LTPP InfoPave™
Extracting Information out of LTPP Data

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Wednesday, March 11, 2015
Overview

PART 1: Introduction to LTPP

PART 2: Data visualization in LTPP InfoPave
- Summary of major visualization tools in LTPP InfoPave
- Visualization approaches to data access and data analysis

PART 3: Extracting information out of the data
- Extraction of meaningful information out of the collected pavement performance data for asset management
- Utilizing LTPP InfoPave to specific problem statements

PART 4: Question and answer session
Introduction to LTPP

Jane Jiang PE, LTPP Database Manager, FHWA
LTPP’s GOAL is…

to provide answers to **HOW** and **WHY** pavements perform as they do!
LTPP Program Illustration
2509 in-service pavement sections

- Field data collection
- Materials testing
- Data QC/QA
- Database Security

Production Database

Q&A
Data Analysis
Educate
LTPP Data – All Encompassing, 500+ tables; 12,000+ data elements
• **Enhance Access & Understanding**

• **Improve Utilization**

• **Disseminate Information**
Data Visualization in InfoPave

Riaz Ahmad, President, iENGINEERING

http://www.infopave.com

Please register to access LTPP data.
Home: Getting Started
Results 1 - 10 of about 139 for Asphalt Aggregate Distribution Code. Search took 0.07 seconds.

Asphalt Aggregate Distribution Code (Slurry Seal ...)
Code describing the distribution of the asphalt aggregate.

LTPP Maintenance and Rehabilitation Data Collection Guide ...
... Distribution Statement No restrictions ... roller was used for seating the aggregate into the asphalt. ... If no aggregate was placed, then from the time the ...

LTPP Inventory Data Collection Guide, July 2005
... Asphalt Type of Asphalt Plant In ... Specific Gravities of Aggregates Aggregate Durability Resilient ... Cement Entrained Air Aggregate Durability Method ...

Forensic Investigation Report on the LTPP Texas SPS-5 ...
... producing a thicker film of asphalt around the ... quality aggregates might be extremely expensive in some ... necessary to select the aggregate type for ...

Long Term Pavement Performance Project Laboratory ...
... to identify "Quick Set" Emulsified Asphalts H14L+ SC10 ... SC12 Determination of Asphalt Content from ... Accelerated Polishing of Aggregate Using the ...

Attachment 2
... to several miscellaneous SPRs are included in the software distribution. ... NUMBER(3,2) NN Percent asphalt absorbed by aggregate ...
Find Sections: Advanced Filters

Experiment Type

Selects sections by LTPP defined Experiment Type (at any time during section monitoring period)

- [ ] Selects sections by latest corresponding LTPP defined Experiment Type

**Basic**

- [ ] GPS-1 - Asphalt Concrete on Un-bound Granular Base
- [ ] GPS-2 - Asphalt Concrete on Bound Base
- [ ] GPS-3 - Jointed Plain Concrete Pavement (JPCC)
- [ ] GPS-4 - Jointed Reinforced Concrete Pavement (JRCP)
- [ ] GPS-5 - Continuously Reinforced Concrete Pavement (CRCP)
- [ ] GPS-6A - Existing AC Overlay on AC Pavement
- [ ] GPS-6C - AC Overlay with Modified Asphalt Cement on AC Pavement, No Milling
- [ ] GPS-6D - Multiple AC Overlays with Conventional Asphalt Cement on AC Pavement, No Milling
- [ ] GPS-6S - AC Overlay on AC Pavement with Milling and/or Fabric

**Advanced**

Please drag filter options from the list below:

- GPS-1 - Asphalt Concrete on Un-bound Granular Base
- GPS-2 - Asphalt Concrete on Bound Base
- GPS-3 - Jointed Plain Concrete Pavement (JPCC)
- GPS-4 - Jointed Reinforced Concrete Pavement (JRCP)
- GPS-5 - Continuously Reinforced Concrete Pavement (CRCP)
- GPS-6A - Existing AC Overlay on AC Pavement
- GPS-6C - AC Overlay with Modified Asphalt Cement on AC Pavement, No Milling
- GPS-6D - Multiple AC Overlays with Conventional Asphalt Cement on AC Pavement, No Milling
- GPS-6S - AC Overlay on AC Pavement with Milling and/or Fabric

OR: Include any of the selected filter options

AND: Include all of the selected filter options

- [ ] GPS-2 - Asphalt Concrete on Bound Base
- [ ] GPS-6B - AC Overlay with Conventional Asphalt Cement on AC Pavement, No Milling

**Apply**  **Cancel**
Toggle (Go To...)
LTPP Data Visualization

View Inspection Videos
Watch the videos of the LTPP pavement sections collected during the manual distress surveys.

