



SOLAR DECATHLON

UTSOLAR<sup>D</sup> 

The University of Texas Bloom House places 2<sup>nd</sup> in Engineering Design at the 2007 Solar Decathlon !!



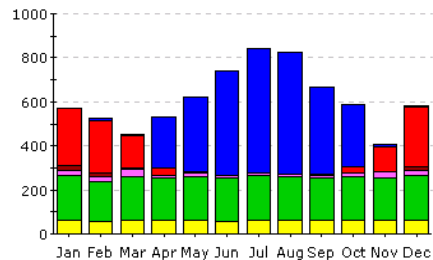


## *What is the Solar Decathlon?*

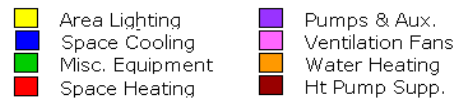
- The Solar Decathlon is an international competition sponsored every two years by the U.S. Department of Energy
- 20 Universities compete to design, build and operate the world's most attractive, energy-efficient solar-powered house



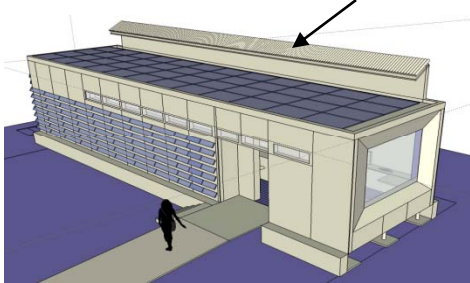
# ENGINEERING: Energy Modeling



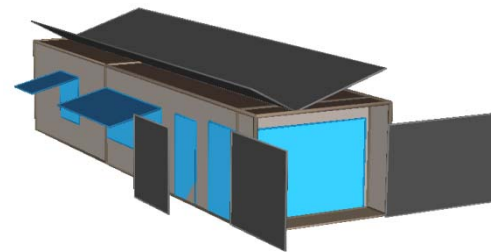
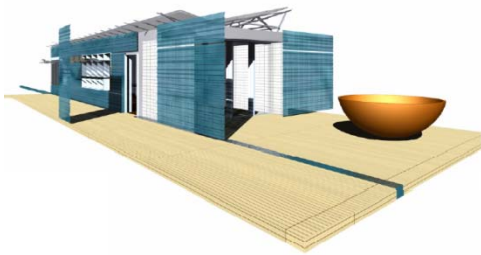
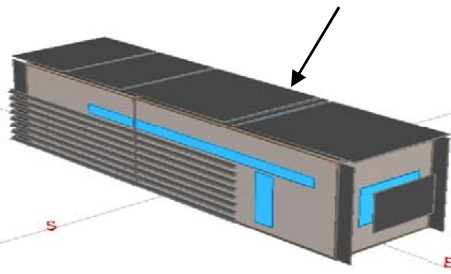
Electric Consumption (kWh)



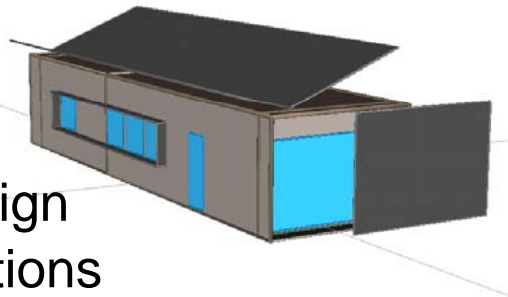
Architectural models



Energy-simulation models



Design iterations



## Design of Building Envelope:

- Collaboration between Architecture and Engineering Students
- Design iterations to optimize shape and energy use

