NATIONAL ASPHALT TECHNOLOGY RESEARCH & INITIATIVES

Kent Hansen

Kalamazoo, MI – March 29, 2016

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

OVERVIEW

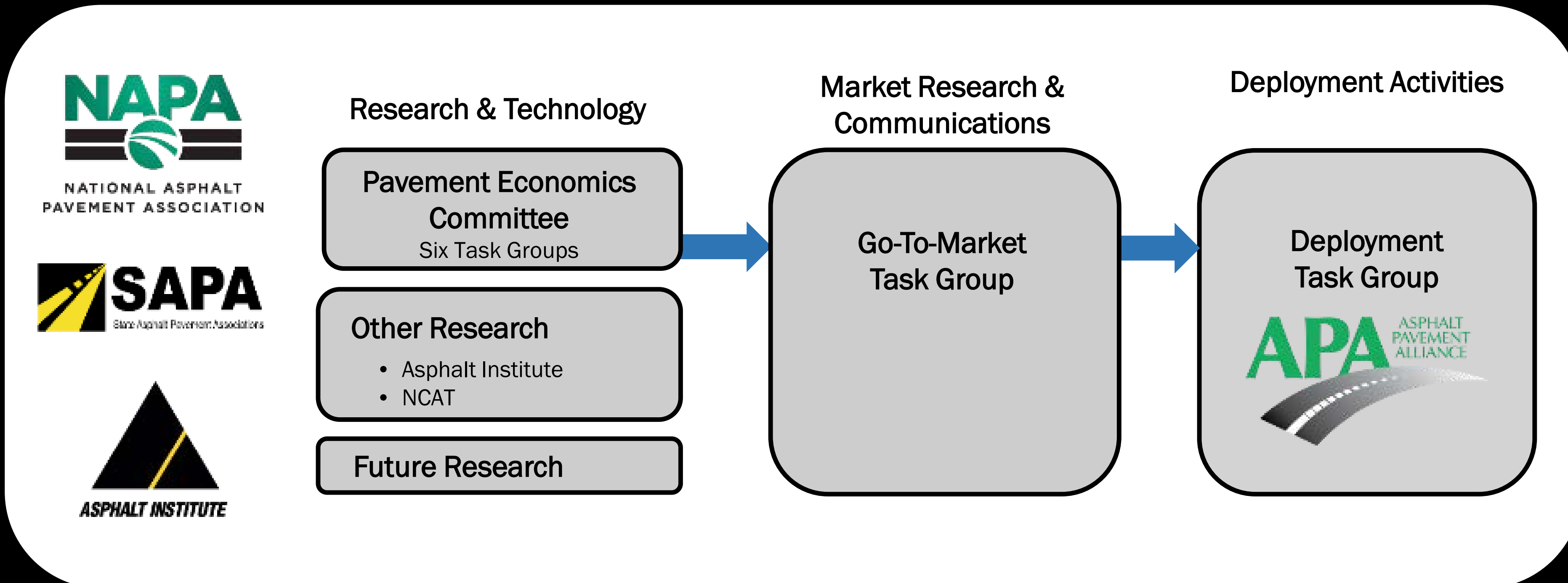
Unified Industry & Pavement Economics Effort Explained

- Government Partnership

Pavement Economics Case Studies

- Deliverables
- Marketing and Implementation

Pavement Performance


NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION
SAPA
State Asphalt Pavement Associations
ASPHALT INSTITUTE
Research & Technology
Pavement Economics Committee
Six Task Groups
Other Research
• Asphalt Institute
• NCAT
Future Research
Market Research & Communications
Go-To-Market Task Group
Deployment Activities
Deployment Task Group
APA ASPHALT PAVEMENT ALLIANCE

What Does NAPA's Pavement Economics Effort Mean?

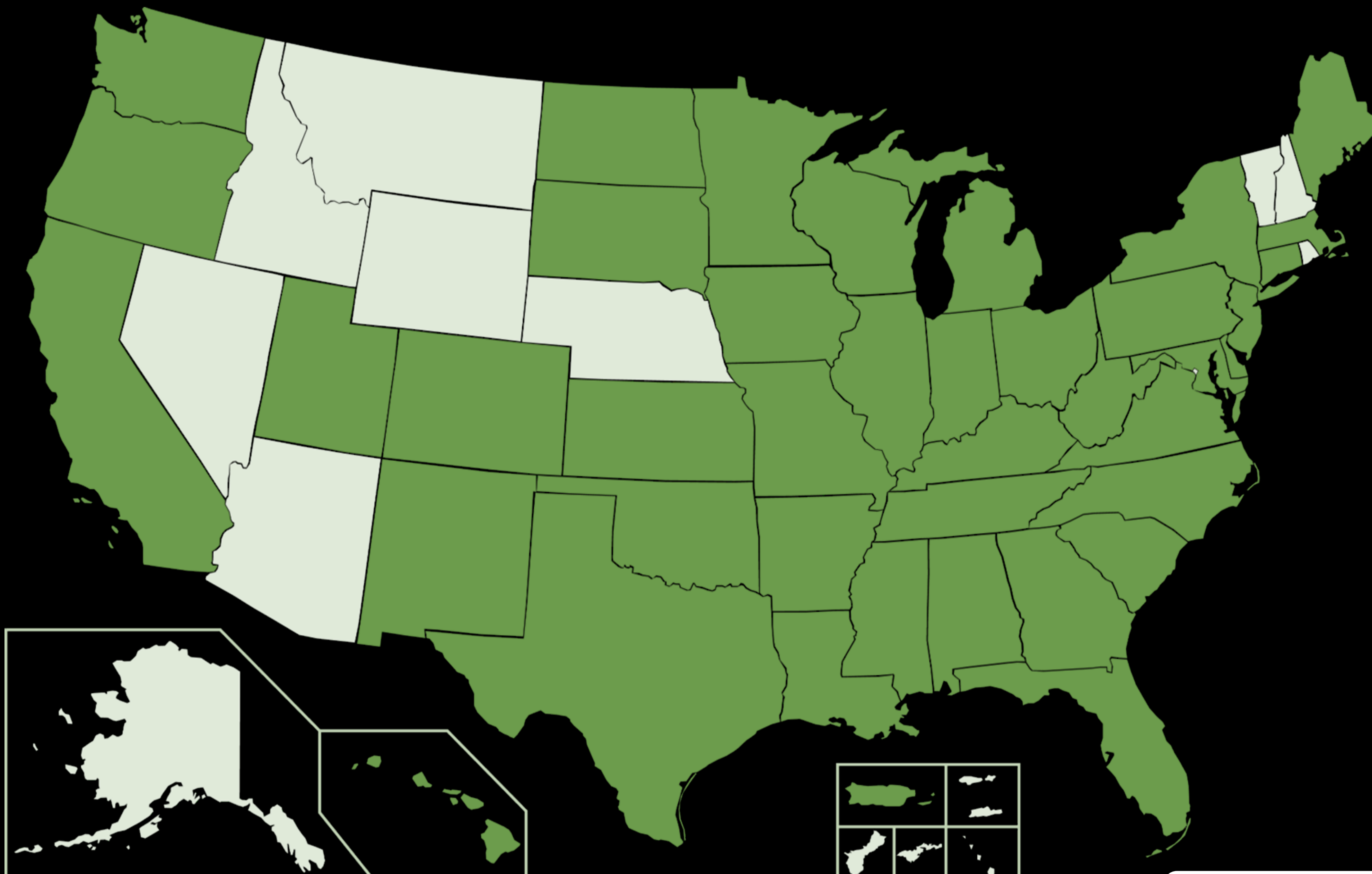
The pavement of the future…

Smart

System - Resilient

Sustainable

State Asphalt Pavement Associations



SAPA
State Asphalt Pavement Associations

Project Partners

SAPA
State Asphalt Pavement Associations

THE TEAMS

- Best Quality and Competitiveness
- Environmental Sustainability
- Legislative
- Pavement Type Selection
- Pavement Design
- Pavement Preservation

LEGISLATIVE

Highway Funding & National Legislation

State Legislation Tracking

Market Analysis and Annual Report

Accelerated Implementation & Deployment of Pavement Technologies Program (AID-PT)

$12 million per year — $6 million for asphalt; $6 million for concrete

MAP-21, P.L. 112-141, §52003

AID-PT: Making a Difference for U.S. Pavements

With most of the U.S. highway system completed, today's focus is on maintaining, rehabilitating, reconstructing, improving, and enhancing the capacity of existing roadways—maximizing the return on the public's original investment in the system.

The needs of the nation's highways are critical: More than 150,000 miles of roadways in the National Highway System—almost half—are not in good condition.[1] Poor road conditions cost U.S. motorists $80 billion a year in repairs and operating costs.[2] Deteriorating pavements, along with increasing traffic and funding constraints, are impeding highway agencies' ability to maintain, improve, and strategically expand the highway system.

More than 50 percent of highway funding is spent on pavements. To ensure the greatest return on these investments and accelerate the process of delivering safe, smooth, durable pavements in a "state of good repair," two things are needed:

1. *Prompt implementation* of pavement technologies, products, and processes developed through research supported in previous Federal authorizations.
2. *Leveraging* of Federal investments with private funding and partnerships.

Recognizing these needs, Congress established the Accelerated Implementation and Deployment of Pavement Technologies (AID-PT) Program as part of the *Moving Ahead for Progress in the 21st Century Act*. The AID-PT program provides funding to advance the latest and best pavement technologies through FHWA/industry collaborations.

To date, the Federal AID-PT program is making a dramatic difference. In 2013–2014 FHWA, with AID-PT funding and in partnership with the National Asphalt Pavement Association (NAPA) and the American Concrete Pavement Association (ACPA), supported deployment of the newest and best technologies to help highway agencies do the following:

- Manage pavement assets more effectively (saving time and money).
- Improve the condition of the national network (saving lives and contributing to economic growth).
- Use recycled materials and byproducts in pavement maintenance, repair, and rehabilitation activities (saving natural resources and benefiting the environment).

The immediate beneficiaries? State highway agencies and the traveling public.

"It has been very encouraging to see the AID-PT program, established under MAP 21, rapidly advance new pavement technologies that are critical to keeping our transportation system in as good a condition as possible with available funding. I serve on the joint industry/DOT Executive Task Group to ensure maximum value from the program and can attest that it is making a positive difference. In only two years, both the asphalt and concrete pavement industries have responded quickly, with FHWA leadership, to bring value to the taxpayer. I would encourage the continuation of this program under future authorizations."

