AGENDA

NFPA Technical Committee on Garages and Parking Structures (GAR-AAA)
NFPA 88A Second Draft Meeting (A2026)

November 4 and 5, 2025
8:00 a.m. – 5:00 p.m. (Eastern)

Savannah, GA
To join the meeting, please contact ksmith@nfpa.org

1. **Call to order.** Michael Carsillo.
2. **Introductions.** See committee roster attached.
3. **Chair report.** Michael Carsillo.
4. **Staff liaison report.** Kevin Carr.
5. **Previous meeting minutes.** October 1-2, 2024, Charlotte, NC. See attached.
6. **NFPA 88A Second Draft.**
   a. **Public Comments.** See attached.
   b. **Task group report(s).**
      i. **TG#1, Electric Mobility/E-Mobility**. Hoyt.
      ii. **TG#2, EV Charging Equipment**. Platz.
      iii. **TG#3, Carbon Monoxide/Nitrous Dioxide Detection.** Towski.
      iv. **TG#4, Fire Protection and Safety Systems.** Gaut.
      v. **TG#5, Drainage.** Towski.
      vi. **TG#6, Product Safety Standards.** Stanley.
   c. **Presentation(s).**
      i. **Update on Classification of Modern Vehicle Hazards in Parking Structures, Phase 3.** Combustion Science and Engineering, Inc.
   d. **Committee Inputs.** See attached.
   e. **Staff Items for Consideration.**
7. **Other Business.**
8. **Future meetings.**
9. **Adjournment.**

Address List No Phone

09/03/2025
Kevin Carr
GAR-AAA

Garages and Parking Structures

Michael E. Carsillo **E** 07/14/2004
Chair **GAR-AAA**
Palm Beach Gardens Fire Rescue
10500 North Military Trail
Palm Beach Gardens, FL 33410
International Fire Marshals Association (IFMA)

Steven A. Abbott **E** 12/07/2021
Principal **GAR-AAA**
Georgia State Financing & Investment Commission
270 Washington Street
2nd Floor
Atlanta, GA 30334-9009

Konstantinos V. Belivanis **SE** 08/23/2023
Principal **GAR-AAA**
Jensen Hughes
100 Quannapowitt Parkway
Wakefield, MA 01880
Alternate: Juan Carlos Hernandez

Cecil Bilbo, Jr. **M** 07/29/2013
Principal **GAR-AAA**
Academy of Fire Sprinkler Technology, Inc.
President
101 South Main Street
Suite 001
Decatur, IL 62523
National Fire Sprinkler Association
Alternate: Ernesto Rodriguez, Jr.

Stephany R. Bomysoad **SE** 04/09/2025
Principal **GAR-AAA**
AECOM
10 S. Jefferson Street
Suite 1600
Roanoke, VA 24011
Alternate: Zade Mohamad

Daniel A. Dahl **SE** 7/19/2002
Principal **GAR-AAA**
Stantec
1455 Lincoln Parkway
Suite 500
Atlanta, GA 30346

John August Denhardt **IM** 04/14/2021
Principal **GAR-AAA**
American Fire Sprinkler Association (AFSA)
1410 East Renner Road
Suite 150
Richardson, TX 75082
Alternate: Kevin R. Hall

Juan Carlos Fernandez **E** 08/17/2017
Principal **GAR-AAA**
Miami-Dade Fire Rescue Department
9300 NW 41st Street
Doral, FL 33178

Brooke Fishback **M** 04/12/2022
Principal **GAR-AAA**
Protectowire Company, Inc.
60 Washington Street
Pembroke, MA 02359

Christina F. Francis **M** 12/07/2021
Principal **GAR-AAA**
Tesla
2415 Moores Mill Road
Suite 265-170
Auburn, AL 36830

James W. Gaut **U** 12/08/2015
Principal **GAR-AAA**
Marriott Vacations Worldwide
11667 Acosta Avenue
Orlando, FL 32836-8821

Robert Hattier **L** 08/29/2024
Principal **GAR-AAA**
IBEW Local 134
2722 S. Martin Luther King Dr
Chicago, IL 60616

Address List No Phone

09/03/2025
Kevin Carr
GAR-AAA

Garages and Parking Structures

Jennifer Hoyt **SE** 08/23/2023
Principal **GAR-AAA**
Code Red Consultants
132 Turnpike Road
Suite 320
Southborough, MA 01772
Alternate: Hubert Biteau

Jeffery P. McBride **SE** 9/30/2004
Principal **GAR-AAA**
EBL Engineers, LLC
EBL Fire Engineering
8005 Harford Road
Baltimore, MD 21234-5701

Somnath Mukherjee **U** 7/29/2005
Principal **GAR-AAA**
Port Authority of New York & New Jersey
Senior Engineer
150 Greenwich Street
4 World Trade Center, 20th Floor
New York, NY 10007
Alternate: Danny Cobourne

Randy Narine **RT** 04/09/2025
Principal **GAR-AAA**
CESAT (Clean Energy Safety and Training Council)
689 McMullen Street
Shelburne, ON L9V 3X4 Canada

Jim Pidcock **E** 08/23/2023
Principal **GAR-AAA**
Roaring Fork Fire Rescue
1089 JW Drive
Carbondale, CO 81623

Christopher M. Platz **E** 08/11/2020
Principal **GAR-AAA**
Abington Township
Fire Marshal
1176 Old York Road
Abington, PA 19001

Melisa Rodriguez **M** 11/29/2023
Principal **GAR-AAA**
Johnson Controls
5757 N Green Bay Ave.
Glendale, WI 53209
Alternate: Sean Cutting

John Saavedra **SE** 04/03/2019
Principal **GAR-AAA**
Bioteckta
Cra 15 No 88-21 Ofc 702
Bogota, CUND 110141 Colombia

Peter T. Schwab **IM** 04/17/2024
Principal **GAR-AAA**
Wayne Automatic Fire Sprinklers, Inc.
222 Capitol Court
Ocoee, FL 34761-3033
Alternate: Brett Curry

Robert Stanley **SE** 08/10/2022
Principal **GAR-AAA**
Walker Consultants
10375 Park Meadows Drive
Suite 425
Lone Tree, CO 80124

Chris Towski **L** 04/12/2022
Principal **GAR-AAA**
Cambridge Fire Department
23 McHugh Avenue
Billerica, MA 01821
International Association of Fire Fighters

Keith Woller **L** 08/17/2017
Principal **GAR-AAA**
UA Sprinkler Fitters Local 669
7050 Oakland Mills Road
Suite 200
Columbia, MA 21046
Alternate: James Michael Masterson

Address List No Phone

09/03/2025
Kevin Carr
GAR-AAA

Garages and Parking Structures

Sesha Yeruva **M** 12/04/2024
Principal **GAR-AAA**
Siemens
3617 Parkway Lane
Peachtree Corners, GA 30092

Felix I. Zemel **SE** 12/06/2019
Principal **GAR-AAA**
Town Of Dover
5 Springdale Road
Dover, MA 02030

Hubert Biteau **SE** 8/8/2019
Alternate **GAR-AAA**
Code Red Consultants, LLC
154 Turnpike Road
Suite 200
Southborough, MA 01772
Principal: Jennifer Hoyt

Danny Cobourne **U** 04/14/2021
Alternate **GAR-AAA**
Port Authority of NY & NJ
150 Greenwich Street
4 World Trace Center - 20th Floor
New York, NY 10007
Principal: Somnath Mukherjee

Brett Curry **IM** 04/09/2025
Alternate **GAR-AAA**
Wayne Automatic Fire Sprinklers, Inc.
222 Capitol Court
Ocoee, FL 34761
Principal: Peter T. Schwab

Sean Cutting **M** 04/09/2025
Alternate **GAR-AAA**
Johnson Controls
1467 Elmwood Avenue
Cranston, RI 02910
Principal: Melisa Rodriguez

Kevin R. Hall **IM** 04/14/2021
Alternate **GAR-AAA**
American Fire Sprinkler Association (AFSA)
3206 Fait Avenue
Baltimore, MD 21224
Principal: John August Denhardt

Juan Carlos Hernandez **SE** 11/29/2023
Alternate **GAR-AAA**
Jensen Hughes
2332 Galiano Street, 2nd Floor
Coral Gables, FL 33134
Principal: Konstantinos V. Belivanis

James Michael Masterson **L** 12/02/2020
Alternate **GAR-AAA**
UA Sprinkler Fitters Local 669
712 Mill Brook Circle
Shepherdsville, KY 40165
Principal: Keith Woller

Zade Mohamad **SE** 04/09/2025
Alternate **GAR-AAA**
AECOM
5805 Monet Drive
Roanoke, VA 24018
Principal: Stephany R. Bomysoad

Ernesto Rodriguez, Jr. **M** 08/23/2023
Alternate **GAR-AAA**
Wiginton Fire Protection Engineering, Inc.
699 Aero Lane
Sanford, FL 32771
National Fire Sprinkler Association
Principal: Cecil Bilbo, Jr.

Kevin Carr 4/19/2018
Staff Liaison **GAR-AAA**
National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

MINUTES

Technical Committee on Garages and Parking Structures (GAR-AAA)
NFPA 88A First Draft Meeting (A2026)

October 1-2, 2024
8:00am – 6:00pm (Eastern)

Charlotte, NC

1. **Call to order.** Michael Carsillo, chair, called the meeting to order at 8:00am on October 1, 2024.
2. **Introductions.** NFPA staff took attendance.
3. **Chair report.** Michael Carsillo welcomed attendees and provided an overview of the meeting.
4. **Staff liaison report.** Kevin Carr provided an overview of the standards development process and the revision cycle schedule.
   a. No members declared that they had been retained to represent the interest of an entity that would be classified in an interest category different from their own with respect to a specific issue or issues that were addressed by the committee.
5. **Previous meeting minutes.** The minutes from the June 15, 2021, Web/Teleconference, and October 25-26, 2023, St. Petersburg, FL were approved without revision.
6. **NFPA 88A First Draft.**
   a. **Review of Public Inputs.** The Technical Committee reviewed the Public Inputs and developed First Revisions and Committee Inputs, as necessary. These will be available in the First Draft Report at www.nfpa.org/88a.
   b. **Task group report(s).** The following task groups provided their reports and recommendations.
      i. **TG#1**. Hoyt. The task group provided a report. The task group has been discharged with thanks.
      ii. **TG#2**. Bilbo. The task group provided a report. No work was undertaken. The task group has been discharged with thanks.
      iii. **TG#3**. Platz. The task group provided a report. First Revisions or Committee Inputs were made. The task group has been discharged with thanks.

iv. **TG#4**. Hoyt. The task group provided a report. First Revisions or Committee Inputs were made. The task group was reconstituted to continue work.

v. **TG#5**. Towski. The task group provided a report. First Revisions or Committee Inputs were made. The task group has been discharged with thanks.

vi. **TG#6**. Zemel. The task group provided a report. No work was undertaken. The task group has been discharged with thanks.

vii. **TG#7**. Platz. The task group provided a report. First Revisions or Committee Inputs were made. The task group was reconstituted to continue work.

viii. **TG#8**. Towski. The task group provided a report. The task group provided a report. First Revisions or Committee Inputs were made. The task group was reconstituted to continue work.

ix. **TG#9**. Gaut. The task group provided a report. The task group provided a report. First Revisions or Committee Inputs were made. The task group was reconstituted to continue work.

c. **Presentation(s).** The committee heard presentations from the following individuals.

i. **Classification of Modern Vehicle Hazards in Parking Structures and Systems.** Combustion Science and Engineering, Inc. 1 hour and 30 minutes. Presentation attached.

d. **In-meeting task groups.** The following task groups were appointed to work within the First Draft meeting and have been discharged.

i. Review Chapter 1 to determine if language pertaining to applicable codes and standards should be provided within NFPA 88A. Chair: Hall. Members: Stanley, Platz, Fishback, Gaut, Hubert (guest).

e. **New task groups.** The following task groups were appointed to work subsequent to the meeting:

i. **TG#1**. TG Chair: Hoyt. Members: Towski, Fishback, Stanley, Gaut, Biteau, Platz, Francis, Belivanis, Zemel, Cutting (guest). Consider possible definitions and requirements regarding electric mobility (e-mobility)/micro mobility devices, which include, but not limited to, electric bikes and electric scooters, for review by the technical committee at the Second Draft meeting.

ii. **TG#2**. TG Chair: Platz. Members: Fishback, Biteau, Hoyt, Towski, McBride, Gaut, Francis, Haag, Belivanis, Cobourne, Sudah, Bilbo, Hattier. Consider the existing language of 7.1.5-7.1.8 pertaining to electric vehicle charging equipment. The task group will determine if changes to NFPA 88A for the existing language should be provided via a diverse and well-balanced group of both NFPA 88A TC members and interested parties. Efforts will be made to include as many outside voices, including NFPA 70 and other NFPA technical committees, with an emphasis on publicly available data, for inclusion within the task group. The task group will provide a report to the technical committee at the Second Draft meeting.

iii. **TG#3**. TG Chair: Towski. Members: Carsillo, Hoyt, Fishback, Gaut, Sudah. Consider if language pertaining to carbon monoxide and nitrous dioxide detection in 6.3/6.6 should be provided. The task group will provide a report to the technical committee at the Second Draft meeting.

iv. **TG#4**. TG Chair: Gaut. Members: Haag, Hoyt, Fishback, Towski, Woller, Rodriguez, Dahl, Cobourne, E. Rodriguez, McBride, Hall, Sudah, Hernandez, Platz, Cutting (guest), Scandaliato (guest). Consider if language pertaining to fire protection and safety systems that pertain to fully automated parking systems, mechanical parking systems, and stacker parking systems, within Chapter 9 should be provided. The task group will review CI-18, PI-62, PI-72, PI-52, PI-57, PI-59, PI-63, PI-65, PI-66, PI-61, PI-73, PI-74, PI-69 and PI-17, as a basis to provide a report to the technical committee at the Second Draft meeting.

v. **TG#5**. TG Chair: Towski. Members: Dahl, Fishback, Stanley, Gaut, Platz, Curry (guest). Review FR created for PI-14 as is applies to drainage and determine if changes are needed to be presented to the technical committee for review during Second Draft. Considerations for the prescriptive requirements and how they may be achieved, as well as possible Annex material to provide guidance, should be considered.

vi. **TG#6**. TG Chair: Stanley. Members: Platz, Towski, Gaut. Review PI-20 and determine if applicable product safety standards pertaining to parking systems are available for review, reference, and inclusion with NFPA 88A. The task group will provide a report on this topic at the Second Draft meeting.

7. **Other Business.** The following items were discussed:

   a. A.9.2.4.1 was discussed. A First Revision was made.

   b. Electric vehicles and sprinkler protection were discussed. No action taken.

   c. The scheduled release of the next FPRF report (PH-III) was discussed. No action taken.

8. **Future meetings.** The next committee meeting will be Summer/Fall 2025. A meeting notification will be posted at www.nfpa.org/88Anext when the meeting is scheduled.

9. **Adjournment.** The meeting was adjourned at 3:43pm on October 2, 2024.

Attendees
Committee Members:

✓	**Carsillo, Michael**	Chair	International Fire Marshals Association
✓	**Abbott, Steven**	Principal	Georgia State Financing & Investment
✓	**Belivanis, Konstantinos**	Principal	Jensen Hughes
✓	**Bilbo, Cecil***	Principal	National Fire Sprinkler Association
✓	**Breen, John***	Principal	Amentum/AECOM
✓	**Dahl, Daniel**	Principal	Morrison Hershfield Corporation
✓	**Denhardt, John***	Principal	American Fire Sprinkler Association
✓	**Fernandez, Juan**	Principal	Miami-Dade Fire Rescue Department
✓	**Fishback, Brooke**	Principal	Protectowire Company, Inc.
✓	**Francis, Christina***	Principal	Tesla
✓	**Gaut, James**	Principal	Marriott Vacations Worldwide
✓	**Haag, Gerhard***	Principal	Robotic Parking Systems Inc.
✓	**Hattier, Robert***	Principal	International Brotherhood of Electrical
✓	**Hoyt, Jennifer**	Principal	Code Red Consultants
✓	**McBride, Jeffery***	Principal	EBL Engineers, LLC
	Mukherjee, Somnath	Principal	Port Authority of New York & New Jersey
✓	**Pidcock, Jim***	Principal	Roaring Fork Fire Rescue
✓	**Platz, Christopher**	Principal	Abington Township
✓	**Rodriguez, Melisa**	Principal	Johnson Controls
✓	**Saavedra, John***	Principal	Bioteckta
✓	**Schwab, Peter***	Principal	Wayne Automatic Fire Sprinklers, Inc.
✓	**Stanley, Robert***	Principal	Walker Consultants
✓	**Sudah, William**	Principal	Honeywell
✓	**Towski, Chris**	Principal	International Association of Fire Fighters
✓	**Woller, Keith**	Principal	UA Sprinkler Fitters Local 669
✓	**Zemel, Felix***	Principal	Town Of Dover
	Anderson, Robert	Alternate	Johnson Controls
	Biteau, Hubert	Alternate	Code Red Consultants, LLC
✓	**Cobourne, Danny***	Alternate	Port Authority of NY & NJ
✓	**Hall, Kevin**	Alternate	American Fire Sprinkler Association
✓	**Hernandez, Juan**	Alternate	JENSEN HUGHES

✓	**Masterson, James**	Alternate	UA Sprinkler Fitters Local 669
✓	**Rodriguez, Ernesto**	Alternate	National Fire Sprinkler Association
✓	**Carr, Kevin**	Staff Liaison	National Fire Protection Association

Guests:

Brett Curry	Wayne Automatic Fire Sprinklers Inc.
Sean Cutting*	Johnson Controls.
Jessica Hubert*	Guardian Services Inc./NFPA DARAC
Michael Klassen*	Combustion Science & Engineering, Inc.
Stephen Olenick*	Combustion Science & Engineering, Inc.
Steve Scandaliato*	SDG, LLC.

*Participated by teleconference
Total number in attendance: 37

Classification of Modern Vehicle Hazards in Parking Structures & Systems – Phase II

NFPA 88A First Draft Meeting

Stephen M. Olenick
Michael S. Klassen
Nasir Hussain

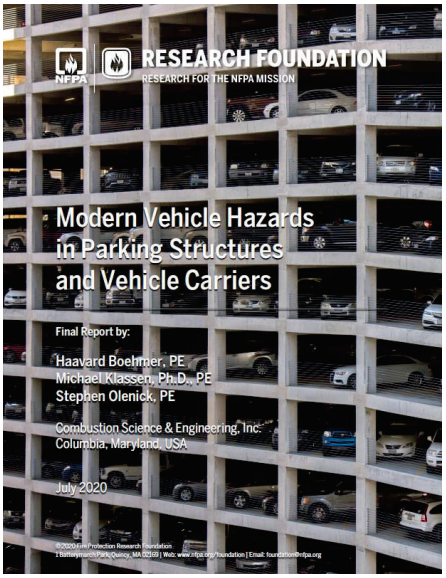
Combustion Science & Engineering Inc

Disclaimer

- We are the authors of the work and are speaking on behalf of CSE
  - We do not speak on behalf of the Fire Protection Research Foundation, the NFPA, or the Project Technical Panel

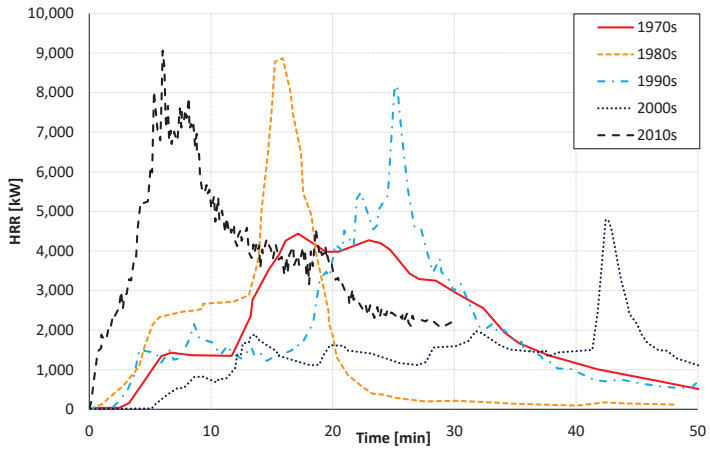
Motivation

- The Phase I project
- Highlights:
  - Identified that the quantity of plastics in vehicles is increasing
  - Sprinklered closed-style garages were not of primary concern
  - Unsprinklered open-style garages were a concern due to vehicle-to-vehicle fire spread



Phase I Highlights – No Clear Trend of HRR

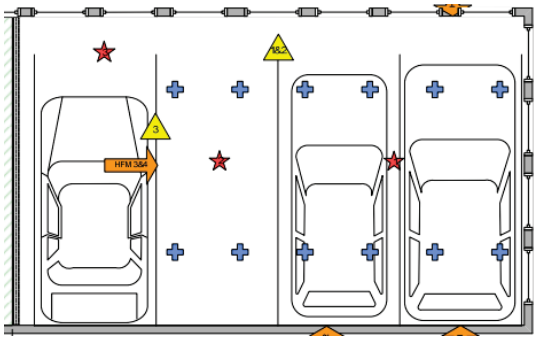
- No clear correlation for vehicle HRR and age of vehicle
- Depends on:
  - Ignition source and location
  - Ventilation
  - Vehicle size



Combustion Science & Engineering Inc

Phase I Highlights – Fire Spread Critical

- BRE test
  - Spread to 2nd vehicle in 10 min (1 test) and 20 min (2 tests)
  - Spread to 3rd vehicle (empty spot separating) <4 min later
  - 1000°C+ ceiling jet temperature pre-heats interior and aids spread
- Similar behavior in other tests (e.g. Tramoni et al.)



