



SPRI, Oak Ridge: Ballast and paver systems save as much as cool roofs

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Ballast and paver systems save as much as cool roofs, according to a joint study released by SPRI, the association which represents sheet membrane and component suppliers to the commercial roofing industry, and the Department of Energy (DOE).

The purpose of the study, "Evaluating the Energy Performance of Ballasted Roof Systems," was to determine whether ballasted roofs offer similar energy efficiency benefits as cool roofs and are deserving of cool roof status from the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), as well as other federal and code organizations.

The research team, led by Andre Desjarlais of the Oak Ridge National Laboratory (ORNL), conducted side-by-side experiments comparing different weightings of ballasted roofs and a paver system along with black and white membrane controls. Each test section was a 4-foot by 4-foot area. The three gravel ballast systems weighed in at 10 pounds per square foot, 16.8 pounds per square foot, and 23.5 pounds per square foot.

The paver assembly weighed 23.5 pounds per square foot — the same as the heaviest stone ballasted roof. There were also 4-foot by 4-foot sections for the white and black membrane controls. Data collection included continuous monitoring of temperatures, heat flows and weather conditions, as well as periodic verification of the surface properties of solar reflectance and thermal emittance.

"After less than two years exposure, the medium and heavy ballast, along with the paver systems, have peak heat flows that are lower than the white membrane roof," Desjarlais said. "This suggests they are as effective as white-membrane roofs in mitigating peak energy demand. In addition, their yearly energy usage is lower than the white-membrane roof, indicating that equal total energy savings can also be obtained with roofing systems that have 'mass.'"

The study also found that the heaviest ballast system and the paver assembly have identical area densities but substantially different solar reflectances of 0.22 and 0.55 respectively yet had similar thermal performance. These observations strongly suggest that the controlling parameter is mass and not solar reflectance.

By reducing peak roof temperatures and delaying heat flow into a building, the mass of a ballasted roof provides measurable energy saving benefits, according to the study.

However, although these roofs show superior energy savings, they currently do not meet the official cool roof requirements of high solar reflectance. Hence, the Environmental Protection Agency and other organizations, such as ASHRAE and the California Energy Commission (CEC), were approached to modify their definition of a cool roof.

The CEC has included ballasted systems as a prescriptive equivalent to a cool roof in the just-approved 2008 Title 24, while ASHRAE has inserted it in the revisions being made for the next version of Standard 90.1. The EPA is reviewing the request that the ballast system be included in the Energy Star roofing category.

The complete report is now available for free download from the SPRI Web site, www.spri.org.