## Solutions:

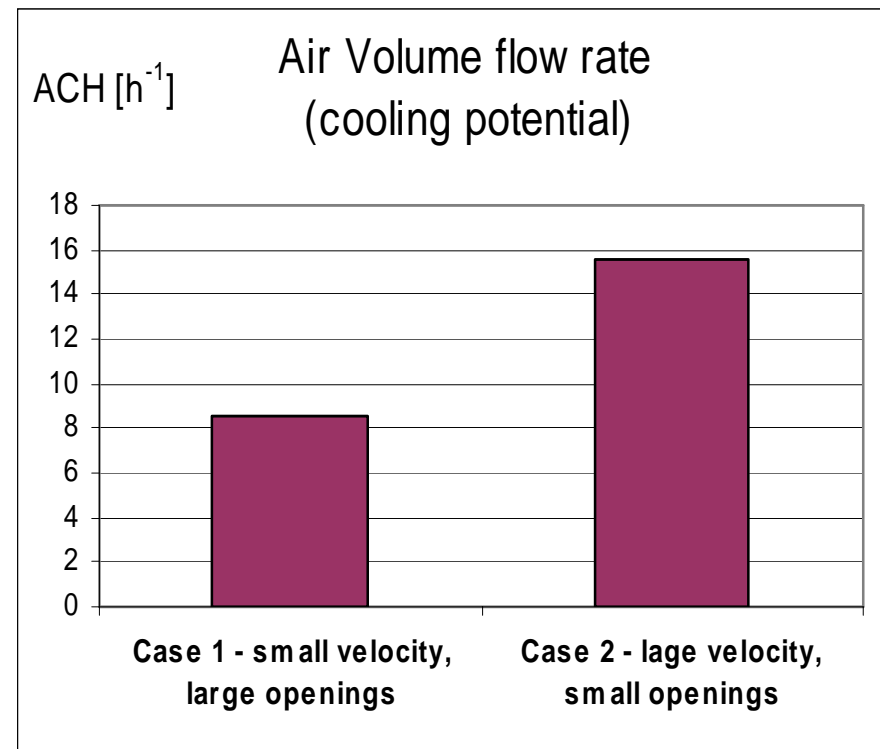
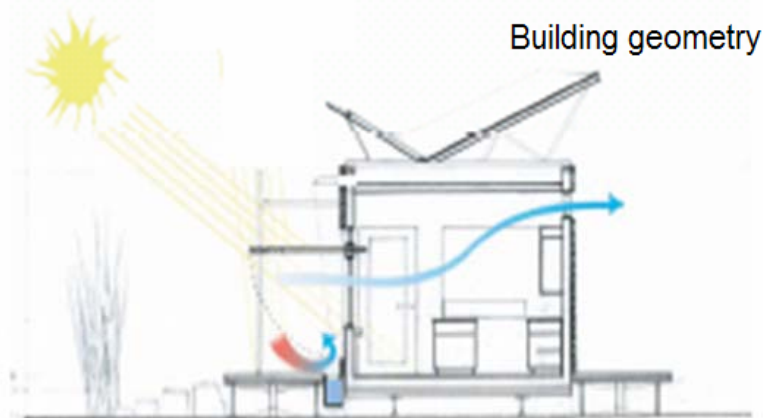
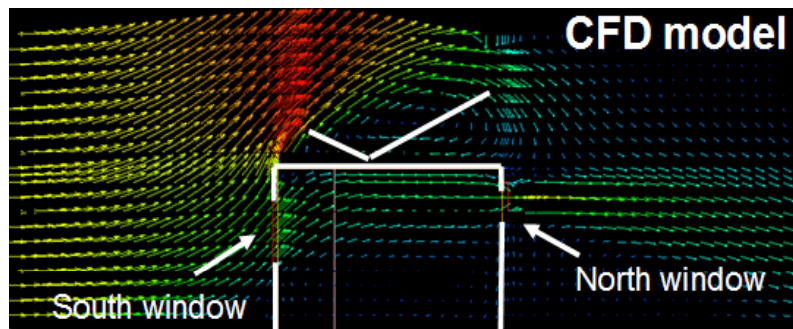
- passive shadings
- positions and area of windows
- insulation value
- tightly sealed envelope
- high-performance window
- position of solar collectors



