BLACK AND GREEN

Sustainable Asphalt, Now and Tomorrow

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Sustainable Asphalt, Now and Tomorrow

- The Road Ahead
- Converting to Warm-Mix Asphalt
- Doubling the Use of Reclaimed Materials
- Expanding the Implementation of Perpetual Pavements
- Accelerating the Appropriate Use of Porous & Open Graded Pavements

Environmental and Economic Sustainability

National Impact

- 2.6 Million Miles of Paved Roadway
  - 94% Paved with Asphalt
- 85% of the Nation's Airfields
- 85% of the Parking Lots
- Approx. 4,000 Asphalt Plants
- 300,000 Workers Employed

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The Road Ahead

- **Advancements in Asphalt Technology**

Nation Center for Asphalt Technology (NCAT)

www.ncat.us

The Road Ahead

- Advancements in Asphalt Technology
- Partnerships

Federal Highway Administration (FHWA)

Federal Aviation Administration (FAA)

American Assoc. of State Hwy. and Transportation Officials (AASHTO)

Departments of Transportation (DOT's)

Transportation Research Board (TRB)

U.S. Army Corps of Engineers

Environmental Protection Agency (EPA)

Occupational Safety and Health Administration (OSHA)

National Institute for Occupational Safety and Health (NIOSH)

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The Road Ahead

- Advancements in Asphalt Technology
- Partnerships
- **Superpave**

PG64 -22

The Road Ahead

- Advancements in Asphalt Technology
- Partnerships
- Superpave
- **EPA delisting of HMA Facilities**

"…no HMA plant has potential to be a major source of hazardous air pollutants."

1970 – 1999:

- *Total Emissions Reduced 97%*
- *Production Increased 250%*

The Road Ahead

- IARC Monograph 2011
- Dermal Study
- Nested Case Control
- Skin Painting
- Animal Inhalation

Warm-Mix Asphalt

- **NAPA 2002 European Scan Tour** *(Germany / Norway)*
- **NAPA 2003-2008 Annual Meetings** *(WOA 2004)*
- **2005-2007: Numerous U.S. Field Trials**
- **2007 – FHWA/AASHTO Scan Tour**

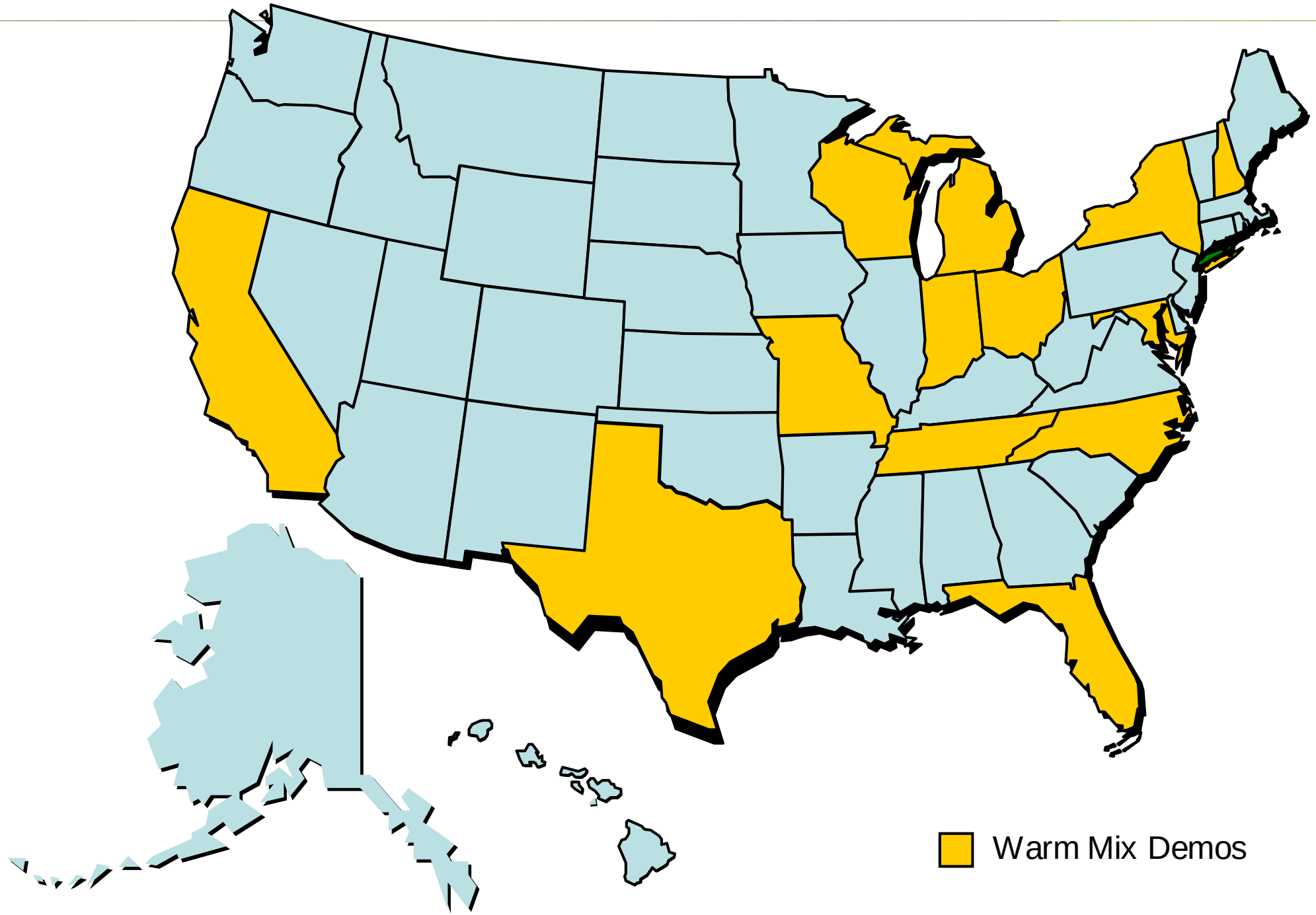
Warm-Mix Asphalt

- Reduced Mixing temperatures (50º-100º F)

