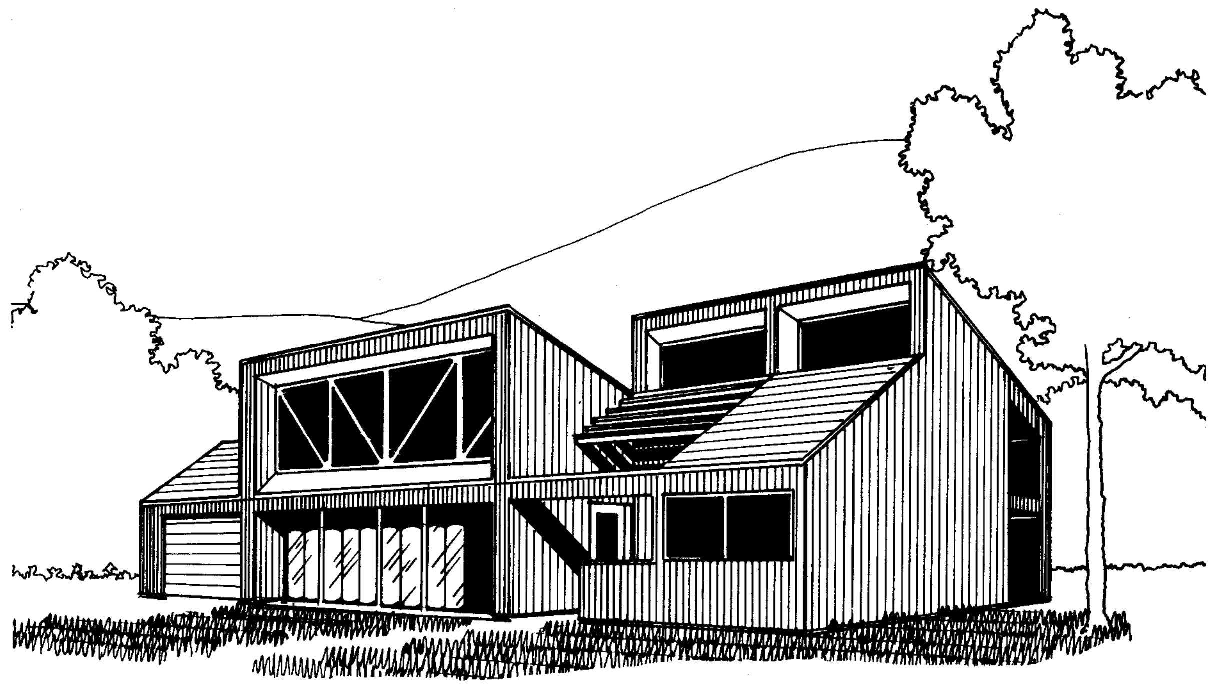
Lincoln, NE



Builder: Peterson Construction Company, Lincoln, NE

Designer: The Clark Enersen Partners, Lincoln, NE

Solar Designer: The Clark Enersen Partners

Price: $75,000

Net Heated Area: 2487 ft^2

Heat Load: 81.3 x 10^6 BTU/yr

Degree Days: 5864

Solar Fraction: 73%

Auxiliary Heat: 1.50 BTU/DD/ft^2

Passive Heating System(s): Direct gain

Recognition Factors: Collector(s): South-facing glass, 426 ft^2 **Absorber(s):** Water-filled thermal storage tubes, mass floors and walls **Storage:** Brick and concrete thermal walls and floors, water-filled thermal storage tubes—**capacity:** 22,869 BTU/°F **Distribution:** Radiation and natural convection **Controls:** Automatic and manual moveable insulation, overhangs, and awnings

