NFPA®

520

Standard on Subterranean Spaces

2021

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NFPA® 520

Standard on

Subterranean Spaces

2021 Edition

This edition of NFPA 520, *Standard on Subterranean Spaces*, was prepared by the Technical Committee on Subterranean Spaces. It was issued by the Standards Council on October 5, 2020, with an effective date of October 25, 2020, and supersedes all previous editions.

This edition of NFPA 520 was approved as an American National Standard on October 25, 2020.

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.

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 had been found to work well.

For the 2010 edition, the committee found that NFPA 520 generally had been an effective document over the past 15 years. The committee made only minor revisions, revising two definitions with appropriate extracts from other documents and clarifying the provisions of three subsections.

For the 2016 edition, the committee determined that NFPA 520 generally has been an effective document over the past 20 years. The committee made only minor revisions, changing the phrase "areas of refuge" to "refuge areas" and updating various reference documents.

For the 2021 edition, NFPA 520 went through a substantial change as two new chapters have been added to the document to address performance-based design. These new chapters allow performance-based design to be an option and provide guidance on the required considerations for performance-based design. The committee changed *fire department* to *emergency response*. The required tests for fire resistance rating determination were added for clarification.

Technical Committee on Subterranean Spaces

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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.

Contents

NFPA 520

Standard on

Subterranean Spaces

2021 Edition

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. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced and extracted 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.

N **1.3.1.1** A documented risk assessment is permitted to be the basis for implementation of this standard.

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

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

N **1.3.1.4** The application of this standard is permitted to be based on the risk considerations outlined in Chapter 4.

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,* 2018 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2019 edition.

NFPA 14, *Standard for the Installation of Standpipe and Hose Systems,* 2019 edition.

NFPA 20, *Standard for the Installation of Stationary Pumps for Fire Protection,* 2019 edition.

NFPA 22, *Standard for Water Tanks for Private Fire Protection,* 2018 edition.

NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances,* 2019 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2020 edition.

NFPA 70®, National Electrical Code®, 2020 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2019 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives,* 2019 edition.

NFPA *101®, Life Safety Code®,* 2021 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems,* 2019 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems,* 2019 edition.

NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls,* 2021 edition.

NFPA 600, *Standard on Facility Fire Brigades,* 2020 edition.

2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* 2019.

ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C,* 2019.

ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C,* 2018.

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

N **2.3.3 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 263, *Fire Tests of Building Construction and Materials,* 2019.

2.4 References for Extracts in Mandatory Sections.

NFPA 72®, National Fire Alarm and Signaling Code®, 2019 edition.

NFPA *101®, Life Safety Code®,* 2021 edition.

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. An NFPA Standard, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and that is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the NFPA Manuals of Style. When used in a generic sense, such as in the phrase "standards development process" or "standards development activities," the term "standards" includes all NFPA Standards, including Codes, Standards, Recommended Practices, and Guides.

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 room or area where the status of the detection, alarm communications, control systems, and other emergency systems is displayed and from which the system(s) can be manually controlled. [**72**, 2019]

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.

Δ **3.3.8 Noncombustible Material.** See Section 6.1.

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.

N 3.3.11 Registered Design Professional (RDP). An individual who is registered or licensed to practice his/her respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed. [***101***, 2021]

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

3.3.12.1 ***Emergency Response Vehicle Roadway.*** Any major thoroughfare designated for emergency response apparatus.

3.3.13 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.

3.3.14 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.

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

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

3.3.14.2 ***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.

N Chapter 4 Fire Protection Approaches

N 4.1 Fire Protection Approach. The fire protection approach for subterranean spaces shall be permitted to be determined based on an evaluation of fire risks and hazards associated with the site and services provided and the business continuity planning and disaster restoration capabilities of the subterranean space specific to the site.

