

GREEN TECH THE SERIES COLUMN FOR JULY 27, 2016

HEADLINE: HOW TO BUILD AN ENERGY EFFICIENT HOME: PART ONE

While I retired from the business of constructing energy efficient buildings over a year ago, I still do some consulting work in conjunction with the designer or architect, helping to integrating energy efficiency systems and methods into a new home or a major renovation. Some weeks ago I sat down with a new client for a preliminary review of his plans. Lately, I have had a number of inquiries from readers along the same vein and I am struck with the lack of understanding as to how the basic planning is done for such a home. Seems those of us in this business have some work to do yet, in helping prospective home owners understand this type of assembly. One reader suggested I provide an outline course to help those just beginning down this road to an energy efficient residence.

The first consideration is the site of a home and its orientation. This is by far the most misunderstood aspect and one that can have a dramatic effect on the overall cost of the ongoing operation of a home. Building on a south slope is ideal, but often not possible. Many physical conditions come into play here: winds; desire to save trees; even water table can create a limitation. Ideally a home should be situated with the majority of its windows facing south or within 10 degrees of south and, if this is done, then situated towards the east is recommended. Morning sun is preferable to afternoon sun, especially in the summer months.

This orientation also makes good use of the sun's rays, passive solar heat as it's called. There are a number of guidelines for the amount of square feet of window space given the home size, but most designers will agree they are recommendations depending upon the home. I have generally recommended up to 10% of the homes total footprint be allocated to south facing windows. I know of more than one case where similar homes with most windows on the south elevation vs. windows all around or an equal number on the north side often arrive at conditioned air costs of upwards of 25% more for the north facing home. Using no more than 4% of the windows on the east side and less than 2% on the west side, coupled with 0% on the north side would be ideal.

"It's all about the envelope" has become the catch phrase today and no truer words are spoken. In Europe, the passive house requirement has its base derived on air sealing the home. "Seal it tight and ventilate it right" is another phrase that

is often referred to when planning an energy efficient home, today. Start with the grade pad, I prefer homes built on an insulated pad or if a basement is desired, the footings, pad and walls must all be insulated and sealed tight. I admit to a bias towards closed cell spray foam. It provides air seal, air barrier and some degree of added structural integrity if done correctly. If the home is to be wood frame, then using the advanced framing methods, 2x4 framing is acceptable and blended with rigid insulation board, then spray foam is one suggestion. I have used this method and it works well, extremely well.

Another area that is often missed is the use of thermal mass. Features like a trombe wall, concrete floors or ceramic or clay tiles coupled with the passive solar built into the home. Some of the “pigmented concrete methods” now available for concrete floors are amazingly decorative. We have a building where this is done and it’s very appealing. Thermal mass serves two purposes; it helps to reduce the effects of overheating on sunny days by absorbing the heat and then releasing when the sun goes down. Mass can also be in the walls, often not recognized. Using a plaster coat on the walls, a thin layer of no more than 1/8” can make a major difference. If you are going to the effort of using wood heat, then a masonry stove like the Tukiviki stoves from Finland would be an excellent investment, again the use of thermal mass from the stove’s soapstone assembly.

Proper insulation, both type and installation can make or break an energy efficient home. As already stated, I have a preference for closed cell spray foam, but sometimes the cost can be prohibitive. If you are planning to use any batt insulation, my preference is Roxul and, if blown is to be used, then recycled fiberglass works very well. Again, efforts to seal at all joints, external wall openings, everywhere any change in levels or materials is happening, some form of air seal is needed. When renovating our church (www.alltechgreenchurch.com) we finished up with an EnerGuide 84 home. Our crew used over three miles of Tuck-Tape and we lost count of the “cases” of cans of spray foam used to fill small cavities and openings. Take your time here, it can make or break your energy efficiency and you only get one chance at this step.

The roof design is critical, with proper attention to the south facing overhang. While passive solar heating can be nice, in the summer it can simply be too hot. I have built homes with an overhang of close to five feet on the south exposure. This not only makes a nice covered porch, it eliminates the summer sun and allows the winter sun to stream in. Design will dictate if an attic can be eliminated and the use of a flat roof or, if not, then and a low slope roof to the pitch, allowing

a metal roof covering. EPDM membrane for flat roofs is a tried and true covering for a flat roof.

Next week, we will cover windows, heating, ventilation and the health aspects of an energy efficient home.

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