

# Long life Pavements for the Future



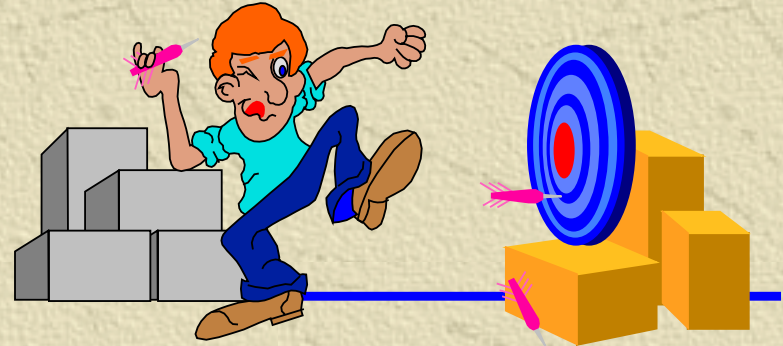
John D'Angelo

Office of Pavement Technology

# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Critical issues



- ✦ Pavements are the backbone of our transportation system.
- ✦ Growing expectations of the highway user for smoother ride and reduced delay and disruption.

# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Critical issues

- ✦ “Just in time” delivery has increased from 10% in 1990 to over 60% in 2000.
- ✦ Of every dollar invested in highways more than 50 cents goes to pavements.

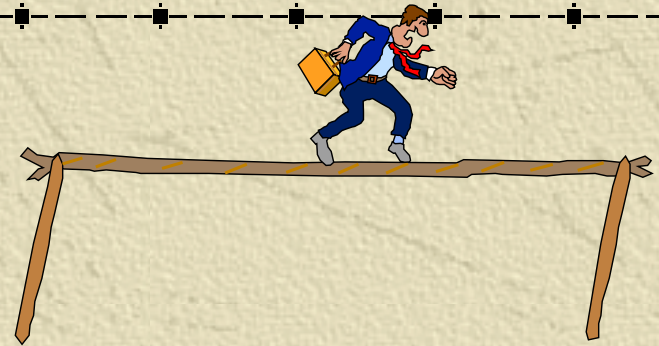




# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Critical issues



- ✦ Most of the NHS pavements were constructed in the 1960-70's.

# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Critical issues

- ✦ From 1970 to 1998 average daily traffic volume has increased 130%. Average daily loading has increased 580%.
- ✦ Average freight loading is currently increasing at 2.7% per year.

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## Critical issues

- ◆ Over 7,000 miles of urban Interstate currently needs replacement and an additional 5,000 miles will within 5 years.
- ◆ Over 13,000 miles of the rural National Highway System (NHS), require immediate attention

# *Traffic*





# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Plan

- ✦ The Long Life Pavement Technology Program would *demonstrate through actual pavement construction, innovative design practices, innovative materials, recycled materials, and improved equipment, for the rehabilitation, repair, reconstruction and building of new pavements throughout the country.*

# Long Life Pavements for the 21<sup>st</sup> Century

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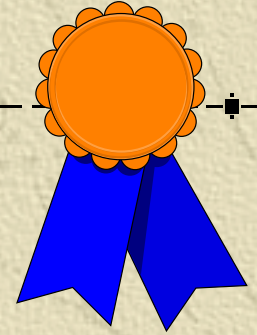
## ✦ Plan

- ✦ Funded annually at \$20 million. It would be focused on construction that would extend the life of pavement systems up to 50 years. It would be available to all 50 States and Puerto Rico and the District of Columbia. In addition to the funding for the States, an additional \$5 million annually would be available for testing and evaluation, documentation, demonstration, and technology transfer.

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## Key Components:

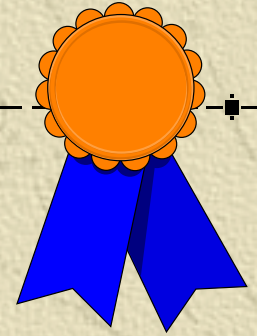


- ◆ Innovative Designs for longer life pavements – start with AASHTO 2002
- ◆ New materials and materials characterization techniques.

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## Key Components:



- ◆ Less disruptive construction and maintenance technologies and technologies to reduce user delay while maintaining service and securing work zone safety.

