NFPA® 88A

Standard for Parking Structures

2023 Edition

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An International Codes and Standards Organization

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NFPA® 88A

Standard for

Parking Structures

2023 Edition

This edition of NFPA 88A, *Standard for Parking Structures*, was prepared by the Technical Committee on Garages and Parking Structures. It was issued by the Standards Council on March 20, 2022, with an effective date of April 9, 2022, and supersedes all previous editions.

This edition of NFPA 88A was approved as an American National Standard on April 9, 2022.

Origin and Development of NFPA 88A

Work on fire protection safeguards for garages was initiated by NFPA in 1927 with the appointment of a committee. After extensive deliberations and the publication of successive drafts, a standard was adopted in 1932. Subsequently, the committee was discharged when it appeared that no further activity was needed in this field. In 1952, the present committee was created. This committee prepared a number of redrafts of the 1932 text, and in 1957 a revised NFPA 88, *Standard for Garages*, was adopted. Revisions were made in 1962, 1968, 1979, 1985, 1995, and 1998.

To treat separately the occupancies of repair garages and parking structures, NFPA 88A and NFPA 88B, *Standard for Repair Garages*, were published separately in 1973.

In 1991, partial revisions were made to this standard, and the 1995 edition contained editorial changes. The 1998 edition contained definitions clarifying the various configurations of parking structures. It also contained changes increasing the area of office space related to the parking structure and further clarified the requirements for vertical opening protection and automatic sprinkler installation. That edition also included new requirements for natural gas powered vehicles.

The 2002 edition contained primarily editorial revisions for compliance with the *Manual of Style for NFPA Technical Committee Documents*, and listed metric units of measurement as the primary units.

In the 2007 edition, the committee rewrote the definition of *open parking structure* to comply with the *Manual of Style for NFPA Technical Committee Documents* and moved the requirements to a new 4.7.1. The NFPA 220 definition of *noncombustible material* was adopted in place of the one used in the previous edition.

Definitions were added to recognize the emergence of *mechanical parking structures* where cars are moved to parking places by lifts or other devices instead of being driven. No specific requirements were added.

Lastly, the committee clarified the use of vehicle ramps in 4.4.3 and 4.4.4.

In the 2011 edition, the committee made a number of significant changes, including the following:

(1) Added new definitions
(2) Defined and addressed *automated mechanical-type parking structure* in a new chapter
(3) Deleted certain sections that were not enforceable
(4) Reorganized the entire document using a chapter structure that emulates other construction documents including, but not limited to, NFPA *101* and *NFPA 5000*

For the 2015 edition, the changes that were made consisted primarily of editorial alterations, reference updates, and clarifications of existing language.

For the 2019 edition, language was clarified and exceptions were removed. A definition for *autodrive vehicle* was added. Clarifying language was added in 5.2.1.1 and Section 5.5; this replaced language that was omitted in error in the 2015 edition. Exceptions to 6.4.3 and 6.6.2.1 were

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removed. References for NFPA 2 and *NFPA 70* in Section 7.1 were added. Revisions in A.4.1.5 were made to stay consistent with NFPA *101*.

The 2023 edition provides significant updates to the standard, including a revised scope (1.1) to include parking systems, and corresponds to new requirements found within Chapter 9. Additionally, new requirements pertaining to emergency plans (1.5), pre-incident planning (5.1.5), mixing fans (6.3.5), and sprinklers (6.4) have been included in this edition. Further, new references to various standards, including NFPA 241 and NFPA 1620, provide direct and mandatory use of these documents for the first time. Finally, updates to reference publications, extracted content from other NFPA standards, and new definitions have been included.

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Committee Scope: This Committee shall have primary responsibility for documents on construction, control of fire hazards, ventilation, and fire protection in parking structures.

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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 B.

Chapter 1 Administration

1.1 Scope. This standard shall cover the construction and protection of, as well as the control of hazards in the following:

(1) Open and enclosed parking structures
(2) Parking systems

N **1.1.1** This standard shall not apply to private garages not exceeding 1000 ft^2 (92.9 m^2) associated with residential buildings.

