



# Residential

Construction

Solar Design

Begin at the Beginning - Understanding Heat

Proper Orientation

Overhangs and Shading

Windows

Thermal Mass

Attached Greenhouses

Everything in Balance

## Passive Solar Design - Proper Orientation

Here's a news flash...the sun rises in the east and sets in the west. Here's another... the sun is higher in the summer sky and lower in the winter sky. So what does that have to do with a passive-design house? Everything. This simple lesson of nature literally sets the foundation for a well-designed solar home.

When settlers constructed haciendas and missions in early California, they used a simple and inexpensive design technique that today's builders all-too-often overlook: placing a building in its natural surroundings to make it more comfortable for its inhabitants. Early Spanish designs were usually long rectangular buildings, situated so their longer walls faced toward the south to absorb the heat from the low winter sun. In the summer, when the sun was higher in the sky, long porches helped to shade the buildings and keep them cooler.

Early Californians knew that the key to good solar design is to *face it south*. There is no substitute for a site with good southern exposure.

Today's passive design solar home is based on exactly the same principles. When sunlight falls on or in a house, it is converted to heat- so the business end of a home, at least from an energy perspective, is the south side.

If possible, the longer axis of the building, also known as the ridge line, should be oriented east/west. By facing the ridge line in that direction, the longer dimension of your home faces sunny south. The optimum position for maximum solar benefits is true south but you can vary the orientation within 20 degrees of that direction with minimal effect. In most parts of the U.S., however, just making the building the right shape, properly placing its windows and pointing it in the right direction can cut the building's total energy use by 30 percent- 40 percent at no extra cost.

Areas which are most frequently used should be located on the longer, south side of the building, where sunlight can enter through windows in the south side, high clerestories windows, or skylights. The shorter east/west side reduces the amount of surface area exposed to the sun and cuts down of heat gain. Spaces such as garages, storage or laundry rooms can be situated on the house's east/west facing "short side" where they act as an additional thermal (or heat) buffer.

Since you live in your home summer and winter, you should design it for the entire year. It is important to be comfortable all year long, not just a single season. Sometimes, solar homes are built with large areas of upward, tilted, south-facing glass, designed to catch every bit of sun, winter or summer. While tilted glass does maximize heat gain during the winter months, it also maximizes that same heat gain during the summer. If you understand that the rays of sun's high summer arc will bounce off vertical, south-facing glass and reduce heat gain, you can let nature do the work for you in a passively designed home. Remember, too, that heating and cooling needs differ from locale to locale - Sacramento's climate (in California's Central Valley) is a lot different than San Francisco's climate, even though they are only 100 miles apart and virtually at the same latitude.

Designing for all 12 months means knowing the environmental particulars and weather patterns that relate to your home's site. Sometimes those factors can be as important as facing the building south.

Landscape features such as trees, rocky outcroppings, small hills or water can impact how your home performs. Become familiar with the prevailing winds and the pattern of air movement on your property - this knowledge will help you use trees and other natural features to direct summer breezes into the house while channeling cold winter winds away from it. Evergreen trees or a sheltering hilly outcropping on the north can buffer winter

winds and harsh weather. Deciduous trees placed on the south and east or west can shade your home in the summer before dropping their leaves in the winter to let the sunlight into your home.

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