NFPA 520

Standard on Subterranean Spaces

2005 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS

Not for Resale

IMPORTANT NOTICES AND DISCLAIMERS CONCERNING NFPA DOCUMENTS

NOTICE AND DISCLAIMER OF LIABILITY CONCERNING THE USE OF NFPA DOCUMENTS

NFPA codes, standards, recommended practices, and guides, of which the document contained herein is one, are developed through a consensus standards development process approved by the American National Standards Institute. This process brings together volunteers representing varied viewpoints and interests to achieve consensus on fire and other safety issues. While the NFPA administers the process and establishes rules to promote fairness in the development of consensus, it does not independently test, evaluate, or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards.

The NFPA disclaims liability for any personal injury, property or other damages of any nature whatsoever, whether special, indirect, consequential or compensatory, directly or indirectly resulting from the publication, use of, or reliance on this document. The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.

In issuing and making this document available, the NFPA is not undertaking to render professional or other services for or on behalf of any person or entity. Nor is the NFPA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

The NFPA has no power, nor does it undertake, to police or enforce compliance with the contents of this document. Nor does the NFPA list, certify, test or inspect products, designs, or installations for compliance with this document. Any certification or other statement of compliance with the requirements of this document shall not be attributable to the NFPA and is solely the responsibility of the certifier or maker of the statement.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

ADDITIONAL NOTICES AND DISCLAIMERS

Updating of NFPA Documents

Users of NFPA codes, standards, recommended practices, and guides should be aware that these documents may be superseded at any time by the issuance of new editions or may be amended from time to time through the issuance of Tentative Interim Amendments. An official NFPA document at any point in time consists of the current edition of the document together with any Tentative Interim Amendments and any Errata then in effect. In order to determine whether a given document is the current edition and whether it has been amended through the issuance of Tentative Interim Amendments or corrected through the issuance of Errata, consult appropriate NFPA publications such as the National Fire Codes® Subscription Service, visit the NFPA website at www.nfpa.org, or contact the NFPA at the address listed below.

Interpretations of NFPA Documents

A statement, written or oral, that is not processed in accordance with Section 6 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.

Patents

The NFPA does not take any position with respect to the validity of any patent rights asserted in connection with any items which are mentioned in or are the subject of NFPA codes, standards, recommended practices, and guides, and the NFPA disclaims liability for the infringement of any patent resulting from the use of or reliance on these documents. Users of these documents are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

NFPA adheres to applicable policies of the American National Standards Institute with respect to patents. For further information contact the NFPA at the address listed below.

Law and Regulations

Users of these documents should consult applicable federal, state, and local laws and regulations. NFPA does not, by the publication of its codes, standards, recommended practices, and guides, intend to urge action that is not in compliance with applicable laws, and these documents may not be construed as doing so.

Copyrights

This document is copyrighted by the NFPA. It is made available for a wide variety of both public and private uses. These include both use, by reference, in laws and regulations, and use in private self-regulation, standardization, and the promotion of safe practices and methods. By making this document available for use and adoption by public authorities and private users, the NFPA does not waive any rights in copyright to this document.

Use of NFPA documents for regulatory purposes should be accomplished through adoption by reference. The term "adoption by reference" means the citing of title, edition, and publishing information only. Any deletions, additions, and changes desired by the adopting authority should be noted separately in the adopting instrument. In order to assist NFPA in following the uses made of its documents, adopting authorities are requested to notify the NFPA (Attention: Secretary, Standards Council) in writing of such use. For technical assistance and questions concerning adoption of NFPA documents, contact NFPA at the address below.

For Further Information

All questions or other communications relating to NFPA codes, standards, recommended practices, and guides and all requests for information on NFPA procedures governing its codes and standards development process, including information on the procedures for requesting Formal Interpretations, for proposing Tentative Interim Amendments, and for proposing revisions to NFPA documents during regular revision cycles, should be sent to NFPA headquarters, addressed to the attention of the Secretary, Standards Council, NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

For more information about NFPA, visit the NFPA website at www.nfpa.org.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Copyright © 2005, National Fire Protection Association, All Rights Reserved

NFPA 520

Standard on

Subterranean Spaces

2005 Edition

This edition of NFPA 520, *Standard on Subterranean Spaces*, was prepared by the Technical Committee on Subterranean Spaces and acted on by NFPA at its November Association Technical Meeting held November 13–17, 2004, in Miami Beach, FL. It was issued by the Standards Council on January 14, 2005, with an effective date of February 7, 2005, and supersedes all previous editions.

This edition of NFPA 520 was approved as an American National Standard on February 7, 2005.

Origin and Development of NFPA 520

In 1993, a symposium was convened by the United States Fire Administration to examine the problem of fire in subterranean spaces that have been converted for commercial use. The symposium was the result of a fire in a developed subterranean space in Kansas City, Kansas, that burned from December 1991 to April 1992. The symposium examined several unique fire and life safety issues that exist in subterranean spaces, including means of egress issues such as orientation and excessive travel distances, poor ventilation, communication difficulties, and nontraditional behavior of fire. The result was a recommendation to the National Fire Protection Association to develop a standard that addresses fire and life safety in these occupancies.

The committee has found that NFPA 520 has generally been an effective document over the past 10 years. For the 2005 edition, the committee made only minor revisions to the document by adding some definitions, clarifying some provisions that users had found unclear, and expanding several concepts that have been found to work well.

--`,,,```-`-`,,`,,`,`,,`---

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS

Not for Resale

Technical Committee on Subterranean Spaces

Fred N. Kissell, *Chair*
U.S. Department of Health & Human Services, PA [RT]

Joseph A. Cappuccio, The RJA Group, Inc., VA [SE]
Donald D Cummins, Louisville Fire & Rescue, KY [E]
Michael Earl Dillon, Dillon Consulting Engineers, Inc., CA [SE]
Charles J. Doughty, Iron Mountain/National Underground Storage, Inc., PA [M]
James C. Duddy, Kansas City Fire Marshal's Office, MO [E]
William A. Eppich, The Protectowire Company, Inc., MA [M]
Deane R. Holmes, Aon Risk Services, Inc., MO [I]
Gary W. Kile, Jacobs Civil, Inc., MA [SE]
Lisa J. Krause, Hunt Midwest Real Estate Development, Inc., MO [U]
Jim D. Lewis, American Fire Sprinkler Corporation, KS [IM]
Francis A. McGarry, Frank McGarry Associates, Inc., NY [SE]
Anthony Meister, Fire Protection and Code Consultants, Inc., MO [SE]
David A. Melzer, Dean Realty Company, MO [U]
Jack Poole, Poole Consulting Services, Inc., KS [SE]
Howard (Mike) Thomas, Service Administration, MO [U]
Donald R. Woodard, Donald R. Woodard AICP, MO [U]
Rep. Underground Development Association

Alternate

Paul J. Villotti, Fire Protection and Code Consultants, Inc., MO [SE]
(Alt. to A. Meister)

Allan Fraser, NFPA Staff Liaison

This list represents the membership at the time the Committee was balloted on the final text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of the document.

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.

Committee Scope: This Committee shall have primary responsibility for documents on safeguarding life and property against fire, explosion, and related hazards associated with occupancies located in subterranean spaces not addressed by other documents.

--`,,`,,`-`-`,,`,,`,`,,`---
Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Contents

Chapter 1 Administration **520–** 4
1.1 Scope **520–** 4
1.2 Purpose **520–** 4
1.3 Application **520–** 4
1.4 Retroactivity **520–** 4
1.5 Equivalency **520–** 4

Chapter 2 Referenced Publications **520–** 4
2.1 General **520–** 4
2.2 NFPA Publications **520–** 4
2.3 Other Publications **520–** 4

Chapter 3 Definitions **520–** 5
3.1 General **520–** 5
3.2 NFPA Official Definitions **520–** 5
3.3 General Definitions **520–** 5

Chapter 4 Construction Features **520–** 5
4.1 Occupancy in Subterranean Spaces **520–** 5
4.2 Compartmentation Requirements **520–** 8
4.3 Interior Finish **520–** 8
4.4 Electrical Installations **520–** 8
4.5 Control of Smoke Spread **520–** 9

Chapter 5 Means of Egress **520–** 9
5.1 Means of Egress Within the Building **520–** 9
5.2 Means of Egress from the Common Space **520–** 9
5.3 Occupant Load Determination **520–** 9
5.4 Egress Capacity **520–** 9
5.5 Exit Doors **520–** 9
5.6 Illumination in Common Spaces **520–** 9
5.7 Marking **520–** 9
5.8 Refuge Areas **520–** 9
5.9 Exit Passageway **520–**10

