



# REVIEW OF SPECIFICATIONS AND GUIDELINES FOR RAIL TUNNEL DESIGN, CONSTRUCTION, MAINTENANCE, AND REHABILITATION

## Background

Transportation Technology Center, Inc. (TTCI), with support from the Center for Urban Transportation Research (CUTR) at the University of South Florida, was tasked by the Federal Transit Administration (FTA) to research areas of transit safety risk, identify existing specifications and guidelines for rail transit tunnel design, construction, maintenance, and rehabilitation, and perform a gap analysis to establish the need for additional standards, guidance, or recommended practices to support and further the safe operation of the nation's public transportation industry.

Industry needs related to tunnel design standards were identified by reviewing past tunnel incidents from reports published by the National Transportation Safety Board (NTSB) and other U.S. and European agencies and through discussions with multiple transit agencies.

## Objectives

Study objectives included performing an extensive literature review to summarize and compare current specifications, guidelines, and standards for rail transit and road tunnels in the U.S. and other countries; performing a gap analysis to determine deficiencies in the current standards; and providing recommended voluntary standards and guidance documents that can be used in the industry to mitigate areas of risk associated with rail tunnels.

## Findings and Conclusions

*There is a need for working fire detection, ventilation, and emergency egress and coordinated emergency response plans that can be used by trained personnel and for more comprehensive guidelines for daily inspections and potential technologies.*

Although multiple applicable standards and guidelines exist for rail transit agencies, they do not always address rail tunnels directly. Both European (railway) and U.S. (roadway) standards for emergency egress and fire exits could potentially serve as a baseline for future supporting system standards. Design, construction, inspection, and maintenance manuals typically include standards or guidelines of best practices. Study findings include the following:

- **Finding 1:** Transit agencies should be aware of current and future research that compares AASHTO LRFD Road Tunnel Design and ASD method for new tunnel designs.
- **Finding 2:** Transit agencies may consider implementing the latest version of National Fire Protection Association (NFPA) 130, Standards for Fixed Guideway Transit and Passenger Rail Systems as a minimum requirement for new rail transit tunnels.

- **Finding 3:** Transit agencies should be aware of guidelines or best practices for emergency ventilation developed by Standards Development Organizations (SDOs), such as NCHRP 836, Recommended ASSHTO Guidelines for Emergency Ventilation in Roadway Tunnels.
- **Finding 4:** Transit agencies should be aware of the many guidelines being developed for tunnel inspection, maintenance, and rehabilitation based on the *Highway and Rail Transit Tunnel Inspection Manual* and other available SDO sources covering minimum inspection frequency, condition-based rating standard for tunnels to help estimate when a tunnel requires emergent or long-term repair or rehabilitation, and primary structural rehabilitation to restore structural elements to a state of good repair and to protect against future deterioration.
- **Finding 5:** Transit agencies may consider creating an industry working group to exchange knowledge about tunneling systems identified in the above findings.

## Benefits

Study findings can support future FTA efforts in providing guidance to the industry on the specifications for rail tunnel design, construction, maintenance, and rehabilitation.

## FTA Report No. 0231 Project Information

This project was performed by the Transportation Technology Center, Inc. under contract with the Center for Urban Transportation Research in support of FTA's Standards Development Program. For more information, contact FTA Project Manager Raj Wagley at (202) 366-5386 or [Raj.Wagley@dot.gov](mailto:Raj.Wagley@dot.gov).

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