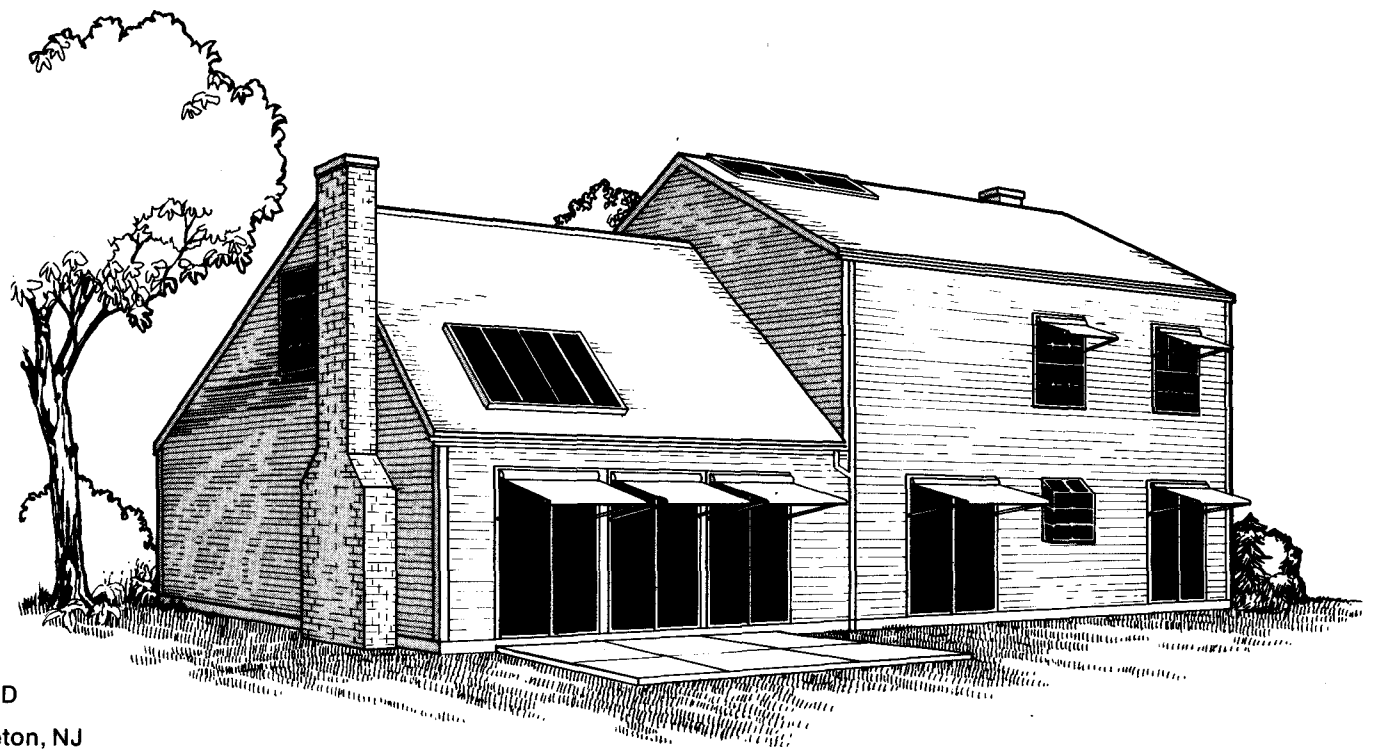


St. Charles, MD



Builder: St. Charles Homes, St. Charles, MD

Designer: Princeton Energy Group, Princeton, NJ

Solar Designer: Princeton Energy Group

Price: \$80,000

Net Heated Area: 2098 ft²

Heat Load: 46.1 x 10⁶ BTU/yr

Degree Days: 4224

Solar Fraction: 71%

Auxiliary Heat: 0.95 BTU/DD/ft²

Passive Heating System(s): Direct gain

Recognition Factors: Collector(s): South-facing windows, south-facing skylight, 260 ft²

Absorber(s): Quarry tile floor **Storage:** Concrete floor slab—**capacity:** 7830 BTU/°F **Distribution:** Radiation, natural and forced convection **Controls:** Insulating curtains, roll-down awnings, operable skylight shutter

Back-up: 26,500 BTU/H electric air-to-air heat pump

Domestic Hot Water: Active 75 ft² liquid collectors, 80-gallon steel storage tank