– Jim Duit, Duit Construction Company

Source: FHWA

Continuing to Make a Difference: Building on Success

The AID-PT program has proven itself.

After only two years, its impacts have far exceeded expectations. It is providing tangible, measurable results across the nation. Both the asphalt and concrete communities support it. State agencies and industry are committed to long-term technology deployment efforts and are working together to optimize the results.

Still, the need for technology and knowledge transfer remains critical as State DOTs continue to experience budgetary constraints along with staff reductions and, conversely, an influx of new personnel.

The next round of AID-PT support can ensure continued success. The paving community will build on progress to date, extending outreach efforts to new organizations and focusing on additional technologies. Continuing the AID-PT program will help realize the goal of pavements that are

- More durable and longer-lasting.
- Smoother, quieter, more comfortable for motorists.
- More cost-effective over the life cycle.
- Designed for improved drivability.
- More environmentally friendly.
- More versatile for various applications.

The AID-PT program is a positive example of the results that are possible when public- and private-sector resources are leveraged to assist State highway agencies, and ultimately, to benefit the traveling public.

Source: Jim Huddleston, Asphalt Pavement Association of Oregon

Source: ACPA

1 U.S. Public Interest Research Group. "Road Work Ahead: Holding Government Accountable for Fixing America's Crumbling Roads and Bridges." April 2010. Accessed from https://pincdn.s3.amazonaws.com/assets/3f120ddc2dc65377539be6738f4743b/Road-Work-Ahead-vUS.pdf

2 TRIP (2011). *Bumpy Roads Ahead: America's Roughest Rides and Strategies to Make our Roads Smoother.* TRIP: A National Transportation Research Group, Washington, D.C.

ACPA American Concrete Pavement Association

NAPA National Asphalt Pavement Association

NAPA National Asphalt Pavement Association

AID-PT Program

AID-PT IMPACT

Provided training & advice to more than 11,400 pavement professionals.

Produced & distributed more than 100 technology transfer publications and articles.

Met and advised over 25 State DOTs on specific pavement issues

Knowledge exchange tour of Japan for asphalt industry and AASHTO representatives

U.S. Department of Transportation
Federal Highway Administration

Partnership for Innovation in Asphalt Pavements

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

U.S. Department of Transportation
Federal Highway Administration

NCAT
Texas A&M Transportation Institute
ADVANCED ASPHALT TECHNOLOGIES, LLC
Engineering Services for the Asphalt Industry
SAPA

Where to find the latest survey report:

Information Series 138

Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage 2014

NAPA

www.asphaltpavement.org/recycling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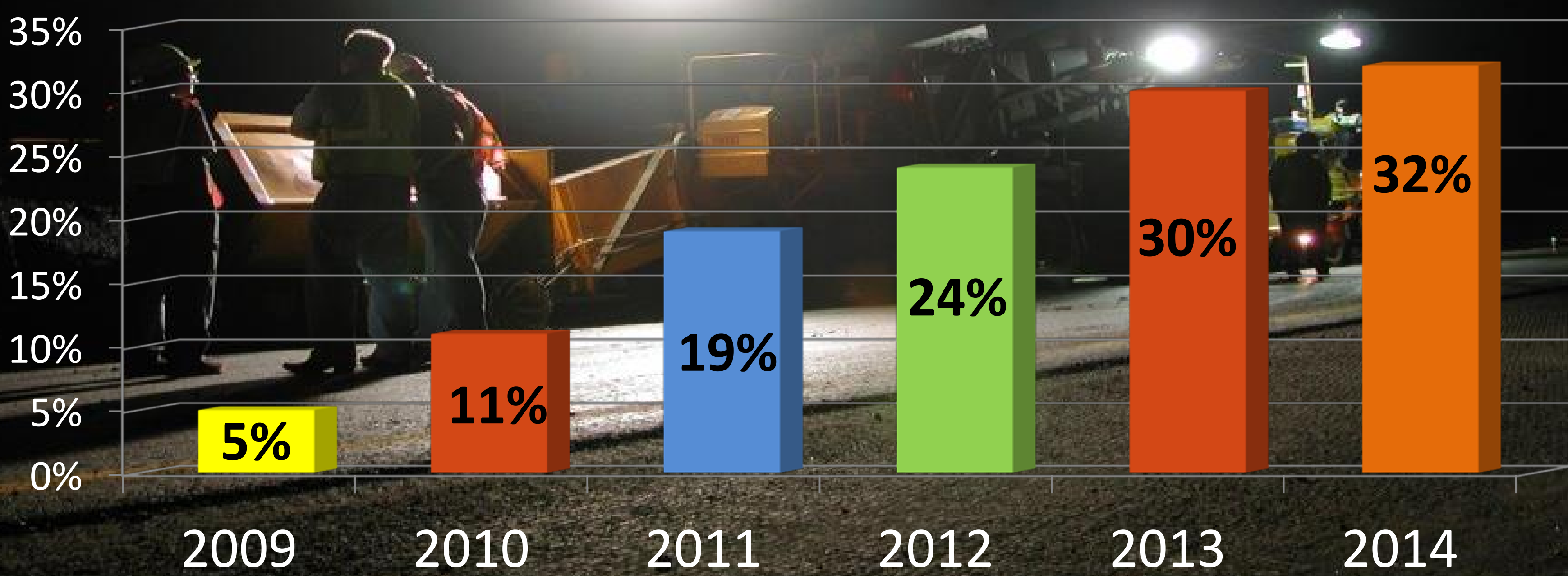
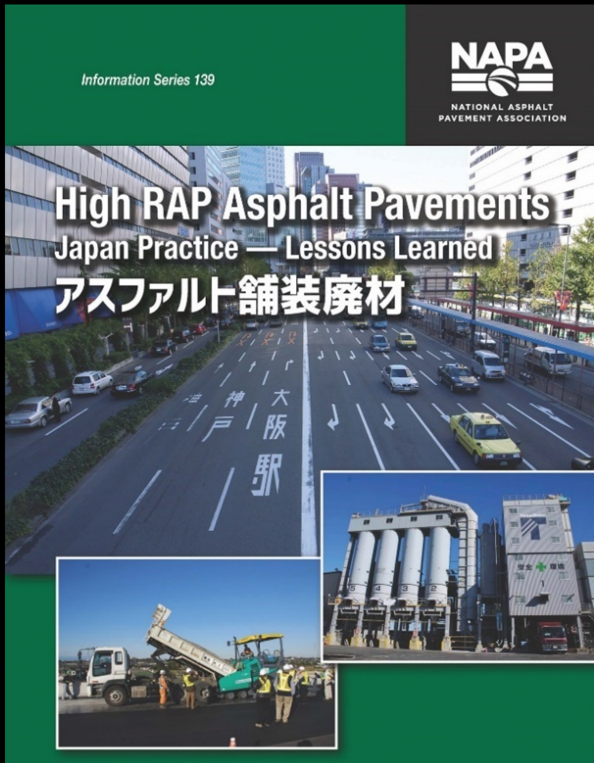
THE IMPACT OF
ASPHALT SUSTAINABILITY
About
4.16M
scrap tires were used to make quiet, rubberized asphalt pavements.4
Reuse of old pavements saves
13,500
Olympic-size pools worth of landfill space.2,3
About
1.9M
tons of roofing shingles were put to use in new pavement mixes and other road-building uses.1
72M
tons of old pavements were put to use in new pavement mixes and other road-building activities.1
99%+
of the material removed

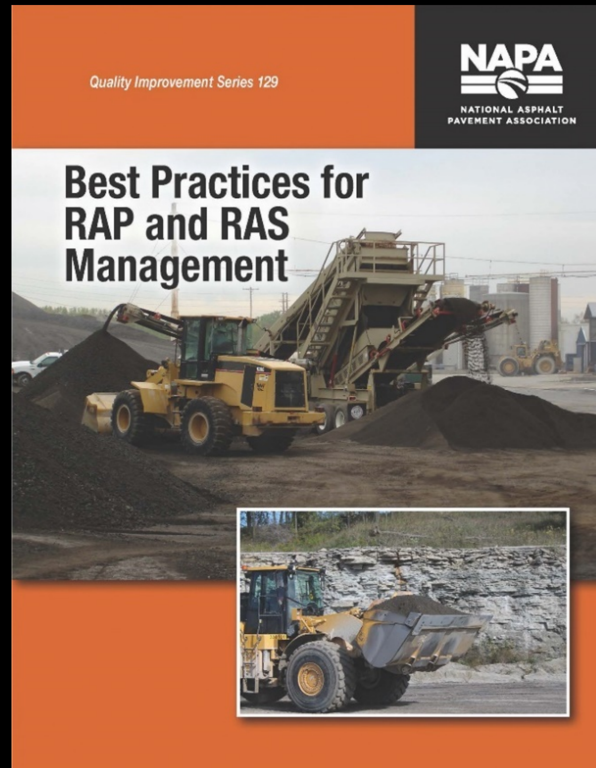

activities.1
99%+
of the material removed from old asphalt pavements is reused in new pavements1
$2.8B+
SAVINGS
from recycled materials compared to the cost of raw materials.1
WARM-MIX
ASPHALT
technologies have the benefit of reducing energy consumption which decreases the production of greenhouse gases.1,5
32%+
Nearly a third of all asphalt pavement mixtures are produced using warm-mix technologies.1

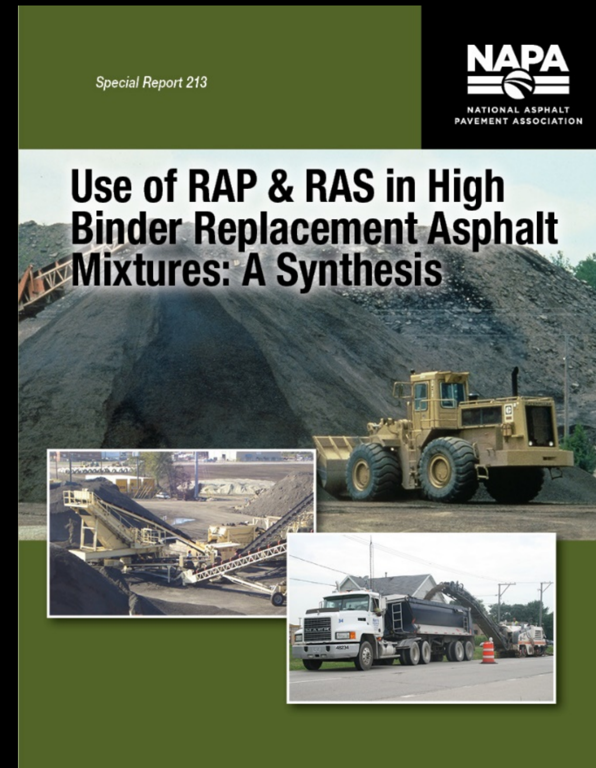
WMA Usage

Percentage of Total Asphalt Production in US









store.AsphaltPavement.org

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Resources on Recycled Materials

TechBrief

The Asphalt Pavement Technology Program is an integrated national effort to improve the long-term performance and cost effectiveness of asphalt pavements. Managed by the Federal Highway Administration through partnerships with state highway agencies, industry and academia, the program's primary goals are to reduce congestion, improve safety, and foster technology innovation. The program was established to develop and implement guidelines, methods, procedures and other tools for use in asphalt pavement materials selection, mixture design, testing, construction and quality control.

