Passive Heating Performance

Q: The article entitled "The Best Passive Heating Data Yet" (*Solar Age*, 7/83) seems to be an accurate overview of the Class B monitoring program. However, the article does not clearly explain the limitations of the method of deriving the passive solar contribution.

While the auxiliary and internal gains are directly measured, the solar contribution is arrived at indirectly by a subtractive technique. There is one potentially big source of error in this technique, namely the air infiltration rate. Any error in estimating the infiltration shows up as an error in the passive solar contribution.

Incidental solar gains are another source of uncertainty in the passive solar contribution. These include gains through non-south apertures and the solar heating effect on conduction loads of the walls and roof. For this reason, it would have been interesting to have included a few non-solar homes in the Class B program as controls.—Andrew Lau, Madison, Wis.

A: According to Joel Swisher at SERI, the one-time infiltration measurements made concurrently with the coheating procedure were used to separate out conductive losses from infiltration losses to obtain the building heat loss coefficient. The overall losses due to infiltration over the heating season are extrapolated from the blower door and tracer gas results and corrected for average monthly wind speeds.

As for the incidental solar gains, Swisher agrees that this presents a problem but that achieving true scientific controls is not a realistic goal, particularly in inhabited homes. In the 1982-83 season Class B study, SERI has monitored non-solar homes for comparison purposes. When the subtractive methodology is applied to these homes, solar gains in the 5 to 20 percent range are found. This would indicate that some of the poorer performing solar homes monitored are not doing much better, which is likely the case.

Pool Gas

Q: There is an overnight accumulation of gas in the solar panels that heat my swimming pool. When the pump turns on in the morning, a small amount of gas (perhaps a quart) comes out of the discharge line. I suspected a leak in the collectors but found none when the water was pumped at about 15 psi. I am concerned that this may indicate corrosion involving the copper collectors and the chemicals in the pool water. Is it possible that this is dissolved gas released overnight, owing to reduced pressure in the solar panels caused by the weight of the water trying to return to the pool? —Russell Ham, Lake Charles, La.

A: As you suspect, the gas in your collector is quite probably nothing more than air that has come out of solution. This would happen for two reasons: 1) The water in the panels will heat up slightly even after the controller has decided that there is no more useful energy to be collected and has shut off the pump. Air is less soluble in warmer water and will form bubbles that accumulate overnight; 2) If your collector is 12 feet above the level of the water in the pool, the water is under a vacuum of about 5 psi less than atmospheric pressure. This vacuum will also draw the dissolved gas out of solution.

According to Doug Root, of the Florida Solar Energy Center, there have been very few cases of actual corrosion of copper collectors by pool water. In the few cases that have been documented, the pool chemicals have been grossly out of balance.

Polystyrene Underground

Q: I am building an earth-sheltered home and discovered that I could save a great deal of money by insulating below grade with expanded rather than extruded polystyrene. Is it unwise to use the expanded polystyrene board, given its tendency to absorb moisture below grade?—Dan Selby, San Jose, Calif.

A: Widely reported research by Dow shows that their extruded polystyrene, on average, outperforms expanded polystyrene (EPS) in below-grade applications. Due to the study's limitations, however, Dow cautions against using the findings to predict long-term performance. Interestingly, the testing found that the most common EPS—2-inch-thick, low-density (1 lb./ft^3) material—held up about as well as extruded stock in both vertical and horizontal applications. Both showed 2- to 13-percent increases in conductivity after 6- and 18-month exposures.

Dow speculates that the poor performance of the high-density EPS was due to high void content and poor bead fusion. EPS manufacturers agree that good bead fusion is harder to achieve in high-density stock. A simple test of quality: EPS should break through the beads, not around them. Because over 175 small companies make EPS board, quality varies considerably.

With well-drained soil, a low water table, and a waterproof outer membrane (e.g., polyethylene), a good-quality EPS board at least 2 inches thick should perform adequately. To play it safe, some underground builders use EPS toward the inside and extruded board facing the soil.