



Assessing the Thermal Advantages Provided by a Clay or Concrete Tile Roof

For years we have known, in concept, that a clay or concrete tile roof assembly has thermal advantages over other roofing materials, mainly because of the air space between the tile and the roof deck. Studies done in Europe and the Florida Solar Energy Center suggested that a standard tile roof assembly reduces heat gain through the system into the living area by 39% and 48% when using counter battens (increasing the air space under the tile) when compared to an asphalt shingle roof. The problem has been that nationally supported thermal standards such as Energy Star were based solely on surface reflectance and coatings.

A recent two year study done by the Oak Ridge National Laboratory (ORNL) for the U.S. Dept. of Energy (a 39 page report) effectively related the two elements, solar reflectance and the unique thermal advantages of a tile roof assembly, as a more complete assessment than other reports on the subject. The study evaluated:

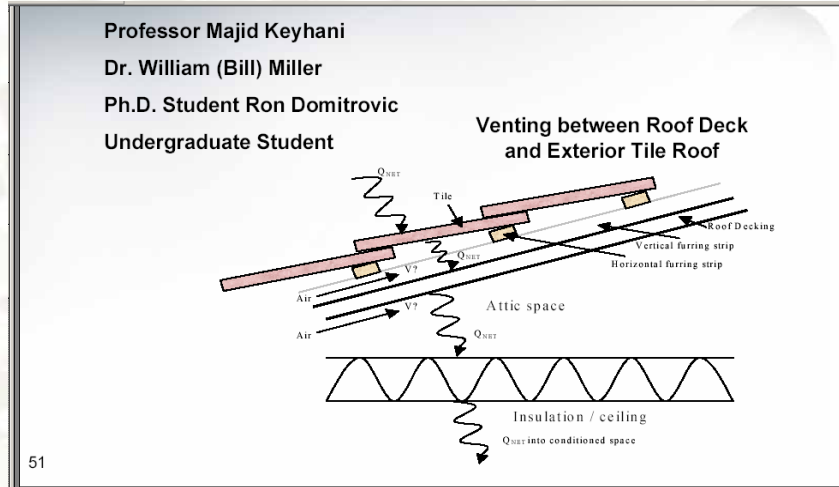
- Roof tile as a roofing component. There are both temperature and wind resistance implications for a rigid roofing system with gaps between the tiles.
- Solar reflectance of cool roof color materials (CRCMs).
- Thermal emittance (how well a particular surface radiates energy away from itself). Roof tile performs well in this test when compared to other roofing materials.
- Sub-tile venting.
- Attic venting.

Some of the analysis from this report can be used as a marketing tool for our product in the short term (sub-tile venting), while attic venting and cool pigmented colors will fuel further efforts in the future. The results of this study separated reflectivity values when using CRCMs and the solar benefits of a tile roof system compared to other roofing materials.

- The report concluded that tile roofs with CRCMs provide a 70% reduction in heat flow across the roof deck when compared to asphalt shingles (this gives us an idea of the potential of CRCMs for the future). 50% of this reduction is attributed to the air space between the tiles and the deck (sub-tile venting)
- The Cool Roof Rating Council (CRRC) has targeted 40% reflectance value to achieve recognition as a Cool Roof.
- To correlate reflectance and the batten space values, the report concluded that sub-tile venting is equivalent to approximately 30 points of solar reflectance. Using a worst case example, a slate grey roof tile (a typical color choice) with a 13% reflectance installed on a counter batten system would be the equivalent of a 43% reflectance value (13% + 30% for sub-tile ventilation). This new data should resonate with builders and architects and homeowners.
- Enhancing natural convection (the upward movement of a warm light air current) by installing a ridge vent (presumably vented eave closure would further increase air flow) on the underside of a dark grey slate tile was 10 degrees cooler than an installation with a closed ridge when exposed to summer-like conditions.

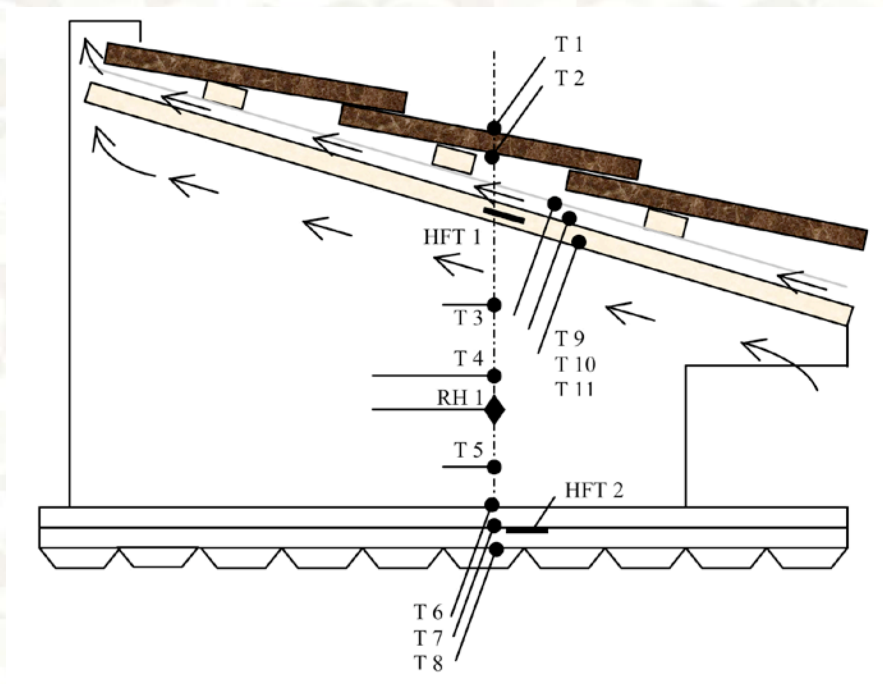
Conclusion:

The results imply that cool roof credits in some regions are obtainable for sub-tile venting. Sub-tile venting of a tile roof is just as important as is the boost of solar reflectance provided by CRCMs for reducing heat gain into the conditioned space.



This is a compelling argument for the use of elevated battens in conjunction with vented eave closure and ridge venting.

Future discussions will include CRCMs and attic venting to further reduce heat transfer into the living area and develop payback periods for various regions in addition to expanded cool roof credits in some U.S. locations.



Complete Reflective and Venting Profile