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Long-Term Bridge Performance (LTBP)
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Long-Term Bridge Performance (LTBP) Program

U.S. Department of Transportation
Federal Highway Administration

Long-Term
Bridge Performance
Program

About the Long-Term Bridge Performance (LTBP) Program

The LTBP Program is a Federal Highway Administration (FHWA) long-term research effort to collect high-quality bridge data from a representative sample of highway bridges nationwide that will help the bridge community to better understand bridge performance.

Program Objectives

The overall objectives of the LTBP Program are to inspect, evaluate, and periodically monitor representative samples of bridges nationwide to collect, document, maintain, and manage high-quality quantitative performance data over an extended time horizon. This will be accomplished by taking advantage of advanced nondestructive evaluation (NDE) and structural health monitoring (SHM) technologies in addition to traditional visual bridge inspection approaches. It will also require close collaboration with State transportation departments, academia, and industry. The LTBP Program is designed in part to collect critical performance data that are not available elsewhere and merge it with data gathered from available sources.

For the selected bridges in the study, researchers will conduct recurrent, periodic evaluations throughout the life of the program and may perform forensic studies on decommissioned bridges to learn more about their capacities, reliabilities, and failure modes.

Program Goals

The primary goals of the FHWA's LTBP Program are to:

- Collect and manage bridge performance data.
- Provide easy access to the data to a variety of stakeholders.
- Improve knowledge of bridge performance.
- Provide opportunities to assess and develop advanced deterioration and predictive models which incorporate various data sources.
- Improve understanding of long-term bridge performance through data collected during periodic assessment using NDE and SHM technologies to quantify changes in bridge performance.
- Support development of improved design methods and maintenance/bridge preservation practices.
- Quantify the effectiveness of various maintenance, repair, and rehabilitation strategies.
- Improve the operational performance of bridges with the potential to reduce congestion, delay, and accidents.
- Promote the next generation of bridge management systems through the implementation of data-driven approaches.

Ultimately, improved understanding of bridge performance will promote safety, mobility, longevity, and reliability of the Nation's highway transportation assets and allow bridge owners to make better data-driven decisions in managing their bridge inventory.

Benefits of Measuring Bridge Performance

Depending on the perspective and responsibilities of users, the following constitute some of the benefits to providing detailed, quantifiable, and scientific grade evaluations of bridge performance:

- Identifying clear links between specific policies (such as the type and quantity of anti-icing materials), actions, and the resulting change in the performance level of a bridge element.
- Improving knowledge of how and why bridges deteriorate.
- Gaining a better understanding of the effectiveness of various design, construction, inspection, and preservation strategies, as well as management practices.
- Gaining a better understanding of the effectiveness of durability strategies for new bridge construction, including material selection.
- Improving bridge management practice using qualitative and quantitative data.
- Evaluating serviceability and durability.
- Setting priorities for resource allocations and evaluating organization-wide policies and programs such as the split between maintenance and capital funds.
- Establishing risk-based evaluations of bridges that are vulnerable to failure.

Bridge Deck Assessment Tool

The FWHA's LTBP Program developed a multifunctional NDE platform to enhance assessment of bridge decks. The RABIT™ bridge deck assessment tool was developed to deploy a suite of NDE technologies to collect comprehensive data on surface and subsurface conditions automatically and simultaneously. Data collection accuracy and repeatability is greatly improved through this automation method. Data acquisition time and operator exposure to traffic are reduced.

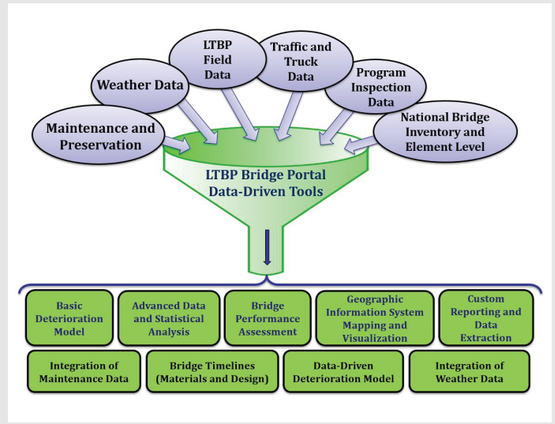
Source: FHWA

The following technologies are incorporated into the robot-assisted, remote-controlled RABIT™ bridge deck assessment tool:

1. Industrial cameras to capture high-resolution images of the deck surface.
2. Electrical resistivity (ER) to characterize the corrosive environment of the concrete.
3. Acoustic array, including impact echo (IE) and ultrasonic surface waves (USW), to evaluate concrete delamination and concrete deck strength, respectively.
4. Ground penetrating radar (GPR) to map rebar and other metallic objects below the surface using electromagnetic waves. GPR also provides a qualitative assessment of concrete deck deterioration.
5. Global positioning system (GPS) to record and mark exact location data.

LTBP Bridge Portal

The LTBP Program collects data from a wide array of sources. By employing the LTBP Bridge Portal to integrate and extrapolate data from multiple sources, temporal data on bridge conditions will reveal unknown mechanistic properties that, when explored, may identify innovative approaches that will be used in preserving various bridge elements.



Source: FHWA

The LTBP Bridge Portal is a centralized, national repository for efficiently and quickly accessing and querying bridge performance-related data, information, and data analysis tools. It was developed to provide storage, retrieval, dissemination, analysis, and visualization of data collected through LTBP Program efforts and to provide users with the ability to holistically assess bridge performance on a network or individual project basis.

The Bridge Portal can provide a statistical summary almost instantly, whether for 100 bridges or 600,000. The query summary provides information on the current average condition state for the deck, superstructure, or substructure, as well as how each condition state has changed from previous years.