

Lawrence Technological University

The members of Team ALOeTERRA from Lawrence Tech want to show how small changes in building and design practices can have a global impact. The team's mission is to educate the masses through a medium everyone can respond to—good design. The project was conceived within a philosophy of reduction, which can be seen throughout the design. However, balanced by thoughtful use of space and technology, the ALOeTERRA home does not sacrifice quality, or aesthetic "delight," for sustainability or power reduction. Aesthetics, technology, and sustainability coexist in harmony rather than as separate entities in conflict.

What's Different?

- The team chose the name ALOeTERRA because it evokes "aloe vera," the gel from the leaves of the aloe plant that soothe and heal. ALOeTERRA aims to help soothe and heal the Earth by promoting the use of renewable energy sources.
- The house exterior is a rainscreen system made from Skatelite, a product generally used for skateboarding ramps.
- A trellis supports the PV system and also serves as a canopy and shading device
- A solar chimney uses energy from the sun to naturally ventilate the house.

Architecture, Interior Comfort

- A trellis that supports the PV system also extends out from the roof over the deck, providing shade for the windows from the hot summer sun, while also acting as a canopy to provide enclosure for the outdoor living spaces.
- A flat roof on the north section of the house allows for natural daylighting through the northern clerestory windows to enter the spaces below.
- A structural insulated panel wall, roof, and floor system minimizes thermal losses.
- The house exterior is a rainscreen system made from Skatelite, a product generally used for skateboarding ramps. The team chose it because it is weatherproof, thin, lightweight, extremely durable, and made of paper—which is both renewable and sustainable. A rainscreen system is designed to redirect water away from a building's surface. The system is made up of an inner panel, a moisture barrier, a hollow space for ventilation, and an outer panel. Venting of the panels occurs at the top and the bottom, which creates an equalization of the outside and inside air pressures. This prevents water from entering into the hollow space between the durable outer material and the actual wall of the building.
- The home is finished with RHEINZINK, a natural titanium zinc material that protects the edges of the home from water and other weather-related damage. RHEINZINK is neither coated nor painted and is 100% recyclable.
- An exterior courtyard helps to elongate the house, creating the perception that the home is larger than its mere 620 square feet. The courtyard provides a natural circulation path through the home, from the more public living room to the more private bedroom.
- The deck is made of a composite material named Xtendex, a combination of rice hulls, an agricultural waste product, and polymer. This strong but lightweight material needs no treatment, is resistant to mold and mildew, and is not susceptible to rotting.
- The bathroom is a "wetroom," meaning that all surfaces in the bathroom can safely get wet. All walls are tiled and the floor is sloped toward the drain. The shower enclosure was eliminated to maximize the usability of the space while maintaining accessibility.

Heating and Cooling Systems

- An energy recovery ventilator provides all ventilation and exhaust needs for the home.
- A solar chimney uses energy from the sun to naturally ventilate a building. The solar chimney in the ALOeTERRA home is built into the structure of the house and ventilates through a skylight opening. When the sun heats the chimney, the air within the chimney warms and exits through the skylight. As the warm air leaves the chimney, cool air is drawn from below, creating a breezy updraft.
- A radiant floor system is optimized by placing the tubes where heat is needed the most, in the radiant

floorboards and bathroom "mud-bed." Water is heated by a Taco X-Pump Block, in which a counterflow heat exchange process takes place between the radiant water and potable hot water. Supply and return manifolds distribute the heated radiant water through a one-zone system consisting of four loops.

Lighting (including Daylighting)

- The placement of the clerestory windows lets natural northern light into the home and can be left open during summer months, allowing for natural ventilation and cooling through the home, while protecting from the rain.
- During summer months, it is important to decrease the amount of direct sunlight entering the home. Team ALOeTERRA used windows with electrochromic shading made by Sageglass, which are powered by independent PV panels. Electrochromic glass darkens to block the sun's rays when an electrical current runs through it.

Appliances

- The dishwasher uses less than 4 gallons of water and half as much detergent as typical dishwashers.
- The washing machine uses 50%–75% less detergent than most washers because of the low amount of water that it requires. The super quick wash cycle uses only 5.7 gallons of water and the quick wash cycle only 9.3 gallons.

PV and Solar Thermal

- The PV system features Kyocera modules and is rated at 7.2 kW.
- Three evacuated-tube collectors, consisting of 20 tubes each, capture radiation from the sun to satisfy the needs of both water heating and space heating. An electric tankless water heater provides heat to the water if it is below 110°F.

Communications

- The team hosted a demonstration booth at the Vans Warped Tour to help educate young people about renewable energy.
- Team members were featured guests at the Future City Competition sponsored by The Engineering Society of Detroit. They also hosted an informational booth at the 2007 Federal Facilities Environmental Workshop and volunteered their time to Habitat for Humanity.

Budget

- Project cost for the house was \$293,773; in-kind donation for the house was \$81,648.
- Total project cost was \$612,146; total in-kind donation was \$108,884.

Future Plans

- The City of Troy Chamber of Commerce has acquired the house and will donate it to the City of Troy. The house will be used as a sustainability education center for the city and the surrounding area with displays, educational courses, and outreach. A pretty good life and a continuation of the intentions of the project—the team is really excited about this. The team will also participate in a project that entails 2 years of monitoring.

Kid's Corner

- Team members have been surprised time and time again with the challenging questions that children present. They have discovered that children are often more familiar with the concepts of renewable energy and sustainable living than most adults.

Team Information

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