ANSI/NFPA 502 An American National Standard June 10, 1987

# NFPA 502 Fire Protection for Highways, Tunnels, and Bridges 1987 Edition

National Fire Protection Association Batterymarch Park, Quincy, MA 02269

## NOTICE

All questions or other communications relating to this document should be sent only to NFPA Headquarters, addressed to the attention of the Committee responsible for the document.

For information on the procedures for requesting Technical Committees to issue Formal Interpretations, proposing Tentative Interim Amendments, proposing amendments for Committee consideration, and appeals on matters relating to the content of the document, write to the Secretary, Standards Council, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

A statement, written or oral, that is not processed in accordance with Section 16 of the Regulations Governing Committee Projects shall not be considered the official position of NFPA or any of its Committees and shall not be considered to be, nor be relied upon as, a Formal Interpretation.

Users of this document should consult applicable Federal, State and local laws and regulations. NFPA does not, by the publication of this document, intend to urge action which is not in compliance with applicable laws and this document may not be construed as doing so.

### Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

---



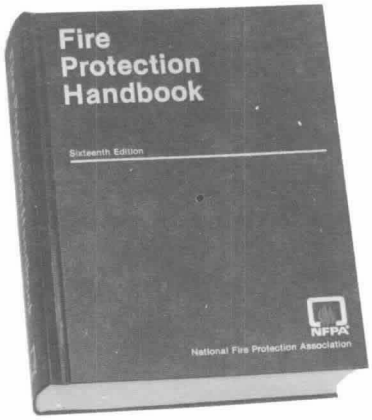
---

### Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

NFPA has no power or authority to police or enforce compliance with the contents of this document and any certification of products stating compliance with requirements of this document is made at the peril of the certifier.

Over 16,000 copies sold!




## Put the experts on your side — with the Fire Protection Handbook!

Stay on top of developments in fire protection techniques, systems and equipment all from one comprehensive source. **The sixteenth edition of the Fire Protection Handbook** features current information on every aspect of firesafety . . . facts you'll use again and again.

Whether you're involved with building design and construction, sprinkler installations, firesafety education, fire service training, or any other aspect of fire protection and prevention, the *Fire Protection Handbook* addresses your specific information needs.

You'll find the latest on building design and construction . . . fire modeling . . . hazardous waste control . . . haz-mat emergency response . . . the fire hazards of robotics . . . aerosol charging . . . mining and industrial safety . . . EMS. It's all here—in one comprehensive volume that's more extensive and easy-to-use than ever before!

Approximately 1,760 pages, 20 sections on specific subjects and occupancies, 173 fact-packed chapters, and nearly 2,000 illustrations, photographs and diagrams!

**For easy ordering, call toll-free 1-800-344-3555!** Monday–Friday, 8:30 AM–8:00 PM, ET

YES! Send me _____ copies of the Fire Protection Handbook. Item No. V5-FPH1686 $75.00 (NFPA Members $67.50)

Plus $2.85 handling. *NFPA pays all shipping charges.*

California residents add 6% sales tax _____

Total amount enclosed $_____

Name _____

Address _____

City, State, Zip _____

NFPA Member No. _____

☐ I enclose a check (payable to NFPA)

☐ Please bill me ☐ Charge my ☐ MasterCard ☐ VISA

Card No. _____

Signature _____ Exp. _____

**National Fire Protection Association**
Batterymarch Park, Quincy, MA 02269

Join over 37,000 professionals like yourself who belong to NFPA!

NFPA®

## You can have impact on issues that affect the firesafety industry...How?

When you belong to NFPA you'll receive special membership benefits that help you make informed decisions and make your voice a stronger one in the firesafety community. Your benefits include:

1. **Voting privileges** on proposed changes to existing codes and standards, and on new codes and standards.

2. **Fire Journal Magazine,** Fire News Newsletter, and Fire Protection Reference Directory & Buyers Guide — *exclusive members-only publications* — your source for fire statistics, reports, investigations, manufacturers, and codes and standards references.

3. **10% discount** on all products and services.

4. **Special invitations** to Annual and Fall, and Regional Meetings — where you can compare notes with your colleagues and take a position on issues that affect you. All these benefits — plus the pride and confidence that comes with membership in an internationally-acclaimed organization can be yours for annual dues of $60.00. **Join NFPA today!**

**For easy ordering, call toll-free 1-800-344-3555!** Monday–Friday, 8:30 AM–8:00 PM, ET

YES! Send me an application to join my colleagues at NFPA today!

