Planning for a New Home

Whether building, buying, enlarging, or remodeling a house, carefully consider energy efficiency when choosing a site and design for your home. When a house is in the planning stages, decisions are critical because they essentially determine your choices for energy conservation.

Energy-saving measures incorporated into house plans often add to building costs, but the benefits are increased comfort and lower operating costs. A home built for maximum efficiency could reduce energy use by 50 percent.

Site Selection

Where the house is built can be just as important in conserving energy as how it is built. Energy efficiency begins with selecting a good site and choosing the proper location for the house on it. Many factors are involved in house orientation, such as the slope of the lot, noise reduction, scenic views, privacy, solar radiation, and wind. The major energy consideration is the way both sun and wind affect a given location.

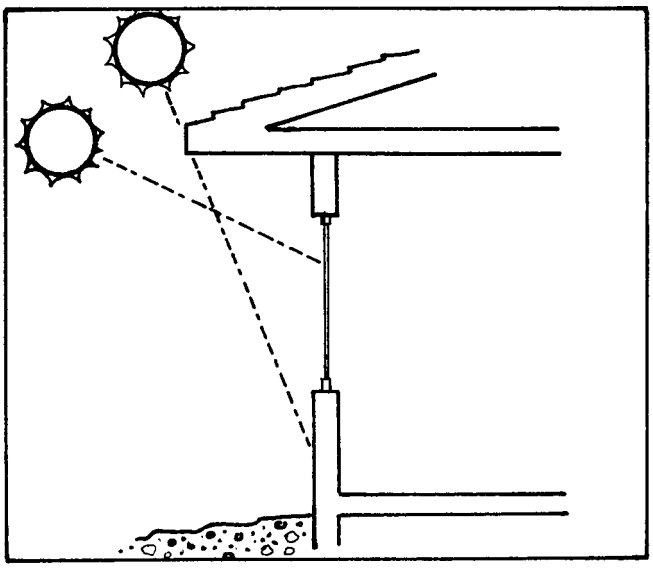
Ideally, the site should have good southern exposure for maximum warmth from the sun in winter. Proper planning, design, and construction can reduce the disadvantage of gaining a lot of sun exposure during the summer.

Orientation

Locate the dwelling on the site so the narrow ends of the house face east and west. Normally, this plan runs the main triangular wall enclosed by the sloping ends of a ridged roof (called the "gable") east and west, which places the longest sides of the structure on the north and south. The house receives maximum southern exposure, which is a benefit in the winter. The placement also limits the western exposure of the house to lessen heat from late-afternoon summer sun.

The most troublesome orientation is toward the west. In summer, walls and windows facing west receive direct afternoon sun. Stopping the sun before it enters through windows is several times as effective at keeping your home cool than mere installation of blinds and curtains on the inside. Take advantage of natural and artificially created shade.

Roof overhang is the most common method of architectural shading. Since the sun's arc is low in winter and high in summer, the overhang should be at least 30 inches. This technique shades the windows from the high summer sun but permits the sun to warm them in winter.



A well-designed roof overhang blocks summer sun and allows winter sun into the house.

Other shading and screening devices that allow energy conservation include wooden trellises, louvered overhangs, awnings, horizontal and vertical louvered panels, adjustable shutters for windows and doors, masonry grills, and extended porches.

Trees can provide shade in the summer if properly located. Large deciduous trees that are close to the east, south, and west sides of a house provide shade for the roof, windows, and walls. In the winter, these trees drop their leaves to allow solar heat gain in the house.

Windbreaks on the north side of the house greatly lower the wind velocity near the house, which reduces heat loss. This is important if the site is in an open, rural area, or on a hilltop. Evergreens are especially effective as windbreaks.

Design

Size and Shape

Before selecting a house or floor plan, carefully analyze your present and future space requirements. A house should be only large enough to meet your needs. Generally, the larger the house, the more energy it takes to heat and cool. Space arrangement, traffic patterns, and family lifestyles must be considered when planning a new house.

The shape of a house can also contribute to energy efficiency. A simple rule governs overall energy-efficient design: Construct a house or addition with a minimum of outside surface exposed.

The best choice is a square floor plan because it provides the least exterior surface and, therefore, suffers less heat loss in winter than long rectangular, L-shaped, or other spread-out designs. Generally, a multi-story house is less expensive to heat and cool than a sprawling, one-story ranch house. This is because the amount of roof area is reduced for the same interior space.

Floor Plans

The best floor plan for a house depends on your family's needs. The following suggestions are based on the premise that possibly more than one family will use a house for many years. The long-term benefits of energy-efficient plans are given critical consideration.

