

NFPA No.
502-T

Tentative

**Tentative Standard
on Fire Protection for**

**LIMITED ACCESS
HIGHWAYS, TUNNELS, BRIDGES
AND ELEVATED STRUCTURES**

May, 1972



CAUTION

Readers are warned that this text does not present official recommendations of the National Fire Protection Association in its present form and is subject to major revision.

This pamphlet circulates for review and comment these requirements prepared by the Committee on Motor Vehicle and Highway Fire Protection. They were Tentatively Adopted at the 1972 NFPA Annual Meeting.

Comments are solicited on this Tentative Code from all those interested. Such comments should be forwarded to the NFPA Office by September 1, 1972, to receive full Committee consideration.

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NATIONAL FIRE PROTECTION ASSOCIATION
International

60 Batterymarch Street, Boston, Massachusetts 02110

National Fire Protection Association International

Official NFPA Definitions

Adopted Jan. 23, 1964. Revised Dec. 9, 1969. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

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**Tentative Standard on Fire Protection for
Limited Access Highways, Tunnels, Bridges
and Elevated Structures**

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Origin and Development

This Code was prepared by the Committee on Motor Vehicle and Highway Fire Protection. It was tentatively adopted at the NFPA Annual Meeting in Philadelphia, Pennsylvania on May 16, 1972.

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Committee on Motor Vehicle and Highway Fire Protection

Wesley L. D. Chisholm, *Chairman*,
Liberty Mutual Insurance Co., 10 Rockefeller Plaza, New York, N. Y. 10020
(rep. American Mutual Insurance Alliance)

John J. Ahern, General Motors Corp.

John J. Bailey, American Insurance Assn.

E. A. Bamford, Factory Mutual Research Corp.

Deputy Chief William Benner, Jersey City Fire Dept.

Deputy Chief Dominic Cardillo, Jersey City Fire Dept.

J. E. Cumming, American Petroleum Institute

Neill Darmstadter, American Trucking Assns.

A. L. Elliott, California Division of Highways.

Clue D. Ferguson, U. S. Dept. of Transportation, Federal Highway Administration, National Highway Safety Bureau.

Ralph E. Ferguson, Transportation Insurance Rating Bureau.

M. R. Kraus, Fire Equipment Manufacturers' Assn. Inc.

Alfred W. Krulee, Norris Industries

Lawrence J. Lewis, International Bridge, Tunnel & Turnpike Assn., Inc.

Deputy Chief William A. Mischke, Fire Dept. of the City of New York

Daniel Nuzzi, Hermann Forwarding

George H. Pope, Underwriters' Laboratories, Inc.

William J. Ronnan, Algonquin, Ill.

C. Austin Sutherland, National Tank Truck Carriers, Inc.

W. J. Welsh, Munitions Carriers Conference, Inc.

J. C. Wilson, Fire Marshals Assn. of North America

Alternates.

S. E. Auck, Underwriters' Laboratories, Inc. (Alternate to George H. Pope)

Clifford J. Harvison, National Tank Truck Carriers, Inc. (Alternate to C. Austin Sutherland)

Donald Maddock, Fire Equipment Manufacturers' Assn., Inc. (Alternate to M. R. Kraus)

W. M. Miller, American Petroleum Institute (Alternate to J. E. Cumming)

Joseph F. Zemattis, U. S. Dept. of Transportation, Federal Highway Administration, National Highway Safety Bureau (Alternate to Clue D. Ferguson)

SCOPE: To develop standards and recommended practices covering motor vehicle fire prevention and protection measures to reduce loss of life and property damage in the operation and maintenance (repair) of such vehicles (except as specified herein), to provide fire prevention and protection recommendations for motor freight terminals, to recommend protection for tunnels, air-right structures and bridges, and to recommend protection facilities on limited-access highways. Included as motor vehicles are trucks, buses, taxicabs, limousines, and passenger cars. Excluded are the design, fire protection, and operational procedures for fire apparatus, mobile homes and travel trailers, tank vehicles of all kinds for handling flammable and combustible liquids and liquefied petroleum gases, and vehicles transporting explosives and other hazardous chemicals. The construction and protection of garages are handled by the NFPA Committee on Garages.

