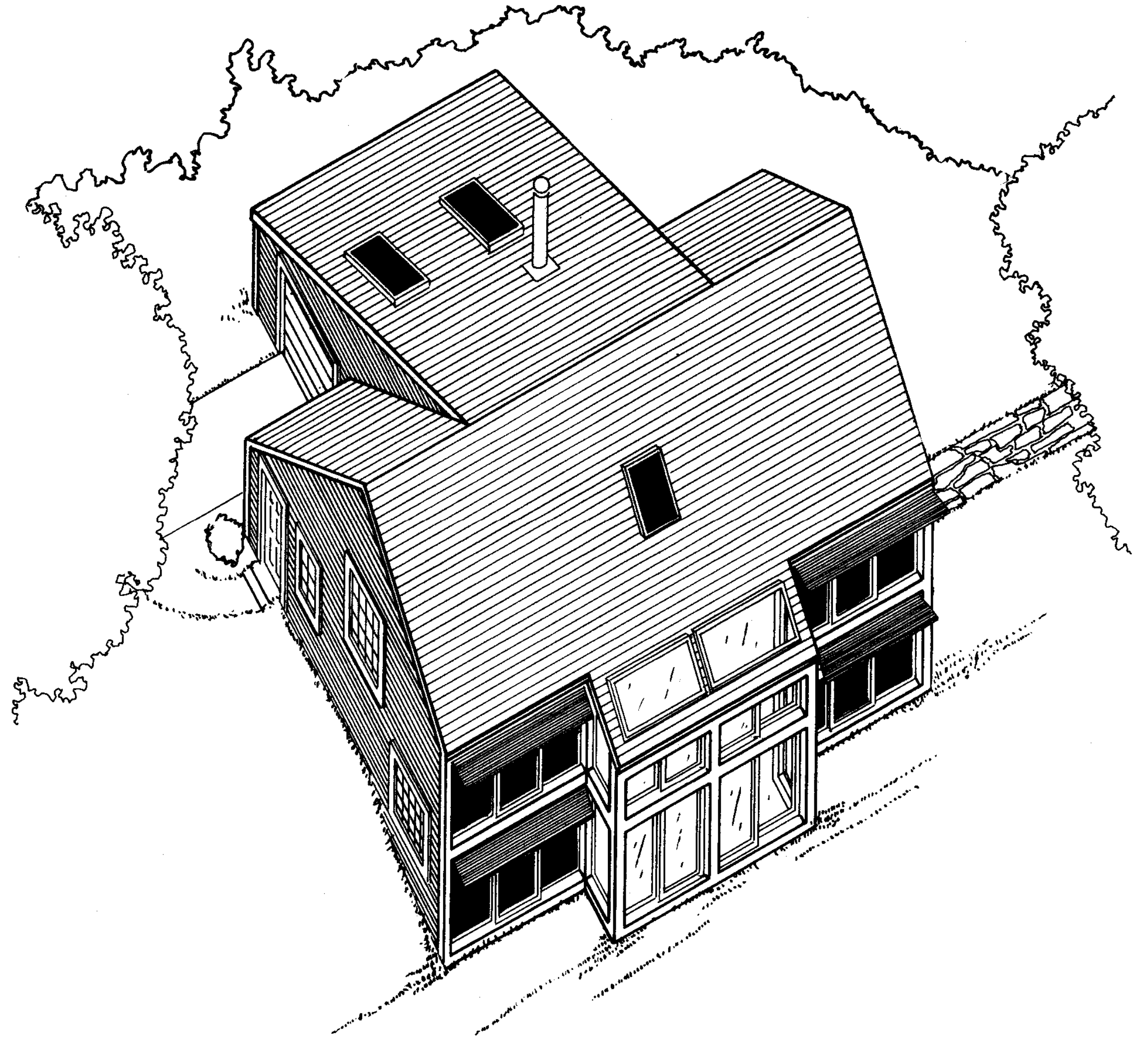
Yarmouthport, MA



Builder: Worthington Associates, West Dennis, MA

Designer: Derek Romely, Architect, South Dennis, MA

Solar Designer: Derek Romely

Price: $45,000 to $50,000

Net Heated Area: 1959 ft^2

Heat Load: 70.9 x 10^6 BTU/yr

Degree Days: 5621

Solar Fraction: 56%

Auxiliary Heat: 2.78 BTU /DD/ft^2

Passive Heating System(s): Direct gain, indirect gain, sun-tempering