Chapter 6 Fire Alarm, Detection, and Suppression Systems **520–**10
6.1 Fire Alarm Systems **520–**10
6.2 Sprinkler Systems **520–**10
6.3 Standpipe Systems **520–**10
6.4 Water Supply **520–**11
6.5 Maintenance **520–**11
6.6 Emergency Power **520–**11
6.7 Standby Power **520–**11
6.8 Alternate Power Supplies **520–**11

Chapter 7 Emergency Preparedness **520–**11
7.1 Emergency Action Plan **520–**11
7.2 Breathing Apparatus **520–**11
7.3 Fire Exit Drills **520–**11
7.4 Fire Extinguishers **520–**12

Chapter 8 Fire Department Provisions **520–**12
8.1 Communications **520–**12
8.2 Preplanning **520–**12
8.3 Fire Department Access **520–**12

Annex A Explanatory Material **520–**12

Annex B Diagrams of Subterranean Spaces **520–**13

Annex C Informational References **520–**14

Index **520–**15

--`,,`-`-`,,`,,`,`,,`---
Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

NFPA 520

Standard on

Subterranean Spaces

2005 Edition

IMPORTANT NOTE: This NFPA document is made available for use subject to important notices and legal disclaimers. These notices and disclaimers appear in all publications containing this document and may be found under the heading "Important Notices and Disclaimers Concerning NFPA Documents." They can also be obtained on request from NFPA or viewed at www.nfpa.org/disclaimers.

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [ ] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for mandatory extracts are given in Chapter 2 and those for nonmandatory extracts are given in Annex C. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1* Scope.

1.1.1 This standard addresses the safeguarding of life and property against fire, explosion, and related hazards associated with developed subterranean spaces.

1.1.2 This standard does not cover the following types of subterranean spaces:

(1) Tourist caverns
(2) Wine storage caverns
(3) Gas and oil storage reservoirs
(4) Hazardous waste repositories
(5) Utility installations such as pump stations
(6) Working mines
(7) Transportation and pedestrian tunnels
(8) Aboveground buildings with belowground stories
(9) Cut and cover underground structures specifically addressed in the building code

1.2 Purpose. The purpose of this standard is to provide minimum requirements for the design, operation, and maintenance of developed subterranean spaces for safety to life and property from fire and similar hazards.

1.3 Application.

1.3.1 General.

1.3.1.1 The requirements of this standard apply to newly developed subterranean spaces.

1.3.1.2 Where specifically noted, this standard also applies to existing facilities.

1.3.2* Modifications, Remodeling, and Additions. Where modifications are made, remodeling is done, or additional space is created in an existing developed subterranean space, the requirements of this standard apply to those modifications, remodeling, or additions.

1.4 Retroactivity. When requirements of this standard apply to existing subterranean spaces, a limited but reasonable time shall be allowed for compliance that is commensurate with the magnitude of the expenditure, the disruption of services, and the degree of hazard.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety as alternatives to those prescribed by this standard, provided sufficient technical documentation is submitted to the authority having jurisdiction to demonstrate the system, method, or device is approved for the intended purpose and is equivalent.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers,* 2002 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2002 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2003 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2003 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 2003 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2002 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2002 edition.

NFPA 70, *National Electrical Code®,* 2005 edition.

NFPA 72®, National Fire Alarm Code®, 2002 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows,* 1999 edition.

NFPA *101®, Life Safety Code®,* 2003 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2005 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* 2005 edition.

NFPA 221, *Standard for Fire Walls and Fire Barrier Walls,* 2000 edition.

NFPA 600, *Standard on Industrial Fire Brigades,* 2005 edition.

2.3 Other Publications. (Reserved)

--`,,```-`-`,,`,,`,`,,`---
Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary,* 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.4 Shall. Indicates a mandatory requirement.

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

3.2.6 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Building. An area of the subterranean space that is separated from the common space or the undeveloped space by fire-resistive construction.

3.3.2 Control Area. An area within a building for storage and use of high-hazard materials.

3.3.3 Exit Passageway. An enclosed passageway that leads from the subterranean space to the exterior public way.

3.3.4 Exterior Building Wall. The rock surface or constructed wall that separates a building in the subterranean space from the remainder of the space.

3.3.5 Fire Command Center. The principal attended or unattended location where the status of the detection, alarm communications, and control systems is displayed and from which the system(s) can be manually controlled. [*72*, 2002]

3.3.6 Floor Area.

3.3.6.1 ***Gross Floor Area.*** The floor area within the inside perimeter of the outside walls of the building under consideration with no deduction for hallways, stairs, closets, and thickness of interior walls, columns, or other features. Where the term *area* is used elsewhere in this standard, it shall be understood to be gross floor area unless otherwise specified.

3.3.6.2 ***Net Floor Area.*** The gross floor area minus the area of support columns.

3.3.7 Hazard.

3.3.7.1 ***High Hazard.*** Contents that are likely to burn with extreme rapidity or from which explosions are likely.

3.3.7.2 ***Low Hazard.*** Contents of such low combustibility that no self-propagating fire therein can occur.

3.3.7.3 ***Ordinary Hazard.*** Contents that are likely to burn with moderate rapidity or to give off a considerable volume of smoke.

3.3.8 Noncombustible. Not capable of supporting combustion. [**80,** 1999]

3.3.9 Parking Area. An area used for parking of occupant vehicles that is not intended to serve as storage of vehicles.

3.3.10 Portal. A horizontal roadway or pedestrian entry to or exit from the subterranean space.

3.3.11 Roadway. Any passageway within the subterranean space intended for use by motor vehicles or by pedestrian traffic.

3.3.11.1 ***Fire Department Vehicle Roadway.*** Any major thoroughfare designated for fire department apparatus.

3.3.12 Roof. The rock overlying the subterranean space together with any structural reinforcement in the form of rock bolts, a surface layer of shotcrete, and/or other reinforcement.

3.3.13 Subterranean Space. A cavern resulting from the extraction of subsurface-located material from underground areas in a manner that the surface area of the property is not disturbed except in the vicinity of the entrances and ventilation openings.

3.3.13.1 ***Developed Space.*** An area of the subterranean space that has been altered for the use of advanced industrial capability, technological sophistication, or economic productivity.

3.3.13.1.1 ***Common Space.*** The area of the developed subterranean space other than buildings, including but not limited to roadways, railways, loading docks, and entrances.

3.3.13.2 ***Undeveloped Space.*** Subterranean space that has been mined but has not been altered for the use of advanced industrial capability, technological sophistication, or economic productivity.

Chapter 4 Construction Features

4.1 Occupancy in Subterranean Spaces.

4.1.1 General. The following occupancies shall be allowed within new and existing buildings:

(1) Assembly
(2) Business
(3) Educational
(4) Detention and correctional
(5) Health care
(6) Residential
(7) Board and care
(8) Industrial
(9) Mercantile
(10) Storage

--`,,```-`-`,,`,,`,`,,`---
Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

4.1.2 Special Occupancy Requirements. In addition to the requirements contained herein, assembly, educational, detention and correctional, health care, and residential occupancies shall comply with the provisions of NFPA *101, Life Safety Code*.

4.1.3 Storage and Use of High-Hazard Materials.

4.1.3.1 Occupancies that contain materials that are within the maximum quantities specified in Table 4.1.3.1(a), Table 4.1.3.1(b), and Table 4.1.3.1(c) shall be permitted.

4.1.3.1.1 The aggregate quantity in use and storage shall not exceed the quantity listed for storage in Table 4.1.3.1(a), Table 4.1.3.1(b), and Table 4.1.3.1(c).

4.1.3.1.2 The quantities of alcoholic beverages in retail sales uses shall be unlimited provided the liquids are packaged in individual containers not exceeding 1 gal (4 L).

4.1.3.1.3 The quantities of medicines, foodstuffs, and cosmetics containing not more than 50 percent of volume of water-miscible liquids with the remainder of the solutions not being flammable shall be unlimited in retail sales or storage occupancies when packaged in individual containers not exceeding 1 gal (4 L).

4.1.3.1.4 Quantities of gaseous and liquefied flammable gases and flammable solids shall be permitted to be increased 100 percent in accordance with Table 4.1.3.1(a), Table 4.1.3.1(b), and Table 4.1.3.1(c) in sprinklered buildings.

4.1.3.1.4.1 When 4.1.3.1.5 also applies, the increase for 4.1.3.1.4 and 4.1.3.1.5 shall be permitted to be applied.

4.1.3.1.5 Quantities shall be permitted to be increased 100 percent in accordance with Table 4.1.3.1(a), Table 4.1.3.1(b), and Table 4.1.3.1(c) when stored in approved storage cabinets, gas cabinets, or exhausted enclosures.

