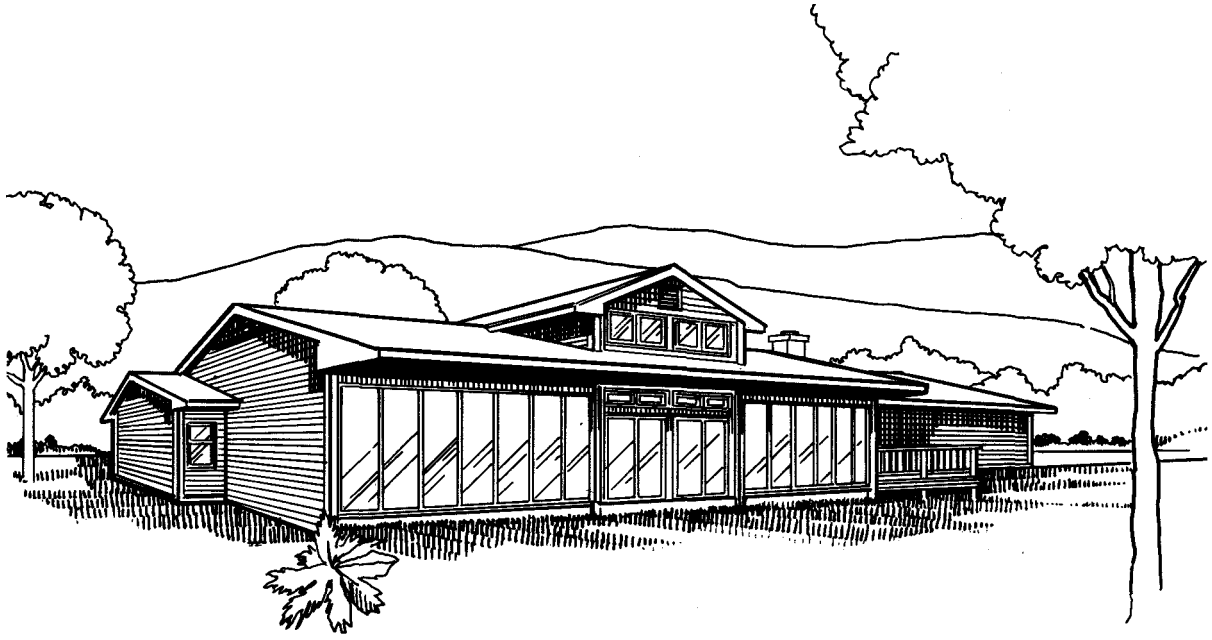
Raleigh, NC



Builder: Wood Builders, Inc.

Designer: Donald Barnes, AIA, Architect, Raleigh, NC

Solar Designer: Donald Barnes, AIA, Architect, Raleigh, NC

Price: $85,000

Net Heated Area: 1700 ft²

Heat Load: 36.5 x 10⁶ BTU/yr

Degree Days: 3393

Solar Fraction: 59%

Auxiliary Heat: 2.66 BTU/DD/ft²

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

Recognition Factors: Collector(s): Glass and plastic glazed panels, south-facing windows, double-glazed sliding doors, clerestory windows, 354 ft² **Absorber(s):** Quarry tile pavers, concrete tribution, natural and forced convection **Controls:** Fixed overhangs, roll-down insulating quilts, slab floor **Storage:** Concrete mass slab floor— **capacity:** 15,444 BTU/°F **Distribution:** Radiant dis- thermostat

Back-up: Woodburning stove and electric resistance heaters

Passive Cooling Type: Natural and induced ventilation

This traditional ranch-style home has its north side facing the street, which makes its appearance similar to other homes in the subdivision. The site slopes gently to the south and has no significant obstruction of its solar access.

Solar **collection** occurs on the south side of the building through two pairs of sliding glass doors and the clerestory windows of an atrium, and at eleven glass and plastic glazed panels divided (six and five) between two **collection** walls in the master bedroom and great room.

Heat is **absorbed** in the atrium and the hallway behind it by 1/2-inchquarry tile pavers, and **stored** by the 4-inch concrete slab beneath. In the collection wall **absorption** occurs in the black-enameled corrugated aluminum set within the space between the glazing and the interior wall. Heated air from this space is **distributed** in the following manner: as it rises to the top of the wall, it is pulled through a duct by a fan to the bottom portion of a double plenum. This plenum runs along the bottom of the wall; from here the heated air is fed into every other core of double-core block positioned to form a concrete duct all the way back to the north wall. The hot air travels down one core of the block to the north wall, where a distribution duct directs its flow back down the other core, where it flows back into the collection space of the wall to be reheated and redistributed in the same manner. The fan is thermostatically set to cut out if the temperature of the absorber wall drops below a set point.

