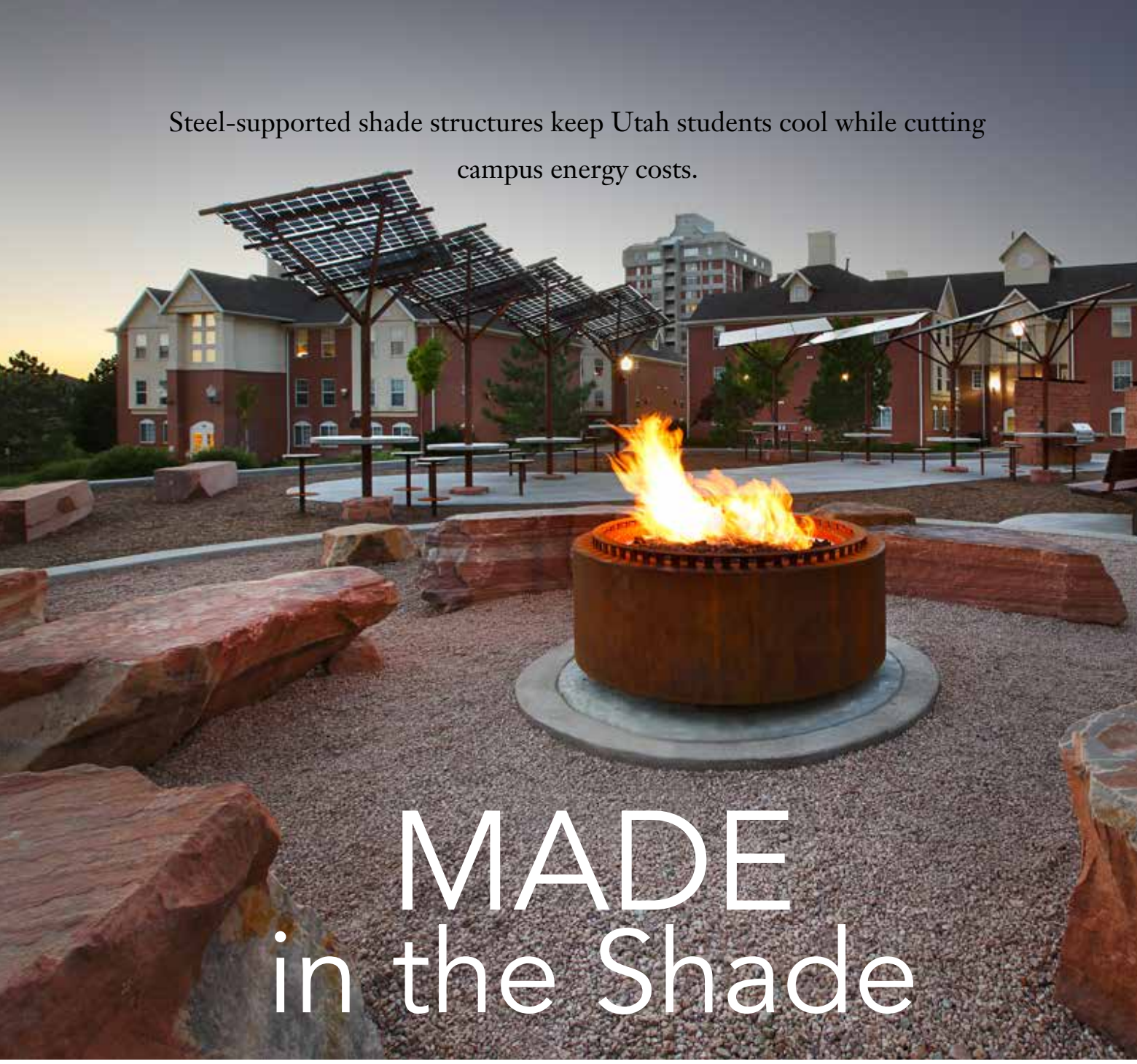
Steel-supported shade structures keep Utah students cool while cutting campus energy costs.



MADE in the Shade

BY TRACY STOCKING AND NATHAN MURRAY

THE UNIVERSITY OF UTAH'S Housing and Residential Education department has upped the green ante with its outdoor public spaces.

The Student Solar Plaza at the university's Shoreline Ridge Residential Community features a series of steel-supported bifacial solar panels that harvest solar power from both the top and bottom surfaces. Originally constructed as athlete housing during the 2002 Winter Olympics, the Shoreline Student apartments were repurposed for student housing.

Located on the university's campus, which sits at the eastern edge of Salt Lake City and at the base of the Wasatch Mountains, the plaza is composed of eight weathering steel "trees"—steel poles and "branches"—oriented in an ellipse and topped with three translucent bifacial photovoltaic (PV) panels; concrete tabletops are located at each tree, with the panels providing shade to students while simultaneously gathering sunlight. A kitchen tower with two gas grills and a weathering steel-clad fire pit surrounded by monolithic stone seating also highlight the communal space.

