

## Nondestructive Testing for Tunnel Linings

*Rapid nondestructive testing of concrete tunnel lining is safe and effective in high-volume traffic conditions*

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 close confinement and 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.

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## The Solution

Nondestructive testing (NDT) methods are automated, quantitative, and rapid, and they provide complete coverage compared with conventional visual inspections. Through the second Strategic Highway Research Program (SHRP2), all the best NDT technologies available have been reviewed and analyzed 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. The technology allows for vehicles to drive through the tunnel and conduct the inspection without the need to close lanes. **A user's manual and training are available for selecting NDT technologies that can detect defects behind or within tunnel linings.** The manual includes information on equipment, test procedures, inspector's training requirements, data management procedures, data analysis procedures, limitations, and interpretation guidelines. **Specific software called TUNNELCHECK has also been developed that supports the integration of GPR and video-collected data to identify problem areas in the tunnel more quickly.**

### Tunnel-lining testing practices that avoid traffic delays

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#### FOCUS AREA: Renewal (R06G)

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User's manual and report offer an analysis of existing NDT methods; new TUNNELCHECK software helps transportation agencies address challenges of tunnel inspection.

#### Save Lives

- Early detection of tunnel deficiencies 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.

## The Benefits

The benefits to using these NDT methods in tunnels include:

- Avoids tunnel shutdown
- Requires no lengthy detours
- Uses safe procedures during testing
- Captures 100 percent coverage of tunnel walls

## Who is using these tools?

This technology has been piloted for SHRP2 in tunnels in Colorado and Texas, and in the Chesapeake Bay area of Virginia. Colorado and Pennsylvania are currently implementing this product.

## How can you learn more?

For more information, contact Matt DeMarco at FHWA, [Matthew.DeMarco@dot.gov](mailto:Matthew.DeMarco@dot.gov); or Patricia Bush at AASHTO, [pbush@AASHTO.org](mailto:pbush@AASHTO.org). Software is available at [www.TRB.org/SHRP2/publications](http://www.TRB.org/SHRP2/publications). Updates on current implementation efforts can be found at [www.fhwa.dot.gov/GoSHRP2](http://www.fhwa.dot.gov/GoSHRP2) or <http://SHRP2.transportation.org>.



### 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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