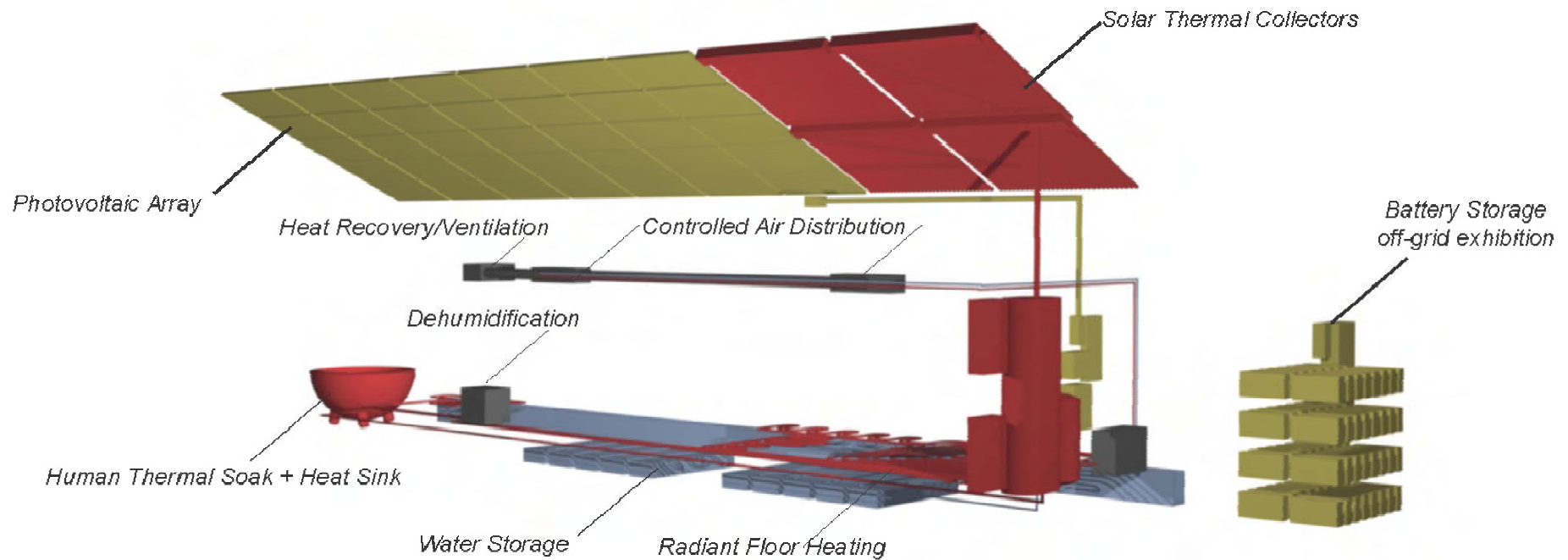
# ENGINEERING: Energy Modeling



- Energy-efficient use of natural cooling
- Computer modeling for analysis of natural ventilation



