

LTPP Program's Continuing Mission

The LTPP program will yield additional benefits as data are added to the database and as data analysis efforts—some currently planned and some yet to be identified—are completed. Continued monitoring of the test sections that remain in service is needed to obtain data encompassing their full performance period. In addition, key LTPP stakeholders recognize the necessity of strategically establishing new LTPP experiments. In light of rapid growth in the use of warm-mix asphalt, an LTPP Warm-Mix Asphalt Overlay experiment (SPS-10) is underway, and the establishment of an LTPP Pavement Preservation experiment is under development. Through these efforts, the LTPP program will continue to play a critical role in answering the primary question, “How and why do pavements perform as they do?”

Table 1. List of General Pavement Studies and Specific Pavement Studies.

| General Pavement Studies (GPS) | Specific Pavement Studies (SPS) |
|---|--|
| GPS-1: Asphalt Concrete on Granular Base | SPS-1: Strategic Study of Structural Factors for Flexible Pavements |
| GPS-2: Asphalt Concrete on Bound Base | SPS-2: Strategic Study of Structural Factors for Rigid Pavements |
| GPS-3: Jointed Plain Concrete Pavement | SPS-3: Preventive Maintenance Effectiveness of Flexible Pavements |
| GPS-4: Jointed Reinforced Concrete Pavement | SPS-4: Preventive Maintenance Effectiveness of Rigid Pavements |
| GPS-5: Continuously Reinforced Concrete Pavement | SPS-5: Rehabilitation of Asphalt Concrete Pavements |
| GPS-6: Asphalt Concrete Overlay of Asphalt Concrete Pavement | SPS-6: Rehabilitation of Jointed Portland Cement Concrete Pavements |
| GPS-7: Asphalt Concrete Overlay of Portland Cement Concrete | SPS-7: Bonded Portland Cement Concrete Overlays on Concrete Pavements |
| GPS-9: Unbonded Portland Cement Concrete Overlays on Portland Cement Concrete Pavements | SPS-8: Study of Environmental Effects in the Absence of Heavy Loads |
| | SPS-9: Validation of Strategic Highway Research Program Asphalt Specification and Mix Design (Superpave) |
| | SPS-10: Warm-Mix Asphalt Overlay of Asphalt Pavements |

LTPP Customer Support and LTPP InfoPave

The LTPP Customer Support Service Center, located at FHWA's Turner-Fairbank Highway Research Center in McLean, Virginia, is committed to providing superb and timely service with LTPP data requests and other information. Some of the services provided by customer support include:

- Helping users select the appropriate data for their use.
- Preparing and disseminating data.
- Explaining the structure of the database and the associated data files.
- Explaining the data collection methods and tools.

LTPP data and program information can also be accessed directly using the LTPP InfoPave Web site.

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LTPP Web site

<http://www.fhwa.dot.gov/research/tfhrc/programs/infrastructure/pavements/ltpp/>



Publication No. FHWA-HRT-15-018

HRDI-30/12-14(1M)E

LONG-TERM PAVEMENT PERFORMANCE

Knowledge into Action... Performance Data for Pavement Innovation



Long-Term Pavement Performance Program



U.S. Department of Transportation
Federal Highway Administration

LTTP Mission Statement

To increase pavement life by investigation of various designs of pavement structures and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices.

What is LTTP?

Started in 1987 as part of the Strategic Highway Research Program (SHRP) and managed by the Federal Highway Administration (FHWA) since 1992, the Long-Term Pavement Performance (LTTP) program studies the performance of in-service pavements. The primary goal of the LTTP program is to understand how and why pavements perform as they do. To accomplish this goal, researchers collect pavement performance data using standard data collection procedures and protocols on a variety of pavement types. This information is stored in a database that can be used by pavement engineers and researchers worldwide to advance the science of pavement engineering.

Since 1989, the LTTP database has grown exponentially and includes electronic information collected from 2,509 pavement test sections throughout the United States and Canada. The LTTP program has two sets of experiments, the General Pavement Studies (GPS) and the Specific Pavement Studies (SPS), detailed in table 1. The GPS test sections were established on existing pavements. An experimental matrix was used to guide the selection of GPS test sections that would cover, to the greatest extent possible, the range of factors required to explain pavement performance. Test sections for SPS experiments were built to specific designs and thicknesses, as defined in the experimental plans.

