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Not too long ago, when our ancestors set out to build a house, they relied on their deep understanding of the land. They often had lived and worked this land for generations, gaining knowledge of where to seek refuge from the sun on a hot August day and how the wind blew in different seasons. Now, with one in six Americans moving each year, our connection to and our understanding of the places we live has shifted to the other end of the spectrum.

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This lack of consideration for site design and home placement is evident in subdivisions all across the country where rows of houses overheat as their large glass windows face toward the oppressive western sun. So how do we regain perspective for the connection between our homes and our land? The potential strategies include passive solar design, interior space programming and preserving natural resources, with the goal of addressing these issues early in the building process.

Passive Solar Basics

Going through the passive solar design methodology on a home is one way to gain a deeper understanding of how our homes work – or don't work – with their surroundings. The overarching concept of passive solar design is simple: Let the sun help to warm the house in winter, and keep heat out of the house in summer. There are myriad ways to accomplish this based on varying home configurations, climate and user interaction.

True passive solar homes involve a very detailed design process. However, regular homes can benefit from many of the same design concepts that are utilized in a passive solar home – a concept known as “sun-tempered” design. The key elements to understand are proper-

Just Follow the Sun

> In the Northeast and across the country, builders and architects need to reacquaint themselves with site and seasonal considerations to build energy-efficient homes.



The stained concrete in this home will act as a thermal mass, absorbing the sun's heat during the day and then releasing that heat slowly at night.



ly sized overhangs, window design and placement, and thermal mass.

Using Overhangs

Since the sun takes a lower track across the southern sky in the winter, it hits the home at a much lower angle. Conversely, the high arc of the summer sun means that the sun is more directly overhead in the hottest months. Calculating these angles for various window head heights and overhang depths at different times of the day and year can be a daunting trigonometry problem, but luckily, there are many tools that simplify this process.

My favorite way to study overhangs is through use of the simple drawing program Google Sketchup. This program is available as a free download (<http://sketchup.google.com/>), and after a few online tutorials, you can draw basic home shapes and begin to analyze how the shadows move across the home.

Consider your climate when deciding the appropriate criteria for shading windows. Common practice is to ensure that windows are fully shaded on the summer solstice (June 21) and fully exposed on the winter solstice (Dec. 21).

In addition to sizing overhangs for the southern side of the home, it is also important to look at windows on the eastern and western exposures. Depending on the climate, these windows can cause overheating in the summer months because the sun is at a lower angle in the morning and afternoon. Solutions for these areas may be larger overhangs or awnings, window shades, covered porches or smaller windows.

Window Design and Placement

In colder climates, placing the majority of the windows on the south side of the home allows for the winter sun to penetrate and warm the house. Commonly used rules of thumb for passive solar design suggest that the area of the south-facing windows should equal 7 to 12 percent of the floor area of the house. Additionally, by limiting the combined

area of east-facing and west-facing glass to less than 5 percent of the house's area, overheating is less likely.

North-facing windows should also be limited. Since they are almost never exposed to the sun, they are little more than a poorly insulated section of wall. While these rules of thumb are helpful for schematic design, it is best to use computer modeling to accurately predict performance. The desired glass properties for south-facing windows are low U-values (i.e., the glass resists conductive heat flow) and a high solar heat gain coefficient (SHGC) to transmit the sun's energy inside the house.

Using these principles on a non-passive house – for example, by moving a couple of windows from the west side to the south side – can still save energy and increase comfort. Sun-tempered homes may have 6 or 7 percent glazing area on the south side and limited windows on the east and west. These small adjustments made in sync with the right overhang can establish a lifetime of energy savings in a home.

Thermal Mass

True passive solar designs rely on thermal mass such as concrete or masonry to act as a battery that holds surplus heat from the sun during the day. As the temperature of the air in the home drops below the temperature of the mass, it begins to release heat back into the home.

Various rules for thermal mass requirements exist, but for most homes with less than 7 percent glazing on the south, the incidental mass in the house is often sufficient.

Keeping Homes Cooler

Many of these strategies will help homes stay cooler in the summer months. For example, properly designed overhangs are not very common on the average home, but can play a huge role in keeping the sun's electromagnetic rays out of the home at the hottest times of year.

Other cooling strategies will vary

quite a bit between climates. But homes in most climates will benefit from looking at natural ventilation strategies and landscaping placement.

Where the site allows, strategically placing trees to block or allow the sun and wind can reap many benefits for little or no additional cost. For example, deciduous trees on the south side of the home will block summer sun while still allowing sun to penetrate through their winter silhouettes.

After a basic orientation is developed to promote passive efficiencies in the home, a layout for the interior space can begin. In general, placing rooms with lower heating requirements – such as laundry rooms – on the north side of the home will allow higher-use areas – such as casual dining areas – to be placed on the south side.

Another element of intelligent site design is the preservation of the natural integrity of the building site. The ways in which this is employed may vary, but the goal is the same: to protect unique natural and cultural resources. In rural areas, these resources may be rare animal or plant habitats, or agricultural lands.

In an urban setting, the focus is on higher-density development that minimizes the transportation needs of the occupants. Additionally, we should promote water quality through careful consideration of local waterways and responsible development practices.

Designing a home that integrates with its natural surroundings is not an all-or-nothing endeavor. Each of these principles can be used at many different levels in a home or community. This is a journey that requires planning and forethought. By utilizing these concepts of intelligent site design, we are taking a great first step. ☺

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