Mangs and Keski-Rahkonen (1994) referring to vehicles built in the 1970s: "In an open car park building, the fire is likely to be constrained to the burning car or at most be spread to one or two adjacent cars"

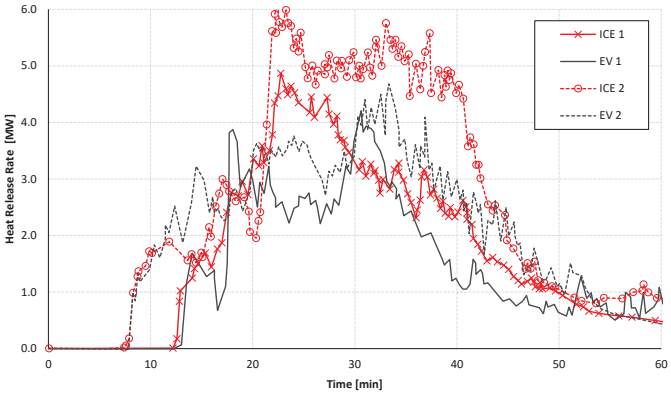
Similar test with sprinklers did not suppress fire, and a peak HRR of 7 MW was reached, but fire did not spread to other automobiles

Combustion Science & Engineering Inc

Phase I Highlights – EVs and ICEs similarities

- EVs vs. ICEs
  - EV lower peak HRR than ICE
  - Growth rate is similar





Phase I Highlights – EVs and ICEs Differences

- EVs vs. ICEs
  - Ignition and fire dynamics are the main differences
    - » Thermal runaway of battery is a new ignition possibility
    - » Jet flame to neighboring vehicles
    - » Long re-ignition period possible
      - Stranded energy
    - » Need for a lot of water to ensure suppression



BRIEFING ROOM

Administration Priorities COVID Plan

FACT SHEET: The Biden-Harris Electric Vehicle Charging Action Plan

DECEMBER 13, 2021 • STATEMENTS AND RELEASES

Vice President Kamala Harris to Announce Action Plan that Fast Tracks Bipartisan Infrastructure Law Investments

President Biden has united automakers and autoworkers to drive American leadership forward on clean cars, and he set an ambitious target of 50% of electric vehicle (EV) sale shares in the U.S. by 2030. Now, the Bipartisan Infrastructure Law will supercharge America's efforts to lead the electric future, Building a Better America where we can strengthen domestic supply chains, outcompete the world, and make electric cars cheaper for working families.

President Biden, American families, automakers, and autoworkers agree: the future of transportation is electric. The electric car future is cleaner, more equitable, more affordable, and an economic opportunity to support good-paying, union jobs across American supply chains as automakers continue

Motivation for Phase II

- The Phase I project
  - Questions remained:
    - » What is the proper protection scheme for vehicles in parking garages?
      - May require full-scale modern vehicle fire testing
    - » Before conducting full-scale tests, though, there was a desire to take a snapshot of:
      - Literature data of full-scale vehicle fire tests
        - Significant amount of new testing
      - Applicable codes and standards
        - Code/standards changes have occurred
      - Characteristics of vehicles and parking garages
      - Statistics on vehicle fire losses in garages
        - Including specific incident review

Phase II Project Objectives

- The Phase II project
  - Task 1 – Literature Review and Data Collection
    - » A: Trends in Parking Structures (i), Parking Systems (i), and Vehicle Composition (ii)
    - » B: Review of Fire Incidents in Parking Structures
    - » C: Review of Codes and Standards
    - » D: Identify Literature of Recent Fire Tests of Modern Vehicles
  - Task 2 – Knowledge Gap Analysis
    - » Identify Knowledge Gaps
  - Task 3 – Propose a Research Full-Scale Testing Plan
    - » To Address the Knowledge Gaps

Task 1A-i – Parking Structure Design Trends

- Typical parking space layout in U.S.
- Sizing is based on "design" vehicle

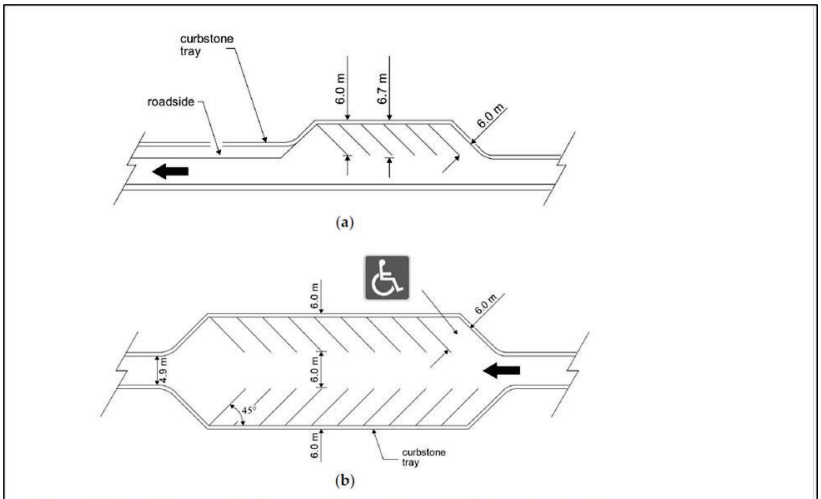


Figure 1. Schemes of planning of parking spaces for passenger cars with one-sided (a) and two-sided (b) placement in the USA.

M. Mikusova, J. Abdunazarov, J. Zukowska and J. Jagelcak, *Computation,* 2020.

Task 1A-i – Design Vehicle Dimensions

One industry group:

- Passenger Vehicle:
  4.3 x 7 x 19 (ft)
  1.31 x 2.13 x 5.79 (m)

- Design vehicle size was not changed between 1998 - 2016

Table 1. Current design vehicle dimensions.

Design vehicle type	Symbol	Overall			Overhang		Dimensions (ft)						
		Height	Width	Length	Front	Rear	WB_1	WB_2	S	T	WB_3	WB_4	Typical kingpin-to-center-of-rear tandem axle
Passenger car	P	4.3	7.0	19.0	3.0	5.0	11.0	–	–	–	–	–	–
Single-unit truck	SU-30	11.0–13.5	8.0	30.0	4.0	6.0	20.0	–	–	–	–	–	–
Single-unit truck (three-axle)	SU-40	11.0–13.5	8.0	39.5	4.0	10.5	25.0	–	–	–	–	–	–
Buses													
Intercity bus (motor coaches)	BUS-40	12.0	8.5	40.5	6.3	9.0[a]	25.3	–	–	–	–	–	–
	BUS-45	12.0	8.5	45.5	6.2	9.0[a]	28.5	–	–	–	–	–	–
City transit bus	CITY-BUS	10.5	8.5	40.0	7.0	8.0	25.0	–	–	–	–	–	–
Conventional school bus (65 passengers)	S-BUS-36	10.5	8.0	35.8	2.5	12.0	21.3	–	–	–	–	–	–
Large school bus (84 passengers)	S-BUS-40	10.5	8.0	40.0	7.0	13.0	20.0	–	–	–	–	–	–
Articulated bus	A-BUS	11.0	8.5	60.0	8.6	10.0	22.0	19.4	6.2[b]	13.2[b]	–	–	–
Combination trucks													
Intermediate semitrailer	WB-40	13.5	8.0	45.5	3.0	4.5[a]	12.5	25.5	–	–	–	–	25.5
Interstate semitrailer	WB-62*	13.5	8.5	69.0	4.0	4.5[a]	19.5	41.0	–	–	–	–	41.0
Interstate semitrailer	WB-67**	13.5	8.5	73.5	4.0	4.5[a]	19.5	45.5	–	–	–	–	45.5
Double bottom semitrailer/trailer	WB-67D	13.5	8.5	72.3	2.3	3.0	11.0	23.0	3.0[c]	7.0[c]	22.5	–	23.0
Rocky Mountain double semitrailer/trailer	WB-92D	13.5	8.5	97.3	2.3	3.0	17.5	40.0	4.5	7.0	22.5	–	40.5
Triple semitrailer/trailers	WB-100T	13.5	8.5	104.8	2.3	3.0	11.0	22.5	3.0[c]	7.0[c]	22.5	22.5	23.0
Turnpike double semitrailer/trailer	WB-109D*	13.5	8.5	114.0	2.3	4.5[a]	12.2	40.0	4.5[a]	10.0[a]	40.0	–	40.5
Recreational vehicles													
Motor home	MH	12.0	8.0	30.0	4.0	6.0	20.0	–	–	–	–	–	–
Car and camper trailer	P/T	10.0	8.0	48.7	3.0	12.0	11.0	–	5.0	17.7	–	–	–
Car and boat trailer	P/B	–	8.0	42.0	3.0	8.0	11.0	–	5.0	15.0	–	–	–
Motor home and boat trailer	MH/B	12.0	8.0	53.0	4.0	8.0	20.0	–	6.0	15.0	–	–	–

Source: AASHTO 2018.

* Design vehicle with 48.0-ft trailer as adopted in the 1982 Surface Transportation Assistance Act (STAA).
** Design vehicle with 53.0-ft trailer as grandfathered in with the 1982 Surface Transportation Assistance Act (STAA).
[a] This is the length of the overhang from the back axle of the tandem axle assembly.
[b] Combined dimension is 19.4 ft and articulating section is 4.0 ft wide.
[c] Combined dimension is typically 10.0 ft.
[d] Combined dimension is typically 10.0 ft.
[e] Combined dimension is typically 12.5 ft.
WB_1, WB_2, WB_3, and WB_4 are the effective vehicle wheelbases, or distances between axle groups, starting at the front and working toward the back of each unit.
S is the distance from the rear effective axle to the hitch point or point of articulation.
T is the distance from the hitch point or point of articulation measured back to the center of the next axle or the center of the tandem axle assembly.

I. B. Potts, D. W. Harwood, D. J. Cook, R. A. Moran and L. Busenbark, "Highway and Street Design Vehicles: An Update," The National Academies Press, Washington, DC, 2023.

Task 1A-i – Parking Space Dimensions

- Un-angled parking Space width varies between: 8 ft – 3 in to 9 ft (2.51 m to 2.74 m) depending on level of comfort

- Design vehicle for this industry group is 6'7" wide

B. Wolshon and A. Pande, Traffic Engineering Handbook, 7th ed., New York: John Wiley & Sons., 2016.

Table 13-3. Stall and Module Dimensions

			All Levels of Service				
			Angle	Veh. Proj. (VP)	Wall Offset (WO)	Overhang (O)	Stripe Offset (SO)
			45	17′–5″	10′–8″	1′–9″	16′–6″
			50	18′–0″	9′–5″	1′–11″	13′–10″
	Width	Length	55	18′–5″	8′–3″	2′–1″	11′–7″
Design Vehicle	6′–7″	17′–1″	60	18′–9″	7′–2″	2′–2″	9′–6″
Stripe Projection (SP)		16′–6″	65	18′–11″	6′–1″	2′–3″	7′–8″
			70	19′–0″	5′–0″	2′–4″	6′–0″
Parallel Stall Length		23′–0″	75	18′–10″	3′–10″	2′–5″	4′–5″
			90	17′–9″	1′–0″	2′–6″	0′–0″

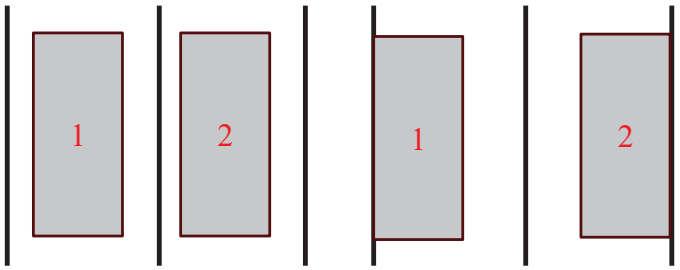
Minimum Level of Comfort					Generous Level of Comfort				
Angle	Width Proj. (WP)	Module (M)	Aisle (A)	Interlock (I)	Angle	Width Proj. (WP)	Module (M)	Aisle (A)	Interlock (I)
0	8′–3″	28′–6″	12′–0″	1 0′–0″	0	9′–0″	33′–0″	15′–0″	1 0′–0″
0	8′–3″	38′–10″	22′–4″	2 0′–0″	0	9′–0″	43′–4″	25′–4″	2 0′–0″
45	11′–8″	46′–10″	12′–0″	1 2′–11″	45	12′ 9″	49′–10″	15′–0″	3′–2″
50	10′–9″	48′–3″	12′–3″	3 2′–8″	50	11′–9″	51′–3″	15′–3″	2′–11″
55	10′–1″	49′–6″	12′–8″	2′–4″	55	11′–0″	52′–6″	15′–8″	2′–7″
60	9′–6″	51′–0″	13′–0″	2′–1″	60	10′–5″	54′–0″	16′–6″	2′–3″
65	9′–1″	52′–3″	14′–5″	1′–9″	65	9′–11″	55′–3″	17′–5″	1′–11″
70	8′–9″	53′–6″	15′–6″	1′–5″	70	9′–7″	56′–6″	18′–6″	1′–6″
75	8′–6″	54′–6″	16′–10″	1′–1″	75	9′–4″	57′–6″	19′–10″	1 1′–2″
90	8′–3″	58′–6″	23′–0″	4 0′–0″	90	9′–0″	61′–6″	26′–0″	4 0′–0″

All dimensions rounded to nearest inch.

1. Minimum aisle width for one-way traffic controls module; no further reduction in aisle may be taken with wider stall.
2. Minimum aisle width for two-way traffic controls module; no further reduction in aisle may be taken with wider stall.
3. Aisle is close to minimum (see 1 and 2), restricting adjustment for wider stall.
4. Module for one-way traffic flow same as two-way; controlled by turn into stalls.

Task 1A-i – Guidance For Spacing Between Vehicles

- Utilizing the design vehicle dimensions and the range of dimensional width for the parking space from the second industry group:
  - Typical distances between parked vehicles: approximately 1.7 to 2.4 ft (0.5 m to 0.7 m)
  - Maximum distance between two design vehicles 3.3 to 4.8 ft (1.0 m to 1.5 m)
- This guidance on spacing should be considered for future testing and analyses



Task 1A-i – Trends/Concepts for Future Parking Structures

- Mixed-use structures (hybrid parking structures)
  - One floor used for purposes other than parking (retail, recreation, storage, housing, etc.)
  - Change in fire load and ignition sources
  - Life safety concerns will become more pronounced in hybrid parking structures

Task 1A-i – Trends/Concepts for Future Parking Structures

- Automated Mechanical Parking Facilities (AMPFs) and Stackers
  - AMPFs use a loading compartment to transport vehicle to storage slot via a lift system
  - Remove human element from parking structure
    - » No need for stairwells, reduced lighting and ventilation
    - » Increase parking density – no space needed for opening doors
  - Stacker systems use lifts, but may not be automated
  - Vehicle density will be high in these facilities
    - » Currently no guidance in national codes on fire protection requirements except for smaller stackers

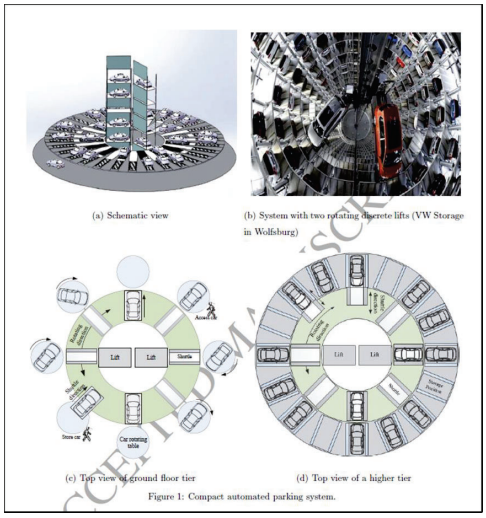
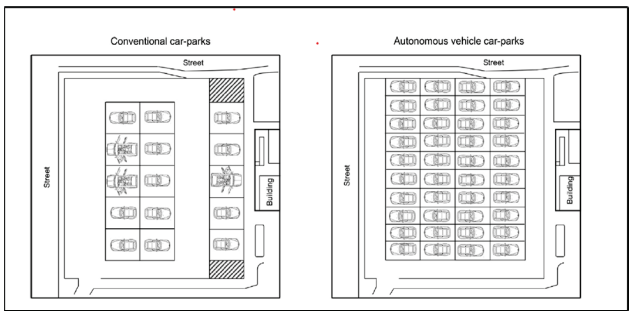


Figure 1: Compact automated parking system.

G. Wu, X. Xu, R. De Koster and B. Zou, *European Journal of Operational Research,* vol. 273, no. 3, pp. 948-967, 2019.

Task 1A-i – Trends/Concepts for Future Parking Structures

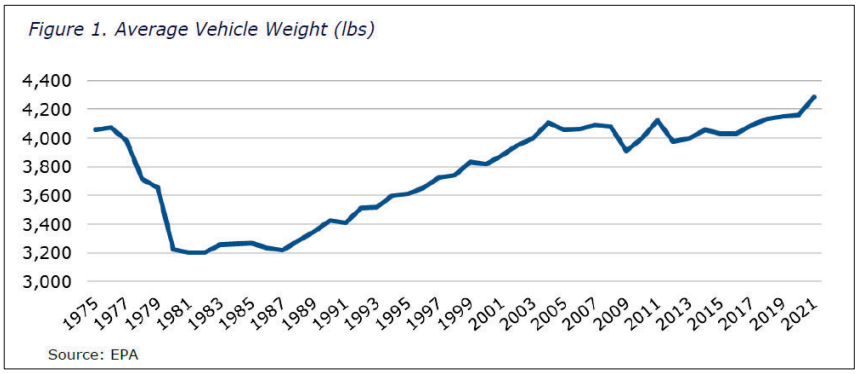
- Parking structures for autonomous vehicles
  - On-going development of self-driving and autonomous vehicles
  - Belief that these vehicles can reduce traffic density in cities and allow for more remote parking facilities (away from city centers)
  - Similar to AMPFs, parking structures for autonomous vehicles would have similar operational benefits, and allow for higher density parking structures
  - Similar fire protection concerns would therefore exist



M. Nourinejad, S. Bahrami and M. J. Roorda, *Transportation Research Part B: Methodological,* vol. 109, 2018

Task 1A-ii – Vehicle Material Composition

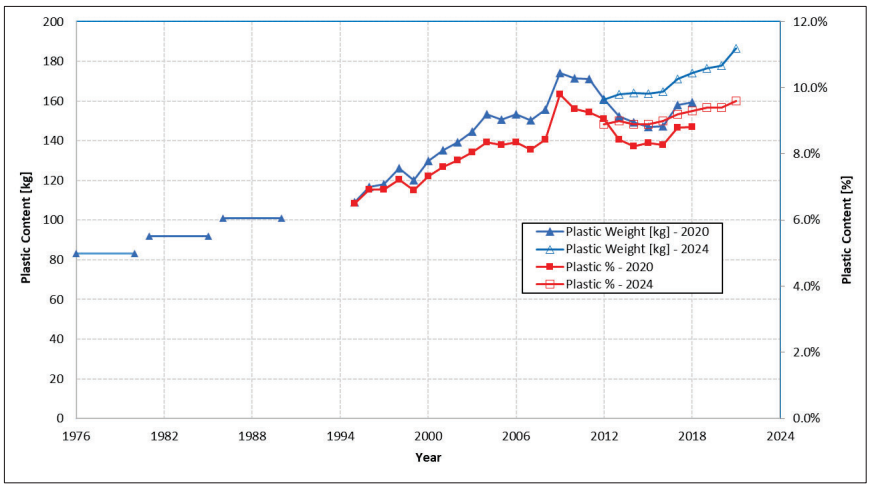
- Average vehicle weight is trending upward
- In the US, continued popularity of SUVs and trucks
- EVs also increasing in popularity



American Chemistry Council (2023)

Task 1A-ii – Vehicle Material Composition

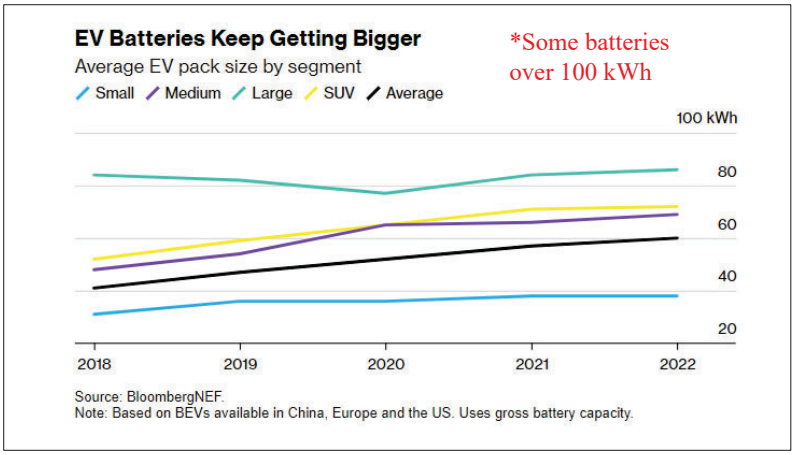
- Plastic content continues to increase in vehicles
- 186 kg (411 lbs) on average per automobile



American Chemistry Council (2023)

Task 1A-ii – Vehicle Material Composition

- Average size of EV batteries in vehicles has increased since 2018
- Average size has increased from ~40 kWh to almost 60 kWh
- Size increase due to customer desire for longer drive times/range between charging



*Some batteries over 100 kWh

Bloomberg (2023)

Task 1B – Incidents - General Statistics

- Fires in US parking structures from 2014-2018
- Note injury levels are low and property damage of $22.8M

Fires in commercial parking garages, by incident type
2014-2018 Annual averages

Incident type	Fires		Civilian Injuries		Direct Property Damage (in Millions)	
Structure fire	644	(35%)	8	(39%)	$15.6	(68%)
Non-confined	476	(26%)	8	(39%)	$15.6	(68%)
Confined	168	(9%)	0	(0%)	$0.0	(0%)
Vehicle fire	766	(41%)	10	(51%)	$6.1	(27%)
Outside or unclassified fires	447	(27%)	2	(9%)	$1.1	(5%)
Total	1,858	(100%)	20	100%)	$22.8	(100%)

Note: Sums may not equal totals due to rounding errors. Confined structure fires are identified by NFIRS incident types 113-118.

Source: NFIRS and NFPA fire department experience survey.

Task 1B – Incidents - General Statistics

- Fires in US parking structures from 2017-2021
- Basically unchanged from earlier years
- The outliers drive the risk

Fires in or at Commercial, General Vehicle or Fleet Parking Garages
2017–2021 Estimated Annual Averages

Incident Type	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Structure Fire	620	(33%)	0	(0%)	9	(45%)	$15.8	(62%)
Vehicle Fire	730	(39%)	0	(0%)	10	(46%)	$8.9	(35%)
Outside or Unclassified Fire	530	(28%)	0	(100%)	2	(9%)	$0.9	(4%)
Total	1,880	(100%)	0	(100%)	21	(100%)	$25.6	(100%)

These are national estimates of fires reported to US municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Fires are rounded to nearest ten. Civilian deaths and injuries are estimated to the nearest one and direct property damage has been estimated to the nearest million dollars. Totals may not equal sums due to rounding errors.

Source: NFIRS 5.0 and NFPA fire experience survey.

