FHWA Update to the AASHTO JTCP

Web Briefing

April 14, 2011
Pete Stephanos
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Agenda – FHWA Update

- FY2012 DOT Proposed Budget - Pavements
- Performance Management Initiatives
- Infrastructure Health Assessment Project Update
- Pavement Type Selection/Alternate Bidding Update
- MEPDG Related Issues
- New FHWA Sustainable Highways Tool
- Initiative Updates
  - Warm Mix Asphalt
  - Safety Edge
  - Concrete Overlays
  - High RAP Mixtures
  - Step Frequency GPR
  - Asphalt Mixture Perf Tester
  - Friction Loan Program
  - Intelligent Compaction
DOT Proposed FY2012 Budget and Program

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FY2012 DOT Proposal Highlights

- Proposal provides funding to:
  - Modernize our highway system and create jobs.
  - Focus investment on safety, state of good repair, and livability.
  - Establish a performance-based highway program.
  - Encourage innovations that will shorten project delivery and accelerate the deployment of new technologies.
  - Simplify the highway program structure by consolidating over 55 programs to 5 core programs.
FY 2012 Overview

- Core Federal-aid highway programs
  - Safety ($2.5 billion)
  - National Highway Program ($32.4 billion)
  - Livable Communities ($4.1 billion)
  - Federal Allocation ($1.4 billion)
  - Research, Technology, & Education ($641 million)
- Transportation Leadership Awards ($1.3 billion)
- “Up-Front” Funding ($27.7 billion)
- Administrative Expenses ($441 million)
National Highway Program

- Supports Performance Management Process
  - FHWA sets goal areas, measures and targets for NHS+

- 2 Sub Programs
  - Highway Infrastructure Performance Program
    - Formula based ($16.75B)
    - Limited to NHS+
    - Limitation on new capacity
    - Infrastructure condition and operations focus
  - Flexible Investment Program
    - Formula based ($15.6B)
    - All Federal-aid roadways and off system bridges
    - Infrastructure focus
Highway Infrastructure Performance

- State targets set in consultation with FHWA and need to support national goals (within 1 yr of FHWA set targets)
- Every 4 yrs FHWA certifies State process to develop an NHS+ Asset Management Plan
- State must have an Asset Management Plan which:
  - is risk based
  - identifies existing performance
  - identifies performance gaps
  - includes analysis of life cycle costs, value for investment, risk management
  - includes a financial plan to fund plan
  - includes strategies to invest funds to achieve targets
Highway Infrastructure Performance

- Reports
  - State report to FHWA required annually
  - Condition and performance of NHS+
  - Progress in achieving State targets
  - Effectiveness of investment strategy

- Penalty
  - State targets not met for 2 consecutive years
  - FHWA will work with State to revisit plan

- Incentive
  - State targets are met for 3 consecutive years
  - Use funds for Flexible Investment Program for 1 year
Flexible Investment Program

- Funding to improve the conditions and performance of highways and bridges
- Fund improvements on any federal-aid highway
- Fund improvements to any bridge on a public roadway
- No restrictions on system expansion
- Additional eligibility:
  - Fringe and corridor parking facilities
  - Highway R&D and T2
  - Congestion pricing
  - Transportation planning
- No requirement for an Asset Management Plan
For More Information

- President’s Budget (DOT/FHWA overview and detailed budget account information): http://www.whitehouse.gov/omb/budget/Overview

- DOT Budget Highlights and FHWA Congressional Justification: http://www.dot.gov

Performance Management Initiatives

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Preparing for a National Approach

- How is performance defined?
- How is performance monitored?
- Where is the source of data?
- How can we manage performance?
Preparing for a National Approach

- How is performance defined?
- How is performance monitored?
- Where is the source of data?
- How can we manage performance?
FHWA Approach

Percentage of NHS vehicle miles travelled in Good condition

170 inches/mile

95 inches/mile

POOR

FAIR

GOOD

U.S. Department of Transportation
Federal Highway Administration

Every Ray Counts
NHS Pavement Condition Trends

- Good Condition
  - Poor Pavements
  - Good Pavements

- Poor Condition

Year:
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
Annual Improvement – Good Pavements

States with Annual Improvement in Pavement Condition
Percentage of System in Good Condition

<table>
<thead>
<tr>
<th>Year</th>
<th>NHS</th>
<th>IS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>27</td>
<td>22</td>
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<td>2006</td>
<td>35</td>
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<td>2007</td>
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<td>27</td>
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<td>2008</td>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>2009</td>
<td>29</td>
<td>29</td>
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</table>
Annual Decrease in Poor Condition

