

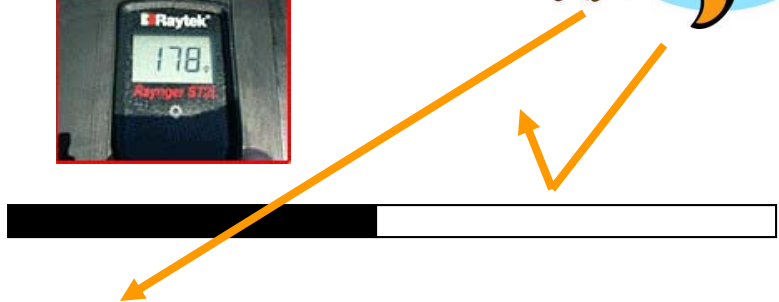


Environment friendly e-library

Cool Roofs

What Is a Cool Roof?

- Generally speaking, cool roofs are highly reflective and emissive. In other words, they reflect sunlight and reradiate absorbed heat as light energy back to the atmosphere, rather than transferring absorbed heat to the building below.



Cool Roofs

What Is a Cool Roof?

- Roofing materials have two important physical properties that determine how “cool” they are: solar reflectance (the fraction of solar energy that is reflected by the roof) and thermal emittance (*the relative ability of the roof surface to radiate absorbed heat*). Both properties are measured as a fraction or percent, and the higher the value, the “cooler” the roof.
- The percentage is often referred to as an index.

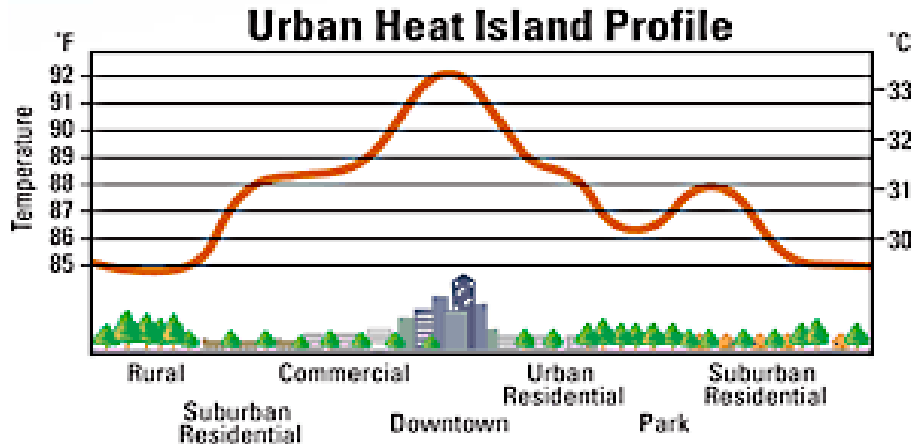
Roof membranes have an initial and aged rating. Aging occurs rather quickly; 2 to 3 years.



Cool Roofs

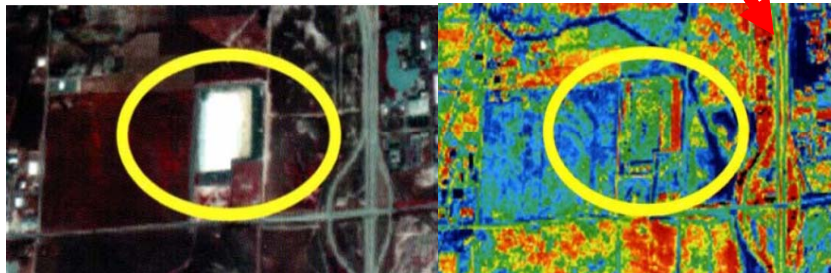
Why Consider a Cool Roof?

- In some cities the “heat island” effect can increase the local temperature by as much as 12%. Cool roofs substantially reduce the heat island effect.



White roof

Hot areas are orange



Cool Roofs

Why Consider a Cool Roof?

- Reflective roofs can directly save up to 40% in heating and cooling energy costs, as reported by the Oak Ridge National Laboratory.

