

URBANEDEN SOLAR DECATHLON HOUSE



UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE of ENGINEERING

UNC CHARLOTTE | EPIC | URBANEDEN-SOLAR DECATHLON HOUSE



TEAM:

The interdisciplinary UrbanEden team was made up of engineering, architecture and business students and faculty members.

SPONSORS:

Some of the companies supporting the project with donations of money and equipment include:

Duke Energy
Hall Building Information Group
Ingersoll Rand
Metromont
Edifice
Electrolus
Elm Engineering
Intus Windows
Bagby Lighting
Precast Concrete Institute Foundation
Sears Contract Inc.
Baker Roofing
Automation Direct
Medallion Transport and Logistics

MORE INFORMATION:

For more about UrbanEden's design and features visit <http://urbaneden.uncc.edu>

UrbanEden is the University of North Carolina at Charlotte's entry from the 2013 U.S. Department of Energy Solar Decathlon. The ultra-efficient UrbanEden is a commitment to sustainability, vibrancy, diversity and technological innovation. The house provides sophisticated urban ambiance while helping occupants reduce their carbon footprint. Design work began on the house in October 2011, and construction started in Charlotte in March 2013. The house was completed that September and then transporting it to Irvine, California, for the competition in October.

UNC Charlotte was one of 19 academic teams participating in the Solar Decathlon competition held this fall in Irvine, California. The competition included academic teams from around the world who built net-zero energy solar-powered houses. The UNC Charlotte house placed third in the engineering category of the competition, being recognized for its geopolymers concrete walls, capillary-tube cooling system, and moveable racks of photovoltaic panels.

EPIC
ENERGY PRODUCTION AND
INFRASTRUCTURE CENTER

Design Features:

- Four rooms include both an indoor and outdoor component to maximize efficiency, comfort, and flexibility.
- Reconfigurable spaces and elements include a living room and home office. The living room features an entertainment center that transforms into a Murphy bed to accommodate overnight guests.
- The pre-cast geopolymer cement concrete structure reinvents a historic building material to provide a sound barrier to city noise and a 90% reduction in carbon footprint over conventional concrete.
- A retractable solar photovoltaic panel rack, which remains over the roof in winter to allow the sun to stream in through the southern window wall, extends over the patio in summer to provide shade and cool the outside living space.
- An exterior living wall, or vertical garden, offers privacy while providing food, flowers, and the ambiance of a plant-filled room.

Technologies:

- Geopolymer concrete walls use a fly-ash mixture to completely replace Portland cement as the binding agent. The use of fly-ash results in up to 90 percent reduction in associated carbon emissions.
- A system of embedded “capillary” tubes circulates cool water through the high-mass, pre-cast concrete walls and up to a heat exchanger mounted on the roof, removing heat accumulated in the walls and resulting in cooling without the use of compressors or refrigerants.
- A hybrid passive-active hydronic radiant cooling system uses only pump energy to control temperature, unlike conventional hydronic systems.
- An interactive energy management control system uses multiple hardware and software tools to maintain interior comfort, provide adequate light for the home’s interior and exterior spaces, ensure a dependable supply of hot water, minimize power consumption, and maximize power generation.

Power

UrbanEden’s electricity is generated renewably by way of a 7.65kW photovoltaic array. Comprising the array are 30 individual photovoltaic panels. Each of the 36 c-SI M60 NA42117 modules has the potential to provide a peak output of 255 watts under Standard Test Conditions (STC).

The house’s adjustable PV rack is comprised of three separate sections, each of which carries 12 panels arranged in two columns and six rows. Each panel is mounted on fixed horizontal and vertical axes. In addition, each of the rack’s three sections can move, independently, across a 17-foot horizontal distance above the home’s roof plane.