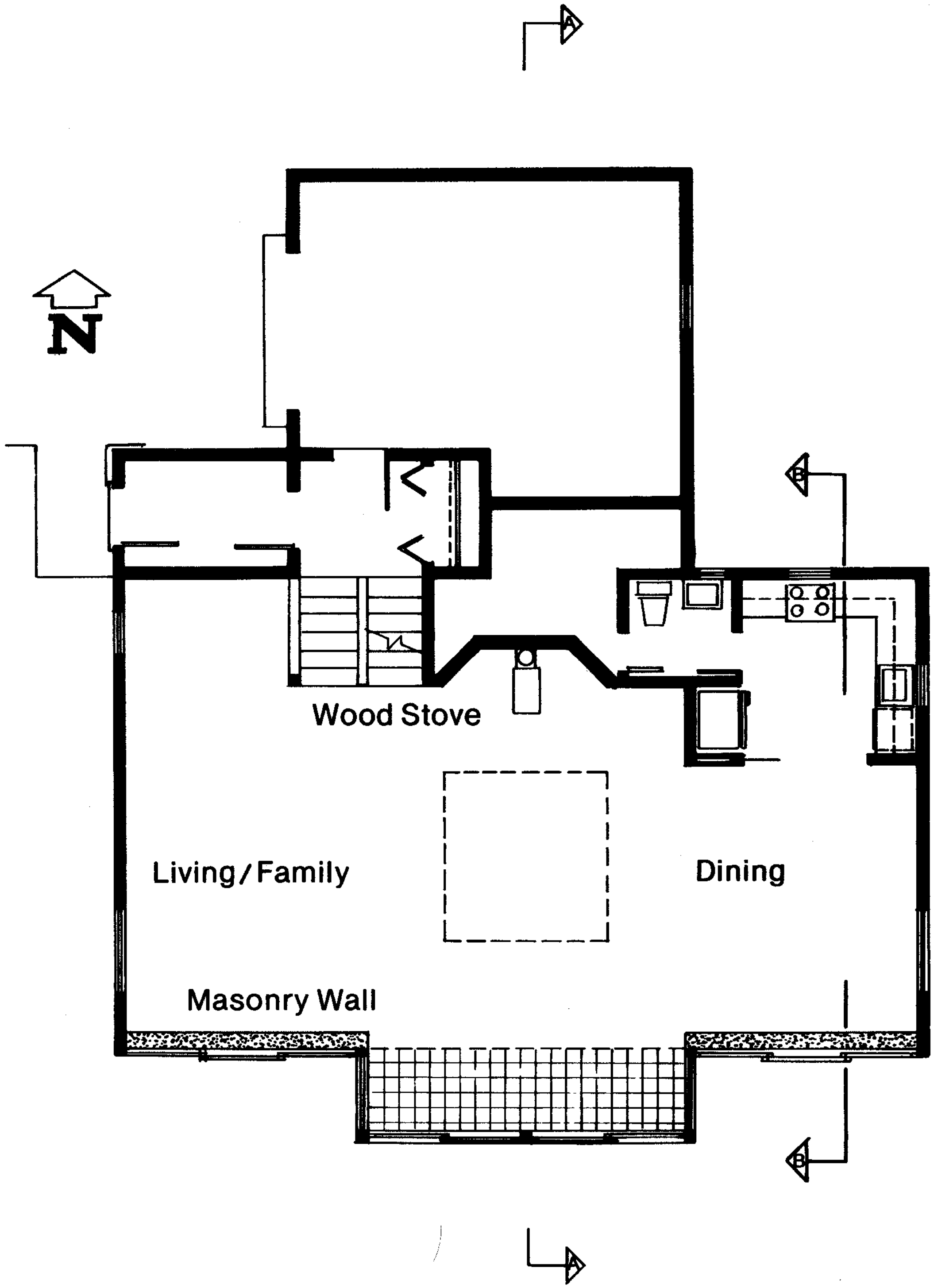
Recognition Factors: Collector(s): South-facing glass over Trombe wall, skylight, 611 ft^2 Absorber(s): Ceramic tile over concrete floor, surface of Trombe wall Storage: Concrete floor, masonry Trombe wall-capacity: n / a Distribution: Radiation, natural convection Controls: Manual window vents in Trombe walls, moveable insulation