U.S. Department of Transportation
Federal Highway Administration

Office of Asset Management, Pavements, and Construction

FHWA-HIF-15-009

April 2015

Porous Asphalt Pavements with Stone Reservoirs

This Technical Brief provides an overview of the benefits, limitations and applications of porous asphalt pavements with stone reservoirs. Considerations for design and construction, as well as maintenance, are discussed.

Introduction

Porous asphalt pavements with stone reservoirs are a multifunctional low impact development (LID) technology, which integrates ecological and environmental goals for a site with land development goals, reducing the net environmental impact for a project. Not only do they provide a strong pavement surface for parking, walkways, trails, and roads; they are designed to manage and treat stormwater runoff. With proper design and installation, porous asphalt pavements can provide a cost-effective solution for stormwater management in an environmentally friendly way. As a result, they are recognized as a best practice by the U.S. Environmental Protection Agency (EPA) and many state agencies (EPA n.d.; PDEP 2006; NJDEP 2004).

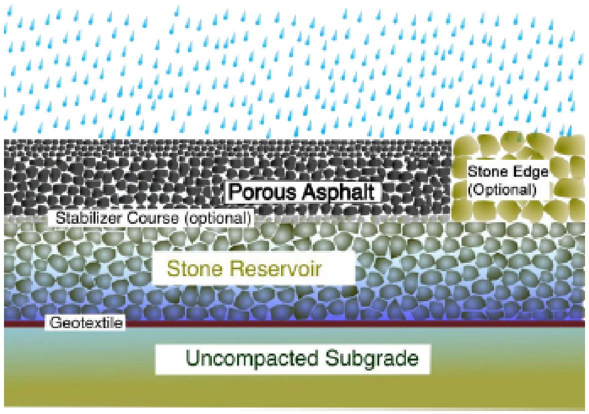

Figure 1: Typical porous asphalt pavement with stone reservoir cross section

RESEARCH PROJECT SUMMARY

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ASPHALT. AMERICA RIDES ON US.

IRI Explorer

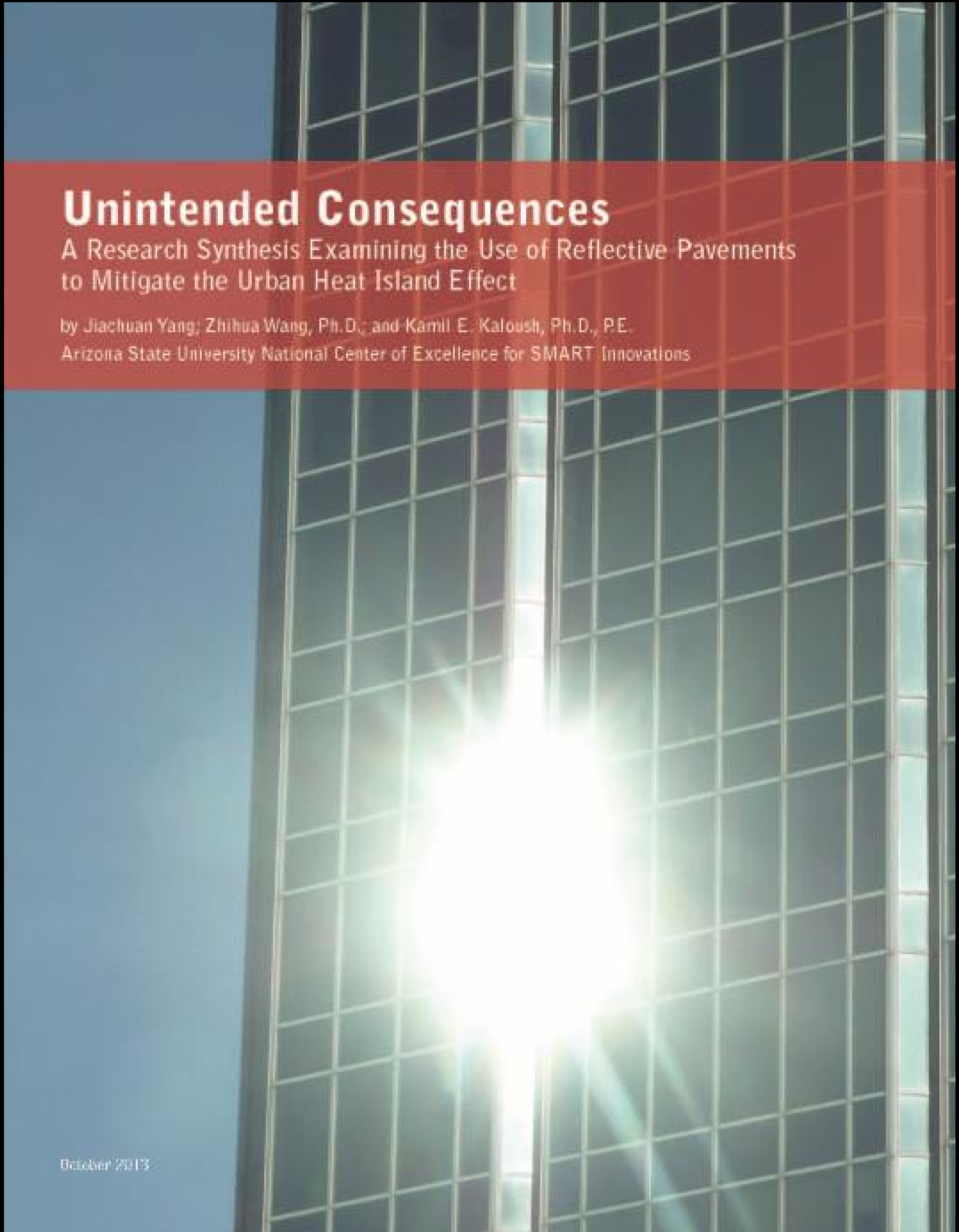
Environmental Product Declaration
NAPA CERTIFIED

PaveXpress

THINLAY
SAFE. SMOOTH. DURABLE.

Environmental Sustainability

The Risks	The Strategies
Pavement Reflectivity Mandates	Awareness of Multiple Variables
The Story on Pavement and Fuel Economy	Further Develop Sound Data and Science
Lack of Information on Smooth Roads and Sustainability & Performance	Partnerships for Sustainability
Quantifying Environmental Impact	Lead Industry in Life Cycle Analysis



Unintended Consequences

A Research Synthesis Examining the Use of Reflective Pavements to Mitigate the Urban Heat Island Effect

by Jiachuan Yang; Zhihua Wang, Ph.D.; and Kamil E. Kaloush, Ph.D., P.E.
Arizona State University National Center of Excellence for SMART Innovations

October 2013

Fuel Economy and Pavements


Surface texture
the roughness of the aggregate materials in a pavement
Smoothness
surface unevenness that affects perceived ride quality
Pavement stiffness
how the pavement deflects under a vehicle's weight
APA
The forces that Matter for Pavement-Vehicle Interaction
Almost 75 percent
How Pavement influences vehicle Fuel Economy
About 75 percent of the oil consumed
Vehicle Energy Consumption by Speed
30 mph
70 mph
NAPA
Vehicle Fuel Economy and the role of pavement Smoothness
When it comes to America's roads,

PAVEMENT HEALTH ANALYSIS TOOL

IRI Explorer

www.IRIExplorer.com

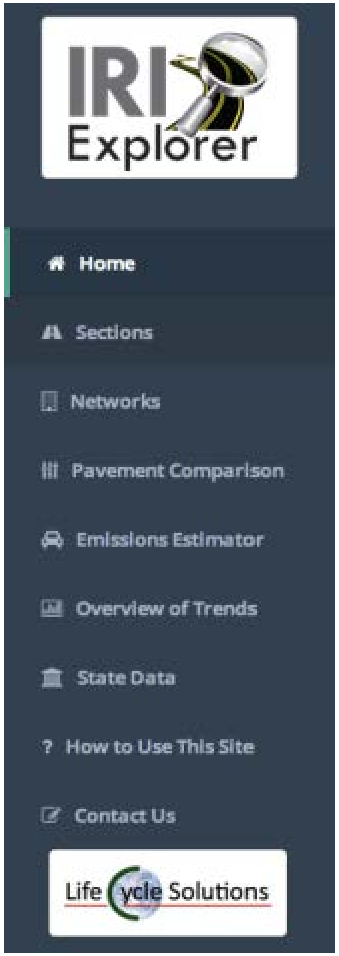
- **Utilizes LTPP Data**
- **Free**
- **Web Based**
- **Customizable**
- **Life-Cycle Emission Benchmarking**

Background — IRI Explorer

The IRI Explorer was created to allow users to easily interface with the LTPP data

