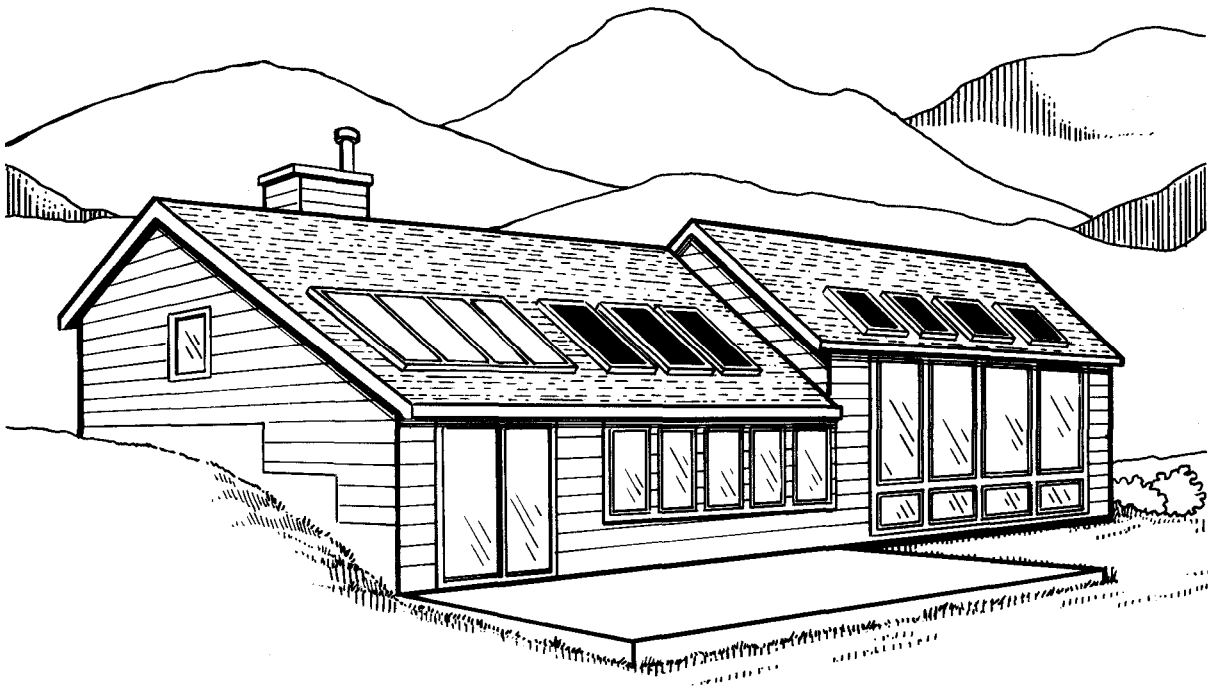
# Bozeman, MT



**Builder:** Mountain Home Builders, Gallatin Gateway, MT

**Designer:** Solar Design and Consulting, Eugene, OR

**Solar Designer:** Robert M. Lorenzen

**Price:** $69,000

**Net Heated Area:** 1240 ft²

**Heat Load:** 96.9 x 10⁶ BTU/yr

**Degree Days:** 8126

**Solar Fraction:** 64%

**Auxiliary Heat:** 6.53 BTU/DD/ft²

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

**Recognition Factors: Collector(s):** Greenhouse glazing, skylights, 279 ft² **Absorber(s):** Mass wall and slab floor, tile floor **Storage:** Slab floors, mass walls—**capacity:** 13,888 BTU/°F **Distribution:** Natural and forced convection, radiation **Controls:** Fixed overhangs, earth berms, shades

**Back-up:** Woodburning stove and electric baseboard heaters

**Domestic Hot Water:** Single-tank thermosiphon system, 82-gallon storage

This ranch-style house is built into a south slope with half of its 2-story north wall earth-bermed for protection against the severe Montana winters. To protect the home from strong prevailing southwest winter winds, the south roof has been steeply pitched both to offer deflection and to reduce the amount of exposed wall area. A 2-car garage on the north wall acts as a buffer zone for the upper-floor entryway. R-38 insulation in the roof and R-19 in exposed walls together with extensive caulking around doors and windows ensure a tight, energy-conserving building.

