

TEMPERATURE OF COOL ROOFS

Normal roof surfaces, even if they are light coloured, are highly absorbent of solar infrared energy. The term "cool roof" refers to a roof with a specialised roof paint or coating that is specifically reflective in the near-infrared band. In this way the daytime temperature of a cool roof will be less. This has a subsequent effect on the thermal comfort in the rooms below or reduces the energy costs in the case of air-conditioned rooms ⁷¹.

TABLE 3.10
Draught-proofing product costs

Draught-proofing measure	Unit Cost
Draught Proofing -external doors	\$35
Sealable exhaust Fan	\$35
Chimney Stopper	\$125
Downlight Cap	\$7
Air Curtains	\$1000

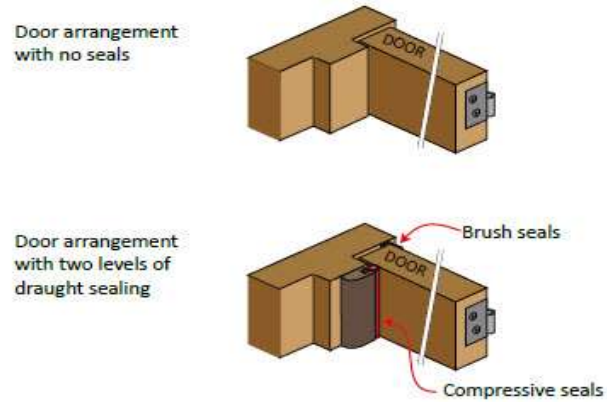


FIGURE 3.16
Door seals, before and after.

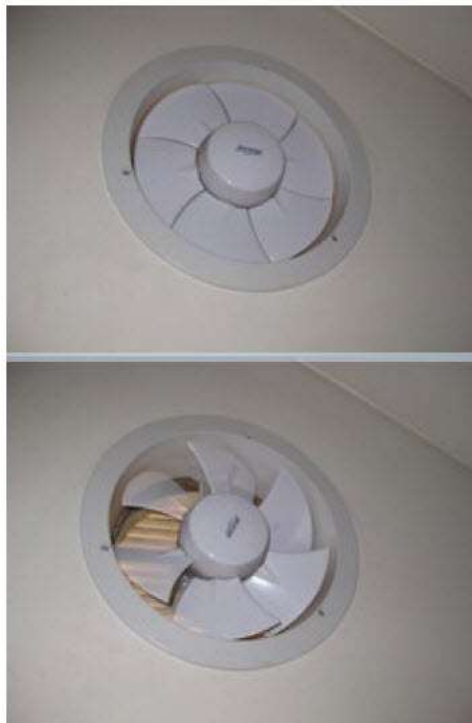


FIGURE 3.17
A draught-reducing exhaust fan.

The technology is most beneficial where a building's cooling load is dominant. In cooler climates, the high reflectivity can slightly increase a building's heating load in the winter.

The increased reflectivity decreases the amount of energy input through the roof which leads to lower temperatures inside the house ⁷². However, much of Australia does not require heating in the winter. Another point worth considering is that the technology is not as beneficial for otherwise well-insulated buildings. It is still an energy saver however, especially in the warmer climates ⁷³.

A cool roof does not have to be white. This is because the roof reflects well in the near infrared spectrum of solar radiation which is not visible to the human eye.

There are a wide range of colours that are available commercially including many dark colours ⁷⁴. However, lighter colours are still best from a thermal point of view.

Cool roofs and the Urban Heat Island effect

Beyond the cooling savings for a particular building is the effect that widespread adoption of cool roof technology would have on urban areas. This would raise the albedo of an urban area which could offset an effect called the urban heat island.

This effect refers to increased temperatures in an urban area relative to the temperature in their surrounding areas. This effect has a number of unwanted consequences, from increased air conditioning energy usage and decreased air conditioning effectiveness to increased smog generation and its associated health effects. Also the increased energy use is required at peak times and hence is particularly significant ⁷⁵.

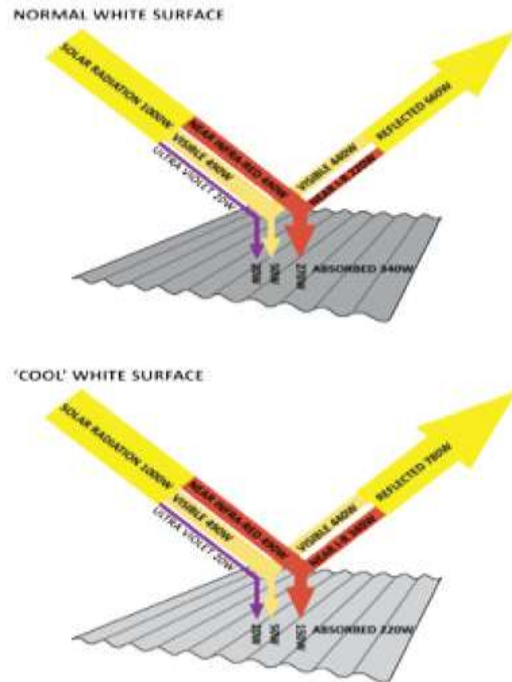


FIGURE 3.18

Surfaces with conventional white paint absorb about 50% more solar energy than surfaces with a typical 'cool white' paint

It is estimated that cool roofs could reduce the urban heat island effect in an area by 33% and that if everyone adopted it, there would be a reduction in city temperatures by an average of 0.4°C ⁷⁶.

Technology Benefits

The benefits of cool roofs are far-reaching:

- Reduction in mains energy requirements
- Reduction in air conditioner maintenance and increased appliance life due to a reduced load on the appliance

- Reduction in air conditioner size
- Increase in thermal comfort in the building
- Reduction of heat stress on the roof materials, leading to an increased lifetime
- Abatement of the Urban Heat Island effect in the local area
- Reduction in power utility loads at the peak time of the afternoon in the summer
- Increase in effectiveness of roof-mounted air conditioners.

Implementation Recommendations

Cool roofs are effective at reducing the thermal load of buildings. However they are year-round less cost-effective than conventional roof insulation. Accordingly cool roofs are recommended only:

- after conventional roof insulation is installed and when additional measures are required; or
- if sufficient conventional roof insulation cannot be installed cost effectively.

Beyond these basic recommendations, green roof retrofits may also be an appropriate retrofit measure when their other benefits come into play, eg to provide aesthetic, storm-water, and biodiversity benefits.

Costs

Since cool roofing is a secondary measure (ie secondary to conventional insulation and only used selectively), it is not specifically costed here.

Source: <http://decarboni.se/publications/zero-carbon-australia-buildings-plan/2-improving-thermal-performance-building-envelope>