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# Virginai Tech Team Selects SIP Panel, Fiber Frame, Elastomeric Combo: Washington DC Capitol Mall Features Display of Solar House Decathlon Models Built by Innovative Students

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**Visitors to the Department of Energy's Solar Decathlon competition, with structures displayed along the Capitol Mall in Washington DC, tour the entry designed and built by the team from Virginia Tech University's architecture department, which placed fifth overall. Right, students chose a combination of steel/foam panel, fiberglass framing and elastomeric roofing to enhance energy efficiency synergistically.**

WASHINGTON, DC—The University of Colorado at Boulder took first place in the Department of Energy's Solar Decathlon, the 10-day competition among university teams from around the country. David Garman, DOE's assistant secretary for energy efficiency and renewable energy, made the award presentations. The University of Virginia captured second place, while Auburn University took third.

**Virginia Tech students got hands-on experience in many phases of building construction. John Rozada attaches C channel at the College of Architecture and Urban Studies Building Research & Demonstration facility.**

The Solar Decathlon ran from Sept. 26 to Oct. 5 on the

The Thermasteel composite panel is designed for flexibility in design and the benefits associated with insulated panel building. Founded by the panel's developer, Luther Dickens, in 1975 (see *Automated Builder,* August 1996 and August 1999), Thermasteel uses a 24-gage galvanized C and L-shaped structural steel stud and a carbon enhanced modified polymer (CEMP) resin foam core to produce its panel.

This combination offers structural strength, insulation, vapor barrier and sheathing in one component. It has been used to produce over 50,000 homes, along with commercial and industrial projects around the world for Thermasteel. The panels are used for exterior and interior walls, floors and ceilings and are compliant with ICBO, BOCA, HUD and UL code requirements. The panel contains no CFCs and resists decay, moisture, insects and mold and mixes a bromate fire retardant with the EPS to increase resistance to ignition.

National Mall in Washington, D.C. Teams from 14 universities competed by building homes that blend aesthetics and modern conveniences with maximum energy production and efficiency. In appearance, the homes are a mix of traditional and modern styles, but all were powered entirely by the sun and incorporate state-of-the-art energy efficiency technologies.

**The Virginia Tech entry ready for transport to the Washington DC Capitol Mall. One of the demanding issues was to devise a structure that could be built, transported and reassembled on site efficiently. Nationwide Homes provided the transport vehicle.**

The solar decathletes had to find ways to harness the power of the sun to supply all the energy for an entire housing unit including a home-based business, along with the transportation needs of the household and business via an electric car. Each house, limited to roughly 500 square feet, was judged on 10 criteria to determine which most efficiently employed solar energy for heating, cooling, hot water, lighting, appliances, computers and charging the electric car. The teams competed in the 10 criteria simultaneously.

**The Thermasteel SIP floor system is inserted between the fiberglass I-beams.**

The design team at Virginia Tech selected the Acrylife white thermoplastic membrane for its Energy Star rating and compatibility with the Thermasteel panel system. The Acrylife 3000 fleeceback membrane could be fully adhered over the insulated panel system while eliminating fasteners that would produce thermal bridging.

Chuck Johnson, president of Acrylife, notes, "Because our roof was flat they were able to stack the solar panels while other designs used a pitched roof which meant they could only have the cells on one side. The Virginia Tech students won the excess energy phase of the competition when they got an extra 30 miles from their solar car."

The Solar Decathlon residential requirements called for a 500 sq. ft. structure, which created rigorous parameters for designing a workable living space, which had to include a home office among other features. One innovation the students came up was a movable bedroom. It had a structure like a canopy on a track with a bed in the wall. When it was needed, it was moved into the living space and the bed was dropped onto the floor.

"This was a demanding challenge for their design creativity," says Johnson, "and you have the brightest minds in the college environment at work. We were able to work with the students to give them hands-on

**The VT solar array consisted of 80 21"X47" photovoltaic cells producing 6Kw at peak output. The panels are clamped, allowing elimination of roof penetration and resultant thermal bridging.**

"The Solar Decathlon proves that solar energy is practical today," Secretary Abraham said. "It is affordable and solar-powered homes can be livable and attractive. Our investment in renewable energy and energy efficiency technologies can contribute to the nation's energy security."

**The adhesive bond between the Thermasteel modified EPS panel and the Acrylife elastomeric roofing membrane is clearly seen here.**

Sponsors of the Solar Decathlon, in addition to DOE, included BP Solar, The Home Depot, EDS, the American Institute of Architects (AIA) and DOE's National Renewable Energy Laboratory (NREL).

experience with the roof system. They will produce concepts for the building industry and I believe they will clearly identify new technologies for the modular industry," Johnson adds.

According to Robert Schubert, associate dean for research at the College of Architecture and Urban Studies, and coordinator for Virginia Tech's Solar Team, the building systems were as much a part of the student's strategy as the solar energy applications. Although the Thermasteel facility is about a 30-minute drive from Virginia Tech and students take field trips to observe the production process, Schubert believes that had it been located across the country, they would have used the composite panel system anyway.

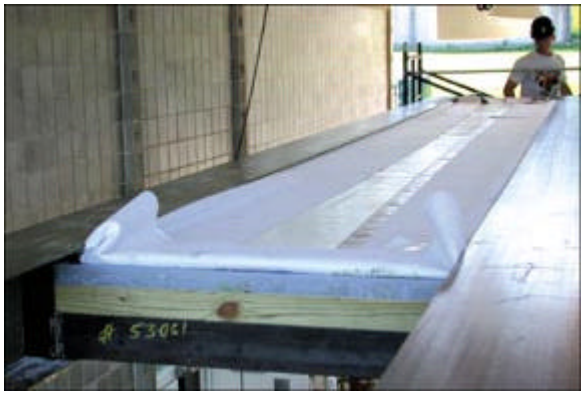
"We wanted to look at the housing unit as prototypical, using building assemblies in applications beyond the solar competition," explains Schubert. "The manufactured housing approach, we felt, was where the economies lie -- in these systems and materials."

The Thermasteel panel offers a structural and insulative system that is integrated, Schubert explains. The VT team used the panel with a 10" fiberglass I-beam superstructure, manufactured by Strongwell, another manufacturer in the region. The fiberglass material is called Extren.

"The stiffness lacking in the fiberglass was provided by the galvanized steel of the panels. We adhered the panels to the I-beam with an adhesive and the result is a very strong, lightweight assembly. That's the whole idea behind composites -- one element complements the others," Schubert explains.

Another benefit, Schubert says, was the fact that the use of 10" I-beams and a 7" Thermasteel panel allowed part of the flange on top of the insulation to be used for wrapping the roof membrane, which produced a clamping edge for the photovoltaic array without the need to penetrate the roof.

"The Thermasteel panel insulation meant that we could



**The Acrylife membrane has been attached to the Thermasteel panel and is being wrapped under and then over the fiberglass I-beam. Below: The Thermasteel SIP floor system is inserted between the fiberglass I-beams.**

Claiming fifth place overall and the Innovation Award, the structure developed by Virginia Tech's team offered an imaginative approach to the building and its solar energy utilization by choosing alternative building materials and control air leakage and the elastomeric roof membrane could also be attached by adhesive to the frame and panel components, which facilitates efficiency of the infiltration barrier. So the combination of the three main structural elements provided multiple functions," Schubert says.

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