Access Distress Maps and Images
Want to get a basic section information?
Access Single- and Multi-Section Summary Reports on the selected section(s) with tabulated data and graphs.

Manual Distress Survey Viewer
New

Pavement Cross-Section Viewer
New

Section Timeline
Updated

What is LTPP Media?

Data Pivot
Section Timeline
Manual Distress Survey Viewer
Pavement Cross-Section Viewer

Find Sections

General
- Age
- Experiment Type
- Study
- Section
- Monitoring Status
- Location
- Maintenance and Rehabilitation
- Roadway Functional Class

Structure
- Surface Type
- Base Type
- Subgrade Type

Climate
- Climatic Region
- Freezing Index (Annual)
- Precipitation (Annual)
- Temperature (Annual)

Traffic
- Avg. Annual Daily Traffic (AADT)
- Avg. Annual Daily Truck Traffic (AADTT)

Performance
- Deflection (9-kip. wheel path)
- Fatigue Cracking
- Faulting
- Longitudinal Cracking
- Longitudinal Profile (IRI)
- Transverse Cracking
- Transverse Profile

Pavement Cross-Section Viewer

There are 2509 of 2509 sections currently selected.

State/Province: Florida
Section: 12-0901

Monitoring Status: Out of Study
Construction No: 1
Construction Description: Date Constructed: 06/01/1963

Click layer type below for more information.
- Asphalt concrete layer (7.1"
- Unbound (granular) base (10.8"
- Unbound (granular) subbase (24"
- Subgrade (untreated)

LONG TERM PERFORMANCE
Access LTPP Data
Section Summary Report
Visual Data Selection
Data Selection and Download
Data Selection and Download
Interactive Help (Guided Tour)

Data Classification
After finding your desired sections, you can select your required data nodes under Structure, Climate, Traffic, and Performance categories. This data classification is organized according to primary and advanced data. The legend key on top, describes the type of data classification.

Structure

Collapse All

- General Section Information
- Section Experiment Type and Improvement (M&R) History
- Compiled Section Data (Layout and Structure History)
- GPS Coordinates
- Age (Inventory)
- Pavement Structure (Representative Structure and Related Data Sources)
- Representative Pavement Structure (Section Level)
- Material - Layer Properties and Field Sampling (Test, M&R, Inventory)
  - AC
  - PCC
  - Bound Base/Subbase
  - Unbound Base/Subbase
  - Unbound Base/Subbase and Subgrade (Applied To Both)
  - Subgrade
  - Surface Treatments
- Feature - Drainage, Joints, Shoulder, Reinforcement (Monitored, M&R, Experiment Specific, Inventory)
  - Joints
  - Maintenance and Rehabilitation (M&R)
  - Improvement (M&R) Details
  - AC Treatments
  - PCC Treatments
  - Joint Seal
  - Patching
  - Grinding, Milling, Grooving

Performance

- Deflection (9-kip, wheel path)
- Fatigue Cracking
- Faulting
- Longitudinal Cracking
- Longitudinal Profile (IRI)
- Transverse Cracking
- Transverse Profile

Add to Selection

Climate

LONG TERM PAVEMENT PERFORMANCE
Data Bucket

Selected Data (3)

Performance ► Automated Distress ► AC: 674 Sections, 3529 Records, 93 Attributes

Performance ► Deflection ► Temperature Data: 729 Sections, 31034 Records, 18 Attributes

Structure ► General Section Information ► Section Experiment Type and Improvement (M&R) History: 730 Sections, 2587 Records, 13 Attributes

Export File Format

Please select file format for data export and submit Data Bucket for extraction. You will receive an e-mail notification when your data bucket is ready for download or you can check the status of your Data Bucket from My Data Extractions page in My LTTP.

Export File Format: Microsoft Excel

Unit System: As-Collected

Include values of coded data elements.