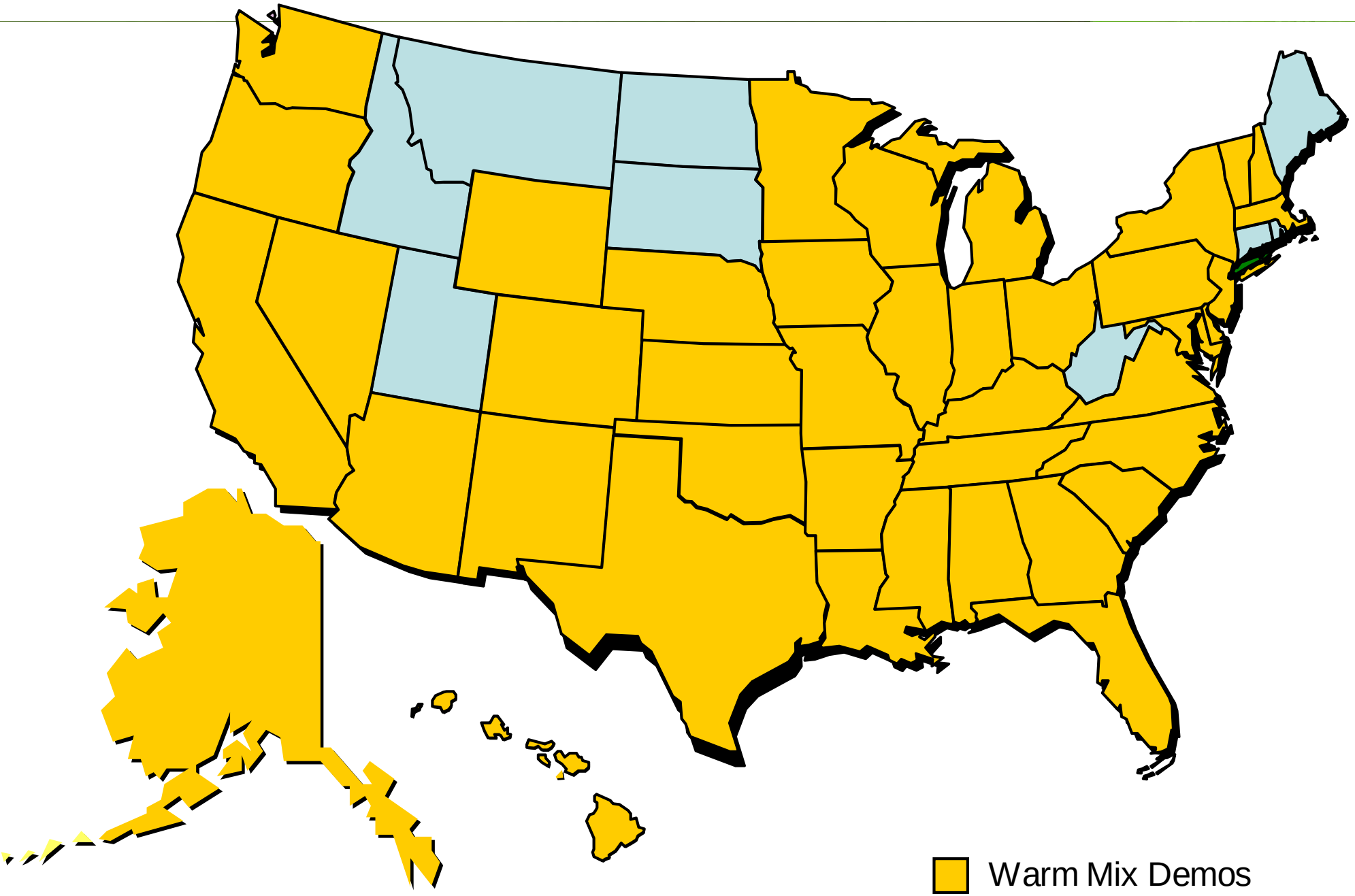
Temp = 320º F

Temp = 245º F

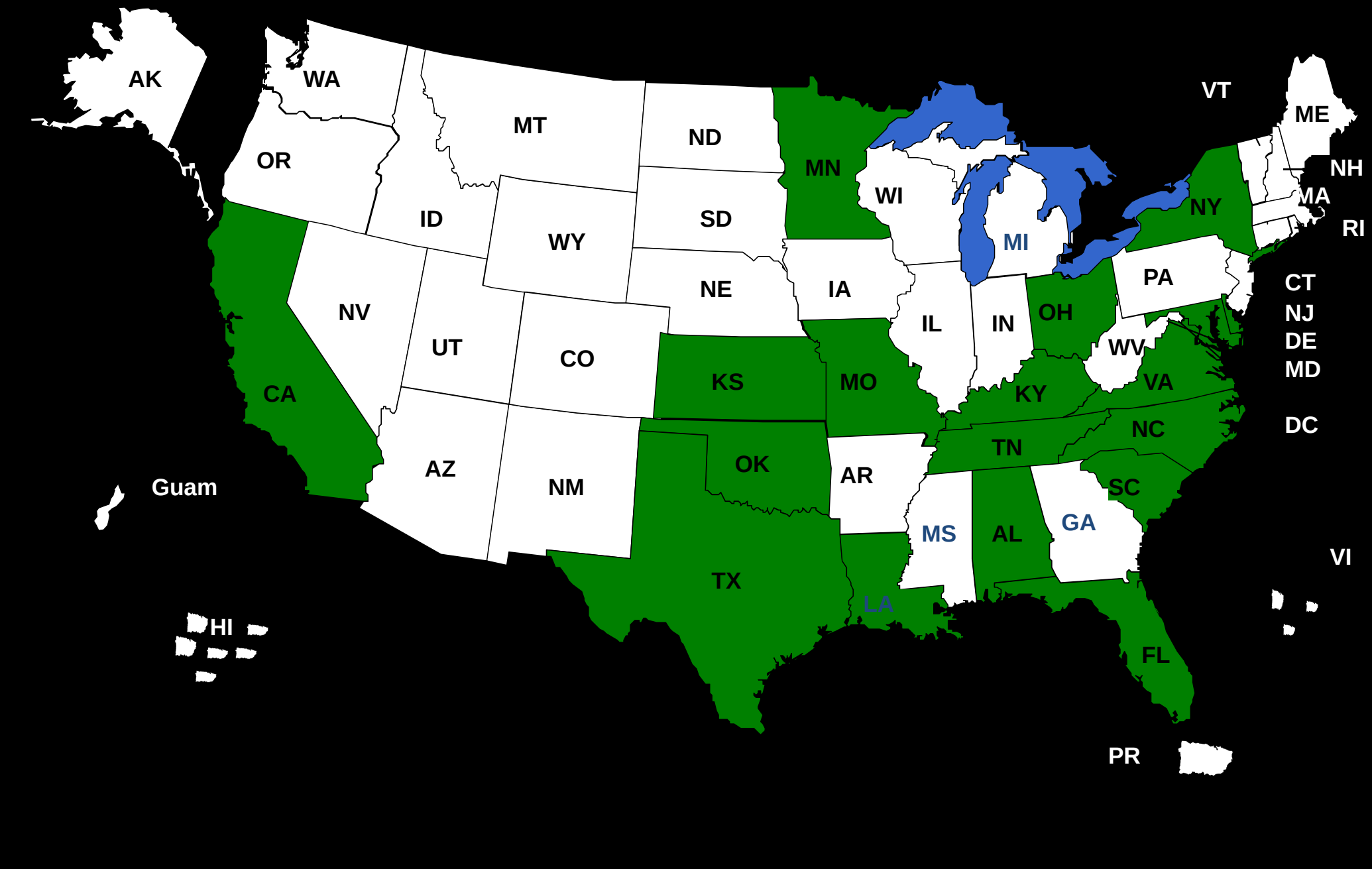
Warm Mix Demonstration Projects in the U.S. as of Jan. 2007



Warm Mix Demonstration Projects in the U.S.



States that have or will have
Permissive WMA Specifications



Use of Reclaimed Materials

- Recycled Asphalt Pavement (RAP)
- Asphalt Roofing Shingles (RAS)
- Crumb / Tire Rubber
- Glass
- Slag
- Foundry Sand

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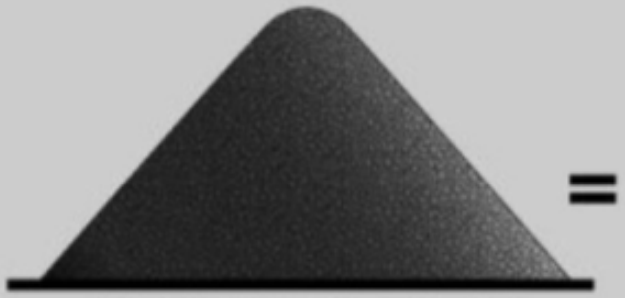
Recycling of Asphalt Pavement

