

SHRP 2 Renewal Program Overview

Tennessee Concrete Paving Conference

March 9, 2010

What Questions will be addressed?

- What is Highway Renewal?
- Why is it important?
- What is the SHRP 2 Renewal Program?
- How can I use the SHRP 2 Products?
- Summary of SHRP 2 R26 – Preservation Approaches for High Traffic Volume Roadways

What are we facing?

- Heavy Traffic Volumes
- Concern to maximize the movement of traffic
- Restrictions on the time and length of traffic lane closures
- Need to maximize service life of facilities
- Need to minimize impacts to the community



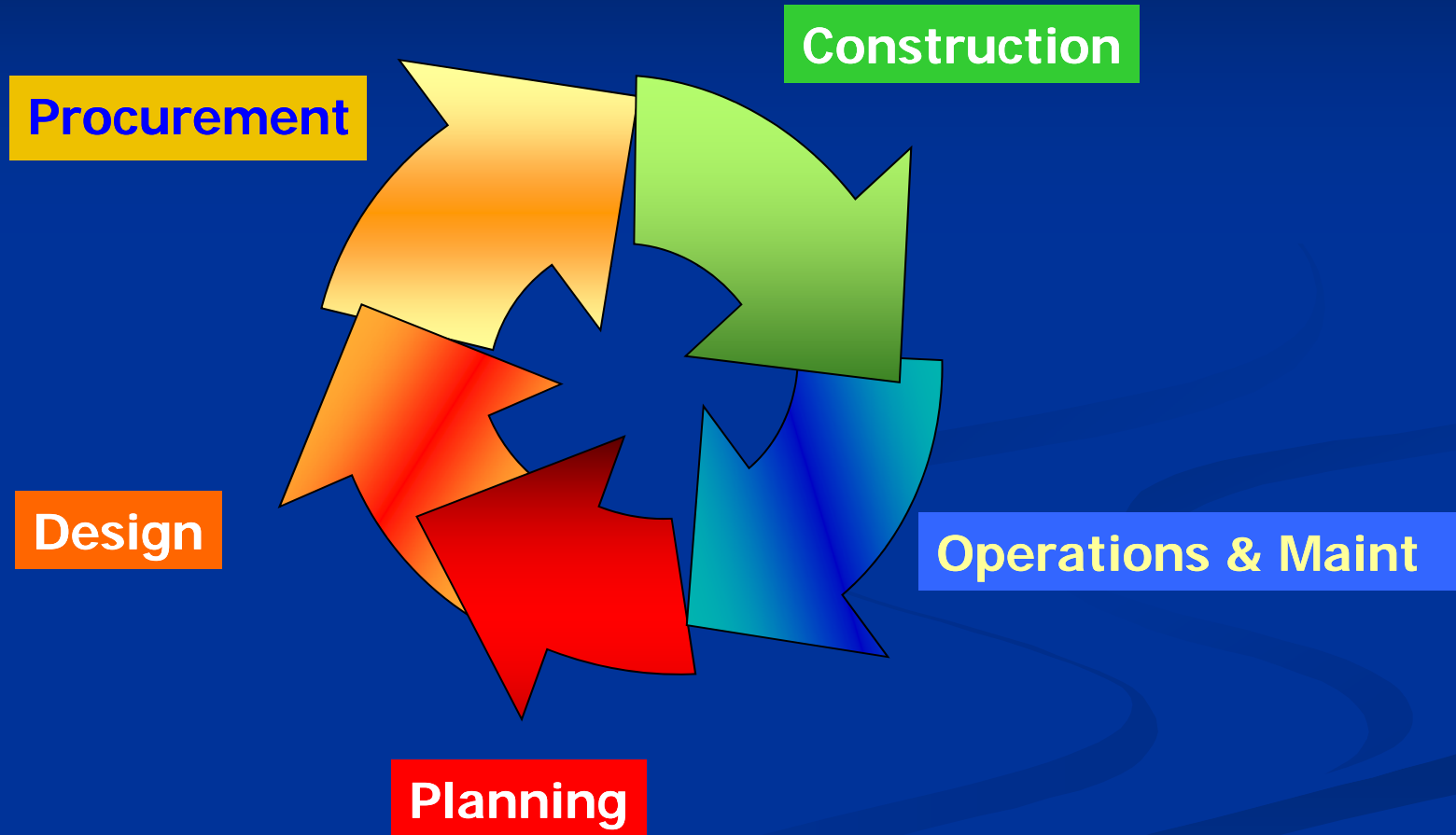
What is Highway Renewal?