Inherently Sustainable

The project followed an underlying design premise of using basic, natural building materials that are inherently sustainable. This allowed TSA Architects to establish a palette of native Utah sandstone, concrete, Ipe wood and weathering steel. Each of these materials are deployed in their most basic natural state, eliminating the need for paint and ongoing maintenance while connecting the project to the surrounding environment.


Jim Fairchild, Fairchild-creative.com


Jim Fairchild, Fairchild-creative.com

The Shoreline Student apartments have been repurposed to student housing from their original use as housing for the 2002 Winter Olympics. The plaza features eight steel-supported bifacial solar panels that harvest solar power from both the top and bottom surfaces.


TSA Architects

The use of exposed weathering steel HSS (4-in.-diameter) enabled TSA and structural engineer BHB Engineering to create an abstraction of a tree. Not only do the trees serve as structural support for the tables and canopies, but they also act as conduit for the electrical wiring connected to the solar panels. The natural oxidized patina on the steel deepens after exposure to weather and remains maintenance-free and resists corrosive weather effects.

Incorporating the solar element into the structure, which was not originally part of the plan, allowed the trees to take on a more active role. In the original plan,

Tracy Stocking (**tracy@tsa-usa.com**) is president and **Nathan Murray** (**nmurray@tsa-usa.com**) is a design principal, both with TSA Architects.


TSA Architects

The panels are capable of generating about 9,000 kW of power each year. Gathered energy is available in outlets at the base of the structures, and unused energy is redirected back to the power grid.


TSA Architects

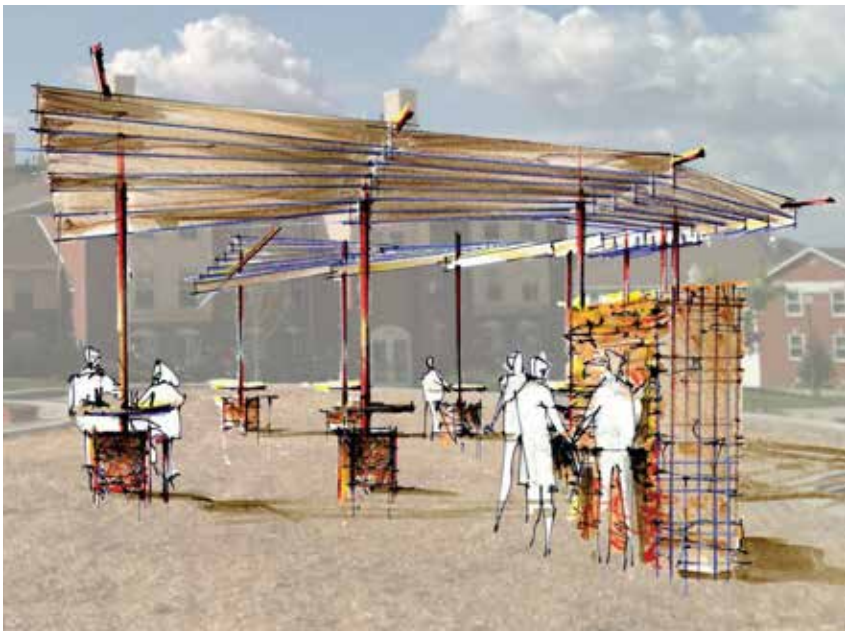
the general structure was the same, but the deflection limits were more stringent with the addition of the solar panels, and the purlin layout was modified to accommodate panel connection locations.

Energy gathered by the panels is available in outlets at the base of the structures for students to plug in laptops or equipment for outdoor cooking. Energy not used at the site is redirected back to the power grid and helps reduce the school's overall power bill. The project is capable of generating about 9,000 kW of power each year, promoting sustainability and demonstrating an immediately accessible use of solar power.

One of the biggest challenges the team anticipated was maintaining tight tolerances when building the trees, which were welded together on-site. As such, all of the trees were designed to be identical. However, they are oriented in an intentionally random arrangement to create a sense of natural variation. The entire plaza was 3D modeled using Revit, which facilitated precision between the steel support structures in maximizing solar orientation and shading from the canopies.

Another challenge was coordinating the attachment of the PV panels to the steel frames, and TSA shared the Revit model directly with the fabricator to ensure a higher level of accuracy for replication. The attachments were made by installing ¼-in.-


TSA Architects



The entire plaza was 3D modeled using Revit, which facilitated precision between the steel support structures in maximizing solar orientation and shading from the canopies.


Jim Fairchild, Fairchild-creative.com

thick tabs on the purlins at the locations dictated by the PV panel supplier, and then the panels were bolted to the tabs.

Completed in the fall of 2014, the plaza illustrates how to integrate bifacial photovoltaic (PV) solar panels with structural steel in an aesthetically pleasing way while simultaneously achieving increased technological awareness and demonstrating innovative use of existing and emerging technologies. The result is a harmonious fusion of green technology and materials. ■

Owner
University of Utah, Housing and Residential Education

General Contractor
Terra Engineering and Construction

Architect
TSA Architects

Structural Engineer
BHB Engineering