N 4.1.1 The fire protection approach shall be established with consideration given to the following factors:

(1) Exposure threat to facility occupants, the general public, emergency responders, and exposed property from a fire occurring at the facility, adjacent to or within the subterranean space
(2) The importance of the continuity of the operations being performed in the subterranean space
(3) Methods and equipment employed as part of a risk management or business continuity strategy that allow any or all of the subterranean space to remain operable during and after an event or to be replaced or restored
(4) The potential for a given protection strategy to result in service or business interruption or inhibit the ability of the subterranean space from being operable in a timely manner, post-event

N 4.1.2 The fire protection approach shall be developed in conjunction with the considerations in 4.2.3 resulting in the use of one or both of the following strategies within the subterranean space:

(1) Prescriptive-based approaches in accordance with this standard
(2) A fire risk-based approach in accordance with 4.1.3 and Section 4.2

N 4.1.3* A fire risk-based approach shall be permitted to be used to determine the construction, fire suppression, fire detection, and utility requirements for the subterranean space where specifically permitted by this standard that are necessary to achieve the purpose of this standard.

N 4.2 Fire Risk Assessment.

N 4.2.1 The fire risk assessment permitted by 4.1.2 shall be documented and acceptable to the authority having jurisdiction.

N 4.2.2 All the subterranean space stakeholders, including a registered design professional (RDP) experienced in fire and life safety system design, shall be integrated into the fire risk assessment process.

N 4.2.3 The fire risk assessment shall include an evaluation of the risk management considerations outlined in 4.2.4.

N 4.2.4* The following risk management elements shall be considered to determine the level of acceptable fire risk documented as part of the fire risk assessment:

(1) The quantity of fuel and hazard level in the subterranean space
(2) The type of operations and activities performed within the subterranean space
(3) The risk of flammable or combustible liquid spills and equipment or process for containment and control
(4) Life safety aspects of an emergency event within the subterranean space
(5) Subterranean space fire threat to the subterranean space occupants and exposed property or operations
(6) Continuity of service, operation, and effects of business interruption
(7) Size and value of the materials and equipment within the subterranean space
(8) Size and value of the subterranean space
(9) Economic loss from loss of function or business interruption
(10) Regulatory and reputation impact
(11) Environmental impact
(12) Construction and compartmentation of the subterranean space
(13) Fire suppression and detection features provided for the subterranean space including portable fire extinguishers
(14) Response time by emergency forces to an alarm
(15) Communication capabilities of the responding emergency forces including the local fire department
(16) Local emergency response capabilities and resources
(17) Evaluation by subterranean space insurance representatives
(18) Redundant infrastructure, including off-site subterranean spaces to support operations
(19) Redundant equipment within the subterranean space
(20) Life safety of occupants of subterranean space and adjacent spaces, emergency responders, and general public
(21) Presence of powered mobile equipment, and any available on-board fire suppression system
(22) Use of fire-resistant hydraulic fluids in machinery and equipment
(23) Ventilation, including smoke control, and personnel interfaces with emergency controls

(24) Secondary power systems requirements and/or availability
(25) Administrative controls, such as requiring personal protective equipment (flash lights, self-contained escape breathing devices, etc.), and limiting combustible materials being utilized to a certain flame spread rating
(26) Building construction, life safety means of egress, and fire compartmentation

N **4.2.5** The fire risk assessment shall cover and address the entire subterranean space, including all adjacent support areas and exposures.

N **4.2.6** An approved performance-based approach, in accordance with Chapter 5, shall be permitted to be applied selectively to specifically identified areas, hazards, or equipment or to specific fire protection requirements for the subterranean space.

N **4.2.7** The AHJ shall be permitted to require an approved, independent third party to review the proposed design brief based on the documented fire risk assessment and to provide an evaluation and approval of the fire assessment and/or the fire protection approach.

N Chapter 5 Performance-Based Design Approach

N **5.1 Performance-Based Design Approach.** The requirements of Chapter 5 shall apply to recognized performance-based practices.