N **1.1.2** This standard shall not apply to a free-standing, one-story covered structure that is open on at least two sides that provides shelter and storage for motor vehicles.

1.2 Purpose. The purpose of this standard is to provide minimum fire protection standards for parking structures.

1.3 Retroactivity. The provisions of this standard reflect a consensus of what is necessary to provide an acceptable degree of protection from the hazards addressed in this standard at the time the standard was issued.

1.3.1 Unless otherwise specified, the provisions of this standard shall not apply to facilities, equipment, structures, or installations that existed or were approved for construction or installation prior to the effective date of the standard. Where specified, the provisions of this standard shall be retroactive.

1.3.2 In those cases where the authority having jurisdiction determines that the existing situation presents an unacceptable degree of risk, the authority having jurisdiction shall be permitted to apply retroactively any portions of this standard deemed appropriate.

1.3.3 The retroactive requirements of this standard shall be permitted to be modified if their application clearly would be impractical in the judgment of the authority having jurisdiction and only where it is clearly evident that a reasonable degree of safety is provided.

1.4 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 over those prescribed by this standard, provided technical documentation is submitted to the authority having jurisdiction to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

N **1.5* Emergency Plans.** Emergency plans for parking structures shall be developed, maintained, and implemented using the all-hazards approach for all parking structures.

N **1.6 Units.**

N **1.6.1 SI Units.** Metric units in this standard shall be in accordance with the modernized metric system known as the International System of Units (SI).

N **1.6.2 Primary Values.** The inch-pound value for a measurement, and the SI value given in parentheses, shall each be acceptable for use as primary units for satisfying the requirements of this standard.

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.

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

NFPA 2, *Hydrogen Technologies Code,* 2023 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems,* 2022 edition.

NFPA 13R, *Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies,* 2022 edition.

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

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,* 2023 edition.

NFPA 30, *Flammable and Combustible Liquids Code,* 2021 edition.

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages,* 2021 edition.

NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* 2020 edition.

NFPA 52, *Vehicular Natural Gas Fuel Systems Code,* 2023 edition.

NFPA 54, *National Fuel Gas Code,* 2021 edition.

NFPA 58, *Liquefied Petroleum Gas Code,* 2020 edition.

NFPA 70®, National Electrical Code®, 2023 edition.

NFPA 72®, National Fire Alarm and Signaling Code®, 2022 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives,* 2022 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems,* 2021 edition.

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

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances,* 2019 edition.

NFPA 220, *Standard on Types of Building Construction,* 2021 edition.

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations,* 2022 edition.

NFPA 1620, *Standard for Pre-Incident Planning,* 2020 edition.

NFPA 5000®, Building Construction and Safety Code®, 2021 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*, 2020.

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

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

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N **2.3.2 UL Publications.** Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096. www.ul.com

UL 32, *Standard for Metal Waste Cans*, 1994, revised 2019.

UL 263, *Fire Tests of Building Construction and Materials*, 2011, revised 2020.

UL 325, *ANSI/CAN/UL Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems*, 2017, revised 2020.

UL 2202, *Standard for Electric Vehicle (EV) Charging System Equipment*, 2009, revised 2018.

UL 2594, *Standard for Electric Vehicle Supply Equipment*, 2016.

UL 2750, *UL LLC Outline of Investigation for Wireless Power Transfer Equipment for Electric Vehicles*, 2020.

2.3.3 Other Publications.

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

2.4 References for Extracts in Mandatory Sections.

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

NFPA 5000®, Building Construction and 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 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* 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.

3.2.5 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 phrases "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 Autodrive Vehicle. An automobile that has computers and equipment enabling it to move from one point to another safely without a human driver.

N **3.3.2 Automated Pay Station.** A mechanical or electronic machine that performs monetary transactions.

