SHRP2 SOLUTIONS
TOOLS FOR THE ROAD AHEAD

Nondestructive Testing for Tunnel Linings (R06G)

Using nondestructive testing technologies to rapidly and comprehensively pinpoint defects in or behind tunnel linings

Challenge

Tunnel inspection is a challenging problem, but owners routinely need to test the integrity of the concrete lining of their tunnels to maintain and repair their assets. Tunnels typically service high-volume traffic and operate in aggressive environments. As a result, they are difficult to inspect for maintenance concerns or deficiencies such as leaks, concrete liner cracking, concrete spalling, delamination, and other debonding issues. Due to their confinement, heavy use, and the often long detours needed when they are closed to traffic, tunnels pose a unique operational challenge that technology is poised to solve.

Solution

Nondestructive testing (NDT) methods are automated, quantitative, and rapid; they provide substantially more complete coverage than conventional visual inspections. SHRP2 has evaluated all the best NDT technologies for their use in tunnel lining assessments. Ground-penetrating radar (GPR), infrared thermography analysis, and impact echo technology were determined to be the most appropriate. These technologies enable inspectors to drive through the tunnel and conduct the inspection without closing lanes.

The web-based, open-source NDToolbox helps identify and characterize testing technologies that are available to locate the primary deficiencies in tunnel linings. With the toolbox, users can explore different NDT technologies and examine their use in detecting deterioration for conditions relevant to the project. The NDToolbox describes the technology and the physical principle behind it, applications, performance, limitations, equipment, test procedures and protocols, and sample results. It also provides recommendations regarding the best technologies for a particular deterioration detection application.

The accompanying user's manual was developed for selecting NDT technologies that can detect defects behind or within tunnel linings. The manual includes more in-depth information on equipment, test procedures, inspector's training requirements, data management procedures, data analysis procedures, limitations, and interpretation guidelines.

Benefits

Using these NDT methods can minimize tunnel shutdowns, resulting in fewer detours. NDT tunnel method procedures provide safety during the testing process and capture 100 percent coverage of the tunnel walls.

The Implementation Assistance Program

Implementation assistance is available to help State departments of transportation (DOTs), metropolitan planning organizations (MPOs), and other interested organizations deploy SHRP2 Solutions. A range of opportunities is available to raise awareness of SHRP2 Solutions and to encourage early adoption of these products. Application periods are offered approximately twice per year. Each product selected for implementation assistance has the potential to deliver more efficient, cost-effective programs to meet the complex challenges facing transportation today.

Save Lives

Detecting tunnel deficiencies early increases safety for the traveling public.

Save Money

Improving inspections means managing tunnels more effectively. Using rapid NDT techniques minimizes traffic impacts, costly tunnel shutdowns, and detours.

Save Time

Avoiding prolonged tunnel shutdowns during inspections saves time.

RENEWAL

One of four SHRP2 focus areas, Renewal products help transportation organizations rapidly build and restore highway infrastructure that lasts longer while minimizing user disruption and delay.

Continued on next page.

Visit: www.fhwa.dot.gov/GoSHRP2
Learn more about products, case studies, and implementation assistance.

How can you learn more?

Visit: www.fhwa.dot.gov/GoSHRP2

- Additional product information
- Information about how this product is being used in the field
- Contact information for peers who are familiar with this product
- Links to research reports

Contacts

Hoda Azari (FHWA)
hoda.azari@dot.gov

Patricia Bush (AASHTO)
pbush@aashto.org

About SHRP2 Implementation

The second Strategic Highway Research Program (SHRP2) is a partnership of the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board (TRB). TRB completed the research, and now FHWA and AASHTO are jointly implementing the resulting SHRP2 Solutions that will help the transportation community enhance productivity, boost efficiency, increase safety, and improve the reliability of the Nation's highway system.

U.S. Department of Transportation | Federal Highway Administration
American Association of State Highway and Transportation Officials • Transportation Research Board

Date Generated: 10/6/2026