N **5.2 Goals and Objectives.** The performance-based design shall meet the following goals and objectives:

(1) The performance-based approach allows the alternative means to be utilized for the elements of the subterranean space as permitted in this standard.
(2) The risk assessment, design criteria, design brief, system performance, and testing criteria are developed in accordance with this section.
(3) The design meets the scope and purpose of the standard as detailed in Sections 1.1 and 1.2.
(4) The performance-based design provides equivalent performance to the prescriptive requirements of this standard.

N **5.3* Qualifications.** The performance-based design documents shall be prepared by an RDP with experience in fire and life safety system design.

N **5.4 Independent Review.** The authority having jurisdiction shall be permitted to require an approved, independent third party to review the proposed design brief based on the documented fire risk assessment and to provide an evaluation of the design.

N **5.5 Final Determination.** The authority having jurisdiction shall make the final determination as to whether the performance objectives have been met.

N **5.6 Maintenance of Design Feature.** The design features required for the subterranean space to continue to meet the performance goals and objectives of this standard shall be maintained for the life of the building.

N **5.7 Performance Criteria.**

N **5.7.1 General.** All designs shall meet the goals and objectives specified in Section 5.2 and the performance criterion of 5.7.2, and the design team shall concur with the design and with the risk management considerations in 4.2.3.

N **5.7.2 Performance Criterion.** The performance criterion shall include the protection of the subterranean space from damage by fire or its associated effects, including smoke, corrosion, heat, and water.

N **5.7.3 Design Team.** The design team shall be comprised of the RDP experienced in fire and life safety system design, the owner or owner's representative(s), the subterranean space insurance representative(s), representative(s) of the authority having jurisdiction, and representative(s) of the emergency response entities.

N **5.7.4 Design Brief.** The design of the subterranean space shall include the preparation of a design brief that is prepared utilizing recognized performance-based design practices.

N **5.7.4.1** Any deviation from a prescriptive requirement shall be detailed in the design brief.

N **5.7.4.2** Design specifications and briefs used in the performance-based design shall be clearly stated and shown to be realistic and sustainable.

N **5.7.4.3** Specific inspection, testing, or maintenance requirements that are necessary to maintain reliable performance of the fire safety features of the subterranean space shall be stated in the design brief.

Chapter 6 Construction Features

N **6.1* Noncombustible Material.** A material that complies with any one of the following shall be considered a noncombustible material:

(1)* A material that, in the form in which it is used and under the conditions anticipated, will not ignite, burn, support combustion, or release flammable vapors when subjected to fire or heat
(2) A material is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*
(3) A material that is reported as complying with the pass/fail criteria of ASTM E136 when tested in accordance with the test method and procedure in ASTM E2652, *Standard Test Method for Assessing Combustibility of Materials Using a Tube Furnace with a Cone-shaped Airflow Stabilizer, at 750°C*

[***101***:4.6.13]

6.2 Occupancy in Subterranean Spaces.

6.2.1 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

6.2.2 Special Occupancy Requirements. In addition to the requirements contained herein, assembly, educational, deten-

tion and correctional, health care, and residential occupancies shall comply with the provisions of NFPA *101*.

6.2.3 Storage and Use of High-Hazard Materials.

N **6.2.3.1** The storage and use of high-hazard material requirements in 6.2.3 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of protection is acceptable.

6.2.3.2 Occupancies that contain materials that are within the maximum quantities specified in Table 6.2.3.2(a), Table 6.2.3.2(b), and Table 6.2.3.2(c) shall be permitted.

6.2.3.2.1 The aggregate quantity in use and storage shall not exceed the quantity listed for storage in Table 6.2.3.2(a), Table 6.2.3.2(b), and Table 6.2.3.2(c).

6.2.3.2.2 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).

6.2.3.2.3 The quantities of medicines, foodstuffs, and cosmetics containing not more than 50 percent of volume of watermiscible 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).

6.2.3.2.4 Quantities of gaseous and liquefied flammable gases and flammable solids shall be permitted to be increased 100 percent in accordance with Table 6.2.3.2(a), Table 6.2.3.2(b), and Table 6.2.3.2(c) in sprinklered buildings.

