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Glazing Featured in Energy Saving Houses During Solar Decathlon 2009

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Glass products were a main feature in many of the energy-efficient houses in the 2009 Department of Energy Solar Competition on the National Mall, which took place last week in Washington, D.C.

For the Iowa State University team, use of glass helped connect inhabitants with the outdoors.

"The entire center module allows the house to transform and expand into the landscape," says Jennifer Ross, project architect. "The concept of the landscape systems and their reciprocal relations with the house creates a richer atmosphere for living."

The public tours the international U.S. Department of Energy Solar Decathlon, featuring energy-efficient, solar-powered houses built by 20 university teams from North American and Europe, on the National Mall in Washington, D.C. Photo by Stefano Paltera, courtesy of U.S. Department of Energy Solar Decathlon.

To connect the inside and out the team used a six-panel NanaWall HSW50 individual panel sliding system in powder-coated aluminum, a four-panel SL70 powder-coated aluminum folding system and a four-panel NanaScreen. Toronto-based Inline Fiberglass Ltd.'s low-iron, krypton-filled 325 series windows were used throughout and a skylight from BioBased Insulation LLC added to the use of natural daylighting. Yale Commercial Locks and Hardware supplied much of the hardware.

Operable louvers from LouvreTec provided shading when needed-while louvers from Power Film Inc. helped provide some of the energy for the house. The louvers covered with thin film photovoltaic (PV) used dampers and balancing fluids to passively track the sun.

The Iowa State house also incorporated recycled glass within the kitchen and bathroom countertops courtesy of Liquid Stone.

Team Cornell also featured a number of products supplied by NanaWall Systems.

Automated external shading and krypton-filled glass help insulate Team Ontario/BC's solar-powered house. Photo by Stefano Paltera, courtesy of U.S. Department of Energy Solar Decathlon.

"NanaWall has been one of the central design elements and unique features in all three Cornell University Solar Decathlon team houses," says Chris Werner, an architecture team leader for CUSD. "In the 2009 design, NanaWall allows us to open the entire living space into the central exterior courtyard. One of the core concepts of the house is the interplay of interior and exterior space. The house will nearly double in size when the NanaWalls are open."

The 2009 house used eight NanaWall units-two WD 65 inward/outward cornerless folding units with low-E glass to open the interior of the house into the exterior courtyard, allowing for cross-ventilation and interior-exterior spatial fluidity, as well as four

WD68TT tilt turn windows and two WD68F fixed windows. In several rooms, the house also features Velux electric skylights with dynamic glazing. Roof-mounted PV collectors also help to power the house.

The Penn State team made a big effort to maximize daylighting and passive solar gain in the design of its house. Clerestory windows and tri-fold doors on the southern façade provide ample daylight throughout the year. When these doors are open to the deck, the living space expands to the outdoors. Solar Innovations supplied a folding glass door for the living room, while Traco supplied numerous aluminum casement and fixed windows. Exterior shading devices supplied by Construction Specialties Group and Solar Power Industries combined operable shading with PV modules.

The University of Kentucky team's house was a rectangular building with a central open space that naturally ventilates the house on sultry summer days. A sky-viewing ribbon of continuous clerestory windows around the top of each wall offers light and a spacious feel. Schuco supplied those aluminum-framed, argon-filled triple-insulating units. Several of the windows as well as skylights the company provided not only let in the light but provided parts of the solar power needed. The design team integrated PV panels in two different ways. First, the team developed a solar roof that both shades the insulated thermal roof and generates energy for use in the home. Second, they placed panels on the south facade as a rain screen. Replacing standard building materials with PV panels helped offset the cost of construction in standard building projects. Schuco's ProSol solar modules were fabricated as a laminated IGU.

Students of Team California celebrate the first-place victory of their solar-powered house in the Architecture Contest. Photo by Stefano Paltera, courtesy of U.S. Department of Energy Solar Decathlon.

Electronically tintable glazing also is featured in the east, west and south walls to help offset the detrimental effects of untimely solar heat gain. Hafele supplied the house's exterior door hardware.

Team Ontario/British Columbia set out to tailor its house to the Canadian climate, meaning a different approach to passive solar heating and solar electric panels. The team could not count on much power from rooftop panels in the winter but could make good use of low-angle sun for much of the year. Thus, the south, east and west sides of North House have floor-to ceiling windows framed by vertical PV panels.

People take a look inside the house of Technische Universität Darmstadt, Germany. Photo by Stefano Paltera, courtesy of U.S. Department of Energy Solar Decathlon.

Highly insulating, quadruple-glazed, floor-to-ceiling windows and vertical PV panels on south, east and west sides work to capture the northern latitude winter sun. The windows use 3/8-inch laminated glass supplied by Pilkington and fabricated by Galt Glass in Cambridge, Ontario. Other technologies include automated exterior shading for the floor-to-ceiling windows featuring louvers that tilt in one direction to shade the house's interior and the other to let in the sunshine. Vertical PV panels form a frame around the glass, while rooftop PV panels are optimized to capture winter solar energy.

For the Virginia Tech team's house, the central theme was light-hence the name given to it, LumenHaus. A pavilion design featured sliding north and south walls made of glass. These glass walls can be opened up to allow air and light in and expand the footprint of the house onto the decking and outdoor space. EFCO, Glass Dynamics LLC and as well as others all supplied glass products to the light-filled house, while Hafele supplied much of the hardware.

Top honors, though, went to Team Germany, the student team from Darmstadt, Germany, for designing, building and operating the most attractive and efficient solar-powered home. Team Germany's winning "Cube House" design produced a surplus of power even during three days of rain. The winning house featured exterior shading devices, used to keep out unwanted heat, supplied by Glas Hahn GmbH. The house also featured exterior door hardware supplied by Hafele, including Topfscharnier concealed hinges and Federscharnier spring hinges.

The University of Illinois at Urbana-Champaign took second place, followed by Team California in third place. Team California, which took the prize in the Architecture category, featured Cardinal's LoE³-366® glass, a reflective coated, laminated tinted glass used in conjunction with Southwall Film's Heat Mirror® films. The house also featured the 2000T aluminum framed swinging glass door supplied by Kawneer.

The University of Minnesota won the Engineering contest, which was evaluated by a group of engineers, who determined which solar home best exemplified excellence in energy systems design, energy-efficiency savings, creative innovations in design and reliability of energy systems. Minnesota also was named the winner of the Lighting contest where teams earned points based on an evaluation by a jury of lighting design experts. Jurors toured each house to evaluate the aesthetics, innovations, energy efficiency, user-friendliness, flexibility and performance of the teams' lighting designs. Part of the lighting was assisted through the use of the house's featured building integrated PV glazed aluminum curtainwall. The curtainwall was custom-fabricated by W.L. Hall Co. in Hopkins, Minn., using Schott's ASI™ solar modules. The house also uses laminated sealed insulating glass units as privacy glass and several other window products from Marvin Windows and Doors.

Crew members from the University of Kentucky prepare to install their house's solar electric panels. Photo by Ismael Martinez, courtesy of U.S. Department of Energy Solar Decathlon.

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Over the course of two weeks, the 2009 Solar Decathlon challenged 20 university-led teams from the United States and as far away as Spain, Germany and Canada to compete in ten contests, ranging from subjective elements such as architecture, market viability, communications, lighting design and engineering, to technical measurements of how well the homes provided energy for space heating and cooling, hot water, home entertainment, appliances and net metering.