Task 1B – Incidents – Specific Incidents

- Selected five (5) parking garage fires
  - Both EV and ICE vehicles
    - And if feasible, sprinklered vs. unsprinklered
  - Utilize public sector reports and other publicly available sources of information
    - Cause of fire
    - Extent and characteristics of spread of fire
    - Financial losses if reported
- Searched for a stacker incident, but did not find one
  - Consistent with a publication by RISE [Skilbred et al., RISE Report 2023:37, 2023]

Task 1B – Incidents – Specific Incidents

- Merriweather District, Columbia, Md, USA
  - Unsprinklered, multiple cars
  - Close call
- Luton Airport, London, UK
  - Unsprinklered, multiple cars
  - Catastrophic event
- Marienplatz, Ravensburg, Germany
  - Sprinklered, possible multiple cars
    - » Lower density than NFPA 13 - OH1
  - EV charging at the time
  - Contained but still some damage
- Des Plaines, Illinois, USA
  - Hybrid vehicle
  - Sprinklers (assume OH1), controlled
  - Multiple re-ignitions
  - Smoke spread to residential areas above via stairwells
- Towson, Md, USA
  - Diesel ICE vehicle
  - Sprinklered (assume OH1), controlled
  - Smoke started spreading to residential areas above via stairwells
  - Vehicle owners re-entering garage to remove their property

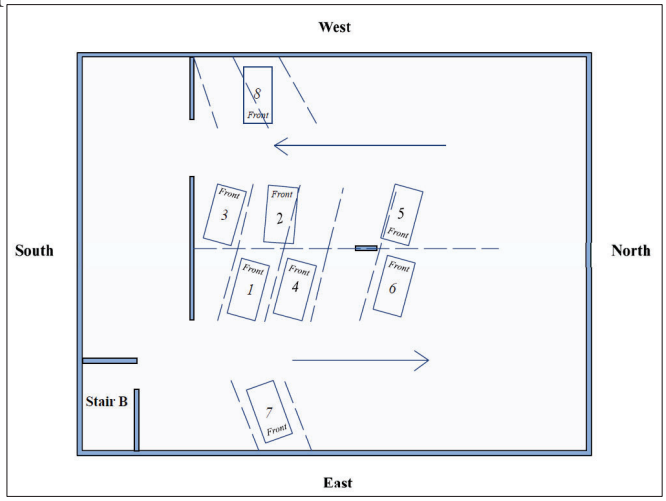


Task 1B – Incidents – Specific Incidents

- Merriweather District



Remains of Vehicle #4



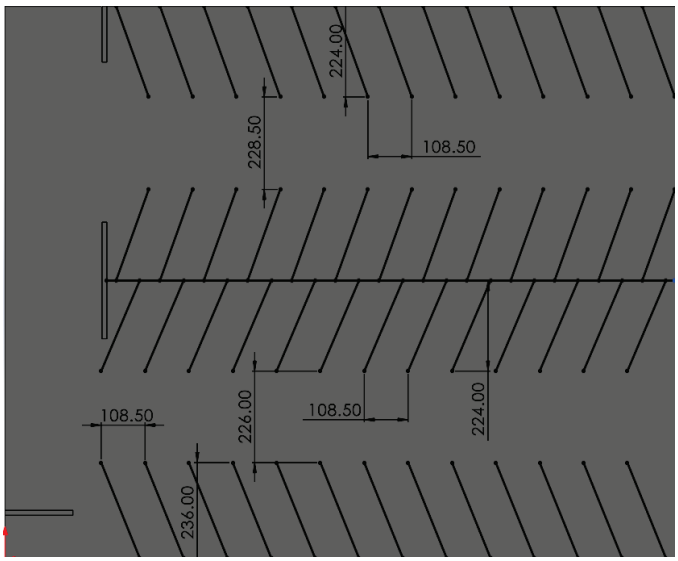
Origin – vehicle #1 - All vehicles are ICE; unsprinklered garage

Task 1B – Incidents – Specific Incidents

- Merriweather District

Damage starting across 1 empty space (> 9’)

Damage even starting across 1 aisle (> ~19’)

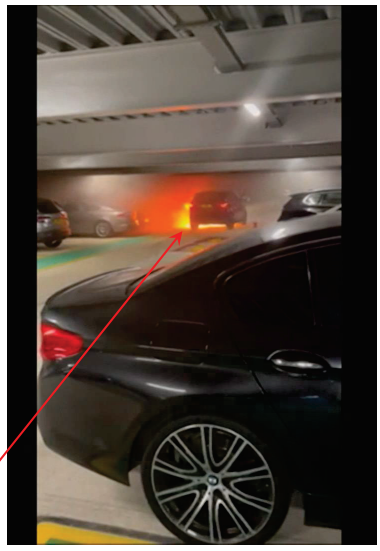


Task 1B – Incidents – Specific Incidents

- Luton Airport – October 10, 2023
  - Unsprinklered garage



Entire level involved



Initiating Vehicle

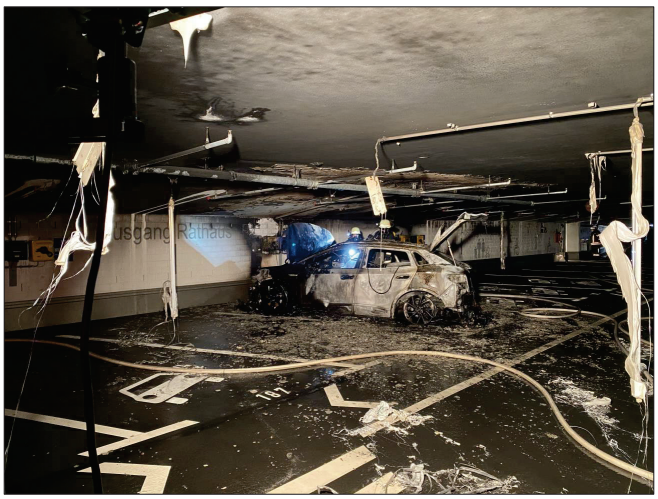
Task 1B – Incidents – Specific Incidents

- Structural considerations
  - Luton airport – steel
    - » Significant collapse
  - Liverpool car park – steel reinforced with concrete
    - » Only localized collapses
  - Stavanger airport – steel section and concrete section
    - » Significant collapse in steel section
    - » No collapse in concrete section

- Only a limited number of data points, but there may be a trend that the steel-only parking garages are more prone to collapse
  - May be meaningless from a property damage perspective
  - May be meaningful from a FD safety perspective

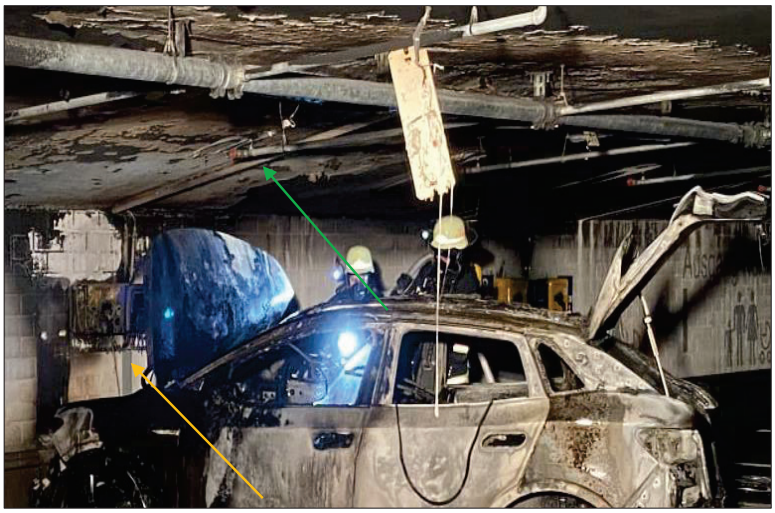
Task 1B – Incidents – Specific Incidents

- Ravensburg, Germany
  - Sprinklered garage
  - Sprinkler head near fire origin
  - EV car charging at time of incident



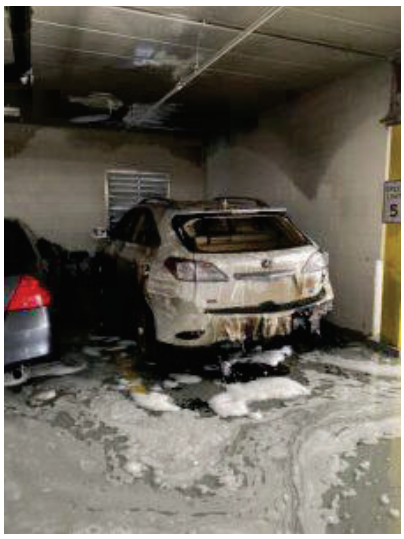
Task 1B – Incidents – Specific Incidents

- Ravensburg, Germany
  - Sprinklers controlled fire
  - Damage to 3 other vehicles
  - Some spalling and potential structural damage
  - Significant damage from a sprinklered incident



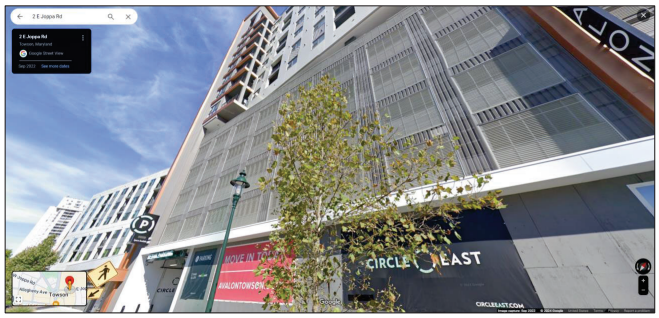
Task 1B – Incidents – Specific Incidents

- Des Plaines, Illinois
  - Single vehicle (hybrid)
  - Sprinkler activation
    - » Controlled fire – no spread/no structural damage
  - Re-ignitions reported by FD
  - Smoke did migrate up stairwells of the podium/pedestal construction to the residential areas
    - » Two occupants treated for smoke inhalation
    - » Smoke residents had to shelter in place



Task 1B – Incidents – Specific Incidents

- Towson, Maryland
  - Single vehicle (Diesel ICE)
  - Very early warning to Emergency Services
  - Manual Extinguishers ineffective
  - Ventilation exhaust system did not activate
  - Smoke migrating up stairwells
  - Numerous occupants attempted to re-enter garage to remove vehicles during the fire



Task 1C – Review of Codes & Standards

- Identify and review updates in codes and standards regarding fire protection requirements
  - Parking structures
  - Parking systems
- Identify applicable technical substantiation for changes

Task 1C – Review of Codes & Standards

- Examined:
  - NFPA Codes
  - ICC Codes
  - FM Data Sheets
  - Municipalities as necessary
  - European summary



Task 1C – Review of Codes & Standards

- Key findings/general trends since 2020 report:
  - Sprinklers basically now required in all garages, regardless of "open" or "closed" configuration
  - Sprinkler density increased in many of the codes, either by reference to NFPA 13 or directly (FM)
    - » NFPA 13 increases from OH1 to OH2
      - Lack of justification for the change, with several TC members voting negative or requesting further analysis and consideration
  - Stackers have a lack of requirements if more than two tiers high, particularly in NFPA 13
    - » Indications of lack of data to drive requirements
    - » Causing municipalities like San Francisco to issue own regulations
      - Did contact San Francisco but did not receive response

Task 1D – Literature Review/Data Collection

- Identify literature of recent fire tests of modern vehicles
  - Put into context of parking structures and parking systems
  - Conduct literature review
  - Create a database of the test data

Task 1D – Literature Review/Data Collection

- 16 publications identified with full-scale testing of modern vehicles
- None published in the United States

Arvidson and Westlund (Sweden) – 2023
Cui et al. (China) - 2022
Kang et al. (South Korea/United Kingdom) - 2023
Cui et al. (China) - 2022
Lam et al. (Canada) - 2016
Lecocq et al. (France) - 2012
Hynynen et al. (Sweden) - 2023
Tramoni et al. (France) - 2021
Strum et al. (Austria) - 2022
Funk et al. (Denmark and Sweden) - 2023
Watanabe et al. (Japan) - 2012
BRE (United Kingdom) - 2010
BRE (United Kingdom) – 2009
Okamoto et al. (Japan), 2009
Okamoto et al. (Japan), 2013
Li et al. (China), 2017

Task 1D – Literature Review/Data Collection

- Database
  - Microsoft Access
  - Graphs added if possible
  - Enables searching of data
- Currently working with FPRF to figure out how to output this database and goal is to eventually share on the project webpage
  - Need to figure out how to output
  - Need to figure out how to have file/folder names match up if downloaded to another computer for searching, etc.

Publication Information	Testing Information
Title	Extinguishment
Author(s)	Extinguishment Start Time (min)
Organization(s)	HRR Chart
Testing Location	HRR Measurement Method
Journal	Peak HRR (kW)
Publication Date	Time to Peak HRR (min)
	Total Heat Released (MJ)
	Initial Mass (Kg)
	Mass Loss Total (kg)
Vehicle Information	Heat Flux Target Distance (m)
Vehicle Info Table	Heat Flux (at Targets)(kW/m2)
Vehicle-Power Type	Heat Flux Table/Chart
Manufacturer	CO Curve
Vehicle ID in Paper	Oxygen Curve
Model	CO2
Manfactured Date	Other Species
Fuel Type	Temperature Curve
Weight (kG)	Temperature Location
Vehicle Type	Flame Height (m)
Transmission	Sprinklers
EV Battery Capacity (kWh)	Sprinkler Flow Rate (LPM)
Amount of Fuel (L)	Sprinkler Density

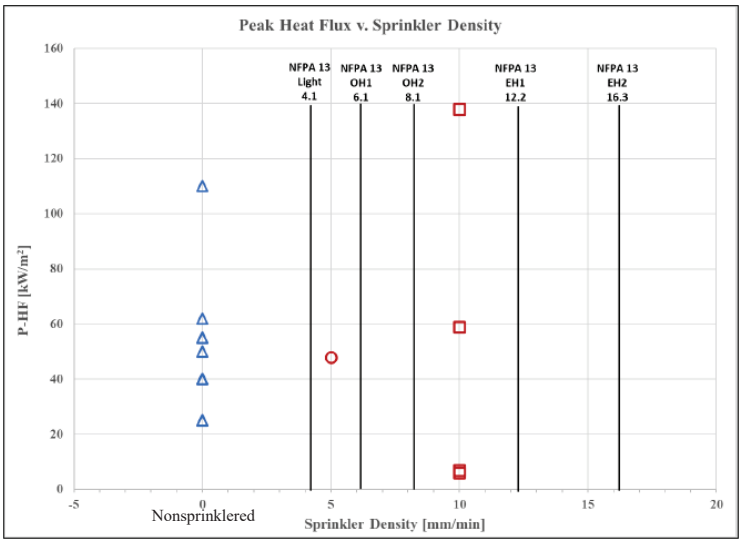
Task 1D – Literature Review/Data Collection

- Example of a few tests from Arvidson and Westlund, 2023

ID	1	2	3	4
Reference No	1	1	1	1
Number of Tests	4	4	4	4
Testing Facility Information	RISE	RISE	RISE	RISE
Objective	Water spray fire suppression comparrison of gasoline fueled and electric vehicles involved in fire			
Vehicle ID	1	2	3	4
Fuel Type	Gasoline	Electric	Gasoline	Electric
Vehicle Condition	New	New	Used	Used
Ventilation Conditions	Large Scale Calorimeter Lab			
Target Vehicles	Heat Flux and Temperature			
Number of Target Vehicles	Sensors on all 4 sides			
Ignition Type	Fuel Leak-Ignited	Battery Damaged-Ignited	Fuel Leak-Ignited	Battery Damaged-Ignited
Ignition Location	Leaked Fuel on the Floor	At the Battery	Floor	At the Battery
Ignition Source	Electronic	Electronic	Electronic	Electronic
Explosion	No	No	No	No
Burn Time (Minutes)	90	90	90	90
Extinguishment	Sprinklers	Sprinklers	Sprinklers	Sprinklers
Extinguishment Start Time (min)	1	13	1	17
HRR Chart	Link	Link	Link	Link
HRR Measurement Method	Calorimetry-Oxygen Depletion			
Peak HRR (kW)	7978	2944	5324	1975
Time to Peak HRR (min)	3	20	4	17
Total Heat Released (MJ)	5241	4510	4765	4474
Initial Mass (Kg)	1614	2120	1295	1598
Mass Loss Total (kg)	-	-	-	-
Heat Flux Target Distance (m)	-	-	-	-
Heat Flux (at Targets)(kW/m^2)	98-138	6-7	44-59	5-6
Heat Flux Table/Chart	Link	Link	Link	Link
CO Curve	-	-	-	-
Oxygen Curve	-	-	-	-
CO2	-	-	-	-
Other Species	-	-	-	-
Temperature Curve	Link	Link	Link	Link
Temperature Location	Gas Temp-above			
Flame Height (m)	-	-	-	-
Sprinklers	Yes	Yes	Yes	Yes
Sprinkler Flow Rate (LPM)	372	372	372	372
Sprinkler Density (mm/min)	10	10	10	10

Task 2 – Gap Analysis

- NFPA 13 Hazard classification
  - What density?
- Prior Testing
  - Numerous tests without sprinklers
  - Some testing at water application density of 10 mm/min or less
  - Wide range of peak heat flux for both sprinklered and nonsprinklered testing



Task 2 – Gap Analysis

- What is the worst case scenario?
  - Status of doors and windows (open vs closed)?
  - Type of vehicle?
  - Ignition location and scenario?

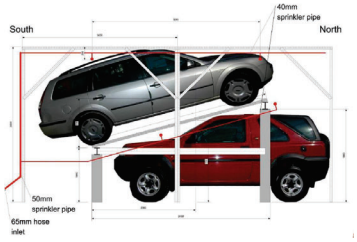
Ref. No	Vehicle Type	Ignition Location	HF Target Distance (m)	Peak HF (at Targets)(kW/m2)	Peak HRR (kW)	Sprinklers	Sprk Density (mm/min)	Windows (Opn/Cld)	Pass. Comp. Ign.
12	ICEV	On the Front Seat			100	No		Closed	Fire set inside
12	ICEV	On the Front Seat			100	No		Closed	Fire set inside
3	BEV	Battery Compartment and Propane Burner under Vehicle	0.89	-	1540	No		Open	Yes
1	BEV	At the Battery		5-6	1975	Yes	10	Closed	Yes
14	ICEV	Right Rear Splashguard			2000	No		Closed	Yes
11	ICEV	Left-rear splash guard	0.5-1.0	31-40	2100			Closed	Yes
9	ICEV	Inside the engine compartment			2300				
1	BEV	At the Battery		6-7	2944	Yes	10	Closed	Yes
14	ICEV	Left Front Seat			3100	No		Open	Yes
15	ICEV	Right Rear Splashguard			3100	No		Closed	Yes
15	ICEV	Front Bumper			3100	No		Closed	Yes
12	ICEV	Engine Compartment			3800	No		Closed	Yes
14	ICEV	Right Rear Splashguard			3800	No		Open	Yes
14	ICEV	Right Rear Splashguard			3800	No		Closed	Yes
15	ICEV	Third Row Seats-Middle			4000	No		Open	Yes
6	BEV	On the Front Seat	5, 8	Not Provided	4200			Open	Yes
6	BEV	On the Front Seat	5, 8	Not Provided	4700			Open	Yes
6	ICEV	On the Front Seat	5, 8	Not Provided	4800			Open	Yes
12	ICEV	Engine Compartment			4800	No		Closed	Yes
9	ICEV	Inside the Vehicle			4900				
12	ICEV	On the Front Seat		48	5000	Yes	5	Open	Fire set inside
1	ICEV	Leaked Fuel on the Floor		41-59	5124	Yes	10	Closed	Yes
5	BEV	Under the Vehicle	3.1-3.9	20-40	5900	No		Closed	Yes
3	FCEV	Propane Burner under Vehicle	0.89	-	5990	No		Open	Yes
5	BEV	Under the Vehicle	3.1-3.9*	20-40	6000	No		Closed	Yes
5	PHEV	Under the Vehicle	3.1-3.9*	20-55	6000	No		Closed	Yes
9	BEV	Under the Vehicle			6100				
6	ICEV	On the Front Seat	5, 8	Not Provided	6100			Open	Yes
11	BEV	Rear bumper	0.5-1.0	32-62	6400			Closed	Yes
3	BEV	Battery Compartment and Propane Burner under Vehicle	0.89	-	6510	No		Open	Yes
5	BEV	Under the Vehicle	3.1-3.9	20-40	6900	No		Closed	Yes
9	BEV	Liquid NaCl inj. Into battery			7000				
5	ICEV	Under the Vehicle	3.1-3.9	20-40	7100	No		Closed	Yes
3	BEV	Battery Compartment and Propane Burner under Vehicle	0.89	40-110	7250	No		Open	Yes
3	ICEV	Propane Burner under Vehicle	0.89	30-50	7660	No		Open	Yes
3	BEV	Battery Compartment and Propane Burner under Vehicle	0.89	-	7810	No		Open	Yes
5	PHEV	Under the Vehicle	3.1-3.9	20-55	7900	No		Closed	Yes
1	ICEV	Leaked Fuel on the Floor		98-138	7978	Yes	10	Closed	Yes
12	ICEV	On the front seat of Bottom vehicle			8500	No		Open	Yes
9	BEV	Liquid NaCl inj. Into battery			8600				
5	ICEV	Under the Vehicle	3.1-3.9	20-40	10800	No		Closed	Yes
12	ICEV			25	11000	No		Open	Yes
12	ICEV			25	16000	No		Open	Yes
15	ICEV	Middle Row Seats-Middle				No		Closed	Yes/ Went Out
16	ICEV	Engine Compartment				No		Closed	Yes

Task 2 – Gap Analysis

- Overarching issue continues to be vehicle to vehicle fire spread and effective measures to slow and/or eliminate this fire spread
- NFPA 13 Hazard classification is unknown
  - Sprinklers seem to have good outcome, in incidents and in experimental testing
  - Water density, though, has varied from between light/OH1 and OH2/EH1 with the fire being successfully controlled
    - » So was a change from OH1 to OH2 necessary? Is even OH1 necessary?
- Ignition scenario and variables can influence the test outcome significantly
  - With sprinklers present
    - » An ICE fire ignited by puncturing the fuel tank had a much higher initial heat release rate that lead to heat fluxes capable of igniting neighboring vehicles but a similar BEV vehicle had significantly lower heat fluxes due to the lack of liquid fuel
      - Can still ignite if target fuel is wet even if over HF crit? Shielded plastic components?
  - With sprinklers not present
    - » A fire ignited in the passenger compartment with the windows closed may self-extinguish while it may spread to multiple neighboring vehicles with the windows open

Task 2 – Gap Analysis

- New, automated and/or vertical parking systems are almost complete unknowns
  - Only two (2) tests on stackers, one with sprinklers, one without
    - » Sprinklers performed well to control spread but only at one known design density (report light/OH1 density but pressure was far higher so density was higher), and they were above both vehicles (lower and upper)
    - » Vehicles were from late 1990s or early 2000s – not really modern vehicles any longer
  - No tests on higher than two tiers (2 vehicles total)
  - No national code requirements for higher than two tiers (2 vehicles total)
  - No tests or national code requirements for other types of automated parking systems
  - No known incidents for lessons learned