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Chapter 1. Introduction

11. Scope

111. This Standard is intended primarily for the guidance of those individuals responsible for the construction, operation and maintenance and fire protection of limited access highways, tunnels, bridges and elevated structures. It also applies, to a lesser extent, to buildings and structures that are exposed to the hazards of the operational zones.

112. In some cases where the facilities do not present serious fire problems because of low traffic volume, small size or other considerations, the authority having responsibility for fire protection may adjust the provisions of this Standard to provide for the fire protection needs of the facility.

12. Limited Access Highways

121. Limited access highways present two fire protection problems. One is the protection to life and property transported by vehicles traveling on the facility and the other is the protection of permanent installations located on, over, below or adjacent to the facility. Protection to life must in all cases merit primary consideration, while protection to the facility becomes of major importance by reason of its vital need to the community.

122. Protection of related facilities such as service areas, rest areas, toll booths and buildings used for administration, law enforcement and maintenance presents problems which are not basically different from the fire protection problems of all such buildings. However, special consideration should be given to the fact that on, or adjacent to, limited access highways such buildings may be in isolated locations.

123. Protection to life and property transported by vehicles is somewhat more complicated in that the location of emergencies cannot be predetermined; they may occur at any point or simultaneously at several points along the course of any facility. Fire emergencies may range from incipient fires in passenger vehicles to

major accidents involving loaded buses, and trucks carrying hazardous materials. Heavy traffic and adverse weather conditions and night usage aggravate the problem.

124. Studies of fire protection for limited access highways indicate that there are three interdependent considerations. The first is the rapid transmission of alarms to the proper authorities and a simultaneous warning to approaching vehicle operators. The second is the response of appropriate apparatus and manpower with a minimum of delay. The third is the matter of rescue operations followed by fire extinguishment or control. When life is endangered by fire, the possibility of effective rescue operations decreases rapidly with any delay.

125. Unless effective means of communication is provided, the reporting of fire and other emergencies by occupants of passing vehicles loses much of its value. Distance to interchanges, service areas and toll booths, and indecision due to unfamiliarity with emergencies will often consume the limited time of possible effective action.

126. Control of traffic is a continuous problem from the time of occurrence of any emergency to the time of removal of the occupants and vehicle from the facility. Experience has indicated that the slowing of traffic is essential to minimize the hazard of multiple collisions.

13. Tunnels

131. The fire protection problem created by a fire in a vehicular tunnel is similar to that of a fire occurring on a highway in that the emergency is complicated by existing traffic conditions, the number of passengers carried by vehicles involved and the wide diversity of cargo transported by trucks. The problem is further complicated by sloping roadways and the possibilities of inadequate ventilation and illumination. Other problems connected with a fire emergency in a tunnel include limitations on fire fighting equipment and personnel, control of traffic and evacuation of the public.

132. Protection to life is the primary concern. The secondary consideration is protection to the tunnel structure itself. Damage to the ventilation, lighting or drainage systems would endanger the lives of persons not involved in the original emergency.

133. As with highways, the primary need is a means for prompt and rapid notification to the authorities of the existence and location of an emergency and the development of effective means of traffic control.

14. Elevated Structures and Bridges

141. A fire occurring on an elevated structure or bridge has the same characteristics as a fire occurring on a highway, but is usually less accessible.

142. Protection to life is the primary concern. However, protection to the structure may be more important than protection to vehicles and cargo. Damage to a critical structural member from collision or exposure to high temperatures could result in dangerous weakening or complete collapse of the structure.

143. Elevated structures and bridge approaches frequently pass directly over congested residential or high value industrial areas. Certain hazardous material fires on the structures could result in serious exposure fires in the occupancies beneath and in close proximity to the structures. Conversely, these occupancies, particularly those dealing with hazardous commodities, may seriously expose the structures.

Chapter 2. Limited Access Highways

21. Scope

211. In some cases where the facilities do not present serious fire problems because of low traffic volume, small size or other considerations, the authority having responsibility for fire protection may adjust the provisions of this Standard to provide for the fire protection needs of the facility.