Name _____

Address _____

City, State, Zip _____

Date _____

Signature _____

☐ I enclose a check (payable to NFPA)

☐ Please bill me ☐ Charge my ☐ MasterCard ☐ VISA

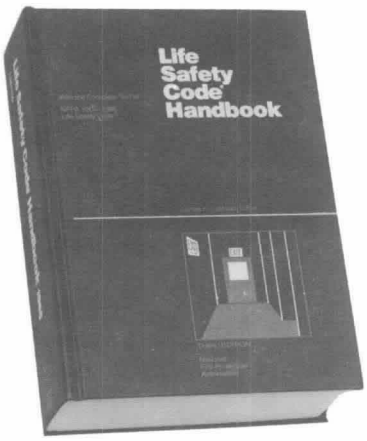
Card No. _____

Signature _____ Exp. _____

**National Fire Protection Association**
Batterymarch Park, Quincy, MA 02269

Code V5

Over 15,000 copies sold!




## How to interpret and apply the Life Safety Code...

The **Life Safety Code Handbook** puts the facts and explanations you need at your fingertips! The Handbook includes:

- Complete text of 1985 Life Safety Code
- Helpful section-by-section explanations of the Code
- Hundreds of useful tables and illustrations
- Formal Interpretations — written by the Committee in direct response to field inquiries

Information is included on: board and care facilities; requirements for sprinklers in new high-rise health care facilities; provisions for revolving doors and smoke proof enclosures; requirements for stairwell floor re-entry; *plus* hundreds of significant changes from previous editions. Improve your ability to apply the Life Safety Code (NFPA 101) requirements in your fire and life safety profession — **order your copy today!**

**For easy order, call toll-free 1-800-344-3555!** Monday–Friday, 8:30 AM–8:00 PM, ET

YES! Send me _____ copies of the Life Safety Code Handbook (1985 ed.). Item No. U5-101HB85 $39.50 (NFPA Members $35.55)

Plus $2.85 handling. *NFPA pays all shipping charges.*

California residents add 6% sales tax _____

Total amount enclosed $_____

Name _____

Address _____

City, State, Zip _____

NFPA Member No. _____

☐ I enclose a check (payable to NFPA)

☐ Please bill me ☐ Charge my ☐ MasterCard ☐ VISA

Card No. _____

Signature _____ Exp. _____

**National Fire Protection Association**
Batterymarch Park, Quincy, MA 02269

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

**BUSINESS REPLY MAIL**
FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

**National Fire Protection Association**
Batterymarch Park
Quincy, MA 02269-9904

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

**BUSINESS REPLY MAIL**
FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

**National Fire Protection Association**
Batterymarch Park
Quincy, MA 02269-9904

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

**BUSINESS REPLY MAIL**
FIRST CLASS PERMIT NO. 3376 QUINCY, MA

POSTAGE WILL BE PAID BY ADDRESSEE

**National Fire Protection Association**
Batterymarch Park
Quincy, MA 02269-9904

# NFPA 502

## Recommended Practice on Fire Protection for

# Limited Access Highways, Tunnels, Bridges, Elevated Roadways, and Air Right Structures

## 1987 Edition

This edition of NFPA 502, *Recommended Practice on Fire Protection for Limited Access Highways, Tunnels, Bridges, Elevated Roadways, and Air Right Structures*, was prepared by the Technical Committee on Motor Vehicle and Highway Fire Protection, and acted on by the National Fire Protection Association, Inc. at its Annual Meeting held May 18-21, 1987 in Cincinnati, Ohio. It was issued by the Standards Council on June 10, 1987, with an effective date of June 30, 1987, and supersedes all previous editions.

The 1987 edition of this standard has been approved by the American National Standards Institute.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

## 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 Annual Meeting.

The 1987 edition includes minor revisions to Chapters 2 through 5, primarily water supply and fire apparatus recommendations.

## Technical Committee on

## Motor Vehicle and Highway Fire Protection

**Wesley L. D. Chisholm,** *Chairman*
Liberty Mutual Insurance Co.
Rep. Alliance of American Insurers

**Neil Darmstadter,** American Trucking Assn., Inc.
**A. L. Elliott,** Sacramento, CA
**Clifford J. Harvison,** Nat'l. Tank Truck Carriers, Inc.
**M. R. Kraus,** Ansul Co.
Rep. Fire Equipment Manufacturers Assn.
**Enoch Lipson,** Port Authority of NY & NJ
**George E. Ralph,** Consulting Architect
**Aaron Small,** Metro Safety
Rep. NFPA FSS
**Michael P. Wilson,** American Insurers Services Group, Inc.

