University of Missouri Extension

G1799, Reviewed October 1993

Solar-Heated New Technology House

C. Leroy Day and N. F. Meador
Department of Agricultural Engineering

In 1980, the College of Agriculture completed construction of a solar-heated home on a University farm near Columbia. It's called a New Technology House because it incorporates the latest technology available for home construction. The major emphasis is on energy conservation and solar heating.

To reduce the heating requirement, a compact (24 x 38 foot) two-story house plan was selected. About one-half of the lower floor is below ground level. This house is 100 percent usable because the lower level has an all-weather wood foundation with a wood floor. So it's possible to keep the lower floor just as comfortable and livable as the upper floor.

The house is insulated with 6-inch fiberglass insulation all around the lower level, 6-inch fiberglass insulation plus 3/4- inch expanded polystyrene sheathing on the walls of the upper floor, and 12 inches of insulation in the ceiling. Most of the windows are in the south wall and the window area is approximately 5 percent of the floor area. The windows selected were triple glazed for better insulation value. The average R value (resistance to heat flow) considering windows, doors, walls and roof is approximately 29.

Steps were taken to reduce the air infiltration to a minimum. Each of the outside doors except one leads to a protected area such as the porch, garage or greenhouse. The doors have a magnetic seal around the edge to reduce air infiltration. The casement windows have about one-tenth the infiltration of a high-quality, double-hung window. To reduce air infiltration even more, electric wiring on the outside wall was placed on the surface rather than cut into the wall.

The house has a 420 square foot solar collector in the attic. The heated air in the attic is circulated through the house or is forced through a rock bed below the house. This rock bed consists of approximately 30 tons of 2-inch rock for heat storage. The furnace fan pulls heated air out of the rock storage when it's needed to warm the house. If there is not enough heat stored in the rock, a heat pump and electrical resistance heating is available to back up the system. During the summer, the attic is ventilated to prevent heat buildup. At night, the fan in the attic can draw cool outside air into the house to cool the rock bed. During the day, air can be circulated through the rock bed to cool the house.

The waste treatment system for this house is a septic tank with a drainage field. Because the clay subsoil at the site is impermeable, an experimental, mounded drainage field was used. This system spreads the effluent evenly over the base of the mound rather than discharging it into trenches. The objective is to improve effluent intake by spreading it over a larger area.

The actual cost of energy from Boone Electric Cooperative (based on 1985 rates) ranged from 5.35 to 6.08 cents per kilowatt hour, depending upon the amount of energy used. At 6 cents per kilowatt hour, the average cost of electrical energy during the entire cooling season was $156 and for the entire heating season the cost was $198.

As a matter of interest, several other appliances were metered during a three-year period. The average monthly energy use is shown below.

Appliance	Average kilowatt hour per month
Water heater	402
Range	54
Clothes dryer	139
Refrigerator	148

Plans for the New Technology House are available from your local MU Extension center.

Related MU Extension publications

- G1972, Saving Energy With Passive Systems
  http://extension.missouri.edu/p/G1972

Order publications online at http://extension.missouri.edu/explore/shop/ or call toll-free 800-292-0969.

UNIVERSITY OF MISSOURI Extension

■ Issued in furtherance of the Cooperative Extension Work Acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Director, Cooperative Extension, University of Missouri, Columbia, MO 65211
■ an equal opportunity/ADA institution ■ 573-882-7216 ■ extension.missouri.edu