Back-up: Central wood stove, electric resistance baseboard heaters

Domestic Hot Water: 67 ft^2 flat-plate collectors, 80-gallon storage

This design reflects an effort to include passive solar features without sacrificing the appeal of traditional style. Extensive south-facing glass, 11/2-story high Trombe walls, and an attached greenhouse are incorporated into the familiar New England saltbox design. The compact, multilevel house has a steep, wood shingle roof and clapboard siding. It is to be built in the Old King's Highway Historic District, which is dedicated to the preservation of the historic character of the area. All of the other sub-division homes are based on such traditional designs as the Cape Cod, the saltbox, and the Yankee barn. These homes have rustic settings on large wooded lots.

To conserve energy, the solar saltbox is partially bermed on the east and west. The north side of the building is sheltered from winter winds by the garage. The effects of winter winds are also minimized by a stand of evergreens to the north. Further protection against winter heat loss is provided by



an air-lock entry. The house is carefully caulked and weather stripped; walls and roof are insulated with fiberglass batting (R23,30).

On the north, east, and west, windows are triple glazed. The glass on the south side of the house is double and there are operable skylights above the bath, landing, and entry. All windows are fitted with insulating shades and operable exterior canvas awnings. The lower-level interior living space is open to permit unobstructed heat flow, and high-activity areas are located on the south side of the building where they will receive direct heat. The attached 2-story greenhouse is one of the two passive solar heating systems. Solar heat is collected through its south-facing sliding glass doors and windows, and through fixed glass panels on the east and west. The floor of the greenhouse and adjacent living space is ceramic tile on a 6-inch concrete slab. Incoming heat is absorbed by the tile and stored in the massive floor.

Heat distribution is facilitated by an open well above the living/family area. Heat stored in the mass floor is radiated upward and moved by convection to the second floor where it collects at the ridge of the cathedral ceiling. A ceiling fan pushes this heated air into the second-story hall and bedrooms and then down the stairwell to be reheated by the warm floor.

