

Toolbox Resource for Non-Destructive Testing

Comprehensive guide on non-destructive testing procedures allows for smarter selection of the right technologies

A number of non-destructive testing (NDT) techniques have become available to the transportation industry in recent years. Some of these are commercially available, some are prototypes, but most are proprietary technologies. Overall, these technologies and techniques have generated faster and more effective ways to perform non-destructive testing on bridge decks, concrete tunnel linings, hot mix asphalt, and other structures and materials.

As part of the research conducted under the second Strategic Highway Research Program (SHRP2), an independent assessment of the many available NDT technologies was conducted to determine the capabilities and limitations within the range of products available.

*Non-Destructive Testing Technologies Lead to
More Rapid Reconstruction*

The Solution

A new resource – the NDToolbox – is being created through SHRP2 as an electronic repository of NDT techniques and technologies, bringing together information and assessments derived from the research in an easily accessible and readily available format. Users will be able to use the NDToolbox to explore different NDT technologies, view their benefits, and learn how to use them effectively. The Toolbox will include information and descriptions of the technology; its applications, performances, and limitations; equipment, test procedures, and protocols; and sample results.

The SHRP2 research of NDT techniques assessed the strengths and limitations of applicable NDT technologies from the perspective of speed, accuracy, precision, and ease of use. Test procedures and protocols for the most effective application of NDT methods will be identified and available in the NDToolbox, as well as a comprehensive guide to the technologies available. The NDToolbox will allow transportation agencies to quickly review these non-destructive testing methods and more easily identify which method is best to use.

The NDToolbox will serve as a quick reference of validated methods for identifying deterioration on concrete bridge decks, as well as those for quality control of construction materials and pavements, and conditions assessment of pavements and tunnels. When completed, the NDToolbox will include results from six related NDT research projects and will provide recommendations regarding the best technologies to use for a particular deterioration detection application.

Knowledge to Help Determine the Condition of Assets

FOCUS AREA:
Renewal (R06)

The NDToolbox is a repository and comprehensive guide of non-destructive testing techniques and technologies, including test procedures and protocols to assist in picking the right NDT technology the first time.

Save Lives

- Better information allows owners to take better care of bridges and roads.



Save Money

- Picking the right technology for the situation prevents trial and error.



Save Time

- Eliminating the learning curve saves owners time.
- Tools detect defects during placement and allow immediate repair.



The Benefits

Many NDT technologies are available to owner agencies, however, each has its own set of applications, strengths, and weakness, and practitioners need clear information to help them select the best NDT method to evaluate the condition of a specific feature. The NDToolbox will provide an independent assessment to allow owner agencies to be confident in their choice of technology and method. The NDToolbox will allow owners to:

- ▶ Quickly and reliably provide information about the under-the-surface conditions of bridge decks without causing undue additional wear to the bridges themselves.
- ▶ Yield faster measurements in the field by using hand-held stereoscopic “fingerprinting” equipment for testing the quality assurance of materials.
- ▶ Use automated thermal profiling systems and other technologies to reliably prevent deterioration and segregation of hot-mix asphalt construction.
- ▶ Easily and efficiently detect the extent, depth, and severity of de-lamination in hot-mix asphalt pavements.
- ▶ Meet smoothness requirements for Portland cement concrete pavements more easily and less expensively by detecting surface irregularities in real-time before the cement hardens.
- ▶ Use continuous deflection measuring devices to determine the structural capacity of pavement with better spatial coverage and less impact on traffic.
- ▶ More thoroughly monitor the condition and deterioration of tunnel linings while providing less disruption of traffic.

How can you learn more?

A Plan for Developing High-Speed, Nondestructive Testing Procedures for Both Design Evaluation and Construction Inspection is available at <http://www.trb.org/Publications/Blurbs/162261.aspx>. Videos of the SHRP2 field validation of NDT technologies are available at www.TRB.org/SHRP2/Videos. The report, *Nondestructive Testing to Identify Concrete Bridge Deck Deterioration*, is currently available at <http://www.trb.org/Main/Blurbs/167278.aspx> and the functional NDToolbox will be available in 2013. *Evaluating Applications of Field Spectroscopy Devices to Fingerprint Commonly Used Construction Materials* (R06B) can be found at <http://www.trb.org/Main/Blurbs/167279.aspx>. *Using Both Infrared and High-Speed Ground-Penetrating Radar for Uniformity Measurements on New HMA Layers* (R06C), *Nondestructive Testing to Identify Delaminations between HMA Layers* (R06D), *Real-Time Smoothness Measurements on Portland Cement Concrete Pavements during Construction* (R06E), and *Development of Continuous Deflection Device* (R06F) will be available in 2013. The final report for *High-Speed Nondestructive Testing Methods for Mapping Voids, Debonding, Delaminations, Moisture, and Other Defects Behind or Within Tunnel Linings* (R06G) will be available in 2014. A Project Brief on these NDT and non-destructive evaluation (NDE) projects is available at <http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2PBNDT-2012-10.pdf>.

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About SHRP2 Implementation

The second Strategic Highway Research Program is a national partnership of key transportation organizations: the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the Transportation Research Board. Together, these partners conduct research and deploy products that will help the transportation community enhance the productivity, boost the efficiency, increase the safety, and improve the reliability of the Nation's highway system.

Strategic Highway Research Program

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