Today, the LTTP program continues to collect performance data for over 700 test sections. Approximately 50 percent of the remaining test sections are GPS experiments with the majority falling into the GPS-6 experiment that evaluates asphalt concrete overlay of asphalt concrete pavement. Many GPS-3 experiment sections that evaluate jointed plain concrete pavements also remain. The remaining 50 percent are SPS experiments. The majority of the test sections are in the SPS-2 experiment, which is the study of structural factors for rigid pavements, followed by the SPS-8 experiment, which is the study of environmental effects on the pavement in the absence of heavy loads.

LTTP Program's Core Functions Data Collection and Management, Data Analysis, and Product Development

Data Collection and Management

From its inception, the LTTP program has sought to collect data believed to be most important in characterizing factors that affect pavement performance. The types of data collected are shown in the figure. Ensuring consistency and accuracy in the collection of data are vitally important from site-to-site and across States and Provinces. Extensive quality assurance processes ensure that the database is populated with the highest quality data possible (*LTTP Information Management System Quality Control Checks, September 2013*). Quality control checks include detailed data collection protocols; personnel training and certification requirements applied to ensure consistency in data collection and test results; a schedule for regular calibration and maintenance of all data collection equipment; and a variety of post-collection data checks.

Collected pavement performance data are stored in the LTTP database, which currently resides on several high-capacity servers and in the Amazon Cloud. As computer technology changes, the LTTP database also changes so that it remains current with technology and accessible to data users. The LTTP InfoPave™ system, which made its debut in January 2014, is an interactive Web-based system capable of providing users with performance and supporting data for LTTP test sections. Users of LTTP InfoPave have several new options to access, view, and download LTTP data.

Data Analysis

Over the past two decades, data from the LTTP program have proven to be useful in advancing pavement engineering technology. The *Strategic Plan for LTTP Data Analysis* identifies and prioritizes projects, tracks projects to completion, and documents future

research needs. The identified projects are pursued by the LTTP program as resources permit. LTTP data are also regularly applied in research sponsored by individual State highway agencies, the Transportation Research Board, and others to address pavement performance-related issues. For instance, the SHRP2 R23 project uses performance data from LTTP test sections to focus on pavement renewal alternatives for both flexible and rigid pavements. LTTP field performance data, in conjunction with other data sources, are being used to develop products for the SHRP2 R23 project.

Product Development

Products developed from the LTTP program take many forms, including data collection guides, test methods, protocols, software, and technical guidance. The program's most valuable product is its comprehensive database because it is the foundation for understanding pavement performance.

For more than two decades, the value of LTTP data has been amply demonstrated. For example, the LTTP database served as a critical resource in developing the American Association of State Highway and Transportation Officials (AASHTO) Mechanistic-Empirical Pavement Design Guide (MEPDG), the first new pavement design procedure in a generation. Data from LTTP test sections were used to calibrate national default models used in the guide. Developers of the MEPDG have said that the guide would not be possible if it were not for the data and information available on a nationwide basis from the LTTP program.



Collecting Quality Data

The LTTP program continues to improve its data collection and quality control procedures through lessons learned and by adapting to changes in equipment and pavement technology. Although data collection and quality control procedures have varied over time, the principal data types collected since the beginning of the program, as shown in the graphic above, have not. The program has collected these data types in a consistent and systematic manner over the years, and they will be the primary source for evaluating pavement performance for the foreseeable future.

Other products of the LTTP program include the *Distress Identification Manual for the Long-Term Pavement Performance Program* (FHWA-HRT-13-092); AASHTO's R32-09 procedure, *Standard Practice for Calibrating the Load Cell and Deflection Sensors for a Falling Weight Deflectometer*; guidelines for collecting reliable traffic loading data; and ProVAL, a software application used to view and analyze pavement profiles. Additional information about LTTP products is available in *Long-Term Pavement Performance Program Highlights: Accomplishments and Benefits 1989–2009* (FHWA-HRT-10-071).