Fall 2020

LTBP News

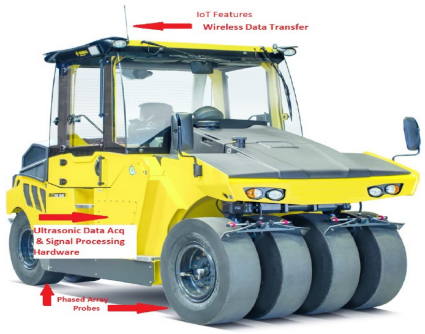
Research Update

Small Business Innovation Research (SBIR) Projects

The United States Department of Transportation (USDOT) SBIR program is a highly competitive award program. SBIR provides qualified domestic small businesses with opportunities to pursue research on and develop solutions to the Nation's transportation challenges.

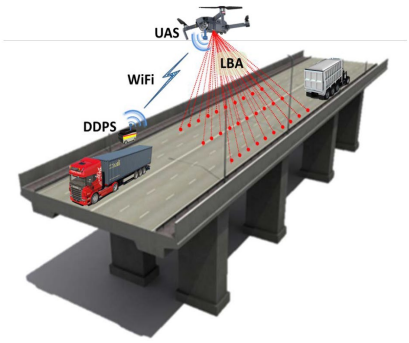
One of the main objectives of the Federal Highway Administration (FHWA) Long-Term Bridge Performance (LTBP) program is to collect and make available research-quality data regarding bridge performance. There are several challenges to collecting data on large, heavily travelled, or remotely accessed bridges. Challenges include interruptions to traffic, worker safety, inclement weather, and speed of operation in collecting data.

In 2019, FHWA funded two research projects focused on addressing data collection challenges and collecting bridge deck performance data. The Fast Track Ultrasonic Imaging of Concrete Bridges project and the Reconfigurable Array Vibrometry Evaluation System project both feature remote, high-speed data collection systems. The phase I proofs of concept of both research projects were completed.



Source: FHWA.

Fast Track Ultrasonic Imaging of Concrete Bridges



Source: FHWA.

Reconfigurable Array Vibrometry Evaluation System

InfoBridge™ Updates

Two updates to InfoBridge were released in March and July of 2020; highlights follow in the next section. For a complete list of new InfoBridge features and enhancements, visit InfoBridge Update Notes.

March 2020:

- National Bridge Inventory (NBI), National Bridge Element (NBE), and climate data updated to 2019 submittals.
- Climate data (number of freeze/thaw cycles and number of snowfall days) can now be downloaded.
- Ultra-high performance concrete (UHPC) and Timber Bridge Study data were added to Special Projects under Advanced Find.

July 2020:

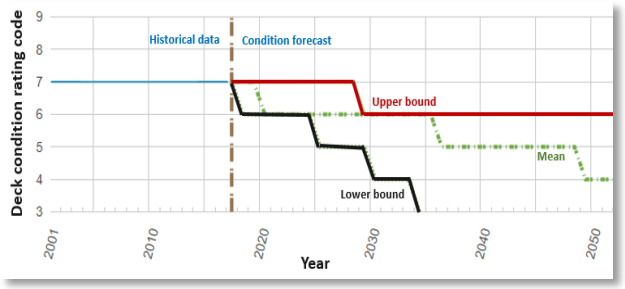
- Unpainted Weathering Steel (UWS) project data added to Special Projects.

- Charts now offers three new attributes: 1) Inventory Route, 2) Minimum Vertical Clearance, and 3) Year of Average Daily Traffic.
- Data for the condition forecasting of bridge decks are updated to include the 2019 NBI data submittal.

Three Bridge Component Forecast Methods

Of the many bridge forecasting methods available, InfoBridge offers three very different approaches. The first method, time-in-condition model, is the simplest method and relies on regression analysis performed on preselected bridge datasets. The second method, deep-learning model, uses machine-learning techniques and looks for patterns and interdependencies of data in a completely automated way. The third method, proportional hazards deterioration model, uses survival analysis to look for factors affecting the condition rating durations to predict future condition ratings and their durations. The second and third models also employ state-of-the-art techniques of big data analysis using stochastic methods.

