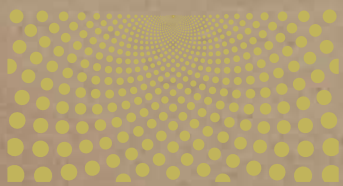


# Context Sensitive Pavement Materials



**EMC**

S Q U A R E D

Stabilized  
Base



Natural

**PAVE**

Resin Pavement

Sustainable  
Pavement



Natural  
**PAVE**

Resin Pavement



## Context Sensitive Solution

The City of Tempe, Arizona, solved a complicated design challenge by selecting the innovative NaturalPAVE® XL Resin Pavement™ product for a new access road running up to their water treatment plant. This facility is hidden in the Papago Buttes and surrounded by the cities of Phoenix, Scottsdale and Tempe, as well as a number of parks in the Papago Park district, a desert botanical garden, a golf course, a historical adobe, a museum, a zoo and a neighborhood concerned about preservation of the natural aesthetics. The access road was narrowed and given its sinuous alignment to protect giant saguaro cactus native to this Sonoran Desert landscape. A high strength NaturalPAVE XL Resin Pavement mix was formulated with complementary natural aggregate coloration to provide a context-sensitive solution that would limit the visual impacts of the new access road.

A clean technology product from Soil Stabilization Products Company, Inc. (SSPCo), non-toxic NaturalPAVE XL Resin Pavement mixtures are manufactured and installed without the use of heat. This cool process eliminates the high levels of energy consumption and the air pollution associated with production and installation of hot mix asphalt pavement materials. When NaturalPAVE XL Resin Pavement mixtures are installed, the finished pavements are typically solar reflective (high albedo) and have superior insulation values. These cool pavements provide a green alternative to heat absorbing asphalt pavement and heat retaining concrete pavement materials. This initiative by the City of Tempe to implement sustainable solar reflective pavement technology is timely as the Greater Phoenix Region struggles to counteract high summertime temperatures and serious Urban Heat Island (UHI) problems.



# Natural PAVE

Resin Pavement



SSPCo<sup>®</sup>



# Pavement Performance

**Marshall Stability** ~ Concrete, with its slab-like behavior and requirement for expansion joints, is classified and tested as a rigid pavement material. Hot mix asphalt pavement and NaturalPAVE® XL Resin Pavement™, with more elastic behavior and joint-free construction, are classified and tested as flexible pavement materials. The Marshall Stability Test Method (ASTM D 1559) has long been a standard procedure used by materials testing laboratories for evaluation of hot mix asphalt pavement mixtures and other types of flexible pavement materials. The stability of a pavement mixture is tested after the pavement specimen is heated to 140° Fahrenheit temperature, which is representative of hot weather service conditions. Stability is the maximum load resistance that a pavement mix test specimen will develop under compression. Stability translates into the resistance of a paving mixture to distortion, to displacement, to shearing stresses, to rutting and to shoving. As part of the Marshall Stability test, a *flow* measurement is also taken to evaluate the relative flexibility of different pavement mixtures. A higher stability measure indicates greater bonding strength. A higher flow number indicates greater flexibility and greater resistance to fatigue cracking.

“Typical Marshall Stability values for hot mix asphalt [are] 4,000 to 6,000 pounds. The NaturalPAVE XL samples tested in our laboratory had Marshall Stability values of 8,000 to 18,000 pounds. NaturalPAVE XL also maintained a higher flow number which, in combination with the stability results, would indicate that the material has good rut resistance, as well as good flexibility for fatigue cracking resistance.”

~ *Kleinfelder, Inc.*

“...it does appear the Resin Pavement (NaturalPAVE XL) can withstand higher loads with a more plastic deformation than the conventional Asphaltic Concrete mixture.”

~ *Alpha Geotechnical & Materials, Inc.*

**Resilient Modulus** ~ Resilient Modulus testing is the method now standardized by the U.S. Department of Transportation's Federal Highway Administration (FHWA) for the evaluation of pavement materials performance. This is the state of the art test method, recognized both nationally and internationally. In the interest of replicating the dynamic loading conditions that pavement layers experience under automobile and truck traffic, Resilient Modulus testing evaluates the elasticity of the pavement material and its ability to be resilient and return to its original shape and size without any permanent deformation or damage after repetitive loading cycles are applied. The comparative resiliency of a pavement material allows pavement design engineers to determine the load bearing capacity of a certain layer thickness of a specific pavement material and to evaluate layer equivalency. In other words, *“How many inches of conventional Hot Mix Asphalt Pavement are required to provide the same layer equivalency as a one inch thick layer of a typical NaturalPAVE® XL Resin Pavement™ material?” Resilient Modulus testing has been conducted on NaturalPAVE XL Resin Pavement materials. Taking all the testing data into account, a layer of NaturalPAVE XL Resin Pavement would be equivalent to a Hot Mix Asphalt pavement material of approximately twice the layer thickness. In hotter climates, the results of both Marshall Stability and Resilient Modulus testing indicate that significantly more than two inches of Hot*



