

Students Demonstrate Earth-friendly Homes

Wouldn't it be great if we could channel the brilliance and enthusiasm of engineering and architectural students into projects that help us transition to renewable energies?

It's exactly what was happening at the Solar Decathlon in 2002 and 2005 where teams from 14-19 universities designed and built earth-friendly homes powered solely by the sun with solar photovoltaic panels on the roof that generate electricity.



Photo Chris Gunn

The Pittsburgh Synergy house built in 2005 by students from Carnegie Mellon University, The University of Pittsburgh and the Art Institute of Pittsburgh

"I've been a professor for a long time, but this project has elicited the highest degree of enthusiasm from the students that I've ever seen," said a faculty advisor to the 2002 Carnegie Mellon team, Dr. Stephen Lee, an architecture professor.

The teams disassembled their houses and transported them to the National Mall in Washington D.C. where they were reassembled them to form a solar village.

"It was an interdisciplinary approach to learning where students studying architecture, civil engineering, mechanical engineering and construction management all came together



Photo Chris Gunn

The 2002 University of Colorado, Boulder, house.

under one roof, learning how to work together. It was more meaningful than sitting in a classroom," said professor Ronald Baier, a construction management advisor with the 2005 Florida International University team.

Sustainability made a great leap forward as more than 100,000 visitors toured the homes during each of past Solar Decathlons.

Electricity from the solar photovoltaic panels was stored in around 40 batteries so there was power even when the sun was not shining.

There were ten contests that measured the attractiveness of the homes as well as the ability to maintain a comfortable temperature, charge an electric car, cook a dinner, run a home office with a computer, heat a shower and wash and dry clothes.

In the energy balance contest, the winning team was the one that had the most electricity left over, which means many of them installed three or four times more solar panels than they needed.

But in these houses, the unused electricity will be fed back into the grid and whoever lives in the house will get credit from the power company.

A variety of strategies were used to heat the homes. "Anyone can put in a heating or air conditioning unit in their home, but what's really powerful is this idea of making full use of natural heating resources in the environment that we have, then supplementing it with mechanical systems," said Diane Chia, an

architecture student from Singapore who helped build the 2005 Pittsburg Synergy house. Their light, airy house uses a 13 ton thermal mass of concrete as their floor, which stores heat from the sun in the winter to make the home warm, then cools the house in the summer.



Photo Chris Gunn

High clerestory windows in the 2005 University of Maryland house bring in natural light. Also, a breeze is stirred as hot air leaves out the clerestory windows while cool air comes in through windows on the opposite wall.

The house is also heated radiantly in the winter by solar-heated hot water that passes through coiled tubes inlaid within the thermal mass. Hot water was produced by evacuated-tube solar collectors on the roofs.

In the home built by the 2005 team from Puerto Rico, a breeze is stirred as air comes in through windows on one wall, while



Photo Chris Gunn

The house made by students from Carnegie Mellon in 2002

hot air that has risen leaves out of very high clerestory windows on the opposite wall - a technique often used in Puerto Rico. "Our country has a hot climate," said Richard Diaz, a civil engineering student, "but by using cross ventilation techniques, we always have a cool place in the house."

The 2002 house built by students from Carnegie Mellon featured a rooftop garden that makes it possible to be connected to the environment - even in a densely populated city.

This team intentionally broke the contest rules at risk of a penalty and built a two story house, asserting that ranch style homes "take up too much space on the planet."

They built with regional products when they were available and sought out products made without harmful processes or chemicals, such as PVC and formaldehyde. To insulate the house they used denim scraps from a local jeans factory.

When building their home, the 2002 team from the University of Virginia used recycled materials where



Photo Chris Gunn

The house made by students from the University of Virginia in 2002

possible. They used copper from a roof and built a rain screen from wooden panels reclaimed from shipping pallets. The floors were made from fast-growing bamboo and the furniture was made from locally harvested birch. The studs of the home were built from engineered lumber, which makes use of a greater portion of the tree.

The 2005 house built by students from the New York Institute of Technology, has two main structures, including one that was built from an old shipping crate that contains a kitchen, a bathroom, the houses mechanical systems and a rooftop garden for collecting rainwater and growing food.

A loft in the other structure provides a place for sleeping or reading.

To preserve forests, the team built kitchen counters made from compressed newspapers, eight inch thick walls made of compressed wheat straw, floors made from fast-growing bamboo and tables made from crushed sunflower hulls. They also used insulation made of soy-based foam.

Instead of using the electricity from their solar panels to



Photo Chris Gunn

The house made by students from the New York Institute of Technology in 2005

power their home, they used it to electrolyze water in order to generate hydrogen that is used in a fuel cell to generate electricity. "We can power the whole house for 30 hours on the hydrogen we make in three or four hours," said Matt Vecchione, an undergraduate in architecture who was with the 2005 New York Institute of Technology team.

It was a glimpse into sustainable homes of the futures.