

Building a Brighter Shade of Green “Home, Passive Home”

Engineering Works

Classic Style

**DEPARTMENT OF MECHANICAL ENGINEERING
TEXAS A&M UNIVERSITY**

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- These homes minimalize energy waste.
- Only a fraction of the energy normally required to heat a house is used.
- Save lots of money in energy bills.
- Cost up front will decrease as more homes are built and materials become more readily available.
- Be better than Europe!

- Why not “average homes”?
- Overview of Passive Houses
 - How do they work?
- Cooling Methods
- Costs
- Advantages
- Landscaping
- Disadvantages
- Specifics
- Conclusions
- Future

- Major source of heat loss is through conventional non-insulated openings
- Start up cost is cheaper but costs more to heat and cool
- Average houses in the U.S. attribute to
 - 40% primary energy use
 - 70% electricity consumption
 - 40% CO₂ emissions nationwide

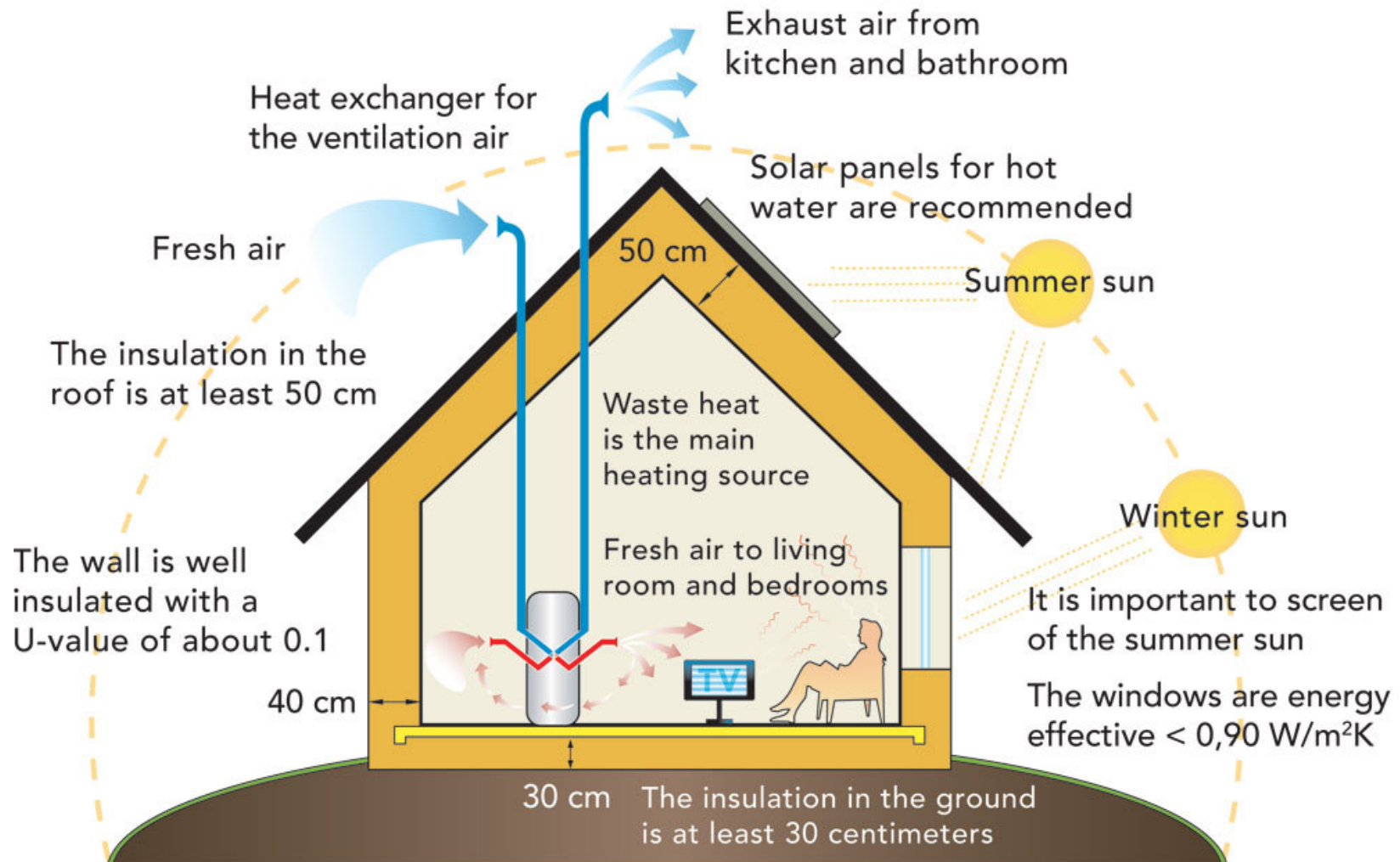


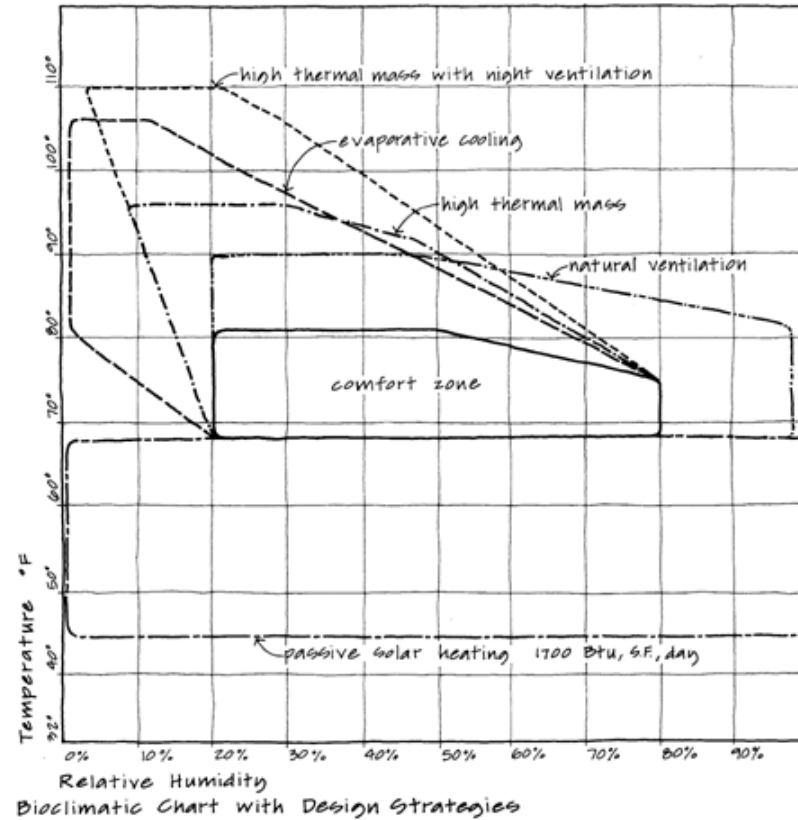
- Houses that are extremely energy efficient
 - Up to 80% more energy efficient
 - Consume just 10% of the heating and cooling energy
- Zero-energy homes or even power generators
- “Tea-kettle” heating



"Matson Residence." *Natural Home*. Web. 8 Feb 2011. <<http://www.naturalhomemagazine.com/leafy-greens/passive-house-design-pushing-the-envelope-passive-house-standard.aspx>>.

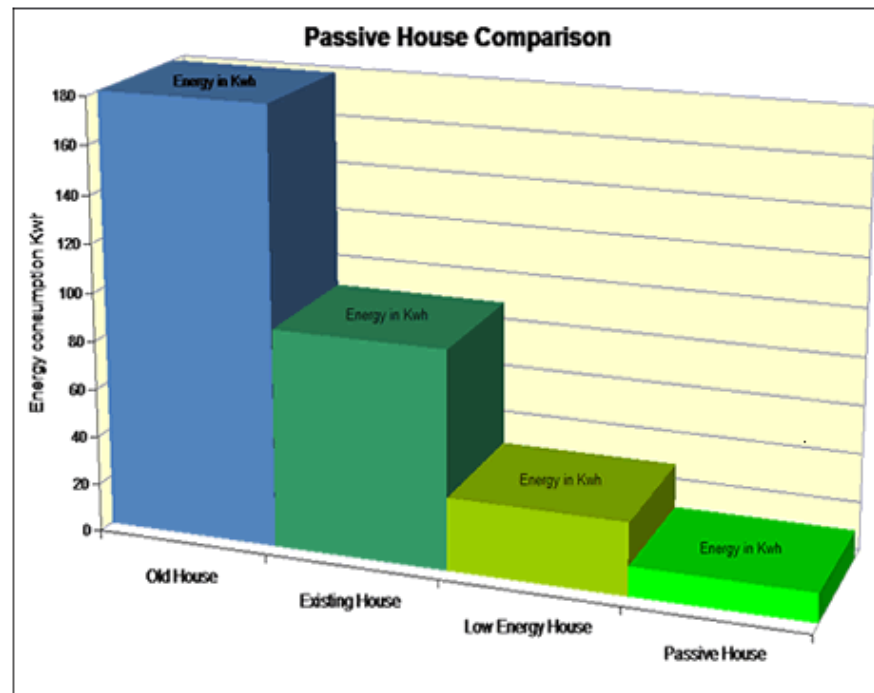
Passive Houses – What are they?





- Natural ventilation
- High thermal mass
- High thermal mass with night ventilation
- Evaporative cooling
- Solar heating

- Up to 10-15% more expensive upfront
 - Varies with exact building features
- The real cost advantage occurs with heat requirement
 - Requirement of 15 kWh/m² a year
 - Eliminates standard HVAC system



- Very low energy requirement
 - Reduce carbon footprint
- Cost of operation remains low
- High quality insulation and air tightness
- A highly controlled healthy environment
- Increased energy prices have little impact
- Great resale value

- Large trees, shrubs and vines can provide shade during summer.
- Deciduous trees drop their leaves in winter, providing for an increase in exposure to the sun, for more heat.
- Evergreens and other large trees can serve as barriers against wind, protecting from heat loss
- Using solar power for lighting and water pumps, as well as heating outdoor pools also helps.

- House orientation
- Few windows
- Aesthetics
- Few direct government subsidies
- Insurance pitfalls
- No room for error
- Cost of meeting passive housing standard increases above 60° latitude (in Northern Europe)

- Windows, insulation, building methods...
 - Exceptionally large R-value construction
- What happens when someone opens the door?
- “Airtight” - \$200,000 fan

- European Union wants to cut annual power consumption by 20%



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