States with Annual Improvement in Pavement Condition
Percentage of System in Poor Condition

- **NHS**
- **IS**

<table>
<thead>
<tr>
<th>Year</th>
<th>NHS</th>
<th>IS</th>
</tr>
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<tbody>
<tr>
<td>2005</td>
<td>23</td>
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<td>24</td>
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<td>2007</td>
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<td>25</td>
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<td>2008</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>2009</td>
<td>25</td>
<td>27</td>
</tr>
</tbody>
</table>
Distribution of Ride Quality

Distribution of NHS Travel on Good Riding Roads

% of NHS Travel/Mileage on Good Riding Roads

% of NHS Miles/Travel

- 0%
- 5%
- 10%
- 15%
- 20%
- 25%
- 30%

- <36%
- 36%-46%
- 46%-56%
- 56%-66%
- 66%-76%
- 76%-86%
- >86%

At or Above DOT Goal
Below DOT Goal

<table>
<thead>
<tr>
<th>% of NHS Travel/Mileage on Good Riding Roads</th>
<th>Travel</th>
<th>Mileage</th>
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</thead>
<tbody>
<tr>
<td>&lt;36%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36%-46%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46%-56%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56%-66%</td>
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<td></td>
</tr>
<tr>
<td>66%-76%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76%-86%</td>
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<td></td>
</tr>
<tr>
<td>&gt;86%</td>
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</table>
I-95 in Virginia

VDOT Criteria

DelDOT Criteria
Preparing for a National Approach

- How is performance defined?
- **How is performance monitored?**
- Where is the source of data?
- How can we manage performance?
State Performance Monitoring

<table>
<thead>
<tr>
<th>Category</th>
<th>Network Level</th>
<th>Project Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Distress</td>
<td>98.2%</td>
<td>58.9%</td>
</tr>
<tr>
<td>Smoothness</td>
<td>94.6%</td>
<td>66.1%</td>
</tr>
<tr>
<td>Structural Capacity</td>
<td>71.4%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Surface Friction</td>
<td>55.4%</td>
<td>33.9%</td>
</tr>
</tbody>
</table>

Source: NCHRP Synthesis Report 401
Surface Distress Types

- Rutting: 100%
- Transverse Cracking: 93%
- Fatigue Cracking: 89%
- Longitudinal Cracking: 89%
- Map/Block Cracking: 77%
- Ravelling: 64%
- Faulting: 64%
- Spalling: 54%
- Ravelling/Flush: 54%
- Edge Cracking: 46%
- Other: 36%
- Punch Outs: 32%
- Shattered Slab: 30%
- Durability Cracking: 27%
- Pumping: 21%

Source: NCHRP Synthesis Report 401
Condition Indices

- Rut Index
- Crack Index
- PCI
- PCR
- PDI
- Condition Rating
- PSR
- Critical Index

- Excellent
- Good
- Fair
- Mediocre
- Poor
- Very Poor

Acceptable Level?
# TXDOT Report

## State Thresholds

<table>
<thead>
<tr>
<th>State</th>
<th>Thresholds</th>
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<tbody>
<tr>
<td>Georgia</td>
<td>75–100 is good to excellent</td>
</tr>
<tr>
<td>Iowa</td>
<td>60–80 is good, 80–100 is excellent</td>
</tr>
<tr>
<td>Montana</td>
<td>63–100 is good</td>
</tr>
<tr>
<td>Nebraska</td>
<td>70–89 is good; 90–100 is very good</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>40–100 is acceptable</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Greater than 80 is good</td>
</tr>
<tr>
<td>Ohio</td>
<td>75–90 is good; 90–100 is very good</td>
</tr>
<tr>
<td>Oregon</td>
<td>75.1–98 is good; 98.1–100 is very good for NHS</td>
</tr>
<tr>
<td>Vermont</td>
<td>40–100 is acceptable</td>
</tr>
<tr>
<td>Virginia</td>
<td>70–89 is good; greater is excellent</td>
</tr>
<tr>
<td>Washington</td>
<td>50–100 is good</td>
</tr>
</tbody>
</table>
Preparing for a National Approach

- How is performance defined?
- How is performance monitored?
- **Where is the source of data?**
- How can we manage performance?
What Source of Data Should be Used?