Back-up: 40,000 BTU/H gas furnace

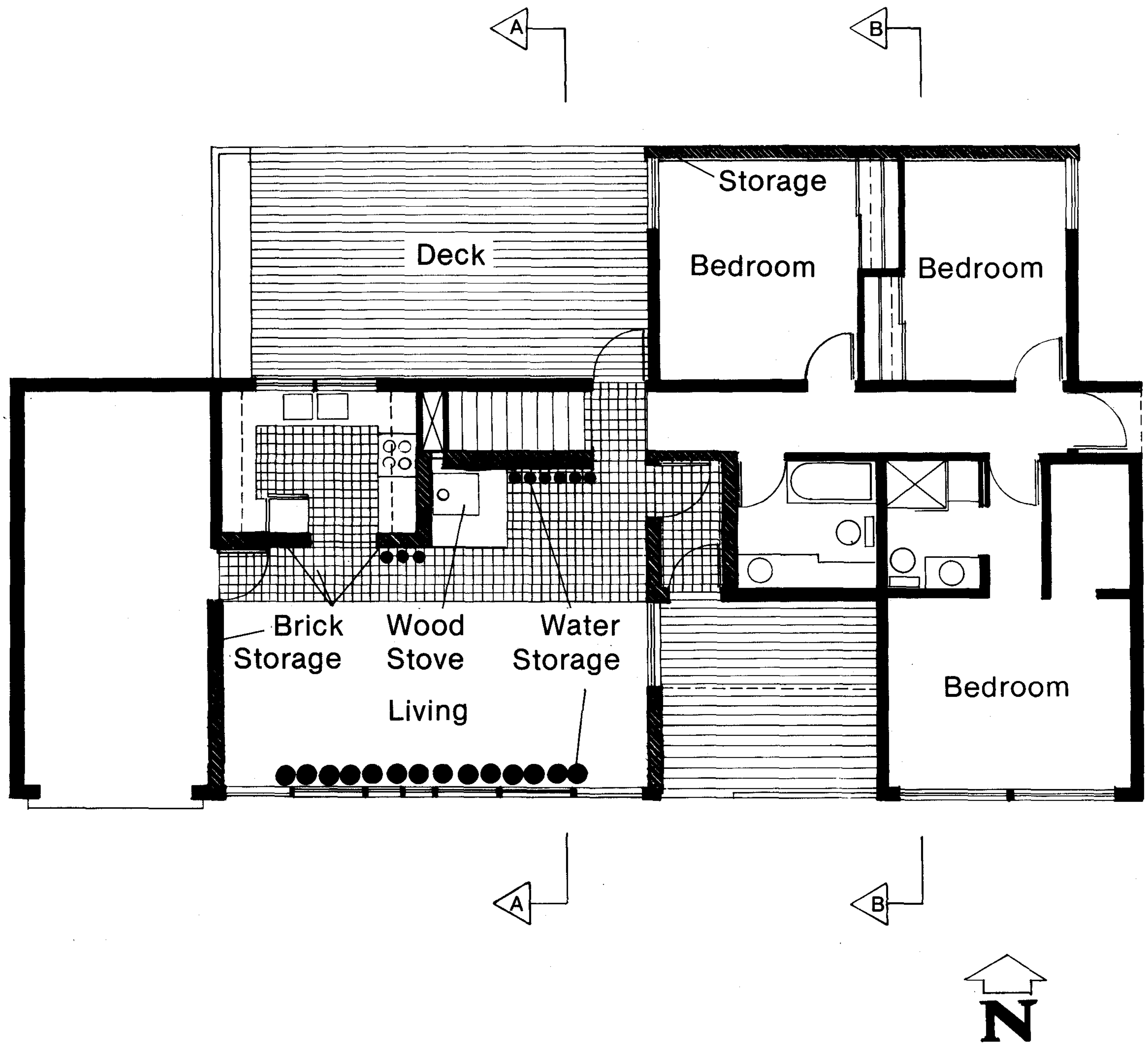
Evergreen trees to the northwest protect this Lincoln, NE home from harsh winter winds, and the garage and storage areas on the west side of the house provide additional buffers. To cut winter heat loss, windows have been kept to a minimum on north, east, and west sides of the house. Walls are insulated to R-20, the roof to R-33.

Passive solar elements have been integrated into every major room of this 1-story house. South-facing windows **collect** direct sunlight for the front living areas. Heat is **absorbed** and **stored** in the living room by 5-foot high 1 1/2 foot diameter water-filled tubes placed immediately inside the south facing glass and by brick walls and floors. Spaces between these water tubes allow solar radiation to reach the 8-inch brick storage wall on the north, east, and west living room walls. Kalwall glazed clerestory windows channel sunlight to additional water-filled heat **storage** tubes along the living room's north wall.

Solar heat stored in the brick walls and water tubes is **distributed** into the room by radiation and natural convection.

A wood burning stove by the north living room wall is used for back-up heat. The nearby water tubes will also absorb excess heat from the wood stove.