An "open" plan that has as few partitions as possible is desirable for main living areas, such as family room, kitchen, and dining area. This allows good heat distribution. In contrast, infrequently used areas, such as bedrooms and bathrooms, should be designed with doors that can be closed when the rooms are not in use. Locating these rooms in the same area of the house allows the entire wing to be closed off. This is known as "zoning" a home.

Limited-use areas, such as a formal dining room or formal living room, require extra energy for heating and cooling. Rooms designed for multiple uses may be more desirable from the standpoint of energy efficiency. If a limited-use room is planned, it is best if it can be closed off when not in use.

Consider the location of different rooms in the house when evaluating floor plans. Areas used frequently during daylight hours should be oriented to the south. Infrequently used spaces, and those requiring little or no heat, are best on the north. Rooms that are sources of heat, such as kitchens and laundry areas, might also be located on the north or east (**Table 1**).

Table 1. Suggested location for different areas in a house.

Space	Suggested location			
	North	South	East	West
Bedroom	X	—	X	—
Family/living	—	X	X	—
Kitchen	X	—	X	—
Play space	—	X	X	X
Work/hobby	X	X	X	X
Storage/garage	X	—	—	X
Bathroom	X	—	—	—
Laundry	X	—	—	—
Eating/dining	—	X	X	—

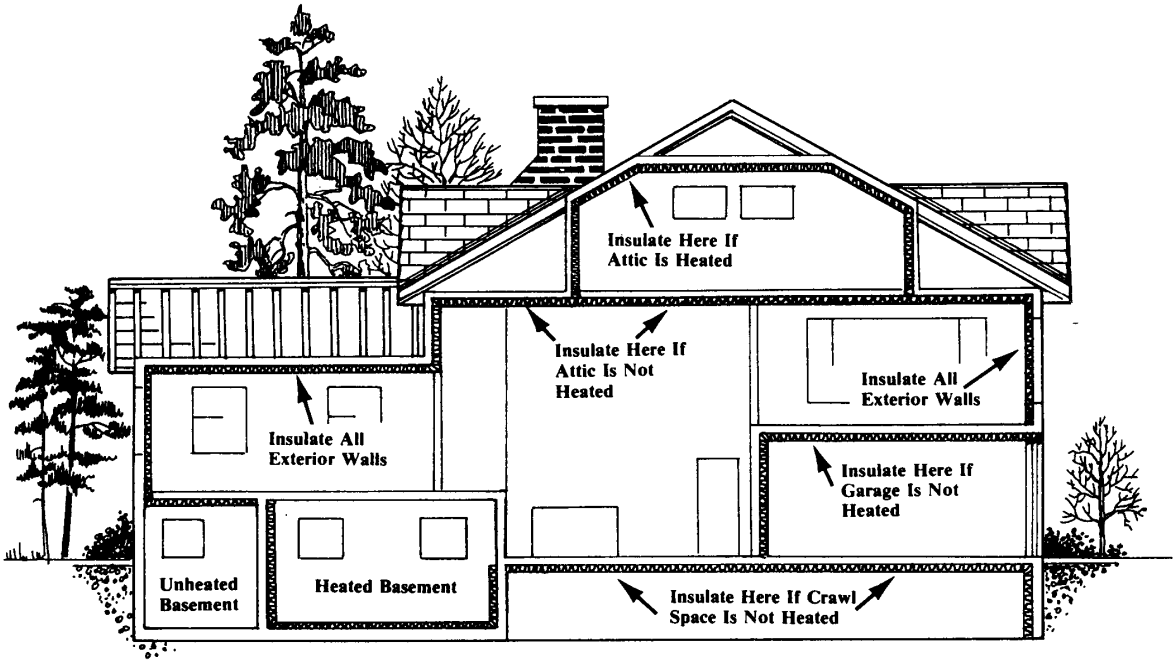
Locate bedrooms not used during daylight hours to the north. Whenever possible, avoid placing a bedroom on the west side of the house. The afternoon sun in summer can heat the room to uncomfortable temperatures and require additional air-conditioning to cool before bedtime. The west side is also a poor choice for family/living areas that are frequently used in the late afternoon and early evening. Outdoor living areas, porches, or rooms used only in the summer are best located on the north or east sides, away from the afternoon sun.

Garages and other unheated areas of the house should be on the north or west sides of the house. These areas can serve as a buffer from cold winter winds.

Insulation

Insulating a home is easiest during new construction when the walls and ceilings are unfinished. Put insulation in every area of the home that is exposed to the exterior.