6.2.3.2.4.1 When 6.2.3.2.5 also applies, the increase for 6.2.3.2.4 and 6.2.3.2.5 shall be permitted to be applied.

6.2.3.2.5 Quantities shall be permitted to be increased 100 percent in accordance with Table 6.2.3.2(a), Table 6.2.3.2(b), and Table 6.2.3.2(c) when stored in approved storage cabinets, gas cabinets, or exhausted enclosures.

6.2.3.2.5.1 When 6.2.3.2.4 also applies, the increase for 6.2.3.2.4 and 6.2.3.2.5 shall be permitted to be applied.

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

6.2.3.3 The storage and use of high-hazard materials not covered by Table 6.2.3.2(a), Table 6.2.3.2(b), and Table 6.2.3.2(c) shall be permitted when approved by the authority having jurisdiction.

6.2.3.4 Flammable and combustible liquids necessary for emergency power generation and other emergency equipment shall be permitted in accordance with 6.5.3.

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

6.2.4.1 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.

6.2.4.2 Control areas shall be separated from each other and all other areas by a wall with at least a 2-hour fire resistance rating when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or UL 263, *Fire Tests of Building Construction and Materials*.

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

Δ **Table 6.2.3.2(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 6.2.3.2.1.
[b] See 6.2.4.2.
[c] See 6.2.3.2.2 and 6.2.3.2.3.
[d] See 6.2.3.2.4.
[e] See 6.2.3.2.5.
[f] See 6.2.3.2.6.

Δ Table 6.2.3.2(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 6.2.3.2.1.
[b] See 6.2.4.2.
[c] See 6.2.3.2.2 and 6.2.3.2.3.
[d] See 6.2.3.2.4.
[e] See 6.2.3.2.5.
[f] See 6.2.3.2.6.

Δ Table 6.2.3.2(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 6.2.3.2.1.
[b] See 6.2.4.2.
[c] See 6.2.3.2.2 and 6.2.3.2.3.
[d] See 6.2.3.2.4.
[e] See 6.2.3.2.6.

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

6.2.4.3 Construction of Areas Containing High-Hazard Liquids.

N **6.2.4.3.1 Construction Requirements.** The construction requirements of 6.2.4.3 for areas containing high-hazard liquids shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of construction is acceptable.

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

6.2.4.3.3 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.

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

6.2.4.3.3.2 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.

6.2.4.3.4 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 designed to provide secondary containment for the high-hazard materials and fire protection water.

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

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

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

6.2.4.3.4.4 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.

6.2.4.3.4.5 Drainage of high-hazard materials and fire protection water directed to a neutralizer or treatment system shall comply with 6.2.4.3.4.5(A) and 6.2.4.3.4.5(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 emergency response vehicle roadway.

6.2.4.3.5 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.

6.2.4.3.5.1 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.

6.2.4.3.5.2 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 smallest.

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

6.2.4.3.5.4 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 emergency response vehicle roadway.

6.2.4.3.5.5 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.

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

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

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

6.3 Compartmentation Requirements.

N **6.3.1** The compartmentation requirements in Section 6.2 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of compartmentation is acceptable.

6.3.2 Developed subterranean spaces shall be compartmented in accordance with 6.3.3.

Δ **6.3.3 Common Spaces.**

N **6.3.3.1** Walls separating buildings from common spaces shall be of construction with at least a 2-hour fire resistance rating when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* or UL 263, *Standard for Fire Tests of Building Construction and Materials.*

6.3.3.2 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 when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials,* or UL 263, *Standard for Fire Tests of Building Construction and Materials.*

6.3.4 Walls separating buildings shall be of construction with at least a 2-hour fire resistance rating when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or UL 263, *Standard for Fire Tests of Building Construction and Materials.*

6.3.5 Buildings shall be subdivided by walls with at least a 2-hour fire resistance rating when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or UL 263, *Standard for Fire Tests of Building Construction and Materials*, into areas no larger than 360,000 net ft^2 (33,444 m^2).

