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Energy Sense: Building and Remodeling

Cooperative Extension South Dakota State University

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building and remodeling



Cooperative Extension Service
South Dakota State University
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building and remodeling

Many opportunities to conserve energy are present when you build, add to, or remodel a house. Be mindful that when a house or addition is in the planning stage, decisions are critical and essentially seal the fate of many conservation techniques.

Energy-saving measures taken when a house is under construction often add to building costs, but benefits will be realized in increased comfort and lower operating costs. If new furniture or appliances, a patio, built-ins, or other extra features are part of your building plans, let them wait and use the money to make the house or addition as energy efficient as

possible from the start. The extras you put off for the sake of energy conservation will soon be affordable.

Site Selection

If you are able to select a building site for a new home, there are a number of energy factors to be considered. For instance, a house located on the southern slope of a hill reaps maximum benefit from the sun. Additional advantage from the southern slope can be gained by building the house into the hill; the soil will act as good insulation to cold, above-ground temperatures.

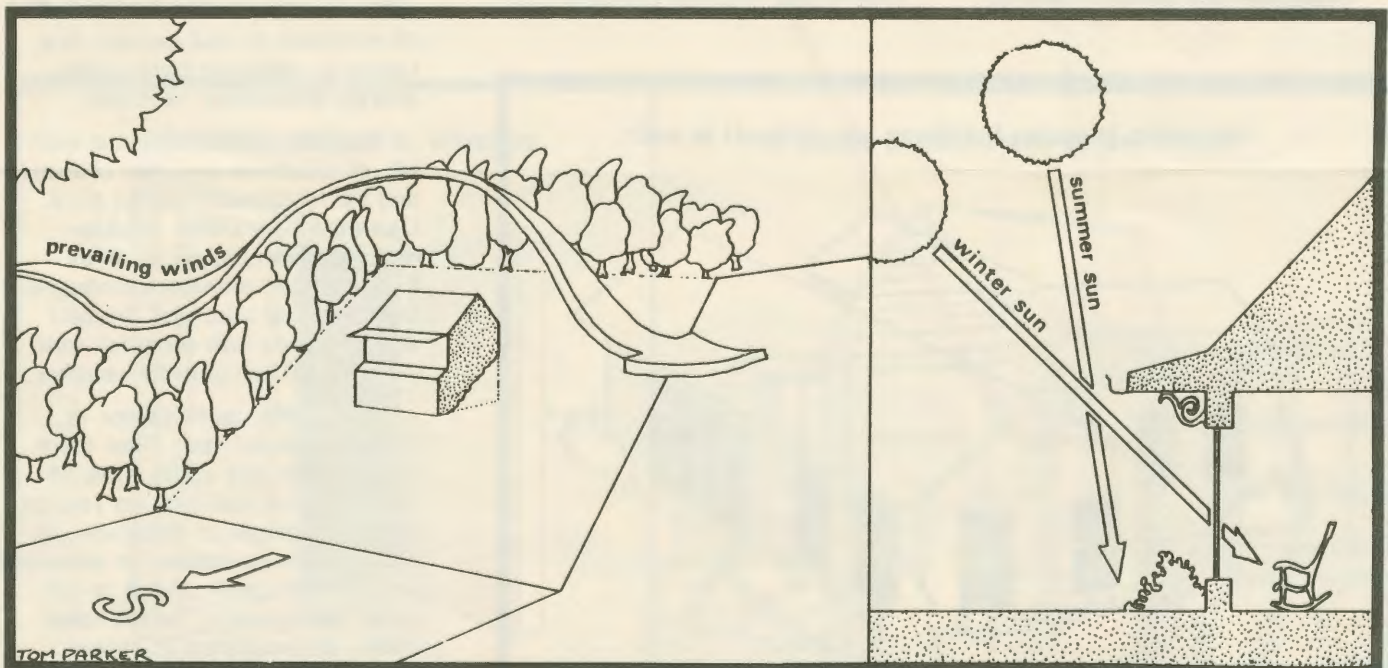
On the other hand, if the site

involves woods, locate the house so that wooded areas come within a reasonable distance of the east, west, and north sides. The woods will provide a windbreak and help reduce heat loss. Open the southern exposure to take advantage of solar heat.

