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The NDOT Research Library is located in Room 115 of the NDOT Headquarters Building, and is open 8-5, Mon-Fri. Or you can contact me, Heidi, at x.7895 or by email at [hwood@dot.state.nv.us](mailto:hwood@dot.state.nv.us).

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# RESEARCH AND TECHNOLOGY REVIEW

Volume 16, Issue 1

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## About NDOT's R&T Review

The NDOT Research Division administers the Department's research, development and technology transfer program and serves as the "clearing-house" for product evaluations.

Research and Technology Review is published quarterly by the NDOT Research Division. Its purpose is to provide the latest information on the NDOT research activities including product information and other pertinent research topics.

If you have comments or need additional information regarding any of the topics discussed in this issue, please contact the Research Division.

Edited by Roma Clewell,  
Research Analyst

## Famous Quotes

"Computers in the future may weigh no more than 1.5 tons."  
--Popular Mechanics, forecasting the relentless march of science, 1949

"I think there is a world market for maybe five computers."  
--Thomas Watson, chairman of IBM, 1943

"640K [cpu ram] ought to be enough for anybody."  
-- Bill Gates, 1981

## RESEARCH DIGEST: COOL PAVEMENTS

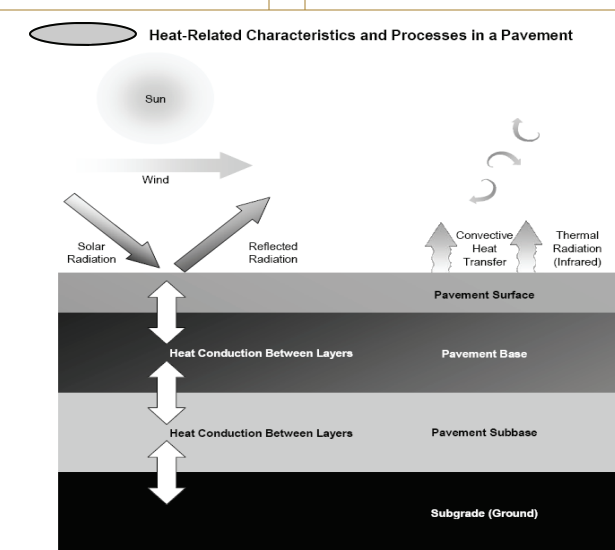
Recent studies show that some US cities have air temperatures up to 10 ° F warmer than surrounding regions, a phenomenon referred to as an urban heat island. The heat island effect can have significant impact on communities by increasing peak energy demand, air conditioning costs, air pollution levels and heat-related illness and mortality.

Pavements are considered an important contributor to this heating effect based on the observation that pavements for both travel and parking in some US cities can account for 29-39% of urban land surfaces. However, this contribution can be reduced by using "cool pavements." The so-called "cool pavements" are often used to describe pavements with high solar reflectance and/or increased permeability; in layman's terms, they refer to light-colored and/or porous pavements. Pavements with higher solar reflectance are cooler in the sun while porous or permeable pavements benefit from the cooling effect of evaporation.

Based on research results, there are several ways in which pavement reflectivity measured by

"albedo" (fraction of reflectivity) may be adjusted: by selecting a binder or aggregate of different color or altering the binder color; and by coating the pavement with a seal or surface of a lighter color. Examples include using light-colored cement or aggregates (e.g. limestones) or additives (e.g. slag and flyash) for concrete pavements, constructing whitetopping over an existing asphalt

pavement, and using light-colored pigments, seal or aggregates for asphalt pavement or chip seals. Porous pavement such as open-graded asphalt pavement intended for improving skid resistance,



reducing traffic noise, and helping storm water runoff also has permeable characteristics that results in cool pavement.

While the "cool pavement" technologies mentioned above are now available, their implementation remains challenging. Not only will specific technologies with cool attributes not be appropriate or feasible for all users, but also local and state agencies often lack the information and incentives to apply them. Nevertheless, the US Environmental Protection Agency

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**COOL PAVEMENTS continued**

(EPA), through its Heat Island Reduction Initiative (HIRI), has extensively studied pavements' effect on urban climate and air and water quality, as well as on the cost effectiveness of the various technology options. Cool pavements are receiving more and more awareness and consideration in the design of pavement projects for urbanized areas. For more information on EPA study results and implementing cool pavements, please visit the websites:

[http://www.epa.gov/hiri/resources/pdf/CoolPavementReport\\_Former%20Guide\\_complete.pdf](http://www.epa.gov/hiri/resources/pdf/CoolPavementReport_Former%20Guide_complete.pdf)  
<http://www.epa.gov/hiri>

**IMPLEMENTING PREVIOUS PAVEMENT RESEARCH**

The Nevada DOT has been very active in materials research for the past two decades. Several new materials, design, and construction techniques have been evaluated throughout the years to assess their applicability and effectiveness under Nevada's unique traffic and environmental conditions. The long-term implementation of the research findings faces a major obstacle, the loss of valuable knowledge with staff turnover. Often new employees are not familiar with older recommendations or the documents that support them and may have to rediscover knowledge.