6.3.6 Walls constructed with a fire resistance rating shall be installed in accordance with NFPA 221.

6.3.7 Opening protection shall be installed in accordance with NFPA 80.

6.3.8 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 6.3 shall be protected in accordance with NFPA 221.

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

6.3.10 The use of coatings to increase the fire resistance rating of a combustible construction material shall not be permitted.

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

6.5 Electrical Installations.

6.5.1 All new electrical and data communications cable shall comply with the requirements of *NFPA 70*.

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

6.5.3 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 when tested in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or UL 263, *Standard for Fire Tests of Building Construction and Materials*.

6.6 Control of Smoke Spread.

N **6.6.1** The control of smoke spread requirements in Section 6.6 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means to control the spread of smoke is acceptable.

6.6.2* The movement of smoke between buildings and between buildings and common spaces shall be minimized in accordance with Section 6.6.

6.6.2.1* Exterior building walls as described in Section 6.3 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.

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

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

6.6.3 Doors in exterior building walls as described in Section 6.3 shall be in accordance with NFPA 80 and shall be without undercuts, louvers, or grilles.

6.6.4 Dampers and air-transfer openings penetrating exterior building walls as described in Section 6.3 shall close upon activation by an approved heat detection system, a fusible link, or an approved smoke detection system within the ducts.

Chapter 7 Means of Egress

7.1 Means of Egress Within the Building.

N **7.1.1** The means of egress requirements in Sections 7.1 and 7.2 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of egress is acceptable.

7.1.2 Means of egress for new and existing buildings within the subterranean space shall be in accordance with the applicable occupancy chapter of NFPA *101*.

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

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

7.2 Means of Egress from the Common Space.

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

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

7.2.2.1 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.

7.2.2.2 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.

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

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

7.3 Occupant Load Determination. The number of occupants for exit width calculations from the common space shall be based on either 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.

7.4* Egress Capacity.

7.4.1 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 7.3.

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

7.5 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.

7.6 Illumination in Common Spaces.

7.6.1 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.

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

7.6.3 Means of egress within the common space shall have emergency lighting complying with Section 7.9 of NFPA *101* powered by a standby power supply that provides power for a minimum duration of 1½ hours.

7.7 Marking.

7.7.1 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.

7.7.2 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.

7.7.3 Maps.

7.7.3.1 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.

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

7.8* Refuge Areas and/or Refuge Chambers.

7.8.1 One or more refuge areas and/or refuge chambers 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).

N **7.8.2** The requirements of 7.8.1 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means to refuge areas and/or refuge chambers through existing passageways is acceptable.

7.8.3 Criteria.

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

7.8.3.2 Engineered Fresh Air System.

7.8.3.2.1 Each refuge area and/or refuge chamber shall have an engineered fresh air system that provides fresh air through a borehole from the surface during a fire emergency.

7.8.3.2.2 Air quantity shall be either 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.

7.8.3.3 Refuge areas and/or refuge chambers shall be provided with positive pressure of 0.05 in./wg (inches/water gauge) (12.5 Pa) relative to the adjacent space.

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

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

7.8.3.6 Two-way voice communications capabilities with the fire command center shall be provided in each refuge area and/or refuge chamber.

7.8.3.7 Refuge areas and/or refuge chambers shall be separated from the remainder of the subterranean space by walls with at least a 2-hour fire resistance rating.

7.8.4 Refuge areas and/or refuge chambers shall be permitted to be used during normal operations for other purposes provided that they are always available for refuge purposes.

7.8.5 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 and/or refuge chamber.

7.9 Exit Passageway.

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

7.9.2 An exit passageway 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.

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

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

7.9.5 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 8 Fire Alarm, Detection, and Suppression Systems

8.1 Fire Alarm Systems.

N **8.1.1** The fire alarm requirements in Section 8.1 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of fire alarm initiation and notification is acceptable.