- **HPMS**
  - Outside lane only
  - One direction of travel
  - One value for each section
  - Reported annually
  - Represents all NHS roadways

- **State PMS Data**
  - Various lanes
  - Both directions
  - Shorter sections
  - Updated frequently
Difference in Outcome - Example

Percent NHS VMT on Good Pavement

Percent NHS VMT on Poor Pavement
Preparing for a National Approach

- How is performance defined?
- How is performance monitored?
- Where is the source of data?
- How can we manage performance?
Managing Performance

- Collective Effort
- National Goal
- Individual State Targets
- Program Design
- Linking Accomplishments to Performance
Six Year State Performance Trend

Six Year Performance Change in NHS Lane-Miles of Pavement in Good Condition
2004-2009 Change in Condition

- Conditions Improved
- Conditions Declined

6 Yr Change in % Good Pavements

- > 40%
- 30%-40%
- 20%-30%
- 10%-20%
- 0%-10%
- 0%-10%
- 10%-20%
- > 20%

No. of States in Improvement Band
Initiatives

Performance Management Framework
- Assessing Infrastructure Health
- Asset Management Plan Prototype/Trials
- Support Tier 2 Measure Development
- Pavement Monitoring Guide

Tools
- HERS-ST Enhancements
- Pavement Health Track Tool – RSL
- Develop Health Monitoring Tool
Initiatives

- Training
  - Awareness, Analysis, Management
- Internal FHWA Efforts
  - HPMS Quality Assurance Process
  - Assessment of HERS
  - NHS Pavement Report Template
Improving FHWA’s Ability to Assess Infrastructure Health

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Project Objectives

- To define a consistent and reliable method to document infrastructure health with a focus on pavements and bridges on the Interstate System (that can be expanded to the National Highway System)

- To develop tools to provide FHWA and State DOTs ready access to key information
Project Approach

- Develop an approach for categorizing pavement and bridges as **Good/Fair/Poor**, that can be used consistently across the country
  - Good/Fair/Poor will be based on condition data
  - Recommend improvements to HPMS and NBI

- Develop an approach for assessing the overall **Health** of a highway corridor
  - Looking for a “visit to the Doctor” outcome
  - Will go beyond condition
Project Structure

- Phase I – Develop a methodology
  - Kick-off meeting
  - Literature review
  - Identify approach
  - Develop work plan for Phase II

- Phase II – Conduct a pilot study
  - Collect and review data
  - Run sample assessment
  - Document conclusions

- Phase III – Hold national meeting to review results and discuss preferred methodologies
Project Milestones

Phase I
- Kick Off Meeting
- Literature Review
- Project Meeting #1: Identifying Metrics

Phase II
- Technical Working Group Meeting #1
- Data Collection Begins
- PILOT STUDY

Phase III
- Pilot Study Conclusions & Report
- Technical Working Group Meeting #2
- Pilot Study Draft Reports
- National Meeting
- Final Report

Key Deliverables
- Key Meetings
- Key Deliverables

Defining Good, Fair, Poor

- General, consistent definition
- Two Options:
  - IRI approach
  - Composite index approach
Option 1. IRI

- There is momentum for IRI to be the initial basis for a national pavement performance measure
- Recent FHWA and NCHRP 20-24(37) G reports propose Good/Fair/Poor thresholds, consistent with C&P Report thresholds

<table>
<thead>
<tr>
<th>Threshold in C&amp;P Report</th>
<th>Category</th>
<th>Proposed Thresholds</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 95</td>
<td>Good</td>
<td>&lt; 95</td>
<td>Good</td>
</tr>
<tr>
<td>≤ 170</td>
<td>Acceptable</td>
<td>95 ≤ IRI ≤ 170</td>
<td>Fair</td>
</tr>
<tr>
<td>&gt; 170</td>
<td>Not Acceptable</td>
<td>&gt; 170</td>
<td>Poor</td>
</tr>
</tbody>
</table>

- A TXDOT study found that less than 10 States use IRI threshold of ~170 to trigger “Poor” condition
Option 2. New Composite Measure

- Based on HPMS 2010+
- Potential approach - use HPMS 2010+ data elements to develop new composite measure
  - IRI
  - Rutting
  - Faulting
  - Cracking (fatigue, transverse, cracked slabs, punchouts)
- Develop modified PCI using HPMS 2010+ data
- Consistent with Tier 2 measure addressed in NCRHP 20-24(37) G
Health Assessment Track

What is it

» A means for FHWA to examine the overall health of specific corridors and respond to requests for information

Vision for the health assessment

» A report that summarizes overall health and identifies potential warning signs
» A tool to review metrics and examine detailed data

Valuable to agencies that manage pavements and bridges
Health Assessment
A Potential Tool

Examine by combination of routes and states

Select routes or segments using a map

Review a quick summary of overall health or more detailed information
Health Assessment
A Potential Tool, continued

Other tabs could provide more detailed information on condition of a particular asset.
Pilot Approach