N **3.3.3 Mixing Fan.** A mechanical unit that moves air to prevent uncirculated segments of a volume, within a space, by inducing air velocity and for the purpose of mitigating the accumulation of contaminants in any portion of that space.

Δ **3.3.4 Noncombustible Material.** See Section 5.2.

3.3.5* Parking Structure. A building, structure, or portion thereof used for the parking, storage, or both, of motor vehicles.

3.3.5.1 ***Parking Structure, Enclosed.*** Any parking structure that is not an open parking structure.

3.3.5.2 ***Parking Structure, Open.*** A parking structure that meets the requirements of Section 5.6.

3.3.5.3 ***Parking Structure, Ramp Type.*** A parking structure that utilizes sloped floors for vertical vehicle circulation.

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N **3.3.6 Parking Systems.** Equipment, either stand-alone or incorporated into the building, that parks vehicles by mechanical or automatic means.

N **3.3.6.1*** ***Fully Automated Parking System.*** An unoccupied, vehicle storage and retrieval system that transports vehicles in X (i.e., horizontal right to left), Y (i.e., forward and backward), and Z (i.e., up and down) directions.

N **3.3.6.2*** ***Mechanical Parking System.*** A parking system that stores and retrieves vehicles on a platform, and that transports vehicles horizontally and vertically to an available parking location within the parking system.

N **3.3.6.3*** ***Stacker Parking System.*** A parking system that stores vehicles vertically only.

N **3.3.7 Terminal.** A space or room where a vehicle is driven into or out of that serves as the location for the vehicle occupants to exit or enter the vehicle at the entry or exit point of the parking system.

Chapter 4 Means of Egress

4.1 Means of Egress.

4.1.1 Means of egress shall comply with NFPA *101* or *NFPA 5000* as modified by 4.1.2.

4.1.2 The ramp requirement of NFPA *101*, 7.2.5, and *NFPA 5000*, 11.2.5, shall not apply to those parts of sloped floors utilized for both parking and vehicle circulation.

4.1.3 In a ramp-type open parking structure with open vehicle ramps not subject to closure, the ramp shall be permitted to serve in lieu of the second means of egress from floors above the level of exit discharge, provided that the ramp discharges directly outside at the street level. [***101:***42.8.2.2.6.1(2)]

4.1.4 For parking structures extending only one floor level below the level of exit discharge, a vehicle ramp leading directly to the outside shall be permitted to serve in lieu of the second means of egress, provided that no door or shutter is installed therein. [***101:***42.8.2.2.6.1(3)]

4.1.5* Open stairs shall be permitted in open parking structures.

Chapter 5 Construction

5.1 General Requirements.

5.1.1* Parking structures shall be built using one of the types of construction defined in NFPA 220, except as otherwise amended in this standard.

5.1.2 Open parking structures shall be of Type I or Type II construction as defined in NFPA 220.

5.1.3 Heights and floor areas of open parking structures of Type I, Type II (222), or Type II (111) construction shall be permitted to be unlimited.

5.1.4 Open parking structures of Type II (000) construction shall be permitted to be of unlimited area where both of the following conditions are met:

(1) The height does not exceed 75 ft (25 m).
(2) The horizontal distance from any point on any parking level to an exterior wall opening on a street, an alley, a courtyard, or other similar permanent open space does not exceed 200 ft (60 m).

N **5.1.5*** Where a pre-incident plan is to be conducted at a parking structure, it shall be developed in accordance with NFPA 1620.

N **5.1.6** Parking structures under construction, demolition, or alteration shall comply with NFPA 241.

N **5.2 Noncombustible Material.** A material that complies with any one of the following shall be considered a noncombustible material:

(1) The material, 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) The material is reported as passing ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.*
(3) The material 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.*

[**5000:**7.1.4.1.1]

5.3 Compartmentation.

Δ **5.3.1** Those parts of parking structures located within, immediately below, attached to, or less than 10 ft (3 m) from a building or another occupancy used for any other purpose shall be separated by walls, partitions, floors, or floor–ceiling assemblies having fire resistance ratings of not less than 2 hours, determined 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*, unless otherwise permitted by 5.3.3.