# ENGINEERING: Mechanical Systems



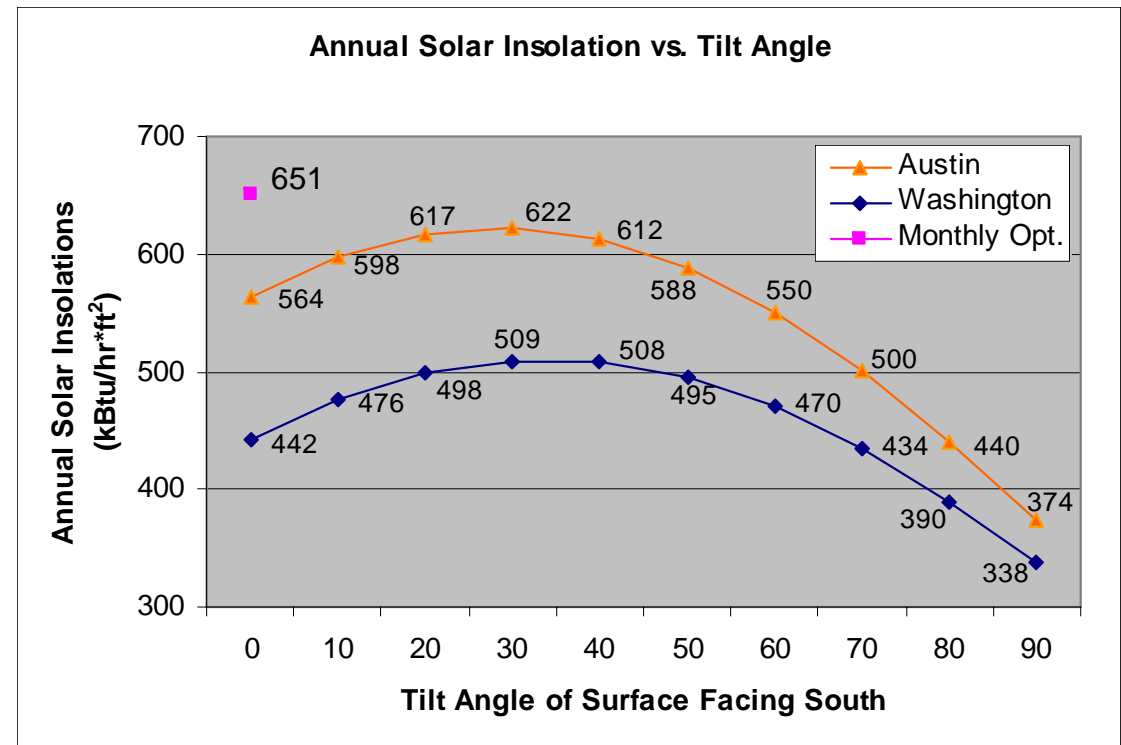
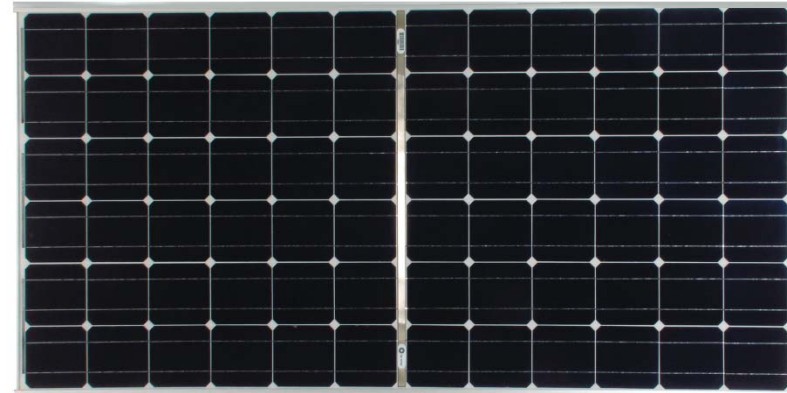
UT strategy for a competitive engineering entry

- well-balanced solutions
- systems designed for residential owner-users
- robust, simple, off-the-shelf components, innovative control