The objective of the research project was to expedite the implementation of beneficial recommendations of two decades of materials research. It was initiated in January 2000 and will be completed in December 2007. The researchers at the University of Nevada, Reno, led by Dr. Peter Sebaaly, have developed an electronic database program to document all the previous and current research and experimental projects that NDOT has constructed. After the completion date of the research contract, the database will continue to be updated to include future activities. This database will enable new employees to more quickly retrieve needed recent and historical knowledge.

The database includes information on the following pavement treatments:

- ◆ Crumb rubber modified hot-mix asphalt (HMA) mixtures
- ◆ Cold in-place recycling
- ◆ Hveem mixtures designed with Superpave per-

formance graded binders

- ◆ HMA mixtures designed with Superpave mix design and performance graded binders
- ◆ HMA mixtures with special binders
- ◆ HMA mixtures designed with Superpave performance graded binders
- ◆ Projects on open graded friction courses
- ◆ Projects on rehabilitation of rigid pavements
- ◆ Construction of longitudinal joints in HMA pavements
- ◆ Hot in-place recycling
- ◆ HMA mixtures characterization for Mechanistic-Empirical Design

The electronic database contains the following information:

- ◆ Location of the test sections.
- ◆ Type of construction, thicknesses of the various layers, and the length of the test sections.
- ◆ Details on the mix design methods and properties of the aggregates / binders used in the test sections.
- ◆ Mix evaluations are listed.
- ◆ Data of test sections for long-term pavement performance.
- ◆ Access to the relevant published research reports and technical papers.

The main idea behind the development of the electronic database was that NDOT engineers would be able to look at past performance of the various materials and pavement technologies at anytime without having to locate old publications or identify and contact people familiar with the research.

Additionally, the database will allow NDOT personnel to input information for current/new projects. The information includes photos of the pavement conditions and the performance curves in terms of the present serviceability index (PSI). The photos also include brief description of the surface conditions as seen by the UNR and NDOT engineers that conducted the survey.

With such information at their fingertips, NDOT engineers will be able to assess the effectiveness of the various materials and design and construction techniques under Nevada's conditions. They will be able to document the long-term performance of the various technologies and use such information to revise and modify current design methods and specifications. In summary, this research makes it possible to continuously pass the knowledge from one generation to the next and reduce the practice of knowledge rediscovery.

Often new employees are not familiar with older recommendations or the documents that support them and may have to rediscover knowledge.

**PRODUCT EVALUATION COMMITTEE ACTIVITIES****FHWA Sole-Source Review**

The continuous Federal Highway Administration (FHWA) Process Review is winding down. Andrew Soderborg of the FHWA presented his findings to the Product Evaluation Committee (PEC) and other related NDOT personnel.

A major reason for initiating the process review was to determine whether NDOT policy was conflicting with the FHWA policy on sole-sourcing for construction contracts.

With recent guidance, FHWA defines a QPL-of-one as "when only one product is listed in a Qualified Product List (QPL) category". Another term for this is sole-sourcing. NDOT did not consider this activity to be sole-sourcing. The NDOT policy is now in the process of being updated to be in harmony with FHWA policy.

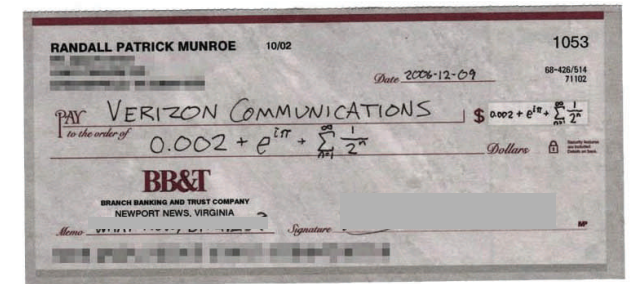
The Process Review also addressed other smaller issues:

- FHWA believes that NDOT needs to perform more internal education on the QPL and sole-sourcing
- FHWA also believes that information about sole-sourcing issues and the QPL should be included in a new Stewardship Manual, since many local projects use federal money.

As part of the Process Review, the Research staff performed a survey of internal and external customers.

The survey generally showed good results, but areas were identified where Research staff can improve user knowledge, especially in the areas of QPL use and sole-sourcing.

Research staff is working to address these issues. Jason Van Havel, Product Evaluation Coordinator, will give a brief presentation about the QPL and related sole-source issues at the Residential Engineer (RE) Academy, RE Annual Meeting, and the Maintenance conference.

**Why You Don't Tick Off An Engineer****Guardrail Galvanizing Process**

A guardrail manufacturer sought approval for a new galvanizing process for Nevada's guardrails.

The proposed galvanizing process is a hot-dipped process. As the steel is rolled into the guardrail shape, it is dipped in the galvanizing solution. Then the steel is stamped to shape the ends and the bolt holes are cut.

The current guardrail process stamps, then galvanizes the guardrail ensuring all surfaces are covered.

The reviewing division expressed concerns that this hot-dipped process might leave the ends and the holes unprotected. The vendor also could not provide economic benefits for the different dipping process.

Consequently, it was recommended that NDOT not approve the hot-dipped guardrail process as the risk/reward was not favorable to NDOT. The Product Evaluation Committee concurred with the division's recommendation.