- Select a three-state pilot corridor
- Compile Federal data sets for pavements (HPMS 2010+ and NBI)
- Compile state data used to develop Federal data sets
- Perform field collection for pavement data (maybe bridge)
- Compare data and measures resulting from data
- Identify issues and recommend improvements
Pilot Corridor
Issues to be Addressed During Pilot

- Consistency between state data and submitted Federal data
- Consistency between states
- Validity of metrics
  - Calculations
  - Good/Fair/Poor thresholds
- Validity of health approach
Compare and Discuss Alternatives

Different Data Sources

- HPMS
- State
- Collected

Different Metric Options

- Option 1
- Option 2
- Option 3
National Meeting

- Funding to send 1 person from every state
- Meeting to be held in Fall, 2011
- Review outcomes of I-90 pilot
- Discuss preferred options
- Identify next steps
Pavement Type Selection

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Overview of Pavement Type Selection

- Components of Agency Processes
  - Selection of alternatives
  - Structural design
  - Economic Analysis
  - Primary/Secondary Factors

- Contractor-based processes
  - Alternate Bidding
  - Design Build
  - Long Term Warranty
  - Other (PPP, Value Engineering, BV Contracting, Contract Maintenance)
FHWA Memo on Alternate Bidding

- Issued November 13, 2008
- Clarifies and consolidates FHWA policy
- Applies to Federal-aid on the NHS
- Alt Bidding is “not encouraged”
- However, many states are doing it....

- Equivalent designs
- Discount rate
- Uncertainty
- Rehabilitation strategy
- Subjective factors

- Commodity price adjustments
- I/D provisions
- Materials quantities
- Approval process
State has advertised at least 1 alternate bid job

State has not utilized alternate bidding

State did not reply to survey
FHWA Next Steps

- Reviewing state experience with alternate bidding – SEP 14 reports
- Identifying key issues that need to be addressed
- Have identified 4 issues
Issue #1

Issue: States may not be taking enough steps in their design process to ensure that sound engineering and economic principles are considered in their pavement type selection decision.

Response: Issue PTS guidance and provide technical assistance.
Issue #2

Issue: More states are using alternate bidding, but FHWA’s position is still to “not encourage” its use.

Response: New guidance will recognize alternate bidding as viable option for pavement type selection.
Issue #3

Issue: Use of alternate bidding needs to be done under SEP-14, requiring approval by FHWA.

Response: FHWA proposes to “graduate” alternate bidding to an accepted practice.
Issue #4

Issue: Alternate bidding practice varies across the country, some approaches do not provide a competitive bidding environment.

Response: FHWA proposes to issue consider additional guidance to recommend best practices for alternate bidding to provide a competitive bidding environment.
MEPDG Related Items

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Evaluation of Recalibrated MEPDG JPCP Distress Models
Background

- An error in the assumed value of coefficient of thermal expansion (CTE) of the calibration bar resulted in overestimating CTE of LTPP PCC sections by about 0.8 micro-strains per °F.
- PCC pavement responses are sensitive to CTE; a major change in CTE requires recalibration of the distress models.
- MEPDG JPCP performance models were recalibrated (NCHRP 20-07) to ensure the results are reasonable and free of any bias.
Assumptions

- The current MEPDG (Ver 1.0/1.1) performance models give reasonable results when used with the old, inflated CTE values.
- CTE depends on aggregate type; on average, we should see about $0.8 \times 10^{-6}^\circ F$ drop in CTE from the correction:
  - Old average CTE: $5.4 \times 10^{-6}^\circ F$
  - Corrected average CTE: $4.6 \times 10^{-6}^\circ F$
Expectations

- Recalibrated models with the new CTE values should provide similar results as the old models with old CTE values.
- No significant change in design thicknesses should result from the correction.
Problems

- The revised JPCP cracking model typically predicts dramatically less cracking than Ver.1.0
  - The new design thicknesses are typically 0.8 to 1.4 in less than the old
  - Similar results (as the old model) are obtained only for thin sections: design thickness less than 8.5 in

- The revised JPCP faulting model over-predicts faulting, especially for high traffic
  - Less faulting is expected for lower CTE
  - The magnitude of over-prediction is significant for high traffic, especially if no edge support is provided
Possible Consequence

- High risk of under-designing pavement, especially for heavy traffic
  - A 0.5-in reduction in the required slab thickness reduces traffic capacity by about 50%
  - A 1.0-in reduction in the required slab thickness reduces the traffic capacity by a factor of 3 (i.e., about 1/3rd of the original capacity)
Effects of slab thickness on traffic capacity (MEPDG)

