



TWENTY-FIRST CENTURY TILE ROOFS



BY JERRY VANDEWATER

Although tile roofs are one of the oldest and most enduring types of roof covering known to man, the methods of application continue to evolve due to both innovations from manufacturers and requirements for improved performance. At a very rudimentary level, clay or concrete roof tiles provide a hard surface that sheds water away from the structure that it protects. The inert properties of the raw materials make the tiles durable against a range of destructive forces such as wind, rain, snow, and hail, while resisting the less obvious effects of ultraviolet rays, heat, fire, and vermin.

The long-term performance of a tile roof, however, depends a great deal on how it is installed. While most tiles carry a 50- or 60-year product warranty, there are tile roofs that have lasted ten times that long with only minor maintenance or repair. On the other hand, there is no greater disappointment than that expressed by a building owner who has invested in a tile roof only to have it require major overhaul within the first 20 years of service life. In most cases, there is nothing wrong with the tiles, but due to either flashing or underlayment failure, the roof is leaking and the recommended solution is typically a total reworking of the roof.

Even though the tiles are fine and could be reused, it is often more cost effective to discard them and replace the entire assembly. This is certainly not viewed as a good value to the building owner, since the expectation was that a greater investment at the time of original construction should have yielded a much longer return on that investment. In many cases, this disappointment may simply drive the owner into

selecting a less expensive alternative that he knows will not last as long but at least will cost less initially.

The good news is that there are other factors that are now starting to have an impact on this scenario, and the net result will be a much more satisfied owner/investor. Even though there are many contractors who are aware of better ways to install tile roofs so that they will measure up to consumers' expectations, a much larger number continue to install tile in the cheapest method possible, with no concern or awareness of climate issues or other conditions that impact the long-term performance of roofs.

While most roofers will argue the merits of their own particular method of installation, there are recent changes that are

quickly driving the entire industry to adopt a "new" method that provides a solution that heretofore had not been considered as an element of tile roofing. The green-build movement has forced designers and builders to reevaluate all of the methods and materials that are used in construction in order to reduce the waste and excess of traditional construction. There are a great many programs and standards that have been developed to guide the industry to more responsible and sustainable selections that will reduce the impact of construction on our environment and on future generations.

As the various elements of construction have been evaluated, tile roof manufacturers have participated in a number of studies that were performed to determine the

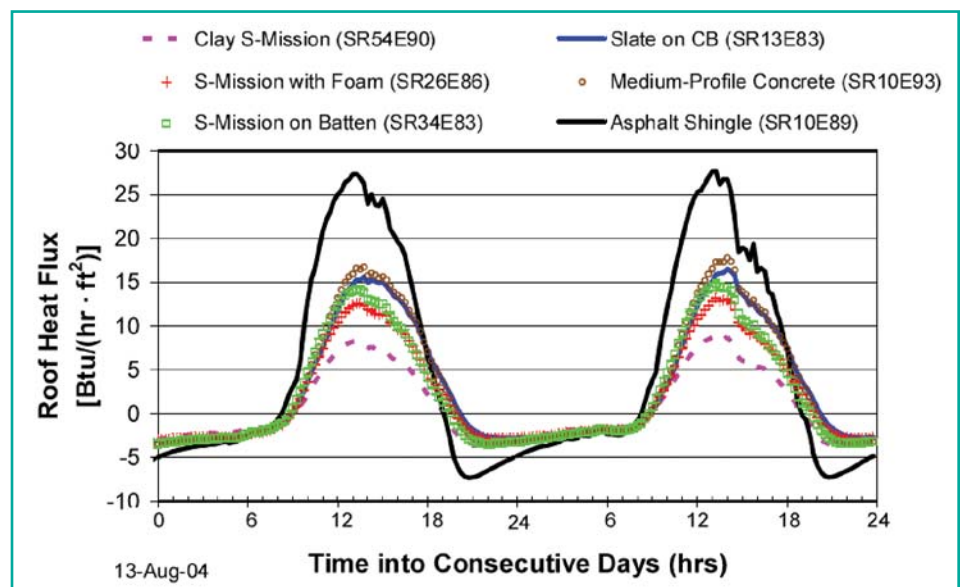


Figure 1 – Heat penetrating the roof of each attic assembly being tested on the Envelope Systems Research Apparatus (ESRA) by the Oak Ridge National Laboratory. (Graphic courtesy of ORNL.)

Figure 2 – Above-sheathing ventilation (ASV).



impact of roof coverings on potential energy savings through the roof. Most of the early studies focused primarily on higher surface reflectivity and emissivity that would reduce the amount of heat that could enter into the building, thinking this could reduce the amount of energy required to cool the interior of the building. Significant improvements were made by promoting the use of “cool roofing” materials that incorporated

either lighter colors or special pigments that mimicked light colors, and more and more municipalities are making these roofs mandatory in many sections of the country.

Some of the studies, however, went beyond the simple measure of surface issues and started to evaluate

the impact of differences within the installed systems. Studies in the U.S. included work done by the Florida Solar Energy Center¹ and Oak Ridge National



Figures 3A and 3B – Counter-batten (A, at left) or shimmed battens (B, above) improve ASV and drainage.

Laboratory,² both of which showed conclusively that the airspace created by the manner of installation of tile roofs played a significant role in the reduction of heat gain into the structure (Figure 1). Numerous studies conducted by Lafarge Roofing Technical Center further validated the studies conducted at FSEC and ORNL and formed the basis for submittals that have been reflected in the new California Title 24 Energy Code.