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

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

8.1.2.2 Where required, the fire alarm system shall be installed and maintained in accordance with *NFPA 72*.

8.1.3 Initiation.

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

8.1.3.2 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*.

8.1.3.3 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.

8.1.4 Notification.

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

8.1.4.1.1* 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.

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

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

8.1.5* 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.

8.1.5.1 An annunciator panel shall be provided.

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

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

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

8.2 Sprinkler Systems.

N **8.2.1** The sprinkler requirements in Section 8.2 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of fire suppression is acceptable.

8.2.2 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

8.2.3 Required sprinkler systems shall be installed in accordance with NFPA 13.

8.3 Standpipe Systems.

N **8.3.1** The standpipe requirements in Section 8.3 shall be permitted to be modified where a risk assessment, as outlined in Chapter 4, identifies that an alternative means of standpipes is acceptable.

8.3.2 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.

8.3.3 All nonsprinklered parking areas in existing subterranean spaces that are not accessible by emergency response apparatus shall be protected by a Class I standpipe system.

8.3.4 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.

8.3.5 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.

8.3.6 Where required, standpipes shall be installed in accordance with NFPA 14.

8.4 Water Supply.

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

8.4.2 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.

8.4.3 Fire protection equipment and systems, where required, shall be installed in accordance with NFPA 20, NFPA 22, and NFPA 24.

8.5 Maintenance.

8.5.1 All water-based extinguishing systems shall be maintained in accordance with NFPA 25.

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

8.6 Emergency Power.

8.6.1 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.

8.6.2 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

8.7 Standby Power.

8.7.1 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*.

8.7.2 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

8.8 Alternative Power Supplies.

8.8.1 The alternative power supply for emergency and standby power systems shall be designed and installed in accordance with NFPA 110 and NFPA 111.

8.8.2 The alternative 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 9 Emergency Preparedness

9.1 Emergency Action Plan.

9.1.1 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.

9.1.2 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

N **9.1.3** Where a fire risk assessment or a performance-based design approach is utilized as permitted in Chapter 4 and 5 of this standard, the design brief and summary of the fire risk assessment shall be captured in the subterranean space plans and specifications and the emergency action plan.

9.2 Breathing Apparatus.

9.2.1 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.

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

9.3 Fire Exit Drills.

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

9.3.2 Each building tenant shall conduct additional drills at frequencies prescribed by NFPA *101*.

9.3.3 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 occupants
(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

9.3.4 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.

9.4 Fire Extinguishers. Portable fire extinguishers shall be provided throughout all buildings according to the requirements of NFPA 10.

Δ Chapter 10 Emergency Response Provisions

10.1 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.

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

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

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

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

Δ **10.2* Pre-Fire Planning.**

N **10.2.1** 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.

N **10.2.2** Where a fire risk assessment or a performance-based design approach is utilized as permitted in Chapters 4 and 5 of this standard, the design brief and summary of the fire risk assessment shall be captured in the subterranean space pre-fire plan.

10.3* Emergency Response Access. Inaccessible or dead-end emergency response 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.

N **A.4.1.3** For the purpose of this standard, see Section 1.2.

N **A.4.2.4** The protection for subterranean spaces should be specific to the nature and anticipated fire risks of each subterranean space facility.

The risk analysis should consider the risk and hazards associated with the site and services provided for a given fire safety problem. Additional consideration should include the following:

(1) Availability of alternative or replacement subterranean space that will accommodate similar operations and activities
(2) Permitted downtime of the subterranean space
(3) Presence of additional fire suppression, alarm, and detection equipment, or risk reduction features proximate to the subterranean space
(4) Survivability of the subterranean space

NFPA 551 should be used as a reference guide for conducting and evaluating fire risk assessments.

N **A.5.3** It is essential that the RDP recognize the possibility of fire in the subterranean space. RDPs who develop performance-based design documents should be well versed in the science of fire, the effects of fire on subterranean spaces and operations, and options for mitigation of the risk to persons, equipment, and operations presented by fire in a subterranean space.

