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QUESTIONS & ANSWERS

Phenolic Pros & Cons

Q. We wish to obtain information about manufacturing sources for phenolic insulation materials. As this material is rated as high as 500°F in temperature range, it may very well suit a specific solar application we have.—*J.I. Osias, Solar Builders, Cheshire, Conn.*

A. Phenolic foams, like polyurethanes and isocyanurates, are closed-cell insulations with entrapped Freon gas. A chief attraction of phenolics is that they can withstand high temperatures and will not support flames (though they can be consumed) in a fire. Typically, phenolic foams can tolerate continuous temperatures in the 300° to 350°F range, with intermittent use up to 400°F. Above that temperature, oxidation is likely to occur and render the boards brittle. Outgassing of Freon at high temperatures should be less of a problem than with other Freon-blown foams. In general, the phenolics are very stable chemically and dimensionally.

The main problems with phenolic foams have been their relatively low compressive and flexural strength and their *friability* or tendency to crumble. Continual improvements in the formulations may overcome these drawbacks. Facings can also help, but until now no one has successfully foamed phenolics between foil facings. At press time, Koppers Co. was about to release a foil-faced, phenolic foam insulation called Exeltherm Xtra residential insulation. At R-8.2 per inch, it will have the highest R-value of any residential insulation.

For more information on phenolics contact: BP North America, Inc., 620 Fifth Ave., New York, N.Y. 10020; Koppers Company, Inc., Department 64C-2D, 1901 Koppers Building, Pittsburgh, Pa. 15219; and Lewcott Chemicals & Plastics Corp., Box 319, Millbury, Mass. 01527.

Pascal-culations

Q. I am confused by a slight lack of consistency in your magazine. Your February 1984 edition (page 47) says that to get the normal air leakage you divide the air changes per hour (ACH) at 50 Pascals by 7. But in your May 1984 issue (page 9) you say 10 ACH at 50 Pascals equals roughly 0.5 natural ACH (dividing by 20). Which is correct?—*Joe Bockelman, Dayton, Ohio*

A. A widely accepted rule of thumb for estimating the natural winter air infiltration rate is to divide the ACH at 50 Pascals by 20. This is most appropriate for a single-story detached house with no unusual wind loads. This rough rule of thumb works pretty well for averages of large samples of homes, yet for a single home, it's not very reliable. For example, the average air infiltration rate at 50 Pascals of 35 passive solar homes monitored by SERI was 11.1ACH. The average natural infiltration rate of this sample (as measured by tracer gas) was 0.5. So dividing by 20 would have worked well for the average. However, for individual homes in this sample, the correct divisor ranged from 10 to 40. The wind speed, shape of the house, location of the cracks, temperature differences, and use of combustion equipment all play a role. A given number tends to work pretty well for a given type of house under similar conditions. The natural ACH in a single house, though, may change by as much as factor of 10 depending on the time of year and weather variables.

Balancing Act

Q. I understand the importance of insulating and weathersealing a house before installing any solar space heating system. How low a Btu/hour value should I attain in a 60-year-old leaky, woodframe house before solarizing? The house is 1900 ft^2, has oil/hot water heat and is located in Maryland (4000 heating degree days). Also, how should the basement be insulated—around its perimeter or under the first floor?—*David Edinberg, Annapolis, Md.*

A. If you want to get the largest return on your investment in energy efficiency, you should balance your expenditures on conservation, solar, and auxiliary equipment so that your economic return is equal for each.

Whatever analysis you use to make economic decisions—whether simple payback, life-cycle costing, or return-on-investment—you should apply the method fairly to each part of the house. How much you want to spend in total will depend on what return on your money you find acceptable. In general, the first dollars invested in energy savings will bring larger returns than later dollars due to the law of diminishing returns. To be fair, you should apply your cost accounting only to the energy cost of a building part, if it serves another desired function (for example as window decoration, structure, or added living space). In the case of an upgraded heating system you should consider the added cost over the conventional equipment you would otherwise install. There's a good deal of fudging and judgment in all this and plenty of room for common sense.

As for the basement insulation, either approach will work. Of course, if you want a heated basement, you should insulate the perimeter. Also, if you insulate the floor, you increase the risk of freezing pipes in the basement. If the basement is mostly below grade and has no leaky doors and windows, this shouldn't be a problem in your climate.