**Alternates**

**Genevieve M. Laffly,** American Petroleum Institute
(Voting Alternate)
**A. B. Rosenbaum III,** Nat'l. Tank Truck Carriers, Inc.
(Alternate to C. J. Harvison)
**Raymond D. Scanlon,** Port Authority of NY & NJ
(Alternate to E. Lipson)
**Bruce A. Warner,** ICI Americas, Inc.
(Alternate to M. R. Kraus)

**Richard Best,** NFPA Staff Liaison

*This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.*

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

## Contents

NFPA 502

Recommended Practice on Fire Protection for

# Limited Access Highways, Tunnels, Bridges, Elevated Roadways, and Air Right Structures

1987 Edition

Information on referenced publications can be found in Chapter 6 and Appendix A.

## Chapter 1 General Information

**1-1 Scope.** This recommended practice is intended primarily for the guidance of those individuals responsible for the construction, operation, maintenance, and fire protection of limited access highways, tunnels, bridges, elevated roadways, and air right structures. It also applies, to a lesser extent, to buildings and structures that are exposed to the hazards of the operational zones.

**1-2 Application.** In cases where the facilities do not present serious fire problems because of low traffic volume, small size, or other considerations, the authority having jurisdiction, responsible for fire protection, may adjust the recommendations of this recommended practice to provide for the fire protection needs of the facility.

### 1-3 Limited Access Highways.

**1-3.1** 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.

**1-3.2** Protection of related facilities such as service areas, rest areas, toll booths, and buildings used for administration, law enforcement, and maintenance presents problems that 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.

**1-3.3** Protection for people 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, adverse weather conditions, and night usage aggravate the problem.

**1-3.4** Studies of fire protection for limited access highways indicate that there are three interdependent considerations. The first is 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 minimal 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.

**1-3.5** 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. The development of Citizens Band radio offers a most effective communication device, especially for nonurban highways.

**1-3.6** 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.

### 1-4 Tunnels.

**1-4.1** 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.

**1-4.2** Protection of life is the primary concern. The secondary consideration is protection of the tunnel structure itself. Damage to the ventilation, lighting, or drainage systems would endanger the lives of persons not involved in the original emergency.

**1-4.3** As with highways, the primary need is a means for prompt and rapid notification of the authorities of the existence and location of an emergency and the development of effective means of traffic control.

### 1-5 Elevated Roadways and Bridges.

**1-5.1** A fire occurring on an elevated roadway or bridge has the same characteristics as a fire occurring on a highway, but is usually less accessible.

**1-5.2** Protection of life is the primary concern. However, protection of the elevated roadway or bridge may be more important than protection of 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 elevated roadway or bridge.

**1-5.3** Approaches to elevated structures and bridges 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 materials, may seriously expose the structures.

**1-6 Air Right Structures.**

**1-6.1** Air right strutures also present two fire protection problems. One relates to the persons and property in the air right structure. The other relates to the persons and property using the roadway that passes under or adjacent to the air right structure.

**1-6.2** Fire protection for air right structures presents problems similar to those involving like buildings in other locations. These problems can be aggravated, however, by limited access, traffic congestion, and the fire situation in the roadway under or adjacent to the structure.

**1-6.3** Fire protection for a roadway under an air right structure is similar to that needed for a tunnel. Occupancy and use of the space above the ceiling of the roadway is a significant difference.

**1-6.4** While protection of life is the primary consideration, there are other important concerns. The structural members that support the air right building could be subjected to very high temperatures, particularly in a flammable liquids fire or explosion. Damage to these members could have a serious effect on the building. In addition, openings from the roadway such as ventilation shafts, drainage systems, and walkways could permit passage of flammable liquids or vapors to the air right structure with subsequent damage from fire or explosion.

**1-6.5** Consideration must be given to the fact that flammable liquids or vapors can flow from the roadway scene by gravity or via the drainage system and thus extend the fire well beyond the area of the original emergency.

**1-6.6** Major structural elements that support an air right structure may be subject to physical damage from motor vehicle accidents.

**1-7 Units.** Metric units of measurement in this standard are in accordance with the modernized metric system known as the International System of Units (SI). One unit (liter), outside of but recognized by SI, is commonly used in international fire protection. See ASTM E380, *Standard for Metric Practice*.

**1-7.1** If a value for measurement as given in this standard is followed by an equivalent value in other units, the first stated is to be regarded as the requirement. A given equivalent value may be approximate.

**1-7.2** The conversion procedure for the SI units has been to multiply the quantity by the conversion factor and round the result to the appropriate number of significant digits.

**1-8 Official NFPA Definitions.**

**Authority Having Jurisdiction.** The "authority having jurisdiction" is the organization, office or individual responsible for "approving" equipment, an installation or a procedure.

> NOTE: The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner since jurisdictions and "approval" agencies vary as do their responsibilities. Where public safety is primary, the "authority having jurisdiction" may be a federal, state, local or other regional department or individual such as a fire chief, fire marshal, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the "authority having jurisdiction." In many circumstances the property owner or his designated agent assumes the role of the "authority having jurisdiction"; at government installations, the commanding officer or departmental official may be the "authority having jurisdiction."

