themselves. For instance, an air conditioning unit with an energy efficiency ratio of 14 will save a homeowner $476 per year when compared to a comparable unit with an EER of 7. Thus, the payback for the high efficiency unit will quickly be seen by the homeowner in the form of lower utility bills.

When you consider that heating and cooling often account for 50 percent of the average homeowner's annual utility bill, an investment in high efficiency equipment may be the best move a homeowner can take. (See Table 2 for reference values.) Other investments in things like compact fluorescent light bulbs, which use a fraction of the electricity required by incandescent bulbs while providing the same amount of light, reduce energy consumption and do not have to be replaced as often as standard incandescents.

ANNUAL SAVINGS RESULTING FROM INCREASED ENERGY EFFICIENCY RATIOS
($/ton of air conditioning*)

EER		Savings for (¢/kwh)		
From	To	7¢	8¢	9¢
6	7	$40	$46	$51
7	8	$30	$34	$39
8	9	$23	$26	$30
9	10	$19	$22	$24
10	11	$15	$17	$20
11	12	$13	$15	$16
12	13	$11	$12	$14
13	14	$9	$11	$12
14	15	$8	$9	$10
15	16	$7	$8	$9

* 1 ton = 12,000 Btu per hour.
Note: The values are based on 2000 hours of cooling per season, which would be typical of the Corpus Shristi climate. To calculate the approximate annual savings in your area multiply the values by the multiplier for the city nearest your location. Multipliers for several Texas cities are: Amarillo 0.3, Brownsville 1.1, Dallas 0.8, El Paso 0.5, Houston 0.8, San Angelo 0.7, and San Antonio 0.8. This chart is based on an analysis of cooling patterns in Texas climate areas done by Larry O. Degelman, professor, Department of Architecture, Texas A&M University.
Savings in this table are cumulative. For example, to derive the savings when upgrading from an EER of 7 to an EER of 10 (and the electric rate is 8¢ per kilowatt-hour), you would add $34 + $26 + $22, for a total of $82 per ton. If this were for a 5-ton air conditioner in San Angelo, you would then multiply $82 x 5 tons x 0.7. The result would be overall annual savings of $287.

Table 2. *Annual Savings from More Efficient Air Conditioners*

ATTIC VENTILATION

Texas attics need to have effective summer ventilation to reduce heat gains and to avoid moisture build-up. The most effective attic ventilation occurs when air is allowed to enter under the soffits and exit at or near the ridge. Consider continuous ridge and soffit vents (see Fig. 3), large gable vents, or power ventilators for hip roofs.

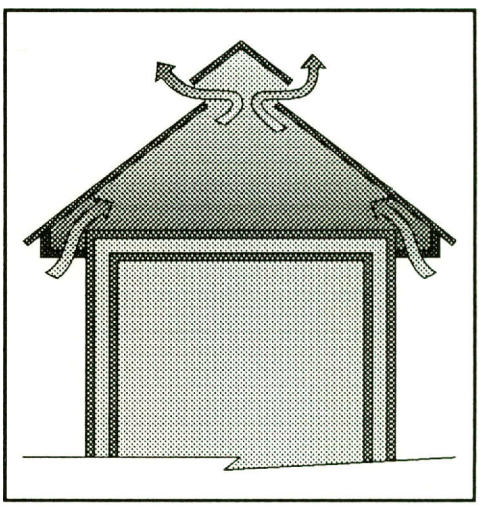

Fig. 3. *Continuous Ridge and Soffit Vents*

InfinitePower.com

Financial Acknowledgement This publication was developed as part of the General Services Commission (GSC) State Energy Conservation Office's Renewable Energy Demonstration Program, which is funded 100% by oil overcharge funds from the Exxon Settlement, as administered by the State and approved by the U.S. Department of Energy. No GSC personnel or any of its employees makes any warranty or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed. Mention of companies, trade names or commercial products does not constitute or imply endorsement, recommendation or favoring by any agency.

ORGANIZATIONS

American Solar Energy Society
2400 Central Ave., G-1
Boulder, CO 80301
303-443-3130

Energy Center
University of Texas at El Paso
P. O. Box Box 645
El Paso, Texas 79968
1-888-879-2887

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922
407-638-1000

Passive Solar Industries Council
1511 K Street, Suite 600
Washington, DC 20005
202-628-7400

Texas Solar Energy Society
P. O. Box 1447
Austin, TX 78767-1447
512-326-3391
e-mail: info@txses.org
http://www.txses.org

Texas Renewable Energy Industries Association
P. O. Box 16469
Austin, TX 78761
512-345-5446
www.seia.org/stwathea.htm#poolheat

RESOURCES

TEXAS RENEWABLE ENERGY EDUCATION CAMPAIGN

Texas is in the midst of a major campaign to develop thought-provoking educational materials on renewable energy. The campaign includes: (1) the first-class video, "The Infinite Power of Texas," (2) 20 fact sheets for students and adults, and (3) a powerful World Wide Web site on the Internet. Begin your search for Texas-specific information on renewable energy at:
http://www.InfinitePower.com

INTERNET SITES:

http://www.InfinitePower.com/factsheets/fs9.html

City of Austin Green Builder Program's comprehensive guide covering energy water, building materials, solid waste and other topics. A mammoth resource.
www.greenbuilder.com/sourcebook

A "whole house" site for diagnosing, designing and improving the efficiency of home energy use. Has a huge list of contractors and other suppliers. **http://www.energyhome.com**

Buy everything from compact fluorescent bulbs to water purifiers and photovoltaic cells; this site run by Real Goods offers many hard-to-get items. A worthy stop for anyone shopping for energy efficient items. **http://www.realgoods.com**

Information on things like passive solar heating and a catalog of energy efficient appliances.
http://energyoutlet.com

BOOKS:

Energy: Its Use and the Environment, by Roger A Hinrichs, 1996, published by Saunders College.

Heating, Cooling Lighting: Design Methods for Architects, by Norbert Lechner, 1991, published by John Wiley & Sons.

Thermal Shutters and Shades, by W.A. Shurcliff, 1980, published by Brick House Publishing Co.

Energy Conservation in the Home, by the U.S. Department of Energy. Call (800) 523-2929.

The Energy Design Handbook, by Donald Watson, Editor, 1993, published by the American Institute of Architects Press.

Climatic Building Design: Energy Efficient Building Principles and Practice, by Donald Watson and Kenneth Labs, 1983, published by McGraw-Hill.

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

General Services Commission
State Energy Conservation Office
PO BOX 13047
AUSTIN, TEXAS 78701-3047
PH. 512.463.1931
FAX 512.475.2569
http://www.InfinitePower.com

Printed on recycled paper.