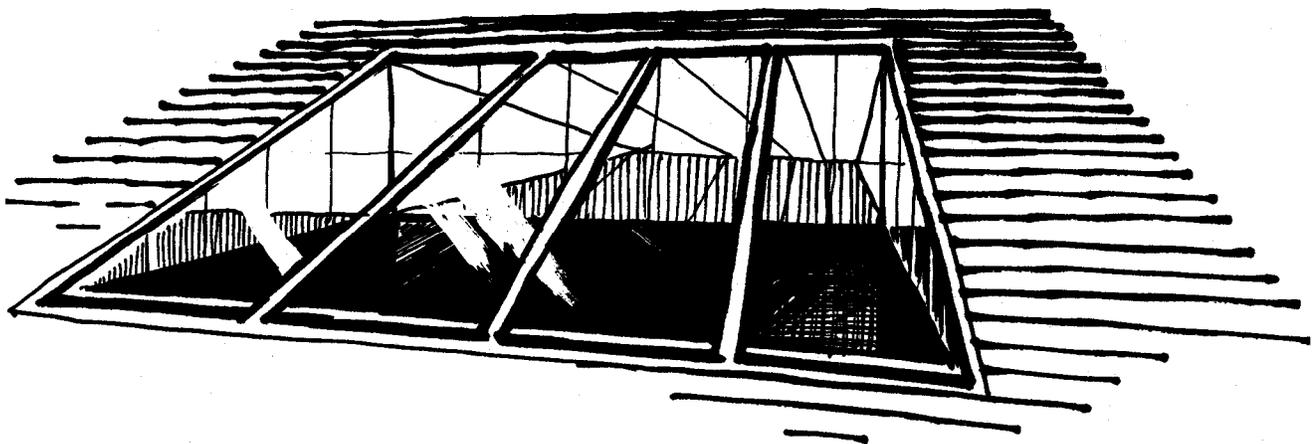


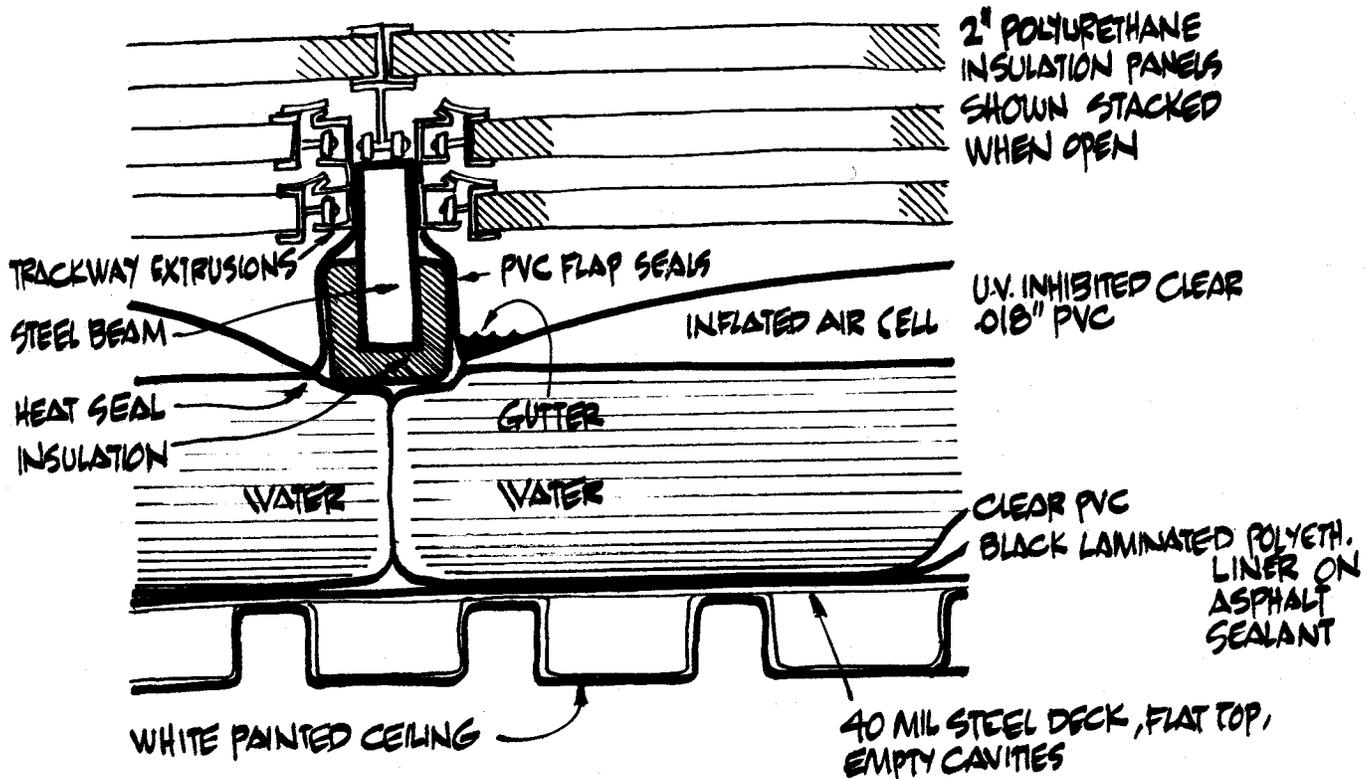
Chapter 6

Solar Roofs

Solar roofs, often called thermal storage roofs, are similar to storage walls. Waterbed-like bags of water, exposed to sunlight, collect, store and distribute heat. This heat passes freely down through the supporting ceiling to the house, gently warming it. In the summer, heat rises through the ceiling into the water, cooling the house. Then at night, the water is cooled by the radiation of its heat to the sky. Movable insulation covers the ponds at night in winter, to trap heat inside, and during the day in summer, to shade the ponds while the sun is shining. See page 71 for a diagram of the system.

Generally, solar roof ponds are 8 to 12 inches deep. Roof ponds are always flat, but in northern buildings the glazing is often sloped to the south to capture the sun's low rays as well as to shed snow. Under the sloped glass, the walls are well-insulated and faced with materials that reflect the sunlight into the ponds.





This cross section is of the solar roof system used in a house designed by Harold Hay in the mild climate of Atascadero, California. The entire 1100 square-foot ceiling is covered with 8 inches of water sealed in clear UV-inhibited, 20 mil, polyvinylchloride water bags. Underneath these 53,600 pounds of water is a layer of black polyethylene to help absorb solar radiation near the bottom of the bags. Additionally, an inflated clear plastic sheet above the water bags enhances the "greenhouse (or heat trapping) effect" during the heating season. This air cell is deflated in the summer months to permit radiational cooling. A 40 mil steel deck roof supports the water bags and provides good heat transfer to and from the living space. Above the roof ponds, a system of movable insulating

panels is mounted on horizontal steel tracks. The insulation is 2 inches of rigid polyurethane faced with aluminum foil. The panels are moved by a 1/6 horsepower motor operating about 10 minutes per day.

Solar roof ponds maintain very stable indoor temperatures. During the winter and summer, temperatures typically fluctuate between 66° and 73° while the outdoor average daily temperature fluctuates between 47° and 82° throughout the entire year. The Atascadero house is 100 percent solar heated and cooled, and it has no other source of heating or cooling. Occupants have found the heating and cooling system provides "superior" comfort compared with conventional systems.

Not many solar roofs have been built, and there is limited information on the design, cost, performance, and construction details of thermal storage roofs. However, they offer tremendous potential for reducing heating and cooling bills. Page 126 has photos of solar roof houses.

The www.BuildItSolar.com website provides hundreds of free plans for solar and renewable energy projects

