Designing High Performance Sustainable Homes

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High Performance Homes are designed to precisely integrate the local climate in a way that maintains indoor comfort conditions while minimizing the use of depletable energy. High Performance Homes minimize their consumption of energy, their generation of greenhouse gasses, their contribution to air pollution, and their cost of operation. This is a Hands-On Seminar in which you will learn how to use HEED, a free user-friendly design tool that shows you graphically how to "fine-tune" your home for optimal energy performance. More important, HEED's powerful graphics give you extremely sophisticated ways of visualizing the subtleties of a home's performance, and communicating these issues to clients.

HEED starts by asking you four questions, then it automatically designs a home that meets California's Energy Code, next it designs another home that is usually about 30% better. HEED's Basic Design options let you easily draw in any shape floor plan, then click and drag windows onto each façade. You can quickly create up to nine schemes and can see how their performance compares on bar-charts of the annual energy costs for heating, cooling, fans, lights, and equipment. HEED's Advanced Design options, allow you to enter more complex home design data if you wish. HEED's many graphic screens shows you everything you need to know about your home's performance including a detailed hour-by-hour picture of energy consumed, indoor temperature, air changes, and costs.

If you bring a laptop to this seminar we will load HEED and you will each have the chance to design a home and create your own series of design alternatives. In this seminar you will learn how to load in climate data for hundreds of stations around the world. HEED stands for Home Energy Efficient Design, but soon you will be able to use it for small non-residential buildings and for multi-zone buildings. HEED runs an 8760 hour energy balance and has been validated against DOE2 using ASHRAE Standard 140. This project is funded by the California Public Utility Commission. HEED is available at no cost from **www.aud.ucla/heed.**

If you have any questions about HEED, email milne@ucla.edu

Passive Design Options Included in HEED:

Weather Station _____ Latitude: _____

WINTER: Design Low Temp. _____ F Average Diurnal Temp. Difference __ ___ F
Average Sky Cover _____ % (Circle one): Cold-Clear Cool-Overcast Temperate

Passive Heating Strategies	**Advantages in this Climate**	**Disadvantages in this Climate**
Direct gain (with exposed mass)		
Super insulation		
Movable night window insulation		
Absorptive (dark) exterior surfaces		
Glazed atrium		
Low thermal mass		
Smart HVAC Control of Temperature Float		
High Efficiency Furnace		
High Performance Glazing		
Infiltration Controls		
Earth Sheltering		
Night Setback Thermostat		

SUMMER: ASHRAE Design High Temp. _____F Average Wind Velocity _____MPH
Average Diurnal Temp. Diff. _____F (Circle One): Hot-Humid Hot Arid Temperate

Passive Cooling Strategies	**Advantages in this Climate**	**Disadvantages in this Climate**
Fixed exterior window shading		
Operable exterior window shading		
High Performance Glazing		
Super insulation		
High thermal mass		
High mass with night flushing		
Low thermal mass		
Smart HVAC Control of Temperature Float		
Economizer Cooling (whole house fan)		
High Efficiency Air Conditioner		
Daylighting		
Energy Efficient Lights		
Infiltration Controls		
Shading with deciduous plant materials		
Reflective (light colored) roof and/or walls		
Earth sheltering		
Natural cross ventilation (also wind scoops)		
Water walls		

There are other Passive Heating and Cooling Strategies that are not yet included in HEED, including solar chimneys, trombe walls, single stage evaporative coolers (swamp coolers), two stage evaporative coolers, convective cooling stack ventilation (if no wind), roof ponds, sun spaces, south wall collectors, the Berra-Constantini system, double envelopes, air-to-air heat exchangers, remote collection, remote storage, thermosyphonic collectors with rock bins, shaded outdoor living spaces (courtyard, patio, lanai), radiant (night sky) cooling system, the roof radiation trap, roof ponds, earth tubes, and fountains. In the future we hope to add PV (photovoltaics) and SDHW (solar domestic hot water), and also we hope to be able to add Proscriptive Performance Title 24 compliance.