Recycling of Asphalt Pavement

- Made practice in early 1970's
- Long-term performance is proven

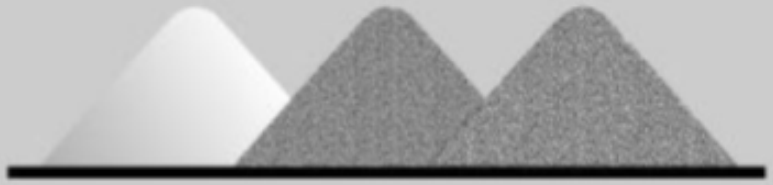
Recycling of Asphalt Pavement



30,000 Tons of RAP

=

70 - 6,000 Gallon Transport Trailers
and 28,200 Tons of Clean Aggregate



Recycling of Asphalt Pavement

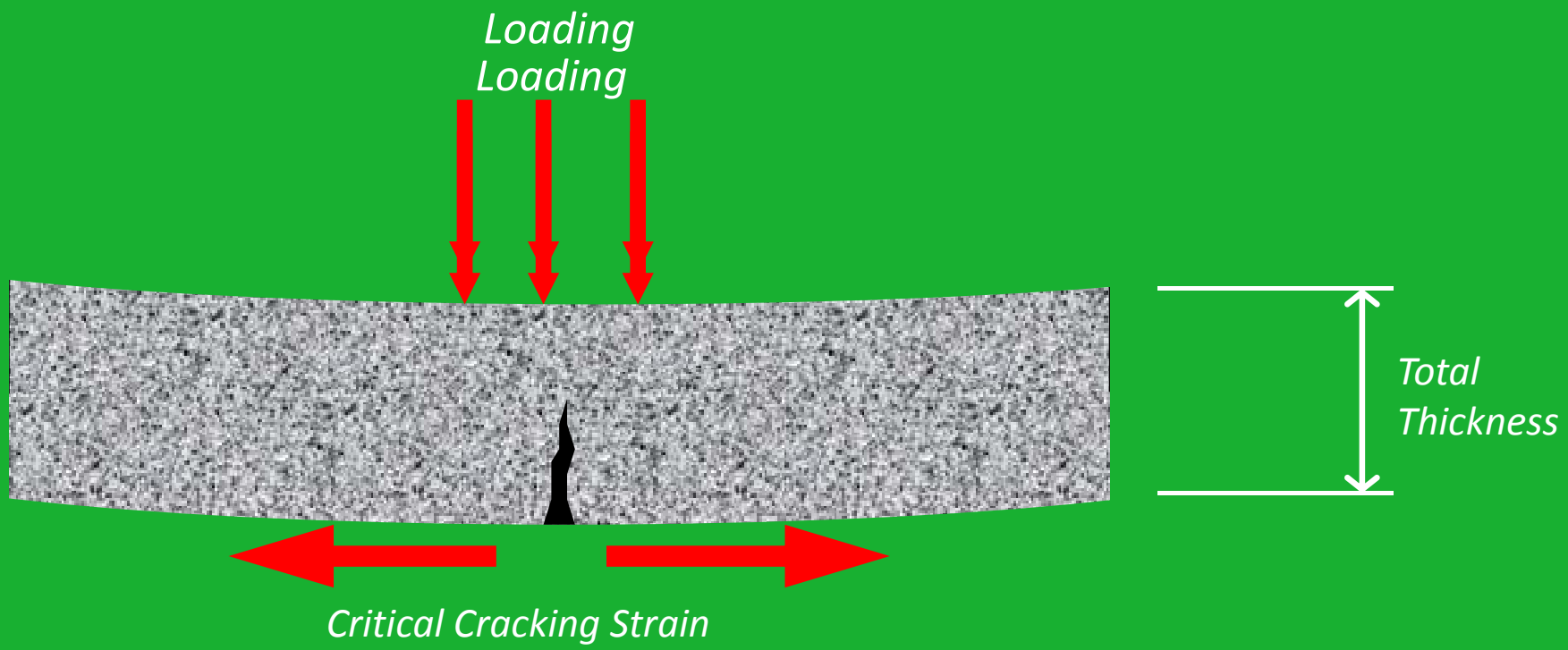
- Significant Reduction in Greenhouse Gas Emissions
- Currently average ~12.5% nationwide.
- Increased to 25% = 10% reduction in GHG.
  (= 2,000,000 Tons Annually!)

Recycling of Asphalt Pavement

- **The Challenge:**

- Encourage States to increase RAP use.
- Encourage Agencies to allow milling.