The reconstruction or substantial rehabilitation of deteriorating highway infrastructure to new standards of service, while the infrastructure continues to serve the traveling public.



Rapid Renewal implies accelerated construction but also includes project delivery, design, and operational & maintenance features that minimize the total project length and produces long lasting facilities

SHRP 2 Renewal The Life Cycle Approach



SHRP 2 Renewal The Life Cycle Approach

Planning

DOT/Railroad Successful Practices and Model Agreements

DOT/Utility Successful Practices

Guidelines and tools for:

- **Project Management**
- **Risk Management**
- **Corridor and Network Level planning for Renewal Projects**

Design

DOT Utility Successful Practices

Tools and Guidelines for Utility Location and Relocation

NDT tools for gathering data for input into Design

Design Guidelines and tools for:

- **Long Life Pavements**
- **Geotechnical Solutions**
- **Long life Bridges**

SHRP 2 Renewal The Life Cycle Approach

Procurement

DOT Railroad Model Agreements

DOT Utility Best Practices

Guidelines and tools for:

- **Performance Specifications**
- **Project Management**
- **Risk Management and Transfer**
- **Worker and Manager Fatigue Management**

Construction

Construction Guidelines and tools for:

- **Long Life Pavements**
 - ✓ **Modular Pavements**
 - ✓ **Composite Pavements**
 - ✓ **Using Existing Pavement in place**
- **Geotechnical Solutions**
- **Long life Bridges**
- **Worker Fatigue**

NDT tools for Construction QA/QC

SHRP 2 Renewal The Life Cycle Approach

Operations & Maint.

NDT tools to assess the ongoing condition of roadways, bridges, and Tunnels

Guidelines and tools for:

- **Preservation approaches for High Traffic Volume Roadways**
- **Maintenance and preservation of 100 year bridges**