Sunlight is **collected** along the south wall and roof by means of a combination of floor-to-ceiling windows and skylights that form a greenhouse; and windows, skylights and sliding glass doors that admit direct radiation to the living room and dining area. All windows are double glazed. An array of active flat-plate solar collectors for domestic water heating is offered to buyers as an option.

Sunlight collected in the greenhouse is **absorbed** and **stored** by a 4-inch concrete floor slab and a 12-inch, 2-story concrete wall that separates the greenhouse from the first- and second-floor bedrooms. In the living room, an 8-inch concrete wall **absorbs** and **stores** neat, and both the living room and dining area have a tile-covered, 4-inch concrete floor slab.

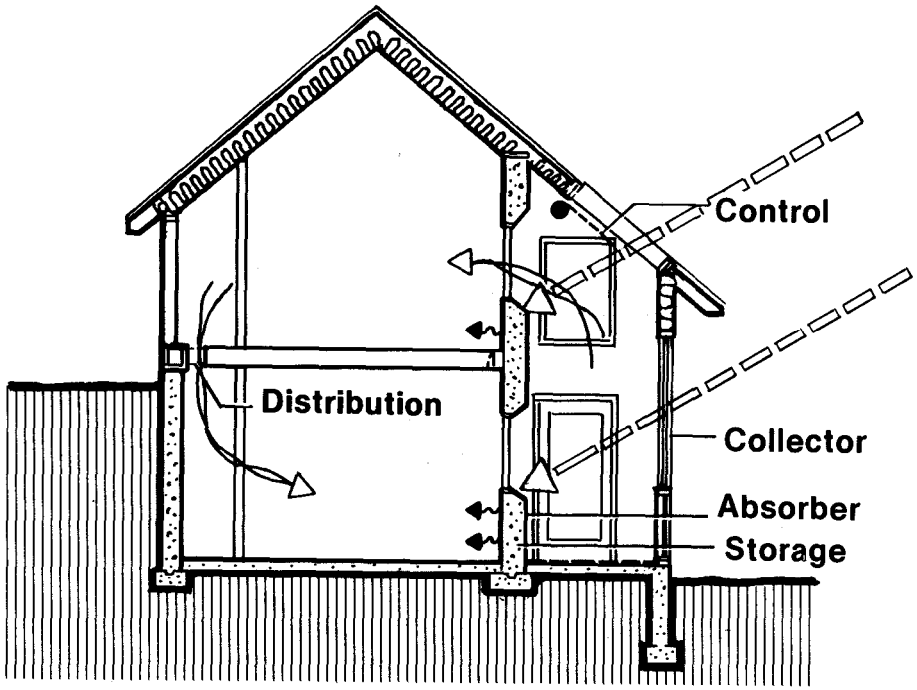
**Distribution** of heat is accomplished by radiation from storage masses as well as by natural convection which moves warm air to areas not receiving direct sunlight, such as the east bedroom, the bathrooms, and the utility room. Warm air from the greenhouse, as it rises, enters the second-story master bedroom through opened windows. Open

doors and north wall vents allow this air to pass to the lower level as it cools and falls. The air is then drawn back into the greenhouse through open first-story bedroom windows for reheating.

The living room is two stories high with an open hallway on the second floor. Warm air from the living room storage masses rises and passes over this hallway, eventually circulating down the rear stairwell as it reaches the cooler north wall areas. Once downstairs, the air is drawn back into the living room for reheating.

At night windows and doors to the greenhouse are closed to **control** heat loss from the house through its glass. The house's back-up electric baseboard heaters and woodburning stove will supplement the solar heat except during moderate weather. The stove has been placed against the north wall of the living room and, like heat from the baseboard heaters, relies on direct radiation and natural convection for distribution.

Protection from overheating in the summer was a minor consideration due to the cool climate. However, shades are placed on the three living room skylights, and a roof overhang protects the south wall windows from the high summer sun.



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