Δ **5.3.2** The 2-hour fire resistance rating required in 5.3.1 shall be permitted to be reduced to 1 hour, determined 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*, where the parking structure is protected throughout by an approved automatic sprinkler system.

5.3.3 No fire-rated separation shall be required when parts of a parking structure and a building used for any other purpose are separated by 10 ft (3 m) or more, and are attached only via open pedestrian balconies or bridges, or open vehicle bridges.

5.3.4* Those portions of an open parking structure located within or immediately below a building used for another purpose shall have the principal supporting members and bearing walls in all levels of the parking structure protected to provide a fire resistance rating equivalent to that required for the other occupancy.

5.3.5 Offices or other similar spaces that are related to the operation of the parking structure and are less than 3000 ft^2 (300 m^2) in area, other than cashier or attendant booths, shall be separated from parking areas by walls or partitions that resist the passage of smoke.

5.4 Floors.

5.4.1 Floor surfaces shall be of noncombustible material.

5.4.1.1 Where combustible construction is permitted, floor surfaces shall be noncombustible and liquidtight.

5.4.1.2* Asphalt shall be permitted on grade.

5.4.2 Floors shall be graded and equipped with drains.

5.4.3 Floors in areas of parking structures where motor fuels are dispensed shall be designed in accordance with NFPA 30A.

5.5 Openings in Fire Resistance–Rated Assemblies.

5.5.1 Doorways and other openings in fire walls and fire partitions shall be protected with approved fire doors and opening protectives installed in accordance with NFPA 80.

5.5.2 Where ducts pass through fire walls or fire partitions, the openings shall be protected in accordance with NFPA 90A.

5.5.3 Unless otherwise provided in 5.5.5, 5.5.6, or 5.5.7, vertical openings through floors in enclosed parking structures four stories or more in height shall be enclosed with walls or partitions having a fire resistance rating of not less than 2 hours determined 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*.

5.5.4 Unless otherwise provided in 5.5.5, 5.5.6, or 5.5.7, vertical openings through floors in enclosed parking structures less than four stories in height shall be enclosed with walls or partitions having a fire resistance rating of not less than 1 hour determined 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*.

5.5.5 Ramps in enclosed parking structures shall not be required to be enclosed in accordance with 5.5.3 or 5.5.4 where the parking structure is protected throughout by an approved, automatic sprinkler system.

5.5.6 Ramps in enclosed parking structures shall not be required to be enclosed in accordance with 5.5.3 or 5.5.4 where the parking structure is protected throughout by an approved, supervised, automatic fire detection system and a mechanical ventilation system in accordance with 6.3.1.

5.5.7 Openings in the floor assembly between an enclosed parking structure and an open parking structure, except exit openings, shall not be required to be enclosed where the enclosed parking structure is protected in accordance with 5.5.5 or 5.5.6.

5.5.8 Unprotected vertical openings through floors in open parking structures shall be permitted.

5.6 Opening Requirements for Open Parking Structures.

5.6.1 For natural ventilation purposes, the exterior sides of the structure shall have uniformly distributed openings on two or more sides.

5.6.2 The area of such openings in exterior walls on a level shall be not less than 20 percent of the total perimeter wall area of each level.

5.6.3 The aggregate length (i.e., total of widths) of the openings considered to be providing natural ventilation shall be not less than 40 percent of the perimeter of the level.

5.6.4 Where the required openings are uniformly distributed over two opposing sides of the building, 5.6.3 shall not apply.

Δ **5.6.5** Interior wall lines and column lines shall be at least 20 percent open, with openings uniformly distributed to provide ventilation.

N **5.6.6** The construction documents shall indicate the openness of the walls for parking structures to be considered open.

N **5.6.7** The construction documents shall provide evidence of natural ventilation and ventilation capacity by using airflow models or mathematical calculations that demonstrate at least four air changes per hour.

