



February 22, 2023

The Honorable Shailen Bhatt
Administrator
Federal Highway Administration
1200 New Jersey Ave., SE
Washington, DC 20590

Dear Administrator Bhatt,

I am writing to you on behalf of the Fiber Optic Sensing Association (FOSA) concerning a January 17, 2023 U.S. Department of Transportation Office of Inspector General (OIG) report, *FHWA Has Made Progress Implementing a Tunnel Safety Program, but Work Remains To Complete a Reliable Inventory, Fully Assess Compliance, and Effectively Monitor Critical Risks*. In the report, the OIG made 12 recommendations to improve FHWA's implementation of the tunnel safety program. FHWA only partially concurred with Recommendation 10 to solicit and consider external stakeholder input. Considering that response, FOSA would like to take this opportunity to make FHWA aware of a technology that should be considered for tunnel safety compliance.

FOSA comprises industry leaders in distributed fiber optic sensing (DFOS) technology and includes organizations that manufacture, install, test, evaluate, and support or use DFOS systems and equipment. Our members have delivered thousands of miles of mature, commercially ready, and viable solutions across the United States and abroad.

DFOS systems are sensor technologies that constantly and consistently monitor roads, bridges, railways, pipelines, power stations, terrestrial and subsea power cables, international borders, critical infrastructure, and telecom networks. DFOS systems connect laser interrogator units to a fiber optic cable converting the optical fiber to an array of distributed sensors.

- DFOS systems can improve the safety and efficiency of many modes of transportation. The technology effectively monitors the structural health of roads, bridges, and tunnels and detects fires in tunnels.
- DFOS is an intelligent traffic sensor that detects congestion or queuing and assists with traffic management, thereby reducing emissions. DFOS also can easily add value to all autonomous vehicle monitoring by providing an independent audit of the autonomous vehicle position.

DFOS systems connect laser interrogator units to a fiber optic cable converting the optical fiber into an array of distributed sensors based on naturally occurring optical backscatter. A single fiber strand becomes the sensor just using light injected into the fiber and its backscatter. DFOS systems can detect, over very long spans, signals that can impact operations and safety. DFOS' "distributed" nature ideally complements the physical aspects of long-length tunnels, bridges, and the highways they connect.

Distributed Temperature Sensing (DTS) is routinely used in Europe and Asia for fire detection in tunnels. Temperature changes are detected rapidly with high locational accuracy, easily

integrating fiber optic systems with other incident mitigation solutions to protect the public and limit the devastating potential of these events.

Distributed Strain Sensing (DSS) cables can be affixed to the structure of a bridge or tunnel to passively monitor 24/7, changes in the structure due to strain events.

Distributed Acoustic Sensing (DAS) is another embodiment of DFOS where vibrations along the entire length of the fiber cable can be detected, analyzed, and reported instantly – pinpointing event location down to a matter of several feet along the entire span of the DAS system.

The OIG report states that, “timely and reliable inspections help detect safety problems and prevent failures.” DFOS solutions would reduce the need for these inspections as safety problems would be detected instantaneously, with event locations pinpointed automatically.

FOSA recommends that the Federal Highway Administration encourage voluntary industry standards organizations such as UL Solutions and the National Fire Protection Association to update appropriate standards to reflect the enhanced functionality of advanced technology, such as offered by DFOS.ⁱ

As a model, FOSA and its member companies have previously worked with the oil and gas pipeline industry through the American Petroleum Institute’s recommended practices process to update leak detection standards to more fully reflect the technology contributions that fiber optic sensing can make.

On behalf of the members of FOSA, we thank you for your consideration. We look forward to working with you as the FHWA implements these recommendations. We can discuss these issues further; our Executive Director Mark Uncapher is available at 240-685-1853 or muncapher@fiberopticsensing.org.

Sincerely,

Paul Dickinson

Paul Dickinson
Chair

ⁱ As examples of voluntary standards that could be reflect available technology, see UL Standard 521 - Heat Detectors for Fire Protective Signaling Systems
<https://www.shopulstandards.com/ProductDetail.aspx?UniqueKey=13009>

Also, NFPA 502 - Standard for Road Tunnels, Bridges, and Other Limited Access Highways
<https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=502>

For European Standards, see EN 54-22:2015- Fire detection and fire alarm systems - Part 22: Resettable line-type heat detectors
<https://standards.iteh.ai/catalog/standards/cen/972b1be4-e154-4bbb-b9fd-8f0e5156e345/en-54-22-2015>