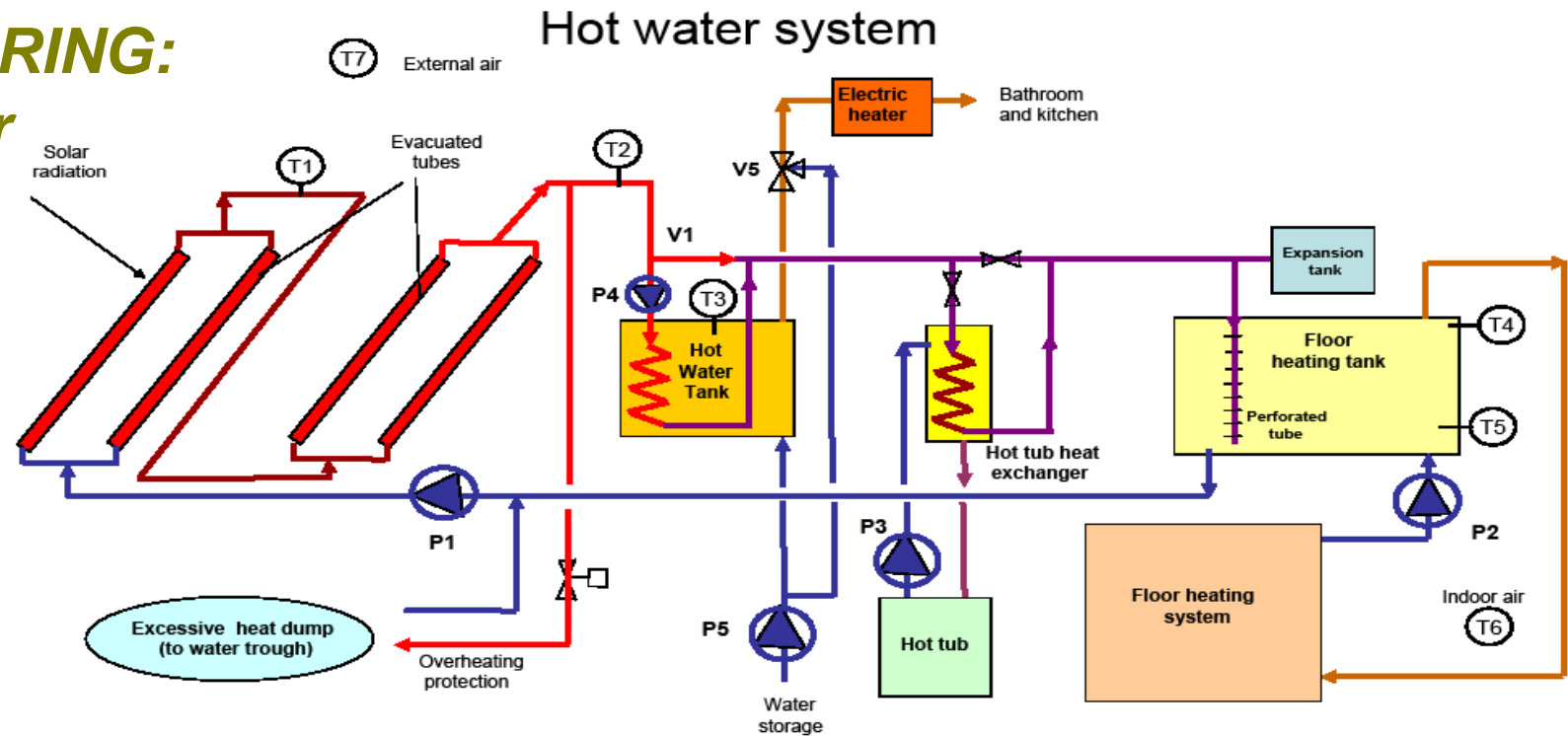
# ENGINEERING: Solar Energy System



- photovoltaics integrated into house geometry
- \$70,000 award from BP Solar
- 7.6-kW array to power house and electric car
- solar angle optimized for Austin and Washington, DC



# ENGINEERING: Hot-Water System



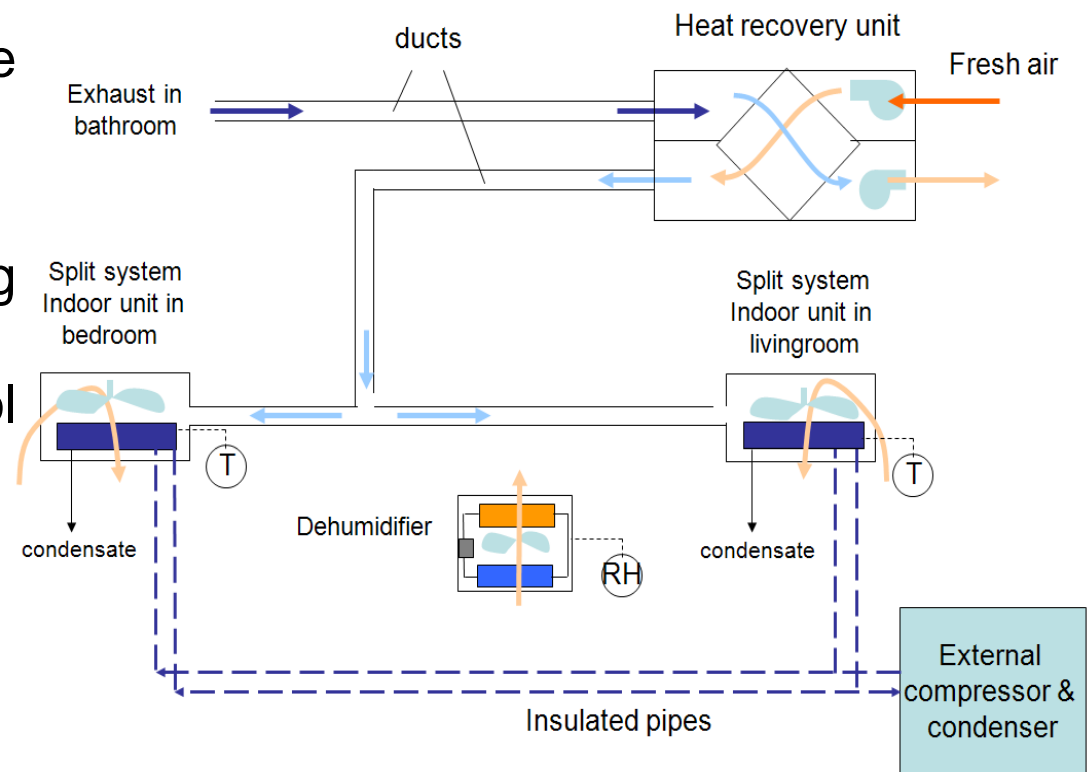
- powered by hot-water solar collectors
  - evacuated-tube technology
- provides energy for:
  - domestic hot water
  - hot-water floor heating
- innovative control system