If your site has neither trees nor hills, incorporate full plantings of trees and shrubs into your building plans.

Orientation

The orientation of a house to sun and wind affects energy efficiency. The southern exposure should incorporate as many features as possible to maximize the benefits of solar



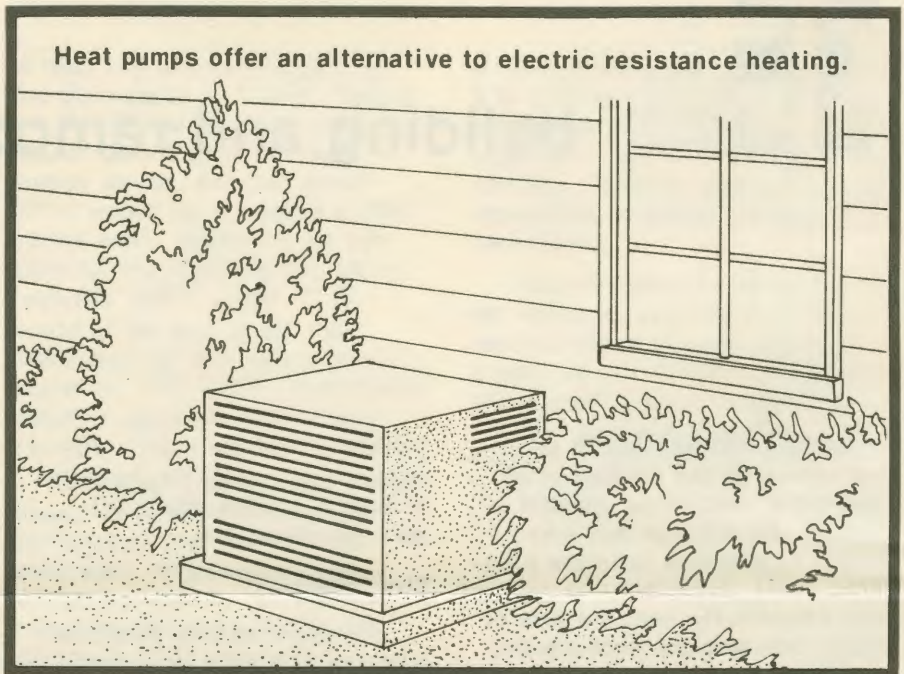
heat. Leave the southern exposure open, especially if you have any plans to use a solar collector in the future. A well-designed roof overhang can protect a southern wall from summer sun yet allow the wall to be warmed in winter when the sun travels in a lower arc across southern skies. Deciduous vines, seasonal awnings, shutters, and an extended porch can also help protect and take advantage of the southern exposure.

Northern and western exposures should be kept minimal and should be protected from prevailing winds by landscaping or fences. Direct afternoon sun in the summer can be troublesome; so plan to shade the western wall with deciduous trees. In fall and winter, the bare branches of deciduous trees allow sunlight to reach the wall and warm it.

Design

Before you begin to draw up a building plan, make a careful projection of your space requirements. Build large enough to meet your needs, but no more. The larger the house, the more energy required to heat it.

A simple rule governs over-



all energy-efficient design: construct a house or addition with a minimum of outside surface exposed. A square floor plan provides the least exterior surface and therefore suffers less heat loss in winter than an oblong or spread-out design. A two-story house, or one with the lower level built partially below ground, will cost less to operate per square foot than a sprawling, one-story ranch.