Chapter 6 Building Service and Fire Protection

6.1 Lighting and Power.

6.1.1 Electric wiring for light, power, heat, and signal or control circuits and for electrically operated tools, portable appliances, and devices shall be in accordance with the provisions of *NFPA 70*.

6.1.2 Areas where flammable liquids are stored, handled, or dispensed shall be delineated and classified for the installation of electrical equipment in accordance with NFPA 30A.

N **6.1.3** Emergency lighting shall be provided in all parking structures and rooms or spaces subject to occupancy in parking systems.

N **6.1.4** Emergency lighting shall be installed in accordance with Section 7.9 of NFPA *101*.

6.2 Heating.

Δ **6.2.1** Heating equipment shall conform to NFPA 31, NFPA 54, *NFPA 70*, NFPA 90A, NFPA 211, and the adopted mechanical code, as applicable.

Δ **6.2.2** Unless otherwise permitted by 6.2.3, all flames associated with heating equipment shall be located a minimum of 18 in. (500 mm) below the floor–ceiling assembly or 500 mm (18 in.) above the floor.

Δ **6.2.3** Heating equipment located so as to be protected by a partition not less than 18 in. (500 mm) above the floor shall not be required to meet the requirement of 6.2.2.

6.2.4 The use of improvised furnaces, construction heaters, and space heaters shall be prohibited.

6.3 Ventilation.

Δ **6.3.1*** All enclosed parking structures shall be ventilated by a mechanical system capable of providing a minimum of 1 ft^3/min per ft^2 of floor area (300 L/min per m^2 of floor area) during hours of normal operation.

6.3.2 A mechanical ventilation system shall not be required in an open parking structure.

Δ **6.3.3** Mechanical ventilating systems shall be installed in accordance with NFPA 90A.

N **6.3.4** Ductwork shall be constructed of noncombustible material.

N **6.3.5** Mixing fans shall be installed in parking structures where any of the following conditions apply:

(1) The shortest distance between any point of the supply air to the closest point of exhaust air is greater than 300 ft (91 m).
(2) Open parking structures where the opposing openings are greater than 300 ft (91 m).
(3) Where supply or exhaust fans are installed and the average air velocity within the parking structure is modeled at less than 1.3 ft/s (0.4 m/s).

N **6.3.5.1** Mixing fans shall provide a condition where no more than 10 percent of the volume of the space has air velocities below 1.3 ft/s (0.4 m/s).

N **6.3.5.2** Supply points, mixing fans, and exhaust fans shall be arranged to distribute supply air throughout the parking structure.

N **6.3.5.3** A registered design professional shall furnish documentation on the construction documents about the arrangement and velocities of the mixing fans.

N **6.3.5.4** Mixing fans shall be controlled with an electronic interface to the automatic fire suppression system and the fire detection and alarm system.

N **6.3.5.5** Mixing fan control systems shall turn off the mixing fans when the automatic fire suppression system is activated.

N **6.3.5.6** Mixing fan control systems shall provide a post-fire override operation to allow fire stop and fire run operations by local fire departments to clear smoke once the automatic fire suppression system is deactivated.

Δ **6.4 Sprinkler Systems.**

6.4.1 Automatic sprinkler systems shall be installed in all parking structures in accordance with NFPA 13 and NFPA 13R as applicable.

6.4.2 Automatic sprinkler systems shall be inspected, tested, and maintained in accordance with NFPA 25.

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6.5 Standpipes.

Δ **6.5.1** Parking structures exceeding a height of 50 ft (15 m) or having parking levels below grade shall be provided with a Class I standpipe system in accordance with NFPA 14.

6.5.2 Class I standpipe systems of the manual dry type shall be permitted in open parking structures.

Δ **6.5.3** Standpipe systems shall be inspected, tested, and maintained in accordance with NFPA 25.

6.6 Detection, Alarm, and Communications Systems.

6.6.1 Where provided, fire detection and alarm systems shall conform to *NFPA 72*.

6.6.2 An approved, supervised, automatic fire detection and alarm system shall be installed in enclosed parking structures having a mechanical ventilation system, located at or above grade, or within or immediately below a building used for another occupancy.

