

Title: Passive Solar in the Hot Deserts of the Southwest?

Abstract: Can passive solar characteristics be used in the hot deserts of the southwest? Elizabeth Adams of SE Construction, LLC believes it is possible.

Body: What is passive solar? “A passive house is one in which a comfortable interior climate can be maintained without active heating and cooling systems [source: [Passivhaus Institut](http://www.passivehouse.com/English/PassiveH.HTM)].” This may sound a little off the charts for a desert with highs above 100 degrees and lows down to freezing.

Elizabeth Adams a licensed General Contractor and owner of SE Construction, LLC states “Thanks to technology, it is more possible than ever before. The major component is insulation in the form of a thicker building envelope. This can be accomplished in a variety of ways - foam, cellulose, block, Insulated Concrete Forms, cement walls, or rammed earthen walls. The goal is to reach an R-value of 40 or above, keeping the walls and roof close to the same R-Value. In the desert sun, we learn from nature that shade is the best form of insulation available to guard against heat.”

“Thermal Bridging and a tight envelope are the next components to consider. Energy likes to follow the path of least resistance. Having walls, windows, floors, ceilings, doors, and roofs that do not allow energy to escape or enter is key to maintaining the temperature and moisture levels inside the structure.”

“Placement and type of windows combined with mechanical ventilation will allow for lighting, fresh air, solar heat gain during winter months, and cooler summer days.”

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**Passive Design in the Desert 101**

Key elements of passive design include the following:

* **Heavy insulation:** The most important component of a passive house is a layer of highly efficient insulation that wraps continuously around the building envelope. This can be in the form of Foam, Cellulose, or Batt Insulation
* **Design without thermal bridges:** The heated air inside a house will follow the path of least resistance to the outside of the house, known as a "thermal bridge." Conventional homes offer plenty of them, in the form of inefficient windows, poorly insulated walls or cracks under doors, but passive house design eliminates them through superior insulation and efficient windows and doors.
* **Airtight construction:** Passive houses feature airtight construction to prevent moist room air (or humid outside air, in warmer climates) from penetrating into the home's construction where it can cause mold, affect inside air quality and even structural damage. There are several ways to achieve this air tight construction. All connections can be caulked. Or a product such as AeroBarrier can be used.
* **Ventilation:** Another important component of passive house design is its efficient central ventilation system, which continually exchanges moist, "polluted" inside air for fresh, filtered outside air to maintain a comfortable, consistent temperature and humidity level. In hot climates and ERV would be used.
* **Passive heating/cooling technology:** Perhaps the most ingenious part of the passive house concept is its ability to heat (or cool) the inside spaces with nothing but fresh exterior air. As fresh, cold air enters the house through the ventilation system, it is heated by the warm air it passes on its way out. Using an air-cooled chiller system or geothermal underground system combined with the other forms of passive design can keep your home at a comfortable temperature in the hot desert summers.
* **High-efficiency windows:** Efficient windows are essential to the passive house design. The specific windows used vary from climate to climate, but triple-paned windows with low-e glazing, argon gas and insulated frames are common.
* **Passive solar gains:** Passive solar gain -- that is, the good old warmth of the sun -- is the primary source of heat for a passive house, so the situation of the home on the lot and the size and position of windows are important factors.
* **Shade:**  In the heat of the summer sun, shade is your best friend. Placing trees, shrubbery, canopies, etc on the hot side of the home reduces the heat gain from the sun, thereby creating a more comfortable climate inside the home.