4.1.3.1.5.1 When 4.1.3.1.4 also applies, the increase for 4.1.3.1.4 and 4.1.3.1.5 shall be permitted to be applied.

4.1.3.1.6 The quantities of Class III-B combustible liquids permitted in a sprinklered building shall not be limited.

4.1.3.2 The storage and use of high-hazard materials not covered by Table 4.1.3.1(a), Table 4.1.3.1(b), and Table 4.1.3.1(c) shall be permitted when approved by the authority having jurisdiction.

4.1.3.3 Flammable and combustible liquids necessary for emergency power generation and other emergency equipment shall be permitted in accordance with 4.4.3.

4.1.4 Control Areas. Control areas shall be constructed in accordance with this subsection.

4.1.4.1 Control areas shall be protected with a fire suppression system that is adequate to suppress fires of the material being stored and/or used and is installed in accordance with the applicable NFPA standard.

4.1.4.2 Control areas shall be separated from each other and all other areas by a wall with at least a 2-hour fire resistance rating.

4.1.4.2.1 The number of control areas within a building used for retail or wholesale sales shall not exceed two.

4.1.4.2.2 The number of control areas in buildings with other uses shall not exceed four.

4.1.4.3 Construction of Areas Containing High-Hazard Liquids.

4.1.4.3.1 Floors. The floor of these areas shall be noncombustible, liquidtight construction.

Table 4.1.3.1(a) Maximum Quantity of High-Hazard Material in Storage[a] per Control Area[b]

		Solid		Liquid		Gas	
Material	**Class**	**lb**	**kg**	**gal**	**L**	**ft³**	**m³**
Combustible liquid[c,d]	II			120[e]	454		
	III-A			330[e]	1,249		
	III-B			13,200[e, f]	49,963		
Combustible fiber							
Loose		100 ft³	2.8 m³				
Baled		1,000 ft³	28 m³				
Explosives		1[e]	0.454	1 lb[e]	0.454 kg		
Flammable solid		125[d,e]	56				
Flammable gas							
Gaseous						750[d,e]	21.2
Liquefied				15[d,e]	56.7		
Flammable liquid[c,d]	I-A			30[e]	113.5		
	I-B			60[e]	227		
	I-C			90[e]	340.7		
Combination							
I-A, I-B, I-C				120[e]	454		

[a] See 4.1.3.1.1.
[b] See 4.1.4.2.
[c] See 4.1.3.1.2 and 4.1.3.1.3.
[d] See 4.1.3.1.4.
[e] See 4.1.3.1.5.
[f] See 4.1.3.1.6.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Table 4.1.3.1(b) Maximum Quantity of High-Hazard Material in Use[a] in Closed Systems per Control Area[b]

		Solid		Liquid		Gas	
Material	**Class**	**lb**	**kg**	**gal**	**L**	**ft³**	**m³**
Combustible liquid[c,d]	II			120	454		
	III-A			330	1,249		
	III-B			13,200[f]	49,963		
Combustible fiber							
Loose		100 ft³	2.8 m³				
Baled		1,000 ft³	28 m³				
Explosives		0.25	0.114	0.25 lb	0.114 kg		
Flammable solid							
Flammable gas							
Gaseous						750[d,e]	21.2
Liquefied				15[d,e]	56.7		
Flammable liquid[c,d]	I-A			30	113.5		
	I-B			60	227		
	I-C			90	340.7		
Combination							
I-A, I-B, I-C				120	454		

[a] See 4.1.3.1.1.
[b] See 4.1.4.2.
[c] See 4.1.3.1.2 and 4.1.3.1.3.
[d] See 4.1.3.1.4.
[e] See 4.1.3.1.5.
[f] See 4.1.3.1.6.

Table 4.1.3.1(c) Maximum Quantity of High-Hazard Material in Use[a] in Open Systems per Control Area[b]

		Solid		Liquid	
Material	**Class**	**lb**	**kg**	**gal**	**L**
Combustible liquid[c,d]	II			30	113.5
	III-A			80	303
	III-B			3,300[e]	12,490
Combustible fiber					
Loose		20 ft³	0.56 m³		
Baled		200 ft³	5.6 m³		
Explosives		0.25	0.114	0.25 lb	0.114 kg
Flammable solid					
Flammable gas					
Gaseous					
Liquefied					
Flammable liquid[c,d]	I-A			10	37.8
	I-B			15	56.7
	I-C			20	75.7
Combination					
I-A, I-B, I-C				30	113.5

[a] See 4.1.3.1.1.
[b] See 4.1.4.2.
[c] See 4.1.3.1.2 and 4.1.3.1.3.
[d] See 4.1.3.1.4.
[e] See 4.1.3.1.6.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

4.1.4.3.2 Sills. All areas shall be recessed a minimum of 4 in. (10 cm) or shall be provided with a liquidtight, raised sill with a minimum height of 4 in. (10 cm) to prevent the flow of liquids to adjoining areas.

4.1.4.3.2.1 Except for surfacing, the sill shall be constructed of noncombustible material and the liquidtight seal shall be compatible with the material being stored.

4.1.4.3.2.2 When liquidtight sills are provided, they shall be permitted to be omitted at door openings by the installation of an open-grate trench that connects to an approved drainage system.

4.1.4.3.3 Drainage System. All areas shall be provided with a drainage system to direct the flow of liquids to an approved location, or the rooms, buildings, or areas shall be designated to provide secondary containment for the high-hazard materials and fire protection water.

4.1.4.3.3.1 Drains from the areas shall be sized to carry the sprinkler system design flow rate over the sprinkler system design area.

4.1.4.3.3.2 The slope of drains shall not be less than 1 percent.

4.1.4.3.3.3 Construction materials for the drainage system shall be compatible with the stored materials.

4.1.4.3.3.4 Incompatible materials shall be separated from each other in the drainage system, except when or unless they have been rendered acceptable for discharge by an approved means into the public sewer.

4.1.4.3.3.5 Drainage of high-hazard materials and fire protection water directed to a neutralizer or treatment system shall comply with 4.1.4.3.3.5(A) and 4.1.4.3.3.5(B).

(A) The neutralizer or treatment system shall be designed to handle the maximum worst-case spill from the single largest container plus the volume of fire protection water from the sprinkler system over the minimum design area for a period of 20 minutes.

(B) Overflow from the neutralizer or treatment system shall be provided to direct high-hazard materials and fire protection water to a safe location away from the area or building, material or fire protection control valve, means of egress, or other building or fire department vehicle roadway.

4.1.4.3.4 Containment System. All drains in the area shall be directed to a containment system or other location designed as secondary containment for the high-hazard materials and fire protection water for the building, room, or area.

4.1.4.3.4.1 The containment system shall be designed to provide secondary containment of high-hazard materials and fire protection water through the use of recessed floors or liquidtight raised sills.

4.1.4.3.4.2 Secondary containment shall be designed to retain the spill from the largest single container plus the design flow rate of the sprinkler systems, or the areas of the room, or areas in which the storage is located, or the sprinkler system design area, whichever is smaller.

4.1.4.3.4.3 The containment capacity shall be capable of containing the flow for 20 minutes.

4.1.4.3.4.4 Overflow from the secondary containment system shall be provided to direct high-hazard materials and fire protection water to a safe location away from the area or building, material or fire protection control valve, means of egress, or other building or fire department vehicle roadway.

4.1.4.3.4.5 When secondary containment is required, a monitoring method capable of detecting high-hazard material leakage from the primary containment into the secondary containment shall be provided.

4.1.4.3.4.6 When visual inspection of the primary containment is impractical, other approved means of monitoring shall be permitted to be provided.

4.1.4.3.4.7 When secondary containment can be subject to the intrusion of water, a monitoring method for such water shall be provided.

4.1.4.3.4.8 Whenever monitoring devices are provided, they shall be connected to distinct visual or audible alarms.

4.2 Compartmentation Requirements.

4.2.1 Developed subterranean spaces shall be compartmented in accordance with 4.2.2.

4.2.2 Walls separating buildings from common spaces shall be of construction with at least a 2-hour fire resistance rating.

4.2.2.1 Glass partitions shall be permitted to be used to separate an enclosed lobby or office area from the common space provided they meet the following:

(1) The lobby or office area is low hazard.
(2) The lobby or office area is separated from the remainder of the tenant space by a wall with at least a 2-hour fire resistance rating.

4.2.3 Walls separating buildings shall be of construction with at least a 2-hour fire resistance rating.

4.2.4 Buildings shall be subdivided by walls with at least a 2-hour fire resistance rating into areas no larger than 360,000 net ft^2 (33,444 m^2).

