

Nondestructive Testing for Concrete Bridge Decks

New technology allows field identification of concrete bridge deck deficiencies through nondestructive testing methods

The number of concrete bridge decks in poor structural condition is one of the biggest problems affecting bridges in the United States. Evaluating bridge deck conditions becomes increasingly critical as highway agencies work to optimize the effective timing, scope, and approaches for preventive maintenance, repair, and replacement.

Normal chain dragging, hammer sounding, and visual methods of identifying concrete bridge deck deficiencies do not accurately and safely provide the needed information to adequately maintain concrete bridge decks. Nondestructive testing (NDT) techniques have the potential to quickly and reliably provide the needed information about under-the-surface conditions of bridge decks, but independent evaluations are needed to determine their best use and to validate their effectiveness under a variety of conditions.

NDT Techniques to Identify Common Concrete Bridge Deck Deficiencies

The Solution

Nondestructive testing (NDT) technologies can reduce costs and the time associated with bridge deck inspections while improving the accuracy and condition assessment of these inspections. The new mobile and portable technologies identified through the second Strategic Highway Research Program (SHRP2) can reduce safety risks for inspectors and minimize road closures and delays to the traveling.

Using the data from these inspections, agencies can rehabilitate aging bridges more cost-effectively. Nondestructive Testing for Concrete Bridge Decks (R06A) includes a collection of geophysical technologies for evaluating and inspecting concrete bridge decks.

A web-based evaluation tool helps transportation professionals select the appropriate NDT technologies for specific applications and identifies test procedures, protocols, and available standards and guidelines. Also included are samples of data output from various technologies, as well as equipment features including cost, availability, and specifications.

The accompanying report identified the four most common types of deterioration affecting concrete bridge decks, as well as corresponding prioritized NDT techniques that are best suited to

Nondestructive testing (NDT) technologies offer more efficient options to identify deterioration in concrete bridge decks

FOCUS AREA: Renewal (R06A)

New web tool and report offer best nondestructive testing methods to identify needed maintenance actions while minimizing road closures and traffic delays.

Save Lives

- Minimizes the likelihood of bridge failures from unrecognized bridge deck deterioration.
- Creates safer conditions for workers because of shorter exposure in work zones.

Save Money

- Provides options for proper cost-effective evaluation of bridge deck deficiencies.

Save Time

- Extends the life of concrete bridge decks through appropriate and timely maintenance treatments.

locating and identifying them. Based on their overall value in detecting and characterizing deterioration in concrete decks, the top technologies were ground-penetrating radar, impact echo, and ultrasonic surface waves. However, the ultimate decision on which equipment to acquire and which technology to use is dependent on the type of deterioration that is of the highest concern to the agency, and whether the evaluation is being done for network-level condition monitoring or for project-level maintenance or rehabilitation.

The Benefits

Comprehensive and accurate assessments of concrete bridge decks can reduce the frequency of detailed regular and follow-up inspections. This can reduce the number of congestion-related traffic interruptions, which, in turn, can provide shorter durations and frequencies of work zones during testing operations. In addition, a number of NDT technologies can generate data at production rates that are comparable to the current practice of chain-dragging and hammer-sounding. The cost of these techniques is also approaching traditional testing values.

Who is using these tools?

Several states are now implementing this product through the AASHTO/FHWA Implementation Assistance Program. They include Alabama, Arkansas, California, Delaware, Florida, Georgia, Hawaii, Indiana, Iowa, Kentucky, Louisiana, Missouri, Nebraska, New Mexico, New York, North Carolina, North Dakota, Oregon, Pennsylvania, and Virginia. State DOT and local agencies that own and maintain bridges as well as bridge construction contractors will benefit from these improved concrete deck testing technologies and the NDToolbox categorizing these technologies.

How can you learn more?

For more information, contact Hoda Azari at FHWA, Hoda.Azari@dot.gov, or Patricia Bush at AASHTO, pbush@aaashto.org. The final report, *Nondestructive Testing to Identify Concrete Bridge Deck Deterioration*, is available at <http://www.trb.org/Main/Blurbs/167278.aspx>. Updates on current implementation efforts can be found at www.fhwa.dot.gov/GoSHRP2 or at the AASHTO product website, http://shrp2.transportation.org/Pages/R06_NondestructiveTesting.aspx.