BRE (2009)

Task 3 – Proposed Research Plan

- Focus of all tests should not be on heat release or heat release rate, but on propensity to spread to other vehicles
  - Two options to achieve this (full-scale vehicle fire source vs. mock-up standardized fire source)
    - » Ultimate goal should still be to fill the identified gaps related to vehicle-to-vehicle fire spread
- Option #1 - Full-scale vehicle fire source
- Experimental setup
  - Parking garage geometry (ceiling), open sides are fine
  - No need for calorimetry – vehicle to vehicle spread is the important variable
    - » If HRR possible, would be good data, but mass-loss is adequate to approximate burning rates and to compare against literature tests
  - One car at a time with mock-vehicles/heat flux gauges/target fuels to mimic nearby vehicles
    - » Heat fluxes can be compared to critical heat fluxes of plastics typically on vehicles
      - Could actually put target plastic vehicle parts at distances away to confirm ignition if necessary
        - Would allow wetting as well if sprinklers are included
      - Temperature/heat fluxes/targets should be based on parking garage spacing data
        - Using design vehicle and various space configurations per Task 1A-i
    - » Temperature and heat flux at ceiling for structural considerations

Task 3 – Proposed Research Plan

Sample	Time to ignition (Seconds) (NI = no ignition) Irradiance level 10kW/m²	20kW/m²	30kW/m²	40kW/m²
Hubcap	NI	205	58	28
Mud flap	380	57	29	16
Bumper grill	NI	114	44	19
Fuel tank	NI	354	114	59
Roof box	NI	121	61	35
Wheel arch	NI	81	44	25
Bumper	NI	450	89	43
Bumper trim	415	83	30	16
Mohair soft top	NI	51	28	19
PVC soft top	67	27	13	7

Sample	Irradiance level 10kW/m²	12kW/m²	15kW/m²	20kW/m²	25kW/m²
Tyre	NI	1100	597	240	140

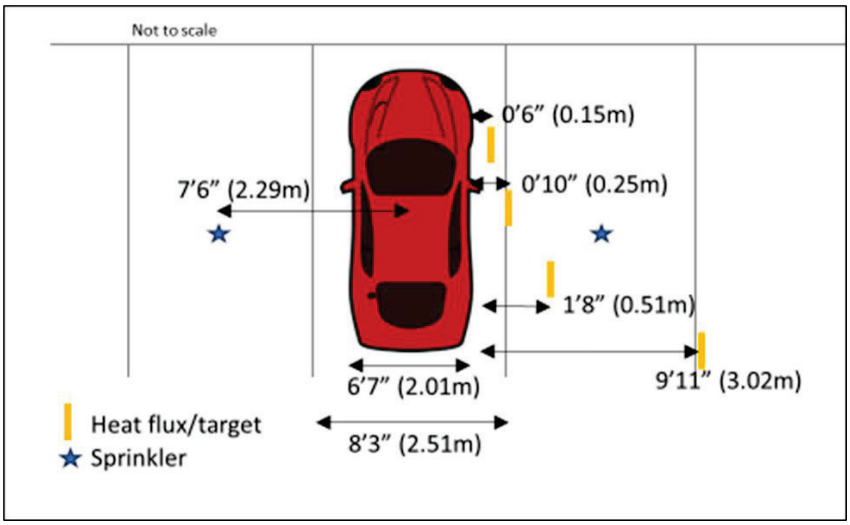
Sample	Critical Irradiance Level (kW/m²)
Hubcaps	17.5
Mud flaps	10
Bumper grill	17.5
Fuel tank	16.5
Roof box	12.5
Wheel arch	12
Bumper	18.5
Bumper Trim	11.5
Mohair soft top	8
PVC soft top	9
Tyre	11

Source: BRE, 2010

Note, this data is relatively dated. Should new ignition testing be considered?

Task 3 – Proposed Research Plan

Using 6’7” width for the design vehicle



Task 3 – Proposed Research Plan

Table 19.2.3.1.1 Density/Area

Hazard	Density/Area [gpm/ft^2/ft^2 (mm/min/m^2)]
Light	0.1/1500 or 0.07/3000* (4.1/140 or 2.9/280)
Ordinary Group 1	0.15/1500 or 0.12/3000* (6.1/140 or 4.9/280)
Ordinary Group 2	0.2/1500 or 0.17/3000* (8.1/140 or 6.9/280)
Extra Group 1	0.3/2500 or 0.28/3000* (12.2/230 or 11.4/280)
Extra Group 2	0.4/2500 or 0.38/3000* (16.3/230 or 15.5/280)

*When required by 19.2.3.1.5.

EN 12845 OH2 – 5 mm/min for 144 m^2 (per EFSN)

- Vehicles – reasonably foreseeable worst case
  - Utilize ICE and BEV (most common)
  - Utilize full fuel tank for ICE
  - Utilize full charge battery for BEV
  - Windows down on vehicle for worst case spread
- Sprinklers at four possible densities depending on the test objective
  - 0 mm/min (none)
  - 6.1 mm/min (OH1)
  - 8.1 mm/min (OH2)
  - 12.2 mm/min (EH1)
  - Will provide insight into what design density is actually needed
    - » Chose these based on known, but limited, literature tests
  - Situate sprinklers at worst-case location
    - » Table 10.2.4.2.1(b) – NFPA 13 (2022) – Maximum spacing in OH – 15 feet
      - Could be spaced at 20 feet for OH extended coverage sprinklers
      - Is offset from vehicle worst-case? – this is unknown
  - Do not activate manually, allow to activate automatically
    - » Environmental issues? – wind/cold/etc.

Task 3 – Proposed Research Plan

- Ignition scenario
  - ICE – fuel tank rupture and ignite fuel
  - ICE – driver or passenger seat of compartment
  - BEV – puncture battery on side (for jet flame)
  - BEV – driver or passenger seat of compartment

Task 3 – Proposed Research Plan

- Minimal Test Matrix
- 7-9 vehicles
- Tests at OH2 first, and then either OH1 or EH1 depending on whether the OH2 successfully prevented the fire spread or not
  - Could also potentially not do a second test at all, or do a repeat, depending on OH2 test
- Assumes fuel tank rupture is worst case ignition scenario, so only tests battery puncture BEV at whatever minimal density was necessary to control ICE to confirm controlled
- Does all BEV tests as passenger compartment ignitions
- Does 1 test with ICE passenger compartment ignition to confirm similar behavior

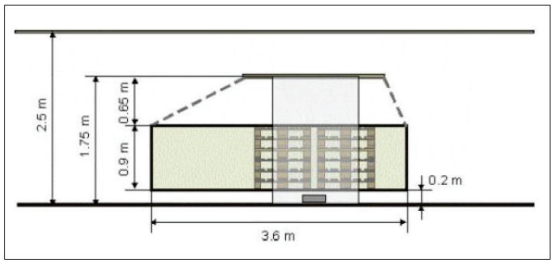
Vehicle Type	Ignition Scenario	Sprinkler Density (mm/min)
ICE	Fuel Tank Rupture	0
ICE	Fuel Tank Rupture	8.1 (OH2)
ICE	Fuel Tank Rupture	6.1 (OH1) or 12.2 (EH1)
BEV	Battery Puncture	0
BEV	Battery Puncture	8.1 (OH2) or 12.2 (EH1)
ICE	Compartment	0
BEV	Compartment	0
BEV	Compartment	8.1 (OH2)
BEV	Compartment	6.1 (OH1) or 12.2 (EH1)

Task 3 – Proposed Research Plan

- Experimental setup – Additional considerations
  - Variable ceiling height?
  - Sprinkler locations and type (worst case?)
    - » Dry pipe or simulate dry pipe (delay)
  - Use design vehicle or something larger, specifically with a larger battery?
    - » What is reasonably foreseeable?
      - Large vehicles but usually supposed to park in larger spaces
      - For EVs, battery capacities are continuing to increase
  - Other fire protection measures
    - » Water mist
  - Sloped floor?
  - Wind flow?

Task 3 – Proposed Research Plan

- Option #2 – Standardized mock-up/surrogate vehicle
  - Repeatability
  - More cost-effective long-term
  - Provides computer modeling data for further analysis
  - Flexibility
    - » Can test many more scenarios/protection schemes/water densities/etc.
  - Used in some similar situations already (IMO for ro-ro spaces)



IMO MSC 1430

Task 3 – Proposed Research Plan

- The options are not mutually exclusive
  - Establishing the standardized mock-up will require some full-scale testing of vehicles
  - Could occasionally validate results with a full-scale vehicle instead of the standardized fire source

Task 3 – Proposed Research Plan

- Option #1 – Full-scale tests
  - Advantages:
    - » Realistic
    - » Contributes significantly to knowledge-base of full scale test burns
    - » Gives data to fill gap in necessary sprinkler density
  - Disadvantages:
    - » Very expensive/resource-dependent
      - Requires at least 1 vehicle per experiment
    - » Questionable repeatability
    - » Results will likely be very vehicle and scenario-dependent – does not necessarily answer the gap regarding worst-case scenarios
- Option #2 – Mock-up tests
  - Advantages:
    - » Flexibility now and into the future
    - » Can be validated with real tests
    - » Repeatable
    - » More cost-effective long-term
    - » Could also answer worst-case scenario gap
  - Disadvantages:
    - » Less cost-effective short-term

Task 3 – Proposed Research Plan

- Stackers
  - These will be expensive tests to execute
  - BRE testing has established around an NFPA 13 OH2 density (after consideration of increased pressure) above each level of vehicles will control fire and prevent significant spread
    - » Though the age of the vehicles is also a concern
  - NFPA 13 (2022) currently allows ceiling OH2 with in-rack sprinklers or ceiling EH2 for two-tier stackers
    - » Therefore, the most prioritized untested/gap configurations are:
      - Whether EH2 alone at the ceiling can control a two-tier stacker fire?
      - What configuration will work for more than two tiers?

Task 3 – Proposed Research Plan

- Stackers
  - Therefore, could do 2 tests
    - » Five (5) vehicles total
    - » All vehicles worst case (open windows), full fuel/battery, worst case ignition, etc.
  - Test 1
    - » Two tiers
    - » EH2 sprinklers at the ceiling alone
      - Activate naturally
      - Ignition in/on lower vehicle. Will fire spread from bottom to upper vehicle?
  - Test 2
    - » Three tiers
    - » OH2 sprinklers at the ceiling and in-rack above levels 1 and 2
      - Activate naturally
      - Ignition in/on lower vehicle. Will fire spread from the bottom to upper vehicle(s)?
  - Target fuels etc. in all tests for evaluation

Task 3 – Proposed Research Plan

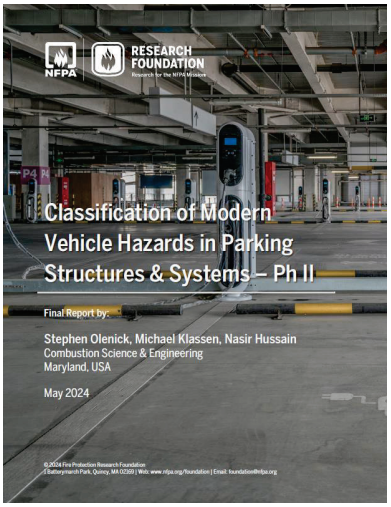
- Stackers – other considerations
  - Could also consider testing an engineered suppression system
  - If ignition does not occur in secondary vehicle in previous tests, may be able to reuse those vehicles in other tests (if properly dried)
  - If option #2 (mock-up vehicle) is selected in the parking garage testing, that same fire source could be used for the lower vehicle in the stacker tests
    - » Upper vehicle still likely needs to be a real vehicle due to the complex geometry, variety of fuels, possible addition of heat release, and ability to shield the fire from sprinkler sprays

Summary

- Codes, incidents, and statistics for parking structures and vehicles examined
- Literature reviewed for full-scale modern vehicle fire tests and a database created
- Knowledge gaps identified
  - What hazard classification should be used for parking garages in NFPA 13?
  - What variables specifically influence the burning behavior of modern vehicles? (i.e. what is the worst case scenario?)
  - How do modern vehicles burn in stackers/automated parking facilities and how should they be protected?
- Testing plan outlined
  - Modern vehicles in parking garages
    - » Two options – use actual vehicles or create a mock-up standardized fire
  - Stackers

Project Resources

- Both project reports and summaries are available at the FPRF website project page
- Phase I has a webinar available as well
- Phase I has a Fire Technology paper
- Phase I has been presented numerous times in multiple venues
- Possible future Phase II technical paper(s) and conference presentation(s)



FPRF project page

Phase III - Testing

- Fundraising is underway and project prospectus is being developed
  - For both testing approaches for vehicles in parking garages
  - Stackers also being considered, but likely will be a separate project and at a later date
    - » Though could be prioritized over vehicles in parking garages
    - » Also could consider standardized testing approach for this as well
- For inquiries to the NFPA Fire Protection Research Foundation, contact the Project Manager:

  Victoria Hutchison (vhutchison@nfpa.org)

Questions



Stephen Olenick, MSFPE, P.E., MBA
Principal Engineer
solenick@csefire.com



Mike Klassen, Ph.D, P.E.
Principal Engineer
mklassen@csefire.com



Nasir Hussain, MSFPE
Project Engineer
nhussain@csefire.com

Combustion Science & Engineering Inc
8940 Old Annapolis Rd, Suite L
Columbia, MD, 21045
410-884-3266
www.csefire.com

Public Comment No. 12-NFPA 88A-2025 [Global Input]

June 3, 2025 v-5

Chapter 9

(n) Parking Systems ~~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.**~~

~~**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.~~

~~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*.~~

~~**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.~~

~~**9.2.5 Occupant Safety.**~~

~~**9.2.5.1 Vehicle Occupants.**~~

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

~~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.~~

~~**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.~~

~~**9.2.5.2 Terminals.**~~

~~**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.~~

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

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

~~**9.2.5.3* Terminal Doors.**~~

~~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.~~

~~**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.~~

~~**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) 9.1.1 The fire protection approach shall be developed using one of the following strategies within parking systems:

(n) (1) A prescriptive-based approach in accordance with this standard.

(n) (2)* A performance-based design approach in accordance with Chapter 10.

(n) a9.1.1 (2) In situations where compliance with specific prescriptive requirements is not feasible or appropriate, a performance-based design approach may be used. This approach allows for flexibility in design while still requiring that the proposed solution achieve the same intended level of fire and life safety as the applicable prescriptive provisions. The performance-based design should demonstrate, through appropriate analysis and documentation, that it provides a level of safety that is equivalent to or greater than that established by the prescriptive requirements.

(n) 9.1.2 When Electric Vehicles and/or charging stations are present on upper levels of any parking system, the total water supply duration shall be 120 minutes.

(n) A.9.1.2 When no Electric Vehicles are permitted the duration should be allowed to meet the requirements of NFPA 13 for Ordinary Hazard (Group 2).

(1)

(a)

i. **(n) Flue Sprinklers** Where flue sprinklers are required they shall be provided at every vehicle platform level.

i. (n) A minimum of two (2) flue sprinklers shall be provided in each flue space on both sides of the vehicle platform.

ii. (n) Sprinklers shall be located within 3 ft. (914 mm) of the front and back of each vehicle platform with a maximum distance between sprinklers of 12 ft 6 in. (3.81 m). Figure 9.1.3.

iii. **(n)** Flue sprinklers shall be calculated as follows:

i.

i. (n) The two (2) most demanding levels of sprinklers, with four (4) sprinklers flowing per level,

ii. Shall be calculated flowing a minimum 20 gpm (76 lpm) per sprinkler.

iv. **(n)** Flue sprinklers are not required to be balanced with overhead sprinklers. A separate calculation will be provided for the overhead sprinklers.

v. **(n)** Flue sprinklers are not required above the uppermost vehicle platform.

vi. (n) Where flue spaces exceed 24 inches (610 mm), a performance-based design shall be provided.

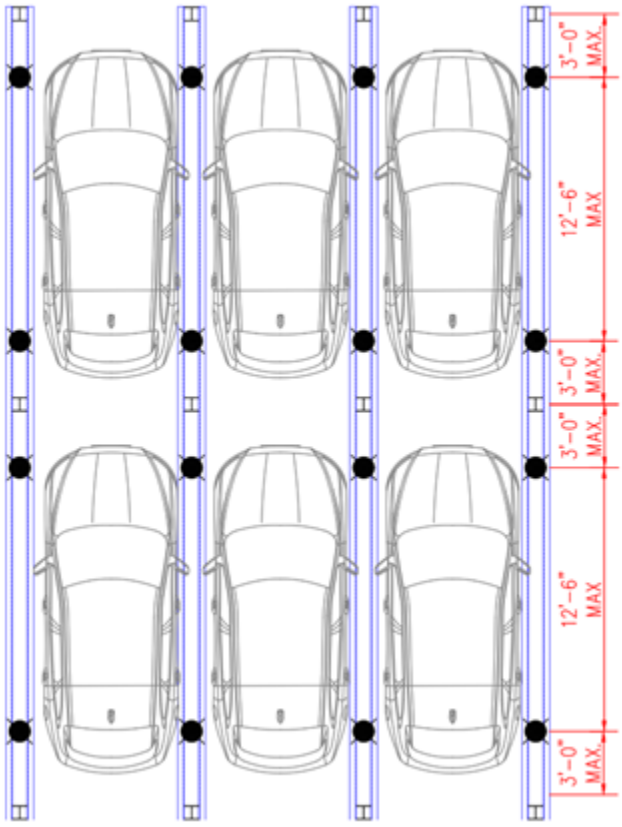


Figure 9.1.3.

(1)

(a)

i. **(n) Mean of Egress.** Means of egress in accordance with Chapter **4** are not required in automated-type parking structures.

ii. **(n) Means of Access** In parking systems that do not provide physical barriers or terminals, a parking attendant shall transport the vehicle from a designated passenger drop-off and pick-up area, prohibiting vehicle occupants from coming in contact with the parking system's equipment, machinery, energizing elements, and other moving parts of the system.

9.2 (n) Multi-Level Stacker Parking

(n) Multi-Level Stacker Parking systems with or without EV and/or EV charging stations shall be in accordance with 9.2.1 – 9.2.3.

9.2.1 (n) Configuration

9.2.1.1*. **(n)** Spacing and location of Multi-Level Stacker (greater than 2) units shall be in accordance with the following criteria (a - c).

(1) **(n)** EV's shall be allowed on ground level of Stacker unit only.

(2) (n) EV's shall be allowed on upper levels with Stacker units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Stacker unit.

(3) **(n)** The maximum number of Stacker unit rows shall be no greater than two (2). (Figure 9.2.1.1.b).

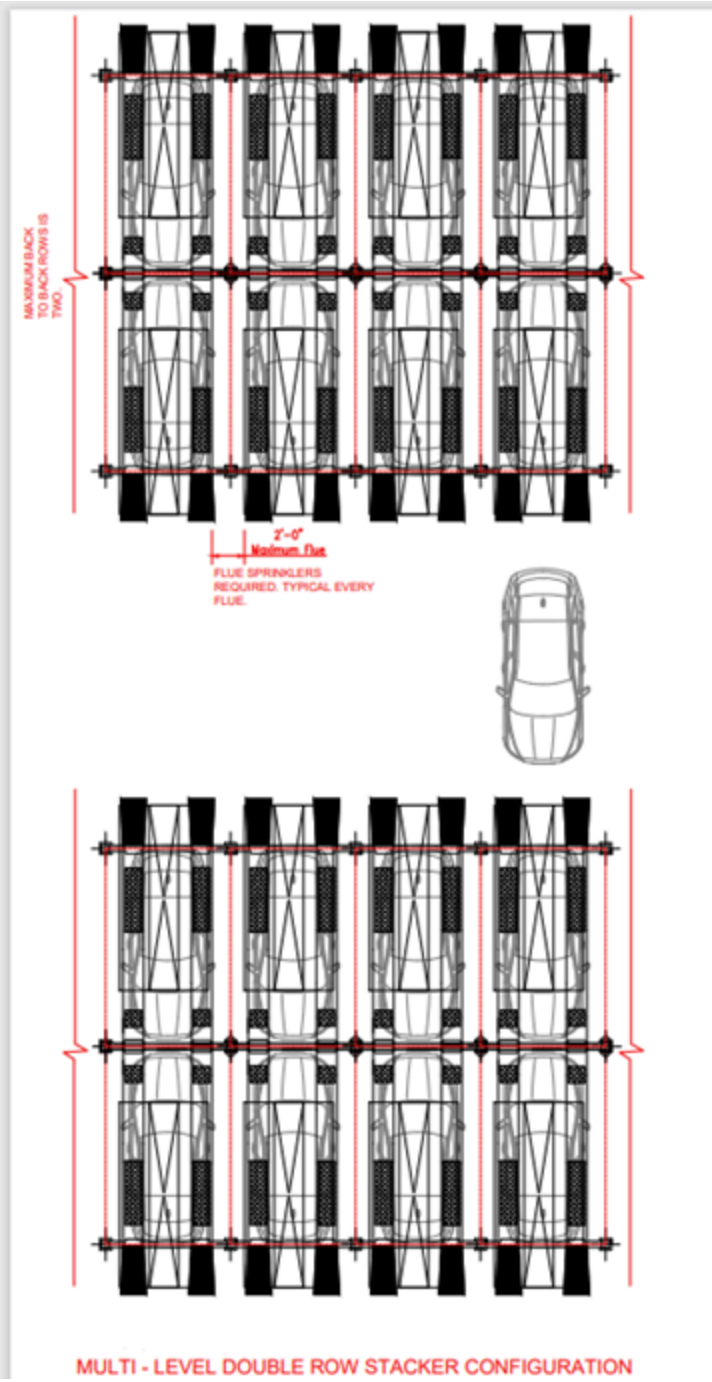


Figure 9.2.1.1.(b).

(1) **(n)** Rows and columns of Stacker units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (Figure 9.2.1.1.c).