N **A.6.1** The provisions of Section 6.1 do not require inherently noncombustible materials to be tested in order to be classified as noncombustible materials. [***101*:**A.4.6.13]

N **A.6.1(1)** Examples of such materials include steel, concrete, masonry and glass. [***101*:**A.4.6.13.1(1)]

A.6.6.2 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*. It is intended only to minimize the amount of smoke movement between the buildings and between the buildings and the common space.

A.6.6.2.1 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.7.2.3 Travel distance within a building is under the jurisdiction of NFPA *101*. The 2000 ft (610 m) travel distance was more reasonable than other existing guidelines, which 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, which permits the moving away from a fire or smoke hazard when entering the common space.

A.7.4 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 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 (e.g., an assembled crowd that includes many persons with disabilities 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 are unusable) in certain situations.

A.7.8 It is the intent of NFPA 520 to provide refuge areas and/or refuge chambers in large facilities where travel distances to exits would exceed 2000 ft (610 m). These refuge areas and/or refuge chambers are different from "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 and/or refuge chamber" is permitted to serve as a safe haven for all people in a subterranean space when evacuation from the space is not possible.

A.8.1.4.1.1 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.8.1.5 The fire command center can serve as a guard room, security office, or manager's office.

A.10.2 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.10.3 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.

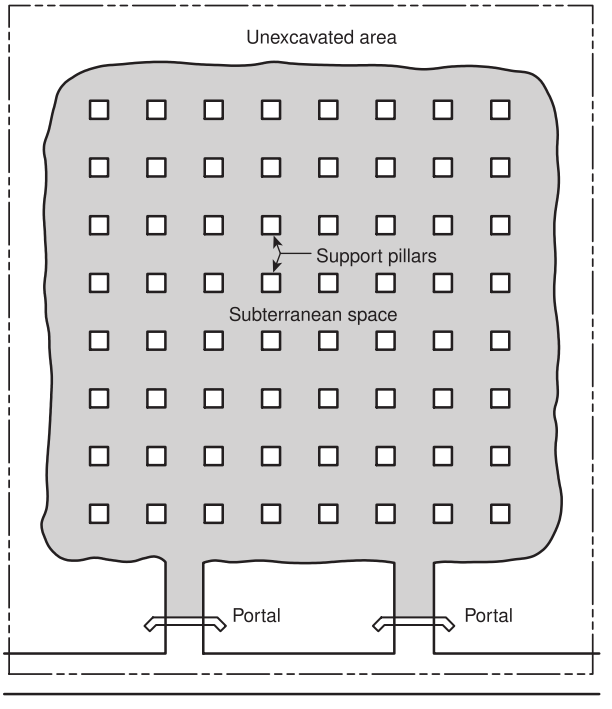

FIGURE B.1(a) Subterranean Space.