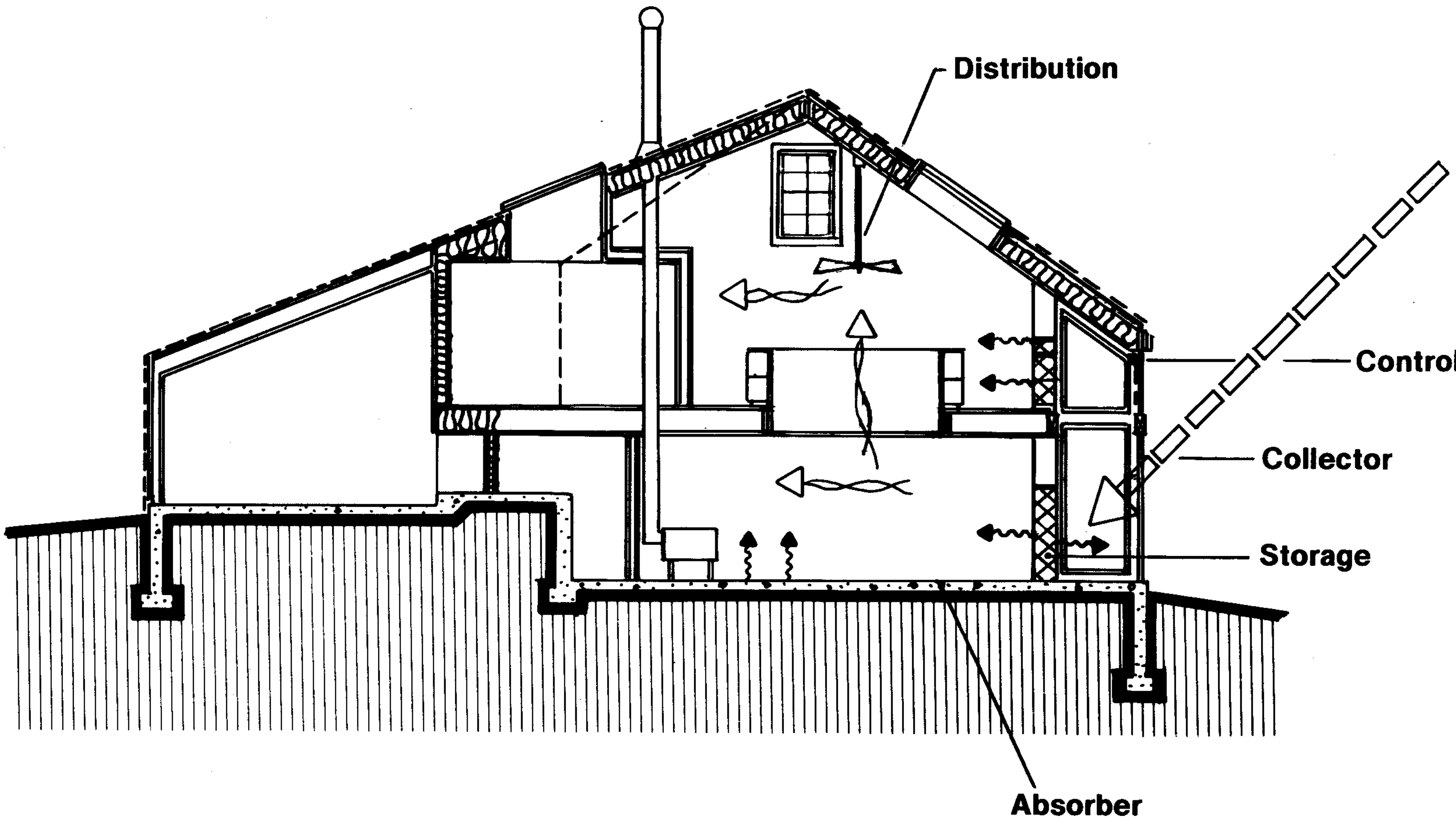
Control of the greenhouse system relies on manually closing quilted insulating drapes over the greenhouse glazing to prevent nighttime heat loss.

The Trombe walls on either side of the greenhouse provide heat to the adjacent living room, dining room, and bedrooms. Heat collection for the Trombe walls takes place through exterior sliding glass doors on both upper and lower levels. These doors can be opened for maintenance and summer cooling. The Trombe walls are 12-inch filled concrete block, painted black; they absorb and store heat collected through the glass.

