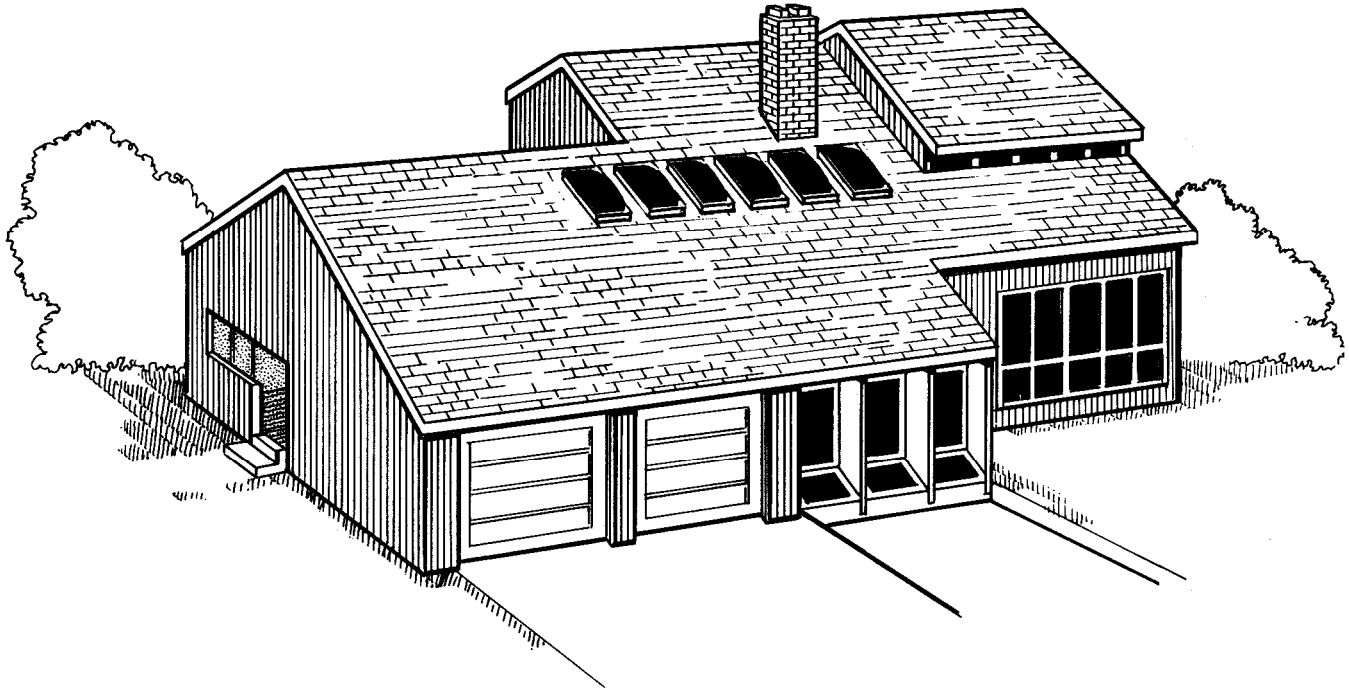
Cheyenne, WY



Builder: Edeen Construction, Cheyenne, WY

Designer: Larry W. Rosentreter, Cheyenne, WY

Solar Designer: Larry Rosentreter

Price: $100,000 to $120,000

Net Heated Area: 3386 ft²

Heat Load: 143.9 x 10⁶ BTU/yr

Degree Days: 7381

Solar Fraction: 44%

Auxiliary Heat: 3.22 BTU/DD/ft²

Passive Heating System(s): Sun-tempering, direct gain, isolated gain

Recognition Factors: Collector(s): South-facing glazing, greenhouse glazing, skylights, 400 ft² **Absorber(s):** Brick pavers over concrete floor, brick walls **Storage:** Brick walls, concrete floor—**capacity:** 9723 BTU/°F **Distribution:** Radiation, natural and forced convection **Controls:** Solarium ducts, insulated window quilts, window shades

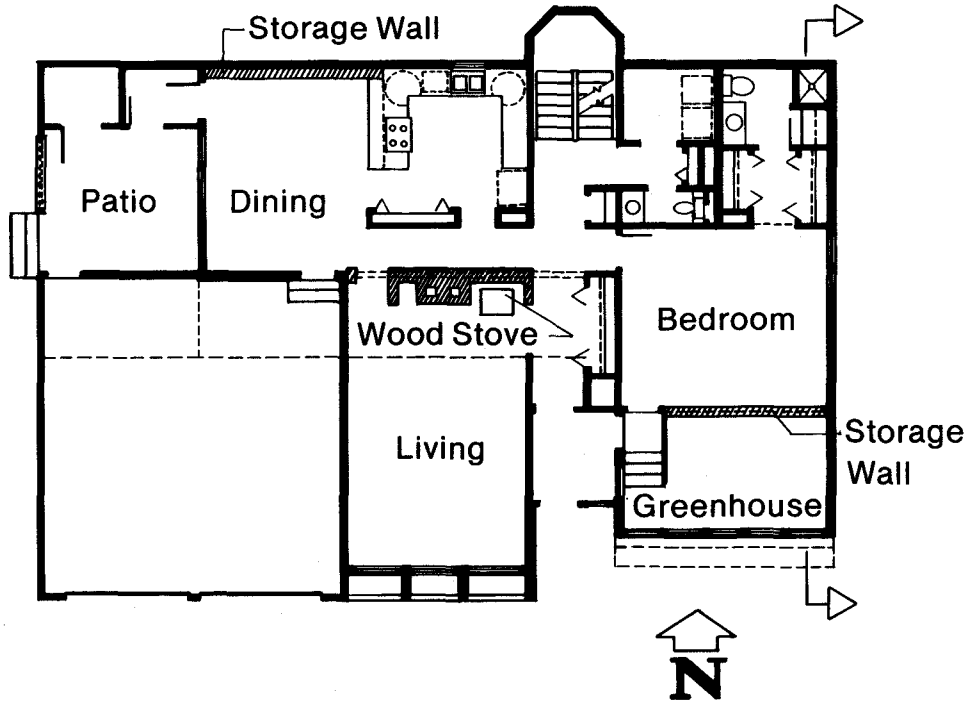
Back-up: Gas furnace (88,000 BTU/H) with electric-powered blower