6.6.2.1 Where enclosed parking structures have an approved automatic sprinkler system installed throughout in accordance with NFPA 13, 6.6.2 shall not apply.

6.6.3 Fire alarm systems shall not be required in open parking structures.

6.6.4 Maintenance. Fire alarm systems shall be regularly inspected, tested, and maintained in accordance with *NFPA 72*.

Chapter 7 Special Hazard Protection

7.1 Storage Use, Handling, and Dispensing of Fuels and Lubricants.

7.1.1 The storage, use, handling, and dispensing of ignitible (flammable or combustible) liquids shall conform to NFPA 30 and NFPA 30A.

7.1.2 The storage, use, handling, and dispensing of liquefied petroleum gas shall conform to NFPA 58.

7.1.3 The storage, use, handling, and dispensing of natural gas fuels shall conform to NFPA 52.

7.1.4 The storage, use, handling, and dispensing of hydrogen fuels shall conform to NFPA 2.

7.1.5 The installation of electric vehicle charging equipment shall comply with *NFPA 70*.

N **7.1.6** Electric vehicle charging stations shall be listed and labeled in accordance with UL 2202, *Standard for Electric Vehicle (EV) Charging System Equipment*.

N **7.1.7** Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2594, *Standard for Electric Vehicle Supply Equipment*.

N **7.1.8** Wireless power transfer equipment for transferring power to an electric vehicle shall be listed and labeled in accordance with UL 2750, *UL LLC Outline of Investigation for Wireless Power Transfer Equipment for Electric Vehicles*.

7.2 Autodrive Vehicles. (Reserved)

N **7.3 Automatic Vehicular Doors and Gates.** Where provided, automatic vehicular door barrier arm, and gate operators shall be both of the following:

(1) Listed and labeled in accordance with UL 325, *ANSI/CAN/UL Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems*
(2) Installed in accordance with the manufacturer's installation instructions and *NFPA 70*

Chapter 8 Housekeeping

8.1 Equipment. Equipment and safety devices shall be maintained and hazardous accumulations of combustible material shall be removed from the structure.

8.2 Aisles. Clear aisle space shall be maintained to permit ready access to, and the use of, firefighting equipment.

8.3 Lockers. Where lockers are provided for employees' clothes they shall be constructed of metal.

8.4 Waste Receptacles.

8.4.1 Metal receptacles listed in accordance with UL 32, *Standard for Metal Waste Cans*, shall be provided for the storage or disposal of oil-soaked waste or cloths.

8.4.2 Containers having a capacity of greater than 55 gal (208 L) used for combustible trash shall be of metal construction and shall be covered.

8.5 Floors. Floors shall be kept clean and free of oil and grease.

Chapter 9 Special Structures

9.1 General. The requirements of Chapter 9 modify the requirements of Chapters 1 through 8.

9.2 Automated-Type Parking Structures.

9.2.1 Means of Egress. Mean of egress in accordance with Chapter 4 are not required in automated-type parking structures.

9.2.2 Access for Fire Service and Maintenance Personnel.

Δ **9.2.2.1** Access shall be provided in accordance with Table 40.2.5.3.1 of NFPA *101* except that the 22 in. (560 mm) minimum dimensional criteria shall be changed to 36 in. (915 mm) in all locations in the table.

9.2.2.2 Horizontal walkways for access shall be provided at intervals of 19.5 ft (6 m) vertically and 98.5 ft (30 m) horizontally.

9.2.2.3 Travel distance to the exterior or to an enclosed stair shall not exceed 400 ft (122 m).

9.2.2.4 One exterior door shall be provided at grade for every stair.

9.2.3 Ventilation. An enclosed automated-type parking structure shall be provided with a ventilation system that continuously provides a minimum of two air changes per hour.

9.2.4 Fire Protection Systems.

9.2.4.1* An automatic sprinkler system shall be installed in an automated mechanical-type parking structure in accordance with NFPA 13.