22. Alarm Transmission

221. Means should be provided whereby emergency alarms may be transmitted to an appropriate authority by the general public from locations along the routes of highways. Alarm transmission may be provided by the installation of outdoor-type telephone boxes, coded alarm telegraph stations, radio transmitters, sensing equipment, or other suitable devices. They shall be made conspicuous by indicating lights or other suitable markers, and shall be located so as to permit their use without stopping vehicles on the roadway. All patrol vehicles, maintenance trucks and emergency vehicles should be radio equipped.

23. Fire Control

231. Arrangements for the response of nearby fire companies and emergency squads should be made. Means of access, permitting the entrance of outside aid companies to the facility, should be provided and procedures for utilizing them should be included in the emergency plan. Appropriate precautions should be taken at these points of entry so as to alert and control traffic to permit safe entrance by emergency equipment.

232. All patrol cars, maintenance vehicles and similar official vehicles should be equipped with portable fire extinguishers with a rating of at least 4A-40B:C.

233. Service areas, maintenance areas and other permanent installations should be protected by public water supply systems with accessible hydrants where such supplies are available. Where such facilities are not served from municipal or other water systems, storage of at least 30,000 gallons with an approved standard fire pump should be provided for major installations.

234. Fire extinguishers shall be provided at highway installations and buildings as recommended in NFPA No. 10, Standard for Installation of Portable Fire Extinguishers. Protection of special hazard areas shall be provided in accordance with appropriate

NFPA standards. For example, for the protection of restaurant cooking facilities, refer to NFPA No. 96, Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment; for gasoline service stations, refer to NFPA No. 30, Flammable and Combustible Liquids Code, and for repair garages, refer to NFPA No. 88, Standard for Garages.

235. It is important that a designated authority carry out a complete and coordinated program of fire protection which should include preplanned response procedures.

236. Emergency traffic control procedures shall be established to regulate traffic.

NOTE: Such procedures have the dual purpose of preventing the involvement of additional vehicles in one accident and of slowing traffic during inclement weather conditions.

237. In order to derive a maximum benefit from the fire protection program, comprehensive training programs are necessary for all personnel and agencies expected to participate in fire fighting operations. Such a program should involve a competent supervisory staff experienced in fire fighting techniques.

238. Contacts should be made with roadside businesses and with responsible persons living along limited access highways to elicit their cooperation in the reporting of fires and other emergencies. The objective of such contacts shall be to establish a positive system for the reporting of emergencies. Those who agree to participate in the system must be provided with specific information as to the procedures for reporting and with a means for determining and reporting the location of the emergency as precisely as possible.

Chapter 3. Tunnels

31. Scope

311. In some cases where the facilities do not present serious fire problems because of low traffic volume, small size or other considerations, the authority having responsibility for fire protection may adjust the provisions of this Standard to provide for the fire protection needs of the facility.

32. Alarm Transmission

321. Means shall be provided whereby emergency alarms may be transmitted by either the general public, by foot patrolmen when stationed in the tunnel or by personnel observing a tunnel operation by means of closed circuit TV. Coded alarm or outdoor-type telephone boxes should be installed at intervals of not more than 300 feet and should be made conspicuous by indicating lights or other suitable markers.

322. A traffic control system should be provided. It may be interlocked with the fire alarm system to turn all signals red between the point of alarm transmission and the tunnel entrance and amber between that point and the tunnel exit, or it may be controlled by personnel on duty either in the tunnel or at a central control observing closed circuit TV.

33. Fire Apparatus, Equipment

331. Suitable apparatus should be available at the tunnel exit. Apparatus should be designed for double-end lifting operation and equipped with "dollies" for towing disabled vehicles from the tunnel. The apparatus should carry a self-contained fire fighting system or means to obtain water from a standpipe system. It should also carry portable extinguishers, complete self-contained breathing apparatus, cutting torches, forcible entry tools, hose, chains, coffin hoists, tarpaulins, and other appropriate hand tools. The apparatus should be radio-equipped.

34. Water Supplies

341. A water supply system capable of supplying not less than 1,000 gallons per minute at adequate pressures should be installed and connected at each end to storage tanks or to an adequate municipal water supply system. Mains should be placed with suitable interconnection and valving facilities to allow isolation and repair of any section without impairing the supply. Hose connec-

tions should be installed and conspicuously marked at a maximum of 300-foot intervals. Where freezing conditions are likely to be encountered, piping should be protected.