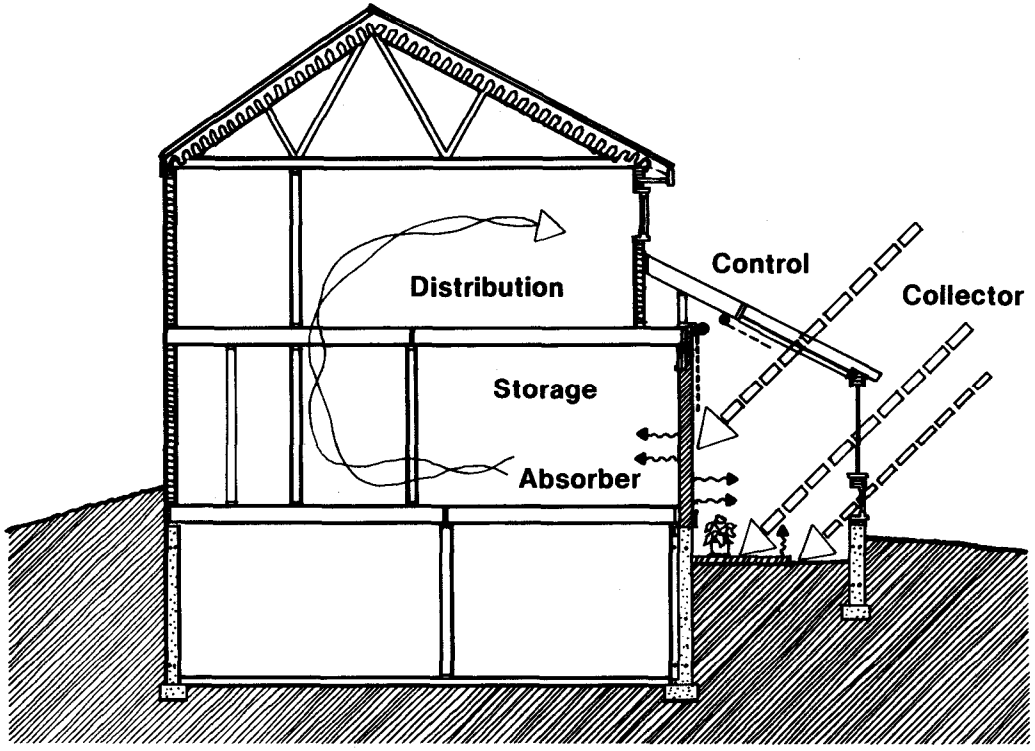
This design for a 2-story, 3-bedroom home with stained board-and-bat exterior is a prototype for a moderately priced, conventional passive solar house in Wyoming, where the few existing solar homes are expensive custom designs. Energy-conserving features include R-19 fiberglass insulation in the walls and R-30 insulation in the roof, insulated windows with storm sashes and slim-shade shutters, and moveable insulation on all south-facing windows and skylights. Both exterior entries have airlock vestibules, and the garage is located on the west to protect against prevailing winter winds. Openings on non-south walls have been minimized as further protection against winter infiltration. The solar design incorporates a variety of passive systems including a greenhouse and three glazed masonry walls.

Solar heat is collected through the south-facing glazing of the greenhouse and then absorbed and stored in the masonry wall and floor. When the house thermostat calls for heat, and, if air at the greenhouse ceiling is warm enough, a motorized damper automatically opens. The heated air is pulled into ceiling-level return grilles and then ducted into the blower unit of the back-up heating system for distribution throughout the house.

If the greenhouse ceiling temperature is no high enough when the house needs heat, a second motorized damper in the greenhouse by-pass duct closes, and only return air from the house is circulated. If the temperature of. the return air is less than 70 F, and there is inadequate heat in the greenhouse, the standby gas-burning furnace is activated. At night, insulating window quilt shades are drawn in front of the greenhouse mass wall to control heat loss and the greenhouse itself becomes a buffer zone for the storage wall.

In another passive system, solar heat is collected through six double plexiglass skylights located along the east-west axis





of the roof. The heat is **absorbed** and **stored** in the dining room masonry wall and floor, and in another masonry wall that separates the living room and kitchen on the first story, and a bedroom and balcony on the second story. This wall is also charged with heat from the living room wood stove. On fall and winter evenings, stored heat is **distributed** as it radiates into living and sleeping areas on both levels.

The second-story hallway and landing, the living room, and an unfinished basement room also receive direct sunlight, but there are no storage elements in these areas.

Summer cooling needs are minimal in the Wyoming climate. The collection and storage elements are protected from solar gain by roll-down and insulating shades and overhangs. During summer nights, shades are opened, allowing heat to escape to the outside. Windows are opened to permit cross-ventilation, and exhaust fans ventilate the greenhouse and dining room. A "summer" setting on the greenhouse motorized dampers allows them to be closed for the season, isolating the greenhouse from the forced-air distribution system. When the furnace blower is activated, cool night air is drawn in through a positive seal damper on the north wall, and is distributed 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.

www.BuildItSolar.com