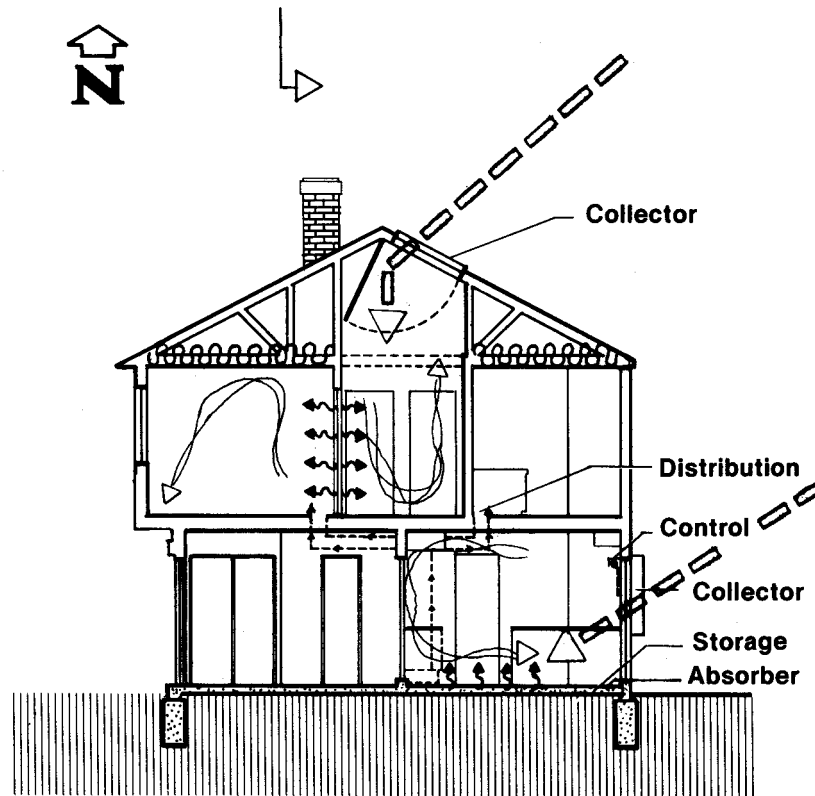
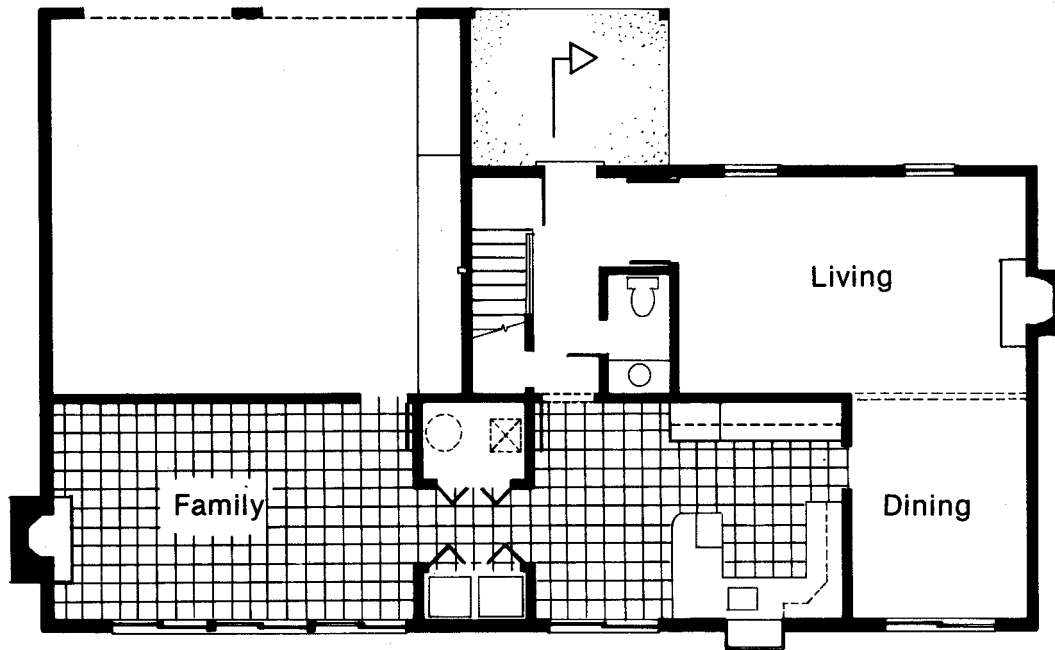
Passive Cooling Type: Earth tubes, induced ventilation

St. Charles is a new planned community in southern Maryland. In order to enhance market acceptance of passive houses, the builder chose the best selling model home design for modification with passive solar heating and cooling features. Also included are active solar panels to heat domestic water. The rectangular house has been located so that its long dimension runs from east to west. Its basic wall construction is 2- x 6-inch wood studs with full fiberglass batt insulation, 1/2-inch insulating sheathing, and aluminum siding (R-22). In the roof trusses, 6-inch batts are installed with an additional 6 inches of cellulose blown in over them (R-43).

All windows are double glazed and are complemented by roll-down insulating curtains (R-15) to further cut heat loss at night.

Few of the windows are on the east or west elevations, and the amount of south-facing glazing was increased to 260 square feet. This glazing includes five sliding doors, one each to the kitchen and dining room and three to the family room, and a sun garden window in the kitchen. All south windows have exterior roll-down awnings to block the rays of high altitude summer sun.

With all awnings and south-facing insulating shades raised, solar energy is **collected** through the south-facing windows for daytime heating on cold weather days. Some of the energy warms the rooms immediately, while the rest is **absorbed** by the tile flooring for **storage** in the floor slab that is 6 inches thick for the entire southern half of the house. A skylight of double-layer acrylic located over the stairwell also **collects** solar



heat for the stairwell and the upstairs gallery.

Convection induced by the heated rooms **distributes** warmth to spaces without direct access to sunlight. In addition, heated air from the kitchen, dining room, and family room on the first floor is **distributed** to the balance of the house through the ducts of the back-upheating system by a blower that pulls air in from those rooms. At night, with all shades drawn, heat radiates from the thickened floor slab, inducing convection to further heat the spaces. The insulating curtains on all windows **control** the loss of heat at night. The skylight is equipped with a moveable shutter (R-6) that also helps to **control** heat loss.

Awnings are extended in summer to reduce heat gain, and the skylight is opened to provide natural exhaust for hot air. The cooling system consists of eight 50-foot sections of drainage pipe located 4 feet below grade with a common inlet on the south side of the house which receives prevailing summer breezes. Air entering the system is cooled by the earth before it enters the house and, along with natural ventilation, keeps the house comfortable.

This plan is from the book
"Passive Solar Homes - 91 new award-winning, energy-conserving single-family homes",
The U.S. Department of Housing and Urban Development, **1982**

The solar homes designs in this book were the winners of HUD's fifth (and final) cycle of demonstration solar homes. The 91 winning home plans in the book were selected from 550 applications from builders.

This was a time of great interest and activity in the passive solar home designs - many of the winning homes show a level of innovation not found in most of today's passive solar designs.

www.BuildItSolar.com

