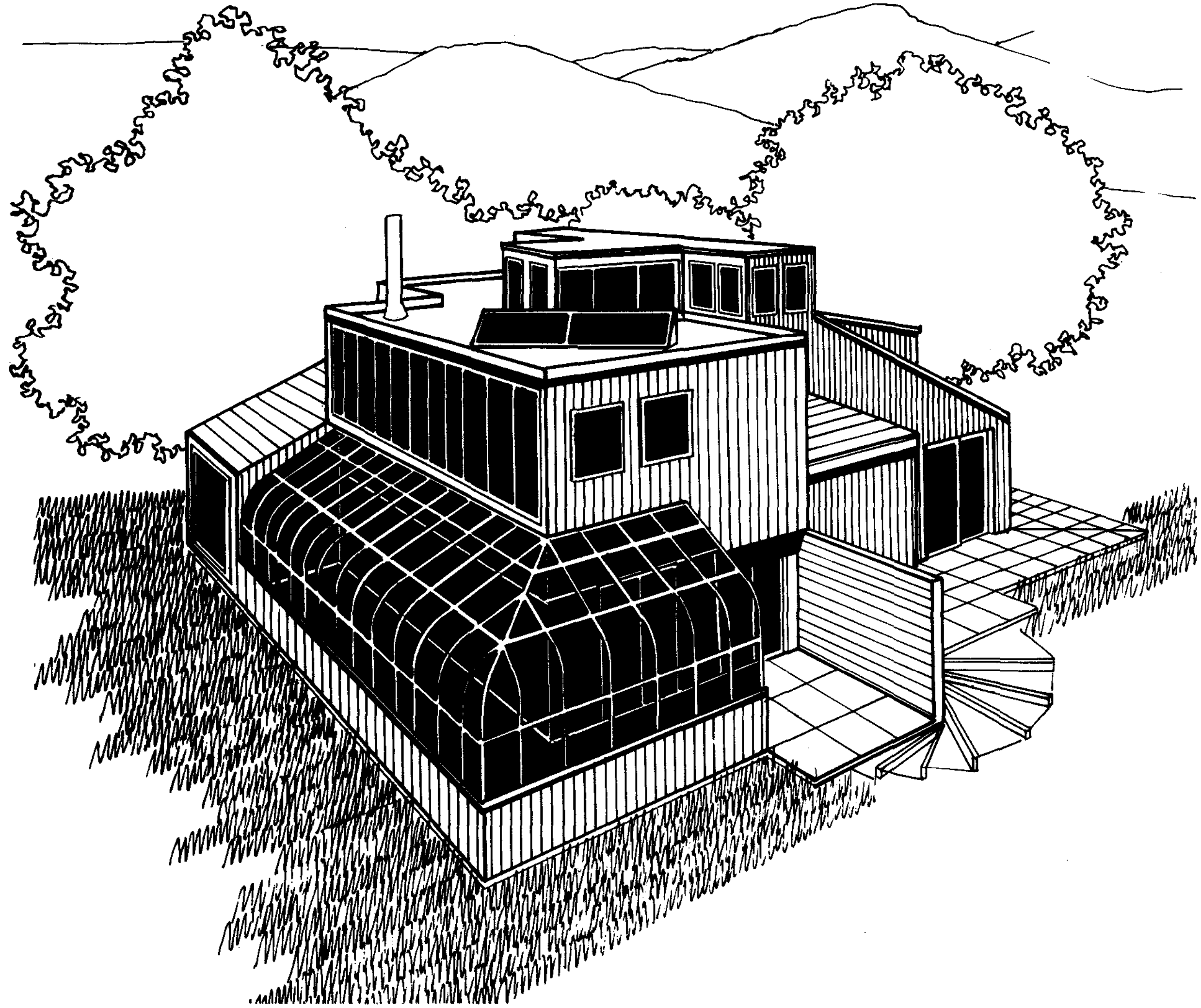
Redwood City, CA



Builder: Redwood City Assoc./Baker Construction, Menlo Park, CA

Designer: VanderRyn, Calthorpe and Associates, Inverness, CA

Solar Designer: VanderRyn, Calthorpe and Associates

Price: $275,000

Net Heated Area: 2200 ft²

Heat Load: 85.4 x 10^6 BTU/yr

Degree Days: 3042

Solar Fraction: 88%

Auxiliary Heat: 1.60 BTU/DD/ft²

Passive Heating System(s): Direct gain, indirect gain

Recognition Factors: Collector(s): South-facing double glazing, greenhouse glazing, 944 ft² **Absorber(s):** Tile-covered concrete floor, concrete block wall **Storage:** Concrete floor, concrete block wall—**capacity:** 14,210 BTU/°F **Distribution:** Radiation, natural convection **Controls:** Vents, shades, dampers, blinds, greenhouse roll-down shade