4.2.5 Walls constructed with a fire resistance rating shall be installed in accordance with NFPA 221, *Standard for Fire Walls and Fire Barrier Walls.*

4.2.6 Opening protection shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows.*

4.2.7 Wall penetrations for pipes, conduits, bus ducts, cables, wires, air ducts, pneumatic tubes and ducts, and similar building service equipment that penetrate exterior building walls as described in Section 4.2 shall be protected in accordance with NFPA 221, *Standard for Fire Walls and Fire Barrier Walls.*

4.2.8 Noncombustible materials shall be used in the construction of all new walls, fixed partitions, insulation, ceilings, and floors.

4.2.9 Fire-retardant coating on otherwise combustible construction materials shall not be permitted.

4.3 Interior Finish. All new wall and ceiling finishes, along with movable partitions, shall conform to the requirements of Chapter 10 of NFPA *101, Life Safety Code.*

4.4 Electrical Installations.

4.4.1 All new electrical and data communications cable shall comply with the requirements of NFPA 70, *National Electrical Code.*

4.4.2 Nonmetallic conduit to address environmental conditions within common spaces shall be permitted.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

4.4.3 Rooms used to store equipment for standby or emergency power generation shall be separated from the remainder of the subterranean space by walls with at least a 2-hour fire resistance rating.

4.5 Control of Smoke Spread.

4.5.1* The movement of smoke between buildings and between buildings and common spaces shall be minimized in accordance with Section 4.5.

4.5.1.1* Exterior building walls as described in Section 4.2 shall be continuous from exterior wall to exterior wall and from floor to roof, including continuity through all concealed spaces, and shall provide an approved means of control of smoke spread.

4.5.1.2 Where pillars are used, the pillar shall be considered part of the exterior wall.

4.5.1.3 Interior smoke barriers required for specific occupancies by NFPA *101*, *Life Safety Code*, shall be provided in accordance with Section 8.5 of NFPA *101*.

4.5.2 Doors in exterior building walls as described in Section 4.2 shall be in accordance with NFPA 80, *Standard for Fire Doors and Fire Windows*, and shall be without undercuts, louvers, or grilles.

4.5.3 Dampers and air-transfer openings penetrating exterior building walls as described in Section 4.2 shall close upon activation by an approved heat detection system, fusible link, or an approved smoke detection system within the ducts.

Chapter 5 Means of Egress

5.1 Means of Egress Within the Building.

5.1.1 Means of egress within new and existing buildings within the subterranean space shall be in accordance with Chapter 7 of NFPA *101*, *Life Safety Code*.

5.1.2 For the purposes of this standard, once the common space is reached, the provisions of NFPA *101*, *Life Safety Code*, shall no longer apply.

5.1.3 Means of egress for new and existing assembly, health care, board and care, and residential occupancies shall comply with the requirements of Chapter 10 and the specific occupancy chapters of NFPA *101*, *Life Safety Code*, both within the building and in the common space.

5.2 Means of Egress from the Common Space.

5.2.1 At least two separate means of egress to the exterior from new and existing subterranean spaces shall be provided.

5.2.2 Required exits from the subterranean space shall be separated by a distance of at least 300 ft (91 m).

5.2.2.1 Means of egress required to be separate shall not be connected by communicating passageways, roadways, and so forth, of less than 300 ft (91 m) in length.

5.2.2.2 Connecting passageways, roadways, and so forth, shall be permitted to be less than 300 ft (91 m) where an approved method of smoke control is provided.

5.2.3* The travel distance to a portal, a refuge area, or the entrance to an exit passageway system shall be not more than 2000 ft (610 m).

5.2.4 When the occupant load exceeds 5000, a third exit leading to the exterior of the subterranean space shall be provided.

5.3 Occupant Load Determination. The number of occupants for exit width calculations from the common space shall either be based on 150 percent of the highest occupant load of a building or 2000 ft^2 (186 m^2) per person net floor area, whichever is greater.

5.4* Egress Capacity.

5.4.1 The egress width within the common space shall be based on 0.2 in. (0.5 cm) per person for level travel and 0.3 in. (0.8 cm) per person for travel on stairs, based on the occupant load determined in Section 5.3.

5.4.2 Where a specific, approved life safety evaluation of the space is provided, the egress width shall be permitted to be modified.

5.5 Exit Doors. Any door in a required means of egress within the common space shall be operable from the inside without the use of a key or special knowledge or effort.

5.6 Illumination in Common Spaces.

5.6.1 Means of egress within the common space shall have illumination providing a minimum of 1 foot-candle (10 lx) measured at the floor level at each hydrant location.

5.6.2 Where the line of sight between hydrants is not possible, additional points of illumination shall be provided.

5.6.3 Means of egress within the common space shall have emergency lighting powered by a standby power supply that provides power for a minimum duration of 1½ hours.

5.7 Marking.

5.7.1 All means of egress within the subterranean space shall be identified for general traffic direction and emergency purposes by signage in reflective lettering that is at least 4 in. (10 cm) high with ½ in. (1.3 cm) wide stroke.

5.7.2 Every other pillar adjacent to roadways and railways shall be identified by name, letter, or number with a large direction arrow associated with the word EXIT in letters not less than 6 in. (15.2 cm) high with ¾ in. (1.9 cm) wide stroke pointing in the direction of nearest exit from the subterranean space.

5.7.3 Maps.

5.7.3.1 All street identification and exit routing within subterranean spaces shall be shown on maps that are available to all persons using the facility, posted in all buildings, and made available to police, fire, and all other agencies with emergency jurisdiction.

5.7.3.2 Maps shall be updated to reflect significant changes on an annual basis.

5.8* Refuge Areas.

5.8.1 One or more refuge areas or exit passageways shall be provided in new and existing subterranean spaces where the travel distance from any building exit to the exterior of the subterranean space exceeds 2000 ft (610 m).

5.8.2 Criteria.

5.8.2.1 Each refuge area shall provide 10 ft^2 (0.9 m^2) of floor area for each person it is intended to serve.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

5.8.2.2 Engineered Fresh Air System.

5.8.2.2.1 Each refuge area shall have an engineered fresh air system that provides fresh air through a borehole from the surface during a fire emergency.

5.8.2.2.2 Air quantity shall either be at least 20 scfm (standard cubic feet per minute) (944 L/s) per person or the minimum required to prevent smoke infiltration, whichever is greater.

5.8.2.3 Areas of refuge shall be provided with positive pressure of 0.05 in./wg (inches/water gauge) (12.5 Pa) relative to the adjacent space.

5.8.2.4 Entrance and exit from the refuge area shall be through a vestibule equipped with doors that have self-closing devices.

5.8.2.5 Refuge areas shall be provided with food, drinking water, emergency lighting, blankets, toilet facilities, and first-aid kits in quantities appropriate to the intended usage.

5.8.2.6 Two-way voice communications to the fire command center shall be provided.

5.8.2.7 Areas of refuge shall be separated from the remainder of the subterranean space by walls with at least a 2-hour fire resistance rating.

5.8.3 Refuge areas shall be permitted to be used during normal operations for other purposes provided that they are always available for refuge purposes.

5.8.4 The surface borehole shall be permitted to be an exhaust ventilation shaft provided that the direction of airflow can be reversed during an emergency by controls located in the refuge area.

5.9 Exit Passageway.

5.9.1 An exit passageway or exit enclosure shall be separated from the remainder of the space by walls with at least a 1-hour fire resistance rating.

5.9.2 An exit passageway or exit enclosure shall be supplied with outside air sufficient to provide positive pressure of 0.05 in./wg (12.5 Pa) relative to the adjacent subterranean space.

5.9.3 Openings other than required exits from normally occupied building spaces and common spaces shall not be permitted.

5.9.4 Penetrations other than ducts, sprinkler piping, and electrical conduit serving the exit passageway shall not be permitted.

5.9.5 The width of an exit passageway shall be adequate to accommodate the aggregate required capacity of all exits discharging through it, but in no case shall be less than 44 in. (112 cm).

Chapter 6 Fire Alarm, Detection, and Suppression Systems

6.1 Fire Alarm Systems.

6.1.1 General. A fire alarm system shall be provided in each newly developed subterranean space.

6.1.1.1 A fire alarm system shall be provided in the portion of the common space used as the sole means of egress.

6.1.1.2 Where required, the fire alarm system shall be installed and maintained in accordance with *NFPA 72, National Fire Alarm Code.*

6.1.2 Initiation.

6.1.2.1 Initiation shall be by manual means or by any required automatic fire detection or suppression system.

6.1.2.2 Buildings without fire suppression systems or fire detection systems that are required to have a fire alarm system shall be provided with manual initiation in accordance with *NFPA 72, National Fire Alarm Code.*

6.1.2.3 An automatic fire detection system shall be installed in a new building, including loading docks, unless such areas are provided with an automatic suppression system.

