

NFPA®

502

**Standard for
Road Tunnels, Bridges,
and Other Limited
Access Highways**

2020



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NFPA® 502

Standard for

Road Tunnels, Bridges, and Other Limited Access Highways

2020 Edition

This edition of NFPA 502, *Standard for Road Tunnels, Bridges, and Other Limited Access Highways*, was prepared by the Technical Committee on Road Tunnel and Highway Fire Protection and acted on by NFPA at its June Association Technical Meeting held June 17–20, 2019, in San Antonio, TX. It was issued by the Standards Council on August 5, 2019, with an effective date of August 25, 2019, and supersedes all previous editions.

This edition of NFPA 502 was approved as an American National Standard on August 25, 2019.

Origin and Development of NFPA 502

A tentative standard, NFPA 502T, *Standard for Limited Access Highways, Tunnels, Bridges, and Elevated Structures*, was prepared by the Technical Committee on Motor Vehicle Fire Protection and was adopted by the National Fire Protection Association on May 16, 1972, at its Annual Meeting in Philadelphia, PA. It was withdrawn in November 1975. In 1980, the committee rewrote the document as a recommended practice and included a chapter on air-right structures. It was adopted at the 1981 NFPA Annual Meeting.

Minor revisions to Chapters 2 through 5, primarily to water supply and fire apparatus requirements, were made in the 1987 edition.

The recommended practice was reconfirmed in 1992.

The 1996 edition incorporated a totally revised chapter on tunnels. Other revisions were made to correlate the new material in tunnel and air-right structure requirements with existing chapters and to update NFPA 502 with respect to current technology and practices.

The 1998 edition was developed by a task group appointed by the chairman of the Technical Committee on Motor Vehicle and Highway Fire Protection. With the planned revision from a recommended practice to a standard, the task group reviewed and completely revised all chapters of the document, with special emphasis on incorporating the lessons learned following completion of the full-scale fire ventilation test program at the Memorial Tunnel in West Virginia. Specific to the Memorial Tunnel Fire Ventilation Test Program, changes were made to Chapter 7, Tunnel Ventilation During Fire Emergencies. The title of the standard was also changed to reflect more accurately the contents and to properly identify the major focus of the standard. The previous title, *Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways, and Air-Right Structures*, was changed to *Standard for Road Tunnels, Bridges, and Other Limited Access Highways*.

The 2001 edition contained a significant editorial rewrite and reorganization of the document. Technical changes regarding emergency communication, emergency egress and lighting in tunnels, and tunnel ventilation were incorporated into the 2001 edition. Further changes were made to clarify the application of the standard based on tunnel length.

The 2004 edition included new requirements for the protection of concrete and steel tunnel structures, specific requirements for emergency lighting, and clarification of the travel distance to emergency exits in tunnels. The 2004 edition also updated the vehicle tunnel fire data in Annex A to more recent international research.

The 2008 edition added specific requirements for fire tests for tunnel structural elements and included revisions that further clarified the categorization of road tunnels; revisions regarding ventilation, tenable environment, and hazardous goods transport and a revision of the discussion topics in Annex E on fixed fire suppression systems.

The 2011 edition further developed performance-based design approaches for tunnels. Table 7.2 was updated to provide a more comprehensive review of the required systems for tunnels based on tunnel category. Chapter 9 was added to address the design of water-based fire-fighting systems. Additional changes to the document included the addition of system commissioning and periodic testing and updated annex material addressing design factors for life safety and property protection.

The 2014 edition included technical changes regarding emergency ventilation systems, electrical systems, emergency response, and emergency exits and new requirements for flammable and environmental hazards. Table 7.2, the comprehensive review of the required systems for tunnels based on category, was reorganized, updated, and moved to Annex A for ease of use. Additional changes to the document included clarifications for water-based fire-fighting and standpipe systems along with updated annex material corresponding to newly added requirements in the body of the standard.

The 2017 edition of NFPA 502 revised the list of considerations to be taken into account during an engineering analysis and added guidance in the annexes. Integrated testing on fire protection, life safety, and emergency systems, in accordance with NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*, is now required. Requirements for the structural protection of bridges were modified. New to Annex B was guidance on establishing noise levels in order to maintain a minimum level of speech intelligibility through the emergency communication system. The constant K_1 used in the critical velocity equation of Annex D was modified and is no longer a constant for heat release rates (HRR) less than or equal to 100 MW. In Annex E, information was provided regarding the effects of fire suppression on HRR and tunnel ventilation. A new Annex M was added providing guidance on the use of automatic fire detection systems in road tunnels.

The 2020 edition of NFPA 502 includes several revisions. In general requirements, a change was made to ensure that protection methods described assume a single fire event. Section 6.11 now requires an analysis to be performed on joints of nonconventional and nonrigid connections. Fixed water-based fire-fighting systems (FFFS) have been further explained throughout the code, as well as in several annex materials. Structural fire protection material has new requirements per 7.3.4. New references to *NFPA 72®*, *National Fire Alarm and Signaling Code®*, have been made in Chapter 7 for automatic fire detection systems. A section on Operations Control Centers (OCCs) has been updated in Chapter 13.

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Committee Scope: This Committee shall have primary responsibility for documents on fire prevention and fire protection measures to reduce loss of life and property damage for limited access highways, road tunnels, bridges, elevated highways, depressed highways, and roadways that are located beneath air-right structures. Excluded from this scope is the protection for facilities for the storage, repair, and parking of motor vehicles.

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