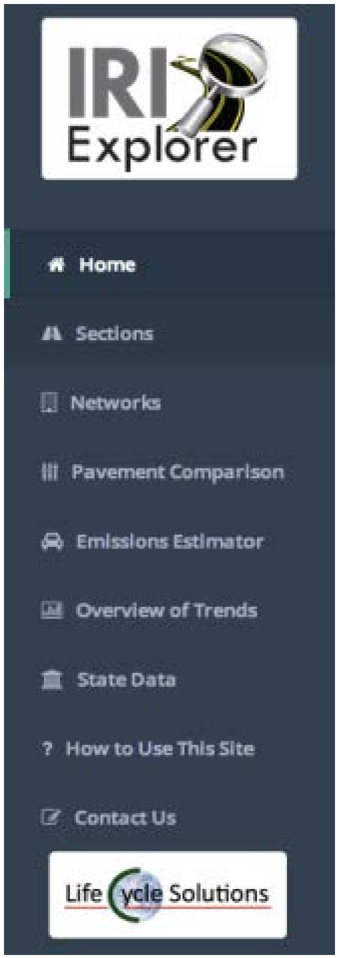
- Easy-to-read graphs
- Statistical rigor
- Look at the effects of pavement selection on IRI and vehicle emissions

IRI Explorer — Tabs and Tools



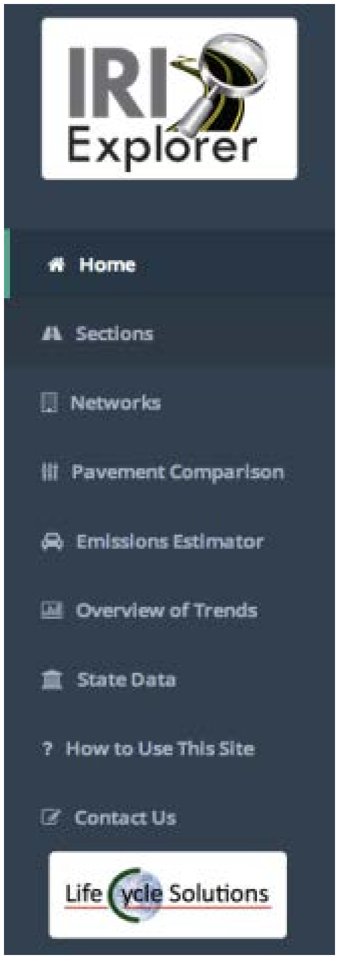
- Sections: Search for a single section and look at its IRI performance over time
- Networks: Examine the performance of broad categories of pavement types within a regionalized network
- Pavement Comparison: Compare two pavement types. Many filters available to make specific comparisons

IRI Explorer — Tabs and Tools



- Emissions Estimator: Find the GHG emissions associated with a roadway over its entire lifetime, including use, construction, and maintenance phases.
- Overview of Trends: A discussion of trends seen in the LTPP data.
- State Data: Houses additional data gathered by certain states. Access is limited to the funding agencies.

IRI Explorer — Goals and Caveats



- Goal: To let users craft their own queries to the LTPP database; to see how different pavements perform in their region, application, road type, and so on

- Avoid making general assumptions from specific data sets

- All of engineering is trade-offs

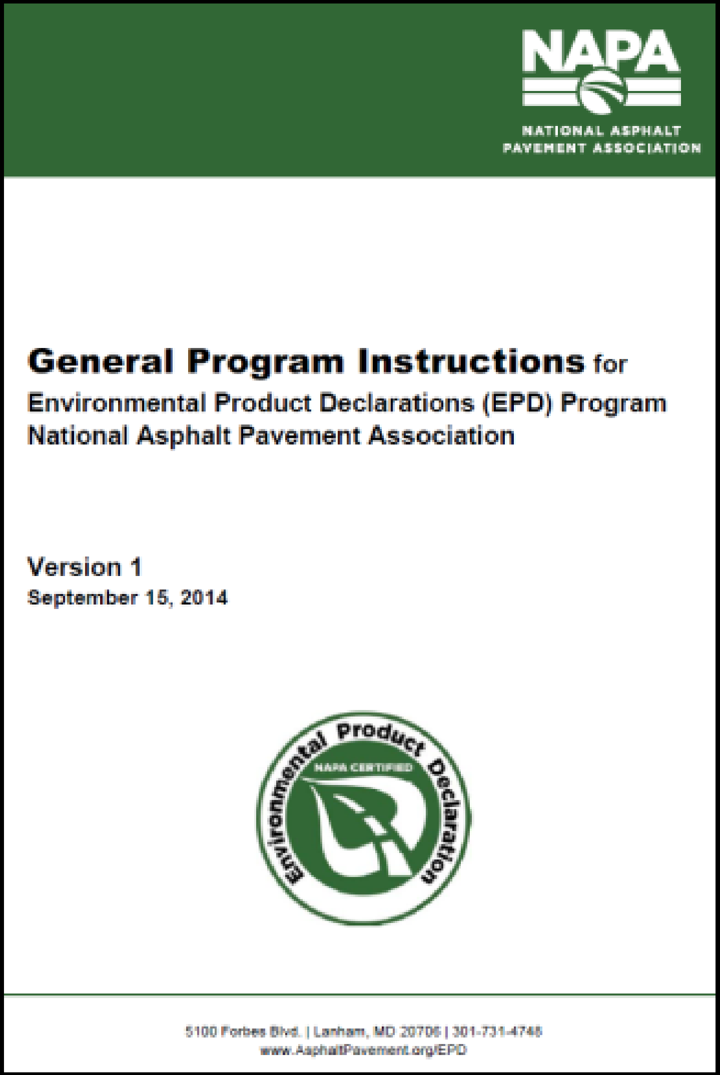
Quantifying the Asphalt Industry's Environmental Impact

Environmental Facts

Functional Unit: 1 metric ton of Asphalt Cement

Primary Energy Demand (MJ)	4.0×10^3
Non-Renewable Energy (MJ)	3.9×10^3
Renewable Energy (MJ)	5.5×10^1
Global Warming Potential (kg CO_2eq)	79
Acidification Potential (kg SO_2eq)	0.23
Eutropication Potential (kg Neq)	0.012
Ozone Depletion Potential (kg CFC-11eq)	7.3×10^{-9}
Smog Potential (kg O_2eq)	4.4

Boundaries: Cradle-to-Gate
Company: XYZ Asphalt
RAP: 10%


NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

General Program Instructions for
Environmental Product Declarations (EPD) Program
National Asphalt Pavement Association

Version 1
September 15, 2014

5100 Forbes Blvd. | Lanham, MD 20706 | 301-731-4748
www.AsphaltPavement.org/EPD

www.AsphaltPavement.org/EPD

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Education Program

Pavement Design

The Challenges

Economics and Overdesign

Mechanistic-Empirical Pavement Design

Need for user friendly, AASHTO-based pavement design tool

Pavement Design Guidance

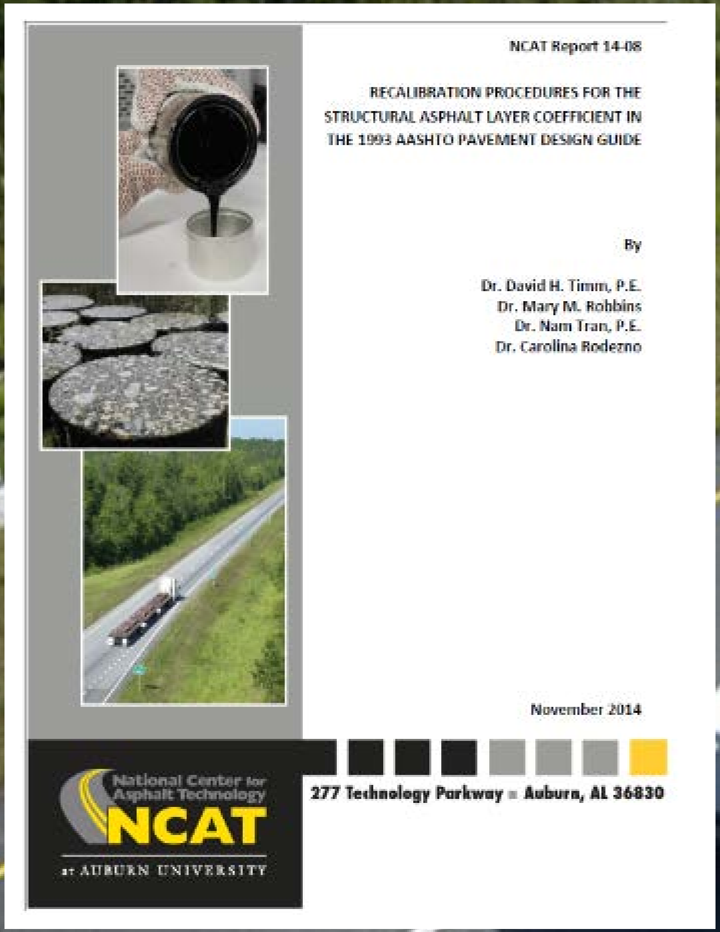
The Solutions

State-of-the-Practice for MEPDG Implementation & Challenges

Pavement Design & Material Improvements

Web-based Pavement Design Software

Advancements in Flexible Pavement Design


NCAT Report 14-08

RECALIBRATION PROCEDURES FOR THE STRUCTURAL ASPHALT LAYER COEFFICIENT IN THE 1993 AASHTO PAVEMENT DESIGN GUIDE

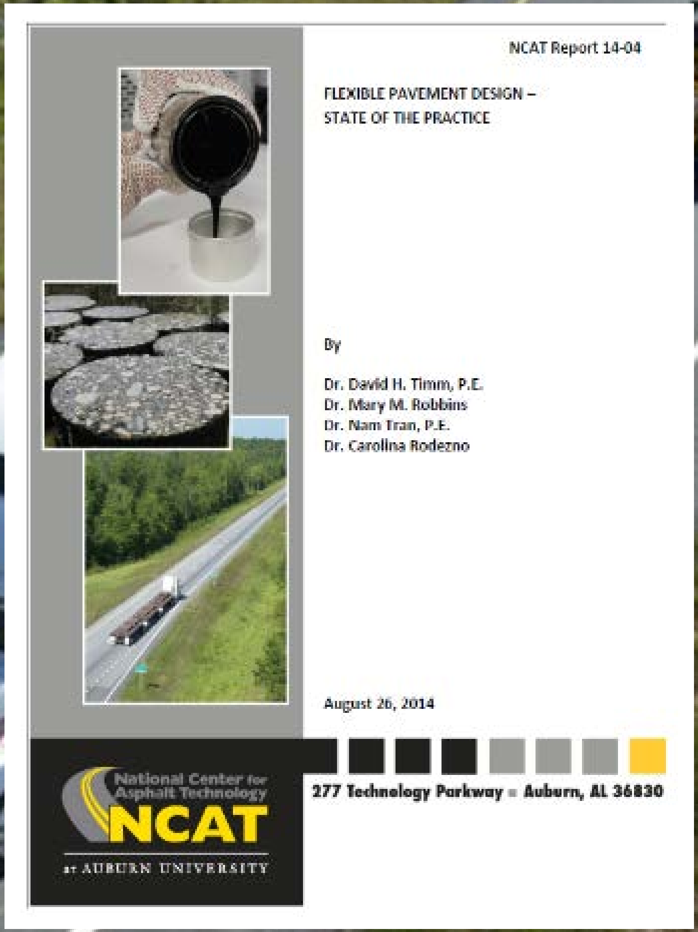
By

Dr. David H. Timm, P.E.
Dr. Mary M. Robbins
Dr. Nam Tran, P.E.
Dr. Carolina Rodezno