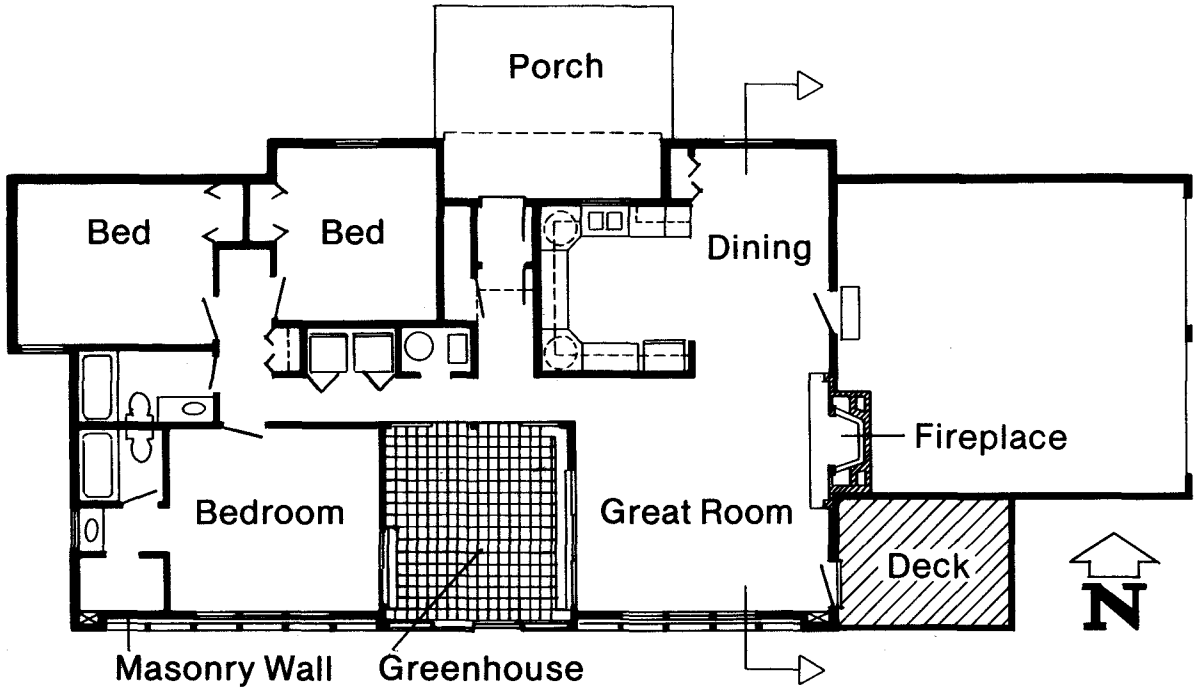
Meanwhile, the solar air that has passed through the floor has had its heat **absorbed** by the block and the 4-inch concrete slab laid over the block, causing it to radiate in a **controlled** manner up into the living areas. Additional heat is available from the atrium if all interior doors to that area are left open

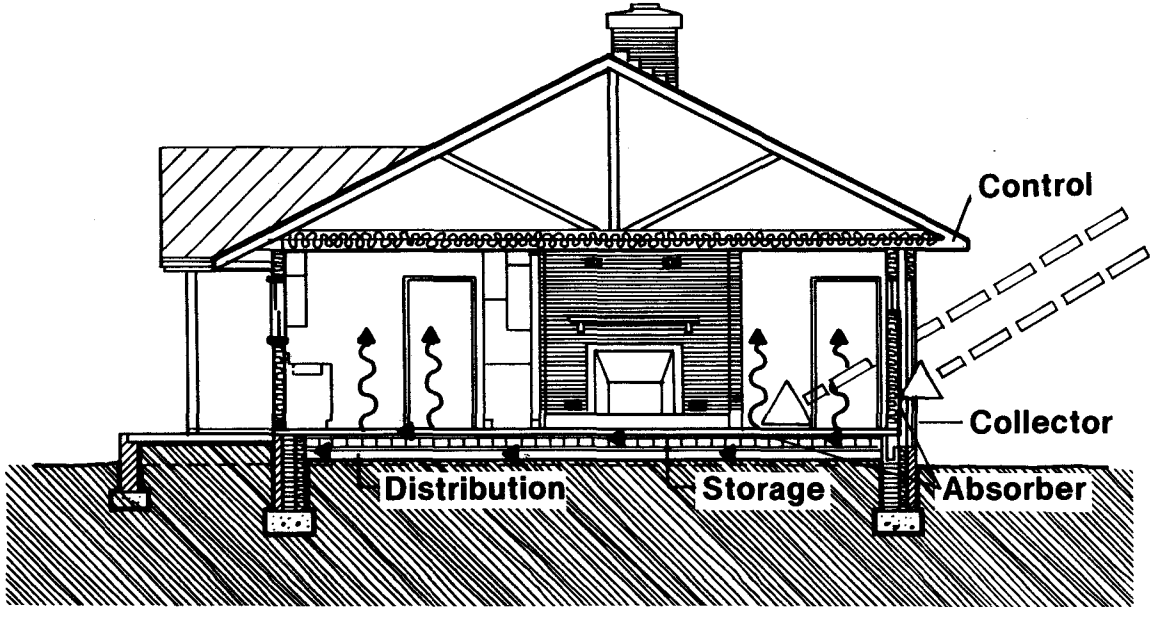
and the ceiling fan is turned on; this arrangement will cause hot atrium air to be **distributed** to the inner living areas. Heat loss is controlled with manually operated roll-down window quilts on all windows.

Back-up heat is available from a heatilator fireplace in the great room-drawing its combustion air from the outside-and electric resistance strips in the air conditioning/heating unit. This unit's duct system runs through the attic and reaches all rooms including the atrium.

In the summer mode, manually operated dampers in the collection wall/duct system are switched so that hot air at the top of the wall is exhausted outside by a separate duct fan. But the heating duct fan is also used on summer nights to draw cool air in and circulate it through the block and concrete slab floor. This will help keep the house cool during the next day. Heat gain is **controlled** in summer by fixed overhangs on all south-facing glass, and by an exhaust fan in the atrium. If windows in all rooms are left open, as well as interior atrium glass doors, this fan can change air in the house at the rate of once every six minutes. For peak cooling needs there is central air conditioning.

The insulation values for the house are R-30 for the roof and R-23in the walls. All windows and glass doors are double glazed, and all entries are through air-lock vestibules.





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 ofHUD'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.