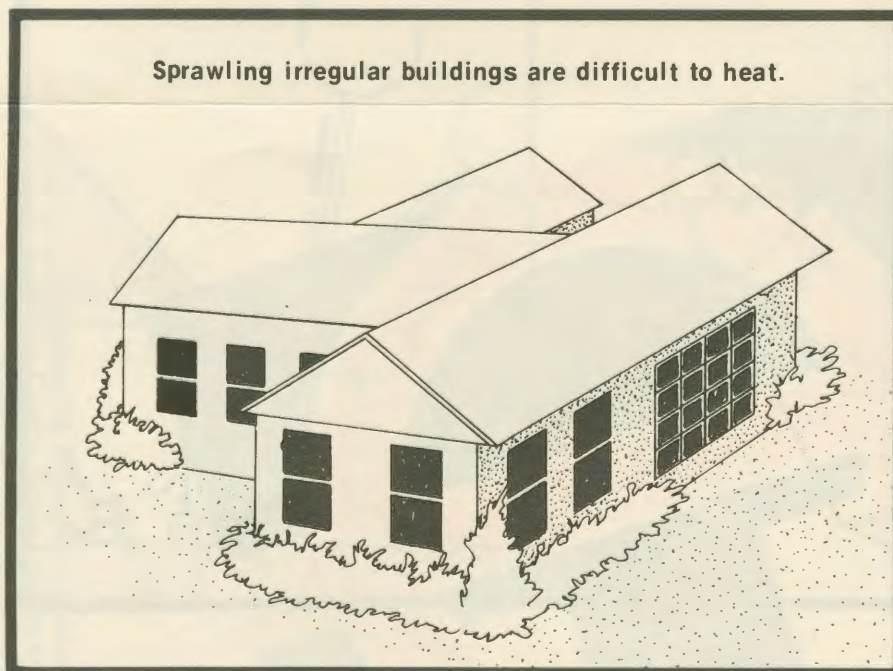
Plan living space for the southern and eastern portions of the house and sleeping areas on the northern side. Orient "hot" rooms—kitchen and laundry—away from the western exposure.

Windows and Doors

The number, size, and location of windows and doors do much to determine energy consumption in a house. Because glass is a poor insulator, walls of windows do not belong in a house or addition built with energy efficiency in mind.

Decide on the minimum number of windows you can tolerate and be reasonable about size. Use carefully fitted double-glazed (thermopane) or even triple-glazed windows throughout the house or addition. Install windows you can open for natural ventilation in mild weather.

The north-south factor is important here, too. Plan more windows on the south side of the house or addition so you can take advantage of sunshine. Install as few windows as possible on the north wall; there is no solar heat gain to be realized there. Be prepared to shield windows with draperies, blinds, or shades, especially on the west side of the house.



For additional insulation, plan on installing storm windows when you build or consider using shutters made from insulating materials such as urethane, polystyrene, or styrofoam. Close the shutters at night and when a room is not in use. At present, such shutters are not readily available but should be soon.

Plan entrances so they will be protected from winter winds. For frequently used entrances, plan on double doors separated so that the outside doors can be closed before opening the inner doors. A vestibule or entrance through an attached garage will serve this end. Doors should be made of insulated material and protected by storm doors.

Sliding glass doors are not good from an energy standpoint; however, this option may be important to you. If sliding glass doors must be used, be certain the glass is double-glazed and select the smallest size door to meet your needs. Wood frames around glass doors are better insulators than aluminum. In winter, cover glass doors with insulated draperies.

Plan doors to separate interior areas of the house and use

them. You can then more effectively concentrate heat in areas where you need it and lower temperatures in less active areas of the home.

Insulation

Spend every penny you can afford to achieve maximum insulation during construction. It will never be easier to insulate than when walls and ceilings are open. Don't skimp! At current fuel costs, the use of R-19 insulation in ceilings and R-11 in sidewalls is essential.

Be an insulation stuffer during construction. Stuff insulation into every possible opening and crack, especially around windows, doors, corners, and electrical boxes and wiring. The extra time taken to fill all cracks with insulation will be repaid many times over the years.