**Should.** Indicates a recommendation or that which is advised but not required.

## Chapter 2 Limited Access Highways

**2-1 Alarm Transmission.**

**2-1.1** Citizens Band (CB) radio has proven to be an excellent and efficient device to augment regular police patrols for transmissions of emergency alarms to appropriate agencies, especially for highways in nonurban areas. Signs should be erected at all access points on the highway indicating that the police monitor Channel 9 (the emergency CB channel). This is especially effective if all police, maintenance, and emergency vehicles are equipped with CB radios, as well as conventional shortwave radios. In addition, 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 should be made conspicuous by indicating lights or other suitable markers, and should be located to permit users to park their vehicles clear of the roadway.

Mile markers or other readily available location reference markers should be installed along the highway to permit motorists to give reasonably accurate locations for accident or emergency areas.

**2-2 Fire Control.**

**2-2.1** 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 to alert and control traffic to permit safe entrance by emergency equipment. It is important that apparatus responding to fires on limited access roads be equipped with booster tanks [500 gal (1900 L) minimum] and foam-production equipment or an equivalent amount of dry chemical.

**2-2.2** All patrol cars, maintenance vehicles, and similar official vehicles should be equipped with portable multipurpose fire extinguishers of nominal 20-lb (9-kg) capacity.

2-2.3 Service areas, maintenance areas, and other permanent installations should be protected as required by NFPA standards and local building codes.

2-2.4 Fire extinguishers should be provided at highway installations and buildings in accordance with NFPA 10, *Standard for Portable Fire Extinguishers*. Protection of special hazard areas should be provided in accordance with appropriate NFPA standards. For example, for the protection of restaurant cooking facilities, refer to NFPA 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 30, *Flammable and Combustible Liquids Code*; and for repair garages, refer to NFPA 88B, *Standard for Repair Garages*.

2-2.5 It is important that a designated authority carry out a complete and coordinated program of fire protection that should include written preplanned response and standard operating procedures.

2-2.6 Emergency traffic control procedures should be established to regulate traffic.

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

2-2.7 To derive the maximum benefit from the fire protection program, comprehensive training programs are necessary for all personnel and agencies expected to participate in fire fighting operations and hazardous material emergencies. Such a program should involve a competent supervisory staff experienced in fire fighting techniques and hazardous material emergencies.

2-2.8 Contacts should be made with roadside businesses and responsible persons living along limited access highways to elicit their cooperation in the reporting of fires and other emergencies. The objective of such contacts should 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 a means for determining and reporting the location of the emergency as precisely as possible.

## Chapter 3 Tunnels

### 3-1 Alarm Transmission.

3-1.1 Means should be provided whereby emergency alarms may be transmitted by the general public, by members of the foot patrol when stationed in the tunnel, or by personnel observing a tunnel operation by means of closed-circuit TV. Coded alarms or outdoor-type telephone boxes should be installed at intervals of not more than 300 ft (90 m) and should be made conspicuous by indicating lights or other suitable markers. In addition, tunnels with high-volume traffic should be equipped with a traffic monitoring system that would automatically transmit alarms to a central control at any time normal traffic flow is interrupted. Such a system is most effective when it is integrated with a closed-circuit television system.

3-1.2 A traffic control system should be provided. It should be interlocked with the fire alarm system to allow all traffic heading away from the fire to exit safely and quickly and to prevent additional traffic from approaching the fire and from entering the tunnel. The systems should be adapted to all modes the tunnel will be operated in; for unidirectional traffic in either direction or two-way traffic. Initially, all signals should be red from the point of alarm transmission to the tunnel entrances and amber from that point to the exits. Once "downstream" traffic has cleared the tunnel, all signals should be red. The system may be controlled by personnel on duty in the tunnel or at a central control observing a closed-circuit television system.

### 3-2 Fire Apparatus, Equipment.

3-2.1 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 potassium bicarbonate-base dry chemical/AFFF, or a similar self-contained fire fighting system and/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.

3-2.2 Responding fire apparatus should be equipped to deliver foam at a rate of 200 gpm (757 L/min) for a duration of 30 minutes. If hydrant or standpipe water is not available, suitable arrangements should be made to transport water in tankers such that the delivery rate of foam can be maintained. Additional supplies of foam should be readily available from mutual aid fire departments or other sources such that the application can be continued for an additional 45 minutes if necessary. These units should also carry multipurpose dry chemical extinguishers and an extinguishing agent for Class D metal fires. Mutual aid, supplier, or manufacturer reserve capability should be available.