![Graph showing the relationship between slab thickness and traffic capacity.]
Trend in Thickness Error

Design thickness, in

Thickness reduction, in

7 8 9 10 11 12 13 14

0.0 0.5 1.0 1.5 2.0 2.5
Effects of CTE Drop on Calculated Damage

- 20-07
- Version 1.0

Months:
0 12 24 36 48 60 72 84 96 108 120 132 144 156 168 180 192 204 216 228 240

Fatigue Damage:
0.00 0.05 0.10 0.15 0.20 0.25 0.30 0.35
Comparison of Cracking Models

![Graph showing comparison between V1.0 and 20-07 models for fatigue damage and percent slabs cracked.](image)
Typical Design
Comparison of Cracking Models

Fatigue Damage

Percent Slabs Cracked

V1.0
20-07
Needed
“Consideration of Pavement Preservation in Mechanistic-Empirical Design and Analysis of Pavement Structures”
NCHRP Project 20-07, Task 251

- “Consideration of Pavement Preservation in Mechanistic-Empirical Design and Analysis of Pavement Structures”
- March 2009, Applied Pavement Technology
- States the case for considering the contributions of preventive maintenance activities in the MEPDG process, and describes both short-term and long-term approaches to accomplish that.
Preventive Maintenance in Design

- Preventive maintenance is part of most agencies’ pavements program – should influence the decisions made in pavement design.

- Treatments are being performed to prevent moisture infiltration or to restore surface characteristics – these will have some effect over time on the structural performance of the pavements.
Next Steps?

- Report describes how to incorporate preventive maintenance treatments into pavement design – adjustment or modification of performance models.
- Provides seven recommendations for additional research or improved tracking of treatment application and performance.
- What can FHWA and AASHTO consider in upcoming activities to incorporate the observations and recommendations of the report into the MEPDG?
Highway Sustainability Rating Tool, INVEST

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What is a sustainable highway?

- Satisfies functional requirements
  - Fulfills transportation goals and needs (e.g. congestion reduction)
  - Addresses development and economic growth
- Reduces impacts
  - Environment
  - Consumption of resources
- Addresses environmental, economic, and social equity dimensions (triple bottom line)
- Addresses sustainability from planning through operations
FHWA’s Sustainable Highways
Self Evaluation Tool

- Encourage sustainable highway projects
- Help agencies measure sustainability and quantify tradeoffs
- Provide a framework for communicating with stakeholders about sustainability
- Establish a method for evaluating sustainable highways
Sustainable Highways Tool

Working Title: 
IN-VEST - Infrastructure Voluntary Evaluation Sustainability Tool

A web-based self-evaluation tool for measuring sustainability over the life cycle of a transportation project or program — from system and project planning through design and construction, to operations and maintenance

Website address—
www.sustainablehighways.org
What are some of the Tool’s characteristics?

- Web-based
- Credits based on best practices
- Each credit assigned a point value based on expected sustainability impact
- In coordination with ASCE effort
- Other sustainable highways tools used as references
  - (GreenLITES, I-LAST, Greenroads)
What the Tool is NOT…

- The tool is not final.
  - We are working on a Beta-version.
- The tool is not required.
  - Use is purely voluntary.
Sustainable Highway Credits

- System Planning (SP)
  - Agency-wide management/planning of highways
  - System/Network evaluation
- Project Development (PD)
  - Environmental Review, project planning, design, and construction
  - Project evaluation
- Operations and Maintenance (OM)
  - Agency-wide approach to operate and maintain system
  - System/Network evaluation
Learning Tab

Learn

This section is a guided tour through the Sustainable Highways Self-Evaluation Tool website to learn about sustainable highways and integrating sustainability best practices into System Planning, Project Development, and Operations and Maintenance. You will:

- Learn more about Sustainability and Sustainable Highways,
- Learn how Context influences sustainability,
- Download and browse the Sustainable Highways Credits,
- Learn how to apply, incorporate and implement Sustainable Highways credits,
- Create a Scorecard of custom-selected credits, and
- Score Your Project or Agency’s Systems & Practices with the Sustainable Highways Self-Evaluation Tool.

Start > What is Sustainability?

Table of Contents

- What is Sustainability?
- What is a Sustainable Highway?
- Why Measure Sustainability?
- How Is Sustainability Measured?
- What is This Tool?
- How Does It Measure Sustainability?
- How Are the Credits Organized?
- How Are the Credits Weighted?
- How Do I Score a Project?
- How Do I Score Systems & Practices?
- What Does the Score Mean?
Browsing Tab

Self-Evaluation Scorecard

List All Credits
- By Code
- By Title

Filter by Phase
- System Planning & Processes
- Project Development
- Transportation Systems Management, Operations & Maintenance

Filter by Principle
FHWA BETA VERSION

Scoring Tab

Sustainable Highways Self-Evaluation Tool

Scorecard

This beta version of the scorecard is for review purposes only and does not tabulate. Projects will soon be able to choose a phase and score, but for this demo, the project development phase has been selected.