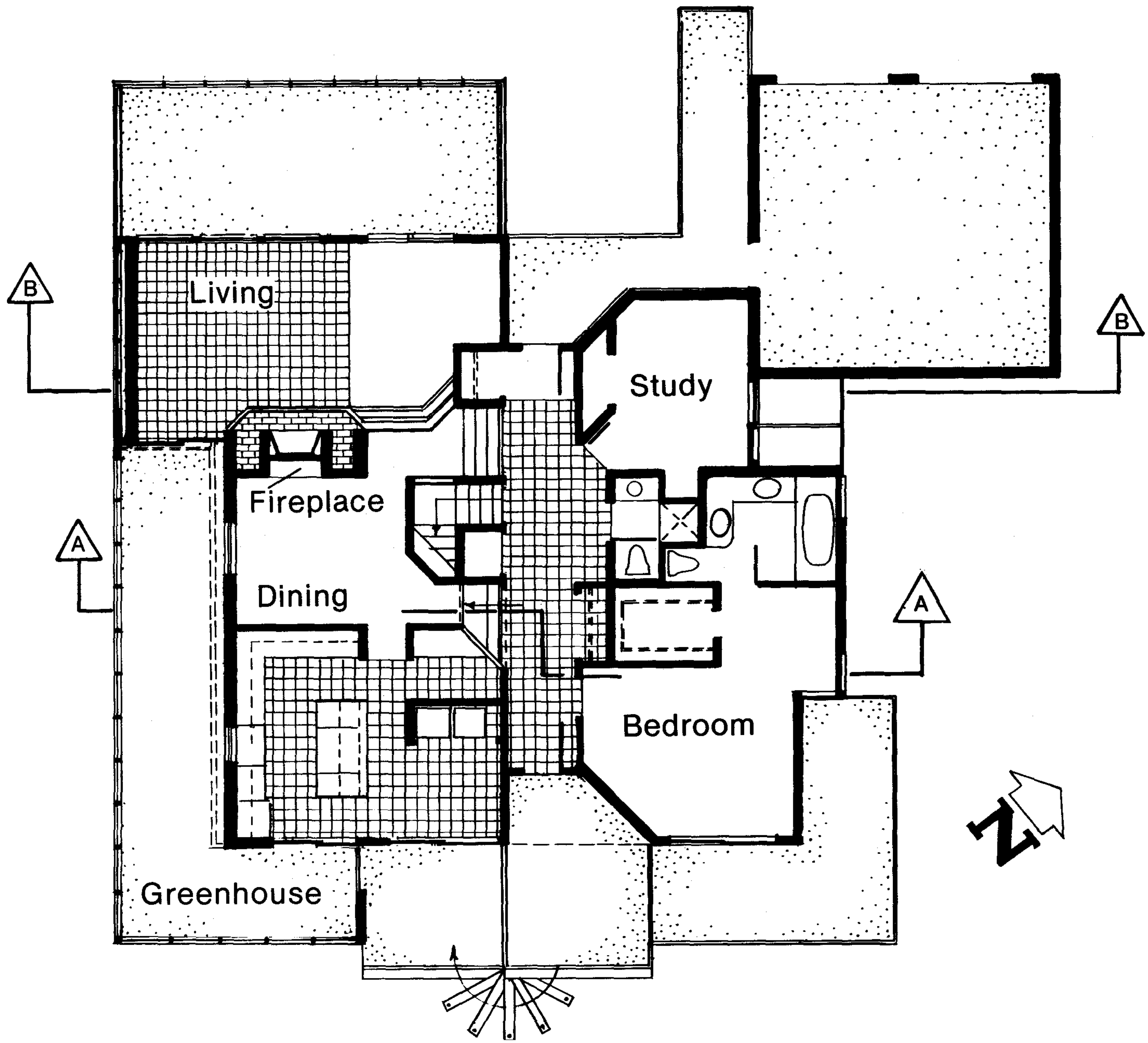
Back-up: Electric resistance heaters

Domestic Hot Water: Liquid flat-plate collectors (49 ft²)

This contemporary California split-level home is well suited to Cordilleras Heights, a luxury development in Redwood City, 20 miles north of San Francisco. The southeast and northeast sides of the lot have been banked to protect the house from prevailing winter winds. The design features an attached first-story greenhouse on the southeast and southwest sides, and a central belvedere with clerestory windows.