Submit for Data Extraction  Save  Clear  Continue to Select Data
InfoPave Tools

Use LTPP Data as MEPDG Inputs for Local Calibration
Select the right LTPP data for MEPDG data analysis input.

Rigid Pavement Design
WIM Cost Analysis
FWD Calibration

Pavement Performance Forecast
LTPP Dynamic Modulus Prediction
LTPPBind
Distress Identification Manual

Pavement Loading User Guide (LTPP-PLUG)
LTPP InfoPave Mobile
Updated

LONG TERM PAVEMENT PERFORMANCE
InfoPave Library

Search LTPP Reference Library
Looking for an LTPP document?
Search all collections of the LTPP documents - operational, functional, protocols, manuals, research reports, tech briefs etc.

Program Documentation
Data Collection Guides

Research Reports
Other Resource Documents

What’s New

Updated
InfoPave Help
LTPP InfoPave Mobile
Extracting Information out of LTPP Data

Jerome Daleiden PE, Director Pavement Engineering, Fugro
Extracting Information out of LTPP Data

- Proposed MAP-21 requirements
  - Establish performance targets
  - Develop a data quality management program
- Develop pavement performance models
- Set performance-based pay adjustment factors
- Evaluate effectiveness of maintenance and rehabilitation
- Generate the inputs for AASHTOWare Pavement ME Design Software
Sample Applications

- **Sample Application 1:** IRI trends following various rehabilitation treatments on AC
- **Sample Application 2:** Cracking trends on JPCP pavements with various structural properties
- **Sample Application 3:** Comparison of AC pavement profiles following various maintenance treatments
Problem Statement #1

Objective: Investigate effects of rehabilitation treatments on flexible pavement performance using International Roughness Index (IRI) data

Approach: compare IRI trends on various sections of one SPS-5 site

Selection Criteria:
- SPS-5 experiment
- AADTT < 1000 trucks/day
- Wet-no freeze climatic zone
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Downloaded Data
# Rehabilitation Treatments Data

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<th>Section</th>
<th>Surface Preparation</th>
<th>Overlay Materials</th>
<th>Overlay Thickness</th>
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<td>No Overlay</td>
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<td>0503</td>
<td>None</td>
<td>Recycled</td>
<td>4.5”</td>
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<td>Virgin</td>
<td>3.8”</td>
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<td>Recycled</td>
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IRI Trends on SPS-5 in Oklahoma

AC Overlay July 1997

Survey Date

IRI (m/km)
Sample Application Findings

On Oklahoma SPS-5 site:

- Milling existing pavement surface resulted in more effective treatments in reducing the IRI
- Thicker overlays resulted in lower IRI increase rates
- Thin overlay with recycled asphalt pavement and without milling had the highest rate of increase in IRI
- There is no difference between the performance of overlays with recycled and virgin asphalt materials
Problem Statement #2

**Objective**: Investigate effects of structural factors on performance of jointed concrete pavements

**Approach**: compare cracking, faulting and IRI trends on various sections of one SPS-2 site

**Selection Criteria:**
- SPS-2 experiment
- AADTT > 2000 trucks/day
- Wet-freeze climatic zone
% Slabs Cracked Transversely (SPS-2 Michigan)

DGAB: Dense-graded aggregate base
LCB: Lean Concrete Base
PATB: Permeable asphalt-treated base
### Longitudinal Crack Length (SPS-2 Michigan)

<table>
<thead>
<tr>
<th>Survey Date</th>
<th>Total Longitudinal Crack Length (m)</th>
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<tbody>
<tr>
<td>Jan-93</td>
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<td>Oct-95</td>
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<td>Jul-98</td>
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<td>Jul-09</td>
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<tr>
<td>Apr-12</td>
<td></td>
</tr>
<tr>
<td>Dec-14</td>
<td></td>
</tr>
</tbody>
</table>

- **DGAB**: Dense-graded aggregate base
- **LCB**: Lean Concrete Base
- **PATB**: Permeable asphalt-treated base

- 7-in slab (very thin!) on LCB
- 8.5-in slab on LCB
- 8.5-in slab on PATB
- 9-in slab on DGAB

PCC Slab Replacement June 2002
Faulting (SPS-2 Michigan)

DGAB: Dense-graded aggregate base
LCB: Lean Concrete Base
PATB: Permeable asphalt-treated base

