



Comparing a “Sun-Inspired House” to a “Passive House”



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With the introduction of the “Passive House” into the U.S., it’s only natural to be confused with the phrase and wonder how it compares to a passive solar house including a Sun Plan. A sun-inspired house has always been a passive solar house, but did you know that it can also be a “Passive House”?

From the Passive House: “A Passive House is a very well-insulated, virtually air-tight building that is primarily heated by passive solar gain and by internal gains from people, electrical equipment, etc.” In *Home Energy* March/April 2011, Steve Mann’s excellent overview article, [Passive House Gets Active](#), summarizes “In order to be certified as a Passive House, a building has to meet only three criteria: Space heating and cooling cannot exceed 15 kWh per square meter per year (4.8 kBtu/ft² per year), source energy cannot exceed 120 kWh per square meter per year (38.1 kBtu/ft² /year), and building air tightness cannot exceed 0.6 ACH50.” Sun Plans can be constructed to these standards.

From the [Sun Plans](#) website: “A sun-inspired house is a sunny, creative, low-energy home that uses the natural heat and light of the sun to both warm and brighten a home. It incorporates both passive and active systems to maintain interior comfort.” There is as much emphasis on the delight, livability, and exterior design as there is on energy-savings.

Sun Plan’s primary passive systems include passive solar heating, passive cooling and daylighting.

In designing the Sun Plans’ passive systems, attention is given to the orientation to the sun, house shape, south window placement, south overhang design, porch placement, thermal mass and energy-efficient details.

Interior and exterior living spaces (the floor plan) are designed based on the home owner’s preference in relation to the sun, wind, topography and views. Small, simple, compact and quaint are starting points.

Sun Plan’s active systems include at least a small heating system (mandated by building codes) and a provision for introducing fresh air. Active systems can be designed by local professionals or by Sun Plans and their consultants.

Often incorporated are one or more additional active systems such as whole house fans, dehumidifiers, air conditioning, wood burning stove, solar hot water, solar electricity (PV), etc.

In designing or selecting the active systems, attention is given to the climate, budget, availability of sun on site; type, price, and availability of non-renewable energy available on site.

Sun Plan’s suggested amount of insulation to be wrapped around, under and on top of a sun-inspired home varies based on the climate, home owner’s budget and energy saving goals. Existing Sun Plans can be easily modified if necessary.

Some choose the Sun Plans minimum savings recommended of Energy Star 3.0 with 30% savings

Most choose a savings of around 50% when budgets are tight since that is often the most economical.

A few choose to build to the Passive House standard with approximate 80% savings

More are choosing the extreme Net-Zero 80-100% savings (or higher when electricity is sold to the grid)

While the air tightness goal of the home is typically dictated by the certification program chosen, attention to construction details and quality of installation of the insulation ultimately determines the air tightness of the home.

A builder and subcontractors experienced in constructing low-energy, tight homes are invaluable since they are ultimately responsible for the home’s air tightness and quality of insulation and mechanical systems.

Often a builder and/or home owner will choose to pass on the tightness responsibility to a third party home energy rater that may be certified by the program through which they are trying to achieve certification.

Frequently homeowners are forced to skip certification due to a lack of available rater or certifier nearby since the cost of having them travel may be greater than the cost of the energy they are hoping to save.

While meeting the Passive House's air tightness standard can be very difficult (almost 7 times as tight as Energy Star 3.0) without a builder experienced at doing so, the space heating/cooling limits and total source energy limits are much more obtainable with a sun-inspired home design. As with any high standard, a commitment from the home owner, the builder, and their subcontractors is a pre-requisite.

Martin Holladay of Green Building Advisor has an article on [Blower Door Basics](#) that discusses air tightness. He quotes: "David Keefe, the manager of training services for Vermont Energy Investment Corporation, recently wrote an article on blower-door testing. "Houses with less than 5 or 6 ach50 are considered tight,...."

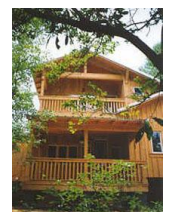
Choosing the smallest, sun-inspired home that meets the family's needs is always a good place to start in planning a low-energy home. Sun Plans can assist with sorting through the family's priorities and requirements. It is possible to balance exterior attractiveness, views of nature, space-saving floor plans, right-sized exterior living spaces and delightful interiors with energy savings! Sun Plans welcomes the opportunity to help select, adapt or create a sun-inspired home design!

Examples of sun-inspired homes meeting most of the Passive House criteria:

(The extreme performance is dictated more by the home owner's lifestyle and attention to detail than a particular plan)

Southern Cypress in Alabama - Total Energy Cost: \$100/month (all electric house except propane for cooking)

- 1) Space heating and cooling: 4 Kbtu/s.f./year (approx. \$30/month heat & cool)
- 2) Source energy: 36 Kbtu/s.f./year
- 3) Air Tightness: 4.4 ach50 (does not meet Passive House)



Northern Sun in Colorado - Total Energy Cost: \$0/month (all electric house)



- 1) Space heating (no cooling): 3 Kbtu/s.f./year
- 2) Source Energy: -12 Kbtu/s.f./year (a net energy producer)
- 3) Air Tightness: 350 cfm50, about 1.0 ach50 or about twice the leakage of Passive House criteria

Custom Home in West Virginia - Total Energy Cost: \$60/month (estimated, all electric with propane for cooking)

- 1) Space heating and cooling: 3.2 Kbtu/s.f./year (estimated \$17/month)
- 2) Source energy: 30 Kbtu/s.f./year (estimated, lower when solar PV is added)
- 3) Air Tightness: 3.5 ach50 (estimated), meets Energy Star 3.0



In conclusion, while meeting the Passive House criteria and subsequently obtaining certification (now about 20 certified homes in the U.S.) will surely result in a very low-energy home, the extra time and costs of doing so need to be evaluated based on the availability of experienced builders and local certified designers to review and certify the home. Sun Plans clients are often quite pleased at their energy bills (see above) even with a home below Passive House criteria.

Regardless of the certification program chosen, Sun Plans encourages home owners to meet the highest level of energy savings that they can afford, but to be realistic in the possibility of obtaining certification. While it is very easy to incorporate the construction details for extra insulation in custom Create-A-SunPlans, the Custom Energy Specs that are a part of Construction Prints and CAD also make it possible to adapt a Sun Plan to meet one or more of the Passive House criteria. SunPlans can have the best of both worlds – Passive House low energy and Sun-inspired interiors!