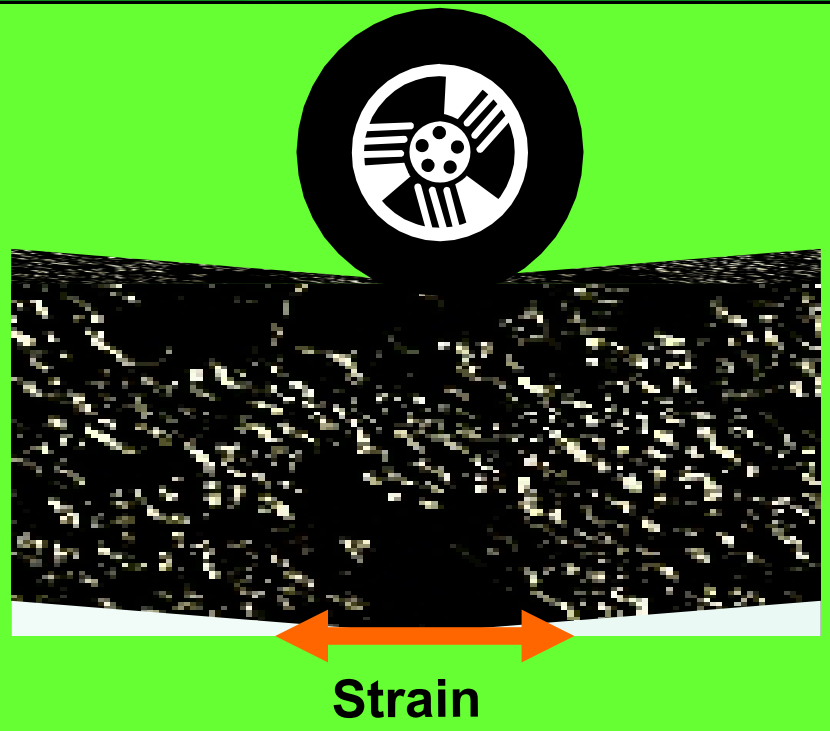
Perpetual Pavements

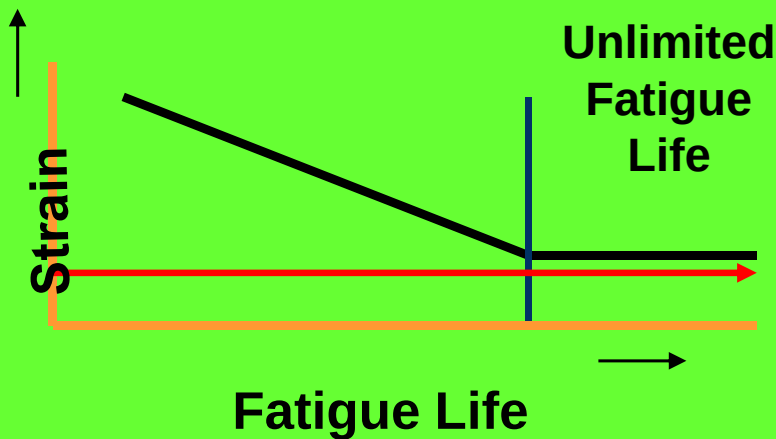


Fatigue Theory for Thick Pavements

High Strain = Short Life

Low Strain = Unlimited Life





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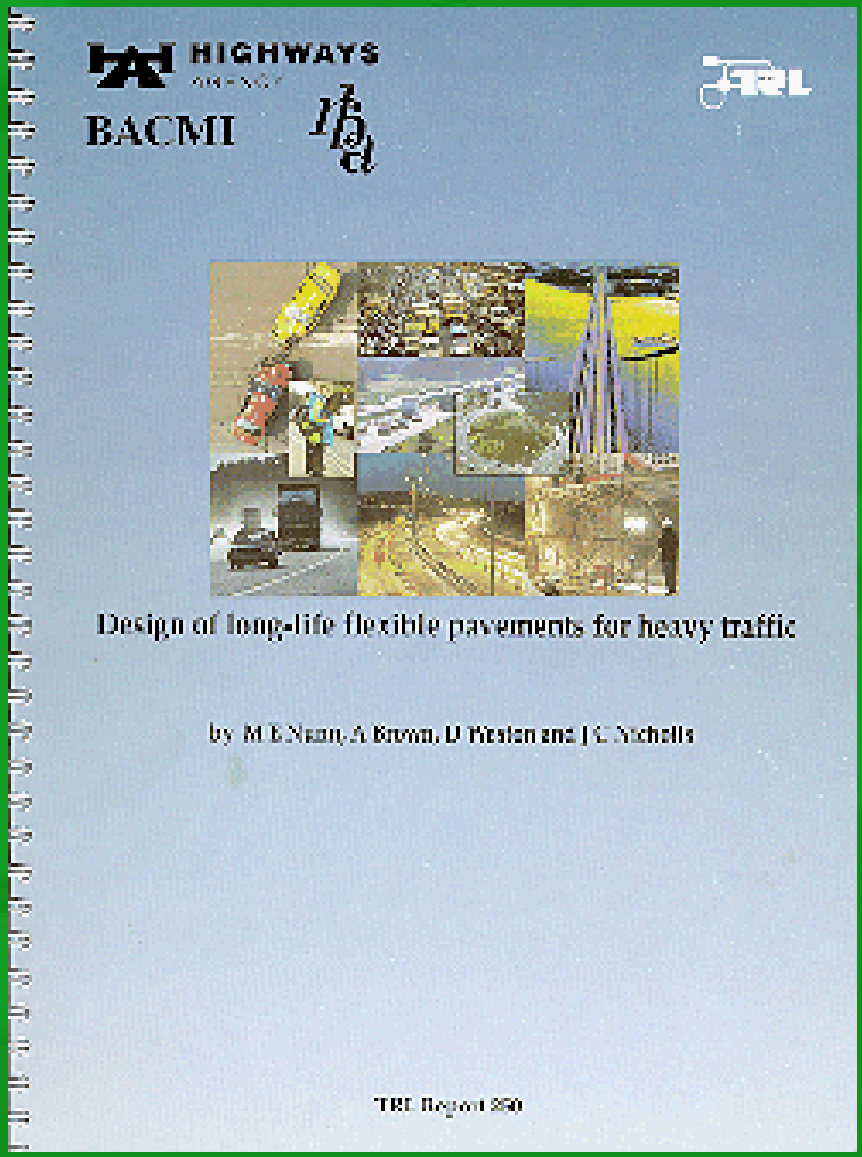
TRL Report 250
Nunn, Brown, Weston
& Nicholls

Design of Long-Life Flexible Pavements for Heavy Traffic

www.trl.co.uk



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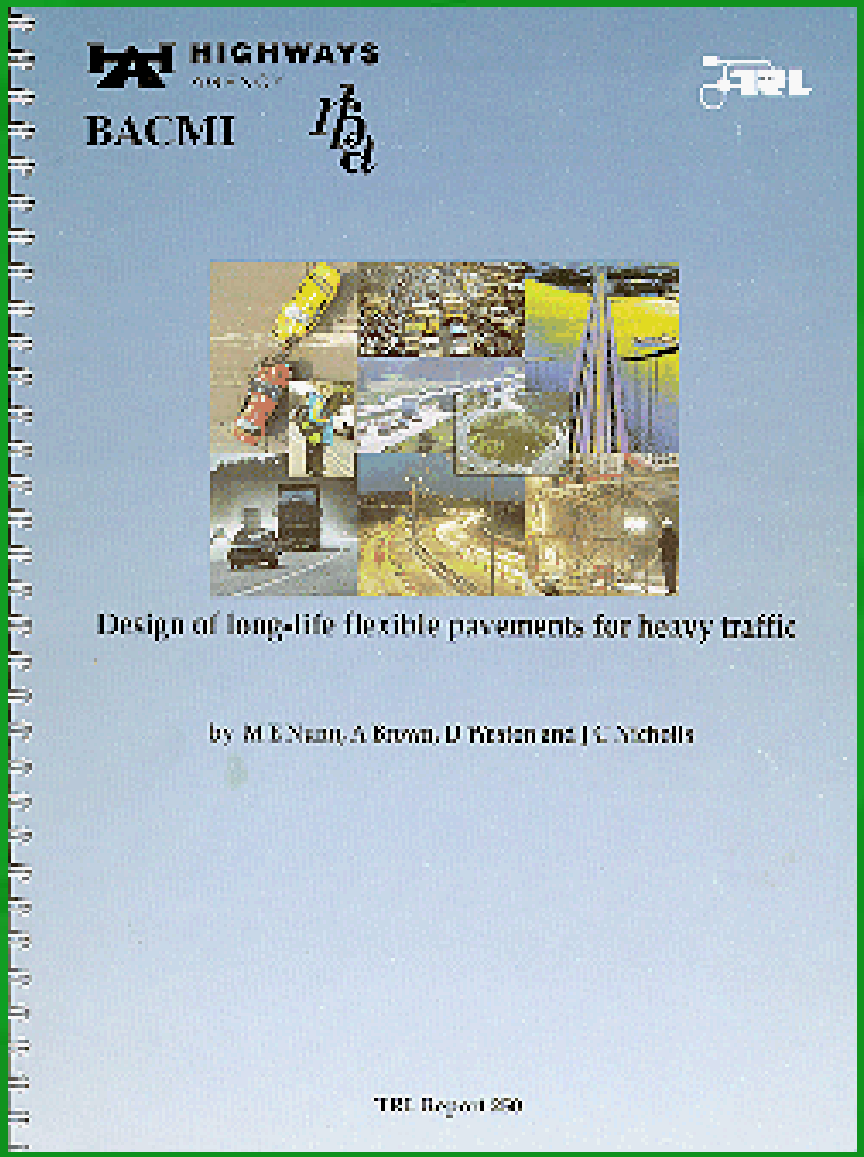
"The deterioration of thick, well constructed, fully flexible pavements is not structural, but occurs at the surface as cracking and rutting."