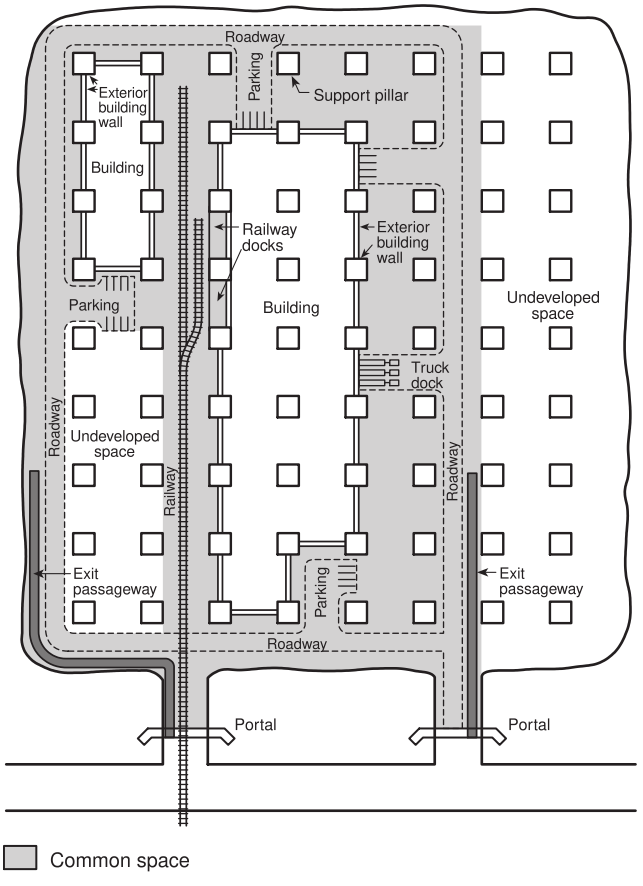

FIGURE B.1(b) Common Space.

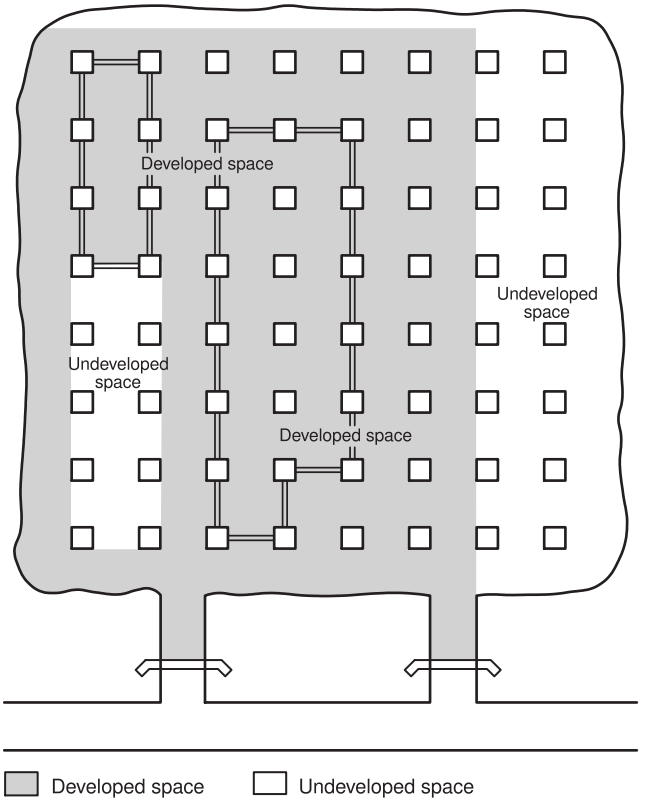

FIGURE B.1(c) Developed and Undeveloped Spaces.

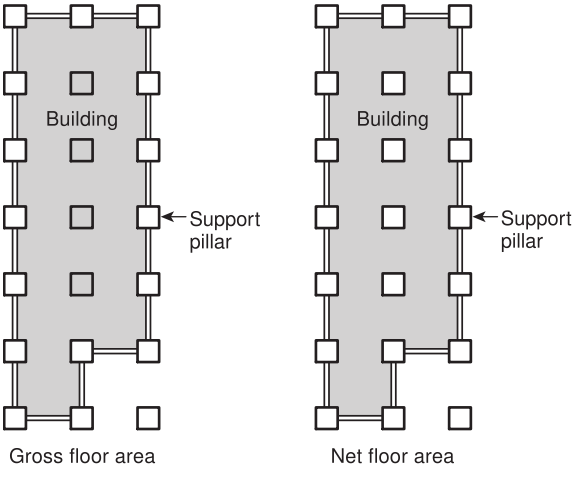

FIGURE B.1(d) Gross and Net Floor Areas.

Annex C Informational References

C.1 Referenced Publications. The documents or portions thereof listed in this annex are referenced within the informational sections of this standard and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

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

NFPA *101®*, *Life Safety Code®*, 2021 edition.

C.2 Informational References. (Reserved)

Δ **C.3 References for Extracts in Informational Sections.**

NFPA *101®*, *Life Safety Code®*, 2021 edition.