### 3-3 Water Supplies.

3-3.1 The primary water supply should be preferably a municipal water supply system with connections at each end of the tunnel. If a municipal supply is not available, storage tanks (one at each end) should be provided, with the tanks at each end of the tunnel having the full suggested capacity.

3-3.2 Fire pumps should be supplied as required.

3-3.3 An auxiliary water supply in the form of local fire department siamese connections should be provided at each end of the tunnel.

3-3.4 The minimum water supply at any point within the tunnel should be 500 gpm (1900 L/min) at 60 psi (420 kPa) residual. Any water supply system available to the local fire department should provide not less

than 1,000 gpm (3,800 L/min) at 20 psi (140 kPa) residual. The tunnel mains should have suitable interconnection and valving to allow isolation and repair of any section without impairment of the supply.

**3-3.5** The water supply should be available for at least one hour. Greater capacity is recommended. Systems should be designed to provide suggested capacity with a part or parts of the system closed for maintenance.

**3-3.6** Where freezing conditions are likely to be encountered, the systems may be wet or dry (as described in 3-3.7). The wet system can be provided with pumps to circulate the water when temperatures are below freezing. When required, the circulated water must be heated. Alarm mechanisms should be provided to warn of approaching failure of the freeze-protection system.

**3-3.7** Although charged (wet) systems are preferable, dry systems may be acceptable. The delivery time of water to any point in the tunnel, from either end, should be less than ten minutes.

Automatic, remote control (redundant) systems should be provided and supervised. Dry systems are suitable only where adequate 24 hour supervision is available to activate the system.

**3-3.8** Hose connections should be installed and conspicuously marked so that no point within the tunnel is more than 150 ft (45.7 m) from a hose connection. Where more than one agency has the responsibility for providing fire protection, every effort should be made to coordinate hose connections. If this is not possible, suitable adapters should be readily available.

### 3-4 Portable Extinguishers.

**3-4.1** Portable fire extinguishers, each with at least a nominal 20-lb (9-kg) capacity multipurpose agent, should be placed on both sides of the roadway in well-marked, flush-wall cabinets at intervals of not more than 300 ft (90 m).

### 3-5 Emergency Ventilation.

**3-5.1** Emergency ventilation procedures should be developed to permit maximum utilization of the ventilation system for the removal of smoke during fires. The ventilation equipment should be heat resistant so it is capable of operating even under sustained fire exposure temperatures. The design of the ventilation system should provide for excess ventilation to accomplish this purpose. The ventilation procedures should be designed to afford maximum protection for motorists trapped between the fire and the tunnel entrance. In addition, the procedure should afford help for fire crews consistent with the primary aspect of protection for the motorists.

### 3-6 Drainage System.

**3-6.1** A system should be provided to drain every low point in the tunnel. The design of the drainage system should provide protected collection areas so that spills of hazardous materials, such as flammable liquid, cannot create a fire or health hazard. The system must be sized to take loads from fire pumps.

### 3-7 Control of Hazardous Materials.

**3-7.1** The authority having jurisdiction of a tunnel, especially those in excess of 200 ft (60 m) in length, should adopt rules and regulations found in Title 49, Transportation, *Code of Federal Regulations*, Parts 100-199, applicable to the transportation of hazardous materials. A program should be maintained for enforcing these regulations. 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.

### 3-8 Responsibility for Fire Protection.

**3-8.1** It is important that a designated authority carry out a complete and coordinated program of fire protection that should include preplanned response and Standard Operating Procedures (S.O.P.).

**3-8.2** To derive the maximum benefit from the fire protection program, comprehensive training programs are necessary for all personnel and agencies expected to participate in fire fighting operations and hazardous material emergencies. Such a program should involve a competent supervisory staff experienced in fire fighting techniques and hazardous material emergencies.

## Chapter 4 Bridges and Elevated Roadways

### 4-1 Alarm Transmission.

**4-1.1** Citizens Band (CB) radio has proven to be an excellent and efficient device to augment regular police patrols for transmissions of emergency alarms to appropriate agencies, especially for bridges in nonurban areas. Signs should be erected at all access points on the bridges indicating that the police monitor Channel 9 (the emergency CB channel). This is especially effective if all police, maintenance, and emergency vehicles are equipped with CB radios, as well as conventional short-wave radios. In addition, 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 should be made conspicuous by indicating lights or other suitable markers, and should be located to permit their use without vehicles having to stop on the roadway.

Signs or mile markers should be installed along the bridge to permit motorists to give reasonably accurate locations for accident or emergency areas.

**4-1.2** A traffic control procedure should be established so that vehicles will either stop or proceed with caution. It is essential that traffic does not block or otherwise interfere with the response of emergency and fire equipment.