NOTE: It may be desirable to provide a small pump to circulate water through the system during the freezing periods.

35. Portable Extinguishers

351. Portable fire extinguishers, each with a rating of at least 4A-40B:C, should be placed on both sides of the roadway in well-marked, flush-wall cabinets at intervals of not more than 300 feet.

36. Emergency Ventilation

361. Emergency ventilation procedures shall be developed to permit maximum utilization of the ventilation system for the removal of smoke during fires. The design of the ventilation system should provide for excess ventilation to accomplish this purpose. The system should introduce the fresh air at roadway level and evacuate the stale air or smoke at the same location high up on the side or through the ceiling of the tunnel with localized control. Protection of fans from excessive heat should be provided.

37. Drainage System

371. A complete drainage system should be provided with a sump and pump at every low point in the tunnel.

38. Control of Hazardous Materials

381. The authority having jurisdiction shall establish rules and regulations applying to the transportation of hazardous materials and should maintain a program for enforcement of such regulations.

39. Responsibility for Fire Protection

391. It is important that a designated authority carry out a complete and coordinated program of fire protection which should include preplanned response procedures.

Chapter 4. Elevated Structures, Bridges

41. Scope

411. In some cases where the facilities do not present serious fire problems because of low traffic volume, small size or other considerations, the authority having responsibility for fire protection may adjust the provisions of this Standard to provide for the fire protection needs of the facility.

42. Alarm Transmission

421. Means should be provided whereby the general public may transmit emergency alarms. This may be accomplished by the installation of outdoor-type telephone or coded alarm boxes or other suitable devices at intervals of approximately 500 feet on bridges and elevated structures. They should be made conspicuous by indicating lights or other suitable markers.

422. A traffic control procedure should be established so that vehicles will either stop or proceed with caution.

43. Fire Apparatus, Water Supplies, Equipment

431. Suitable apparatus should be available within one mile of all points on elevated structures and bridges; use of ladders by municipal fire fighters is satisfactory where elevated structures and bridges are accessible from beneath. Design of apparatus intended for use only on bridges or elevated structures must be based upon the conditions encountered. The apparatus should have braking equipment adequate under all conditions, both to maintain a position on any existing slope and to restrain disabled vehicles being towed. Apparatus responding to fires on bridges should be equipped with booster tanks and should also be radio-equipped.

432. Standpipe systems capable of supplying not less than 1,000 gallons per minute at adequate pressures should be installed to be supplied from pumpers in the street below and, if available, from fire boats. It is desirable that duplicate systems be installed on each side of the roadway and the systems be cross-connected. Where freezing conditions prevail, systems should be dry-type.

433. Sand should be provided for use during icy weather conditions. Suitable absorbent materials should be provided for controlling the spills of hazardous materials. On elevated structures, consideration should be given to drainage systems to channel spilled hazardous materials to areas that will not cause additional hazards. Expansion joints should prevent spillage to the area below.

44. Control of Explosives and Radioactive Materials

441. The authority having jurisdiction of a bridge facility should consider the promulgation of reasonable rules governing the movement of vehicles transporting explosives, Class A and Class B, and certain radioactive materials. In developing such regulations, consideration should be given to the following factors:

- (a) The fire and accident experience of other similar facilities.
- (b) Past fire and accident experience on the facility and adjacent roads, or, in the case of a new facility, the past fire and accident experience on roads in the area.
- (c) Anticipated traffic volumes in peak and off-peak periods.
- (d) The need for inspection of vehicles and cargo and the availability of a safe place to conduct inspections with a minimum of interference with other traffic.
- (e) The need and desirability of escort service with due consideration of the extent to which it may disrupt the orderly flow of traffic and create additional hazards.
- (f) The extent to which diverting such vehicles from the facility may result in a greater degree of hazard by requiring them to use less safe routes.

45. Responsibility for Fire Protection

451. It is important to have a designated authority to carry out a complete and coordinated program of fire protection which should include preplanned response procedures.