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Seductively Solar

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Seductively Solar

RISD is part of only
two college teams
from the US entering
a full-scale model
home in this
summer's 2014 Solar
Decathlon Europe.

by Liisa Silander

NATURE CONCOCTED THE CONCEPT OF COCOONS FOR good reason: Weaving a strong but lightweight shelter makes sense. Yurts in Asia, teepees in North America and tents used for recreation all over the world stem from the same basic cocooning instinct. If you need flexible, portable shelter and lack the biological wherewithal to spin your own home, fabric offers a good option. But there are other reasons to consider homes without solid walls: they leave less of an impact on the land, and if designed well, can provide all the amenities of a more traditional home using 90% less energy.

Take *Techstyle Haus*, the name students from RISD, Brown and the University of Applied Sciences Erfurt (FHE) in Germany chose for the full-scale prototype they're entering in this summer's *Solar Decathlon Europe*. Clad as it is in textiles (the source of its namesake *techstyle*), the home essentially wears its high-tech style on its sleeve. But this curvy, sensuous house also weaves together a story of vision and commitment from many members of the RISD community, using its textural fabric walls as a powerful metaphor for how caring people might approach life on a planet of dwindling resources.

"*Techstyle Haus* asks its inhabitants to... see sustainable living as an integrated system woven into each level of daily life—from the fabric of their walls to the conversion of solar energy into heat, light and power," students note in the 575-page book they're submitting with their entry. Rather than proselytize about eco-conscious choices, the design of this house is meant to show a viable path for living comfortably and well while consuming no energy at all beyond what the house itself produces.



“There is no better learning platform for architecture and engineering students than the solar decathlon.”

Jonathan Knowles BArch 84

Fully certified as a high-performance passive house, the design also offers an “active construction system” with applications for disparate uses that “can be uniquely shaped to their environment,” notes Associate Professor of Architecture **Jonathan Knowles** BArch 84. A designer of net-zero energy homes himself, he has played a pivotal role every step of the way, from getting the project off the ground to ensuring that it’s bound for the competition site in Versailles, France in June. Ever since he led RISD’s 2005 solar decathlon team to a competition in Washington, DC, Knowles had been itching to do it again—despite the massive undertaking of coordinating a succession of studios over several years and raising approximately \$1 million in private and corporate sponsorship.

Why consider such a crazy challenge? “There is no better learning platform for architecture and engineering students than the solar decathlon,” Knowles says by way of explanation. “Students have to learn management, business, design, collaboration and construction skills to successfully compete. My students from 2005 have gone on to become leaders in their disciplines and I know the same will be true this time around.”

This round Knowles took a different approach to the decathlon, opting to enter the European version of the competi-

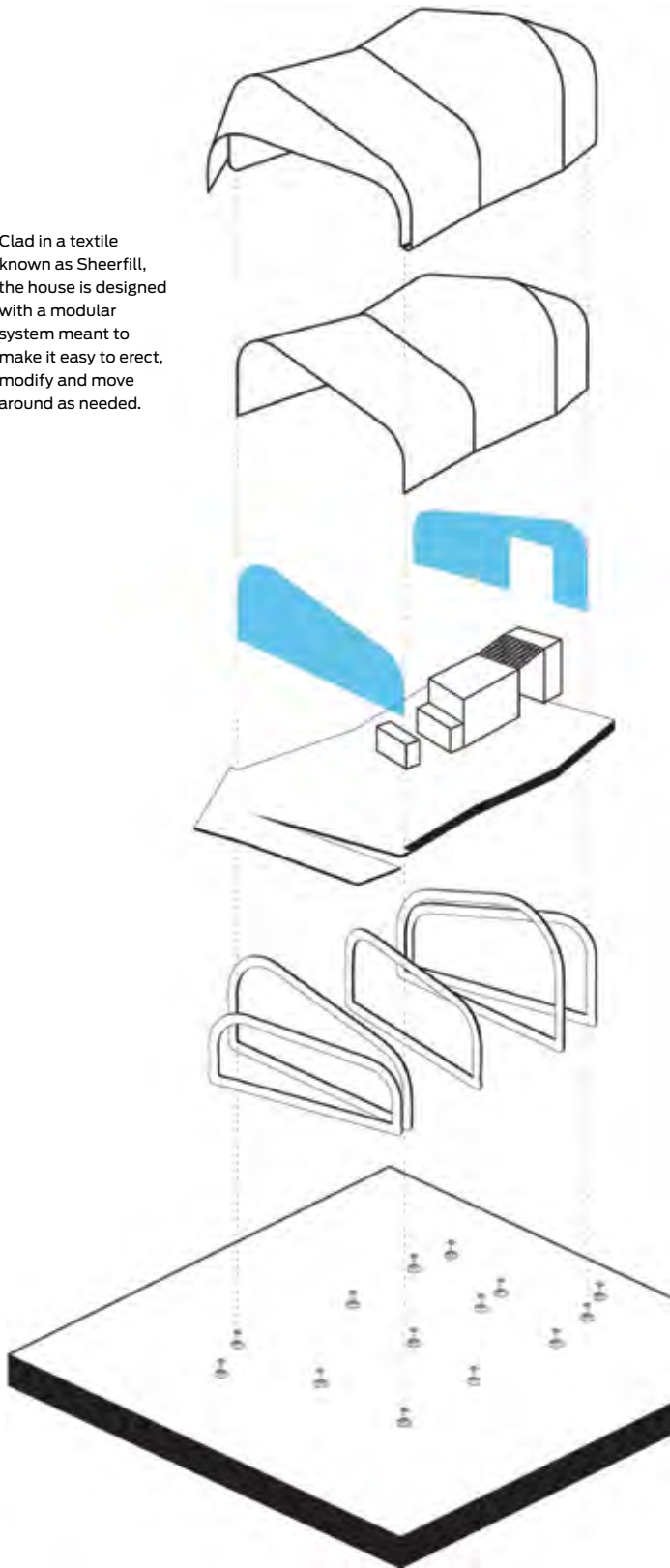
tion and team up with partners from Brown and FHE, which made it more feasible to undertake an effort of this magnitude during an economic downturn. Given his longstanding collaboration with lead faculty member **Ludwig Rongen**, a passive architecture expert at Erfurt, and the university’s proximity to the competition site in Versailles, Knowles says FHE was a natural choice, with the professor ultimately serving as a project advisor. As an equally strong partner, Brown offers talented students and strengths in science and engineering that have helped in the development of many of the technical innovations needed, with **Derek Stein**, an assistant professor of physics, serving as Brown’s project advisor.