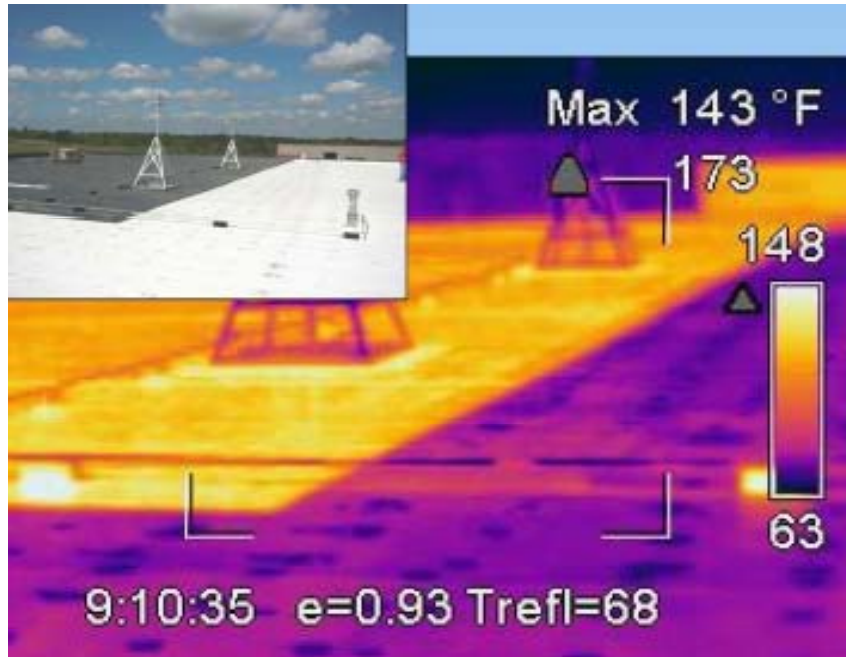


- **The Clean Energy Act**, passed by Congress in 2009, establishes carbon reduction goals; and creates federal building codes based on LEED & ASHRAE 189.1
Cool roofs are mentioned 6 times in the act.

Cool Roofs

Why Consider a Cool Roof?

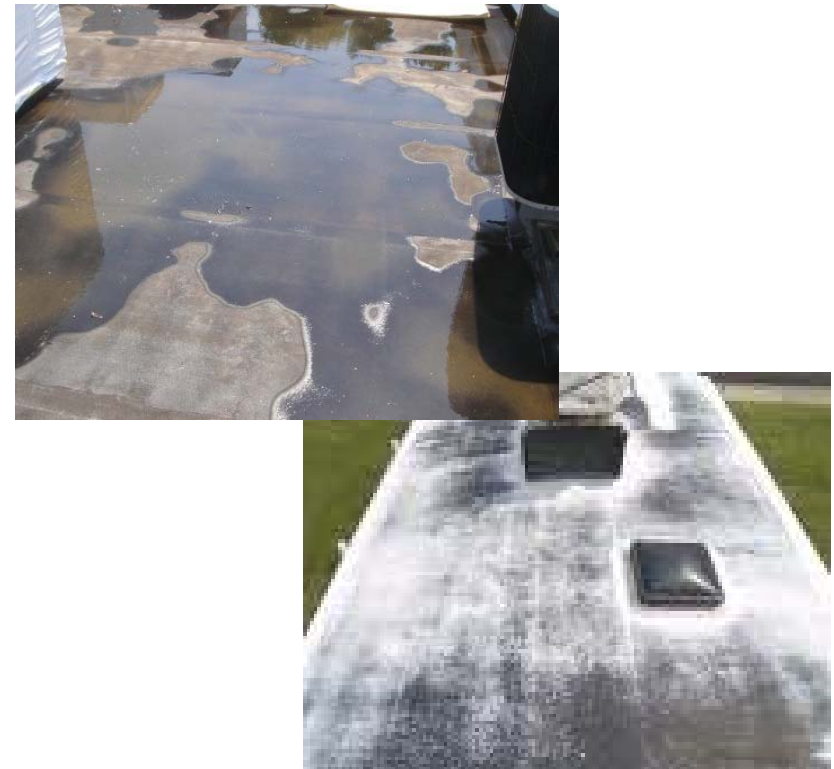
- White roofs generally have better performance in all climate zones as studies indicate that HVAC units operate more efficiently due to lower air temperatures.



Cool Roofs

Why Consider a Cool Roof?