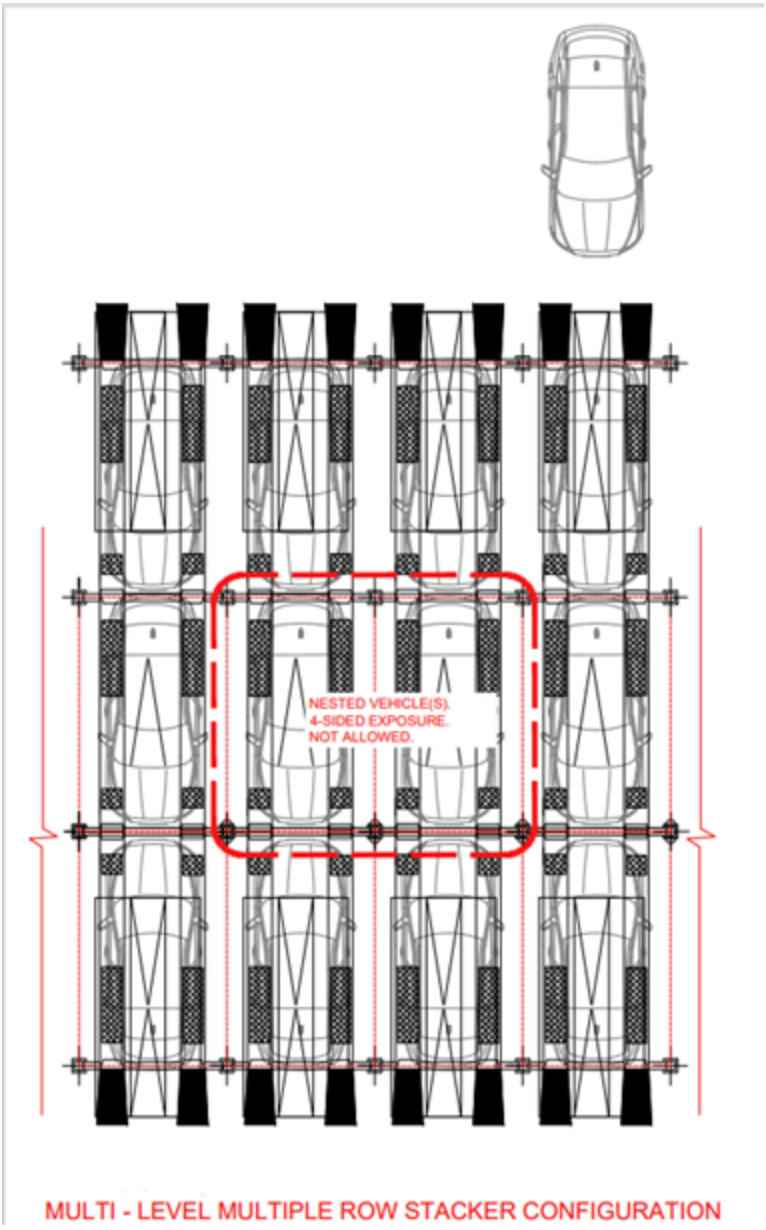


Figure 9.2.1.1. (c).

(n) A9.2.1.1 (a). The upper-level vehicle platforms must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

(n) A9.2.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be “nested” vehicles is restricted.

(n) 9.2.2. Fire Protection Systems

(n) 9.2.2. Fire Protection for Multi-Level Stacker units shall be in accordance with NFPA 13 except as modified in 9.2.2.1.

(n) 9.2.2.1*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1..

(1) (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

(2) (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.

(3) (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.

(4) (n) Flue sprinklers shall be provided according to 9.1.3.

(n) 9.3 Mechanical Parking System

Mechanical Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.3.1 through 9.3.3.

(n) 9.3.1 Configuration.

(n) 9.3.1.1. Spacing and location of Mechanical Parking Systems shall be in accordance with the following criteria (a - d).

(1) (n) EV's shall be allowed on ground level of Mechanical Parking Systems only.

(2) (n) EV's shall be allowed on upper levels with Mechanical Parking System units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Mechanical Parking System unit.

(3) (n) The maximum number of Mechanical Parking System unit rows shall be no greater than two (2). (Figure 9.3.1.1.b).

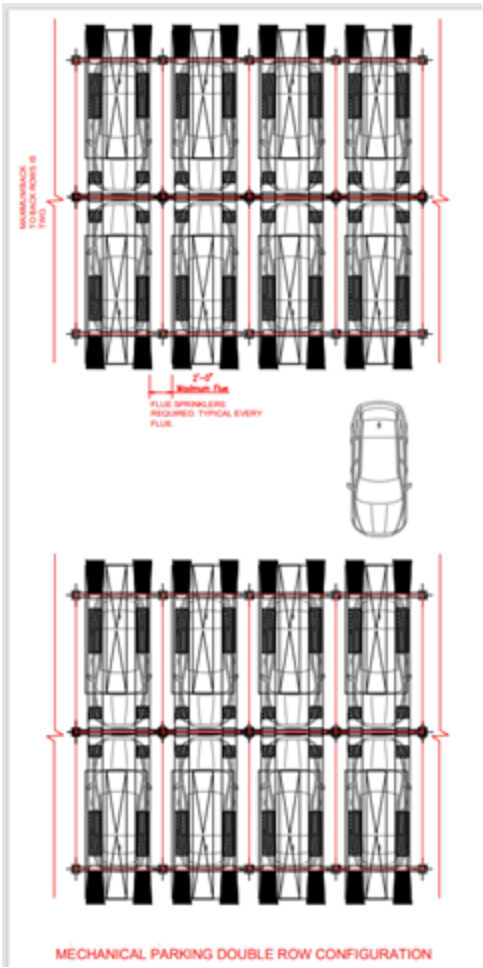


Figure 9.3.1.1. (b).

(1) **(n)** Rows and columns of Mechanical Parking System units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (Figure

9.3.1.1.c).

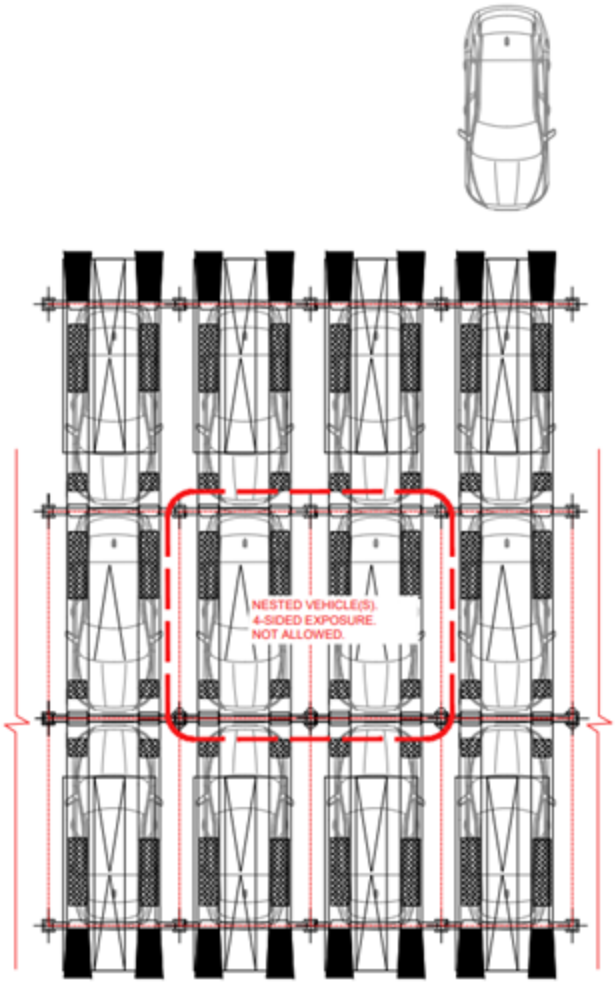


Figure 9.3.1.1. (c).

(n) A9.3.1.1 (a). The upper-level vehicle platform must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

(n) A9.3.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be “nested” vehicles is restricted.

(n) 9.3.2 Fire Protection Systems

(n) 9.3.2.1 Sprinkler Systems

(n) Fire Protection for Mechanical Parking System units shall be in accordance with NFPA 13 except as modified in 9.3.2.1.2.

(n) 9.3.2.1.2*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1.

(1) (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

(2) (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.

(3) (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.

(4) (n) Flue sprinklers shall be provided according to 9.1.3.

(n) 9.3.3.2 Standpipes Where required, standpipe systems shall be provided per NFPA 14.

(n) 9.4 Fully Automated Parking System

(n) Fully Automated Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.5.1 through 9.5.4.

(n) 9.4.1. Occupant Safety

(n) 9.4.1.1. All vehicle occupants shall be required to enter and exit the vehicle at a designated terminal.

(n) 9.4.2. Terminals.

(n) 9.4.2.1. 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) 9.4.2.2. Terminals shall be designed in accordance with the other relevant provisions of this standard.

(n) 9.4.2.3. Terminals shall be considered an incidental use area to the entire parking system.

(n) 9.4.2.4*. Terminal 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) A.9.2.4. 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.

(n) 9.4.2.5. 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) 9.4.3. Fire Service and Maintenance Access.

(n) 9.4.3.1. Access shall be provided in accordance with Table 9.5.2.1.

(n) Table 9.4.3.1 Parking Equipment Access Dimensional Criteria

Feature	Dimensional Criteria
Minimum horizontal dimension of any walkway, landing, or platform	36 in. (915 mm) clear
Minimum stair or ramp width	36 in. (915 mm) clear between rails
Minimum tread width	36 in. (915 mm) clear

Feature	Dimensional Criteria
Minimum tread depth	10 in. (255 mm)
Maximum riser height	9 in. (230 mm)
Handrails are permitted to terminate, at the required height, at a point directly above the top and bottom risers.	
Maximum height between landings	12 ft (3660 mm)
Minimum headroom	6 ft 8 in. (2030 mm)
Minimum width of door openings	36 in. (915 mm) clear.

(n) 9.4.3.2. Horizontal walkways for access shall be provided at intervals of 20 ft (6 m) vertically and 100 ft (30 m) horizontally.

(n) 9.4.3.3. Travel distance to the exterior or to an enclosed stair shall not exceed 400 ft (122 m).

(n) 9.4.3.4. A minimum of one exterior door shall be provided at grade for every required stair.

(n) 9.4.3.5.* An automatic retrieval system shall be provided for cars that are not readily accessible to fire department operations. Cars shall be capable of being moved to approved designated locations.

(n) A9.4.3.5. Fully Automated Parking Systems have limited accessibility to upper levels of parking and therefore are more difficult for fire department access and operations. An automatic retrieval system allows the fire department to have adequate access to the vehicle(s) involved.

(n) 9.4.4. Ventilation. A ventilation system that continuously provides a minimum of two air changes per hour shall be provided.

(n) 9.4.5. Fire Protection Systems

(n) 9.4.5.1* Sprinkler Systems

(n) 9.4.5.1.2 An automatic sprinkler system shall be installed in a parking structure with Fully Automated Parking Systems in accordance with NFPA 13 except as modified in 9.5.3.1 (a – d).

(n) 9.4.5.1.3. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1.

(1) (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

(2) (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.

(3) (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.

(4) (n) Flue sprinklers shall be provided according to 9.1.3.

(n) A.9.4.5.1 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 reports, Modern Vehicle Hazards in Parking Structures and Vehicle Carriers (All phases).

(n) 9.4.5.2 Standpipes

(n) Standpipes shall not be required in Fully Automated Parking Systems.

(n) 9.4.5.3. Fire alarm systems shall not be required in parking structures with Fully Automated Parking Systems that are protected by an automatic sprinkler system in accordance with NFPA 13 except as modified in 9.5.3.

9.5.x Pay Stations.

9.5.x.x 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).

9.5.x.x 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.

9.5.x.x Pay Station Entrance.

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

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

9.5.x.x 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.

END OF SECTION

Additional Proposed Changes

File Name	Description	Approved
Chap_9_Illistrations.docx	Chap 9 Illustrations	
6-3-25_copyright_granted.pdf	2025 TG 4 Copyright	
6-3-25_Chapter_9_v5_submission_.docx	Chap 9 Submission 6-3-25	

Statement of Problem and Substantiation for Public Comment

June 2, 2025

Section 9 changes, Substantiation.
Task group 4 determined the following information to add to NFPA 88a.

Change chapter title from Special Structures to Parking Systems as this is more appropriate for the content now included in this chapter.

9.1.1 – Indicates that they can either follow the prescriptive guidelines in this chapter or they can go to a performance based design. The performance based design would be potentially a way for someone to prove through their own testing, modeling, engineering analysis, etc that they can meet the intent of preventing fire spread but perhaps with fewer sprinklers than what our proposed prescriptive language requires.

9.1.2 – In parking systems, if EV's will be present on any but the ground level, an increased duration of water will buy additional time for the responding fire department to assess and come up with a plan of attack to extinguish or contain a fire that could contain a Li-ion battery which have been proven to burn longer, but not hotter.

9.1.3 – Establishes the prescriptive means to protect every car within a parking system by ensuring that each car will have four sprinklers around it at approximately the four corners of the car. Also establishes a minimum flow of 20 gpm. With an average of around 100 square feet per sprinkler, this flow would be approximately equal to the design density associated with Ordinary Hazard (Group II) which we have established through calculation and some preliminary testing to be an appropriate amount of water to absorb enough heat to control a typical vehicle fire.

9.1.4 – Was already in Chapter 9, moved for organization

9.2 – It is necessary to include that the following design guidelines apply to systems both with and without EV's because it will indicate that they have been considered and that we have determined the threat level remains the same both ways.

9.2.1 This section requires that electric vehicles will only be permitted on upper levels of a multilevel stacker with the vehicle platforms are solid so no direct flame impingement will be applied to the battery compartment when the vehicle below is on fire. The rest of this section will limit the ability to have a car surrounded on all sides by other vehicles, thus maintaining at least one side accessible to a responding fire department.

9.2.2 This establishes the minimum discharge density but ensures there is additional safety factors involved such as not allowing a reduction in the design area for quick response sprinkler. Additionally, limiting maximum spacing to no more than 12'-6" ensures that we have adqaute sprinkler coverage over each vehicle. Then it points back to the flue sprinkler design criteria established in 9.1.3
9.3 – See substantiation for section 9.2, it will be the same

9.4 – This section is a reorganization of what was already included in this chapter for fully automated and additional design criteria. 9.4.1 and 9.4.2 were existing and the content has not changed but they have been moved.

9.4.3 takes the information that was previously 9.2.2 for fire service and maintenance access and puts it into a table format as well as adds additional requirements for stairs, headroom, door openings.

9.4.3.5 is a new section requiring an automatic means of retrieving a car not readily accessible to the fire department.

9.4.4 has not changed content, only location

9.4.5.1 Same substantiation as 9.2.2

9.4.5.2 has not changed, new location only

9.4.5.3 Adds requirement that fire alarm system would not be require if fully sprinklered
The committee has created this CI to permit further work on this topic at Second Draft. The task group has developed the content presented in PI-71 with a significant amount of research and input from external sources including FPE's and organizations doing research on these types of systems including with electric vehicles. The task group has been reconstituted and will continue to engage with additional experts and interested parties to further develop the material prior to the Second Draft meeting. New requirements for NFPA 88A should rely on data and technical reports, including, but not limited to, the upcoming NFPA FPRF report (Phase 3, when provided), for technical substantiation of design and installation requirements. The task group will also provide referenced figures within this submission for review during the Second Draft phase.

Related Item

• The committee has created this CI to permit further work on this topic at Second Draft. The task group has developed the content presented in PI-71 with a significant amount of research and input from external sources including FPE's and organizations doing research

on these types of systems including with electric vehicles. The task group has been reconstituted and will continue to engage with additional experts and interested parties to further develop the material prior to the Second Draft meeting. New requirements for NFPA 88A should rely on data and technical reports, including, but not limited to, the upcoming NFPA FPRF report (Phase 3, when provided), for technical substantiation of design and installation requirements. The task group will also provide referenced figures within this submission for review during the Second Draft phase.

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 02 16:58:03 EDT 2025
Committee: GAR-AAA

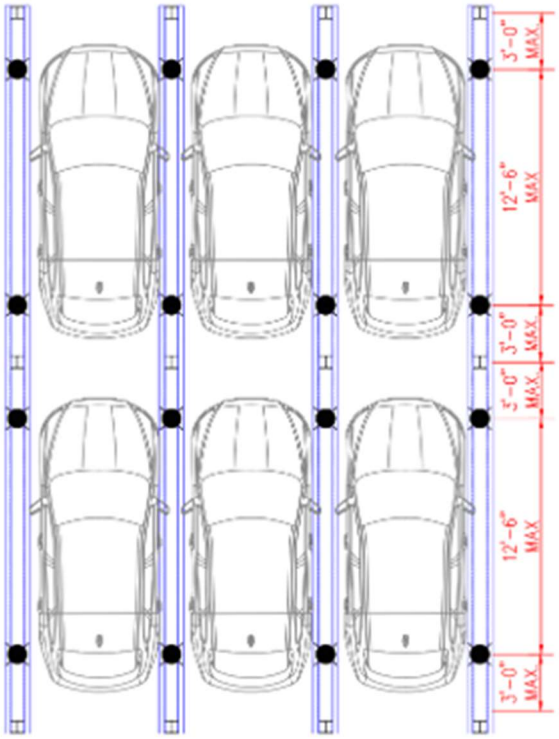


Figure 9.1.3.

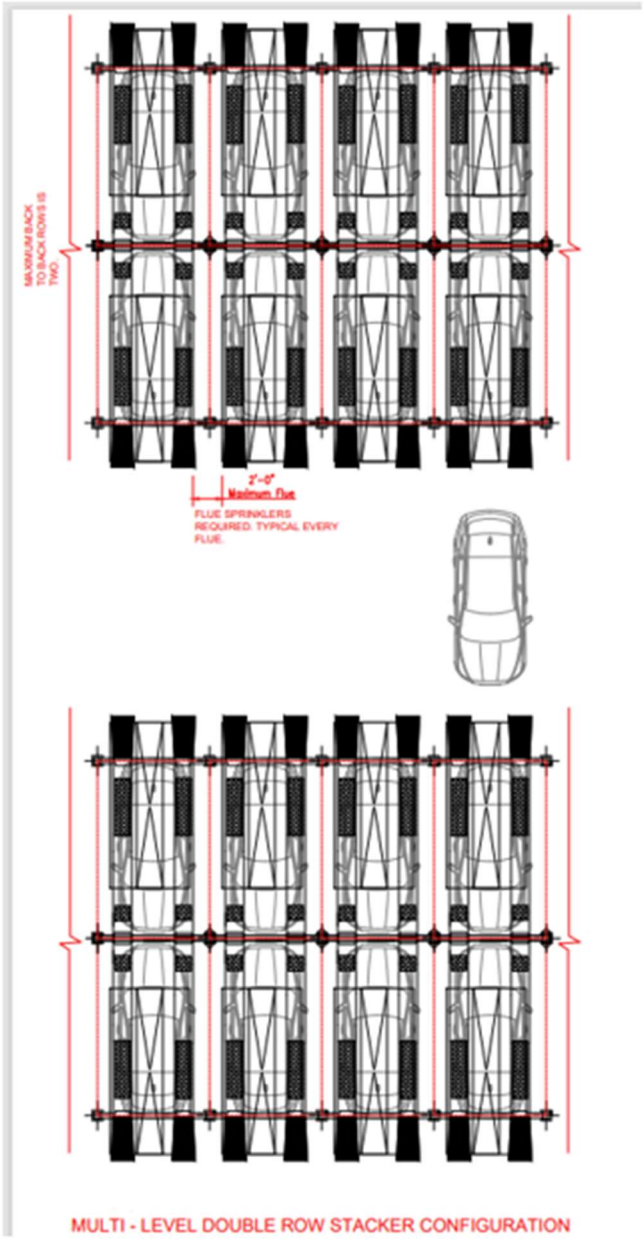
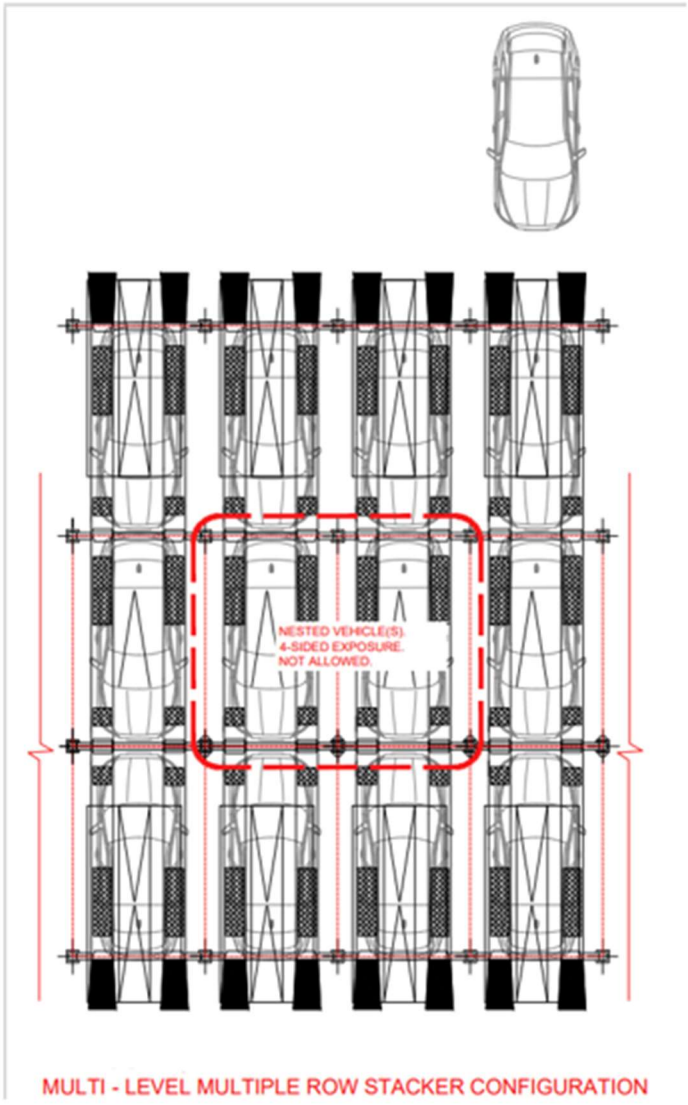


Figure 9.2.1.1.(b).



MULTI - LEVEL MULTIPLE ROW STACKER CONFIGURATION

Figure 9.2.1.1. (c).