Rigid plastic insulation materials may be used under the siding on outside surfaces. This adds resistance and reduces heat loss caused by air infiltration. With this type of insulation, it is very important to have a good vapor barrier on the inside of the wall; carefully installed polyethylene is recommended. Unless covered with fire-resistant gypsum board or

its equivalent, rigid plastic insulation is not recommended for interior walls.

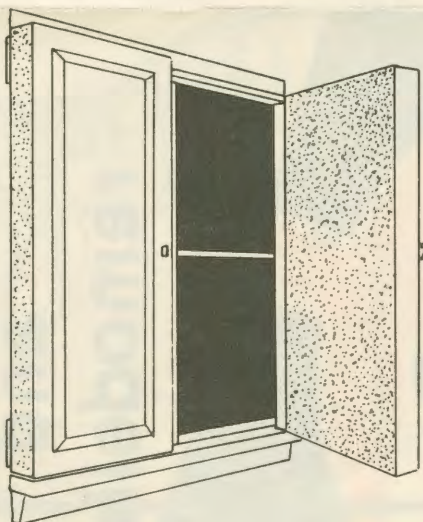
The foundation should not be overlooked when installing insulation. A compressible filler applied to the top of the foundation before the sill plate is fastened will retard air infiltration.

Heating System

After a basic design is determined, your architect or heating contractor can plan the most efficient heating system for your new house or addition. The equipment should be no larger than necessary. If you follow the energy conservation measures recommended in this fact sheet, the equipment can probably be reduced in size, and, therefore, your operating costs will be lower. Locate your furnace centrally so that heat is not lost between the furnace and the area you want to heat.

Because of energy shortages, electric resistance heating is being used in many new homes. If electricity is your only option, you may want to consider using a heat pump which operates on electricity and in conjunction with electric heating systems but uses 50 percent less electricity than conven-

Insulated shutters on windows



A double entrance will conserve heat.



tional systems. The initial cost of a heat pump is high, but it provides heat as well as air conditioning. Consult a heating-cooling contractor about the possibility of installing a heat pump in your new home or addition.

It is recommended that those planning new construction install and insulate ductwork for central heating even though wall-board resistant heating is planned for the present. This will offer more options in the future for switching to alternative heating systems (such as solar energy or a heat pump) when they are more feasible and/or economical.

Hot Water

Install the water heater as close as possible to areas of major use, and cover all water pipes with insulation. Use small-diameter pipes for hot water lines to reduce stand-by losses. If pipes have to run more than 70', consider installing an additional 20-gallon water heat-

er near the main bathroom. Set the thermostat at 110°F. During the life of the unit the water heater should pay for itself in energy saved. Another possibility would be to install a 20-gallon water heater in the kitchen for the dishwasher, which requires 140°F water. This would allow you to set the thermostat on the main water heater at 110°-120°F and should result in considerable energy savings.

To avoid running extra water lines, try to back up bathroom and kitchen plumbing on the same wall. When remodeling, relocate plumbing lines away from outside walls and cover them with pipe insulation.

Lighting

Forethought and planning can reduce lighting requirements considerably. If you use light colors for interior decoration, you will find you need less illumination. Paint ceilings in lighter tones than walls so that light will be reflected back into

a room. Fluorescent lighting is 3 to 5 times more efficient than incandescent. Use fluorescent lighting in the kitchen, bathroom(s), laundry, workshop, and recreation or family areas of your home.

You will be more apt to turn off lights as you leave a room if each doorway is equipped with a wall switch. Dimmer switches allow you to adjust lighting to suit the activity in a room; use them in living, dining, and bedroom areas.

One in a series of home energy conservation fact sheets. Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the USDA. Hollis D. Hall, Director of CES, SDSU, Brookings. Educational programs offered without regard to age, race, color, religion, sex, handicap, or national origin. An Equal Opportunity Employer.

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