9.2.4.2 Standpipes shall not be required in automated-type parking structures.

9.2.4.3 Fire alarm systems shall not be required in automated-type parking structures.

N **9.2.5 Occupant Safety.**

N **9.2.5.1 Vehicle Occupants.**

N **9.2.5.1.1*** For parking systems, all vehicle occupants shall be required to exit the vehicle at a designated location.

N **9.2.5.1.2** The designated exit location shall be designed to prevent vehicle drivers and passengers from coming into physical contact with the parking system's equipment, machinery, and other moving parts of the system.

N **9.2.5.2 Terminals.**

N **9.2.5.2.1** Where terminals are installed, they shall be separated from the parking system by an enclosure designed to prevent vehicle occupants and other building occupants from entering and exiting the parking system.

N **9.2.5.2.2** Terminals shall be designed in accordance with the other relevant provisions of this standard.

N **9.2.5.2.3** Terminals shall be considered an incidental use area to the entire parking system.

N **9.2.5.3* Terminal Doors.**

N **9.2.5.3.1** Doors separating the terminal from the parking system shall be constructed with safety features to prevent vehicle occupants or any other building occupants from accessing the parking system.

N **9.2.5.3.2** All other doors, except garage doors, that lead from the terminal into other areas or to the exterior, other than into the parking system, shall be subject to the relevant provisions of this standard.

N **9.2.6 Pay Stations.**

N **9.2.6.1 Automated Pay Stations.** Automated pay stations that are located within a parking structure, but that are not within an enclosed room or space, shall be installed greater than 5 ft (1.52 m) from the edge of any parking space(s) or traffic lane(s).

N **9.2.6.2 Pay Stations Within Separate Spaces.** Pay stations located within an enclosed room or space shall be subject to all other requirements of NFPA 88A, as applicable.

N **9.2.6.3 Pay Station Entrance.**

N **9.2.6.3.1** The entrance to this pay station room or space shall be made only from a sidewalk or other pedestrian way.

N **9.2.6.3.2** Pedestrian access directly to a parking space or traffic lane to or from this pay station room or space shall not be permitted.

N **9.2.6.4 Vehicle Barriers.** A vehicle barrier system protecting an automated pay station area or pay station room or space shall be installed on all sides of the pay station area, room or space that abut a parking space(s) or traffic lane(s), and be constructed in accordance with the structural provisions of NFPA 5000.

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.

N **A.1.5** Emergency plans for parking structures can assist owners, operators, and emergency service providers in the event of an emergency or fire protection system failure at the location. The most desired approach to developing these emergency plans is to include all stakeholders in the planning and development of the emergency plan. The emergency plan, depending on the size and complexity of the parking structure, can be as simple or as complex as the stakeholders feel is necessary. Vital elements of the plan should include emergency contacts, fire prevention planning, emergency response, mitigation, and recovery plans. Events such as inclement weather, fires, fuel spills, hazardous materials incidents at the location or in the vicinity, fire protection system impairments, bomb threats, active shooters, and other types of emergencies should be included in the plan. The locations and numbers of fire protection devices, automatic defibrillators, and first aid equipment should also be listed to ensure that they can be utilized in the event of an emergency and maintained properly.

Parking garages have a significant impact on business continuity of operations. Parking garages should have a business impact analysis (BIA) to determine how the interruption of access to a parking structure could impact occupants and parking garage business owners. NFPA 1600's crisis/disaster/emergency management and business continuity/continuity of operations programs should be referenced where developing an emergency plan.

Δ **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 or 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 standards in a broad manner because 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.3.2.4 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.3.3.5 Parking Structure. A parking structure is permitted to be enclosed or open, use ramps, and use mechanical control push-button-type elevators to transfer vehicles from one floor to another, or mechanical or stacker systems. Motor vehicles are permitted to be parked by the driver or by an attendant where a mechanical or stacker parking system is used. Motor fuel is permitted to be dispensed, and motor vehicles are permitted to be serviced in a parking structure in accordance with NFPA 30A.

