

Truths and Myths About Cool Roof Coating Systems

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Using cool coating systems on rooftops has recently become a hot topic. But what can these coatings really do for your roof? This article explains how cool coatings work and how they'll benefit your energy bills and maintenance budget. And some common myths and misleading claims about cool coatings are dispelled.

What Makes a Roof Coating Cool?

There are two properties of cool roof coatings which keep roof surfaces cool in the sun:

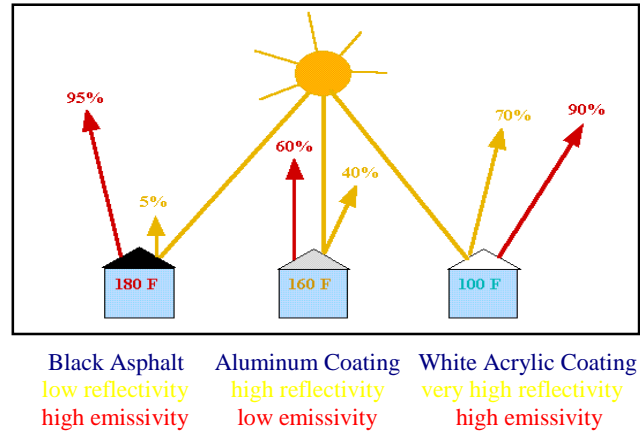
- High **reflectivity** to reflect away the sun's energy instead of absorbing it.
- High **emissivity** to radiate away any energy they do absorb.

Cool coatings have solar reflectivities of 60-75%, while conventional roofing materials have reflectivities of only 5-25%. Most roofing materials have emissivities which are a healthy 90% or higher.

Metals are one unfortunate exception, with low emissivities that range between 20-60% depending on their surface finish and condition. Even though they're generally very reflective, metal roofing and metallic roof coatings (i.e. aluminum coatings) tend to get hot since they're unable to emit away even the modest amount of solar energy they do absorb (think "Cat on a Hot Tin Roof").

The effect of these two properties on roof surface temperature is striking. Conventional roof surfaces with low reflectivity and high emissivity heat to 160-190°F at midday during the summer. Metal or aluminum coated roofs with high reflectivity and low emissivity still warm to 140-170°F. Cool coated roofs, with

both high reflectivity and emissivity, only reach 100-120°F in the summer sun.



What Are the Benefits of Cool Coating Systems?

Cooler roof surface temperatures mean less heat is transferred to the building below. Less heat in the building means it's cooler and more comfortable in the summer since its indoor and ceiling temperatures are lower.

Cool coating systems can also save cooling energy. Monitoring of more than 10 actual buildings in California and Florida with cool roofing have shown 20% to 70% reductions in cooling energy use. Cooling energy savings vary from building to building due to differences in roof insulation, building configuration, cooling loads, cooling system equipment, the local climate, and other variables. But your cooling needs are always decreased by using a cool coating on your roof.

Cool coatings can also help your roof last longer. Ultraviolet (UV) rays from the sun break down many conventional roofing materials. A cool surface reflects the sun's ultraviolet rays and slows down roof aging.

Roofing materials also contract and expand daily as they heat up during the day and cool down at night. A roof with a cool coating doesn't experience such large daily temperature fluctuations so it undergoes less thermal fatigue. Lower roof temperatures also reduce the rate of any chemical breakdown. A cool coating can increase roof life and significantly decrease roof maintenance and expenditures.

Cool coatings can also reduce air pollution. Direct reductions in air pollution generated from power plants result when less energy is used to cool a building. Widespread use of cool coatings can also reduce the summertime warming trends or "heat island" effect in our cities, and cooler air in cities slows down the formation of smog, beyond reducing cooling energy needs and emission production.

Use of cool coatings can also reduce the amount of roofing materials produced, used and thrown away. Eleven million tons of roofing waste currently land in U.S. landfills every year. If cool coatings are used to increase roof life this waste can be greatly reduced, and the energy and materials needed to produce new roofing can be conserved.

What Won't Cool Coatings Do?

Cool coatings cannot save wintertime heating energy; in fact they increase the amount of heating needed. The same properties that keep a roof cool in summer also reduce its temperature and heat transfer to the building below in winter.