“The European version of the decathlon is different in that it really highlights innovation,” Knowles says. “The Europeans are also years ahead of the US in terms of energy-efficient design, so we wanted to go head-to-head with the best.”

Navigating the complex rules and regulations governing the competition is mindboggling in itself, but that’s also part of the learning experience for students, Knowles says. And ultimately they’re being judged not only on the efficiency and aesthetics of the house they designed and built, but on factors ranging from innovation and affordability to mobility, density and “sobriety” of energy consumption.

Students working with project lead **Jonathan Knowles** BArch 84 (above left) explain the core features of the *Techstyle Haus* to visitors to the test construction site in Providence.

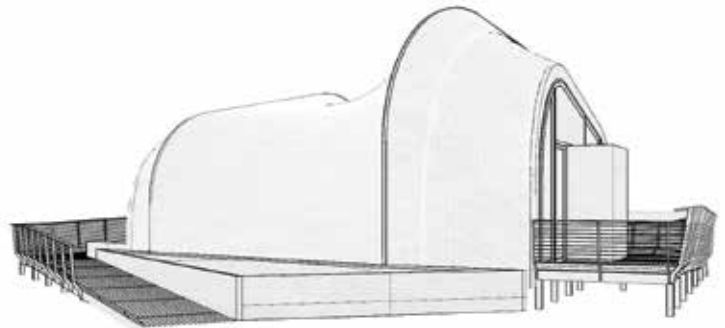
Clad in a textile known as Sheerfill, the house is designed with a modular system meant to make it easy to erect, modify and move around as needed.



PLAYFUL INNOVATION

Though the effort essentially started as an extracurricular activity in the summer of 2012, it quickly snowballed once the *Techstyle Haus* proposal got the green light on January 1, 2013. Sponsored by the US Department of Energy, the *Solar Decathlon Europe* pits 20 college and university teams from throughout the world against each other in 10 challenges to see which team builds the most innovative, appealing and livable solar house. Only two of the teams that made the final cut are from the US.

As excitement for the project escalated, the team quickly grew to more than 60 members from all three institutions. At RISD students from Architecture, Interior Architecture, Film/Animation/Video, Furniture Design, Landscape Architecture and Textiles are involved. Last semester alone students in five RISD studios focused on honing all aspects of the design. For instance, Knowles co-taught an advanced studio in preparation for the competition with Provost **Pradeep Sharma** and Dean of Fine Arts **Anais Missakian** 84 TX (a textiles artist who has been an advisor on the project since the beginning). And in *Integrated Building Systems*, another studio taught by Knowles, students completed the required technical drawings.



In addition, students in a course taught by Associate Professor **Peter Yeardon** devised a lighting system for the house using photo-luminescent materials, and others in a studio taught by Assistant Professor **Peter Dean** BArch 77 created custom furniture for the house. Other faculty who have contributed to the project include professors **Daniel Hewett**, **Anne Tate**, **Hans van Dijk** and **Damian White**, who heads the new Nature-Culture-Sustainability Studies concentration (see page 52).

From the beginning, the *Techstyle* team set out to design a prototype that would meet the standards for a passive house—a structure so well insulated and tight that it needs little, if any, heating system. “The analogy is that you only need the equivalent of a hair dryer to heat your home,” Knowles says. But the team also wanted to create a beautiful, inviting home using cutting-edge materials.