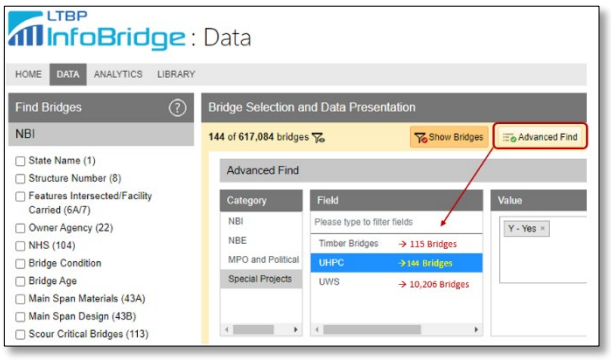
The accuracy of the three methods improves as the amounts of available data increase. All three models provide upper- and lower-bound predictions. The difference between the upper- and lower-bound predictions increases as the number of prediction years increases. All three models are documented in InfoBridge under Library/InfoBridge Documentation.



Source: FHWA.

Difference Between Upper- and Lower-Bound Predictions

on environments of high temperatures above 100 ºC (212 ºF). At low temperatures (lower than 50 ºC (122 ºF)), stainless steels may develop localized



Source: FHWA.

UHPC and Timber Bridges Under Special Projects

Coatings and Corrosion Laboratory Update

In 2019, FHWA's Coatings and Corrosion Laboratory was moved under the purview of the Long-Term Infrastructure Performance team. The research conducted in the laboratory is focused on structural preservation and the mitigation of corrosion of metals used within the highway system. The research also includes other applications, such as concrete structural elements in bridges—pre and posttensioned (PT) components, tunnels, foundations, and ancillary elements. Research results assist in developing guidance on best practices to prevent or mitigate corrosion using fundamental research on emerging materials and processes, and using applied engineering research on structural elements.

There are three ongoing research projects:

1. The **Corrosion Performance of Metalized Coatings over Contaminated Steel Substrate** study evaluates the corrosion protection performance of three thermal-sprayed coating systems applied to steel substrates with various chloride contamination levels. The study's purpose is to identify thermal-spray coating systems which can provide extended service life for steel bridges with minimal surface preparation.

2. The **Stress Corrosion Cracking of Stainless Steels in Contact with Chloride Ions at Low Temperature** research project evaluates the possibility of stress corrosion cracking in various grades of stainless steels at close-to-ambient temperatures. Previous research on stress corrosion cracking in stainless steels was mainly focused

corrosion at locations of chloride ions. U-bend specimens were made from various stainless steels. The specimens are currently being constantly exposed to salts, such as calcium chloride, magnesium chloride, and sodium chloride in an evaporative condition.

3. The **Laboratory Evaluations of Alternative Systems for Corrosion Control of Posttensioned Tendons in Prestressed Concrete Bridges** research project is being carried out to evaluate alternative materials and methods to control corrosion in the PT tendons. The project has two objectives. The first objective is to conduct an accelerated corrosion testing to quantify corrosion resistance of various metallic strand materials. The second objective is to evaluate the effectiveness of the most common flexible filler, impregnation method, and drying air plus inert gas method to suppress tendon corrosion. Five commercially available metallic strand materials—including ASTM A416 bare strand; ASTM A882 epoxy-coated; ASTM A475-03 hot-dip galvanized; 95-percent zinc/5-percent aluminum coated; and ASTM A1114 2205 duplex stainless steel—are used.

Recent Publication

Report:
Coating Performance on Existing Steel Bridge Superstructures, FHWA, FHWA-HRT-20-065, September 2020
[PDF]

LTBP Staff Meet with Transportation Research Board (TRB) Expert Task Group (ETG) on Bridges

LTBP program staff met with the TRB ETG on Bridges in August of 2020. The ETG consists of representatives from State departments of transportation (DOTs), academia, and industry. LTBP staff provided updates on enhancements to InfoBridge, ongoing research projects, communication and outreach activities, and data collection efforts. The group discussed and approved a proposal to hold a workshop in early 2021 to review and update LTBP's data collection plan. The 2021 workshop participants will include subject matter experts, including members of the ETG on Bridges, State DOTs, academia, industry, and FHWA staff.

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