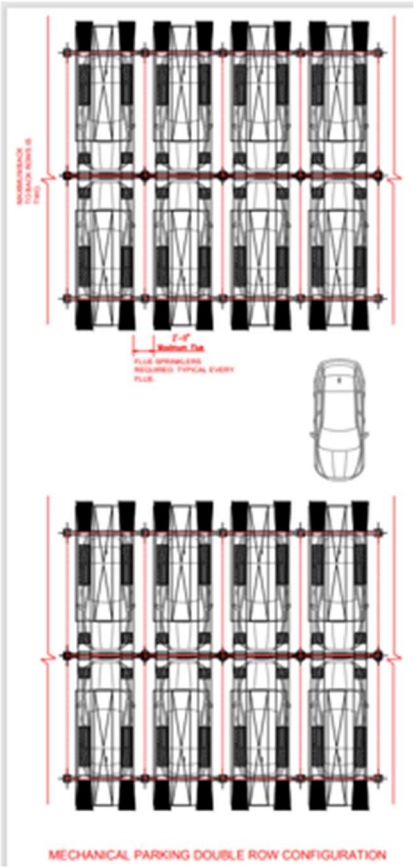
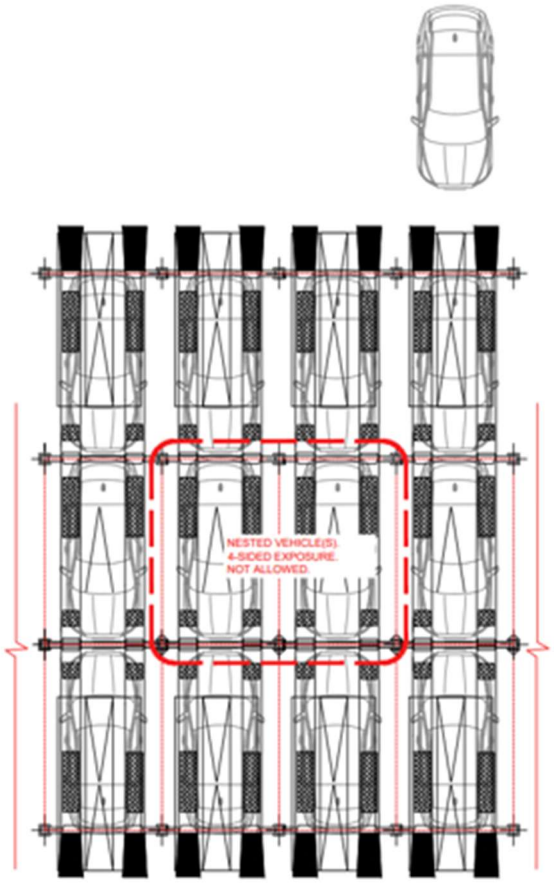


Figure 9.3.1.1 (b)



MECHANICAL PARKING MULTIPLE ROW CONFIGURATION

Figure 9.3.1.1. (c).

Gaut, James

From: Steven Scandaliato <steven@Scandaliatodesign.com>
Sent: Wednesday, March 26, 2025 11:32 AM
To: Gaut, James
Subject: [EXT] RE: Copyright for your illustrations

Kevin, et al,
This is written notice that I am giving NFPA the rights to the drawings and illustrations that I created for the 88A task group in their entirety.

Thanks,
Steven Scandaliato, SET CFPS RME
SDG, LLC.
520.971.2322 Mobile

From: Gaut, James <James.Gaut@mvwc.com>
Sent: Wednesday, March 26, 2025 8:52 AM
To: Steven Scandaliato <steven@Scandaliatodesign.com>
Subject: Copyright for your illustrations

Good morning sir,
I hope this email finds you well.

Kevin Carr sent this to me regarding the copyright requirements for your illustrations. It is an attestation the copyright is turned over to NFPA.

Kevin advised an email from you would be enough giving me rights to your illustrations, mainly for a record.

Once we decide what illustrations we decide to use, you can give me the copyrights to the illustration, I promise I will not use them but for NFPA or another agreement, and I submit the PI. Or you submit the PI clicking the attestation.

MVW

Jim Gaut
Director,
Global Fire and Life Safety
T 407-206-6088 **M** 321-354-5223

7812 Palm Parkway
Orlando, FL 32836
MVW Global Fire and Life Safety TRIP Page

Book time to meet with me

NOTICE: This MVW communication may be confidential for you if you do not mind. Unauthorized copying, distribution, disclosure, or use is prohibited. Please let me know if you have sent it to me in error, and then delete it. They are not intended to be electronic signatures under applicable law.

This message is from an external source. Be sure you know and trust the sender before clicking any attachments or links.

June 3, 2025 v-5

Chapter 9

(n) Parking Systems ~~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.**~~

~~**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.~~

~~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*.~~

~~**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.~~

~~**9.2.5 Occupant Safety.**~~

9.2.5.1 Vehicle Occupants.

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

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.

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.

9.2.5.2 Terminals.

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.

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

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

9.2.5.3* Terminal Doors.

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.

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.

~~**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) 9.1.1 The fire protection approach shall be developed using one of the following strategies within parking systems:

(n) (1) A prescriptive-based approach in accordance with this standard.

(n) (2)* A performance-based design approach in accordance with Chapter 10.

(n) a9.1.1 (2) In situations where compliance with specific prescriptive requirements is not feasible or appropriate, a performance-based design approach may be used. This approach allows for flexibility in design while still requiring that the proposed solution achieve the same intended level of fire and life safety as the applicable prescriptive provisions. The performance-based design should demonstrate, through appropriate analysis and documentation, that it provides a level of safety that is equivalent to or greater than that established by the prescriptive requirements.

(n) 9.1.2 When Electric Vehicles and/or charging stations are present on upper levels of any parking system, the total water supply duration shall be 120 minutes.

(n) A.9.1.2 When no Electric Vehicles are permitted the duration should be allowed to meet the requirements of NFPA 13 for Ordinary Hazard (Group 2).

9.1.3 (n) Flue Sprinklers Where flue sprinklers are required they shall be provided at every vehicle platform level.

9.1.3.1 (n) A minimum of two (2) flue sprinklers shall be provided in each flue space on both sides of the vehicle platform.

9.1.3.2 (n) Sprinklers shall be located within 3 ft. (914 mm) of the front and back of each vehicle platform with a maximum distance between sprinklers of 12 ft 6 in. (3.81 m). Figure 9.1.3.

9.1.3.3 **(n)** Flue sprinklers shall be calculated as follows:

9.1.3.3.1.1 (n) The two (2) most demanding levels of sprinklers, with four (4) sprinklers flowing per level,

9.1.3.3.1.2 Shall be calculated flowing a minimum 20 gpm (76 lpm) per sprinkler.

9.1.3.4 **(n)** Flue sprinklers are not required to be balanced with overhead sprinklers. A separate calculation will be provided for the overhead sprinklers.

9.1.3.5 **(n)** Flue sprinklers are not required above the uppermost vehicle platform.

9.1.3.6 (n) Where flue spaces exceed 24 inches (610 mm), a performance-based design shall be provided.

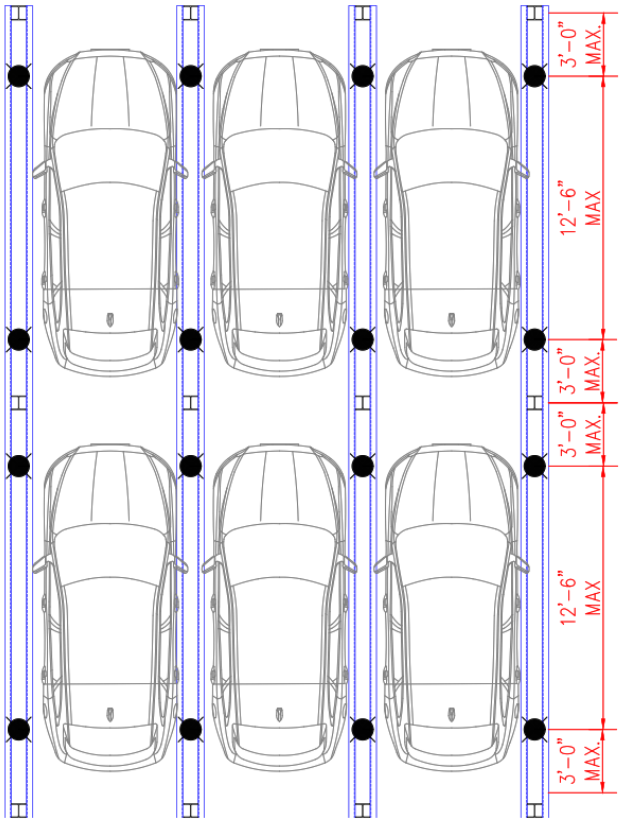


Figure 9.1.3.

9.1.4 (n) Mean of Egress. Means of egress in accordance with Chapter **4** are not required in automated-type parking structures.

9.1.5 (n) Means of Access In parking systems that do not provide physical barriers or terminals, a parking attendant shall transport the vehicle from a designated passenger drop-off and pick-up area, prohibiting vehicle occupants from coming in contact with the parking system's equipment, machinery, energizing elements, and other moving parts of the system.

9.2 (n) Multi-Level Stacker Parking

(n) Multi-Level Stacker Parking systems with or without EV and/or EV charging stations shall be in accordance with 9.2.1 – 9.2.3.

9.2.1 (n) Configuration

9.2.1.1*. **(n)** Spacing and location of Multi-Level Stacker (greater than 2) units shall be in accordance with the following criteria (a - c).

a. **(n)** EV’s shall be allowed on ground level of Stacker unit only.

b. (n) EV’s shall be allowed on upper levels with Stacker units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Stacker unit.

c. **(n)** The maximum number of Stacker unit rows shall be no greater than two (2). (Figure 9.2.1.1.b).ك

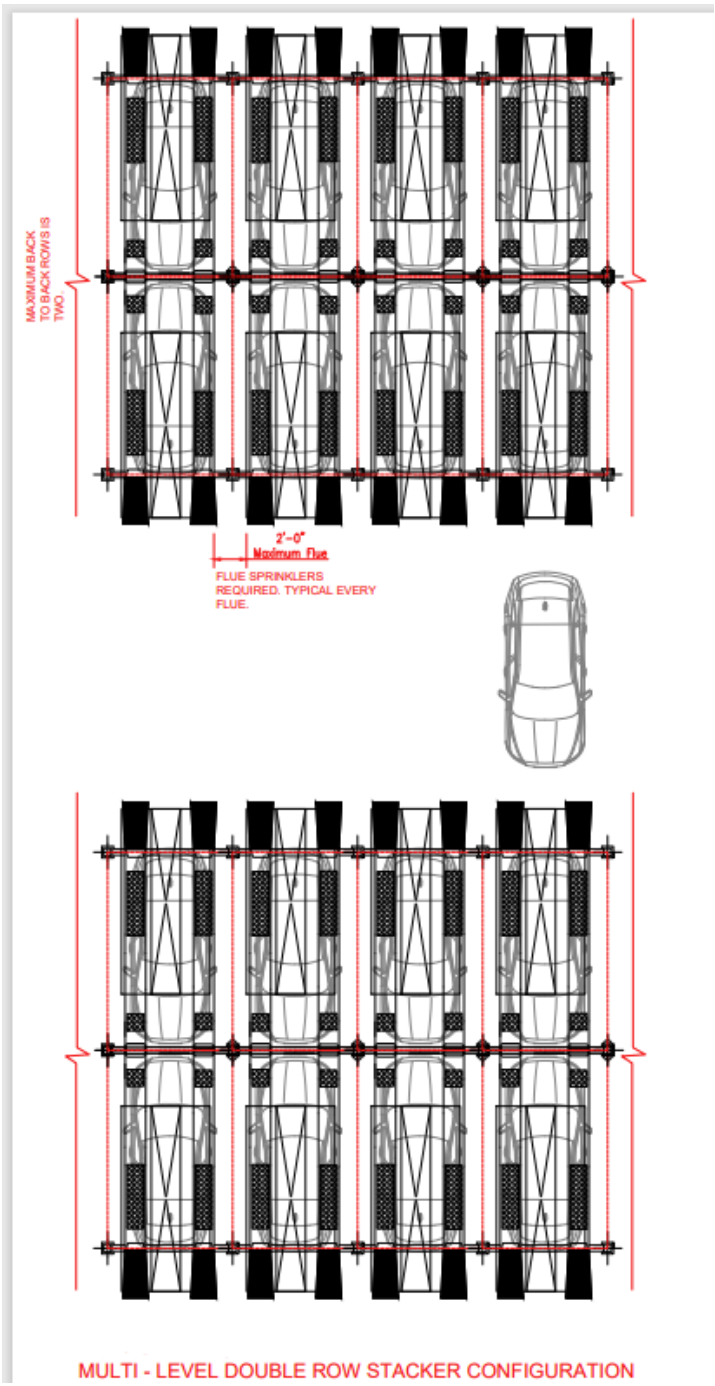


Figure 9.2.1.1.(b).

d. **(n)** Rows and columns of Stacker units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (Figure 9.2.1.1.c).

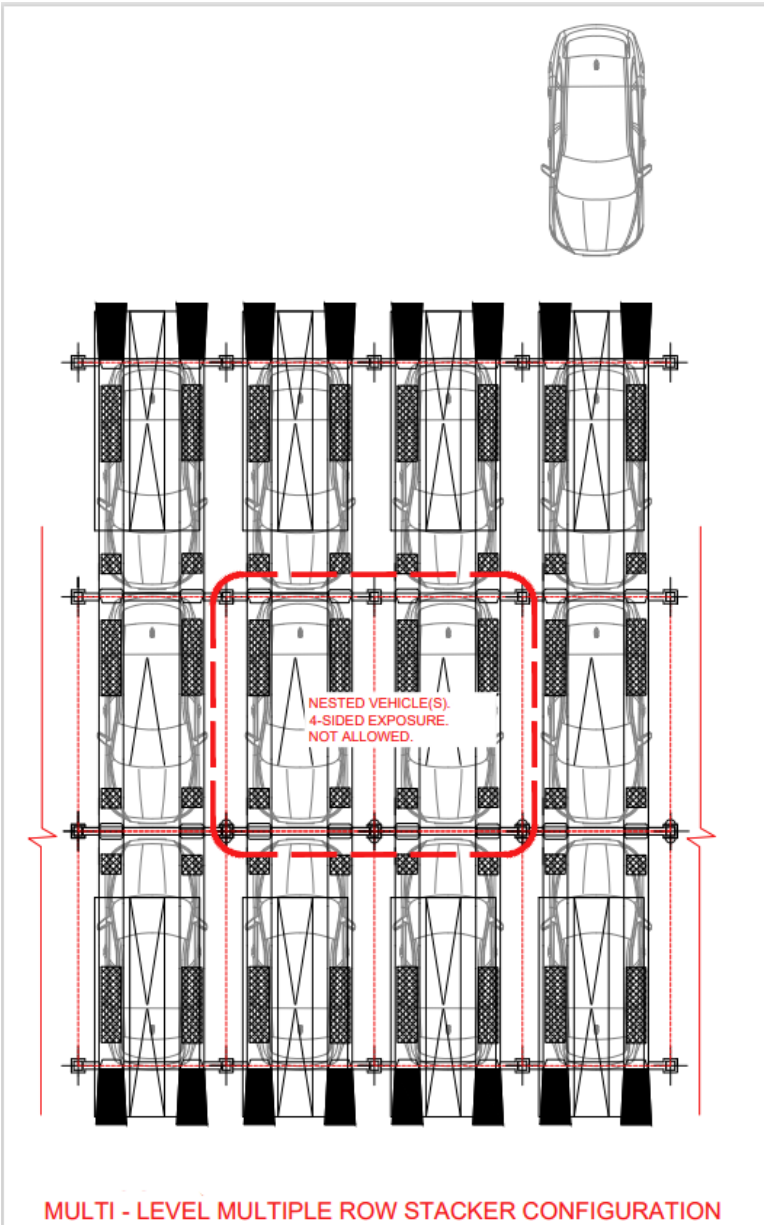


Figure 9.2.1.1. (c).

(n) A9.2.1.1 (a). The upper-level vehicle platforms must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

(n) A9.2.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be “nested” vehicles is restricted.

(n) 9.2.2. Fire Protection Systems

(n) 9.2.2. Fire Protection for Multi-Level Stacker units shall be in accordance with NFPA 13 except as modified in 9.2.2.1.

(n) 9.2.2.1*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1..

a. (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

b. (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.

c. (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.

d. (n) Flue sprinklers shall be provided according to 9.1.3.

(n) 9.3 Mechanical Parking System
Mechanical Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.3.1 through 9.3.3.
(n) 9.3.1 Configuration.
(n) 9.3.1.1. Spacing and location of Mechanical Parking Systems shall be in accordance with the following criteria (a - d).

a. (n) EV's shall be allowed on ground level of Mechanical Parking Systems only.
b. (n) EV's shall be allowed on upper levels with Mechanical Parking System units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Mechanical Parking System unit.
c. (n) The maximum number of Mechanical Parking System unit rows shall be no greater than two (2). (Figure 9.3.1.1.b).

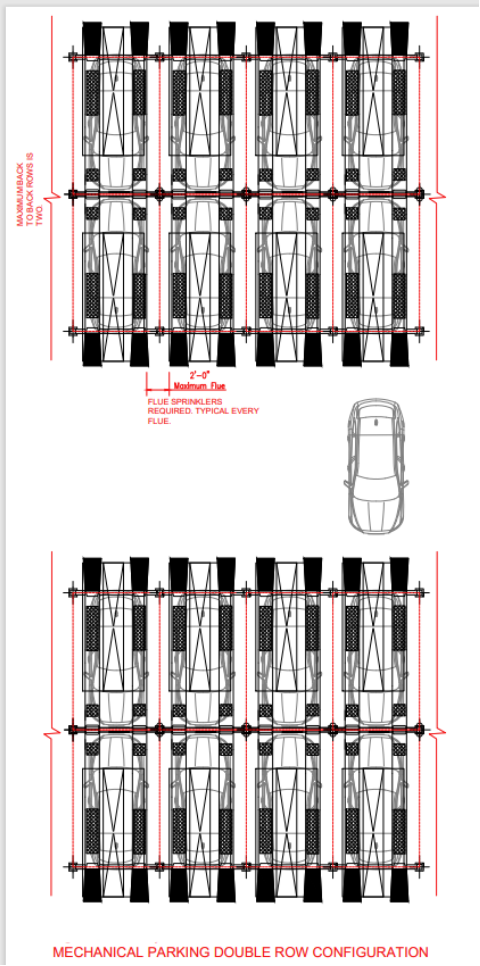
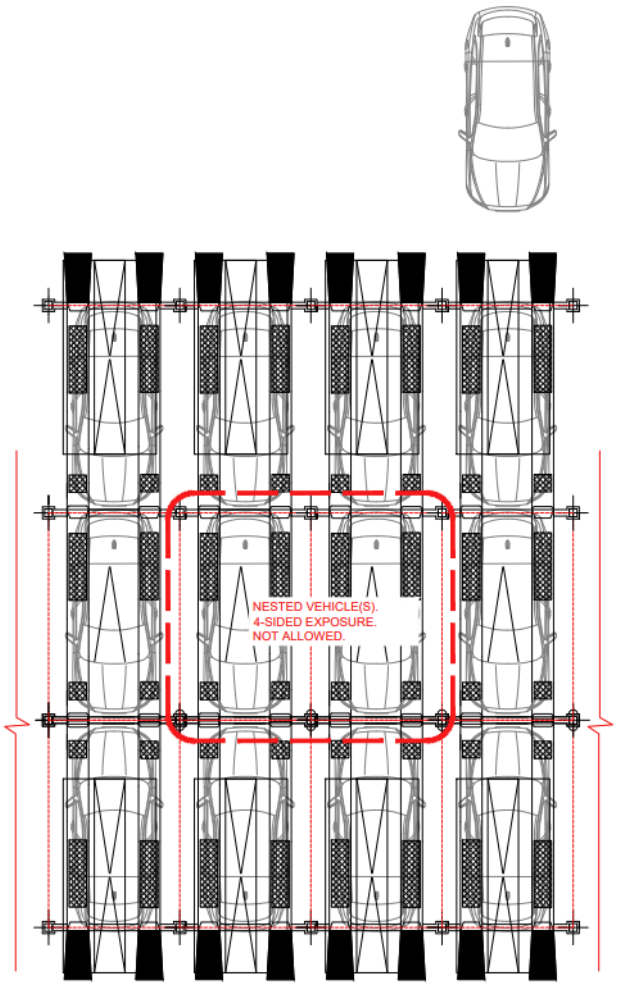


Figure 9.3.1.1. (b).

d. **(n)** Rows and columns of Mechanical Parking System units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (Figure 9.3.1.1.c).



MECHANICAL PARKING MULTIPLE ROW CONFIGURATION

Figure 9.3.1.1. (c).

(n) A9.3.1.1 (a). The upper-level vehicle platform must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

(n) A9.3.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be “nested” vehicles is restricted.

(n) 9.3.2 Fire Protection Systems

(n) 9.3.2.1 Sprinkler Systems

(n) Fire Protection for Mechanical Parking System units shall be in accordance with NFPA 13 except as modified in 9.3.2.1.2.

(n) 9.3.2.1.2*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1.

a. (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

b. (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.

c. (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.

d. (n) Flue sprinklers shall be provided according to 9.1.3.

(n) 9.3.3.2 Standpipes Where required, standpipe systems shall be provided per NFPA 14.

(n) 9.4 Fully Automated Parking System

(n) Fully Automated Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.5.1 through 9.5.4.

(n) 9.4.1. Occupant Safety

(n) 9.4.1.1. All vehicle occupants shall be required to enter and exit the vehicle at a designated terminal.

(n) 9.4.2. Terminals.

(n) 9.4.2.1. 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) 9.4.2.2. Terminals shall be designed in accordance with the other relevant provisions of this standard.

(n) 9.4.2.3. Terminals shall be considered an incidental use area to the entire parking system.

(n) 9.4.2.4*. Terminal 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) A.9.2.4. 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.

(n) 9.4.2.5. 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) 9.4.3. Fire Service and Maintenance Access.

(n) 9.4.3.1. Access shall be provided in accordance with Table 9.5.2.1.

(n) Table 9.4.3.1 Parking Equipment Access Dimensional Criteria

Feature	Dimensional Criteria
Minimum horizontal dimension of any walkway, landing, or platform	36 in. (915 mm) clear
Minimum stair or ramp width	36 in. (915 mm) clear between rails
Minimum tread width	36 in. (915 mm) clear
Minimum tread depth	10 in. (255 mm)
Maximum riser height	9 in. (230 mm)
Handrails are permitted to terminate, at the required height, at a point directly above the top and bottom risers.	
Maximum height between landings	12 ft (3660 mm)
Minimum headroom	6 ft 8 in. (2030 mm)
Minimum width of door openings	36 in. (915 mm) clear.

(n) 9.4.3.2. Horizontal walkways for access shall be provided at intervals of 20 ft (6 m) vertically and 100 ft (30 m) horizontally.

(n) 9.4.3.3. Travel distance to the exterior or to an enclosed stair shall not exceed 400 ft (122 m).

(n) 9.4.3.4. A minimum of one exterior door shall be provided at grade for every required stair.