The "R-value" is a measurement of how well the insulation resists the flow of heat. The higher the number, the greater the insulating capacity will be. Use these numbers (rather than inches of thickness) as reliable



This drawing shows where to insulate a house.

indicators of capacity when buying at a store or ordering through a contractor. The recommended R-values for a Mississippi home are:

- Ceilings: R-30
- Walls: R-19
- Floors: R-19

Make sure vapor barriers are used properly when installing insulation. The vapor barrier is applied to the side of the insulation that faces the interior of the house.

The foundation should also have rigid foam insulation around the perimeter of the concrete slab, extending 2 feet deeper than the slab.

Do not overlook hot-water pipes and heating ducts that pass through unheated areas of the home (such as a crawl space or unfinished attic). Wrap these fixtures with insulating material.

Caulking and Weather Stripping

To ensure a tight fit for windows and doors, you must use weather stripping and caulking compounds. Liberal use of weather stripping and caulking is a relatively inexpensive way to increase the energy efficiency of a house.

Caulking is used to seal door and window frames, and the meeting of two different materials, such as the area between the siding and the foundation. The more expensive caulking compounds, such as butyl and silicone, are more durable and have longer life expectancies. Weather stripping is used where a tight seal is needed between moving parts, such as around the doors. The ease of installation is a factor in the choice of weather stripping, but rolled-vinyl, neoprene-coated sponge rubber, bronze, and brass-plated steel are generally considered the most durable.

Entrances

Entrances are potential areas for significant energy loss. When exterior doors open directly into the interior of the house, large amounts of heated or cooled air may escape each time they are opened. Buffer areas around main entries are effective in minimizing this airflow. A garage entrance or foyer serves this purpose. Another partial solution to this problem might include outside protective walls, a porch, or a fence.

A metal, polyurethane-insulated door with magnetic weather stripping is the most efficient choice for exterior doors. A solid-core wood door with a storm door is an acceptable alternative. Metal doors with polystyrene insulation, or those without insulation, are less effective than solid-core wood doors. A tight-fitting storm door is recommended with all types of doors. The storm door creates a dead space, which increases the insulation values and reduces air infiltration.

Sliding glass doors are not a good choice for energy efficiency. If sliding glass doors must be used, be certain the glass has double thickness, and select the smallest sized door to meet your needs.

Windows

It is often assumed a house with a large amount of window area uses more energy than one with less window area. This is frequently true, but a house with well-designed and well-located windows can actually save energy.

In the winter, the south side of a house receives the most intense sun. In summer, the sun's rays are most intense on the southeast and southwest. To gain needed heat in the winter, the south side should have the largest window area.

To avoid excessive heat gain in summer, a roof overhang or other means of exterior shading, as mentioned earlier, should shade windows on the south side of a house. The key is to stop the sun before it enters the house through the windows.

Keep northern windows to a minimum in size and number. They receive no direct sunlight and are a source of air infiltration and heat loss.

Place windows to take advantage of natural ventilation, which can help reduce the need for summer cooling. Windows on opposite sides of the house will give cross-ventilation. It is generally best to have window areas on all sides of the house to take advantage of natural breezes.

In many energy-efficient research houses, the total glass area has been reduced to encompass from 8 to 10 percent of the home's total square footage. This limitation reduces heat loss and air infiltration through windows and around them.

Reducing the window area can also cut down the amount of natural available light. Therefore, well-planned, energy-efficient lighting is needed. Generally, the energy cost for additional artificial lighting is more than offset by the energy savings from reduced heat loss through the windows.

Plan bedroom windows large enough and low enough to allow for escape in case of fire. Use large areas of glass only where there is a worthwhile view, but avoid floor-length windows.

All windows should have "double glazing" (insulated glass or a prime window plus storm window) and should be certified against excessive air infiltration.

Summary

Energy-conscious design, which includes site selection, the home's shape, the floor plan, exterior features, and interior characteristics, contributes to energy efficiency. There may be trade-offs when you build an energy-efficient, comfortable house for you and your family. A house must be functional to meet the requirements of space and layout for your family's lifestyle and be an energy-efficient dwelling.

It is not always possible to use all of the principles of energy efficiency. For example, the best site for energy-efficient orientation of the house may be too far from your place of work, requiring more energy use in commuting. A more energy-efficient shape of house may not allow you to zone your floor plan to reduce your total heat load.

There are other considerations in building for energy efficiency:

- Energy-efficient appliances
- Fluorescent lighting
- Carpeting
- Insulated interior window treatments
- Automatic setback thermostats
- Flow-restricted devices to reduce hot-water use
- Attic fans
- Fireplaces
- Wood stoves that use outside air for combustion

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