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Study: white roofs reign supreme

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By Cameron Jewell

28 January 2014 — A report out of Lawrence Berkeley National Laboratory has found white roofs to be the most cost-effective option over a 50-year time span — ahead of green and black roofs — lending support to the notion that black roofs should be phased out.

"White roofs win based on the purely economic factors we included, and black roofs should be phased out," said study co-author Dr Arthur Rosenfeld, a Berkeley Lab distinguished scientist emeritus and former commissioner of the California Energy Commission.



The report, *Economic Comparison of White, Green, and Black Flat Roofs in the United States*, will be published in the March 2014 edition of *Energy and Buildings*, but is now available [online](#).

The research looked strictly at the economic costs and benefits of the three types of roof, though acknowledged that while there was a high installation cost to green roofs, they had additional environmental and amenity values that weren't captured in the analysis. For example, rooftop gardens or green roofs can provide stormwater management, cool the roof's surface and surrounding air, and increase aesthetic appeal.

"We leave open the possibility that other factors may make green roofs more attractive or more beneficial options in certain scenarios," said Benjamin Mandel, a graduate student researcher at Berkeley Lab. "The relative costs and benefits do vary by circumstance."

However, the report found that green roofs, unlike white roofs, did not directly offset climate change. White roofs were more reflective than green roofs, reflecting about three times as much sunlight back into the atmosphere. By absorbing less heat, white roofs were found to offset more of the warming effects of greenhouse gas emissions.

"Both white and green roofs do a good job at cooling the building and cooling the air in the city, but white roofs are three times more effective at countering climate change than green roofs," Dr Rosenfeld said.

White roofs win on cost

Relative to black roofs, white roofs provided a 50-year net saving of US\$25 a square metre. Green roofs were US\$96 a sq m more expensive than white roofs and, despite lasting at least twice as long as black or white roofs, could not recover the installation premium. However the report found that despite this, the annualised cost premium of a green roof was just US\$3.20 a sq m per year.

This annual difference was small enough that the choice between a white and green roof should be based on preferences of the building owner, for example, whether they valued combating climate change or were concerned with aesthetic values or tackling stormwater management.

The study authors said that the other benefits of green roofs would ideally be included in analysis.

"We've recognised the limitations of an analysis that's only economic," Mr Mandel said. "We would want to include these other factors in any future study."

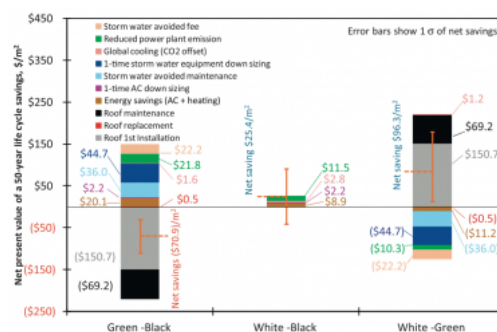
Black roofs pose a health risk

The researchers said black roofs posed a major health risk in cities that had high summer temperatures.

"In Chicago's July 1995 heat wave a major risk factor in mortality was living on the top floor of a building with a black roof," Dr Rosenfeld said.

With Australia experiencing increasing heat waves, there has been concern over the continued popularity of [black tiles](#) on residential properties.

Dark-coloured pavements and roofs were noted as a contributing factor to the urban heat island effect, which the latest State of Australian Cities report predicted would contribute to heatwave-related deaths.



See our article [Heatwave deaths predicted in State of Australian Cities report](#)

An article published in [Renew](#)

magazine pointed to three factors that has led to the continued use of black roofs in Australia.

First was the notion that people had an aesthetic preference for black roofs, as they were considered to blend in better.

Second was the building industry, which the article stated did "tend to set trends" based on perceptions of customer desire.

"Builders install them because they think customers want them, and customers want them because 'the building industry always uses dark roofs, so they must be the best option'," the article stated.



Distinguished Scientist Emeritus Arthur Rosenfeld

Another environmentally disastrous product that had persevered thanks to builders was halogen down lights, which were installed because they were cheap to buy and because there was a perception they were more desirable, however running costs were extremely high, a factor that seemingly did not enter the equation.

Finally, the article stated that many local councils had restrictions on how light a roof could be, perhaps because the majority of roofs were dark and a degree of likeness needed to be employed.

Dr Rosenfeld said government should have an active role in limiting the use of black roofs, and supported building code policies that phased out dark-coloured roofs in heat-prone climates.

"White doesn't win out over black by that much in economic terms, so government has a role to ban or phase out the use of black or dark roofs, at least in warm climates, because they pose a large negative health risk," he said.

Dr Rosenfeld has been a longtime supporter of solar-reflective "cool" roofs, including white roofs, as a way to reduce energy costs and address global warming. He co-authored a [2009 study](#) in which it was estimated that making roofs and pavements around the world more reflective could offset 44 billion tons of CO2 emissions. A [later study](#) using a global land surface model found similar results: cool roofs could offset the emissions of roughly 300 million cars for 20 years.

28 January, 2014

One Response for "Study: white roofs reign supreme"

[Dominique hes](#)

January 28th, 2014 at 5:13 pm

For Melb roofs for metal roof retrofits we found a benefit above link and tile black versus tile white with a 6 star house a 4 degree benefit (if coming paper)

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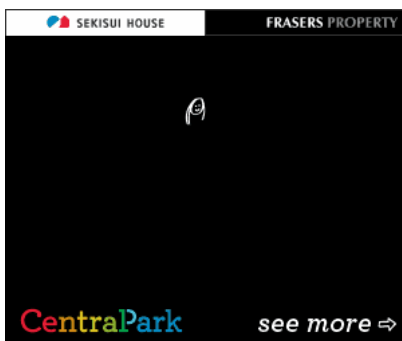
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