November 2014

National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

277 Technology Parkway ▪ Auburn, AL 36830


NCAT Report 14-04

FLEXIBLE PAVEMENT DESIGN – STATE OF THE PRACTICE

By

Dr. David H. Timm, P.E.
Dr. Mary M. Robbins
Dr. Nam Tran, P.E.
Dr. Carolina Rodezno

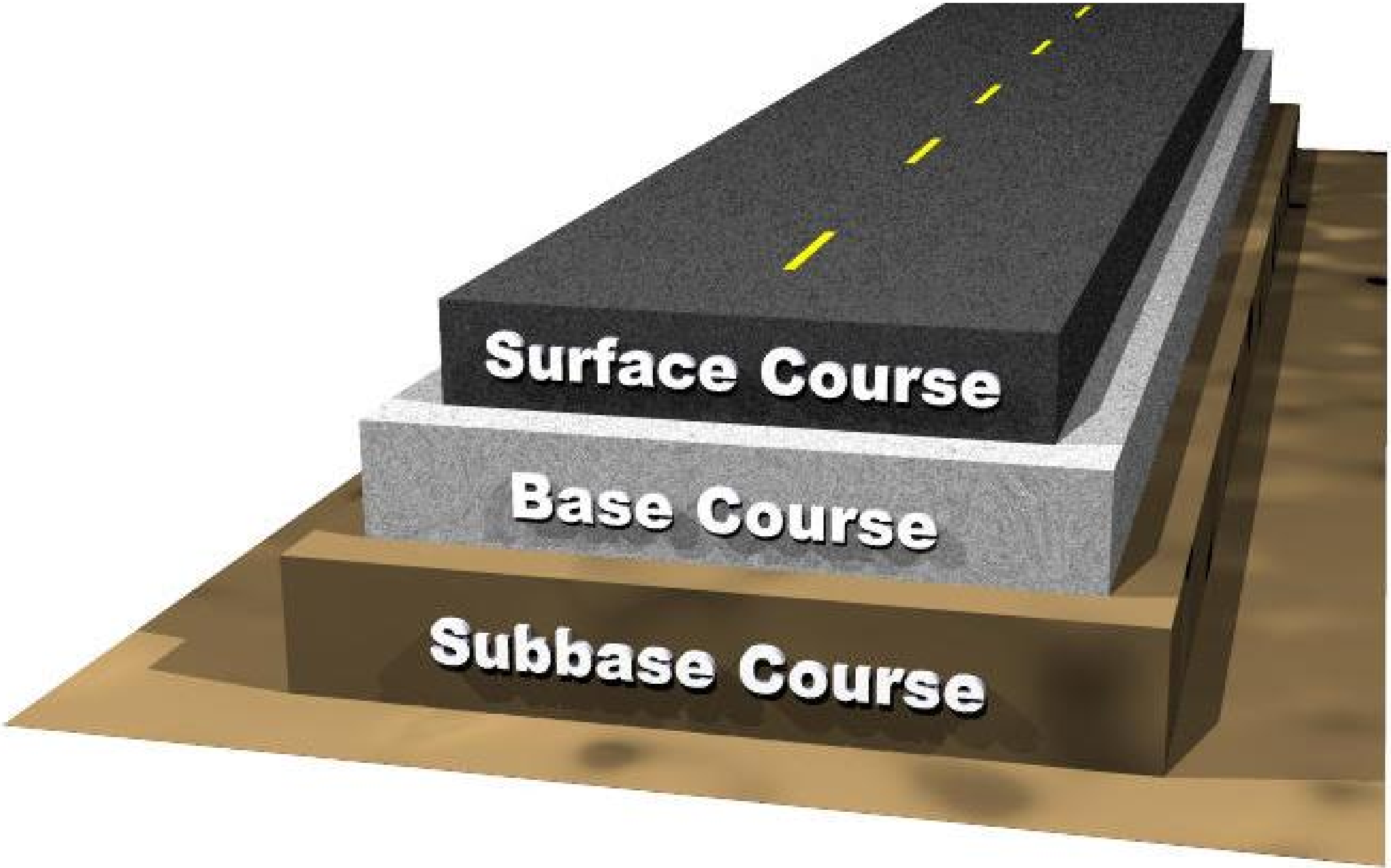
August 26, 2014

National Center for Asphalt Technology
NCAT
at AUBURN UNIVERSITY

277 Technology Parkway ▪ Auburn, AL 36830

http://ncat.us/files/research-synopses/synopsis14-04.pdf
http://ncat.us/files/research-synopses/synopsis14-08.pdf


PaveXpress
A Simplified Pavement Design Tool
www.PaveXpressDesign.com



AASHTO has been developing MEPDG for high volume roads, but a gap has developed for local roads and lower volumes

Pavement Interactive

PAVEMENT DESIGN
Simplified

Web-Based Pavement Design Tool

Designing the right pavement for the job just got easier thanks to PaveXpress, a free web-based pavement design tool for roadway and parking lot pavements.

Projects created in PaveXpress can be printed, shared, and saved, and design options can easily be evaluated in a side-by-side comparison. As a browser-based tool, PaveXpress is always up to date and can be accessed from any computer or mobile device, regardless of screen size or operating system.

PaveXpressDesign.com

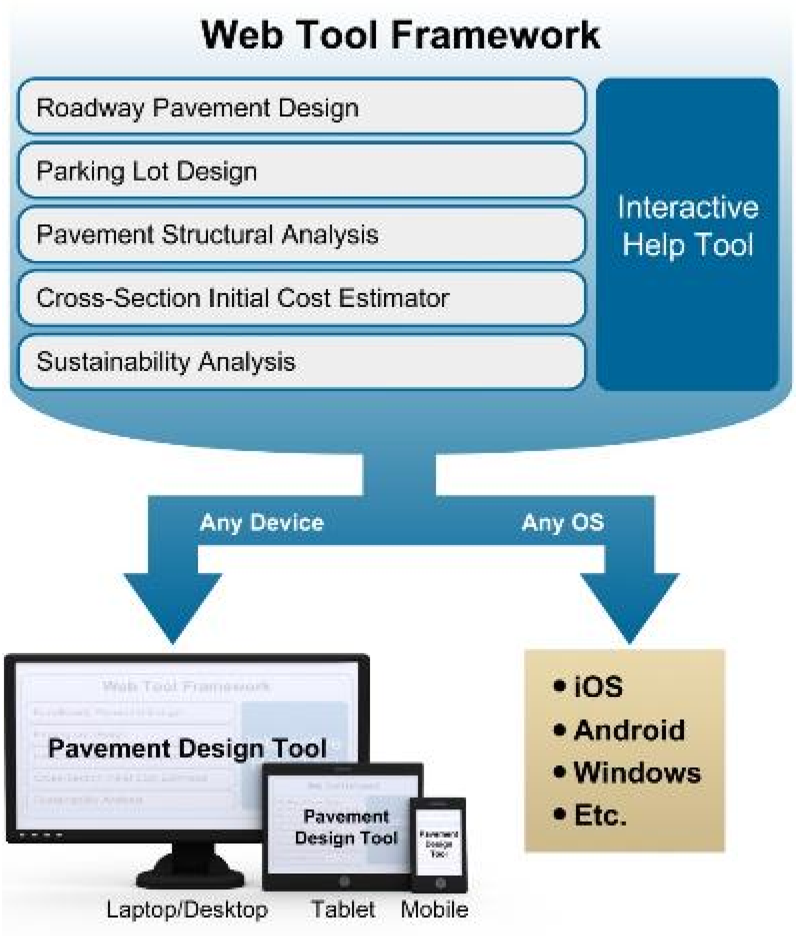
Guiding Principles

- Provide accurate un-biased results…**be a trusted resource**
- Only ask the user for what is required to perform a technically sound design
- Where appropriate suggest industry accepted defaults to minimize user input
- Provide context sensitive help and guidance
- Assume users aren't pavement design experts

Application Users

- State Transportation & Highway Agencies
- Local Government Agencies
- A/E/C Firms
- FHWA
- Engineering Students
- Foreign Companies & Governments

Approach: Web Delivery



- Browser based delivery
- Available via the web
- Supports all kinds of devices/OS
  - Desktops
  - Laptops
  - Tablets (7" – 10" - includes iPad Mini on up.
  - Handheld device capabilities
- Easily scalable and updatable