May-90 Jan-93 Oct-95 Jul-98 Apr-01 Jan-04 Oct-06 Jul-09 Apr-12 Dec-14

Survey Date

Average Joint Faulting at Wheel Path (mm)

-6.4 -4.4 -2.4 -0.4 1.7 3.7 5.7

0.25 inch

8.6 in. on DGAB
8.9 in. on DGAB
11.2 in. on DGAB
11.4 in. on DGAB
8.5 in. on LCB
7.1 in. on LCB
10.9 in. on LCB
11.1 in. on LCB
8.2 in. on PATB
8.4 in. on PATB
11 in. on PATB
11.2 in. on PATB

LONG TERM PAVEMENT PERFORMANCE
IRI (SPS-2 Michigan)

DGAB: Dense-graded aggregate base
LCB: Lean Concrete Base
PATB: Permeable asphalt-treated base
Sample Application Findings

On Michigan SPS-2 site:

- The very thin slab (7”) has exhibited higher amount of transverse and longitudinal cracking
- Base type does not seem to have affected amount of cracking
- The amount of faulting is negligible (less than 1/8”) on all sections
- Drainage in asphalt treated bases has reduced the amount of roughness compared to other types of base layers
Problem Statement #3

**Objective:** Investigate effectiveness of AC maintenance treatments in the wet-freeze climatic zone

**Approach:** compare performance on various sections of one SPS-3 site

**Selection Criteria:**
- SPS-3 experiment
- Wet-freeze climatic zone
- Fine-Grained Subgrade Soils
- Deflection under the center of 9,000 lb load < 500 microns
Section Summary Report

- General
  - Experiment Type
  - Study
  - Section
  - Monitoring Status
  - Location
  - Maintenance and Rehabilitation
  - Roadway Functional Class

- Structure
  - Surface Type
  - Base Type
  - Subgrade Type

- Climate
  - Climatic Region
  - Freezing Index (Annual)
  - Precipitation (Annual)
  - Temperature (Annual)

- Traffic
  - Avg. Annual Daily Traffic (AADT)
  - Avg. Annual Daily Truck Traffic (AADTT)

- Performance
  - Deflection (9-kip, wheel path)
  - Fatigue Cracking
  - Faulting
  - Longitudinal Cracking
  - Longitudinal Profile (IRI)
  - Transverse Cracking
  - Transverse Profile

- Select Sections
  - State/Province: Pennsylvania
  - Section: 42-B310

- Unit System: As-Collected

- Basic Section Overview
- Structure Information Overview
- Annual Average Daily Traffic (State Highway Agency Data)
- Annual Average Daily Truck Traffic (State Highway Agency Data)
- International Roughness Index (IRI)
- AC Distress - Fatigue Cracking
- AC Distress - Rutting

LONG TERM PAVEMENT PERFORMANCE
Compare Treatments

### Basic Section Overview

### Structure Information Overview

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>CN6</td>
<td>CN6: 05/1999: 1- Crack Sealing (linear ft.)</td>
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Example Site

SPS-3 Site in Pennsylvania: 42-B300
Wet-Freeze, Fine Grained Subgrade Soils, Low Traffic
Good Conditions Before Maintenance

- 42-B340: Control Section, No Maintenance
- 42-B330: Crack Seal
- 42-B350: Chip Seal
- 42-B310: Thin Overlay
Longitudinal Profile
Transverse Profile

- Total Area of AC Fatigue Cracking
- Average Depth of AC Rutting (Manual Distress Survey Data)
- Average FWD Deflection Under the Load Plate
Sample Application Findings

On Pennsylvania SPS-3 site:

- the sections with thin overlay and chip seal had the least amount of IRI increase among the four sections
- the sections with thin overlay and chip seal had the least amount of rutting increase among the four sections
- the section with thin overlay performed the best with respect to both longitudinal and transverse profiles
- The control section that had received no maintenance, had the highest rate of increase in IRI
- The section with crack seal had the highest rate of increase in rutting
Discussion

1. Any other suggestions to facilitate data visualization?
2. Any suggestions to help new users get familiar with the website?
3. Any other problems that could be solved using LTPP data?
4. Any suggestions to provide preliminary evaluations to identify availability of data for specific analysis topics?

Please submit your feedback at http://www.infopave.com or email to ltppinfo@dot.gov.
Questions and Feedback

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