

Solar Tempering

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As housing costs continue to increase in Colorado, homeowners are seeking new ways to save money. One common solution is increasing your home's energy-efficiency, which in-turn reduces the costs of heating and cooling your home. Choosing energy-efficiency has the added benefit of reducing your environmental footprint, so you can feel confident that you are protecting Colorado's natural resources.

Homeowners have several options for increasing their energy-efficiency, but one of the easiest and most cost-effective options is solar-tempering. Since solar-tempering involves the home's window placement and orientation on the lot, it is much more feasible for home-builders than home-buyers, but you can still look for these features in pre-existing homes if you are concerned about energy-efficiency.

What is it?

Solar-tempering involves making small changes to a home's design to maximize solar gain. In other words, positioning the home's windows to let the sun in during the winter months, while allowing them to remain in shade during summer months. To accomplish this, the home would be positioned with its longer walls facing north and south and about 50% of the home's window surface-area on the south wall.

If you are interested in solar-tempering and still looking for a lot, think about how you would place your home to maximize solar-tempering. If a lot's size or shape suggests placing your long walls to the east and west, it will not be a good candidate for solar-tempering. If you already have your lot, where are you planning to build? Is there a better orientation that would provide you with more solar benefits?

Solar Tempering vs. Passive Solar

Passive solar is another popular method of increasing a home's energy efficiency. Though passive solar can provide up to 80% of a home's annual heating, compared to the 30% offered by solar-tempering, passive solar requires costly building materials and extensive planning.

Passive solar relies on the home being oriented on an east-west axis, similar to solar-tempering, while also using thermal mass to collect, store, and release heat from the sun. Materials with thermal mass have high density and conductivity, like concrete, stone, brick, or ceramic tile. These materials are used primarily in the floor and interior walls of the home and can drive up building costs.

Passive solar homes must have an open floorplan to effectively circulate heat. If improperly implemented, passive solar can easily result in the home over-heating, so although it does offer tremendous gains in energy-efficiency, passive solar will require investing more time and money into the building process.

Principles of Solar Tempering

Solar-tempering, by contrast, offers the maximum impact for minimal effort. As mentioned above, the main tenet of solar-tempering is simply orienting the long wall of the house to the

south and placing the majority of its windows (about 50%) along that side. Common living areas should also be located on the south side of the house, which adds light and warmth to the areas where you spend most of your time.

For optimal solar-tempering, you will want to aim for a 14% window-to-floor area, which is pretty standard for most new builds. Since you are simply moving windows that would normally be placed on other sides of the house, there is no added cost for the extra south-facing windows.

You can further control the effects of the sun on your property through the design of the house's roof and soffits, which are the small overhangs where the roof extends slightly beyond the walls of your home. They provide ventilation and airflow to the attic, but can also help limit the amount of sun coming through the house's windows in the summer months.

You will want to carefully design your soffits for optimal shade in the summer while preserving heating gains in the winter. The sun's angle is roughly the same in March in September, so you may have to compromise a bit. Discuss the benefits of shorter soffits with your builder, and consider using foliage or a removable awning to minimize solar gain in the warmer months.

High-quality window shades can also help solve this problem, through blocking out additional heat or cold depending on the season. Insulated cellular shades installed with minimal gaps between the shade and window frame are the most effective, especially if you are attentive to the changes in the sun's position. During the summer, close the shades when the afternoon sun starts peeking in, and in winter, keep all of your shades closed except for the ones which let in direct sunlight.

Upgraded Materials

One of the best parts of solar-tempering is that it doesn't require materials with a high thermal mass, so constructing a solar-tempered home not only saves you money down the line, but eliminates some of the up-front costs of designing a more energy-efficient home. You may want to use a higher quality insulation to maximize the benefits of your solar-tempering, but the building code standard is usually sufficient.

The one thing you may want to splurge on when designing your solar-tempered home is the windows. Though solar tempering does not require adding window surface-area, many builders recommend using windows with a higher Solar Heat Gain Coefficient (SHGC) on the south side of your home.

SHGC ratings range from 0-1. According to *Energy.gov*, throughout most of the United States windows only need a SHGC of 0.32 to be Energy Star rated. Ideally, you will want to look for windows with a SHGC of 0.4 or higher, which allow more solar heat to enter the home than windows with a lower SHGC.

If one of your motivations for choosing solar-tempering, however, is to save money, make sure that windows with a higher SHGC is a cost-effective option. Several articles, including mechanical engineer Gary Proskiw's "Identifying Affordable Net Zero Energy Housing Solutions," suggest that the benefits provided by expensive windows with high SHGC, may not be worth the cost.

In Conclusion

If you are planning to build your own home, are concerned about energy-efficiency, and are not ready to commit to passive solar, solar-tempering is one of the smartest choices that you can make—saving you money on years-worth of heating and cooling costs with minimal up-front investment. So as you are designing your dream home, consider making a few small changes that will pay big dividends in the future, both financially and for our environment.