6.1.3 Notification.

6.1.3.1 Notification of the fire alarm system shall be by general alarm throughout a building or space.

6.1.3.1.1* Where total evacuation of occupants is impractical due to the configuration of the building, only the occupants in the affected zones shall be initially notified.

6.1.3.1.2 Provisions shall be made to selectively notify occupants in other zones to afford orderly evacuation of the entire building.

6.1.3.2 The fire alarm system shall transmit an alarm signal to the fire command center.

6.1.4* Fire Command Center. A fire command center shall be located near the entrance of the subterranean space unless the facility maintains a 24-hour interior structural fire brigade meeting the requirements of NFPA 600, *Standard on Industrial Fire Brigades.*

6.1.4.1 An annunciator panel shall be provided.

6.1.4.2 Audible and visual signals shall be provided for each zone.

6.1.4.3 An approved map of the subterranean space shall be located at or near the annunciator panel.

6.1.4.4 The map shall identify by letter, name, or number, each pillar adjacent to a roadway or railway, each building, or tenant space.

6.2 Sprinkler Systems.

6.2.1 A sprinkler system shall be provided throughout all developed areas of new and existing subterranean space except in the following areas:

(1) Existing freezer storage areas
(2) Common space in which roadways, railways, and parking areas are not the sole means of egress from any building of the subterranean space
(3) Areas protected by other approved fire suppression systems designed and installed in accordance with the applicable NFPA standard

6.2.2 Required sprinkler systems shall be installed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems.*

6.3 Standpipe Systems.

6.3.1 All nonsprinklered parking areas in new subterranean spaces with travel distances greater than 500 ft (152 m) from the nearest fire hydrant shall be protected by a Class I standpipe system.

6.3.2 All nonsprinklered parking areas in existing subterranean spaces that are not accessible by fire department apparatus shall be protected by a Class I standpipe system.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

6.3.3 All nonsprinklered railways in new and existing subterranean spaces that are used as a required means of egress and that have travel distances greater than 500 ft (152 m) from the nearest fire hydrant shall be protected by a Class I standpipe system.

6.3.4 All nonsprinklered freezer areas in existing subterranean spaces shall be served by exterior hydrants with travel distances not greater than 500 ft (152 m) to the most remote portion of the freezer or shall be protected by a Class I standpipe system.

6.3.5 Where required, standpipes shall be installed in accordance with NFPA 14, *Standard for the Installation of Standpipe and Hose Systems.*

6.4 Water Supply.

6.4.1 All new and existing subterranean spaces shall be provided with an adequate and reliable water supply as approved by the authority having jurisdiction.

6.4.2 Fire hydrants shall be located along developed roadways and roadways serving building-type construction at not more than 500 ft (152 m) intervals or as necessary to protect all accessible exterior building areas.

6.4.3 Fire protection equipment and systems, where required, shall be installed in accordance with NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*; NFPA 22, *Standard for Water Tanks for Private Fire Protection*; and NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection.*

6.5 Maintenance.

6.5.1 All water-based extinguishing systems shall be maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.*

6.5.2 Where flow testing of systems or equipment is impractical, an alternate means of testing shall be permitted as approved by the authority having jurisdiction.

6.6 Emergency Power.

6.6.1 For power loads classified as emergency power, the transition time from the instant of failure of the normal power source to an alternative power source shall not exceed 10 seconds.

6.6.2 Where required, the following shall be classified as emergency power loads:

(1) Fire detection systems
(2) Fire alarm systems
(3) Exit sign illumination
(4) Emergency lighting
(5) Fire command center lighting

6.7 Standby Power.

6.7.1 For power loads classified as standby power, the transition time from the instant of failure of the normal power source to an alternative power source shall not exceed 60 seconds unless there is an approved secondary, independent source of power in accordance with Article 700, Part III, of NFPA 70, *National Electrical Code.*

6.7.2 Where required, the following shall be classified as standby power loads:

(1) Electric-driven fire pumps
(2) Mechanical air-handling systems and smoke control systems for all areas of refuge and exit passageways
(3) Standby lighting required for areas of refuge and smoke control mechanical equipment rooms
(4) Two-way communications systems

6.8 Alternate Power Supplies.

6.8.1 The alternate power supply for emergency and standby power systems shall be designed and installed in accordance with NFPA 110, *Standard for Emergency and Standby Power Systems,* and NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems.*

6.8.2 The alternate power supply shall be capable of providing power for a minimum of 1½ hours for emergency power systems and 4 hours for standby power systems.

Chapter 7 Emergency Preparedness

7.1 Emergency Action Plan.

7.1.1 The owner or the owner's representative of new and existing subterranean spaces shall establish, implement, and maintain an emergency action plan acceptable to the authority having jurisdiction.

7.1.2 An emergency action plan shall include but not be limited to the following:

(1) A procedure to be used to communicate an alarm
(2) A procedure to be used to evacuate or relocate all building occupants
(3) A procedure to be used to conduct fire and evacuation drills and to account for all personnel
(4) A procedure for emergency control of the ventilation system
(5) A procedure for traffic control during emergencies
(6) A designated method of distribution of the plan to all personnel
(7) The method and frequency of revising the plan

7.2 Breathing Apparatus.

7.2.1 Where required by the authority having jurisdiction, the owner shall supply on-site self-contained breathing apparatus and necessary equipment for the use of emergency response personnel.

7.2.2 The location of the equipment shall be approved by the authority having jurisdiction.

7.3 Fire Exit Drills.

7.3.1 Fire exit drills for new and existing subterranean spaces and new and existing building spaces shall be conducted at least annually.

7.3.2 Each building tenant shall conduct additional drills at frequencies prescribed by NFPA *101*, *Life Safety Code.*

7.3.3 The drill procedure for the subterranean space shall include but not be limited to the following:

(1) Activation of alarm communication procedures described in the emergency action plan, including notification of building
(2) Evacuation of building occupants to the exterior of the subterranean space or a designated location
(3) Prior notification of the annual test to the authority having jurisdiction

--`,,`,`-`-`,,`,,`,`,,`---
Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

7.3.4 A written record of such drills shall be kept on the premises for 3 years and shall be readily available for inspection by the authority having jurisdiction.

7.4 Fire Extinguishers. Portable fire extinguishers shall be provided throughout all buildings according to the requirements of NFPA 10, *Standard for Portable Fire Extinguishers.*

Chapter 8 Fire Department Provisions

8.1 Communications. The owner or the owner's representative of new and existing subterranean spaces shall provide an approved communications system for use by emergency personnel.

8.1.1 The communications system shall be capable of communication throughout all developed spaces and shall provide communication with the fire command center.

8.1.1.1 In existing subterranean spaces, alternate communications systems that are acceptable to the authority having jurisdiction shall be permitted.

8.1.1.2 A subterranean space provided with a fire fighter's phone system throughout shall be permitted.

8.1.2 Phone locations shall be at a minimum at each of the required hydrants.

8.2* Preplanning. The owner or the owner's representative of new and existing subterranean spaces shall establish and maintain a written emergency response plan to be coordinated with the local emergency responders.

8.3* Fire Department Access. Inaccessible or dead-end fire department vehicle access roadways shall be identified or marked as approved by the authority having jurisdiction.

Annex A Explanatory Material

Annex A is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

A.1.1 This standard's primary focus is to safeguard life and property against fire and related hazards. Other safety concerns such as structural adequacy, plumbing, and mechanical system design, including environmental conditions, are beyond the scope of this standard. These issues are considered important, and additional requirements are expected to be enforced by the authority having jurisdiction. Where no authority having jurisdiction exists, the owner or operator should include due consideration of these items.

A.1.3.2 Change of a tenant does not necessarily constitute a change of occupancy. If the type of occupancy, such as storage, does not change with change of ownership or tenant, the requirements of new construction might not apply.

A.3.2.1 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization that is concerned with product evaluations and is thus in a position to determine compliance with appropriate standards for the current production of listed items.

A.3.2.2 Authority Having Jurisdiction (AHJ). The phrase "authority having jurisdiction," or its acronym AHJ, 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, or 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 or her 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.

A.3.2.3 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation; some organizations do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A.4.5.1 This section is not intended to require a smoke barrier between buildings and between the buildings and the common space that is compliant with NFPA *101*, *Life Safety Code*. It is intended only to minimize the amount of smoke movement between the buildings and between the buildings and the common space.

A.4.5.1.1 These are walls with a 2-hour fire resistance rating that separate building spaces from common spaces and are intended to provide a moderate level of smoke protection. Requirements of a fire-resistive wall provide an acceptable level of smoke resistance. As an example, required smoke/fire dampers in such walls can close upon fusible link or heat detection.