Project Development

<table>
<thead>
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<th>Credit</th>
<th>Points</th>
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<tr>
<td>PD-01 Cost Benefit Analysis</td>
<td>1</td>
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<tr>
<td>PD-02 Highway and Traffic Safety - INTERIM</td>
<td>10</td>
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<tr>
<td>PD-03 Context Sensitive Solutions</td>
<td>5</td>
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<td>PD-04 Lifecycle Assessment</td>
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<tr>
<td>PD-05 Lifecycle Cost Analysis</td>
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</tbody>
</table>

Self-Evaluation Scorecard

Project Score

Your Rating: Not Rated

0

37 points needed for Bronze
50 points needed for Silver
62 points needed for Gold
74 points needed for Platinum

Help Me Build It

Ecology

filter clear
System Planning & Processes Credits

SP-1 Comprehensive & Integrated Planning
SP-2 Environmental Management System
SP-3 Context Sensitive Solutions
SP-4 Equity Analysis
SP-5 Integrated Transportation Land Use Planning
SP-6 Multimodal Transportation
SP-7 Professional Development
SP-8 Travel Demand Management
SP-9 Safety Management
SP-10 Air Quality Management
SP-11 Greenhouse Gas Emissions
SP-12 Climate Change Effects
SP-13 Noise Reduction Management Plan
SP-14 Financial Sustainability
Project Development Credits: Project Planning

PD-1 Cost Benefit Analysis
PD-2 Highway and Traffic Safety
PD-3 Context Sensitive Solutions
PD-4 Lifecycle Assessment
PD-5 Lifecycle Cost Analysis
PD-6 Freight Mobility
PD-7 Educational Outreach
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<th>Historical, Archaeological, and Cultural Preservation</th>
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<td>PD-9</td>
<td>Runoff Flow Control</td>
<td>PD-20</td>
<td>Scenic, Natural, or Recreational Qualities</td>
</tr>
<tr>
<td>PD-10</td>
<td>Runoff Quality</td>
<td>PD-21</td>
<td>Low-Emitting Materials</td>
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<tr>
<td>PD-11</td>
<td>Ecological Connectivity</td>
<td>PD-22</td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td>PD-12</td>
<td>Low Impact Development</td>
<td>PD-23</td>
<td>Traffic Systems, Management and Operations (TSMO)</td>
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<tr>
<td>PD-13</td>
<td>Recycled Materials</td>
<td>PD-24</td>
<td>Long-Life Pavement</td>
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<td>PD-14</td>
<td>Renewable Energy</td>
<td>PD-25</td>
<td>Pavement and Structure Reuse</td>
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<tr>
<td>PD-15</td>
<td>Site Vegetation</td>
<td>PD-26</td>
<td>Stormwater Cost Analysis</td>
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<tr>
<td>PD-16</td>
<td>Pedestrian Access</td>
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<td>PD-17</td>
<td>Bicycle Access</td>
<td>PD-27</td>
<td>Thermal Pavement</td>
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<td>PD-18</td>
<td>Transit &amp; HOV Access</td>
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## Project Development Credits: Project Construction

<table>
<thead>
<tr>
<th>PD-28</th>
<th>Contractor Warranty</th>
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<tbody>
<tr>
<td>PD-29</td>
<td>Stormwater Pollution</td>
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<td>Prevention Plan</td>
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<td>PD-30</td>
<td>Environmental Training</td>
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<td>PD-31</td>
<td>Equipment Emission Reduction</td>
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<td>PD-32</td>
<td>Fossil Fuel Reduction</td>
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<td>PD-33</td>
<td>Construction Noise Mitigation</td>
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<td>PD-34</td>
<td>Quality Control Plan</td>
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<td>PD-35</td>
<td>Reduced Energy Materials</td>
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<td>PD-36</td>
<td>Waste Management</td>
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<td>PD-37</td>
<td>Earthwork Balance</td>
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<td>Environmental Management</td>
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<td>PD-39</td>
<td>Tracking Environmental</td>
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<td>Commitments</td>
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<td>OM-1</td>
<td>Pollution Prevention Plan</td>
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<tr>
<td>OM-2</td>
<td>Pavement Management System</td>
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<td>OM-3</td>
<td>Bridge Management System</td>
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<td>OM-4</td>
<td>Paved Surfaces Management System</td>
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<tr>
<td>OM-5</td>
<td>Traffic Control Infrastructure Maintenance</td>
</tr>
<tr>
<td>OM-6</td>
<td>Cleaning and Litter</td>
</tr>
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<td>OM-7</td>
<td>Roadside Infrastructure Maintenance</td>
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### OM-2 Pavement Management System

