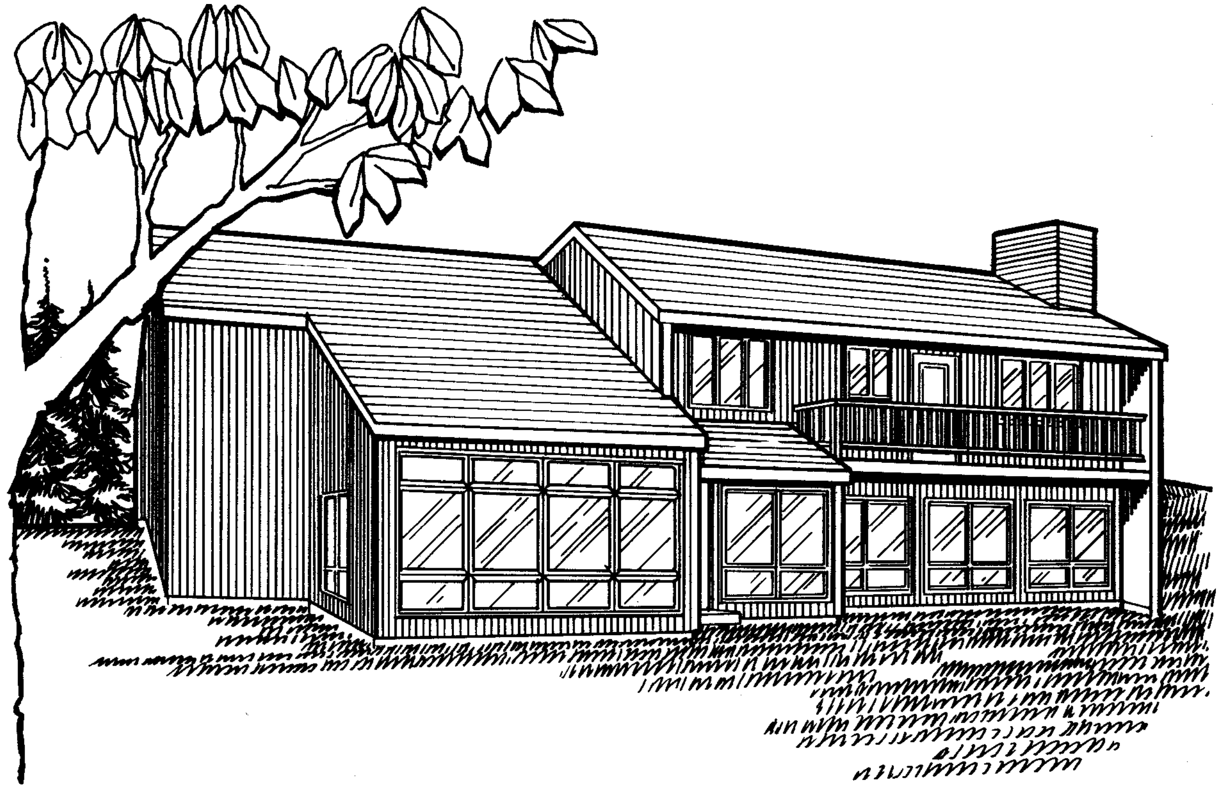
Sioux Falls, SD



Builder: Dick Sorum Construction, Renner, SD

Designer: The Spitznagel Partners, Inc., Sioux Falls, SD

Price: $100,000

Net Heated Area: 2074 ft²

Heat Load: 125.7 x 10⁶ BTU/yr

Degree Days: 7839

Solar Fraction: 33%

Auxiliary Heat: 5.12 BTU/DD/ft²

Passive Heating System(s): Isolated gain, direct gain

Recognition Factors: Collector(s): Greenhouse glazing, south-facing double glazing, 364 ft² **Absorber(s):** Water storage tank surface, concrete slab floors, masonry wall **Storage:** Water storage tank, concrete slab floors, masonry wall —**capacity:** 16,028 BTU/°F **Distribution:** Radiation, natural and forced convection **Controls:** Vents, dampers, roll-down insulating curtain and shades, greenhouse overhang