### 4-2 Fire Apparatus, Water Supplies, Equipment.

**4-2.1** Suitable apparatus should be available within 1 mile (1.6 km) of all points on elevated roadways and bridges in urban areas; 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 should be based on 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 and elevated roadways should be equipped with potassium bicarbonate-base dry chemical/AFFF or similar self-contained fire fighting equipment. In addition, the vehicle should have booster tanks [500 gal (1900 L) minimum], and should be radio equipped.

**4-2.1.1** Responding fire apparatus should be equipped to deliver foam at a rate of 200 gpm (757 L/min) for a duration of 30 minutes. If hydrant or standpipe water is not available, suitable arrangements should be made to transport water in tankers such that the delivery rate of foam can be maintained. Additional supplies of foam should be readily available from mutual aid fire departments or other sources such that the application can be continued for an additional 45 minutes if necessary. These units should also carry multipurpose dry chemical extinguishers and an extinguishing agent for Class D metal fires. Mutual aid, supplier, or manufacturer reserve capability should be available.

**4-2.2 Urban Bridges.** Hose outlets (hydrants) from the municipal water supply shall be located at each end of bridges. Where more than one agency has the responsibility for providing fire protection, every effort should be made to standardize hose connectors. If this is not possible, suitable adapters should be readily available. In addition, where the length or width of the bridge is such that hose lines of over 400 ft (122 m) cannot be provided from the hydrants, a standpipe system capable of supplying not less than 1,000 gpm (3,800 L/min) at adequate pressures [minimum 20 psi (140 kPa) residual] should be provided. No point on the bridge should be more than 150 ft (45.7 m) from a hose outlet or connection. An alternate would be to supply a standpipe system from pumpers in the street below and, if available, from fire boats. It is desirable that duplicated systems be installed on each side of the roadway and the systems be cross-connected. Where freezing conditions prevail, systems should be dry-type. Signs should indicate the location of street-level hydrants.

**4-2.3** Sand should be provided for use during icy weather conditions. Suitable absorbent materials should be provided for controlling the spill of hazardous materials. On bridges and elevated roadways, consideration should be given to drainage systems to channel spilled hazardous materials to areas that will not cause additional hazards. For example, expansion joints should be designed to prevent spillage to the area below.

### 4-3 Control of Hazardous Materials.

**4-3.1** The authority having jurisdiction of a bridge facility or an elevated roadway, especially those in excess of 200 ft (60 m) in length, should adopt rules and regulations found in Title 49, Transportation, *Code of Federal Regulations*, Parts 100-199, applicable to the transportation of hazardous materials. A program should be maintained for enforcing these regulations. 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.

### 4-4 Responsibility for Fire Protection.

**4-4.1** It is important that a designated authority carry out a complete and coordinated program of fire protection that should include preplanned response procedures.

**4-4.2** To derive the maximum benefit from the fire protection program, comprehensive training programs are necessary for all personnel and agencies expected to participate in fire fighting operations and hazardous material emergencies. Such a program should involve a competent supervisory staff experienced in fire fighting techniques and hazardous material emergencies.

## Chapter 5 Air Right Structures

### 5-1 Alarm Transmission.

**5-1.1** When the air right structure approximates the physical characteristics of a tunnel, an alarm system similar to that of a tunnel should be considered. Means should be provided whereby emergency alarms may be transmitted by the general public. Coded alarm or outdoor-type telephone boxes should be installed at intervals of not more than 200 ft (60 m) and should be made conspicuous by indicating lights or other suitable markers. Air right structure roadways with heavy traffic volumes should be equipped with a traffic monitoring system that would automatically transmit alarms to a central control at any time normal traffic is interrupted. Such a system is most effective when it is integrated with a

closed-circuit television system. Some method of early detection of smoke and/or fire should be provided.

**5-1.2** A traffic control system should be provided. It may be interlocked with the fire alarm system. The system should be capable of operation from a remote control source or from either end of the roadway passing under the air right structure. The traffic control system should be designed for use by authorized personnel only.

**5-2 Fire Apparatus — Equipment.**

**5-2.1** Fire apparatus assigned to companies responsible for air right structure roadways must be equipped to effectively deal with flammable liquid and hazardous material fires and incidents. They should be equipped to carry foam, potassium-based dry chemical/AFFF, or similar systems for this purpose and suitable to the unique characteristics of the structure. If the air right structure roadway approximates the physical characteristics of a tunnel, the fire apparatus required would be similar to that required for a tunnel.