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Perpetual Pavements

Structure Remains Intact

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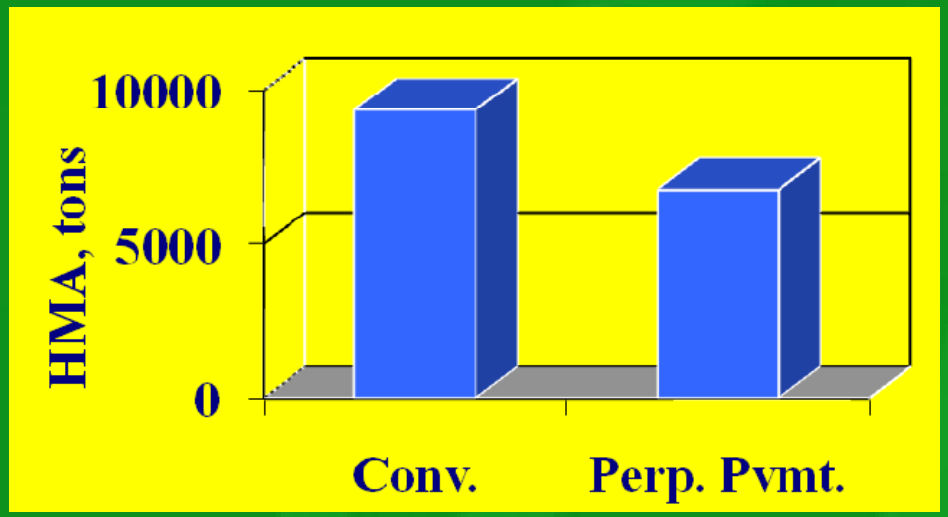
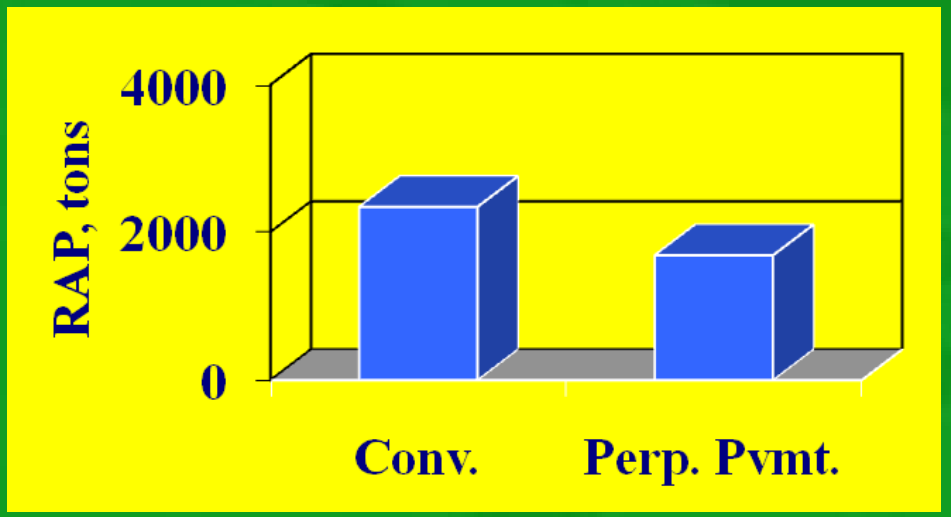
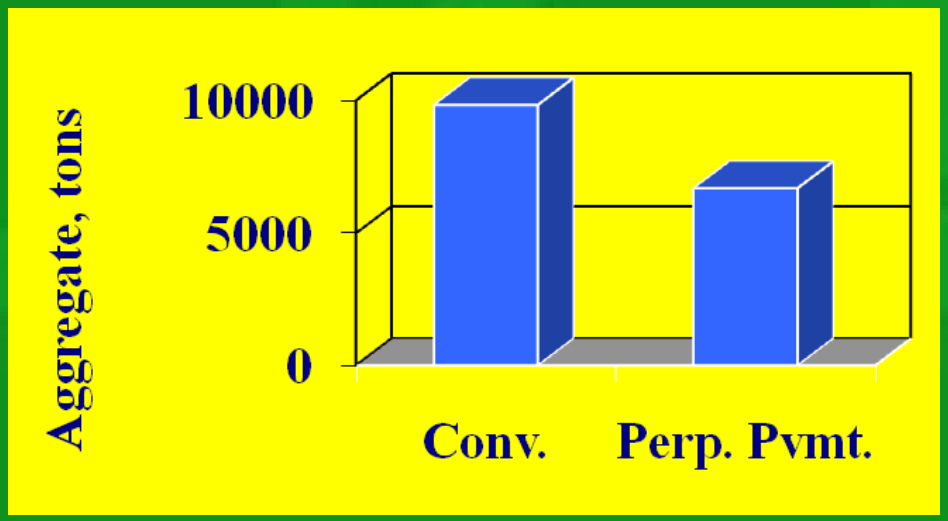
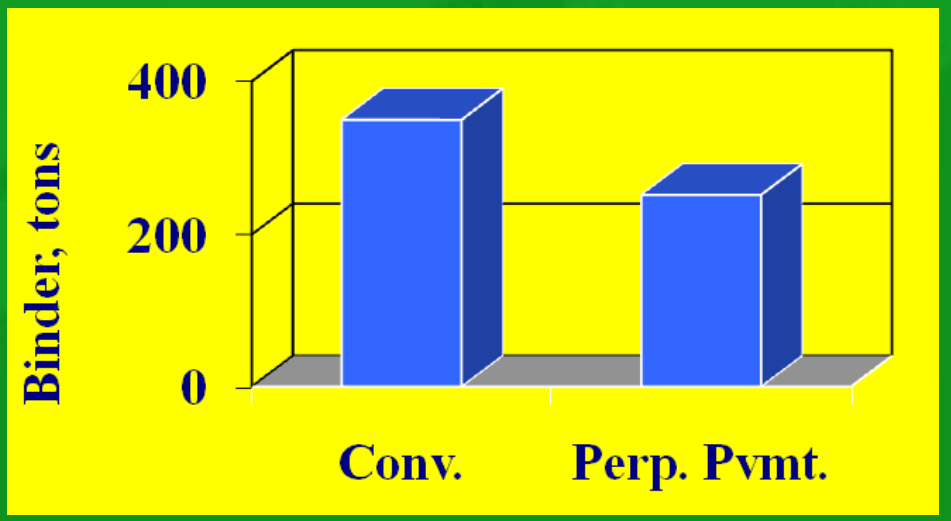
Perpetual Pavements









