QUESTIONS & ANSWERS

Sizing Up Rocks

Q: I'm curious about rock-bed heat storage systems. Have any tests been done to determine the optimum size for rocks for these systems? How can I ensure good circulation of the air? Where can I find information on rock-bed design?—*Kenneth Leifheit, Batavia, Ill.*

A: Rocks can be anywhere from ½ to 6 inches in diameter. The standard seems to be ¾ to 1½ inches. It's not a good idea to mix widely divergent sizes. The largest rocks should be no more than twice the size of the smallest—holding to this rule may require some screening after the rocks are delivered. Large rocks heat up slowly and cool off slowly. Small rocks do both more quickly. The smaller the rocks, the greater the resistance to the flow of air, meaning a larger fan is required unless the air-path is very short.

Air inlets and outlets must be designed to channel the air so it wends its way through the rocks. This can be done by placing the inlet vent higher than the outlet, forcing the warm air to drop, or building vertical baffles within the rock bed. A sand-covered sheet of polyethylene on top of the rocks will prevent a gap from forming should any settling occur.

"Passive Principles: Rockbeds" in the March 1982 issue of *Solar Age* covers the basics of sizing and design. "Building it Right" in the June 1982 issue gives practical guidelines for builders.

Figuring Solar Heat Gain

Q: I am having a hard time determining which specification to use when calculating solar heat gain through windows. Does one use visible light transmission, total solar transmission, or some other figure? 3M's Sungain Film brochure mentions "Solar Input," which represents the shading coefficient times 0.87. What exactly does that give you? How do visible light transmittance, solar transmittance, and shading coefficient relate to one another?—*Jeff Pendl, Enervision, Cincinnati*

A: Solar heat gain is calculated with the *shading coefficient* and the *solar heat gain factor* (not to be confused with the *solar heat gain coefficient*). The *solar transmittance* is the percentage of visible and near-infrared light that passes directly through a window. It is used to compare different types of glass. It doesn't include the solar heat the glass absorbs and reradiates into the building, so alone it isn't accurate enough for calculating total solar gains.

The "solar input" number in the brochure, also known as the solar heat gain coefficient, is the solar transmittance modified to account for reradiated heat. If you divide it by 0.87 (the coefficient for ⅛-inch clear glass), you get the shading coefficient you need to calculate solar heat gain.

See *ASHRAE Fundamentals*, Chapter 27, for lists of solar heat gain factors. Calculating solar gains by hand is a laborious, imperfect process. Many computer programs listed in the *1985 Spec Guide* make the job easier by calculating solar heat gain for you.

The higher its solar transmittance or solar heat gain coefficient, the better a glazing is for solar heating. The lower those numbers are, the more suitable it is for cooling.

Slate as Mass

Q: A client of mine has a unique storage material to use in his solarium—30 one-inch-thick slate pool-table tops. Will the thermal expansion and contraction affect the thermal bond to the slab below? Should we buffer the joints to prevent damage to the edges?—*Tom Deal, alternative energy consultant, San Francisco*

A: Slate's coefficient of expansion is 0.0000058, meaning that for every foot of length, it will expand 0.0000058 feet or 0.00007 inches for every °F rise in temperature. A 60°F rise will cause an 8-foot-long slab to increase 0.0336 inches—roughly 1/32 inch—in length. If the sunspace experiences wider temperature swings, the expansion and contraction will be greater.

Kevin Callahan at the National Concrete Masonry Association recommended using a Type M mortar, which has a higher compressive strength than mortar normally used for concrete blocks. He commented, though, that the mortar might not bond very well to the slate, which doesn't have a very porous surface. Bedding the slate in mortar should create a fine thermal bond.

Outside Combustion Air

Q: I've often read about the necessity of providing combustion air to a wood stove, but there's usually not much explanation of how it's done. Is it just a pipe that ends near the stove air inlet?—*Chris Rich, New Castle, Va.*

A: Many wood-stove manufacturers produce a special line of stoves intended for manufactured housing. These stoves must have an external combustion-air inlet hard-ducted directly into the stove. Often the air duct comes up through the floor under the stove, making it almost invisible from the room. This makes it attractive for the homeowner, and easy for the builder to install.

Address questions about articles in Solar Age *to Q&A,* Solar Age, *7 Church Hill, Harrisville, N.H. 03450. If you want a reply, send a self-addressed stamped envelope and a member of our staff will respond.*