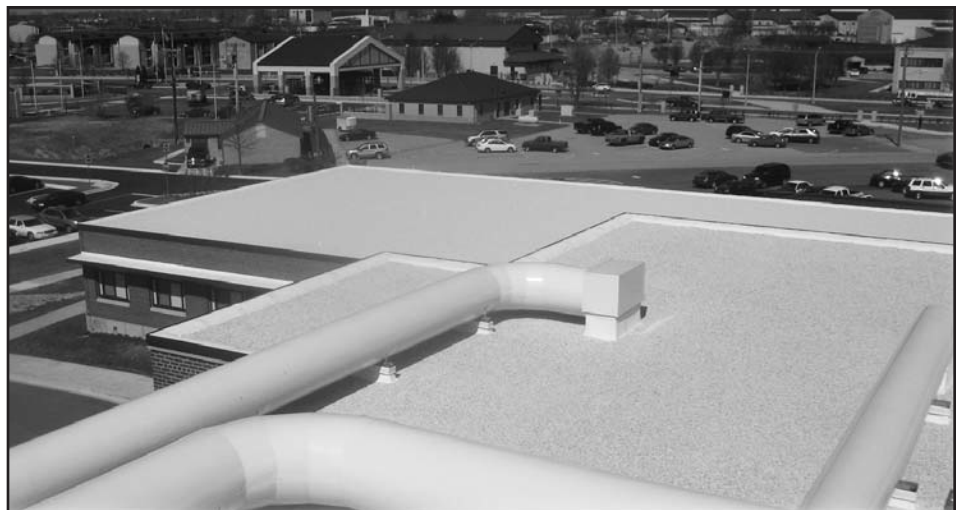
While work is ongoing to further define the benefits of what has been termed Above-Sheathing Ventilation (ASV), the significance of this information is likely to create a very strong impetus for change in how tile roofs are installed (Figure 2). Whereas the ASV of a high-profile tile is quite good regardless of how the tile is installed, lower profiles and flat tiles have a fairly limited ASV unless they are elevated above the roof deck. Fortunately, there are time-tested methods already in place for accomplishing this task, even though traditionally they have been used only for low-slope applications or in regions habitually subjected to severe winter weather.

The solution is elevated or counter-batten installations (Figures 3A and 3B). While most concrete tiles and some clay tiles are designed to be hung on batten strips, the most common practice in America is to fasten these battens directly to the roof deck (Figure 4). Unfortunately, this practice is perhaps the greatest contributor to premature failure of tile roofs, particularly in climates subject to severe weather. Tile roofs are water-shedding assemblies that, like other roofing materials, require a back-up underlayment system to prevent intrusive water from entering into the roof during extreme conditions.

In standard applications where tiles or battens are attached directly to the roof deck, if water somehow gets under the tile, either from severe weather conditions or from less-than-perfect installation, that water has a tendency to collect and pool wherever it does not have a clear channel of escape. It is this repeated and long-term occurrence of wetting that ultimately caus-



Figure 4 – Standard batten system.



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Figure 5 – Trapped moisture gradually destroys most underlayments, resulting in roof leaks.


es tile roofs to fail. While the underlayment may keep the water out for a period of time, eventually, the repeated exposures will cause it to fail, resulting in a roof leak (Figure 5).

With the growth of the green movement and attention being paid to finding as many ways as possible to use responsible building techniques and materials, the opportunity to use roofs to save energy is likely to gather momentum as more people become aware of this opportunity. Many cities and states around North America are already rolling out plans to either create incentives or require cool roofing on both new construction and particular reroofing projects in their jurisdictions. As this happens, roofing professionals will have to become familiar with the particulars of compliance.

The good news about tile roofs is that they do not have to go through major modifications to become effective energy-saving assemblies. The tiles themselves offer a much higher thermal mass than other roofing materials, and even the simplest method of application creates an air space that serves as an effective buffer against heat transfer. While this is most effective in predominantly hot climates, the ventilated tile roof has also been shown to be effective in the prevention of ice damming that can occur in cold climates.

So, as the benefits of ventilated tile roofs become better known, it is most likely to stimulate a move toward the elevated batten systems that accentuate this feature in order to save as much energy as possible. In general terms, the more air space between the roof deck and the bottom of the tile, the more effective the assembly will be in reducing heat transfer. Add a light or cool color to the surface of the tile, and the energy savings increase some more.

This means that tile manufacturers will be adding more colors that are capable of satisfying the demands of this new market. Most manufacturers have already begun to have their certified products listed with the Cool Roof Rating Council or Energy Star® to help designers and consumers make selections that will satisfy their needs and requirements.

won't leak while they are providing environmental advantages will become the norm in North America. They will very simply become the most responsible choice. 

References

- 1 Beal, D. and Chandra, S., "The Measured Summer Performance of Tile Roof Systems and Attic Ventilation Strategies in Hot Climates," *Thermal Performance of the Exterior Envelopes of Buildings VI*, US DOE/ORNL/BETEC, December 4-8, 1995, Clearwater, FL.
- 2 Miller, W., Desjarlais, A., Atchley, J., Keyhani, M., MacDonald, W., Olson, R., and Vandewater, J., "Cool Roofing...Cutting through the Glare," RCI Foundation, Atlanta, GA, May 12-13, 2005.

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