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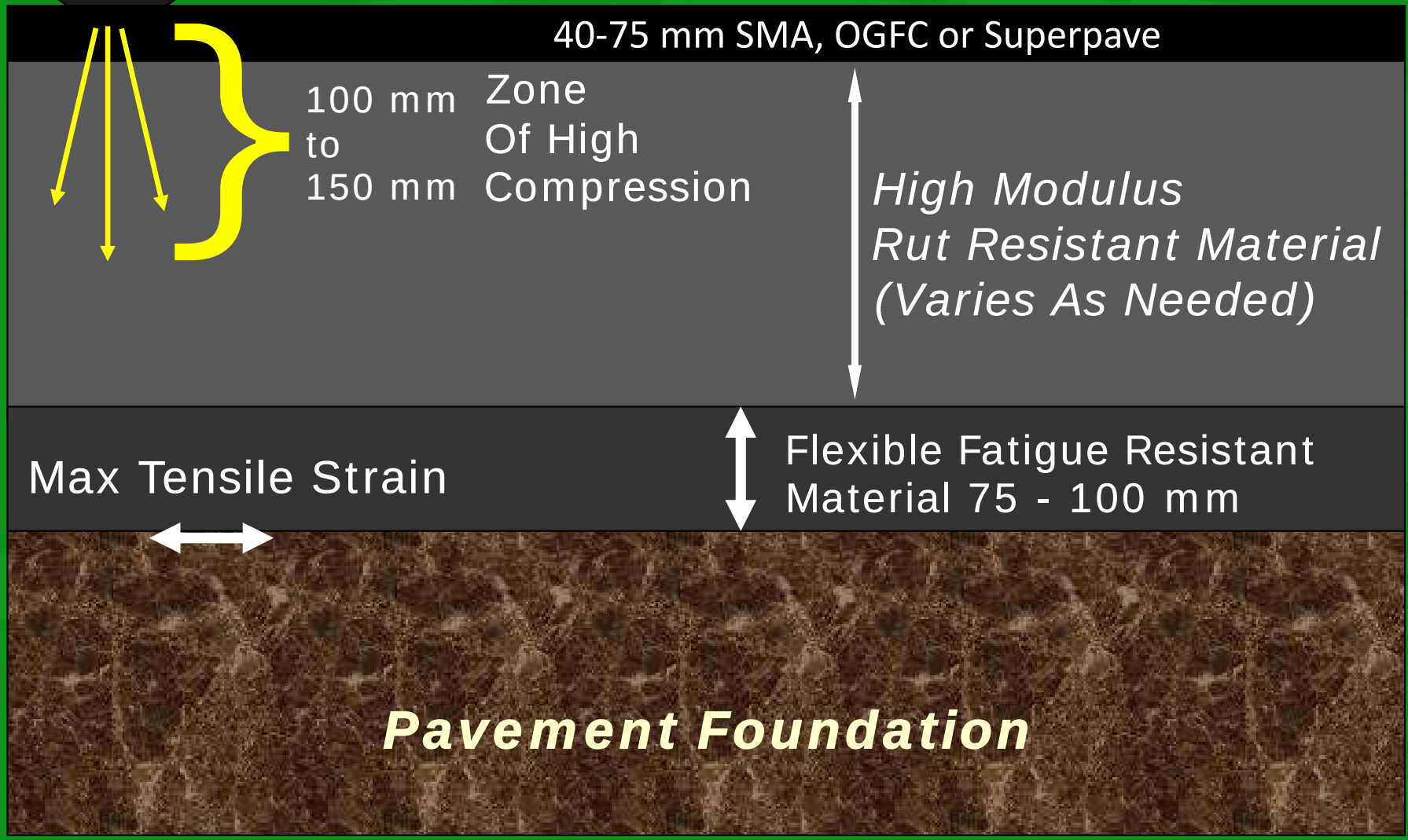
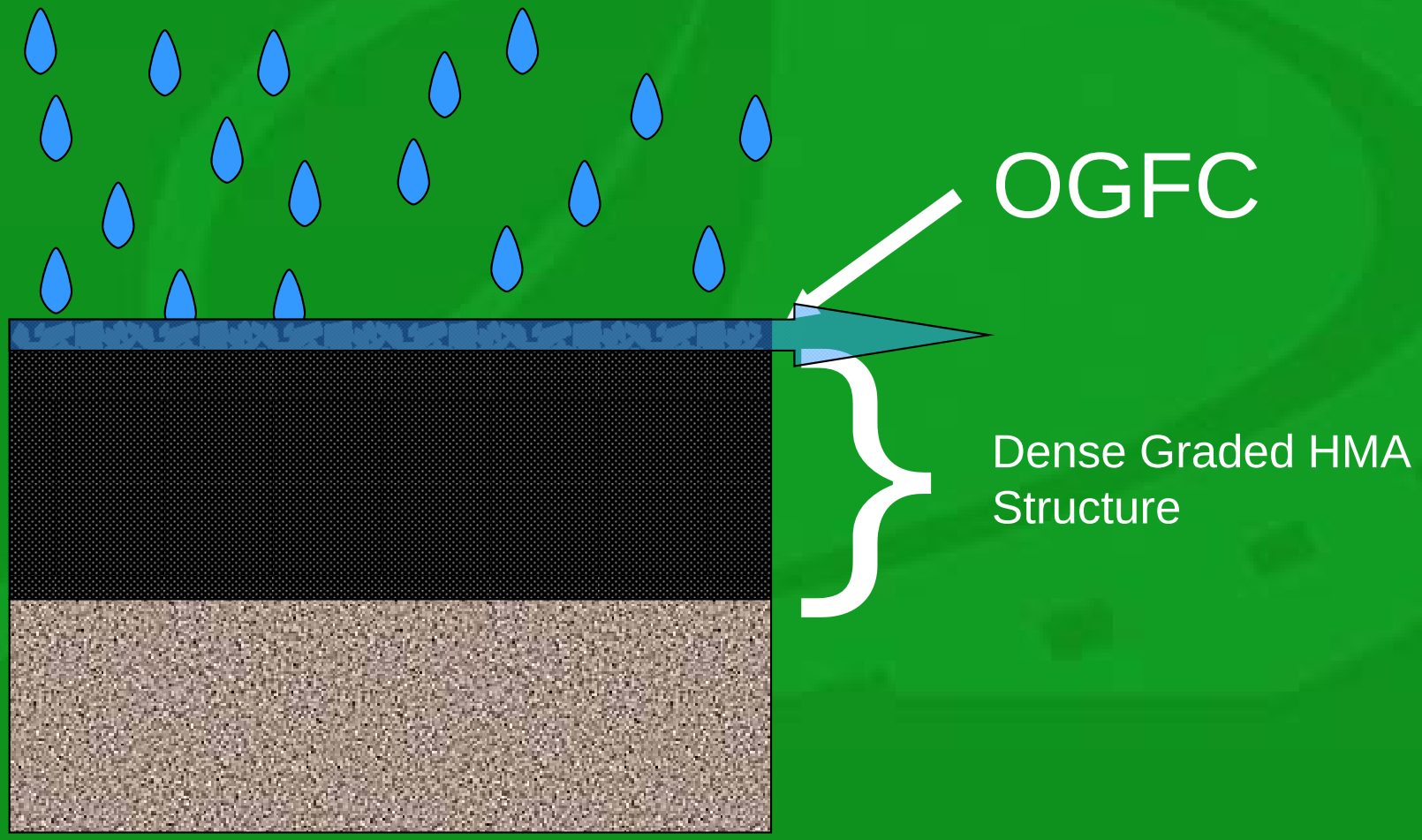
Perpetual Pavements



Porous & Open Graded Pavements

- Dense-Graded asphalt pavements were historically the standard for roadways.
  - Provides structure, strength, and smoothness
  - Can cause water spray
- Open-Graded Friction Courses (OGFC) developed to minimize water spray.
  - Developed in the late 1940's (airports)
  - Pavement contains greater air voids
  - Thin OGFC dens-graded structure

Open Graded Friction Course



Open Graded Friction Course

Open Graded Friction Course

- **OGFC Highly successful in minimizing accidents**
  - Calif-DOT identified a 50% decrease in deaths and 20% decrease in accidents after Hwy re-paved using OGFC
  - Tx-DOT sees even more dramatic results:
    - 93% reduction in wet weather accidents
    - Reducing fatalities by 86%

Open Graded Friction Course

Noise Reduction

- Noise from the tire/pavement interface accounts for 75% of the vehicle noise.
- Sound-walls are expensive and only somewhat effective if placed in the line-of-sight.
- Traffic noise can be reduced significantly using OGFC's