A.5.2.3 Travel distance within a building is under the jurisdiction of NFPA *101*, *Life Safety Code*. The 2000 ft (610 m) travel distance was more reasonable than other existing guidelines that range from 2640 ft to 3500 ft (805 m to 1067 m). The travel distance was established based on the compartmentation of the subterranean space that permits the moving away from a fire or smoke hazard when entering the common space.

A.5.4 When measuring the egress width in roadways or railways, the minimum egress width should not include the required width for vehicle traffic or railway vehicles.

A life safety evaluation is a written review dealing with the adequacy of life safety features relative to fire and behavior and of the related safety considerations. This review should be done by a person acceptable to the authority having jurisdiction. Such an evaluation includes, for example, a documented case that shows that products of combustion in all conceivable but reasonable fire scenarios will not significantly endanger occupants using means of egress in the facility (e.g., because of fire detection, automatic suppression, smoke control, large volume space, or management procedures). Moreover, means of egress facilities plus

--`,,`,,`-`-`,,`,,`,`,,`---

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

facility management capabilities should be adequate to cope with scenarios where certain egress routes are blocked for some reason.

In addition to making realistic assumptions about the capabilities of persons in the facility (i.e., an assembled crowd including many disabled persons or persons unfamiliar with the facility), the life safety evaluation should include a safety factor of at least 2 in all calculations relating hazard development time and required egress time (the combination of flow time and other time needed to detect and assess an emergency condition, initiate egress, and move along the egress routes). This safety factor takes into account the possibility that half of the egress routes cannot be used (or usable) in certain situations.

A.5.8 It is the intent of NFPA 520 to provide refuge areas in large facilities where travel distances to exits would exceed 2000 ft (610 m). These refuge areas are different than "areas of refuge" for persons with extreme mobility impairments as required in NFPA *101*.

In NFPA *101*, an area of refuge is required to provide a safe haven for an individual with severe mobility impairment to await fire department rescue.

In NFPA 520, a refuge area is permitted to serve as a safe haven for all people in a subterranean space when evacuation from the space is not possible.

A.6.1.3.1.1 In order to approve an evacuation plan to selectively notify building occupants, the authority having jurisdiction should consider several building parameters, including building compartmentation, detection and suppression system zones, occupant loads, and the number and arrangement of the means of egress.

A.6.1.4 The fire command center can serve as a guard room, security office, or manager's office.

A.8.2 A pre-fire plan should contain the following:

(1) Identification of tenant
(2) Types of occupancies within the subterranean space
(3) Commodity classification
(4) Hazard content
(5) Location of fire command center
(6) Location of fire department connections
(7) Location of utility shutoffs
(8) Map of the subterranean space
(9) Any other information required by the authority having jurisdiction
(10) Emergency contacts and telephone numbers

A.8.3 Consideration should be given to vehicle turning radius, dead-end conditions, and turnarounds.

Annex B Diagrams of Subterranean Spaces

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Figure B.1(a) through Figure B.1(d) illustrate the different spaces that are identified in this standard.

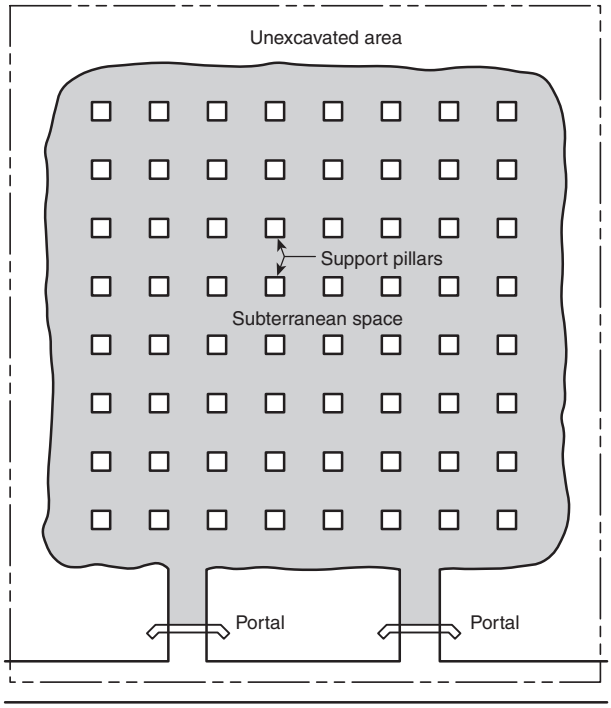


FIGURE B.1(a) Subterranean Space.

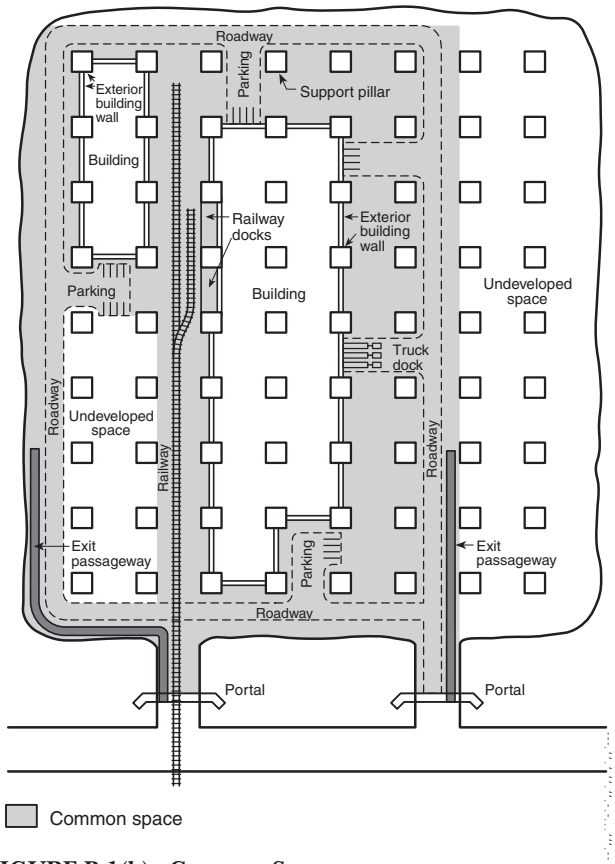


FIGURE B.1(b) Common Space.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

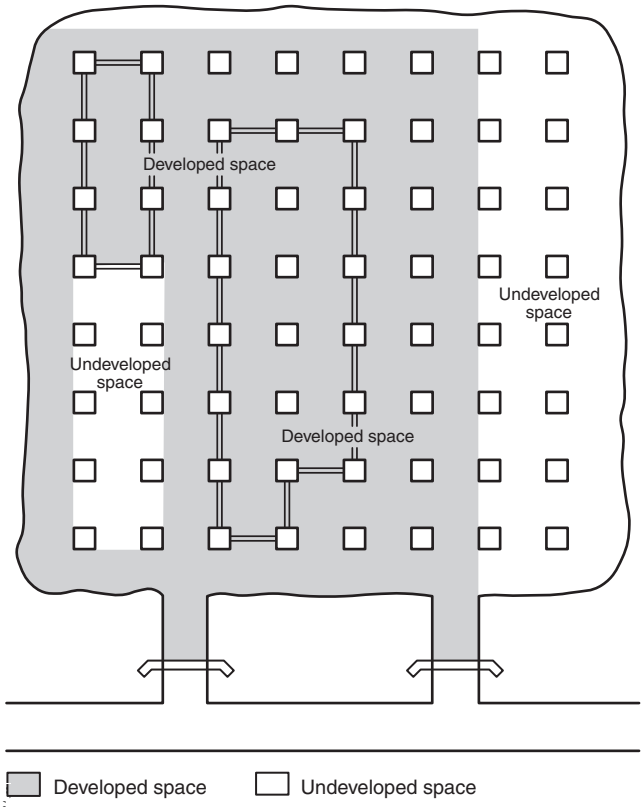


FIGURE B.1(c) Developed and Undeveloped Spaces.

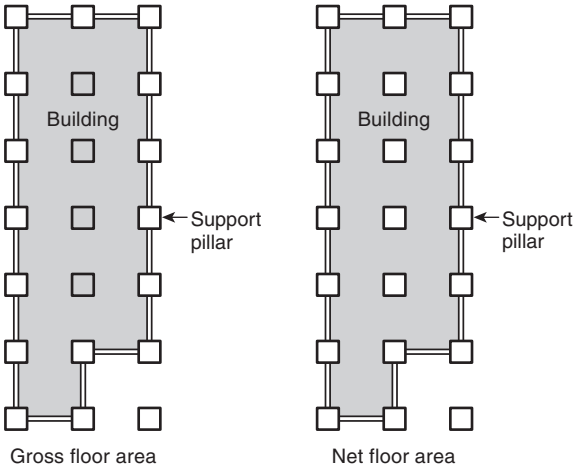


FIGURE B.1(d) Gross and Net Floor Areas.

