

Solstice and Passive Solar Gain

By Andy Bailey

There is to be found on a section of baseboard in my living room, a small mark made with a Sharpie, on December 21, 2007. On this day each year, the sun extends its warm caress a full eleven feet, six inches across dark green ceramic tiles, reaching eagerly to illuminate the cool, dim interior.

This “technology” is what is known as passive solar heating. A thermal mass of masonry is required, as well as a decent southern exposure. If you’ve ever felt the brick facade of a home during the cool shade of evening, and been surprised at the residual warmth of the afternoon beneath your hand, then you are familiar with the concept of a thermal mass.

This is most commonly achieved inside the home with a poured concrete slab floor covered with dark tiles. An interior brick wall can also provide the desired result, however it may be easier to “wash” the floor with sunlight than to do so on a vertical surface. In order for an interior wall to be properly bathed in the sun’s rays, the situation would require at least two stories of windows...otherwise this thermal mass would have to be at most only a few feet from the glass (only practical if the space is a hallway or nook).

In my home I have nine foot ceilings and south facing windows that are a little higher than usual...about 90 inches to the top as opposed to the standard 80 inches above the finished floor surface. The extra window height provides additional distance for the sun’s rays to reach into the depth of the home. Eleven and a half feet of sunshine striking the floor is what I get on December 21, as opposed to zero sunlight penetrating the windows on June 21.

It’s definitely not enough solar gain to heat the house without my auxiliary systems, but there is a noticeable amount of heat, and it’s a great feeling to know that for this warmth I am not paying the utility company. Even in January and February, at my elevation of 3000 feet, I usually do not have to run any auxiliary heat during the day to keep the house at a comfortable level (provided that the sun is shining).

Another consideration was to have **no** low-E glass windows and doors on the home’s south facade, for this type of glass would insulate the interior from the sun’s warmth and therefore work to defeat the advantages. The remaining three sides of the house have typical windows and doors with low-E glass.

In addition, a generous roof overhang of 2 feet helps to shade the house during the summer months. My home is 2 stories, and the roof overhang alone would have been too high to provide shade to the windows on the lower level. To correct this problem, the floor joists on the upper level are cantilevered beyond the exterior wall a full two feet (see fig 1), effectively providing the necessary shade for the doors and windows on the lower level of the south face.

December 21 – short on time but long on light and shadow.

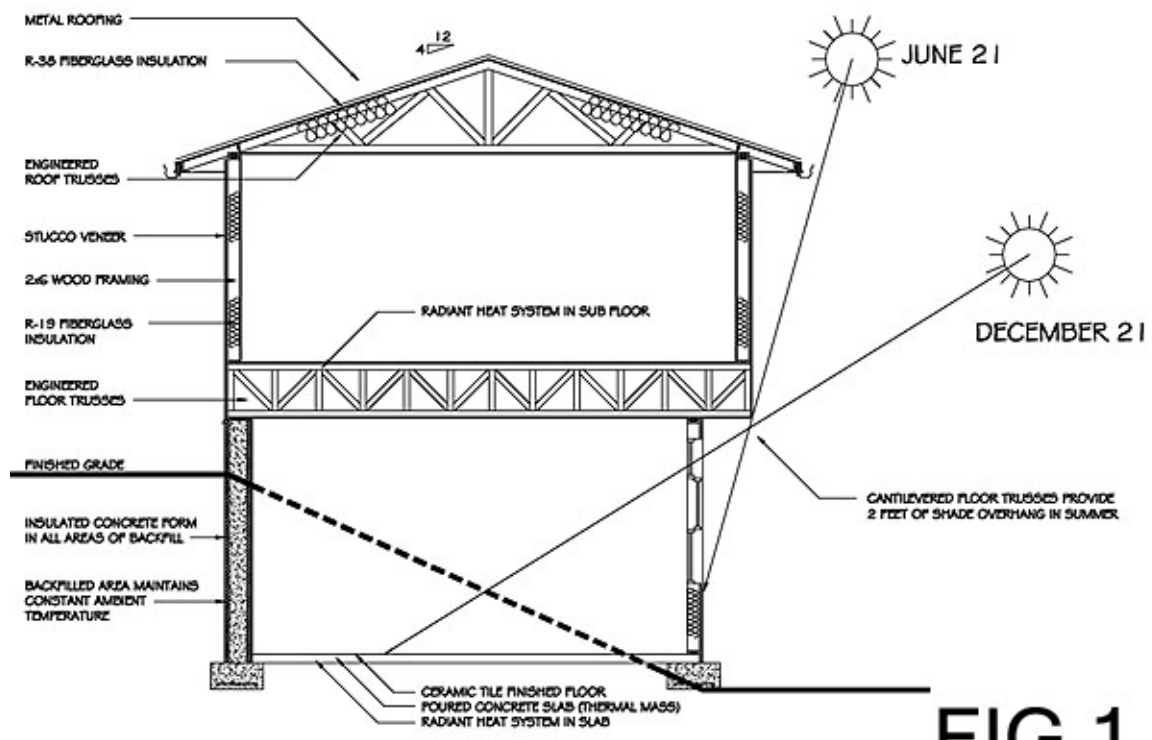


FIG 1.

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