(n) 9.4.3.5.* An automatic retrieval system shall be provided for cars that are not readily accessible to fire department operations. Cars shall be capable of being moved to approved designated locations.

(n) A9.4.3.5. Fully Automated Parking Systems have limited accessibility to upper levels of parking and therefore are more difficult for fire department access and

operations. An automatic retrieval system allows the fire department to have adequate access to the vehicle(s) involved.

(n) 9.4.4. Ventilation. A ventilation system that continuously provides a minimum of two air changes per hour shall be provided.

(n) 9.4.5. Fire Protection Systems

(n) 9.4.5.1* Sprinkler Systems

(n) 9.4.5.1.2 An automatic sprinkler system shall be installed in a parking structure with Fully Automated Parking Systems in accordance with NFPA 13 except as modified in 9.5.3.1 (a – d).

(n) 9.4.5.1.3. An automatic sprinkler system shall be provided in accordance with NFPA 13, ordinary hazard group 2 and except as modified below 9.3.2.1.

a. (n) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.
b. (n) Maximum sprinkler spacing shall be 12 ft 6 in. (3.81 m), figure 9.1.3.
c. (n) Hose Allowance shall be 250 gpm (950 lpm) for 120 minutes when EVs are present.
d. (n) Flue sprinklers shall be provided according to 9.1.3.

(n) A.9.4.5.1 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 reports, Modern Vehicle Hazards in Parking Structures and Vehicle Carriers (All phases).

(n) 9.4.5.2 Standpipes

(n) Standpipes shall not be required in Fully Automated Parking Systems.

(n) 9.4.5.3. Fire alarm systems shall not be required in parking structures with Fully Automated Parking Systems that are protected by an automatic sprinkler system in accordance with NFPA 13 except as modified in 9.5.3.

9.5.x Pay Stations.

9.5.x.x 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).

9.5.x.x 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.

9.5.x.x Pay Station Entrance.

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

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

9.5.x.x 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.

END OF SECTION

Public Comment No. 14-NFPA 88A-2025 [Global Input]

June 2, 2025

(n) Chapter 10 * Performance-Based Design Approach for Parking Structures & Parking Systems.

10.1* Performance-Based Design Approach

10.1.1 The requirements of Chapter 10 shall be used to recognize a performance-based design approach where fire and life safety solutions are engineered to achieve a quantified goal for a specified use or application.

10.1.2 Where compliance with specific prescriptive requirements is not feasible or appropriate, a performance-based design approach shall be permitted, provided that it demonstrates an equivalent level of safety and achieves the intended outcome of the applicable prescriptive provisions.

10.1.3 The performance-based design approach shall provide a level of fire and life safety that is equivalent to or greater than that established by the applicable prescriptive requirements.

10.2* Fire Risk Assessment.

10.2.1 A fire risk assessment shall be performed prior to completing a Performance Based Design.

> **A.10.2.1 The fire risk analysis should be evaluated by the stakeholders. See NFPA 551 for additional guidance.**

10.2.2 The fire risk assessment shall be documented and approved by the authority having jurisdiction (AHJ).

10.2.3 The fire risk assessment shall include an evaluation of risk management considerations and involve all parking structure and parking systems stakeholders.

10.2.3.1 Fire risk assessment documents shall be prepared by a licensed professional with experience in all aspects of fire protection and life safety system design for parking structures and parking systems and they shall be acceptable to the AHJ.

10.4* Goals and Objectives

> **A 10.4 Assumptions:**
>
> **Occupants can be assumed to hear the fire alarm activation and respond appropriately. They should be awake, alert, and able to exit without assistance. Exits should be clearly marked and accessible, parking ramps are considered an exit.**

Parking systems have inherent hazards similar to a parking structure; however, it is an unoccupied space and it can be assumed that the maintenance crew are familiar with the parking system because they should be considered employees that are awake, alert, and mindful of how to exit the parking system without assistance. The employees should be able to hear a fire alarm activation.

The performance-based design shall meet the following goals and objectives:

(1) The risk assessment, design criteria, design brief, system performance, and testing criteria are developed in accordance with this section

(2) Meet the scope and purpose of the standard as detailed in Section 1.1 and Section 1.2

(3) The performance-based design provides an equivalent level of protection to the prescriptive requirements of this standard

(4) Ensure all applicable codes, standards and regulations are identified and complied

(5) Select appropriate fire detection & suppression systems for the hazard present, such that the fire protection system will be activated and provide sufficient coverage to limit the fire's spread to no more than two vehicles.

(6) The performance based design should consider a means to limit excessive temperatures to the structure.

(7) Prepare response plan with AHJ & responding emergency services. A copy of the plan, either physical or digital, to be kept on site and reviewed on an annual basis with owner, occupants, and AHJ.

A 10.3.(7) The response plan should include all stakeholders, see NFPA 2800, Standard on Facility Emergency Action Plans.

(1)

(a)

i. Perform training sessions for staff, and the responding fire department on the procedures related to a fire in parking structures and parking systems. AHJ's will determine the frequency of the training.

ii. Documentation shall be provided on site outlining the response plan as well as signage to provide direction when separate procedures are in place for alternative fuel vehicles.

10.5 Qualifications.

The performance-based design documents shall be prepared by a licensed professional engineer, Certified Fire Protection Specialist (CFPS), or other qualified professional with experience in fire protection and life safety system design and risk assessments that are acceptable to the AHJ.

10.6* Independent Review.

The AHJ shall be permitted to require an approved, independent third party to review the proposed design based on the Performance-Based Design Report and the Design Brief.

A 10.6 The SFPE Guidelines for Peer Review in the Fire Protection Design Process provides guidance concerning the peer review process for fire protection designs.

10.7 Final Determination.

The authority having jurisdiction shall make the final determination as to whether the performance objectives have been met.

10.8 Maintenance of Performance-Based Design Approach.

The design features required for parking structures and parking systems to continue to meet this standard's performance goals and objectives shall be maintained for the life of the building.

10.8.1 A re-evaluation of the Performance-Based Design Report shall be performed when the building or specialty parking systems are modified.

10.9 Performance Criteria.

10.9.1 General.

All designs shall meet the goals and objectives specified in Section 10.4 and the performance criterion of 10.9.2, and all the parking structures and parking systems stakeholders shall concur with the design and risk management considerations.

10.9.2* Performance Criterion.

In addition to life safety considerations, the performance criterion shall include the protection of the vehicle parking areas from damage by fire and its associated effects, by employing active and passive fire protection features.

A 10.9.2 Active and passive fire protection features should ensure that all occupants can evacuate in a safe manner before the fire compartment and adjoining compartments become untenable. To accomplish this the designer should consider early notification and fire suppression systems able to cool the area and prevent the fire from spreading to adjoining vehicles and compartments, while maintaining tenability for the occupants to evacuate. Ventilation should be a consideration to mitigate the release of highly toxic and dangerous gases that can cause significant immobility or death of occupants.

In addition to the life safety aspects, efforts should be made to reduce the thermal effects of the vehicle fire to the structural components of the parking garage and/or parking system. According to the 2008 edition of NFPA 502, the peak temperature ranges from 444°C (832°F) to 1400°C (2552°F) within ten minutes and within four feet of the roof of a vehicle on fire.

10.9.2.1 Fire protection systems shall be designed and constructed to reasonably prevent structural failure of concrete or steel under fire conditions by limiting the exposure of the concrete surface to not exceed 716°F (380°C), or steel surface to not exceed 1000°F (539°C).

10.9.2.2 Fire protection systems shall be designed and constructed to prevent the failure of parking systems under fire conditions by limiting the exposure of the steel to not exceed 1000°F (539°C).

10.9.2.3 Buildings shall be designed and constructed to effectively prevent the spread of fire to adjacent buildings and structures for a duration sufficient to allow emergency responders to arrive on-site and initiate fire suppression operations.

10.9.3 Parking structure and parking system Stakeholders.

Parking structures and parking systems stakeholders shall include, but not be limited to, the following:

(1) Registered design professionals experienced in fire protection and life safety system design and risk assessments

(2) The owner or owner's representative

(3) Parking structures and parking systems insurance representative

(4) Representatives of the authority having jurisdiction

(5) Representatives of emergency response entities

(6) Building design professionals (architectural, structural, civil, mechanical, plumbing, and electrical design professionals)

10.9.4* The design of the fire protection elements, in parking structures and parking systems shall include the preparation of a Design Brief, that is prepared utilizing recognized performance-based design practices.

> **A.10.9.4 The SFPE's Engineering Guide: Performance-Based Fire Protection is a recommended guide that should be used in the development of a Design Brief and Performance-Based Design Report.**

10.9.4.1* The design brief shall provide in detail the purpose of the performance-based design and outline where it is proposing deviation from prescriptive requirements.

> **A.10.9.4.1 The intent of the permitted deviation would be stated in the Design Brief or an informational annex of the Design Brief. A deviation might be permitted as long as the equivalent performance features are maintained.**

10.9.4.2 Design specifications and briefs used for performance-based design shall be clearly documented and proven to be realistic and sustainable.

10.9.4.3* Specific inspection, testing, and maintenance requirements that are necessary to maintain the reliable performance of the fire safety features of vehicle parking areas shall be stated in the Performance-Based Design Report.

> **A.10.9.4.3 An inspection, testing, and maintenance program is recommended to be provided to the responsible parking structures and parking systems owner or operator and made readily available.**

10.10 Records, Record Retention, and Record Maintenance.

10.10.1 A complete record of the performance-based design must be maintained by the building owner or building owner's representative for the life of the parking Structure.

10.10.2 A complete record of the inspection, testing, and maintenance of the systems that make up the performance-based design must be maintained by the building owner or building owner's representative.

10.10.3 The building owner or building owner's representative shall be responsible for maintaining and operating the parking Structure in compliance

with this performance design for the life of the parking Structure.

10.10.4 The performance-based design, inspection, testing, and maintenance records shall be available to the code official upon request.

Annex material for Chapter 10*

A10.0 Currently there is a dearth of technical information on the performance of fire protection systems and combustion characteristics of modern vehicles in stacker systems and/or other automated parking systems. In general, most data sources provided very little guidance and justification, if any at all, on the recommended fire protection scheme for these types of parking systems. Regarding automated parking systems, there are no known published experiments, no known incidents from which to compare performance, and no known code requirements.

A 10.1 Annex materials – Guideline for Performance-Based Design of Parking Structures & Parking Systems

The basic form of any performance-based design is to first select the performance objectives of the design. A preliminary design is developed and then assessed against its ability to meet the objectives established. If the performance meets the objectives the performance based design is complete, if it does not meet the objectives the design is revised and reevaluated until the performance objectives are met. The main objective of a design for these types of ~~parking systems~~ Parking Structures & Parking Systems should be to prevent structural collapse. Research has shown that in fires in Parking Structures & Parking Systems, keeping the fire from spreading beyond the vehicle of origin provides for the best outcome with the least amount of damage. While adjacent vehicles may sustain damage via heat or smoke, active involvement of additional vehicles beyond the vehicle of origin should a primary goal for a Performance Based Design. By limiting the fire from involving multiple vehicles the structure of the building and the parking system can be protected from collapse. This can be achieved through a combination of both active and passive protection measures.

Here is an outline of the items that need to be considered when creating a Performance Based Design (PBD) for a parking system:

(1) Risk assessment

- **(a) Identify the potential fire hazards associated with the automated parking system and assess the level of risk. Consider proximity of vehicles to one another, potential for fire spread in any direction, impact of fire on the building and parking system structure, hazards present both from vehicles as well as components of the parking system.**
- **(b) Evaluate risk to adjacent structures and proposed mitigation if necessary.**
- **(c) Consider the unique characteristics of the parking systems and their impact on fire safety.**

(2) Regulatory Compliance

- **(a) Familiarize yourself with local building and fire codes, as well as any specific regulations related to parking systems.**

(b) Ensure that your design adheres to relevant safety standards and guidelines.

(c) Identify who the Authority Having Jurisdiction will be that will provide final approval of the PBD.

(3) Establish passive protection measures

(a) Prepare a plan for emergency egress of any occupants of the building. Ensure that evacuation paths are well-marked, adequately illuminated, and easily navigable

(b) Install reliable communication systems to facilitate emergency notifications and coordination. Integrate fire alarm systems with the parking system to trigger appropriate responses in case of emergencies.

(c) Consider compartmentation to limit fire spread via the means of rated construction or other measures. under consideration of insurance requirements

(4) Establish active protection measures

(a) Select appropriate fire suppression systems for the hazard present. Ensure that sprinklers will be provided in a manner to activate in a timely manner and provide sufficient coverage to limit the fire spread to the design area only.

(b) Establish a minimum duration of water supply to a water-based suppression system based on the hazards present. Fire involving batteries in electric vehicles may require available water for a minimum of 2 hours. The duration should be no less than the minimum required for an Ordinary Hazard Group II occupancy, 90 minutes.

(c) Address how to provide for verification of final extinguishment. In cases involving ICE vehicles it may be appropriate to provide control/suppression in place with support from the responding fire department. For longer duration fires such as those involving batteries in EV's encapsulation and removal of the vehicle may be necessary in order to ensure final extinguishment has occurred.

(d) Design an effective smoke management system to prevent smoke accumulation

(5) Prepare response plan with AHJ & responding emergency services to be kept on site and reviewed on an annual basis with owner and AHJ.

(a) Conduct training sessions for occupants, staff and the responding fire department on the procedures related to a fire in the automated parking system.

Documentation should be provided on site outlining the response plan as well as signage to provide direction when separate procedures are in place for

END OF SECTION

Additional Proposed Changes

File Name	Description	Approved
6-3-25_copyright_granted.pdf	Copyright TG 4 2025	

Statement of Problem and Substantiation for Public Comment

June 2, 2025

Section 9 changes, Substantiation.

Change chapter title from Special Structures to Parking Systems as this is more appropriate for the content now included in this chapter.

9.1.1 – Indicates that they can either follow the prescriptive guidelines in this chapter or they can go to a performance based design. The performance based design would be potentially a way for someone to prove through their own testing, modeling, engineering analysis, etc that they can meet the intent of preventing fire spread but perhaps with fewer sprinklers than what our proposed prescriptive language requires.

9.1.2 – In parking systems, if EV's will be present on any but the ground level, an increased duration of water will buy additional time for the responding fire department to assess and come up with a plan of attack to extinguish or contain a fire that could contain a Li-ion battery which have been proven to burn longer, but not hotter.

9.1.3 – Establishes the prescriptive means to protect every car within a parking system by ensuring that each car will have four sprinklers around it at approximately the four corners of the car. Also establishes a minimum flow of 20 gpm. With an average of around 100 square feet per sprinkler, this flow would be approximately equal to the design density associated with Ordinary Hazard (Group II) which we have established through calculation and some preliminary testing to be an appropriate amount of water to absorb enough heat to control a typical vehicle fire.

9.1.4 – Was already in Chapter 9, moved for organization

9.2 – It is necessary to include that the following design guidelines apply to systems both with and without EV's because it will indicate that they have been considered and that we have determined the threat level remains the same both ways.

9.2.1 This section requires that electric vehicles will only be permitted on upper levels of a multilevel stacker with the vehicle platforms are solid so no direct flame impingement will be applied to the battery compartment when the vehicle below is on fire. The rest of this section will limit the ability to have a car surrounded on all sides by other vehicles, thus maintaining at least one side accessible to a responding fire department.

9.2.2 This establishes the minimum discharge density but ensures there is additional safety factors involved such as not allowing a reduction in the design area for quick response sprinkler. Additionally, limiting maximum spacing to no more than 12'-6" ensures that we have adqaute sprinkler coverage over each vehicle. Then it points back to the flue sprinkler design criteria established in 9.1.3
9.3 – See substantiation for section 9.2, it will be the same

9.4 – This section is a reorganization of what was already included in this chapter for fully automated and additional design criteria. 9.4.1 and 9.4.2 were existing and the content has not changed but they have been moved.

9.4.3 takes the information that was previously 9.2.2 for fire service and maintenance access and puts it into a table format as well as adds additional requirements for stairs, headroom, door openings.

9.4.3.5 is a new section requiring an automatic means of retrieving a car not readily accessible to the fire department.

9.4.4 has not changed content, only location

9.4.5.1 Same substantiation as 9.2.2

9.4.5.2 has not changed, new location only

9.4.5.3 Adds requirement that fire alarm system would not be require if fully sprinklered

The committee did not agree with the text of PI-72 as provided, as it contained NFPA MOS concerns, as well as questions pertaining to language as extracted from NFPA 409. PI-62 was resolved as it was a related input based on the definition, which could not be added as the term is not utilized within NFPA 88A. The task group for Chapter 9 will review this further and provide possible Public Comment, as well as provide a report to the committee at the Second Draft meeting.

Related Item

• The committee did not agree with the text of PI-72 as provided, as it contained NFPA MOS concerns, as well as questions pertaining to language as extracted from NFPA 409. PI-62 was resolved as it was a related input based on the definition, which could not be added as the term is not utilized within NFPA 88A. The task group for Chapter 9 will review this further and provide possible Public Comment, as well as provide a report to the committee at the Second Draft meeting.

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Mon Jun 02 18:06:55 EDT 2025
Committee: GAR-AAA

Gaut, James

From: Steven Scandaliato <steven@Scandaliatodesign.com>
Sent: Wednesday, March 26, 2025 11:32 AM
To: Gaut, James
Subject: [EXT] RE: Copyright for your illustrations

Kevin, et al,
This is written notice that I am giving NFPA the rights to the drawings and illustrations that I created for the 88A task group in their entirety.

Thanks,
Steven Scandaliato, SET CFPS RME
SDG, LLC.
520.971.2322 Mobile

From: Gaut, James <James.Gaut@mvwc.com>
Sent: Wednesday, March 26, 2025 8:52 AM
To: Steven Scandaliato <steven@Scandaliatodesign.com>
Subject: Copyright for your illustrations

Good morning sir,
I hope this email finds you well.

Kevin Carr sent this to me regarding the copyright requirements for your illustrations. It is an attestation the copyright is turned over to NFPA.

Kevin advised an email from you would be enough giving me rights to your illustrations, mainly for a record.

Once we decide what illustrations we decide to use, you can give me the copyrights to the illustration, I promise I will not use them but for NFPA or another agreement, and I submit the PI. Or you submit the PI clicking the attestation.

MVW

Jim Gaut
Director,
Global Fire and Life Safety
T 407-206-6088 **M** 321-354-5223

7812 Palm Parkway
Orlando, FL 32836
MVW Global Fire and Life Safety TRIP Page

Book time to meet with me

NOTICE: This MVW communication may be confidential for you if you do not mind. Unauthorized copying, distribution, disclosure, or use is prohibited. Please let me know if you have sent it to me in error, and then delete it. They are not intended to be electronic signatures under applicable law.

This message is from an external source. Be sure you know and trust the sender before clicking any attachments or links.

Public Comment No. 18-NFPA 88A-2025 [Global Input]

(n) 3.3.7.4* Multilevel Stacker Parking System. A parking system that stores vehicles vertically only, with more than 2 vehicles.

(n) A.3.3.7.4 Multilevel Stacker Parking System. A stacker system can store up to five vehicles in a single unit. Vehicles are permitted to be driven into the stacker system and backed out at time of retrieval.

Statement of Problem and Substantiation for Public Comment

Substantiation, section 9.2, the task group uses multilevel parking systems in section 9.2. It is necessary to add the definition for Multilevel Stacker Parking System to have clear and consistent understanding across NFPA standards. The task group recommends this new definition.

Related Item

- Referenced in section 9.2

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 12:13:32 EDT 2025
Committee: GAR-AAA

Public Comment No. 19-NFPA 88A-2025 [Global Input]

(n) 3.3.x.x. Flue Space. The vertical space between vehicle platforms along the vehicle sides of the parking systems, creating spaces that are a minimum of 6 inches (150 mm) maximum of 24 inches (600 mm) in width, which can act as a flue to spread fire and hot gases.

Statement of Problem and Substantiation for Public Comment

Substantiation, section, 9.1.3, the task group added language to the standard under 9.1.3. It is necessary to add the definition for flue spaces to have clear and consistent understanding across NFPA standards. The task group considered other NFPA references to flue spaces when the definition was developed.

Related Item

• Referenced in section 9.1.3

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 12:17:06 EDT 2025
Committee: GAR-AAA

Public Comment No. 20-NFPA 88A-2025 [Global Input]

(n) 3.3.10 Performance-Based Design Approach. A design process where fire and life safety solutions are engineered to achieve a specified goal for a specified use or application.

Statement of Problem and Substantiation for Public Comment

Substantiation, Performance based design is referenced in chapter 9 & 10. section 9.1.1(2), Chapter 10. It is necessary to add the definition for Performance-Based Design Approach to have clear and consistent understanding across NFPA standards as well as NFPA 88a. The task group recommends this new definition.
The committee did not agree with the text of PI-72 as provided, as it contained NFPA MOS concerns, as well as questions pertaining to language as extracted from NFPA 409. PI-62 was resolved as it was a related input based on the definition, which could not be added as the term is not utilized within NFPA 88A. The task group for Chapter 9 will review this further and provide possible Public Comment, as well as provide a report to the committee at the Second Draft meeting.

Related Item

• Referenced in chapters 9 & 10

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 12:19:04 EDT 2025
Committee: GAR-AAA

Public Comment No. 21-NFPA 88A-2025 [Global Input]

(existing) A.3.3.7.1 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) 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) Fully automated is differentiated from a mechanical Parking System since, in Fully Automated Parking Systems move vehicles in three axes, up/down, forward/backward, and side to side. Mechanical Parking systems move only in two axes, up/down and side to side.

(n) Robotic parking system definition is a retired term that was replaced by combining Fully Automated, Mechanical, and Stacker Parking System definitions.

Statement of Problem and Substantiation for Public Comment

Substantiation, providing explanatory material for defined terms can assist users of the standard in understanding how these terms are intended to be applied within the context of the document. This clarification supports consistent interpretation and application of the standard's provisions. The task group recommends this new definition.

Related Item

• Related to definition Fully automated parking system.

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 12:23:33 EDT 2025
Committee: GAR-AAA

Public Comment No. 23-NFPA 88A-2025 [Global Input]

(n) 3.3.x Physical Barrier. A physical obstruction intended to prevent contact with equipment or energized electrical conductors and circuit parts or to prevent unauthorized access to a work area.

Statement of Problem and Substantiation for Public Comment

Substantiation, Physical barrier is referenced in chapter 9, section 9.1.4. It is necessary to add the definition for physical barrier to have clear and consistent understanding across NFPA standards as well as NFPA 88a. The task group recommends this new definition.