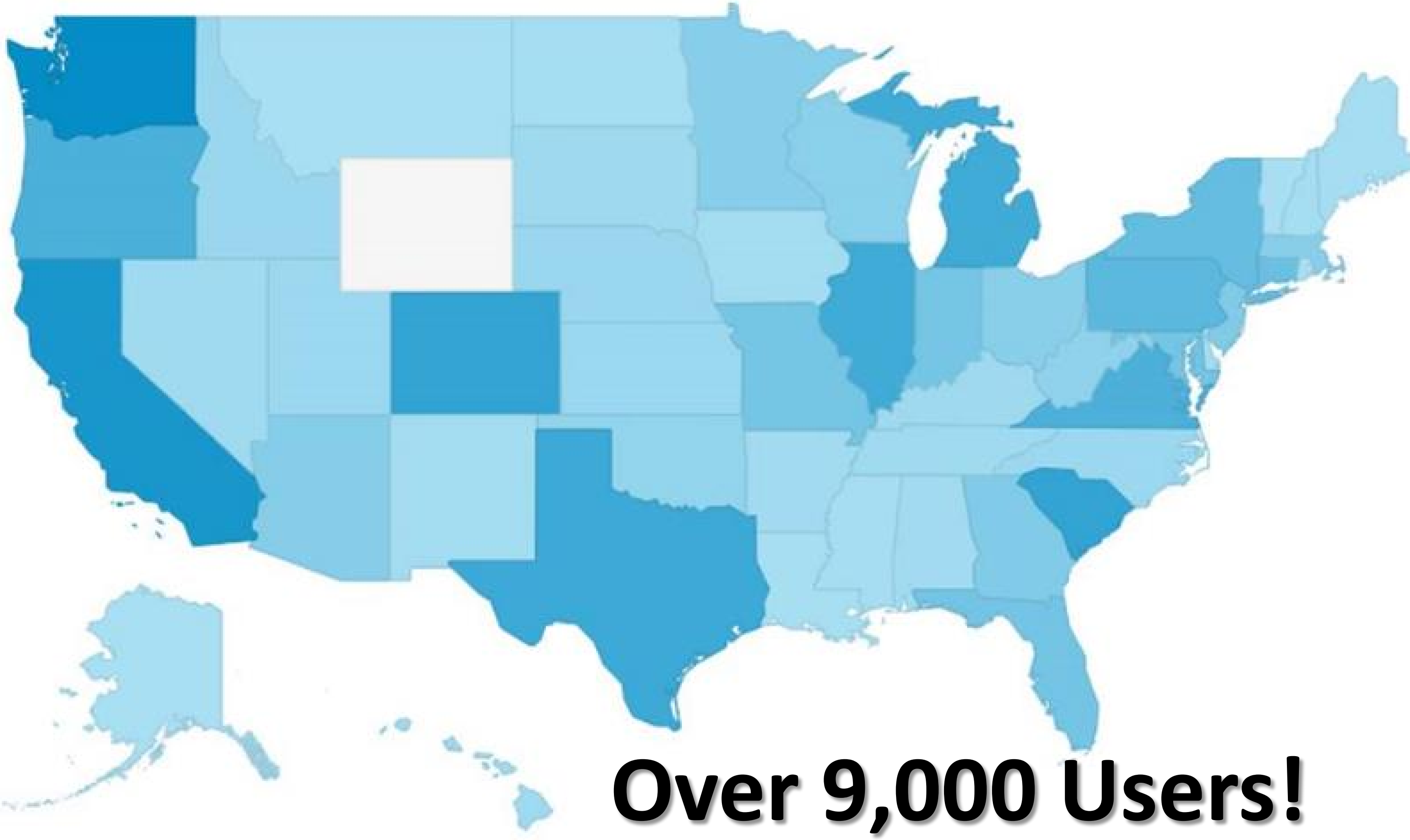
Approach: Technical

- Provide technically sound designs using:
  - Flexible: AASHTO ’93
  - Rigid: AASHTO ‘93 w/ ‘98 Supplement
  - Parking lot guidance (Flexible only)
- Use industry accepted standards and guidance
- Linkages to State and Local guidance
- Linkages to Pavement Interactive

PaveXpress Knowledge Transfer

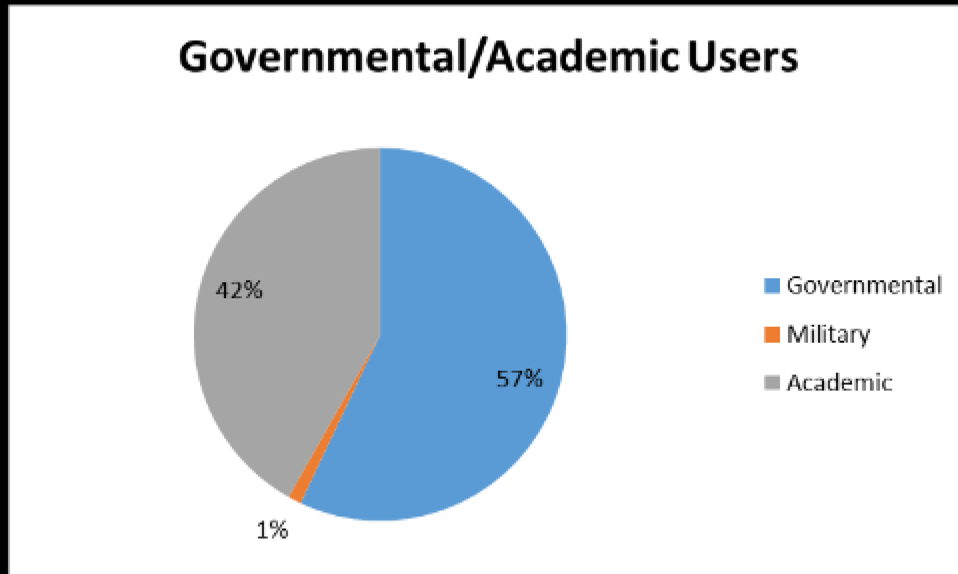
1,650 people reached

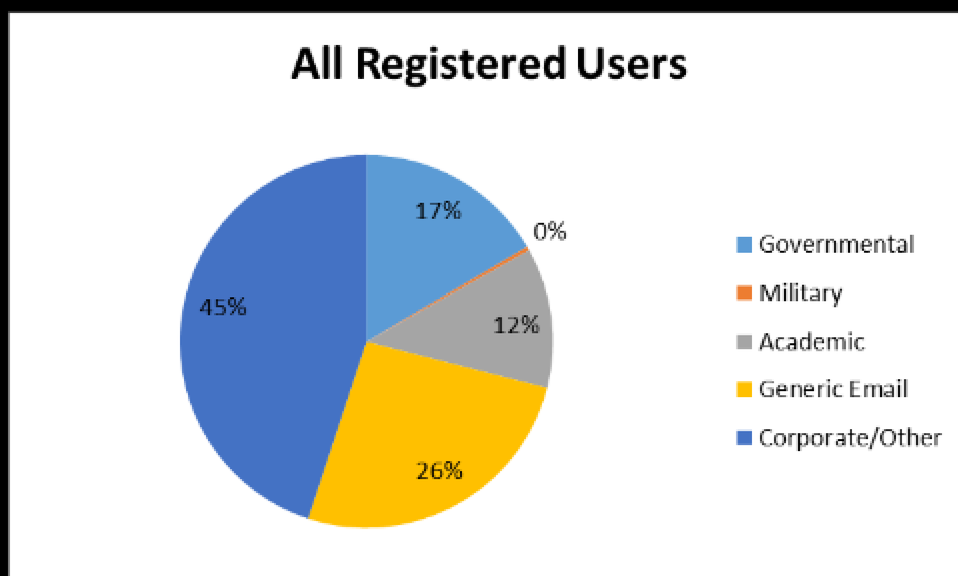
PaveXpress



Over 9,000 Users!

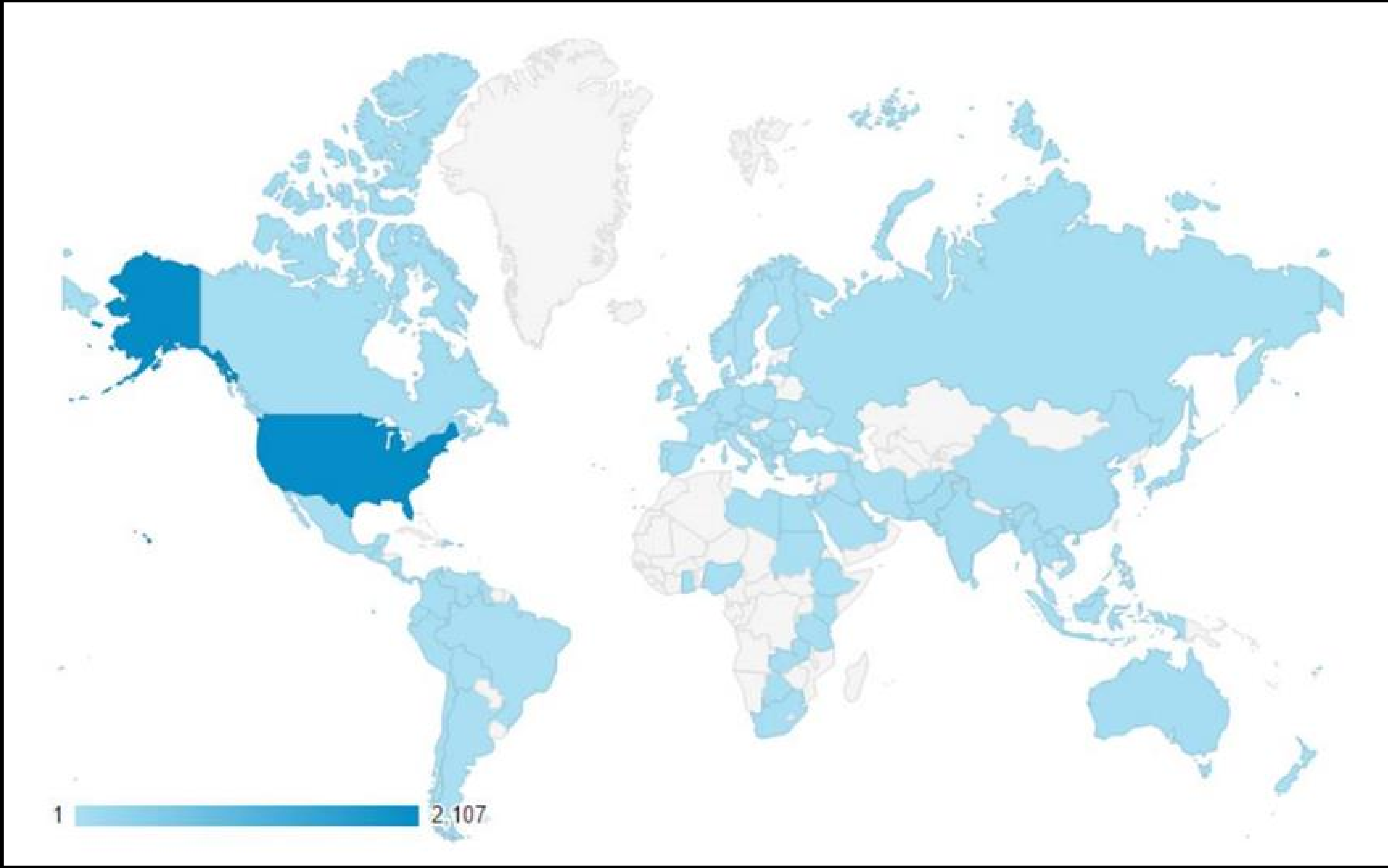
PaveXpress





as of July 2015

PaveXpress



Future of PaveXpress

- Simplified mechanistic design for asphalt pavements
- Pavement cost estimating module
- Porous pavement design tool
- Suggestions?