Back-up: Gas forced-air heating system

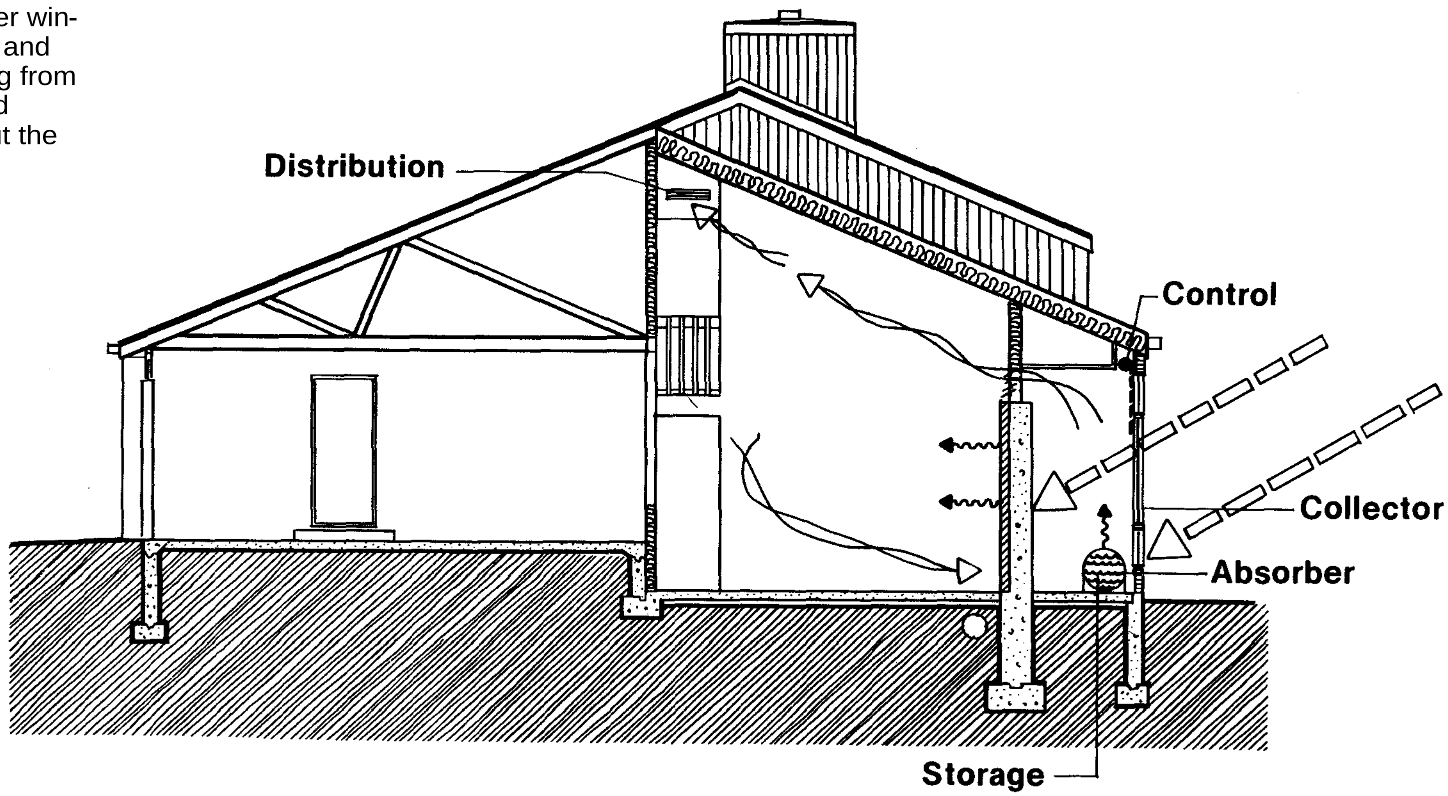
This split-level, 3-bedroom passive solar design in South Dakota is a modification of a conventional home with high market appeal. The house is built into a south-facing slope that provides earth berming for the lower level. A windbreak wall on the north, an airlock entry, high activity areas zoned to the south, and insulation R-values of 31 in walls and 40 in ceilings are additional energy-conservation features. All windows are double or triple glazed and have moveable insulation.

A south-facing greenhouse is the first solar **collection** area. During the day, heat is **absorbed** and **stored** in a water storage tank, in the concrete slab floor, and in a dark masonry wall faced with brick on the living room side. The masonry wall has floor and ceiling air vents and the high vents are equipped with backdraft dampers. As the house begins to cool in the evening, the storage walls and floor **distribute** radiant heat into the greenhouse and living room. Circulation between the two rooms is by natural convection. When temperatures at the cathedral ceiling of the living room are high enough, a thermostat activates the low-speed blower of the back-up forced air heating system, and solar-heated air is **distributed** throughout the house via the conventional furnace ductwork and vents. Air is returned to the greenhouse through the lower thermo circulation vents in the masonry wall.

At night, heat loss from the greenhouse is **controlled** by closing an automatic rolldown insulating curtain.

The second **collector** is the double-glazed, south-facing windows in the kitchen and family room. Heat is **absorbed** in the quarry tile floor and **stored** in the 6-inch concrete slab, which later radiates it back into the rooms for **distribution.** Because of the open floor plan, solar heat collected and stored in the kitchen and family room circulates through the lower level and through the upper level when bedroom doors are open. Windows in these rooms are protected from heat loss by manually operated insulating shades.

During the summer, the greenhouse is ventilated by operable upper and lower windows; overhangs, insulating curtains, and shades protect all south-facing glazing from heat gain. Cross-ventilation is induced when windows are opened throughout the house



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.

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