For additional information on Marshall Stability and Resilient Modulus testing, see our document *Layer Equivalency Between NaturalPAVE XL Resin Pavement and Hot Mix Asphalt* available on our website,

[www.sspco.com](http://www.sspco.com)

# Cool Pavement for Green Building Projects

Typical NaturalPAVE® XL Resin Pavement™ mixtures have solar reflectance measurements that help in meeting or exceeding the minimum Solar Reflectance Index (SRI) value of 29 to qualify as high albedo pavement materials. Use of such pavement materials reduces heat absorption and radiance as required for a LEED® Rating System Point toward Green Building Certification from the USGBC as per Credit SS 7.1 (Heat Island Effect) for light-colored/high albedo pavement.

**Solar Reflectance** ~ The most important aspect of a cool pavement is its ability to reflect rather than absorb solar energy. Among the traditional pavement materials, concrete is the most reflective (high albedo), while black asphalt is the least reflective (low albedo) and most absorbent of solar energy. Typically, NaturalPAVE XL Resin Pavement mixtures are formulated with light colored aggregate mixtures and consequently have high solar reflectance similar to concrete pavements. The differences in pavement surface temperatures between heat absorbent asphalt and highly reflective NaturalPAVE XL Resin Pavement can be

significant. For example, utilizing an infrared thermometer during mid-August afternoon conditions (98°F air temperature) and measuring areas of pavement subject to full day sun exposure, the following pavement surface temperatures were recorded at a zoo facility in Washington, D.C.

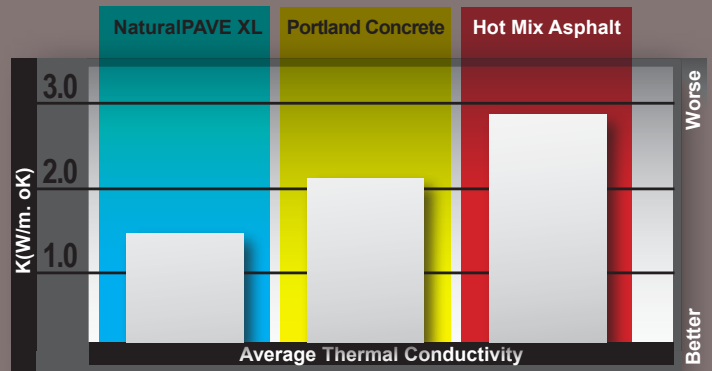
- New Asphalt Pavement . . . . .145°F
- Weathered Asphalt Pavement . . . . .139°F
- NaturalPAVE XL Resin Pavement . . . .121°F

As part of its educational mission regarding sustainable living practices for the Las Vegas Valley, the Springs Preserve in Las Vegas, Nevada, has an outdoor exhibit displaying the difference in residual heat between objects that reflect solar energy and objects that are non-reflective and absorb solar energy. Using the lizard thermometer sculptures pictured at left, visitors can observe the temperature differences throughout the day between the reflective white lizard and the heat absorbent black lizard. The 119.4°F and 153.5°F temperatures displayed were recorded mid-morning on a summer day while the air temperature was still under 100°F. They closely parallel the actual temperatures of reflective NaturalPAVE XL Resin Pavement and heat absorbent black asphalt pavement surfaces in these same weather conditions. NaturalPAVE XL Resin Pavement is the ideal surfacing for overlaying existing asphalt, as well as for new pavement installations and paving projects where the relationship of pavement surface temperatures to human health, Urban Heat Island effect and climate change are of concern.



Outdoor exhibit with temperature sensors to display the difference in residual heat from reflective and non-reflective objects

**Thermal Conductivity** ~ The thermal conductivity of a pavement material is also relevant to its effectiveness as a cool pavement. A pavement that has high thermal conductivity, such as asphalt, is going to rapidly absorb the solar energy and transmit heat through the pavement into the base course materials and subgrade soils below the pavement. As indicated by testing at the ASU SMART Materials Testing Facility, both asphalt and concrete pavement materials conduct heat more rapidly than NaturalPAVE XL Resin Pavement. This means NaturalPAVE XL Resin Pavement has superior insulation value, or thermal resistance. In combination with high solar reflectance, this advantage in thermal resistance makes NaturalPAVE XL Resin Pavement the standard for cool pavement technology.



Thermal Conductivity  
Arizona State University SMART Materials Testing Facility

# NaturalPAVE® XL Resin Pavement™ installation in progress

EMC SQUARED® Stabilized Base in construction

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NaturalPAVE XL Resin Pavement, similar to hot mix asphalt, is a surface course pavement material that is reliant on the workmanship of the pavement contractor during placement operations and on the strength and stability of the base course and underlying layers upon which it is constructed. SSPCo is a supplier of pavement materials only and not a contractor, engineer, installer, or construction inspector.

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