Pavement Preservation

The Challenges	The Strategy
Focus from construction to preservation The value of the US highway and road system is estimated at $1.75 trillion Preservation of the existing system is the challenge for pavement managers	Develop and place high quality Thinlay mixes Improve cost competitiveness while maintaining quality & performance Market Thinlays as an effective preservation method

Thinlays for Preservation: From Drawbacks to *Innovative* Solutions

- May have higher initial cost than other preservation strategies.
  - *Provide longer life*
  - *Thinner lifts*
  - *Use low-cost screenings and recycled materials (RAP, RAS, rubber)*
- Construction & application in cooler temperatures
  - *Warm Mix Asphalt*
- Durability versus permanent deformation
  - *Higher asphalt contents*
  - *Engineered binders (e.g. polymer, rubber, etc.)*

POSITION PAPER

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION
5100 Forbes Boulevard, Lanham, MD USA 20706-4407
TF: 888.468.6499 PH: 301.731.4748 FX: 301.731.4621
www.asphaltpavement.org

Thinlays: The Pavement Preservation Tool of Choice

NAPA Position on Thin Asphalt Overlays for Pavement Preservation

Every day in 2011, more than 48 million tons of goods, worth some $46 billion, were
transported across … was carried over the
nation's highways … istration (FHWA), 49.4
percent of vehicle … stem failed to meet the
standard of "good … ailed to reach the less
stringent "acceptab… a "… direct impact on
vehicle operating c… les and repair costs.
Poor pavement ca… pact on crash rates."[3]
Given the value of … ads, and the effect of
road condition on costs, time, and safety for the public, it is critical that our nation's highways and roads be kept in proper condition.

THINLAY

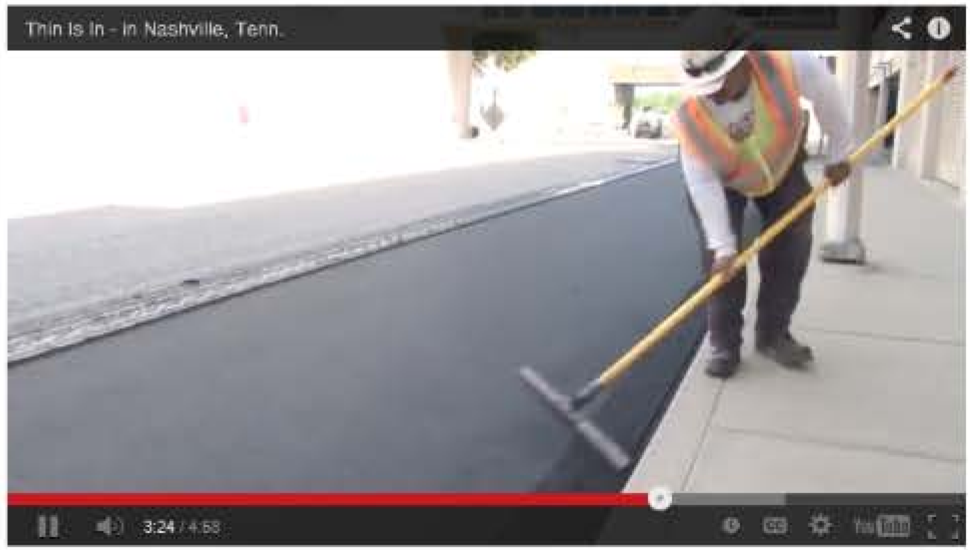
SAFE. SMOOTH. DURABLE.

Many agencies apply pavement preservation techniques to cost effectively maintain or

Asphalt Pavement

Thin Overlays

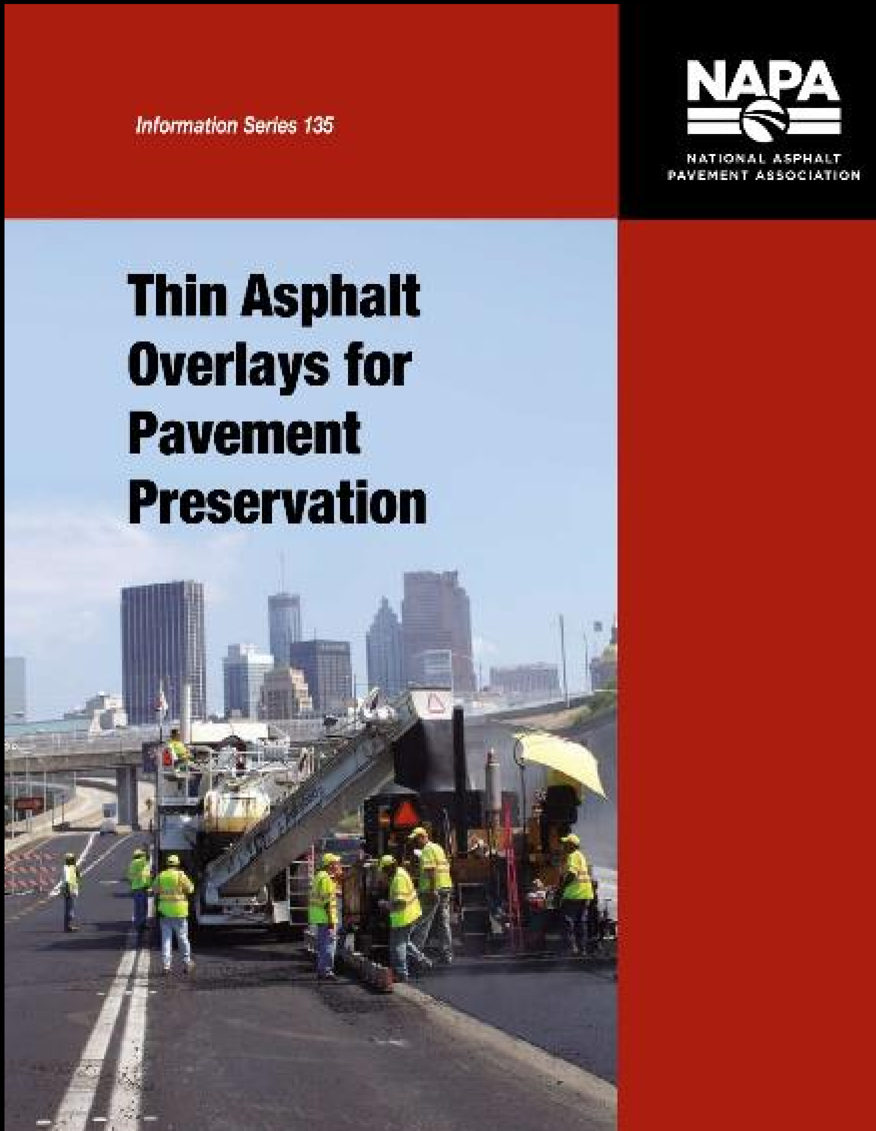
Thin asphalt overlays, also known as Thinlays™, are a popular approach to pavement preservation because of their ability to provide improved ride quality, reduce pavement distresses, maintain surface geometrics, reduce noise levels, reduce life-cycle costs, and provide long-lasting service. Recently, NAPA helped organize a thin asphalt overlay using warm-mix asphalt and recycled materials in Nashville, Tenn.



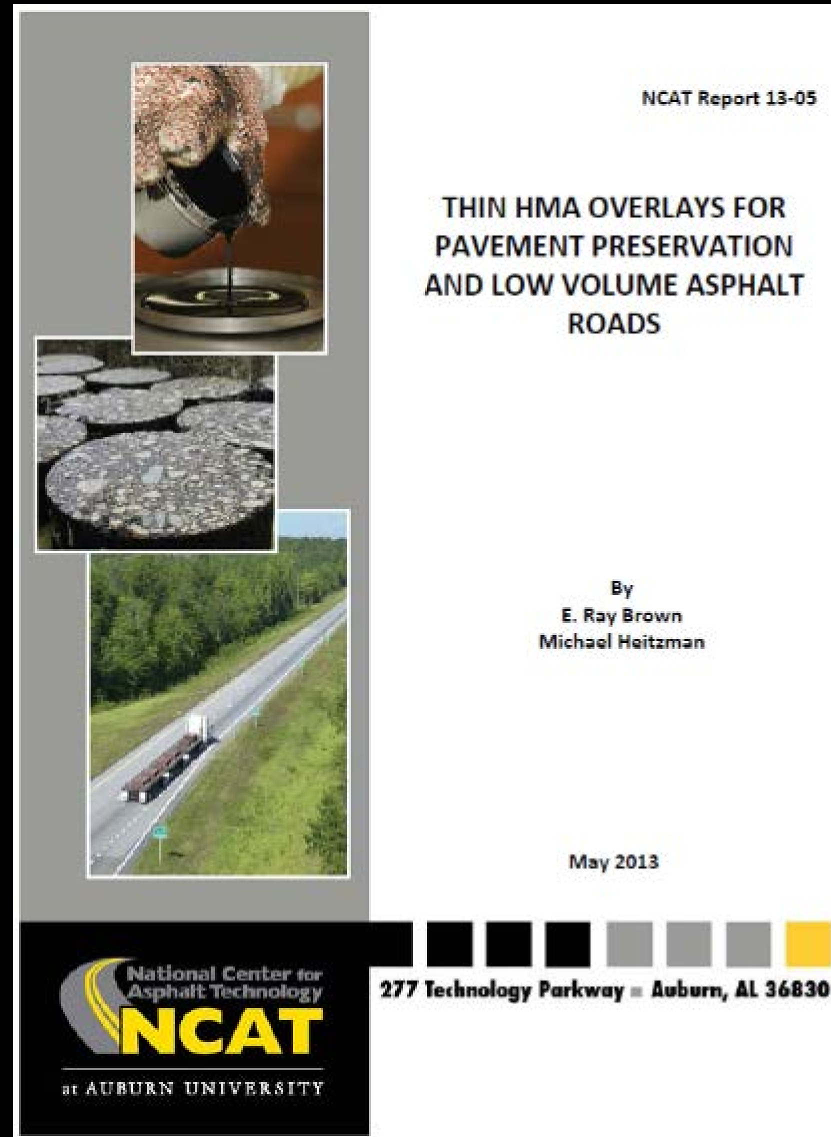
Tenth Street in downtown Nashville, an urban pavement with many utility cuts, was given 10 years more of life with this green (economically and environmentally) thin asphalt overlay preservation treatment. This is a NAPA instructional demonstration for those interested in asphalt paving processes and procedures. Mike Huner, Director of Technical Services for the Tennessee Road Builders Association, is the presenter. Special thanks go to the contractor, LoJac Enterprises Inc. of Lebanon, Tenn. The Tenth Street project was completed in August 2012.