N **A.3.3.6.1 Fully Automated Parking System.** Vehicles can be driven into terminals separated from the parking system. Typically, fully automated systems can be designed to accommodate thousands of parking spaces. Many storage and retrieval actions can occur simultaneously, which allows high peak storage and retrieval performance.

N **A.3.3.6.2 Mechanical Parking System.** Vehicles can be permitted to be driven into the mechanical parking system. One mechanical parking unit typically serves for up to 50 vehicles. For more than 50 vehicles, additional units will need to be added.

N **A.3.3.6.3 Stacker Parking System.** A stacker system can store up to 4 vehicles in a single unit. Vehicles are permitted to be driven into the stacker system and backed out at time of retrieval. For a stacker system to operate as designated at grade, the parking space must be vacant, or a pallet(s) or platform(s) must be available from the at-grade access location for both the storage and retrieval of the vehicles to take place.

A.4.1.5 Exit travel distance is measured in accordance with NFPA *101*.

A.5.1.1 Building codes generally contain provisions limiting the heights and areas of parking structures of various types of construction.

N **A.5.1.5** The pre-incident plan should be developed by fire rescue with input from the building owners or operators of parking structures or systems.

A.5.3.4 See NFPA 220.

A.5.4.1.2 Asphalt pavement applied over earth substrates is an acceptable method of surfacing.

A.6.3.1 This ventilation requirement is also intended to address vehicles that use natural gas [compressed natural gas (CNG) or liquefied natural gas (LNG)]. A natural gas leak should pose no greater risk than leaks of conventional motor fuels.

Δ **A.9.2.4.1** As with the more conventional parking garages, NFPA 88A refers to other NFPA standards (NFPA 13, NFPA 14, *NFPA 72*, NFPA *101*, and *NFPA 5000*) for certain fire protection features of automated-type parking structures. Also, see the NFPA FPRF report, *Modern Vehicle Hazards in Parking Structures and Vehicle Carriers*.

N **A.9.2.5.1.1** In parking systems that do not provide physical barriers or terminals, a parking attendant can transport the

vehicle from a passenger drop-off and pick-up area, so vehicle occupants do not come in contact with the parking system's equipment, machinery, and other moving parts of the system. Operators of the parking system should be the only ones that move a vehicle into stacker and mechanical parking systems.

N **A.9.2.5.3** The door to the outside must be open so that a vehicle can drive into the terminal. The door must also stay open until all passengers are out of the terminal. The outside kiosk only allows the system to activate if and when it is secured and all passengers are out of the terminal, which can be confirmed secondarily by sensors and motion cameras, as well as by the driver initiating the process on the outside kiosk. Because of that fact, which is common with all fully automated systems, the requirement of these doors complying with the 'relevant provisions of this standard' is not applicable.

Annex B Informational References

B.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.

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

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2022 edition.

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

NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*, 2021 edition.

NFPA 72®, *National Fire Alarm and Signaling Code®*, 2022 edition.

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

NFPA 220, *Standard on Types of Building Construction*, 2021 edition.

NFPA 1600®, *Standard on Continuity, Emergency, and Crisis Management*, 2019 edition.

NFPA 5000®, *Building Construction and Safety Code®*, 2021 edition.

NFPA Fire Protection Research Foundation (FPRF) report, "Modern Vehicle Hazards in Parking Structures and Vehicle Carriers," 2020.

B.1.2 Other Publications. (Reserved)

B.2 Informational References. The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

B.2.1 ASME Publications. American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME B30.13, *Storage/Retrieval Machines and Associated Equipment*, 2017.

B.2.2 RMI Publications. Rack Manufacturers Institute, An Affiliated Trade Association of Material Handling Industry of America, 8720 Red Oak Boulevard, Suite 201, Charlotte, NC 28217-3992.

MHI MH16.1, *Specification for Industrial Steel Storage Racks*, 2012 (R2019).

B.3 References for Extracts in Informational Sections. (Reserved)