# Long Life Pavements for the 21<sup>st</sup> Century

Key Components:

- ◆ Innovative Contracting
  - PRS & Warranties
- ◆ Pavement Evaluation Techniques

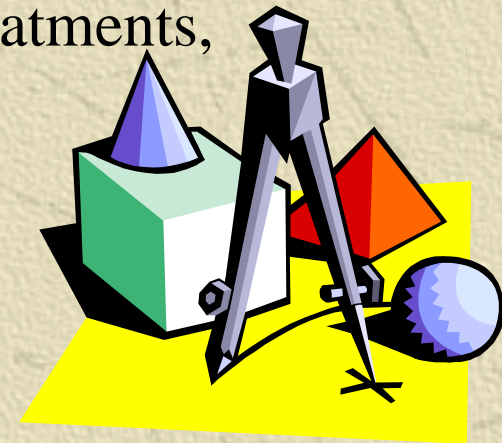


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## ✦ Innovative Designs for longer life pavements – start with AASHTO 2002

- ✦ Procedures for the design/analysis of new and rehabilitated pavement systems
- ✦ Procedures for evaluating existing pavements
- ✦ Recommendations on rehabilitation treatments, sub-drainage, and foundation improvements.



# Long Life Pavement

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✦ Structure Lasts 50+ years.

- ◆ Bottom-Up Design and Construction
- ◆ Indefinite Fatigue Life

✦ Renewable Pavement Surface.

- ◆ High Rutting Resistance
- ◆ Tailored for Specific Application

✦ Consistent, Smooth and Safe Driving Surface.

✦ Avoids Costly Reconstruction.

# Pavement appears severely distressed





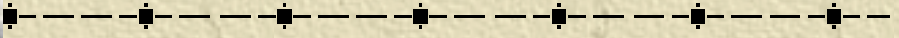
# Crack at inside of left wheel path



# JPCP Top-down Cracking



Top of slab (crack initiation)



# Long Life Pavements for the 21<sup>st</sup> Century

- ✦ New materials and materials characterization techniques.
  - ◆ NCHRP 9-19 simple performance test
  - ◆ AASHTO 2002 procedures
  - ◆ Use of recycled materials



# Concrete Modulus of Elasticity – Test Specimen and Measurement

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Strain  
Indicator

# Construction Technology

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✦ Improved paving techniques.

- ◆ Density

- ◆ Smoothness

✦ And reduction in delays.



# Construction Technology

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✦ Improved paving techniques.

- ◆ Night paving
- ◆ Safety



# Innovative Contracting

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Performance Related Specifications are specifications that. . .

- ✦ Identify key A Q C Characteristics (AQC) that relate to product performance.



# Innovative Contracting

PRs use mathematical models to relate AQL's

- ✦ To distresses and product performance
- ✦ To life-cycle cost analysis (LCCA). . .
- ✦ To determine one overall price adjustment for a lot.





# Innovative Contracting

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## ✦ Warranties

- ✦ Shared responsibility between the owner and builder.
- ✦ Promotes innovative design and construction
- ✦ Transfer responsibility for performance from owner to builder.
- ✦ Sets Life Expectations



# Pavement Evaluation Techniques

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✦ We will need to improve equipment and procedures for rapid and accurate evaluation of the pavement structure.

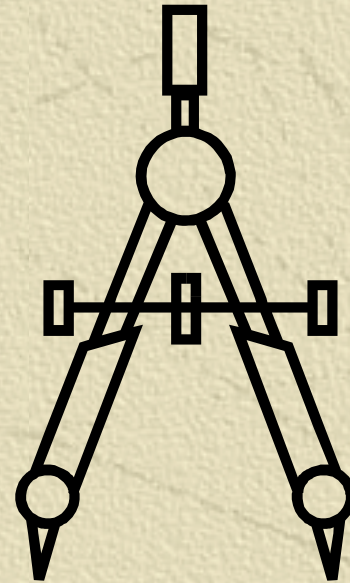


# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ FHWA role in implementation

- ✦ Training
- ✦ Technical Assistance
- ✦ Field Demo's



# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ FHWA role in implementation

### ✦ Training

- National Design Course Train the Trainer
- NHI Classes



# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ FHWA role in implementation

### ✦ Technical Assistance

- Design Examples
- Materials Testing
- Computer Assistance



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## ✦ FHWA role in implementation

### ✦ Field Demo's

- Equipment Demo's
- Pavement Evaluations



# Long Life Pavements for the 21<sup>st</sup> Century

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## ✦ Results of the program

- ✦ New technology on the design and construction of long life pavements delivered to the states.
- ✦ Advancement in construction techniques to reduce delays during construction.
- ✦ Construction of actual pavements demonstrating long life paving techniques.



# Questions?