# ENGINEERING: Heating, Ventilating, Air Conditioning



- air conditioning by ductless mini-split system heat pump
  - minimal losses from leakage and ducts
  - precise temperature control in both zones of the house
  - operation coordinated with hot-water floor heating
- fresh air and air-quality control by heat-recovery ventilation system





# ENGINEERING: Structural Design

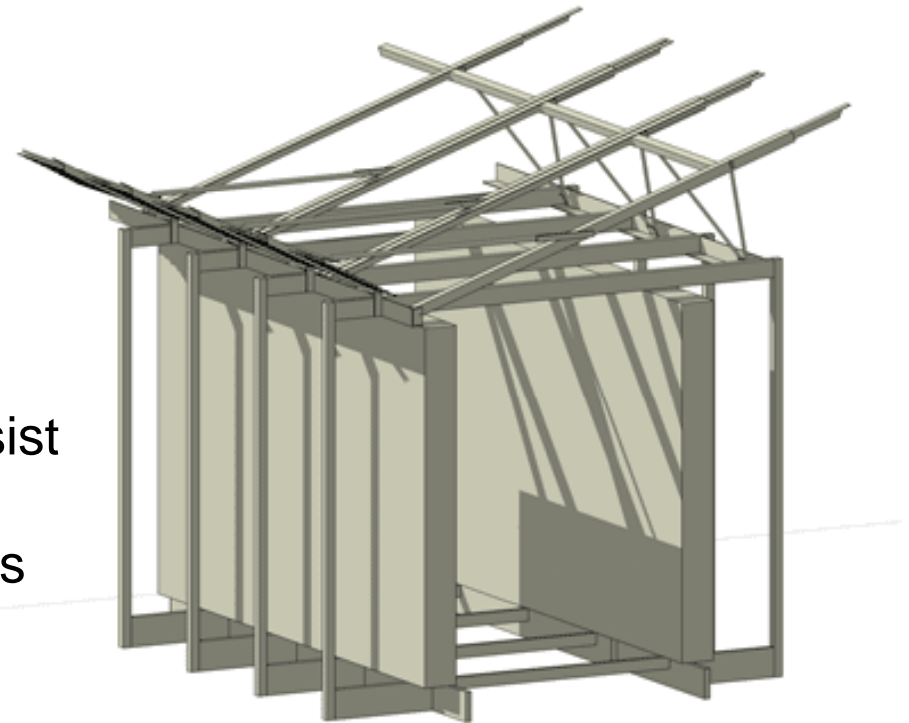


- Challenges

- transportation loading
- high live load
- low soil capacity in DC
- no interior shear walls
- deployable structure
- short assembly time

- Design

- steel mobile-home chassis
- steel moment-frame structure to resist lateral loads
- structural insulated panel (SIP) walls
- collapsible solar-panel rack system
- deployable foundation