What SHRP 2 is doing ... Construction QA/QC

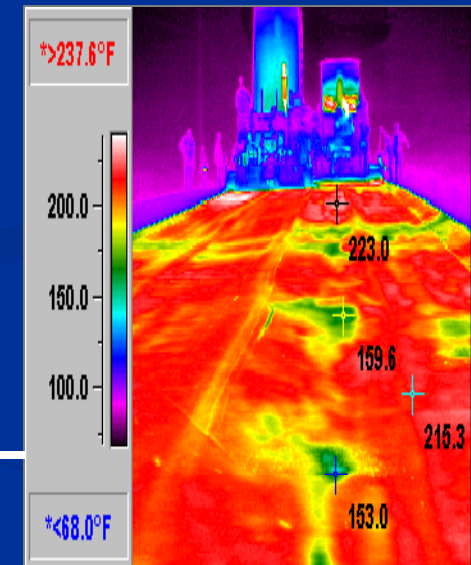


Nondestructive Testing Tools

Evaluation of Field Spectroscopy Devices



Infrared and GPR for Uniformity Measurement of New HMA Layers



Real-Time Smoothness Measurements of PCC Pavements

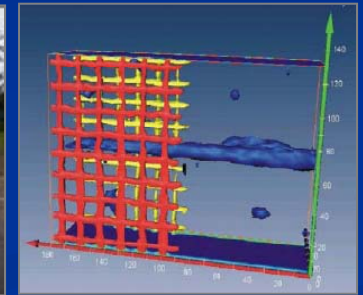


What SHRP 2 is doing ... Condition Assessment



Nondestructive Testing Tools

NDT to Identify **Bridge Deck**
Deterioration



NDT to Identify **Delaminations**
between HMA Layers

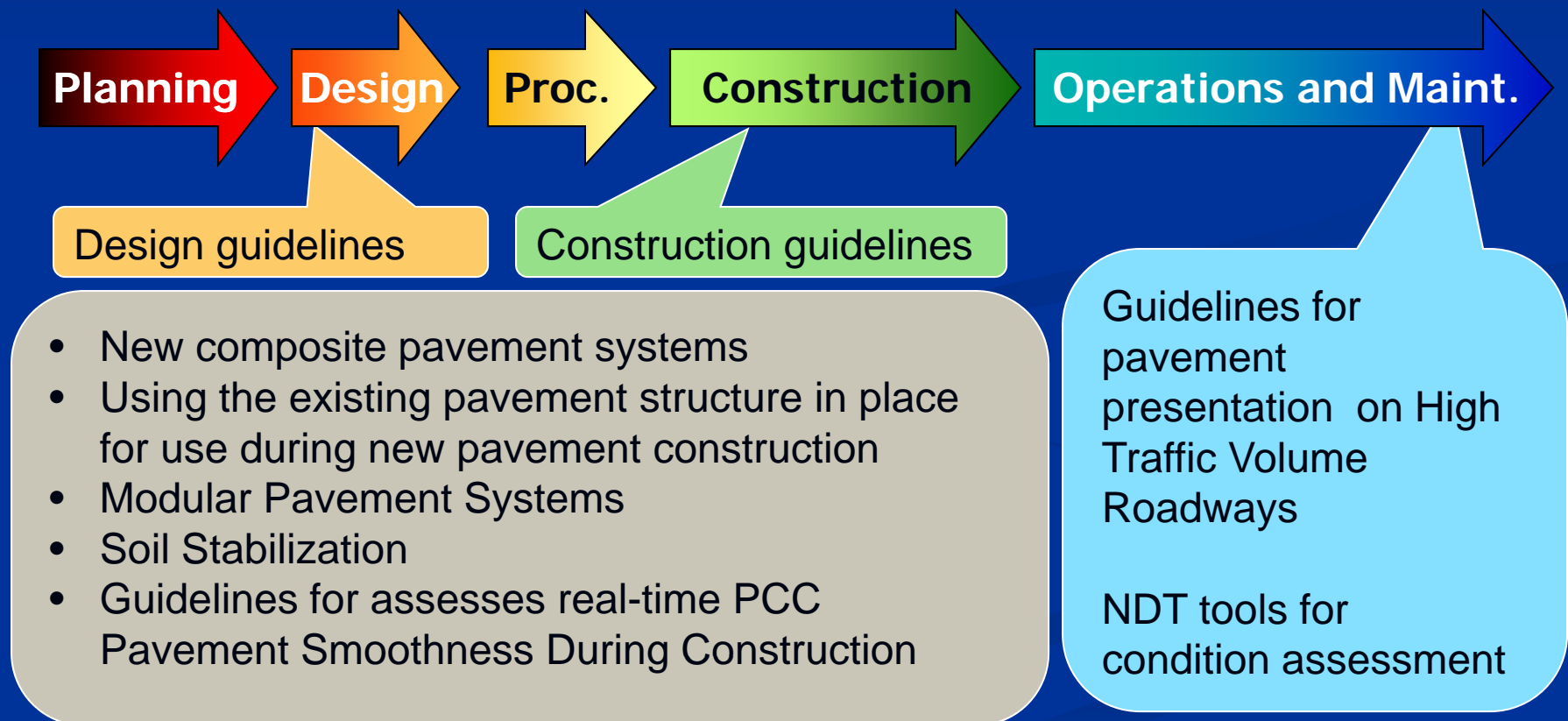


NDT for **Tunnel Linings**



What SHRP 2 is doing ... Long Life Pavements

Focusing on tools for the design, construction, and preservation of long life pavements.



Upcoming/On-going Field Activities

R05 Modular Pavement Technology (August 2011)

Modular Pavement Design Procedures

Model Construction Specs and Guidelines



Field testing of In-place precast concrete pavement systems

R06-E Real-Time Smoothness Measurements During PCC Pavement Construction (August 2011)

Draft Model Specifications for Real-Time Smoothness During Construction



Field Testing devices in April/May 2010

Upcoming/On-going Field Activities

R07 Performance Specifications for Rapid Highway Renewal (February 2012)

Draft Model Performance Specs and guidelines for several asset types (e.g. pavements, bridges, traffic management, etc)



**Workshop for the development of PCC Pavement Performance Specs
March 2010**

R21 Composite Pavement Systems (September 2011)

Procedures for development of composite pavement systems. Model Construction Specs & guidelines



**Construction of 2-layer wet-on-wet composite pavement test cells at MnRoad
May 2010**

SHRP 2 R26

Preservation Approaches for High Traffic Volume Roadways

- Use of pavement preservation is growing
- Use on high-traffic roads is not widely accepted and is poorly documented
- Formal guidelines being developed by many agencies do not include higher ADTs

Project Objectives

- Develop Pavement Preservation guidelines for high-traffic volume roads
- Identify promising preventive maintenance strategies for high-traffic volume roads
- Recommend further research opportunities

Agency Survey

- Sought information on
 - Defining “high”
 - Successful and potential successful treatments
 - Challenges and solutions
- Distributed to 50 SHAs, Canadian Provinces, cities, international practitioners, and industry reps
- Responses from 40 SHAs, 7 Provinces, and 3 cities, as well as industry

