Project Summary
Techstyle Haus, was conceived, designed, and built by an international team of students from three universities, two in the United States and one in Germany. These students combined forces in order to compete in the Solar Decathlon Versailles 2014 - a leading forum to foster new sustainable design strategies. During the two-week exhibition, Techstyle Haus was visited by 80,000 people and seen by many more through publications such as the New York Times, Huffington Post, and Le Monde.

The students proposed a broad strategy more than a single house; a way of designing and building based on highly engineered components and efficient construction. Our innovative building system has the potential to be implemented in various applications, including single and multifamily housing, live/work, mixed-use, utilitarian buildings, and market sheds. Techstyle Haus is an energy-efficient and solar-powered approach to building – shaped, patterned and layered with high-performance textiles.

Why textiles? Advances in material science have made textiles and membranes an advantageous alternative to traditional masonry and wood construction and at a lower cost and easier assembly. The use of textiles allows us to build sleek, flexible forms, engineered to meet the stringent passive house energy standard. An optimally contoured solar array generates electricity while solar thermal tubes provide hot water, resulting in a net-zero, energy-independent prototype that consumes 90% less heating and cooling energy than an average American home.

After the competition, the student team installed the house at the Domaine de Boisbuchet, an academy in France for interdisciplinary art and design workshops. There, the house was adopted as housing for visiting artists, designers, and students from around the world. Visitors will carry the lessons of Techstyle Haus with them when they leave, extending Techstyle Haus's research far beyond its physical location. Eventually, a series of houses, deploying the fundamental innovations of Techstyle Haus, will be built on the campus to expand its year-round capacity.
Curriculum Integration
Originally organized by students from Engineering and Architecture, the team quickly expanded to include students of graphic design, textile design, furniture design, computer science, digital media, and the natural sciences. The strength of our proposal was based on our cross-disciplinary approach. 100 students committed to work on Techstyle Haus. Engineering students coordinated building analysis, systems modeling, and prototyping. The two architecture programs co-chaired the design, including the enclosure detailing, the visual communications, product design, interior architecture and the lighting design. Our shared ambition was to use the Techstyle Haus as a platform for student research and implementation that was academically structured and ongoing in the following ways:

Initiating a strong culture of collaboration: Throughout the process and the aftermath, we showcased the collaborative process and its results. During the design phase, we offered a series of cross-disciplinary and sponsor based workshops – both in the USA and in Europe. By involving many disciplines, we created new relationships across the schools and strengthened existing ones. We became a model for collaborative research and partnerships for subsequent projects across our institutions.

Opening new curricular innovations: Techstyle Haus created an ongoing research effort for the deployment of existing and emerging sustainable technologies. By creating partnerships with those doing applied scientific research, the academic partners challenged students to be inventive, allowing them to manipulate new possibilities rather than merely absorbing old knowledge. We taught our students to work their way through problems “just-in-time”, whether with building systems and structures, or new ways to use textiles or fabricate glass. The research-based investigation realigned the strengths of our programs to culminate in regular full-scale projects on campus.

Building our reputation: Using the Solar Decathlon Competition as a launch, the academies partnered with research entities and corporations to develop new and exciting applications for new technologies. The Techstyle Haus project raised our profile with new international and corporate partners and established our presence as an important innovator in the field of sustainable design.

In short, Techstyle Haus is a call to innovation and a celebration of creative thinking. Techstyle Haus encourages inhabitants to see sustainable living beyond systems and parts, but rather as materials and technology woven into each level of daily life - from the fabric of the walls, to the conversion of solar energy into heat, light, and power. At its core, Techstyle Haus is an experiment, a question, and a proposition for sustainable architecture that is not just a house or settlement, but an experience.
TECHSTYLE HAUS.

Roof Plan
TECHSTYLE
HAUS.

Long Section

Cross Section
PROJECT DIMENSIONS.
Gross Area: 90.82 m² (978 sq.ft.)
Net Floor Area: 76.68 m² (825 sq.ft.)

PASSIVE ARCHITECTURE.
Technology: Innovative super-insulated double curvature textile wall assembly
Wall Assembly (outside-to-inside):
- Fiberglass Membrane Coated in Teflon (Sheerfill II Architectural Membrane)
- Weather Barrier (CertainTeed CertaWrap)
- Mineral Wool Insulation, 30 cm (11.8 in.) Thick (Isover Integra ZKF-032)
- Vapor Membrane (Isover Vario KM Duplex)
- Light-Block Textile (ShowTex Molton Colour)
- Interior Finish Textile (ShowTex PolyStretch P8 CS)

HEATING/Cooling TECHNOLOGY.
Heating Technology: Air-to-liquid heat pump (Viessmann Vitocal 242-S)
Manufacturer: Viessmann
Cooling Technology: Air-to-liquid heat pump (Daikin FDXS25F/RXS25K)
Manufacturer: Daikin
Heat Recovery Technology: Heat Recovery Ventilator with countercurrent heat exchanger (Viessmann Vitovent 300-F)
Manufacturer: Viessmann

PHOTOVOLTAIC (PV) TECHNOLOGY.
Technology: Monocrystalline PV cells laminated to vinyl fabric
Manufacturers: Solbain and Pvilion (panels), Schneider Electric (inverter)
Surface: 23.9 m² (257.3 sq.ft.)
Power: 5000 Wp
Power-to-Consumption Ratio: 0.545 (injected to the grid, no electrical storage)

SOLAR THERMAL TECHNOLOGY.
Technology: Evacuated tube collectors (Viessmann Vitosol 200-T)
Manufacturer: Viessmann
Surface: 5.93 m² (257.3 sq.ft.)
Power-to-Consumption Ratio: 0.513
Storage Technology/Manufacturer: Insulated hot water tank, Viessmann

WINDOW TECHNOLOGY.
Technology: Custom triple pane glazing with 95% krypton fillers
Manufacturers: Saint-Gobain (glass), Zola European (window frames)

ANTICIPATED ENERGY PERFORMANCE.
Wall/Roof Assembly U-Value: 0.104 W/m²K
Window (North) U-Value: 0.42 W/m²K
Window (South) U-Value: 0.53 W/m²K
Floor U-Value: 0.106 W/m²K

Heating Demand: 13.3 kWh/m² annual *
Cooling Demand: 5.5 kWh/m² annual *
Airtightness: 0.6 (1/h) ACH *
*Meets Passivhaus European Standards
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PROJECT RENDERINGS.

TEAM PHOTO.
TECHSTYLE HAUS.
Passive House, Active Experience.
Connecting Everyone to Sustainable Living.

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COMPETITION PHOTOS.
Credit Kristen Pelou.
COMPETITION PHOTOS.

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