NAPA has outlined the benefits of Thinlay thin asphalt overlay mixes in a 2014 position paper, Thinlays: The Pavement Preservation Tool of Choice. When used for pavement preservation, Thinlays can help agencies better manage both pavement condition and scarce funds. Thinlays can also help increase the structural capability of a roadway when used with well-built pavements.

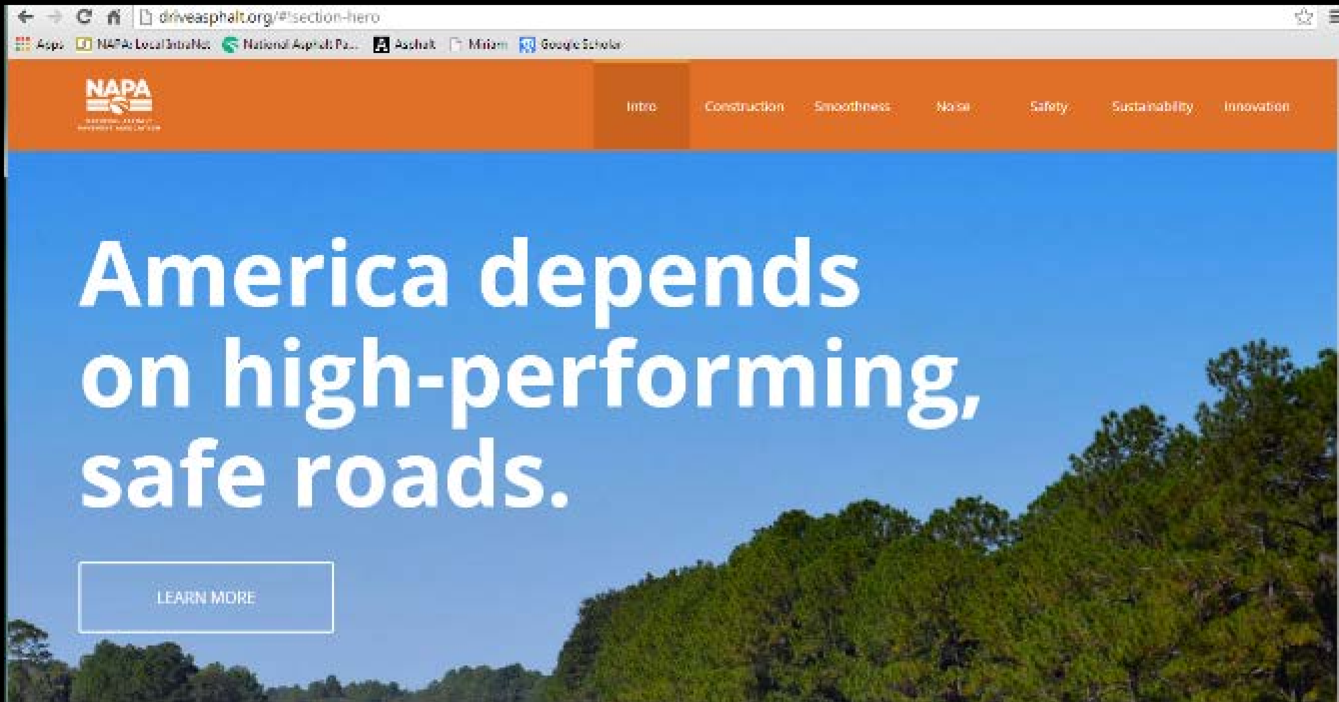
THINLAY
SAFE. SMOOTH. DURABLE.



www.asphaltpavement.org/ThinIsIn



www.ncat.us/files/reports/2013/rep13-05.pdf


driveasphalt.org/#!section-hero
Apps
NAPA: Local IntraNet
Asphalt
Google Scholar
NAPA
Intro
Construction
Smoothness
Noise
Safety
Sustainability
Innovation
America depends on high-performing, safe roads.
LEARN MORE


How to Design a Road
To Withstand Time, Traffic, and Taxpayers
Perpetual Pavement Design
A Design That Limits Distress
This Could Be Your Grandfather's Pavement
The Overachieving Pavement
43.25
Optimized Designs = Optimized Budgets
Maintaining Drivability
89%


The Place to Be
IN TUNE


Asphalt: The Answer to Road Age

Improved Performance with Premium Materials

- Quantify the increased improvements in service life when premium materials are utilized:
  - Polymer Modification
  - High-Polymers
  - Stone-Matrix Asphalt
  - Rubber Modification
  - Additives

Porous Pavements

- Structural Design
  - Low Volume Applications
  - Structural Value, Thickness, Material Properties
- Mix Design
  - Investigate Permeability and Scuffing Resistance

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

SAPA
State Asphalt Pavement Associations

New 2016 Projects

NAPA WEBINARS

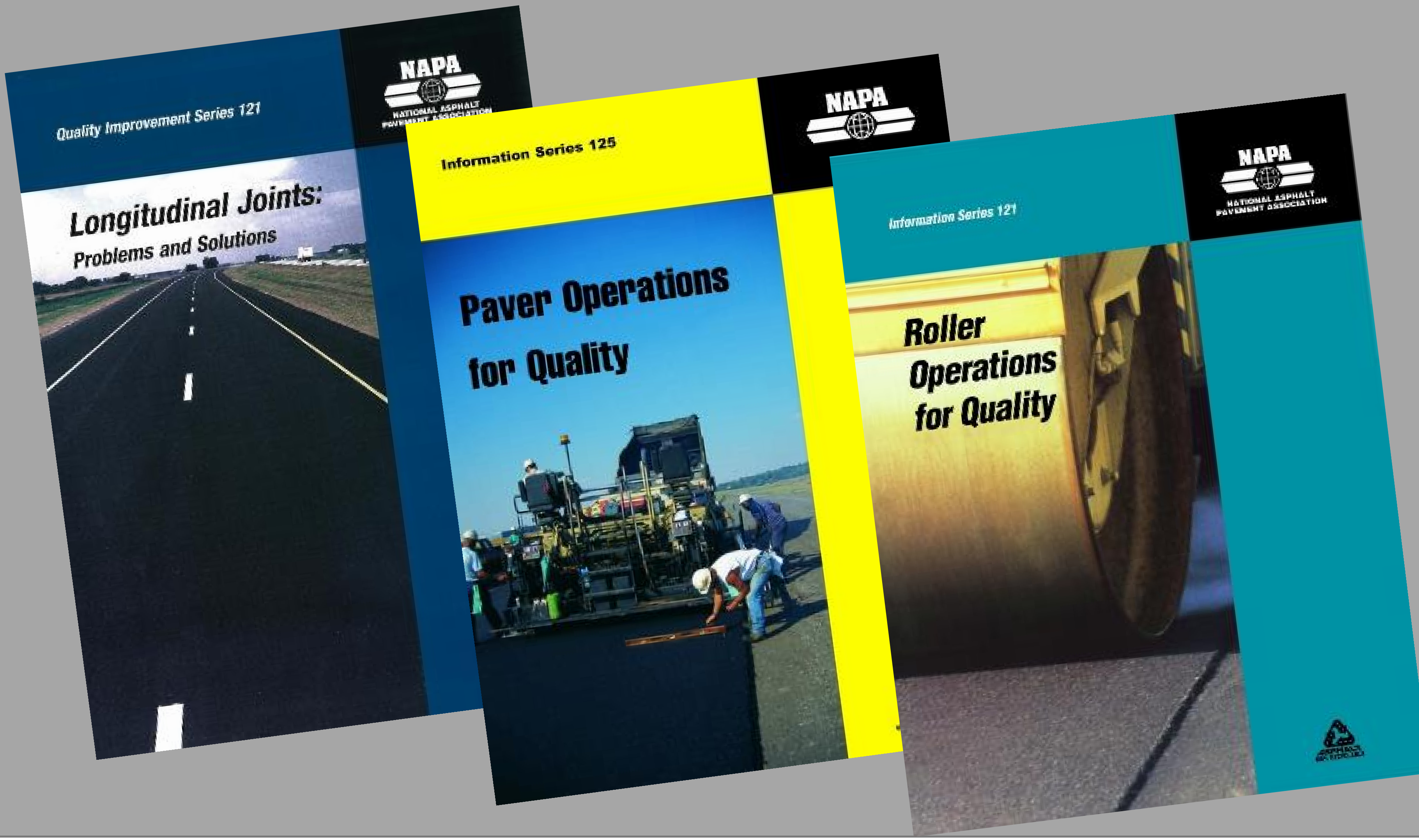
Pavement Economics Webinars have reached about 400 people in two years.

UPCOMING WEBINARS

- Best Practices in Paving Series: Best Practices in Positioning Technology in Asphalt Pavement
- 2016 NAPA Legislative and Regulatory Policy Outlook
- Best Practices in Paving Series: Best Practices for Residential and Commercial Paving

Pavement Performance

The Issues	The Strategy	The Focus
Long-term funding and lack of proper funding for preservation and maintenance Possible dry mixtures with low asphalt content Construction practices, lack of inspection, and need for training.	Pavement Performance Task Group Issues and Industry Strategies Partnerships Recommendations for Ensuring Durability	Refocused Engineering Committee Focus on Durability in Partnership with FHWA & SAPAs Rethinking Asphalt Mixture Design & Simplifying Specifications TRB Workshop NAPA Workshop FHWA Task Group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