Open Graded Friction Course

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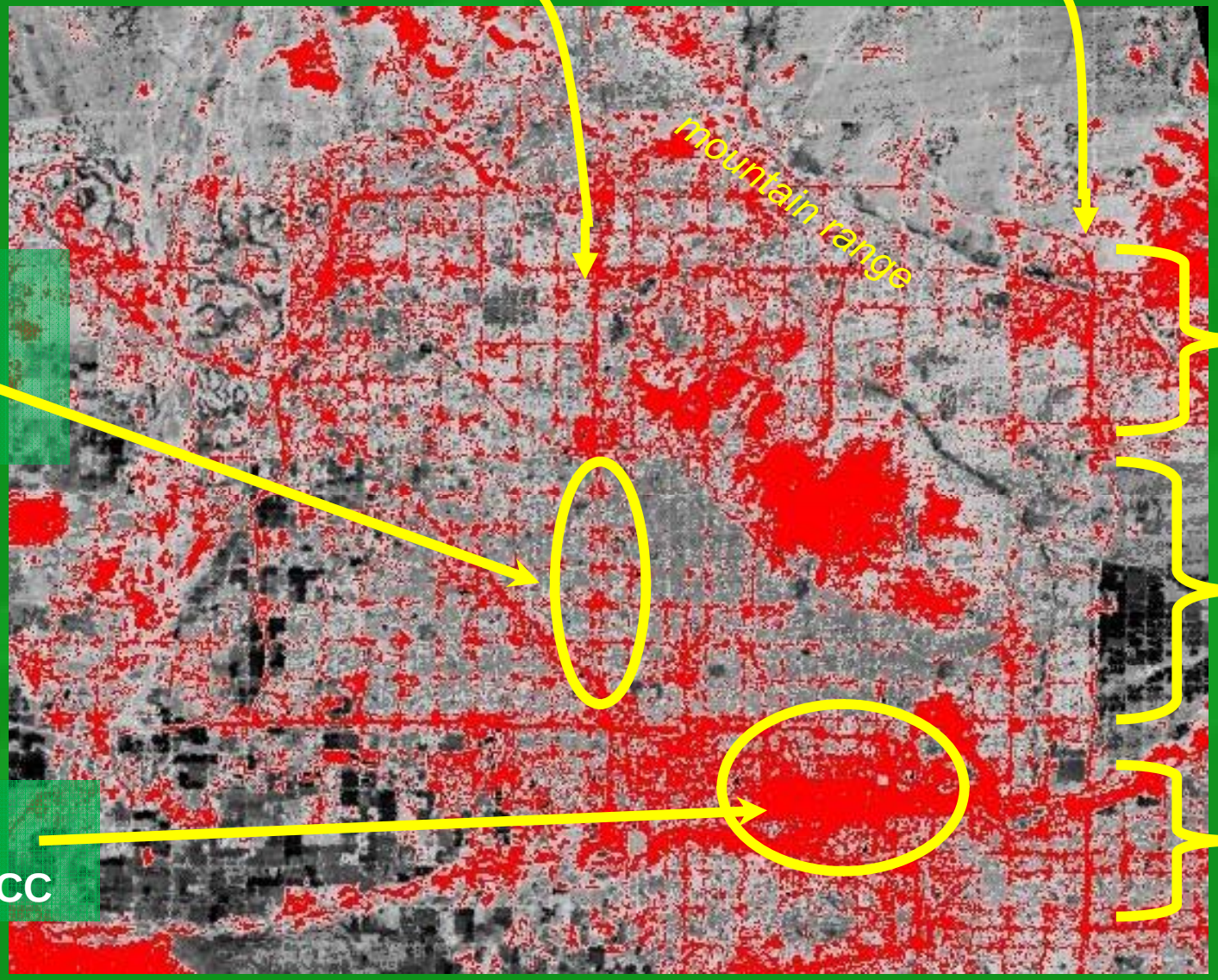
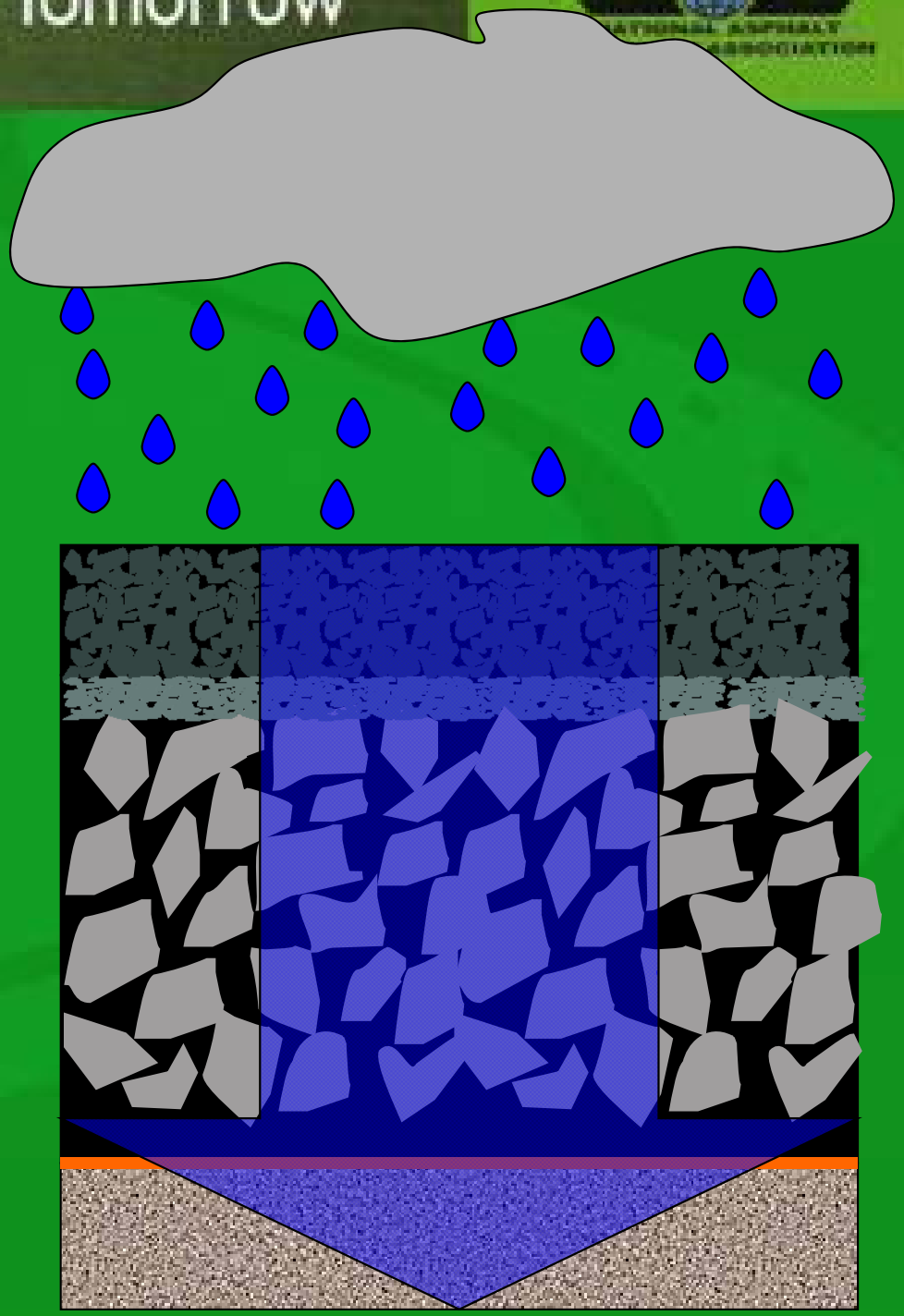