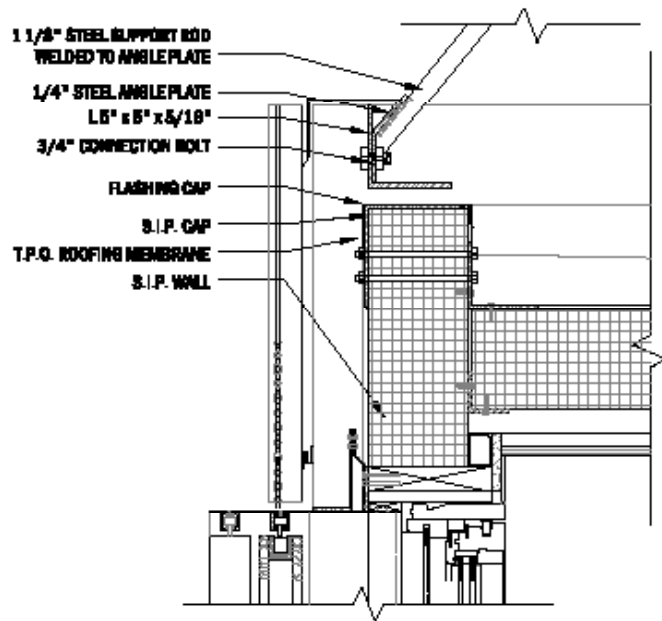


Roof Rack, Steel Frames & SIP side panels

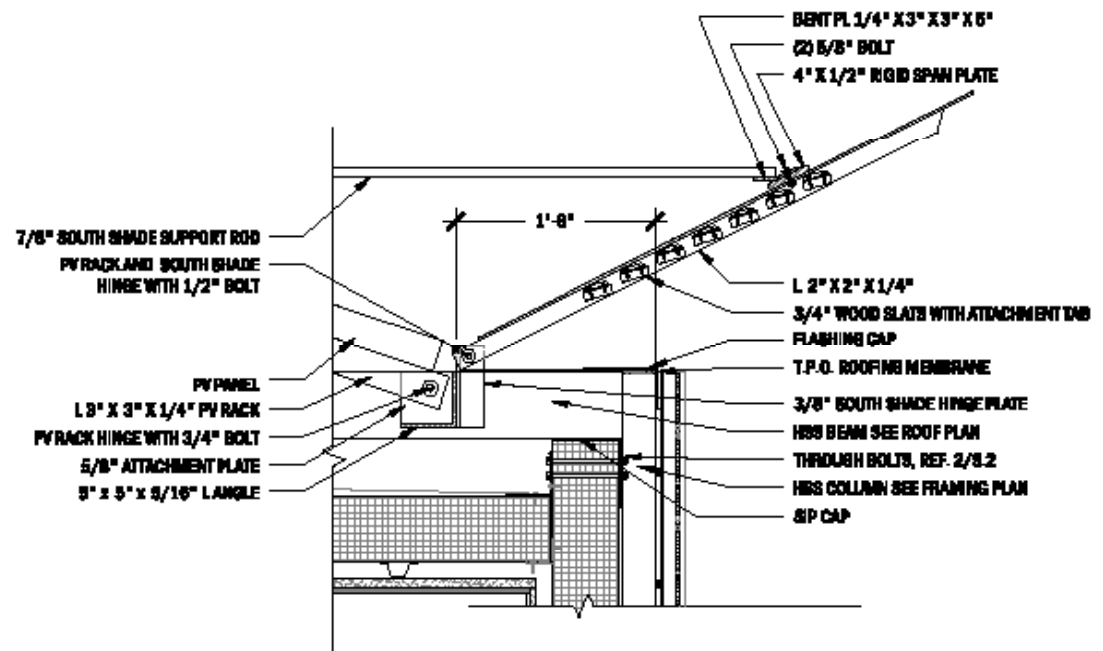


# ENGINEERING: Structural Design

- created by students
- designed by students
- computer-modeled by students
- financed through students
- scheduled by students
- constructed by students
- presented by students



**1** STRUT CONNECTION AT MOMENT ANGLE  
1 1/2" = 1'



**2** RACK AND SHADE HINGE  
1" = 1'

# ENGINEERING: 2<sup>nd</sup> Place



[www.utsolard.org](http://www.utsolard.org)



The Solar Decathlon provides high-level exposure for UT and the CAEE with more than 300,000 visitors and many sponsors

## Texas

Current Overall Points	877.503	Current Overall Standing	10
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These are the final scores for the 2007 Solar Decathlon. The results were announced on Friday, Oct. 19, 2007, at 2 p.m.

Contest	Miles/Current Points	Current Standing
Architecture	174.25	9
Engineering	130.65	2
Market Viability	101.20	10
Communications	87.500	4
Comfort Zone	75.716	3
Appliances	63.749	12
Hot Water	100.00	1
Lighting	78.967	16
Energy Balance	27.049	14
Getting Around	/38.422	18