Greenhouse glazing collects solar heat, which is absorbed and stored in the bottom half of a 2-story high, 8-inch thick masonry Trombe wall. The wall is coated with a black selective surface to increase absorption. Additional storage is provided in the 4-inch thick exposed aggregate greenhouse floor. Solar heat is distributed by radiation and convection to the dining room and kitchen. Excess greenhouse heat is circulated to the interior of the house by a 500 cfm fan located in a joist space of the second floor.

Above the greenhouse on the southwest side, double-glazed fixed glass collects sunlight to be absorbed and stored by the upper half of the 2-story Trombe wall.

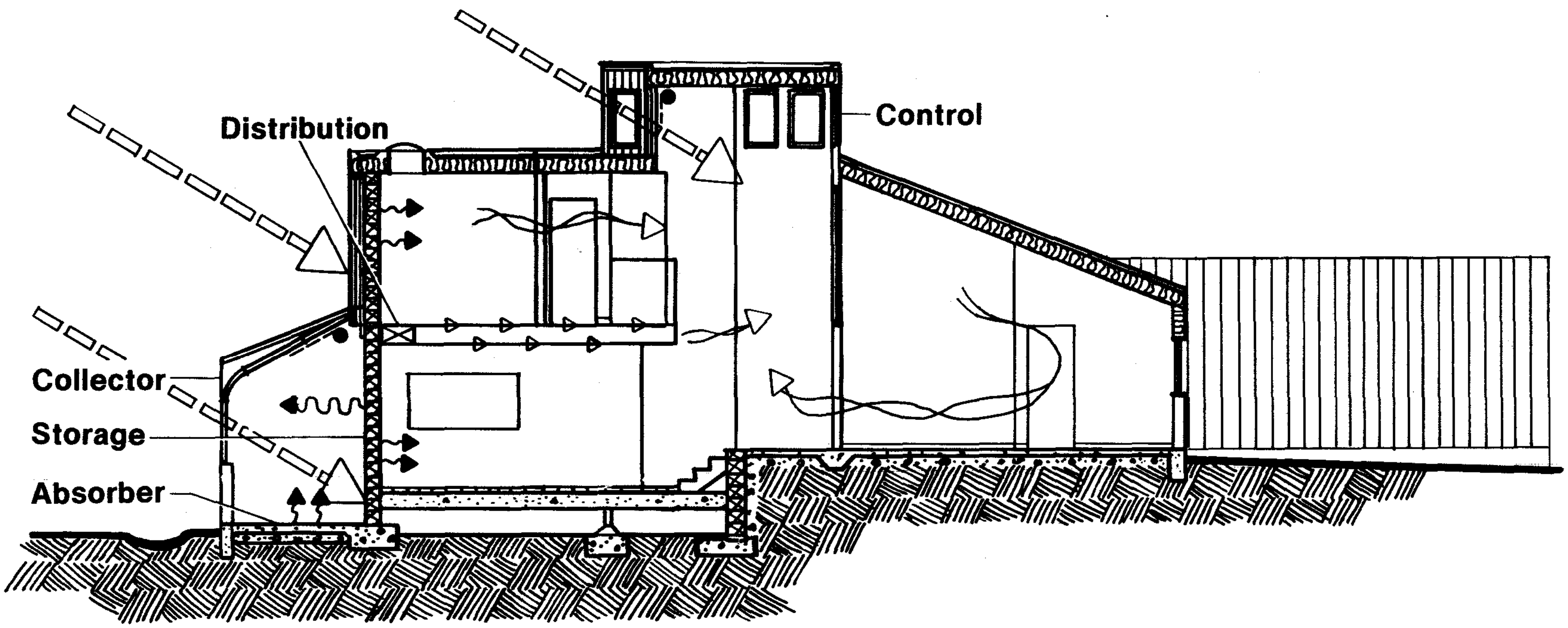

B
Living
B
Study
Fireplace
A
Dining
A
Bedroom
Greenhouse
N

Radiation and natural convection of heat stored in the wall provide nighttime heating for the second-story bathroom and bed-rooms.

