

# University of Missouri-Rolla

The University of Missouri-Rolla is a three-time Solar Decathlon competitor, but the overriding goal every year has been the same: to focus on the public and present solar energy in a way that appeals to them. But the team also seeks to investigate something new each year and establish research opportunities for current and future students and faculty. A 12-foot folding glass wall brightens the main living space of this house—the entire wall can be opened so the interior spaces join up with the deck.

## What's Different?

- The front folding glass wall, a product from Solar Innovations, can completely open to 12 feet. This helps to make the living space even larger and allows for nature to be brought into the home.
- An HAI home automation system helps to monitor the major systems of the house and suggest energy-saving alternatives. This can be done via the easy-to-use touchscreens or through a secure Internet connection and any standard computer. The audio inputs are in place throughout the home and allow for audio devices (such as MP3 players, DVD players, and computers) to input sound directly into the system. The user can control the sound level and the selection of input devices in the living and dining rooms, bedroom, bathroom, and back deck.

## Architecture, Interior Comfort

- The design concept for this house is Modern Organic. The clean lines and minimalist concept dominate the exterior and are continued inside.
- The grey exterior panels are PaperStone Rainscreen and are made from 100% recycled paper and non-petroleum-based resins. These panels are very durable and require little maintenance.
- Overhangs surround the house exterior and allow for passive shading in the summer and heat gain in the winter. They will also conceal a rainwater collection system, which will be put in place once the house is returned to Rolla, Missouri.
- The front folding glass wall is a product from Solar Innovations and can completely open to 12 feet. This helps to make the living space even larger and allows for nature to be brought into the home. A second folding glass wall by Solar Innovations opens the bedroom to a private back deck and creates secondary ventilation through the entire house.
- A product called Choice Decking, used for the two decks, and is made from recycled plastics and sawdust.
- Lyptus wood, an engineered eucalyptus hardwood, is used for the flooring and cabinets. Cyprus, a fast-growing wood local to Missouri, is used for the major woodwork.
- The surround sound, lights, and window motors are all controlled through the HAI home automation system.
- The electronics closet contains the "brain" of the home automation and other electrical components such as the breaker box. The home automation system also contains a battery backup, so if there is a power outage, the system will still be able to perform major tasks.
- The kitchen cabinets are made from Lyptus wood and have a Paperstone countertop, which is a thicker version of the exterior panels.
- The bathroom features a floating vanity made from Lyptus wood and a Paperstone countertop. The dual-flush toilet helps to conserve water consumption, while the walk-in, tiled shower adds a feeling of luxury to the area.

## Heating and Cooling Systems

- The house is heated via radiant flooring, which is more efficient than a standard central hot air system. The water used in the system is initially heated through evacuated tubes on the south exterior wall.
- The mechanical closet contains the hot water tank and the Watts Radiant board. The Watts Radiant board is the distribution and control system for the radiant flooring and the hot water supply.

### **Lighting (including Daylighting)**

- The open floor plan with lots of windows allows for ample natural daylighting. Some of the upper windows also have window motors, which allow for natural ventilation within the main living space.

### **Appliances**

- All of the appliances are ENERGY STAR rated, which is a standard energy efficiency rating that is found on many of the appliances on the market.
- The appliances include an induction cooktop, which works through magnets and transfers heat directly to the pot or skillet. The convection oven/microwave saves on space and electricity, while the dishwasher, down draft, and refrigerator are also attractive and ENERGY STAR rated.
- The Asko washer/dryer combination saves on space and energy. It is able to wash and dry a load all in the same unit.

### **PV and Solar Thermal**

- The PV system is rated at 7.0 kW and comprises 40 BP 4175 panels. The maximum power point trackers enable the system to operate at peak power.
- An Outback inverter transfers the power produced by the PV modules to the battery bank or for immediate use in the house. The power production and consumption are maintained and monitored through the inverter box.
- The system will also keep track of the net metering, which will be put into place once the house is taken back to Rolla.
- The house is heated via radiant flooring, which is more efficient than a standard central hot air system; the water used in the system is initially heated through the evacuated tubes that are on the south exterior wall.

### **Budget**

- The total cost for the materials and transportation is estimated to be a little more than \$370,000, but the budget for the house itself is \$225,000.

### **Future Plans**

- The team plans to reconstruct the house on a permanent foundation in Rolla, Missouri, where it will be used for student housing and research.

### **Team Information**

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