“We wanted to meet this challenge using textiles since we knew that performance textiles are being designed to be weather-proof, breathable and puncture proof, which makes them structurally resilient,” Knowles explains. “So why not just use these new options instead of more conventional building materials like plywood, drywall and wood studs?”

As students at the three participating institutions delved deeper into the requirements of the competition over the past 18 months, they became increasingly excited about the solutions they’ve developed for their 800-sf home. In addition to designing a structure that’s tight and efficient, they opted for ultimate flexibility, so that the interior can be reconfigured to accommodate different uses—extra bed space for house-guests or more open space for group gatherings. And since the entire thing needs to be packed up, shipped and rebuilt at the competition site in France, it’s designed to be taken apart

“The analogy is that you only need the equivalent of a hair dryer to heat your home.”

Jonathan Knowles BArch 84



Both the interior and exterior walls of the home are made of fabric, which helps accentuate the organic feel of its skin. In addition, abundant amounts of natural light flood in through the windows and partially translucent roof, minimizing the need to power artificial lighting.





in sections, moved and reassembled—with lightweight materials that can be shipped cheaply and sustainably.

This spring the team began building sections of the final prototype in a warehouse owned by Ximedica, the Providence medical products company founded by **Stephen Lane** 85 ID and **Aidan Petrie** MID 85, both of whom teach at RISD on a regular basis. Last fall, as part of their impressive fundraising efforts, team members presented their design at the US Embassy in Paris and in the winter and spring they shared

progress on the project with US Senator **Sheldon Whitehouse** (D-RI), a leading advocate for renewable energy. Through their persistence, the team ultimately earned support from industry partners Saint-Gobain, a green materials company; STOLL, a leading manufacturer of knitting machines; Schneider Electric, which produces smart grid solutions; PVillion, a maker of solar panels; Viessmann, a heating system company; Taco, a Rhode Island-based maker of heat transfer systems; and Shawmut Design and Construction, a Boston-based building company.



“Yes, it can be reproduced, but at its core, *Techstyle Haus* is a call to playful innovation and a celebration of creative thinking.”

At a ribbon-cutting ceremony in late April, members of the Brown and RISD communities got an opportunity to see the house before it was disassembled for shipping to France—and those who did were clearly impressed. “This is obviously a very exciting time for students, who are seeing their designs take form at full scale,” notes Stein, the faculty project lead from Brown. “I’m most impressed with how they have organized themselves. The management and communication system they spent over a year building is now proving its worth by guiding each student’s contribution to the whole.”

As students explained to visitors, the curvy structure of the *Techstyle Haus* is supported by a series of ribs, with an interior lined in a knit fabric designed at RISD and produced at STOLL in NYC. The exterior is made of Sheerfill, a durable woven fiberglass that’s used on roofs for stadiums and shopping centers but hadn’t previously been considered for residential applications. Flexible photovoltaic cells that generate 5-kilo-watts of power are embedded in the fiberglass, meaning the roof isn’t encumbered by rigid solar panels—an aspect of the design that’s unique, Knowles says.

When US Senator **Sheldon Whitehouse** visited the construction site in Providence, he spoke at length with students about the features of the house and how they fit in with new developments in energy policy.



Sheets of flexible photovoltaic cells replace stiff solar panels on the curvy roofline. And thanks to photoluminescent paint on the interior, there's no need to turn on a light to use the bathroom at night.

Since part of the roof is translucent, it allows natural light to enter the home, reducing the need for electricity. Glass walls at either end of the house also maximize light exposure and help create heat in the winter. Photoluminescent paint, which absorbs sunlight during the day and glows in the dark, replaces electric lights in places, such as the path to the hub that will house the bathroom, kitchen and mechanical systems—meaning there's no need to turn on the lights to go to the bathroom in the middle of the night, for instance.

Overall, the design approach rests on “weaving the systems that are traditionally kept in the background into the foreground” so that people living in the home are aware of the electrical, heating and water systems they use and how their behavior impacts their consumption of resources. “We hope this will strengthen the relationship that users have with their living space and will promote a responsible and environmen-

tally friendly lifestyle,” the team notes in its official entry book.

While its first stop in Europe is at the competition site in Versailles, *Techstyle Haus* will ultimately move on to Domaine de Boisbuchet, an arts organization in southwestern France that plans to erect the house in an apple orchard and try it out as a dormitory. If it works as hoped, the organization will commission up to seven more textile dwellings for the rural retreat.

This summer as thousands of people tour the homes during the *Solar Decathlon*—which runs from June 28 through July 14—the Energy Department hopes they will leave with a heightened sense of possibility about the beauty of solar living. Ultimately, the RISD/Brown/FHE team is feeling incredibly optimistic about their entry, regardless of how they place. “Yes, the house works,” they write. “Yes, it can be reproduced. But at its core, *Techstyle Haus* is a call to playful innovation and a celebration of creative thinking.” ■