

Recommended Cool Pavement Strategies Sac Metro Air District

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Extreme heat days and heat waves are projected to increase in the Sacramento area, with an average of 38 days over 100 degrees Fahrenheit per year for the 2025-2055 period, according to the State of California's Cal-Adapt tool. Traditional asphalts worsen heat by absorbing solar heat – like a sponge – and radiating the heat back out; they can be as hot as 158 degrees Fahrenheit in the summer.¹ Extreme heat also exacerbates ozone formation – of particular concern to this project, as vehicles release volatile organic compounds (VOC), an ozone precursor.

To mitigate these challenges, the SMAQMD recommends pavements with greater solar reflectance (i.e., they reflect more sunlight) to reduce localized heat island impacts and reduce ozone impacts.

Potential pavement types include:

- **Asphalt with microsurfacing (solar reflectance > 35%):** Microsurfacing can be applied in a thin layer to an asphalt surface. It is an emulsion-based paving system that uses dense-graded aggregate blend, emulsion, water, and mineral fillers. Its solar reflectivity is determined by the color of the materials used. It is suitable for parking lots, providing skid resistance.
- **Asphalt with reflective coatings (solar reflectance 30-50%):** These surface coatings can be applied to new or existing pavements. They use light-colored pigments and materials to increase the solar reflectance of pavements. They are relatively easy to apply and do not require milling of existing surfaces. Many of them extend pavement lifespan and improve skid resistance.
- **Whitetopping or ultra-thin whitetopping (solar reflectance 40-70%):** Whitetopping is a bonded concrete overlay onto an existing asphalt pavement suitable for parking lots and heavy traffic. Other benefits include increased lifespan of pavement and lower maintenance costs.
- **Concrete or roller-compacted concrete (solar reflectance 40-70%):** Concrete has a higher albedo, greater durability, and a longer material lifespan than asphalt, though it is more carbon-intensive to manufacture.
- **Conventional asphalt with light-colored aggregate (solar reflectance 5-20%):** Adding a light-colored aggregate to conventional asphalt increases solar reflectance. The solar reflectance lightens as the concrete ages.
- **Concrete containing or coated with titanium dioxide:** Titanium dioxide is a component of mineral sunscreens and can have a similar effect for pavements. It reflects sunlight away from the pavement and act as a photocatalyst to oxidize air pollutants from vehicle emissions such as NO_x (reducing NO_x by 25-40%) (nitrogen oxides), and SO_x (sulfur oxides). It also breakdowns volatile organic compounds (VOCs). It can also decompose soot, particulates, mold, bacteria, allergens, and other pollutants.

¹ U.S. DOT Federal Highway Administration: https://www.fhwa.dot.gov/pavement/sustainability/articles/pavement_thermal.cfm