Annex C Informational References

C.1 Referenced Publications. The following documents or portions thereof are referenced within this standard for informational purposes only and are thus not part of the requirements of this document unless also listed in Chapter 2.

C.1.1 NFPA Publication. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA *101®*, *Life Safety Code®*, 2003 edition.

C.1.2 Other Publications. *Merriam-Webster's Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

C.2 Informational References. (Reserved)

C.3 References for Extracts. The following documents are listed here to provide reference information, including title and edition, for extracts given throughout the nonmandatory sections of this standard as indicated by a reference in brackets [ ] following a section or paragraph. These documents are not a part of the requirements of this document unless also listed in Chapter 2 for other reasons.

NFPA 72®, *National Fire Alarm Code®*, 2002 edition.

NFPA 80, *Standard for Fire Doors and Fire Windows*, 1999 edition.

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Index

© 2005 National Fire Protection Association. All Rights Reserved.

The copyright in this index is separate and distinct from the copyright in the document that it indexes. The licensing provisions set forth for the document are not applicable to this index. This index may not be reproduced in whole or in part by any means without the express written permission of NFPA.

-A-

Access, fire department 8.3, A.8.3
Additions, application to 1.3.2, A.1.3.2
Air-transfer opening 4.5.3
Alarms
Containment areas 4.1.4.3.4.8
Fire ..... *see* Fire alarm systems
Alternate power supplies 6.8
Annunciator panels 6.1.4.1, 6.1.4.3
Application of standard 1.3, A.1.3.2
Approved (definition) 3.2.1, A.3.2.1
Authority having jurisdiction (definition) 3.2.2, A.3.2.2

-B-

Breathing apparatus 7.2
Buildings ..... *see also* Exterior building walls
Definition 3.3.1
Interior walls 4.2.4, 4.4.3, 4.5.1.3
Means of egress 5.1
Secondary containment, location of 4.1.4.3.4.4
Smoke movement between/within 4.5, A.4.5.1

-C-

Ceilings
Construction materials 4.2.8
Finishes 4.3
Combustible liquids ..... *see* Flammable and combustible liquids
Combustible materials, maximum quantity per control area ..... Tables 4.1.3.1(a) and (b)
Command center ..... *see* Fire command center
Common spaces ..... Fig. B.1(b)
Buildings, walls separating 4.2.2
Definition 3.3.13.1.1
Egress capacity 5.4, A.5.4
Exit doors 5.5
Fire alarm systems 6.1.1.1
Illumination in 5.6
Means of egress ..... 5.2 to 5.6, 6.1.1.1, 6.2.1, A.5.2.3, A.5.4
Nonmetallic conduit 4.4.2
Occupant load determination 5.3
Smoke movement between buildings and 4.5, A.4.5.1
Sprinkler systems 6.2.1
Communications systems ..... 6.7.2(4), 8.1
Compartmentation requirements 4.2
Construction features ..... Chap. 4; *see also* Occupancies
Compartmentation requirements 4.2
Control areas 4.1.4
Electrical installations 4.4
Interior finishes 4.3
Smoke spread, control of 4.5, A.4.5.1
Containment
Alarms for 4.1.4.3.4.8
Primary 4.1.4.3.2, 4.1.4.3.4.5, 4.1.4.3.4.6
Secondary 4.1.4.3.3, 4.1.4.3.4
Control areas
Construction requirements 4.1.4
Definition 3.3.2
Maximum quantity of high-hazard control area ..... Tables 4.1.3.1(a) and (b)
Control valves, fire protection 4.1.4.3.4.4

-D-

Dampers 4.5.3
Definitions ..... Chap. 3
Detection systems ..... 4.5.3, 6.1.2.1 to 6.1.2.3, 6.6.2(1)
Developed spaces ..... Fig. B.1(c)
Definition 3.3.13.1
Diagrams of subterranean spaces ..... Annex B
Doors
Exit 5.5
Fire 4.2.6, 4.5.2
Drainage systems, control areas 4.1.4.3.3

-E-

Electrical installations ..... 4.4, 6.6 to 6.8
Emergency action plan 7.1
Emergency lighting ..... 5.6.3, 6.6.2(4), 6.7.2(3)
Emergency power 4.4.3, 6.6, 6.8
Emergency preparedness ..... Chap. 7
Engineered fresh air system 5.8.2.2
Equivalency to standard 1.5
Evacuation ..... 6.1.3.1.1, 7.3, A.6.1.3.1.1; *see also* Means of egress
Exit passageways ..... 5.8.1, 5.9, 6.7.2(2)
Definition 3.3.3
Exits ..... *see* Means of egress
Explosives ..... Tables 4.1.3.1(a) and (b)
Exterior building walls
Buildings, walls separating 4.2.3
Common spaces, separation from 4.2.2
To control smoke spread 4.5.1.1, A.4.5.1.1
Definition 3.3.4
Openings and penetrations 4.2.6, 4.2.7, 4.5.2, 4.5.3
Protection for 6.4.2
Extinguishers, portable fire 7.4

-F-

Fire alarm systems ..... 6.1, 6.6.2(2), A.6.1.3.1.1, A.6.1.4
Fire command center ..... 6.1.4, 6.6.2(5), 8.1.1, A.6.1.4
Definition 3.3.5
Fire department provisions ..... Chap. 8
Fire department vehicle roadways ..... *see* Roadways
Fire doors and windows 4.2.6, 4.5.2
Fire exit drills 7.3
Fire protection ..... *see* Suppression systems; Water supplies, fire protection
Fire protection control valves 4.1.4.3.4.4
Fire walls
Buildings, walls separating 4.2.3
Buildings and common spaces, between 4.2.2, A.4.5.1.1
Construction of 4.2.5
Control areas 4.1.4.2
Electrical power generation, rooms for 4.4.3
Interior 4.2.4, 4.4.3
Penetrations 4.2.7, 4.5.3
Flammable and combustible liquids ..... Tables 4.1.3.1(a) and (b), 4.1.3.1.2 to 4.1.3.1.6, 4.1.4.3
Flammable gases ..... Tables 4.1.3.1(a) and (b), 4.1.3.1.4
Flammable solids ..... Tables 4.1.3.1(a) and (b), 4.1.3.1.4
Floor area
Gross ..... Fig. B.1(d)
Definition 3.3.6.1
Net ..... 5.3, Fig. B.1(d)
Definition 3.3.6.2

--`,,,```-`-`,,`,,`,`,,`---

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Floors
Construction materials 4.2.8
Control areas containing liquids 4.1.4.3.1, 4.1.4.3.4.1
Freezer storage areas 6.2.1, 6.3.4
Fresh air system, engineered 5.8.2.2

-G-

Gases, flammable ..... Tables 4.1.3.1(a) and (b), 4.1.3.1.4
Gross floor area ..... *see* Floor area

-H-

Hazards
High
Construction of control areas containing 4.1.4.3
Definition 3.3.7.1
Maximum quantity of material per control area ..... Tables 4.1.3.1(a) and (b)
Storage and use of materials 4.1.3
Low (definition) 3.3.7.2
Ordinary (definition) 3.3.7.3
Heat detectors 4.5.3
High hazard ..... *see* Hazards
Hydrants 6.3.1, 6.3.3, 6.3.4, 6.4.2
Illumination at 5.6.1

-I-

Industrial fire brigades 6.1.4, A.6.1.4
Initiation, fire alarm systems 6.1.2
Interior finishes 4.3

-L-

Life safety evaluations, means of egress 5.4.2, A.5.4
Liquids ..... *see also* Flammable and combustible liquids
Control areas containing liquids, construction of 4.1.4.3
Listed (definition) 3.2.3, A.3.2.3
Loading docks, fire alarm systems 6.1.2.3
Low hazard (definition) 3.3.7.2

-M-

Maps 5.7.3, 6.1.4.3
Marking
Fire department access roadways 8.3
Means of egress ..... 5.7, 6.6.2(3)
Means of egress ..... Chap. 5
Within building 5.1
Common spaces ..... 5.2 to 5.6, 6.1.1.1, 6.2.1, A.5.2.3, A.5.4
Egress capacity 5.4, A.5.4
Exit doors 5.5
Exit passageways 5.8.1, 5.9
Fire alarm systems 6.1.1.1
Illumination 5.6
Life safety evaluations 5.4.2, A.5.4
Marking ..... 5.7, 6.6.2(3)
Occupant load determination 5.3
Railways used as 6.3.3
Refuge areas ..... 5.8, 6.7.2(2), 6.7.2(3), A.5.8
Secondary containment, location of 4.1.4.3.4.4
Modifications, application to 1.3.2, A.1.3.2

