

Carnegie Mellon University

This year, the team from Carnegie Mellon is offering an innovative way of looking at sustainable solar design by creating a “Plug n’ Play” housing product that employs modularity on a variety of scales, allowing users to configure and reconfigure their home as personal or family needs dictate. For the competition, the team designed TriPOD. As the name indicates, this model has three pods: kitchen, bedroom, and live/work space. Meanwhile, the core houses all the home’s utilities, including a bathroom and a laundry closet.

What’s Different?

- The modular “Plug n’ Play” concept allows maximum flexibility and mass production.
- A raised-floor system in the core allows easy access to mechanical systems, simplifying maintenance and system upgrades.
- The greenscape on the north side of the house, along with the green roof on top of the kitchen, is “Eco Art” that grows many edible plants while acting as a rainwater-catchment system.
- Collaboration with Technische Universität Darmstadt has developed into a shared green space between the two houses during the competition.
- Collaboration within the team has included students from Carnegie Mellon’s Schools of Architecture, Design, Art, Drama, Human Computer Interaction, and Business. In addition, the team has been helped by students from both the University of Pittsburgh and the Art Institute of Pittsburgh.

Architecture, Interior Comfort

- The modular nature of the house provides comfort through flexibility—each pod of the home has a different zone for heating and cooling.
- A modular in-wall shelving system, combined with standardized wall, ceiling, and floor panels, allows the inhabitant to customize the interior to have storage on any wall surface the inhabitant chooses.
- All mechanical systems are contained within a central core, which allows living spaces or “pods” to be added or exchanged with infinite possibility.
- A southern courtyard lets in additional daylight while adding to the house’s usable space and begins to blur the boundaries between interior and exterior.
- Highly efficient structural insulated panels (Centria Versawall) provide the house with impeccable insulation. The R-value of the insulated panels is 30 (compared to the average house built in 1960, which is usually R-7 or less).

Heating and Cooling Systems

- Instantaneous water heaters are used for a radiant floor system.
- An energy recovery ventilator is used to decrease hot/cool air loss.
- Passive heating and cooling strategies have been implemented through the placement of operable windows and southern glazing.

Lighting (including Daylighting)

- Glazing dominates the southern walls to allow daylight and passive heating.
- Clerestory windows in the upper core, along with a skylight above the shower, bring daylight into the higher reaches of the house.
- Also in the upper core is an array of color-mixing LED fixtures.
- A mixture of fluorescent and halogen fixtures light the interior and provide task lighting.
- White LEDs provide exterior lighting at night.

PV and Solar Thermal

- The roof-mounted PV system is rated at 6.88 kW with 32 SunPower 215 modules.
- An Apricus solar thermal array provides domestic hot water with an instantaneous water heater as backup (the radiant floor will be run primarily on the instantaneous water heater).

Communications

- A new and improved Web site is constructed for the competition with the goal of keeping people updated as the competition unfolds.
- House tours during the competition involve interactive elements to engage both children and adults.
- Graphic displays inside and outside the house provide information about the house before, during, and after the tour.

Budget

- The total cost for materials and transportation is estimated to be a little more than \$378,000.

Future Plans

- The 2007 Carnegie Mellon solar house will become a permanent addition to the facilities in Powder Mill Nature Reserve in Ligonier, Pennsylvania. The reserve is an outdoor educational center and natural field station affiliated with the Carnegie Museum of Natural History, which hosts more than 40,000 people annually with a series of public programs and workshops for educational institutions.
- Powdermill is also implementing a "Living Machine" (a completely biological process to break down waste water) that the team can permanently tie the house into.
- The house will be used primarily as an exhibit for sustainable living/housing for visitors. However, visiting research scientists will have the opportunity to stay in the house while doing field research.

Kid's Corner

- What are those plants doing on the roof? Having plants growing on the roof helps to keep the house warmer, while providing a place to grow food and collect rainwater.
- Want to change the color of your room with the click of a switch? This house has color-changing lights that let you pick any color in the rainbow!
- Take a tour of this house and you'll get to play a Stamp Hunt game.

Team Information

Web site: www.cmusolardecathlon.com

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