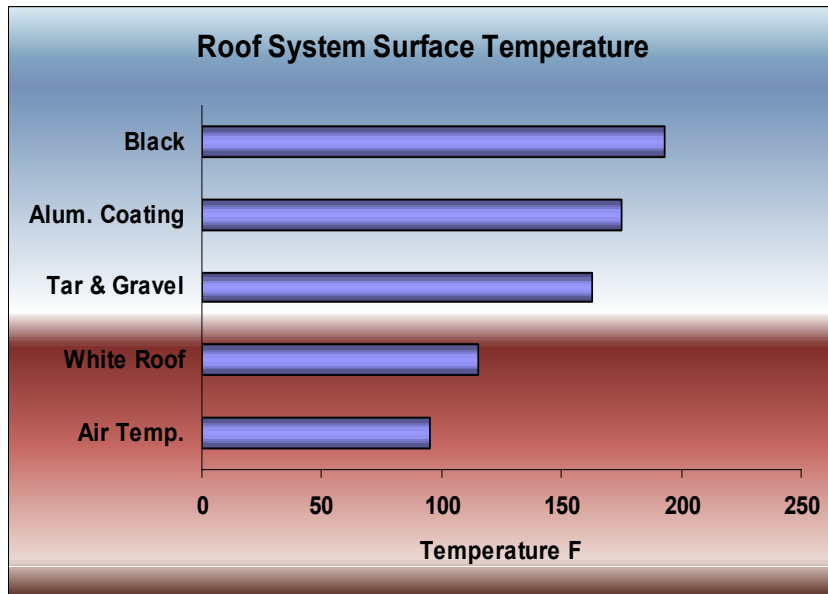
- White roofs also reduce thermal shock a condition that occurs when cool rain hits a hot surface. Thermal shock can reduce the life span of the roof.



Cool Roofs

Why Consider a Cool Roof?

- The roof surface heat difference is significant between various roof systems. One study had the following results:



Keep in mind that each 1° F reduction in building temperature can increase cooling efficiency by 8%.

Cool Roofs

Why Consider a Cool Roof?

- Another study had these results on an 89 degree day at noon:

EPDM
single-ply
173 °F



BUR topped
with aggregate
159 °F



BUR topped
with capsheet
158 °F



Cool single-ply
121 °F



Cool coating over BUR
108 °F



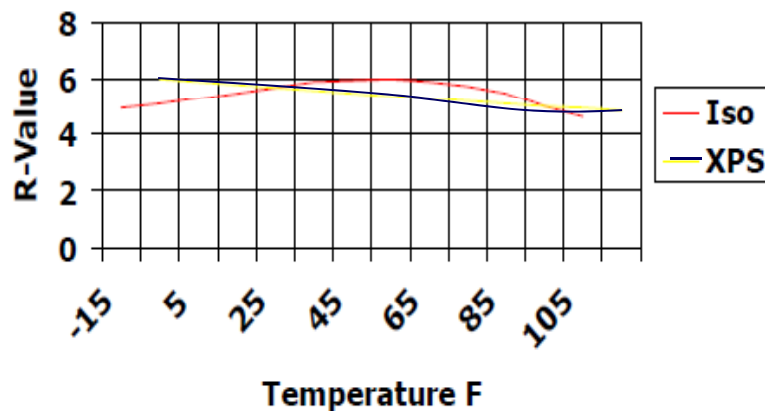
Cool Roofs

Why Consider a Cool Roof?

- The thermal resistance of insulation materials installed immediately below a black membrane has been found to be **up to 30% lower than advertised**, when measured at peak summertime temperatures in Austin, Texas

– *Konopacki and Akbari, 2001*

PI and XPS Board, R Values at Temperature



Cool Roofs

Why Consider a Cool Roof?

- A Lawrence Berkeley National Laboratory study found that world-wide reflective roofing will produce a global cooling effect equivalent to offsetting 24 gigatons of CO₂ over the lifetime of the roofs. This equates to \$600 billion in savings from CO₂ emissions reduction.
- Scientist Hashem Akbari states that converting 100sft of black roof to white roof offsets 1 ton of carbon dioxide.



Cool Roofs

Why Consider a Cool Roof?

- There is only a minimum “winter penalty” in Northern climates for Cool Roofs?



- Winter days are shorter (less hours of sunshine)
- The sun is lower on the horizon and less intense
- Higher incidence of cloudy days
- Roof may be covered in snow for long periods
- Heating costs typically 2 – 3 X < AC costs (per Btu)

Cool Roofs

Why Consider a Cool Roof?

For additional information visit:



Cool Roof Rating Council

<http://www.coolroofs.org/>