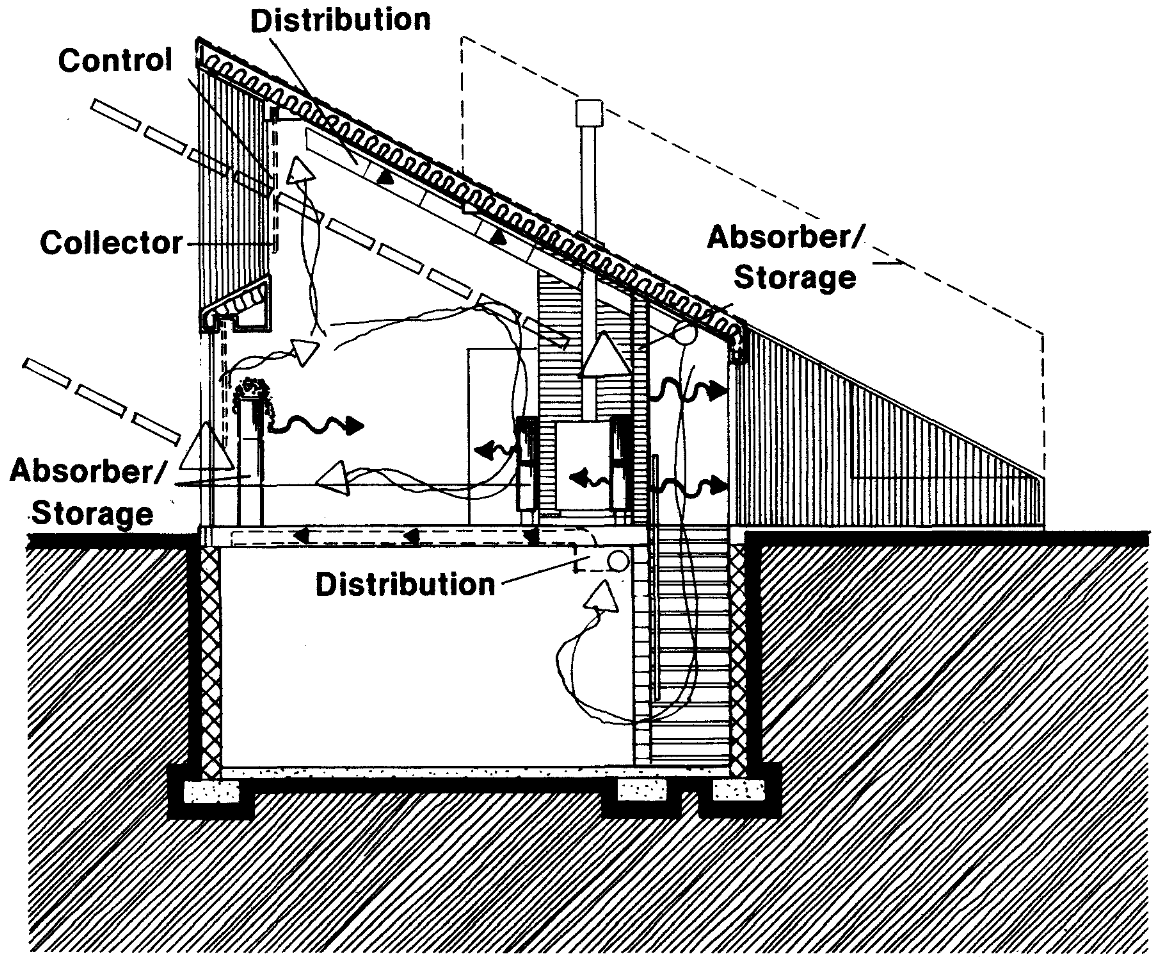
Two Kalwall clerestory windows channel sunlight to the back bedrooms. This design is one of the few methods that permits sunlight to penetrate directly to rooms on the north side of a building. The angle of the clerestory shafts enables sunlight to reach the bedrooms in the winter but blocks it during the summer.


A
B
Storage
Deck
Bedroom
Bedroom
Brick Storage
Wood Stove
Water Storage
Living
Bedroom
A
B
N

Brick walls and concrete floors in the bedrooms also serve as storage mass for solar heat. Light **collected** by the clerestory shafts strikes the north walls, is **absorbed** at the surface and **stored** in the walls' mass. The heat is **distributed** by radiation from the brick walls and by natural convection.

A vestibule located between the living room and front bedroom is both an air-lock entry and a heat collection area with brick thermal storage walls on the east, west, and north sides. The greenhouse shares one common wall with the living room, front bedroom, and bathroom, and provides heat to these areas.

The auxiliary distribution system gives a mechanical assist to the natural **distribution** processes of convection and radiation. Stratified air is returned from the ceiling of the east living room wall to the furnace. In winter, solar energy preheats the air returning to the furnace before distribution to the other rooms.

