Heating Small Loads

Solutions are in sight for this surprisingly tough task.

Spend more on conservation, it is said, and you can spend less on a heating system. Yet we frequently hear the complaint that small heating systems are hard to find. And once you find them, they may be no cheaper than a larger system. It's like buying a four-and-a-half-foot bathtub—you pay more money for less hardware.

Sizing

Don't rely on rules of thumb to size heating systems. They can oversize by 100 percent or more in an energy-efficient house. Learn how to do a heat-loss calculation yourself (it's not really difficult) or find someone who can. If you do it yourself, use a full worksheet method or computer program, not a quicky estimator. You can get a thorough workbook, *Heat Loss Calculation Guide*, for $8 from the Hydronics Institute, P.O. Box 218, Berkeley Heights, N.J. 07922.

Standard practice is to size a heating system to meet the *design heat load*, which is the heating load the system will exceed only 2½ percent of the time in the three coldest months of winter. Most heating contractors oversize systems by a large margin—mostly for quick recovery after nighttime setbacks, but also just to be on the safe side. Some undersize slightly to boost efficiency. ASHRAE recommends oversizing by 40 percent to make up for a 10°F setback.

Gross oversizing is bad practice because it hurts efficiency. But given all the uncertainty in heat-loss calculations, the true delivery efficiency of the heating system, and weather, I would oversize a bit. In a high-mass house, you can overcome the setback problem by timing the setbacks to allow extra time for the building to warm up.

Electric or combustion?

One school of thought holds that the economics favor electric-resistance heating in small-load houses. In my part of the country, with electricity at 10¢ per kilowatt-hour and rising, a 1500-square-foot house with R-20 walls and R-40 ceilings costs about $1000 per year to heat, according to a computer estimate. Even a super-duper-insulated house (R-40 walls, R-60 ceilings) would cost about $400 to heat.

By comparison, a mid-efficiency (85-percent AFUE) oil-fired furnace would heat the houses for about $300 and $120 dollars, respectively, with oil at $1 a gallon. The moral is that high electric rates and electric baseboard heating don't mix.

On the other hand, paying a big premium for a super-efficient condensing furnace is not a good investment in a low-energy house. You'll never recoup the extra cost above a mid-efficiency unit because the annual heating load is so low. Good-quality, correctly sized, middle-of-the-road equipment is really what's in order. Look for a high AFUE rating.

Distribution

Here is where you can win real savings. Tighter, better-insulated homes can use smaller and simpler distribution systems.

Massachusetts custom builder Paul Bourke recently told me he saved $1500 to $2000 by downsizing the heating system on a 2000-square-foot superinsulated house. Nearly all of the savings came from using smaller ducts—mostly 8-inch round. The savings paid for a $1300 air-to-air heat exchanger, which Bourke hooks in-line into the duct system.

You can win other savings by ignoring standard layout rules that no longer apply. For example, in a thermally sound home, registers and radiators needn't go on outside walls or below windows. In general, these houses need fewer points of heat supply. Often a single pipe loop or trunk duct will do. You can simplifiy or eliminate zoning.

Centralizing heat distribution may mean fewer distribution losses, too. In a major monitoring study, the Solar Energy Research Institute found that the actual delivery efficiency of 23 heating systems averaged 49 percent—far below their 80-percent average combustion efficiencies. Researchers attributed the poor showing, in

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Steve Bliss is building editor of Solar Age *and managing editor of* Progressive Builder.