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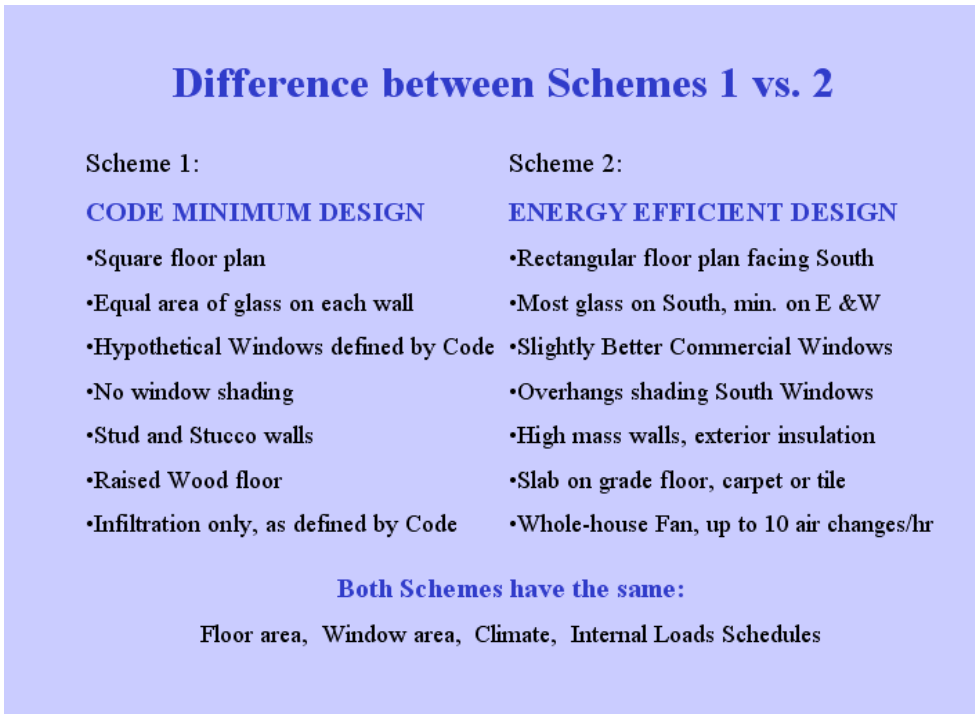
Excerpts from the HEED PowerPoint Presentation (which is also available on the HEED web site)

This screen explains how HEED automatically creates two different buildings based on the four initial facts you give it. You should then copy your Scheme 2 into a new Scheme 3, re-name it and try to improve your design.



Scheme 1 and Scheme 2 both meet the California Energy Code for your local climate zone, but the second one is more Energy Efficient because of these simple changes tht= HEED made in its architectural design.

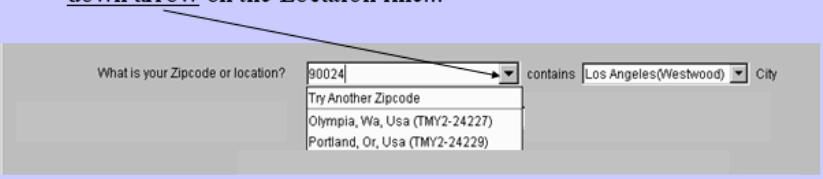
For Other Climates….

To load in climate data for any station outside California, click on **Help** at the Climate screen or see the **READ-USA.TXT** file in the c:\heed\docs folder…

It explains how HEED can directly read EnergyPlus Weather for over 700 stations around the world …

From the HEED web site, click on the EnergyPlus site, then download your station in the .epw format and into the heed\solar5\tmy folder...

Now go back to HEED's Initial Design screen and click the down arrow on the Location line...



Top switch to other climates, follow this procedure.

HEED can be downloaded at no cost from:

www.aud.ucla.edu/heed

A copy of the PowerPoint Tutorial along with our Research Documentation and our other Design Tools can be downloaded from

www.aud.ucla.edu/energy-design-tools

You can contact Murray Milne at:

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The current version of HEED is funded by the California Public Utilities Commission. It is being developed by the Energy Design Tools Group at the UCLA Department of Architecture, in Association with CTG Energetics, Malcolm Lewis President.

If you have any questions about running HEED on a building you are designing, just email me.

... Remember, once you attend one of my workshops, I am your consultant for life