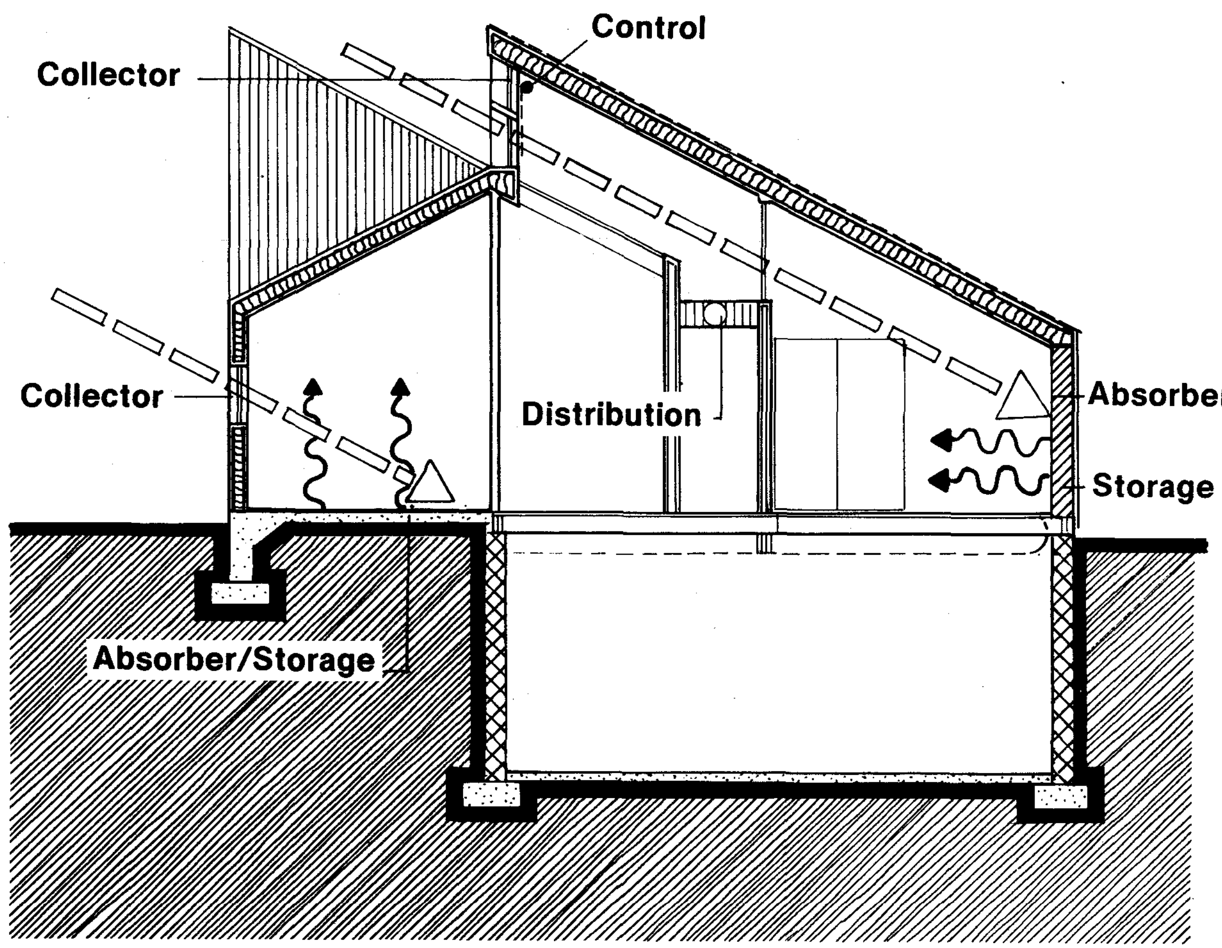


A-A

In the return air system, damper positions are reversed between seasons to draw conditioned air from different sides of the house. In the summer, return air is drawn through perimeter floor registers in the cool north end of the house and recirculated. In the winter, return air comes from the warm south rooms.

Moveable insulation for the living room glazing and the clerestory is automatically controlled. During the winter it will open in the day and close at night. This is reversed in summer. All other windows have manually operated awnings. During spring and fall, the moveable insulation can be manually positioned to control solar gain when necessary. Insulated glass on the south wall is operable to allow summer ventilation across the living space.

Southeast deciduous trees channel summer breezes for cooling and provide some summer shade. Vents in the south wall take advantage of the prevailing southeast summer winds.



B-B

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.