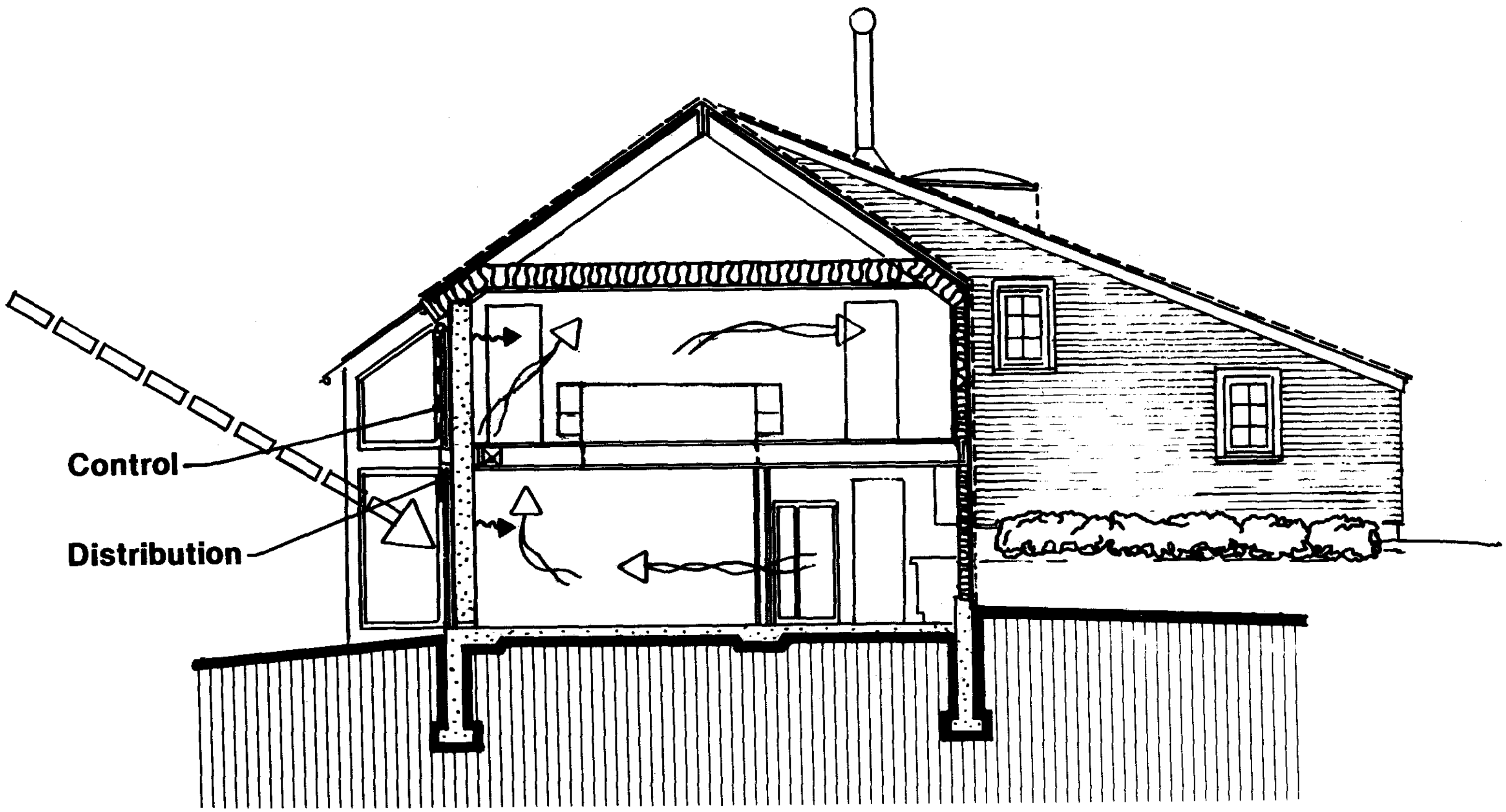
At night, the Trombe walls distribute radiant heat directly into the living and dining areas on the first story, and into both bedrooms on the upper level. Excess heat that is absorbed by the Trombe walls on the lower level may spill into the air well and contribute to whole-house circulation, but the main function of the walls is to heat the adjacent living and sleeping spaces.

Control of heat from the Trombe wall system is accomplished by manually opening the vents in the walls during the day to permit the air that is heated between the wall and exterior glass to circulate into the living spaces. At night, these vents are closed to prevent a reverse flow.

When cooling is required during the summer, ventilation is induced by opening the skylights, the greenhouse glazing, and the access door to the attic. The resulting convective circulation pulls heat upstairs through the air well and out of the house through the skylights and attic. The greenhouse is vented directly through the upper-level sliding glass windows. Moveable exterior canvas awnings are opened out over the greenhouse and Trombe wall glazing at the beginning of the summer. These shade those areas from direct sunlight to prevent them from absorbing heat. The design includes a Solafern domestic water preheat system. Two flat-plate collectors with a net collection area of 60 square feet are located on the roof above the greenhouse. An air to-water fin-coil heat exchanger is located in the 8O-gallon domestic hot water storage tank.



A-A



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.