

**Builder:** Burnham Construction, Port Townsend, WA

**Designer:** Burnham Construction

**Solar Designer:** Burnham Construction

**Price:** \$92,000

**Net Heated Area:** 1596 ft<sup>2</sup>

**Heat Load:** 62.8 x 10<sup>6</sup> BTU/yr

**Degree Days:** 5330

**Solar Fraction:** 65%

**Auxiliary Heat:** 2.52 BTU/DD/ft<sup>2</sup>

**Passive Heating System(s):** Direct gain, indirect (Trombe wall) gain, isolated gain

**Recognition Factors: Collector(s):** Trombe wall glazing, greenhouse, skylight, glass doors, 278 ft<sup>2</sup>

**Absorber(s):** Surface of Trombe wall, mass walls and floors **Storage:** Trombe wall, greenhouse wall, living room wall, concrete slab floors—**capacity:** 9885 BTU/°F **Distribution:** Radiation, natural and forced convection **Controls:** Fixed overhangs, moveable shade, louvers on greenhouse, earth berming

**Back-up:** Woodburning stove, electric baseboard heaters

**Domestic Hot Water:** Active DHW flat-plate collectors (55 ft<sup>2</sup>)

This home was designed for 2-person occupancy in a neighborhood made up predominantly of retired couples. An additional bedroom/bathroom guest unit is expected to have only occasional use and can be shut off completely; there are electric baseboard heaters in all rooms, but only in this extra bedroom does the heater carry the total heating load. Styling is northwest rustic traditional and is typical of other homes in the area.

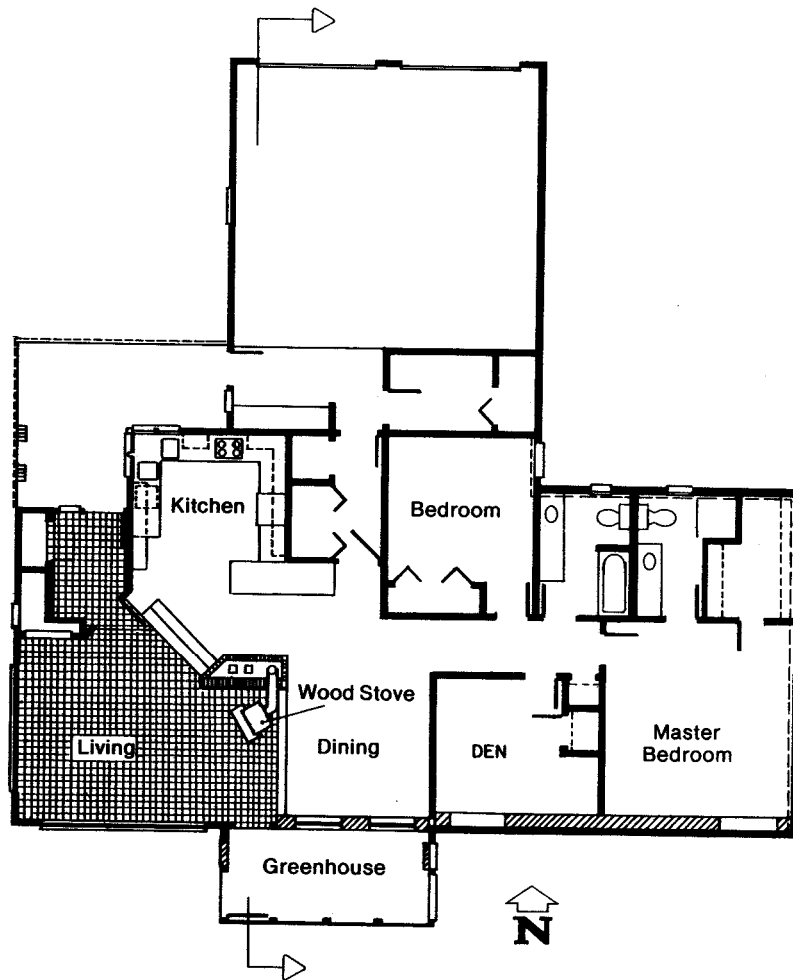
There are a variety of collection modes: a series of four sliding glass doors and skylight in the living room; a greenhouse with a connecting door to the living room and windows to the dining room; and a wall of glass (sections of which constitute a Trombe wall) for the den and master bedroom. All these apertures face south and are double glazed. For domestic water heating there are roof-mounted flat-plate collectors.

Direct radiation to the living room is absorbed and stored by a ceramic tile-covered 4-inch concrete floor slab and a 4-

inch brick wall located behind the wood-burning stove in the northeast corner.

The den and master bedroom have as their south wall a 12-inch brick Trombe wall for absorption and storage. The brick wall in the dining room has as its collector the greenhouse, projecting 7 feet from the wall. Also, absorbing and storing heat in the greenhouse and dining room are 4-inch concrete floor slabs, each having exposure to direct radiation.

Distribution in the den and master bedroom is by natural convection and radiation from the Trombe wall. In the dining room, which is separated from the living room by a 42-inch high brick wall, warm air is drawn in from the greenhouse through opened windows, circulated by natural convection and returned, through cold air vents in the floor, to the greenhouse for reheating. There is also radiation from the brick wall at night, when the greenhouse loses its effectiveness. Radiation and natural convection from floors distribute warm air in the living room.



In colder weather, hot air that accumulates at the cathedral ceiling is drawn down the brick chimney enclosure by a small fan and vented onto the kitchen floor. This air is heated further when the stove is being used because the sealed flue within the chimney heats room air.

During summer months this system is sealed off and another fan at the top of the chimney exhausts hot air trapped at the ridge. Also used to **control** heat gain are overhangs on all south glass, moveable insulation on all windows, natural ventilation and wooden and fiber slats in the skylight and at the top of the greenhouse. These slats are adjusted manually. Because of strong summer sea breezes and good ventilation, there is no additional cooling system to backup the exhaust fan.

This design takes advantage of the gradual slope of the site through partial berming on the north, east, and west walls. The 2-car attached garage and air-lock entryway serve as buffer zones for winter entry. R-32 insulation is used in the roof and R-19 in all exposed walls.