-N-

Net floor area ..... *see* Floor area
Noncombustible materials
Compartments 4.2.8
Control areas 4.1.4.3.1
Definition 3.3.8
Notification, fire alarm systems 6.1.3, A.6.1.3.1.1

-O-

Occupancies 4.1
Allowed occupancies 4.1.1
Control areas, construction of 4.1.4
Storage and use of high hazard materials 4.1.3
Occupant load determination 5.3
Openings, protection of 4.2.6, 4.2.7, 4.5.2, 4.5.3
Ordinary hazard (definition) 3.3.7.3

-P-

Parking areas 6.2.1, 6.3.1, 6.3.2
Definition 3.3.9
Passageways, exit ..... *see* Exit passageways
Pillars 4.5.1.2, 5.7.2, 6.1.4.4
Plans
Emergency action 7.1
Pre-fire 8.2, A.8.2
Portals (definition) 3.3.10
Pre-fire planning 8.2, A.8.2
Purpose of standard 1.2

-R-

Railways 6.2.1
Pillars adjacent to, marking of 5.7.2, 6.1.4.4
Standpipe systems for 6.3.3
References ..... Chap. 2, Annex C
Refuge areas ..... 5.8, 6.7.2(2), 6.7.2(3), A.5.8
Remodeling, application to 1.3.2, A.1.3.2
Retroactivity of standard 1.4
Roadways 6.2.1
Definition 3.3.11
Fire department vehicle 4.1.4.3.4.4, 8.3, A.8.3
Definition 3.3.11.1
Hydrants located along 6.4.2
Pillars adjacent to, marking of 5.7.2, 6.1.4.4
Portals (definition) 3.3.10
Secondary containment, location of 4.1.4.3.4.4
Roof (definition) 3.3.12

-S-

Scope of standard 1.1, A.1.1
Secondary containment 4.1.4.3.3, 4.1.4.3.4
Self-contained breathing apparatus (SCBA) 7.2.1
Shall (definition) 3.2.4
Should (definition) 3.2.5
Sills, control areas 4.1.4.3.2
Smoke spread, control of ..... 4.5, 6.7.2(2), 6.7.2(3), A.4.5.1
Solids, flammable ..... 4.1.3.1.4, Tables 4.1.3.1(a) and (b)
Sprinkler systems 4.1.4.3.3, 6.2
Standard (definition) 3.2.6
Standby power 4.4.3, 5.6.3, 6.7, 6.8
Standpipe systems 6.3
Storage
Freezer 6.2.1, 6.3.4
High hazard materials 4.1.3
Subterranean space
Definition 3.3.13
Diagrams ..... Annex B
Suppression systems ..... 6.1.2.1 to 6.1.2.3, 6.2.1; *see also* Water supplies, fire protection
Hydrants 6.3.1, 6.3.3, 6.3.4, 6.4.2
Maintenance 6.5
Sprinkler systems 6.2
Standpipe systems 6.3

-U-

Undeveloped spaces ..... Fig. B.1(c)
Definition 3.3.13.2

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

-V-

Ventilation systems
Standby power for ..... 6.7.2(2)

-W-

Walls .....*see also* Fire walls
Construction materials 4.2.8
Exterior building .....*see* Exterior building walls
Finishes 4.3
Interior 4.2.4, 4.4.3, 4.5.1.3
Openings/penetrations 4.2.6, 4.2.7, 4.5.2, 4.5.3
Water supplies, fire protection 6.4
Drainage of 4.1.4.3.3
Hydrants 6.3.1, 6.3.3, 6.3.4, 6.4.2
Maintenance 6.5
Standpipes 6.3
Windows, fire 4.2.6

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale

Sequence of Events Leading to Publication of an NFPA Committee Document

Call goes out for proposals to amend existing document or for recommendations on new document.

▼

Committee meets to act on proposals, to develop its own proposals, and to prepare its report.

▼

Committee votes on proposals by letter ballot. If two-thirds approve, report goes forward. Lacking two-thirds approval, report returns to committee.

▼

Report — *Report on Proposals* (ROP) — is published for public review and comment.

▼

Committee meets to act on each public comment received.

▼

Committee votes on comments by letter ballot. If two-thirds approve, supplementary report goes forward. Lacking two-thirds approval, supplementary report returns to committee.

▼

Supplementary report — *Report on Comments* (ROC) — is published for public review.

▼

NFPA membership meets (Annual or Fall Meeting) and acts on committee report (ROP or ROC).

▼

Committee votes on any amendments to report approved at NFPA Annual or Fall Meeting.

▼

Appeals to Standards Council on Association action must be filed within 20 days of the NFPA Annual or Fall Meeting.

▼

Standards Council decides, based on all evidence, whether or not to issue standard or to take other action, including upholding any appeals.

Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.

M *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.

I/M *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.

SE *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES:

1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make such appointments as it seems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

--`,,`-`-`,,`,,`,`,,`---

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS

Not for Resale

NFPA Technical Committee Document Proposal Form

Note: All proposals must be received by 5:00 p.m. EST/EDST on the published proposal closing date.

For further information on the standards-making process, please contact Codes and Standards Administration at 617-984-7249. For technical assistance, please call NFPA at 617-770-3000.

FOR OFFICE USE ONLY
Log #: _____
Date Rec'd: _____

Please indicate in which format you wish to receive your ROP/ROC: ☐ **CD ROM** ☐ **paper** ☐ **download**
(Note: In choosing the download option you intend to view the ROP/ROC from our Website. No copy will be sent to you.)

Date 12/18/02 **Name** John B. Smith **Telephone** 617-555-1212
Company _____
Address 9 Seattle St. **City** Seattle **State** WA **Zip** 02255
Please indicate organization represented (if any) Fire Marshals Assn. of North America

1. **a) NFPA Document Title** National Fire Alarm Code
   b) NFPA No. & Edition NFPA 72, 2002 ed. **c) Section/Paragraph** 4.4.7.1.1

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.)* Note: Proposed text should be in legislative format, that is, use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~). Delete exception.

4. **Statement of Problem and Substantiation for Proposal.** Note: State the problem that will be resolved by your recommendation. Give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication. 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.** Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought, or research and, to the best of his/her knowledge, is not copied from another source.

   ☐ **This Proposal is Not Original Material; Its Source** ***(if known)*** **is as Follows:** _____

Sample

I hereby grant the NFPA all and full rights in copyright to 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 ***(Required)*** John B. Smith

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL • NFPA FAX (617) 770-3500

Mail to: Secretary, Standards Council • NFPA • 1 Batterymarch Park • PO Box 9101 • Quincy, MA 02269-9101

--`,,```-`-`,,`,,`,`,,`---

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS

Not for Resale

NFPA Technical Committee Document Proposal Form

Note: All proposals must be received by 5:00 p.m. EST/EDST on the published proposal closing date.

For further information on the standards-making process, please contact Codes and Standards Administration at 617-984-7249. For technical assistance, please call NFPA at 617-770-3000.

FOR OFFICE USE ONLY
Log #: _____
Date Rec'd: _____

Please indicate in which format you wish to receive your ROP/ROC: ☐ **CD ROM** ☐ **paper** ☐ **download**
(Note: In choosing the download option you intend to view the ROP/ROC from our Website. No copy will be sent to you.)

Date _____ **Name** _____ **Telephone** _____
Company _____
Address _____ **City** _____ **State** _____ **Zip** _____
Please indicate organization represented (if any) _____

1. **a) NFPA Document Title** _____
   b) NFPA No. & Edition _____ **c) 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.)* Note: Proposed text should be in legislative format, that is, use underscore to denote wording to be inserted (inserted wording) and strike-through to denote wording to be deleted (~~deleted wording~~). _____

4. **Statement of Problem and Substantiation for Proposal.** Note: State the problem that will be resolved by your recommendation. Give the specific reason for your proposal including copies of tests, research papers, fire experience, etc. If more than 200 words, it may be abstracted for publication. _____

5. ☐ **This Proposal is Original Material.** Note: Original material is considered to be the submitter's own idea based on or as a result of his/her own experience, thought, or research and, to the best of his/her knowledge, is not copied from another source.

   ☐ **This Proposal is Not Original Material; Its Source *(if known)* is as Follows:** _____

I hereby grant the NFPA all and full rights in copyright to 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 *(Required)* _____

PLEASE USE SEPARATE FORM FOR EACH PROPOSAL • NFPA FAX (617) 770-3500

Mail to: Secretary, Standards Council • NFPA • 1 Batterymarch Park • PO Box 9101 • Quincy, MA 02269-9101

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS
Not for Resale