Thankfully this heating penalty is smaller than the summertime cooling benefit in most U.S. climates. Days are shorter and the sun is lower in the sky during the winter, so the amount of energy reflected from the roof is much smaller in winter than in summer. Buildings are usually heated using less expensive natural gas and cooled using more expensive electricity, which also minimizes the cost of the wintertime heating penalty relative to the cooling savings.

Cool coatings cannot plug leaks or fix an unsound roof. Cool coatings can be applied over old roofing materials, but repairs must be made prior to coating a roof. Consult qualified manufacturers and contractors regarding a detailed installation specification that addresses all roofing system aspects. Then re-roof using a cool material or even consider applying a cool coating over a brand new layer of conventional roofing. Recoating a sound roof every ten to fifteen years or so helps the underlying roof last indefinitely at a fraction of the cost of relayering or replacing old roofing.

Cool coatings are also not recommended for use over existing shingles on sloped roofs. The coating can inhibit normal shingle contraction and expansion, causing the shingles to curl up at the edges. The coatings can also block drainage channels between the shingles, potentially causing water to collect and leak into the building below. Cool coatings work best over the flat or "low-slope" roofs found on most commercial buildings and some homes.

Don't Be Confused by Advertising!

Many ads for roofing materials make misleading and sometimes downright incorrect claims. Here is some scientific gobbledy-gook to watch out for:

**“This aluminum roof keeps your home cooler in summer, warm in winter” or
“This coating reduces cooling costs by as much as 40% & heating costs up to 15%”**

Aluminum coatings only keep your roof minimally cooler due to their low emissivity. If you're looking for significant roof cooling with energy, comfort and maintenance benefits, you're better off using a non-metallic roof coating. Plus no roof coating by itself can both cool a building in summer and warm it in winter. All cool coatings have a heating penalty during the winter, although this penalty is usually small enough to make using a cool coating very cost effective.

Some ads may assume you're applying the coating inside the building on the walls and ceiling. Technically, it's not clear that this idea has merit. Increased reflectivity of your indoor surfaces may help offset some of your heating losses in the winter, but may also tend to trap heat inside your building during the summer. This is also a questionable decorating idea. The most effective coatings are a very bright white, which is too harsh for interior spaces. Cool roof coatings are also formulated with algecides, mildicides and self-washing capabilities, which you don't need to pay extra for on your interior surfaces.

**“Use of this coating outperforms 4 inches of foam insulation against heat gain” or
“Tests prove that this coating is equal to or exceeds R-20 against heat gain”**

While technically correct, comparing cool coatings to insulation is confusing and potentially misleading. Cool coatings and insulation may reduce a building's heat gain by the same amount during the summer, but their effects in winter are very different. Cool coatings reflect away the warming rays of the sun in both summer and winter, making the building slightly colder in winter. Insulating a roof reduces the heat flow through the roof all year, keeping a building cooler in summer (by letting less heat in) and warmer in winter (by letting less heat out).

The above claims also make you wonder whether to spend your money adding insulation or adding cool roofing. Frankly, it's smarter to evaluate roof insulation and cool roof coatings as separate issues, not as an either/or proposition. Check the box below for some rules of thumb to help decide what your building needs.

Do You Need a Cool Coating?

Adding a cool coating is most beneficial for a building which:

- Is in a climate with hot & sunny weather during at least part of the year;
- Uses significant cooling energy and/or has problems maintaining comfort;
- Has a large roof area compared to the rest of the building's surface area;
- Has roofing which tends to crack and age prematurely from sun damage.

Cool coatings most often can be added directly over any existing roof in working condition, after making certain necessary repairs. Cool coatings are also recommended to cool and protect brand new roofs.

Do You Need Insulation?

Adding insulation to a roof is best for a building which:

- Has substantially less insulation than called for in local building codes;
- Is in a climate with significant cold weather and/or heating needs;
- Has a large roof area compared to the rest of the building's surface area.

Roof insulation has traditionally been added above the ceiling. However, it's often tough to do this without disrupting the building occupants. It's now often easier and less expensive to install sprayed polyurethane foam (SPF) directly onto your roof. But trust only an experienced SPF roofing contractor, and check their references.



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