PCC Treatments

| | |
|---|------------------------|
| 1 | Joint Seal |
| 2 | Crack Seal |
| 3 | Diamond Grinding |
| 4 | Diamond Grooving |
| 5 | Partial-Depth Patching |
| 6 | Full-Depth Patching |

| | |
|----|----------------------------|
| 7 | Dowel Bar Retrofit |
| 8 | Thin PCC Overlay |
| 9 | Thin Bonded Wearing Course |
| 10 | Thin HMA Overlay |
| 11 | Drainage Preservation |
| 12 | Other |

“High” Traffic ($\geq 20,000$ ADT)

Widely used PCC treatments

- Joint Seal
- Diamond Grinding
- Full-Depth Patching

PCC treatments with limited use

- Diamond grooving, thin bonded wearing course, thin HMA or PCC overlay

Guidelines

- Discussion of decision criteria
- Detailed information on treatments
- Flow of decision process
- Treatment feasibility matrices

Decision Criteria

- Traffic levels
- Pavement condition
- Climate/environment
- Available work hours
- Expected performance
- Costs

Flow of Decision Process, part 1

Evaluate Current and Historical Pavement Performance Data

(from field surveys and testing and/or agency PMS database)

- Overall Condition Indicator (PCI, PSR, etc.)
- Individual Distress Types, Severities, and Extents
- Smoothness (IRI, PI, etc.)
- Surface and Subsurface Drainage Characteristics
- Safety Characteristics
 - friction/texture (FN, MPD/MTD, IFI, etc.)
 - crashes
- Pavement–Tire Noise

Review Historical Design, Construction, and Maintenance and Rehabilitation (M&R) Data

- Pavement Type and Cross-Sectional Design
- Materials and As-Built Construction
 - M&R Treatments (materials, thicknesses, etc.)

Develop Preliminary Set of Feasible Preservation Treatments

Flow of Decision Process, part 2

Develop Preliminary Set of Feasible Preservation Treatments

Assess Specific Needs and Constraints of Project

Performance Needs

- Treatment Life
 - traffic effects (functional class and/or traffic level)
 - climate/environment effects
- Risk
 - Availability of qualified contractors
 - Availability of quality materials

Construction Constraints

- Funding
- Time (of year) of construction
- Geometrics
- Work duration (facility downtime)
- Traffic accommodation

Develop Final Set of Feasible Preservation Treatments

Flow of Decision Process, part 3

**Develop Final Set of Feasible
Preservation Treatments**



**Select the Preferred Preservation
Treatment**

- Conduct Cost-Effectiveness Analysis
 - Benefit-Cost Analysis
 - Life-Cycle Cost Analysis (LCCA)
- Evaluate Economic and Non-Economic Factors

Example Treatment Matrix

| Preservation Treatment | Window of Opportunity | | Distress Types and Severities | | | | |
|---------------------------------|-----------------------|------|-------------------------------|-------------------|-------------|-------------------|------------------|
| | | | Surface Distress | Joint Distress | | Cracking Distress | |
| | | | D-Crack | Joint Seal Damage | Joint Spall | Corner | Long/Trans |
| | | | PCI | Age, yrs | L/M/H | L/M/H | L/M/H |
| Concrete Joint Resealing | 75-90 | 5-10 | | ○◎● | ○×× | | |
| Concrete Crack Sealing | 70-90 | 5-12 | | | | ●◎○ | ●◎○ |
| Diamond Grinding | 70-90 | 5-12 | ××× | ××× | ××× | ××× | ××○ ^a |
| Diamond Grooving | 70-90 | 5-12 | ××× | ××× | ××× | ××× | ××× |
| Partial-depth Concrete Patching | 65-85 | 6-15 | ××× | ××× | ◎●● | ××× | ×○◎ |
| Full-depth Concrete Patching | 65-85 | 6-15 | ○◎● | ××× | ×○◎ | ◎●● | ××○ |
| Load Transfer Restoration | 65-85 | 6-15 | ××× | ××× | ××× | ×○○ | ××× |
| Thin Bonded Wearing Course | 70-90 | 5-12 | ◎○× | ××× | ××× | ○×× | ○◎○ |
| Thin HMA Overlay | 70-90 | 5-12 | ◎○× | ××× | ××× | ○×× | ○◎○ |

● Highly Recommended ◎ Generally Recommended ○ Provisionally Recommended × Not Recommended

^a May be appropriate in conjunction with partial- and/or full-depth repairs to ensure smooth profile.

Thank you for listening

www.trb.org/shrp2

James Bryant
jbryant@nas.edu