**5-3 Water Supplies.**

**5-3.1** When the air right structure approximates the physical characteristics of a tunnel, the water supply for the air right structure roadway should resemble that of a tunnel. The primary water supply should be preferably a strong municipal water supply system with connections at each end of the air right structure roadway. If a municipal supply is not available, storage tanks (supplying each end of the air right structure roadway) should be provided, with the full suggested capacity available at either end of the air right structure roadway.

**5-3.2** Fire pumps should be supplied as required.

**5-3.3** Where the suggested hose outlets along the length of the air right structure roadway are fed from a standpipe rather than directly from a municipal water line, an auxiliary water supply in the form of local fire department siamese connections should be provided at each end of the air right structure roadway.

**5-3.4** The minimum water supply at any hose outlet within the air right structure roadway should be the same as that for a tunnel.

**5-3.5** It is recommended that the water supply be available for at least one hour. Systems should be designed to provide suggested capacity with part of the system closed for maintenance.

**5-3.6** Where freezing conditions are likely to be encountered, the system must be heated. Alarm mechanisms should be provided to warn of approaching failure of the freeze-protection system.

**5-3.7** Although charged (wet) systems are preferable, dry systems may be acceptable. The delivery time of water to any point in the air right roadway from either end should be less than ten minutes.

Automatic, remote control (redundant) systems should be provided and supervised. Dry systems are suitable only where adequate 24-hour supervision is available to activate the system.

**5-3.8** Hose connections should be installed and conspicuously marked so that no point within the air right structure roadway is more than 150 ft (45.7 m) from a hose connection. Where more than one agency has the responsibility for providing fire protection, every effort should be made to coordinate hose connections. If this is not possible, suitable adapters should be readily available.

**5-4 Portable Extinguishers.**

**5-4.1** Portable multipurpose fire extinguishers, each with a nominal 20-lb (9-kg) capacity, should be placed on both sides of the roadway in well-marked, flush-wall cabinets, at intervals of not more than 200 ft (60 m). Consideration should be given to incorporating removal of an extinguisher into the fire alarm system.

**5-5 Emergency Ventilation.**

**5-5.1** Air right structure roadways in excess of 200 ft (60 m) in length should be designed with a positive ventilation system. The ventilation equipment should be heat resistant so it is capable of operating even under fire conditions. Emergency ventilation procedures should be developed to permit maximum utilization of the system for removal of smoke from the roadway area during fires. The design of the system should provide excess ventilation capabilities for this purpose. The design should also prevent or minimize adverse effects on air right structures and their occupants from the fire products such as heat, smoke, and toxic gases.

**5-6 Drainage System.**

**5-6.1** A complete drainage system should be provided for the air right structure roadway. Sumps with automatic pumps should be provided where necessary. The design of the drainage system should provide protected collection areas so that spills of hazardous materials, such as flammable liquids, cannot create a fire or health hazard in another area.

**5-7 Control of Hazardous Materials.**

**5-7.1** The authority having jurisidiction over an air right structure roadway, especially those in excess of 200 ft (60 m) in length, should adopt rules and regulations found in Title 49, Transporation, *Code of Federal Regulations*, Parts 100-199, applicable to the transporation of hazardous materials. A program should be maintained for enforcing these regulations.

**5-8 Structural Factors.**

**5-8.1** All structural elements that support buildings over roadways and/or provide separation between the buildings and roadways should have a 4-hour fire resistance rating in accordance with ASTM E119, *Fire Tests of Building Construction and Materials.* This recommendation does not apply to the buildings above the 4-hour-rated separation.

**5-8.2** Structural members should be protected from physical damage from vehicle accidents. An inspection and repair program should be kept in force to maintain the protection.

**5-8.3** Roadway, center line, structural support elements should be discouraged.

**5-8.4** Buildings above roadways should be designed with the consideration that the roadway below the air right structure is a potential source of heat, smoke, and toxic gases. The design of the structural elements should be such as to shield the air right buildings from these potential hazards. The design of the building should neither increase nor create any risk to the patrons of the roadway below.

**5-9 Responsibility for Fire Protection.**

**5-9.1** It is important that a designated authority carry out a complete and coordinated program of fire protection that should include written preplanned response and Standard Operating Procedures (S.O.P.).

**5-9.2** To derive the maximum benefit from the fire protection program, joint comprehensive training exercises are necessary for all personnel and agencies expected to participate in fire fighting operations and hazardous material emergencies. The training program should involve a competent supervisory staff experienced in fire fighting techniques and hazardous material emergencies.

## Chapter 6 Referenced Publications

**6-1** The following documents or portions thereof are referenced within this document and should be considered part of the recommendations of this document. The edition indicated for each reference should be the current edition as of the date of the NFPA issuance of this document. These references should be listed separately to facilitate updating to the latest edition by the user.