<table>
<thead>
<tr>
<th>Goal</th>
<th>Make pavements last longer and perform better by preserving and maintaining them.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>1 – 10 points</td>
</tr>
<tr>
<td>Description</td>
<td>The agency shall have a pavement management system (PMS). A pavement management system is a formal systematic process of preserving and rehabilitating a particular pavement or network of pavements.</td>
</tr>
</tbody>
</table>
OM-2 Pavement Management System

Requirements

- Have a Plan (1 point)
  - Measure pavement condition at least every two years
  - Document decision criteria for timing rehabilitation
  - Record when rehabilitation occurs

- Measure Performance (3 points) – Track pavement network performance using two common metrics:
  - Overall network condition using common metrics
  - Number and fraction of rehabilitation actions scheduled on time and delayed

- Set and Achieve Goals (6 points)
  - Set quantifiable goals relating to the two metrics, including when these goals are to be achieved
  - Monitor progress towards goals; show measurable advancement towards goals.
Achievement Levels

How will success be measured?

- Achievement levels are included in Beta version
- Look similar to LEED Rating system
  - Bronze (base level)
  - Silver (level 2)
  - Gold (level 3)
  - Platinum (top level)
Next Steps

- Beta version released Fall 2010
- Requested input from the transportation community in testing and improving the tool
- Evaluating feedback
- Making website improvements
- Release revision (Version 1.0)
  - Target date: April 22, 2011
Website address—
www.sustainablehighways.org
Initiative Updates

- Warm Mix Asphalt
- Safety Edge
- Concrete Overlays
- High RAP Mixtures
- Step Frequency GPR
- Asphalt Mixture Perf Tester
- Friction Loan Program
- Intelligent Compaction
Warm Mix Asphalt

Allows a reduction in asphalt mixture production & placement temperatures

Benefits:

- Provides better compaction
- Reduce worker fatigue
- Reduces fossil fuel consumption
- Reduces CO$_2$e & other emissions
- Longer paving season
- Allows for longer hauling distances
- Benefits with High RAP
Warm Mix Asphalt

- Various technologies are used, which allows the plant mix to be produced and compacted at lower temperatures...

  Typical production temperature reduction 30 to 75°F

WMA Technologies:
- Foaming Processes
- Wax-like Additives
- Chemical Additives
- Hybrids
Warm Mix Asphalt

- First public demo in US in 2004
- WMA projects have been completed in 40 States
- At least 10 States have adopted permissive specifications
WMA Workshops

- NAPA/FHWA Sponsored Events
- Asphalt In Depth
  - Recycled Materials, WMA, & Construction
  - Nashville, TN
  - June 1-2, 2011
  - [www.hotmix.org/asphaltindepth](http://www.hotmix.org/asphaltindepth)
- 2nd International Conference on WMA
  - St. Louis, MO
  - October 11-13, 2011
  - [www.hotmix.org/warmmix](http://www.hotmix.org/warmmix)
What Is the Safety Edge?

When used on asphalt pavement, the edge allows a vehicle to re-enter the pavement with greater stability and less loss of control resulting in reduced crashes.
Basic Principle

Without a Safety Edge
Basic Principle

With Safety Edge
Safety Impacts

Graphic Source: Zimmer and Ivey, Texas Transportation Institute
Costs of the Safety Edge

- **Hardware**
  - Approximately $3000 per shoe
  - Reusable

- **Material**
  - Minor additional asphalt (depends on shoulder condition)

- **Paving Process**
  - No change in paving speed
  - No additional operation
  - Minimal monitoring

- **Surface Details**
  - No change in smoothness/ride quality
Safety Edge Construction Webinar

**What:** The FHWA Safety Edge Team will host a webinar to share lessons learned from the construction of more than 10 demonstration projects completed in 2010 and 2011. Highlights include construction techniques, hardware improvements, testing results, and answers to the most frequently asked questions.