Afternoon sunlight **collected** through double glazing on the southwest side of the living room is **absorbed** and **stored** in an 8inch thick, single-story masonry Trombe wall. Stored heat is radiated back into the living room at night.

During the day, direct solar radiation heats the first-story kitchen, breakfast room, master bedroom, and the second-story bedrooms. The clerestory windows of the belvedere **collect** direct solar heat for the 2-story stairwell and gallery that form the core of the house. None of these areas have significant storage mass. However, a destratification fan in the top of the belvedere redistributes solar heated air that has risen to the ceiling from other areas of the house. A high transom and low vent in the study wall below the belvedere allow solar heat from the gallery to warm the study by natural convection.

The main effort to **control** heat in this house is directed toward limiting incoming solar radiation in the summer. Greenhouse and other south-facing glazing is equipped with roll-down shades to prevent sunlight from entering when heat is not needed. The

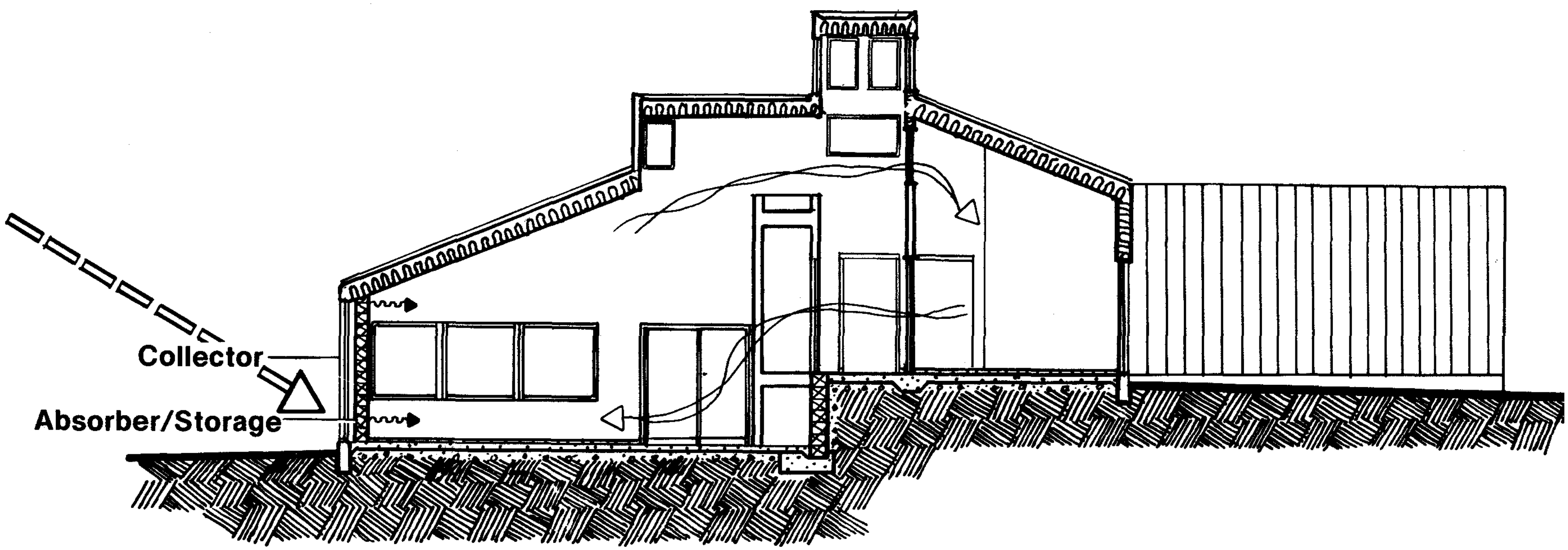


A-A

masonry walls act as convective drive for natural summer ventilation, taking fu1l advantage of Redwood City's mild summers. Ventilation is induced by opening the windows at the top of south-facing glazing on both levels. Trombe wall vents with oneway dampers at floor level on both stories allow hot air to be pulled from the interior of the house into the stack between the masonry and glazing, and vented through the open windows. Opening upper-level bedroom windows, high belvedere windows, and vents in the study and master bedroom induces natural cross-ventilation.

The clerestory windows and southeast glass are shaded by narrow white venetian blinds.

An active solar collector for the domestic hot water system faces true south on the flat section of the roof.



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.