**6-1.1 NFPA Publication.** National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 10-1984, *Standard for Portable Fire Extinguishers.*

**6-1.2 Other Publications.**

**6-1.2.1 ASTM Publications.** American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E119-1978, *Fire Tests of Building Construction and Materials*

ASTM E380-1976, *Standard for Metric Practice.*

**6-1.2.2 CFR Publication.** Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20401.

Title 49, Transportation, *Code of Federal Regulations,* Parts 100-199.

## Appendix A

**A-1** The following documents or portions thereof are referenced within this document for informational purposes only and thus are not considered part of the recommendations of this document. The edition indicated for each reference should be the current edition as of the date of the NFPA issuance of this document. These references should be listed separately to facilitate updating to the latest edition by the user.

**A-1.1 NFPA Publications.** National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

NFPA 30-1987, *Flammable and Combustible Liquids Code*

NFPA 88B-1985, *Standard for Repair Garages*

NFPA 96-1987, *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.*

# Index

# SUBMITTING PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

**Contact NFPA Standards Administration for final date for receipt of proposals on a specific document.**

## INSTRUCTIONS

**Please use the forms which follow for submitting proposed amendments. Use a separate form for each proposal.**

1. For each document on which you are proposing amendment indicate:
   (a) The number and title of the document
   (b) The specific section or paragraph.

2. Check the box indicating whether or not this proposal recommends new text, revised text, or to delete text.

3. In the space identified as "Proposal" include the wording you propose as new or revised text, or indicate if you wish to delete text.

4. In the space titled "Statement of Problem and Substantiation for Proposal" state the problem which will be resolved by your recommendation and give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If a statement is more than 200 words in length, the technical committee is authorized to abstract it for the Technical Committee Report.

5. Check the box indicating whether or not this proposal is original material, and if it is not, indicate source.

6. If supplementary material (photographs, diagrams, reports, etc.) is included, you may be required to submit sufficient copies for all members and alternates of the technical committee.

NOTE: The NFPA Regulations Governing Committee Projects in Paragraph 10-10 state: Each proposal shall be submitted to the Council Secretary and shall include:

(a) identification of the submitter and his affiliation (Committee, organization, company) where appropriate, and

(b) identification of the document, paragraph of the document to which the proposal is directed, and

(c) a statement of the problem and substantiation for the proposal, and

(d) proposed text of proposal, including the wording to be added, revised (and how revised), or deleted.

**FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS**

**Mail to:** Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

**Date** 5/18/85 **Name** John B. Smith **Tel. No.** 617-555-1212

**Address** 9 Seattle St.. Seattle, WA 02255

**Representing (Please indicate organization, company or self)** Fire Marshals Assn. of North America

1. a) **Document Title:** Protective Signaling Systems **NFPA No. & Year** NFPA 72D

   b) **Section/Paragraph:** 2-7.1 (Exception)

2. **Proposal recommends: (Check one)** ☐ new text
   ☐ revised text
   ☒ deleted text.

3. **Proposal (include proposed new or revised wording, or identification of wording to be deleted):**

   Delete exception.



4. **Statement of Problem and Substantiation for Proposal:**

   A properly installed and maintained system should be free of ground faults. The occurrence of one or more ground faults should be required to cause a "trouble" signal because it indicates a condition that could contribute to future malfunction of the system. Ground fault protection has been widely available on these systems for years and its cost is negligible. Requiring it on all systems will promote better installations, maintenance and reliability.

5. ☒ **This Proposal is original material.**
   ☐ **This Proposal is not original material; its source (if known) is as follows:** _____

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

**I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.**

John B. Smith
**Signature**

**PLEASE USE SEPARATE FORM FOR EACH PROPOSAL**

## FORM FOR PROPOSALS ON NFPA TECHNICAL COMMITTEE DOCUMENTS

Mail to: Secretary, Standards Council
National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269

Date _____ Name _____ Tel. No. _____

Address _____

Representing (Please indicate organization, company or self) _____

1. a) Document Title: _____ NFPA No. & Year _____

   b) Section/Paragraph: _____

2. Proposal recommends: (Check one) ☐ new text
   ☐ revised text
   ☐ deleted text.

3. Proposal (include proposed new or revised wording, or identification of wording to be deleted):

4. Statement of Problem and Substantiation for Proposal:

5. ☐ This Proposal is original material.
   ☐ This Proposal is not original material; its source (if known) is as follows: _____

(Note: Original material is considered to be the submitter's own idea based on or as a result of his own experience, thought, or research and, to the best of his knowledge, is not copied from another source.)

I agree to give NFPA all and full rights, including rights of copyright, in this Proposal and I understand that I acquire no rights in any publication of NFPA in which this Proposal in this or another similar or analogous form is used.

_____
Signature

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL

Cut Here