**When:** May 5th - May 23rd - June 6th
1 pm – 2:30 pm EDT

**Where:** http://fhwa.adobeconnect.com/safetyedge/
Call-in Number: 888-684-8852
Participant access code: 2792670#

**Who:** Federal, State, and Local highway agency representatives

**Contact:**
Chris Wagner, P.E.
Christopher.wagner@dot.gov
404.562.3693

*Safety Edge Installation: North Carolina 2011*
Step-Frequency GPR (SF-GPR)

- SF-GPR is a promising NDT technology for pavement evaluation
- Advantages
  - Wide detection range
  - Full coverage of a traffic lane in 2 passes
  - 2-D and 3-D imaging capability
  - Continuous calibration
The APE
Current status of APE

- Current applications – ready for demonstrations and implementation
  - Pavement layer thickness
  - Moisture detection
  - Void detection
  - Variations in material properties (AC density)

- Future applications
  - AC stripping
  - Layer debonding
  - Rutting evaluation (2-D & 3-D imaging)
  - Detection and quantification of cracking
  - Depth of dowel bars, tie bars, and reinforcing steel
Concrete Overlays

- Guide to Concrete Overlay Solutions
- One day Workshops
  - Overlay Types & Uses
  - Project Evaluation & Selection
  - Overlay Design
  - Concrete Materials Section
  - Work Zones under Traffic
  - Overlay Construction
  - Accelerated Construction
  - Specification Considerations
System of Concrete Overlays

**Concrete Overlays**

- **Thinner**
  - Bonded Overlay System
    - Bonded Concrete Overlay of Concrete Pavements
    - Bonded Concrete Overlay of Asphalt Pavements
    - Bonded Concrete Overlay of Composite Pavements
  - Unbonded Overlay System
    - Unbonded Concrete Overlay of Concrete Pavements
    - Unbonded Concrete Overlay of Asphalt Pavements
    - Unbonded Concrete Overlay of Composite Pavements

- **Thicker**
  - Bonded Overlay System
  - Unbonded Overlay System

**Bond to existing pavement is integral to design.**

**Existing pavement serves only as a base.**
High RAP Use

- Increase application to 25% RAP in all pavement layers
- Supporting national research efforts
- Supporting industry initiatives
- ETG activities
- Field testing and evaluation
- Specification development
AASHTO RAP Survey Results

Surface Mixes -- Average Use 2007

Surface Mixes -- Average Use 2009

States That Have Increased RAP Allowed Since 2007 Survey
Asphalt Mixture Performance Tester (AMPT)

Machine Specifically for Testing Engineering Properties of Asphalt Mixtures:
- Dynamic Modulus
- Flow Number
- Fatigue Test (potential)
AMPT Pooled Fund Study TPF-5(178)

- **Objectives**
  - Procure AMPT for highway agencies
  - Provide training on AMPT
  - Support national AMPT implementation

- **Progress and Schedule**
  - Four AMPTs delivered, four more ordered
  - More AMPTs to be ordered in 2011
  - Four training course completed
  - Two additional courses planned in 2011
AMPT Pooled Fund Study TPF-5(178)

- Participants
  - Alabama
  - Colorado
  - Connecticut
  - Florida
  - Georgia
  - Illinois
  - Kansas
  - Kentucky
  - Maine
  - Maryland
  - Nevada
  - New Hampshire
  - New Jersey
  - New York
  - North Carolina
  - Oregon
  - Pennsylvania
  - Tennessee
  - Utah
  - Virginia
  - Wisconsin
  - Wyoming
  - Ontario
  - FHWA - Lead agency
Application of Performance Testing

- Mix Design and Evaluation
  - Identify potential performance issues
- Pavement Design
  - Engineering properties for MEPDG
- Construction Acceptance
  - Performance based specifications
- Performance Monitoring
Friction Loan Program

- Equipment available for loan to states
- Technical assistance is provided
- Equipment:
  - Circular Texture Meter
  - Dynamic Friction Tester
  - Griptester
- Contact: Bob Orthmeyer
  - robert.orthmeyer@dot.gov
Intelligent Compaction Initiative

- Intelligent Compaction Equipment Loan/Demo (TPF5-128)
- Demo Projects (MN, NY, MS, MD, GA, IN, TX, KS)
- Best Practice Documents:
  - (1) Asphalt Materials and (2) Soils
- Analysis Software and MN DOT Effort to standardize data
Intelligent Compaction

- Active Pooled Fund Project
  - 12 States
  - Demonstrate and Evaluate Application
  - [www.intelligentcompaction.com](http://www.intelligentcompaction.com)
- Holding Regional Workshops
- Provide State Demonstrations
- Developing Manual
  - Best practices
  - Review of Technologies
  - Use of IC to reduce density testing
Initiative Contacts

- Warm Mix Asphalt
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THANK YOU!