Porous Asphalt



What we usually do…

Pavement

Storm Sewer Inlet

What we usually do…

Storm Sewer Outlet

Detention Pond

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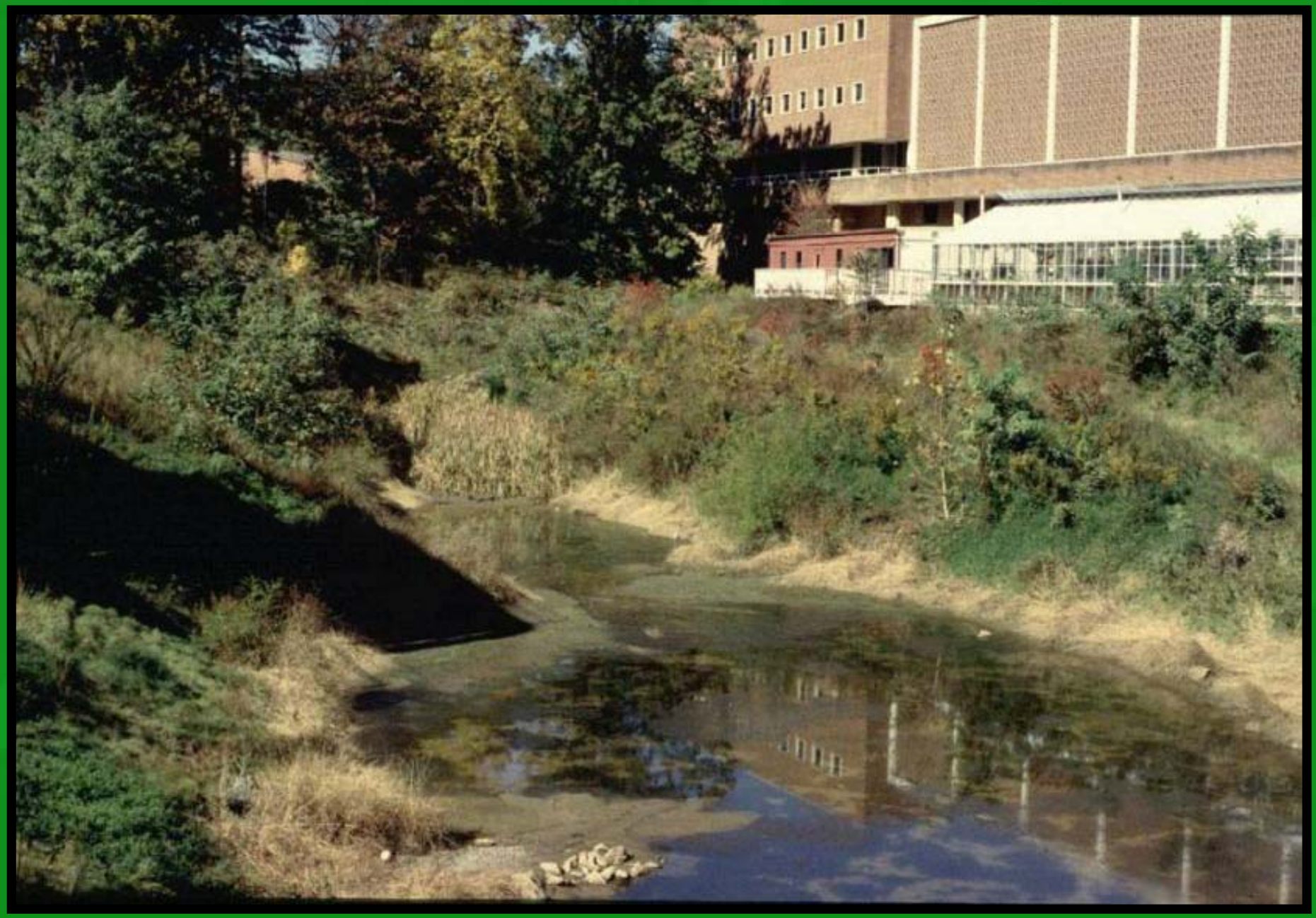


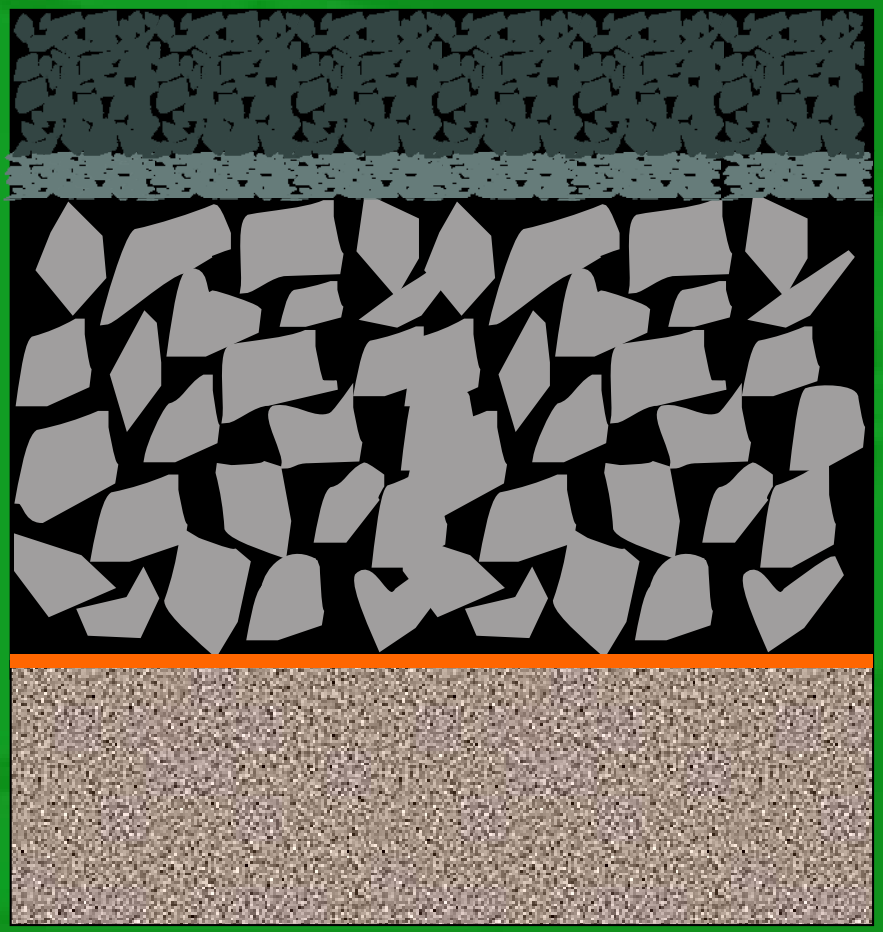
Open-Graded HMA ~ 2 ½”

½” Agg. (#57) ~ 1 – 2” Thick

Clean Uniformly Graded 2”-3”
Crushed Agg. (#2) – 40% Voids

Non-Woven Geotextile

Uncompacted Subgrade



Porous Asphalt Pavements

Morris Arboretum

Philadelphia, PA

1984

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Porous Asphalt Pavements

Shared Medical Systems

Malvern, PA

1982

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MAXIMUM ASPHALT

by Tiffany Eaton

Green Paving Grows Beyond Parking Lots

Designers and engineers have been reluctant to introduce porous pavement technology to higher-traffic applications. . . until recently

The concept of porous pavement — one designed to take water into the pavement structure and slowly filter it into the soil below — has been around for decades. It offers many benefits, but its application has been limited primarily to low-traffic applications like parking lots. "Streets have historically been designed specifically to keep water out of the pavement structure," said Jim Huddleston, executive director of the Asphalt Pavement Association of Oregon. "Pavements do just the opposite, and people who have been trained to regard water as a culprit of pavement problems are sometimes skeptical of this approach," he said. Huddleston served as a consultant on porous pavement technology to the Pringle Creek Community development in Salem, Oregon, which represents the first residential development of significant size to use 100% porous asphalt in its streets.

Inbound in "green paving" is on the rise in other locales as well, like Chicago, Illinois, where the Department of Transportation recently completed installation of five green alleys in support of an aggressive citywide sustainability initiative. "We've had many more inquiries about permeable pavement in the last eight months since construction of the alleys was completed," said Cindy Williams, the department's quality assurance manager.

Pringle Creek Community represents the first residential development of significant size to use 100% porous asphalt in its streets.

94 Better Roads Green Asphalt Section

"Green Streets" in Oregon

Pringle Creek Community – Salem, OR

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“Green Streets” in Oregon

Pringle Creek Community – Salem, OR

In Conclusion

- Technologically Advanced Asphalt
- Proven to Last a Lifetime
- The Most Environmentally Advanced

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