

BY ANDREW WORMER



The compact design has a 7.6-kilowatt solar array (1). Students prefabricated the wall and roof panels off-site (2), then assembled the shell on-site with the help of a set crew (3). The R-42 walls are insulated with natural wool batts (4). The CU team monitors the completed home's energy performance (5).

## A Practical Solar Home for a Cold Climate

**Both in distance** and in climate, it's a long way from the hot and humid National Mall in Washington, D.C., to Fraser, Colo., which takes some pride in being the coldest incorporated town in the lower 48 states. Perched at an elevation of 8,574 feet, a freeze has been recorded there on every date of the year. But as the crow flies, it's less than 30 miles from Fraser to Boulder, home of Colorado University, where back in 2017, students Gabriella Abello and Hannah Blake began assembling a team to compete in the U.S. Department of Energy's Solar Decathlon 2020 Build Challenge. They had just visited the 2017 event, held in Denver, and were inspired to design and build their own solar-powered model home to be assembled and displayed on the Mall during a future competition.

COVID-19 changed the trajectory of the Build Challenge, however. Instead of figuring out the logistics of transporting their projects to Washington, teams had to refocus their efforts on building in their own communities and measuring and monitoring for the competition there instead of on the Mall. Fortunately, during the Denver event, Abello and Blake had connected with a couple who owned land in Fraser and were interested in building a sustainable home. With a few modifications, the CU team's SPARC house—for Sustainability, Performance, Attainability, Resilience, and Community—would be a perfect fit for their site.

A rotating team of more than 30 students and faculty members worked on the project in the pre-fab facilities of Denver-based Simple Homes where construction began. There, the team learned about the panelization process as they assembled the R-42 wall panels and R-60 roof panels for the 1,176-square-foot, two-story home. After the panels were trucked up to the building site, the setting crew from Simple Homes, the homeowners, and the CU team spent a couple of days assembling the shell. After that, it was a race to complete the project by the competition deadline, with small groups of students commuting up the mountain to Fraser regularly (it's a two-hour drive) to work on the house alongside the homeowners and local trade partners, all while dealing with COVID-19 restrictions.

Housing costs are high in Fraser, so the home was designed with a 300-square-foot rental unit to help provide an affordable option for seasonal workers at the local ski resort. It's insulated with Havelock natural wool batts, powered by a 7.6-kilowatt grid-tied array, and heated with three cold-climate heat pumps. Along with cold and snow, Fraser also gets a lot of sun—over 300 days per year—so most of the time, the home is selling excess electricity back to the grid. Solar Decathlon judges were so impressed with the results that they awarded the CU team first place in three Build Challenge categories and first overall. —Andrew Wormer is executive editor of the JLC Group.

Photos courtesy: University of Colorado Boulder