Related Item

• Referenced in section 9.1.4

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:00:22 EDT 2025
Committee: GAR-AAA

Public Comment No. 24-NFPA 88A-2025 [Global Input]

(n) 3.3.x Open Vehicle Platform. A device that is part of a parking system where the vehicle drives onto, and the platform moves the vehicle to its desired location in the parking system. An Open platform is exposed to the vehicle below.

Statement of Problem and Substantiation for Public Comment

Substantiation, The term is used in section 9.2.1.1(a), a 9.2.1.1 (a), 9.3.1.1 (a), a 9.3.1.1(a). It is necessary to add the definition for Open Vehicle Platform, to have clear and consistent understanding across NFPA standards as well as NFPA 88a. This device is a significant feature that would affect the fire protection performance. The task group recommends this new definition.

Related Item

• The term is used in section 9.2.1.1(a), a 9.2.1.1 (a), 9.3.1.1 (a), a 9.3.1.1(a).

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:02:22 EDT 2025
Committee: GAR-AAA

Public Comment No. 26-NFPA 88A-2025 [Global Input]

(n) 3.3.x Solid Vehicle Platform.This is a device that is part of a parking system. The vehicle drives onto it, and the platform moves the vehicle to its desired location in the parking system. The solid (closed) noncombustible platform is not open to the vehicle below.

Statement of Problem and Substantiation for Public Comment

Substantiation, The term is used in section 9.2.1.1(a), a 9.2.1.1 (a), 9.3.1.1 (a), a 9.3.1.1(a). It is necessary to add the definition for Solid Vehicle Platform, to have clear and consistent understanding across NFPA standards as well as NFPA 88a. This device is a significant feature that would affect the fire protection performance. The task group recommends this new definition.

Related Item

• The term is used in section 9.2.1.1(a), a 9.2.1.1 (a), 9.3.1.1 (a), a 9.3.1.1(a)

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:05:32 EDT 2025
Committee: GAR-AAA

Public Comment No. 27-NFPA 88A-2025 [Global Input]

(n) A 3.3.x Mechanical Parking systems are also referred to as semiautomated parking systems.

Statement of Problem and Substantiation for Public Comment

Substantiation, The task group felt more explanation was necessary to clarify the definition.

Related Item

• The task group wanted to identify this to reduce confusion.

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:07:18 EDT 2025
Committee: GAR-AAA

Public Comment No. 28-NFPA 88A-2025 [Global Input]

(n) A.3.3.9.3 Stacker Parking System.A stacker system can store up to two vehicles in a single unit. Vehicles are permitted to be driven into the stacker system and backed out at time of retrieval.

If the stacker parking system stores three or more vehicles in a single unit, it is considered a multilevel stacker parking system.

Statement of Problem and Substantiation for Public Comment

Substantiation, The term stacker parking system is used in Sections 6.4.1.2 and 6.4.1.2.1 of the standard. To ensure clarity and consistency across NFPA 88A and other applicable NFPA standards, it is necessary to formally define this term. The inclusion of a definition will support a uniform understanding of the system's configuration, function, and associated hazards. Given that stacker parking systems can significantly affect fire protection design and performance—particularly with regard to access, suppression, and egress a clear definition is essential for accurate application and enforcement of fire safety provisions.

Related Item

- The term stacker parking system is used in Sections 6.4.1.2 and 6.4.1.2.1 of the standard

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:10:12 EDT 2025
Committee: GAR-AAA

Public Comment No. 8-NFPA 88A-2025 [Global Input]

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.

(n) 6.4.1.1* Parking structures shall be protected as an Ordinary Hazard (Group 2) occupancy.

(n) A.6.4.1.1 Parking structures without stacker systems can be protected with an Ordinary Hazard (Group 2) design regardless of the types of vehicles present or the presence of EV chargers. As noted in Phase 1 of the Fire Protection Research Foundation report on *Modern Vehicle Hazards in Parking Garages and Vehicle Carriers*, electric vehicles did not present a greater hazard than the internal combustion engine vehicles. Due to the thermal mass of EVs, an increase in the water supply duration should be considered.

(n) 6.4.1.2 Where car stacker systems with a maximum of two cars stacked vertically are present, the area containing the car stacker shall be protected as an Extra Hazard (Group 2) occupancy.

(n) 6.4.1.2.1* Where supplemental sprinklers are installed above each vehicle, the occupancy classification at the ceiling level shall be permitted to be Ordinary Hazard (Group 2).

(n) A.6.4.1.2.1 Two levels of supplemental sprinklers need to be installed within the car stacker (see Figure A.6.4.1.2.1.a) to reduce the occupancy classification based on fire testing detailed in BRE Global's report on *Sprinkler Protected Car Stacker Fire Test.*

(n) Where ceiling-level sprinkler deflectors are located within 36 inches (910 mm) of the top of the upper vehicle, the upper level of supplemental sprinklers may be omitted. In such cases, it is advisable to limit the spacing between sprinklers to a maximum of 12 ft (3.7 m) and to maintain a minimum design area of 1500 ft² (140 m²), without applying any area reductions for the use of quick response sprinklers.

(n) Figure A.6.4.1.2.1.b Example of Supplemental Sprinklers Installed at Each Stacker Level.

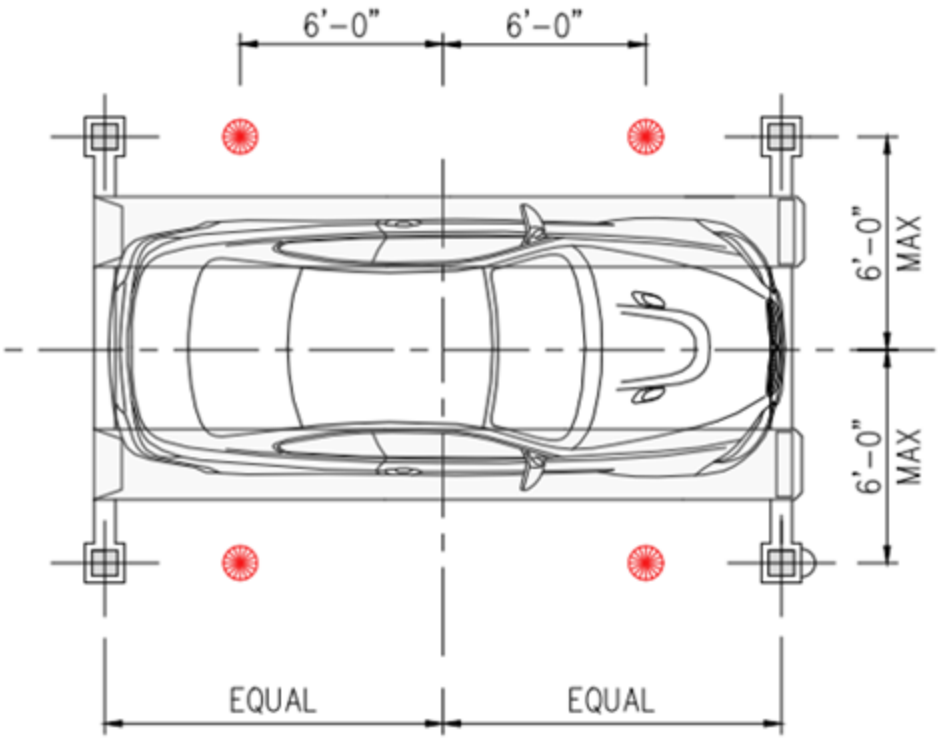


Figure A.6.4.1.2.1.a

CEILING LEVEL PROTECTION

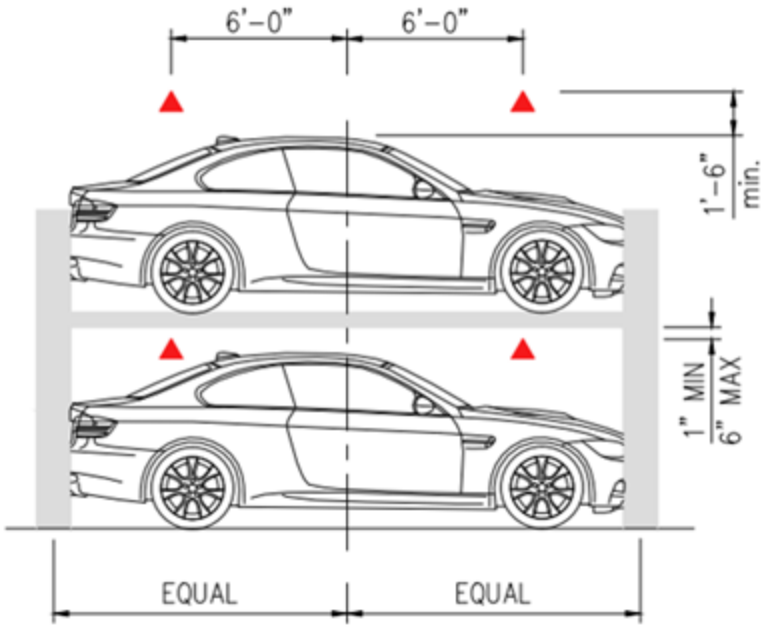


Figure A.6.4.1.2.1.b

(n) 6.4.1.2.1.1 Supplemental sprinklers shall be located at approximately each corner of each vehicle.

(n) 6.4.1.2.1.2 Hydraulic calculations shall include eight sprinklers total with four sprinklers discharging per level.

(n) 6.4.1.2.1.3 The minimum discharge shall be 20 gpm (75 lpm), Ordinary Hazard (Group 2) occupancy

(n) 6.4.1.2.1.4 The supplemental sprinklers shall not be required to be balanced with the overhead sprinkler demand.

(n) 6.4.1.3* Installation and discharge requirements for car stacker systems other than those described in 6.4.1.2.1, mechanical parking systems, and fully automated parking systems shall be determined in accordance with Chapter 9.

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

END OF SECTION

Additional Proposed Changes

File Name	Description	Approved
6-3-25_copyright_granted.pdf	2025 TG4 Copyright	

Statement of Problem and Substantiation for Public Comment

Section 6.4 changes, Substantiation.

6.4.1.1 – This addition solidifies parking garages as an Ordinary Hazard (Group 2) occupancy which until now was only indicated in the annex of NFPA 13. The move from Ordinary Hazard Group 1 to Group 2 was based on general information related to the increased size and amount of plastic in modern vehicles as compared to older vehicles but with limited full scale sprinklered testing to determine if this design criteria was appropriate for control of a fire involving automobiles. Adding this to NFPA 88A is based on both the existing information that cars have more combustible materials now than they used to and based on calculations performed based on available data of the HRR seen over the course of a car fire which was tested and included in the NFPA Research Foundation's Phase I report. By making some assumptions on how much heat needs to be absorbed to consider a fire "controlled" and assuming a steady state HRR throughout the course of a car fire it is possible to show that a density of 0.2 gpm/sqft will sufficiently control a typical car fire, while a 0.15 density may not provide enough heat absorption to do so.
It has also not been proven that electric vehicles produce higher HRR than ICE vehicles and so the OHII hazard will still be appropriate for control of a fire that involves an EV.

6.4.1.2 – A two-car stacker without sprinklers between the two levels of vehicles would result in a shielded fire, which is included in the list of examples of what would be considered Extra Hazard (Group 2) in NPFA 13. This is the conservative approach to protect these fires until we have more full-scale sprinklered tests to base any consideration in reducing this. This is the same as what is recommended in the annex of NFPA 13

6.4.1.2.1 (and subsections) – The only full scale sprinklered test that we are able to base substantiation at this time comes from a referenced car stacker fire test by BRE in the NFPA Research Foundation report and it provided sprinklers above each car in the stack as well as sprinklers at the ceiling level. By providing a minimum requirement for a design pressure that would equate to an equivalent density as OHII we can have reasonable confidence that this will control a vehicle fire in this arrangement. It also then would be logical to reduce the density at the ceiling as we no longer have a shielded fire. The stacker sprinklers should be assume to operate independently from the ceiling sprinklers.

6.4.1.3 – Points to Chapter 9 for anything that's more than a two car stacker so they can follow either the prescriptive design guidelines or move to a performance based design

CI from first draft

Because PI-71 was not incorporated as an FR, it is not appropriate to include these requirements at this time. These requirements should be addressed by the TG working on the Chapter 9 requirements for parking systems.

Related Item

• Because PI-71 was not incorporated as an FR, it is not appropriate to include these requirements at this time. These requirements should be addressed by the TG working on the Chapter 9 requirements for parking systems.

Submitter Information Verification

Submitter Full Name: James Gaut
Organization: Marriott Vacations Worldwide
Street Address:
City:
State:
Zip:
Submittal Date: Sat May 31 17:41:25 EDT 2025
Committee: GAR-AAA

Gaut, James

From: Steven Scandaliato <steven@Scandaliatodesign.com>
Sent: Wednesday, March 26, 2025 11:32 AM
To: Gaut, James
Subject: [EXT] RE: Copyright for your illustrations

Kevin, et al,
This is written notice that I am giving NFPA the rights to the drawings and illustrations that I created for the 88A task group in their entirety.

Thanks,
Steven Scandaliato, SET CFPS RME
SDG, LLC.
520.971.2322 Mobile

From: Gaut, James <James.Gaut@mvwc.com>
Sent: Wednesday, March 26, 2025 8:52 AM
To: Steven Scandaliato <steven@Scandaliatodesign.com>
Subject: Copyright for your illustrations

Good morning sir,
I hope this email finds you well.

Kevin Carr sent this to me regarding the copyright requirements for your illustrations. It is an attestation the copyright is turned over to NFPA.

Kevin advised an email from you would be enough giving me rights to your illustrations, mainly for a record.

Once we decide what illustrations we decide to use, you can give me the copyrights to the illustration, I promise I will not use them but for NFPA or another agreement, and I submit the PI. Or you submit the PI clicking the attestation.

MVW

Jim Gaut
Director,
Global Fire and Life Safety
T 407-206-6088 **M** 321-354-5223

7812 Palm Parkway
Orlando, FL 32836
MVW Global Fire and Life Safety TRIP Page

Book time to meet with me

NOTICE: This MVW communication may be confidential for you if you do not mind. Unauthorized copying, distribution, disclosure, or use is prohibited. Please let me know if you have sent it to me in error, and then delete it. They are not intended to be electronic signatures under applicable law.

This message is from an external source. Be sure you know and trust the sender before clicking any attachments or links.

Public Comment No. 22-NFPA 88A-2025 [Section No. 3.3]

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.

3.3.2 Automated Pay Station.

A mechanical or electronic machine that performs monetary transactions.

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.

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.

3.3.6 Parking Systems.

Equipment, either stand-alone or incorporated into the building, that parks vehicles by mechanical or automatic means.

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.

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.

3.3.6.3* Stacker Parking System.

A parking system that stores vehicles vertically only.

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.

3.3.8* Light electric vehicle (LEV).

A light duty on-road or off-road vehicle that uses electricity as its source of energy for motive power, which is not considered suitable for use on highway systems.

A3.3.8 Light Electric Vehicle (LEV).

The following are examples of light electric vehicles (LEV)s: electric bicycles; electric scooters; electric wheelchairs; golf carts; all-terrain vehicles; non-ride-on industrial material handling equipment, unmanned aerial vehicles (UAVs); ride-on floor care machines; and personal e-mobility devices.

3.3.9* Safety-certified light electric vehicles (SCLEV).

A *light electric vehicle* for which the vehicle, or its electrical system, has been certified for compliance with an approved standard.

A3.3.9 Examples of standards that can help determine compliance include, but may not be limited to, the following: (1) Underwriters Laboratories (UL) standards UL 2849 or UL 2272; (2) European (EN) standards EN 15194 or EN 17128; or (3) Other safety standard of an accredited laboratory, approved by the AHJ.

Statement of Problem and Substantiation for Public Comment

The definition of light electric vehicles was needed for correlation with proposed code language. The task group intended to coordinate with 2024 NFPA 1 Section 3.3.194 Micromobility Device, powered definition, but not align entirely. There is a 2027 Code Change proposal to the 2024 NFPA 1 definition – “Industrial trucks, mobile equipment, accessories, motorized bicycles, motorized scooters, or other personal transportation devices powered by lithium-ion or lithium metal batteries. (FCC-FUN)” The task group felt that the limitation of “lithium-ion or lithium metal batteries” tied the definition to a type of battery technology which is subject to change as technology changes.
The task group also felt it was important to identify certain light electric vehicles that may be otherwise certified by a safety standard. Annex material is provided with examples of standards that are regionally specific.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 25-NFPA 88A-2025 [New Section after 7.5]	

Related Item

- CI-15

Submitter Information Verification

Submitter Full Name: Jennifer Hoyt
Organization: Code Red Consultants
Affiliation: NFPA 88A Task Group 1
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 12:54:38 EDT 2025
Committee: GAR-AAA

Public Comment No. 3-NFPA 88A-2025 [Section No. 6.3.2 [Excluding any Sub-Sections]]

Where mechanical ventilation systems are used and activated by carbon monoxide (CO) or ~~nitrous oxide~~ nitrogen dioxide (~~N~~ NO_2 ~~O~~) detectors, the CO and ~~N~~ NO_2 ~~O~~ detectors shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors*.

Statement of Problem and Substantiation for Public Comment

Section should be referring to NO2 not N2O.

Related Item

• FR 22

Submitter Information Verification

Submitter Full Name: Scott Lang
Organization: Honeywell
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 03 11:08:35 EST 2025
Committee: GAR-AAA

Public Comment No. 1-NFPA 88A-2025 [New Section after 6.4.1]

Electric Chargers

Within 15 ft of electric chargers or otherwise provided with a draft stop, Extra Hazard Group 2 in accordance with NFPA 13 shall be provided.

Statement of Problem and Substantiation for Public Comment

Electric vehicles pose a larger fire hazard compared to ICE vehicle. While we know that charging does not pose a higher fire risk/probability than when an EV is not charging and out there, there is a known expectation that at least EVs will be at chargers. So that higher fire source can be protected. OH2 which the newer editions of NFPA 13 do not account for EVs and unprotected steel building like Type IIB are at higher risk of collapse due to EV fires.

Related Item

• PI

Submitter Information Verification

Submitter Full Name: Chris Nelson
Organization: Boston Fire Department
Street Address:
City:
State:
Zip:
Submittal Date: Thu Feb 20 10:31:46 EST 2025
Committee: GAR-AAA

Public Comment No. 29-NFPA 88A-2025 [New Section after 7.3]

7.4 Electric Vehicle Charging Equipment

7.4.1 Compliance. The installation of electric vehicle charging equipment, and charging of electric vehicles in parking structures, shall comply with 7.4.1 through 7.5.4.4.

7.4.1.1 The requirements listed shall be applicable to all new installations in both existing and new parking structures.

7.4.1.2 Electric Vehicle Charging Equipment equipped with Energy Storage Systems (ESS) shall also comply with the applicable regulations of NFPA 855, Standard for the Installation of Stationary Energy Storage Systems.

7.4.2 The charging of electric vehicles in parking structures shall only occur in Electric Vehicle Charging Areas utilizing approved EVSE.

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

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

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

7.4.3.3 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*.

7.4.4 Designated Area. Electric vehicle charging equipment and supply equipment shall be installed in a designated approved area(s).

7.4.4.1 The designated electric vehicle charging area and electric vehicle charging supply area shall be located in a building or designated fire area with a 2-hour fire rated construction.

7.4.4.2 The parking structure shall be protected in the Electric Vehicle Charging Area and Electric Vehicle Charging Supply Area with an automatic sprinkler system designed in accordance with NFPA 13 and the following provisions. If the requirements can not be met, a performance-based design may be utilized that meets or exceeds the intent outlined in the prescriptive requirements and is designed in accordance with Chapter 5 of NFPA 5000.

7.4.4.2.1 Sprinklers shall be ceiling mounted

7.4.4.2.2 Sprinklers shall have a minimum nominal discharge density of 0.2 gpm/ft2

7.4.4.2.3 The sprinkler system shall have a shunt trip to de-energize all electric vehicle charging equipment within the building upon activation of the sprinkler system.

7.4.4.2.4 Non-sprinkled buildings protected with fire alarm systems shall have a shunt trip to de-energize vehicle charging equipment upon activation of

heat detection devices above the Electric Vehicle Charging Area and Electric Vehicle Charging Supply Area.

7.4.4.3 Electric vehicle charging equipment shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects.

7.4.4.3.1 At least one emergency shutoff device or electrical disconnect shall be installed in approved locations not less than 6 m (20 ft) or more than 30 m (100 ft) from the electric vehicle charging device(s) that they serve.

7.4.4.3.2 Additional shutoff devices or electrical disconnects shall be permitted to be located less than 6 m (20 ft) or greater than 30 m (100 ft) from an individual dispenser, or as required by the Authority Having Jurisdiction.

7.4.4.3.3 Emergency shutoff devices or electrical disconnects shall disconnect power to all electric vehicle charging equipment; to all associated power, control, and signal circuits; to all other electrical distribution equipment in the electric vehicle charging area.

7.4.4.3.4 When more than one emergency shutoff device or electrical disconnect is provided, all devices shall be interconnected.

7.4.4.3.5 Resetting from an emergency shutoff condition shall require manual intervention.

7.4.4.3.6 The manner of resetting shall be approved.

7.4.4.3.7 The devices or disconnects shall be readily accessible to occupants and labeled with an approved sign stating “EMERGENCY ELECTRIC VEHICLE CHARGING EQUIPMENT SHUTOFF” or equivalent language.

7.4.4.4 The designated electric vehicle charging area and associated elements shall not interfere with or be within a designated emergency egress path.

7.4.4.4.1 The Electric Vehicle Charging Area shall be separated from any accessible means of egress as required by the AHJ to ensure safe egress under fire conditions but in no case less than 10 ft (3 m).

7.4.4.5* Electric vehicle charging equipment shall be protected from vehicle impact in accordance with NFPA 70.

7.4.4.6 The Electric Vehicle Charging Area shall be designed to prevent vehicle traffic from traveling through the charging area.

7.4.4.7 Electric Vehicle Charging cables shall be maintained in accordance with Manufacturer's Guidelines and NFPA 70B Chapter 33.

7.4.4.7.1 Electric Vehicle Charging cables shall be stored in a manner to prevent them from laying on the ground in the Electric Vehicle Charging Area and within egress paths.

7.4.4.7.2 Electric Vehicle Charging connectors shall be stored in their designed holder when not in use.

7.4.4.8 Electric Vehicle Charging Supply Area(s) shall be designed in accordance with NFPA 70 relative to the associated equipment being installed.

7.4.5 Signage. Signage shall be provided in accordance with 7.4.5.1 through 7.4.5.4.

7.4.5.1 Signage shall be posted at the Electric Vehicle Charging Area stating, "Charging of Electric Vehicles not permitted if vehicle has been: 1) damaged, 2) submerged in water, 3) exposed to fire/heat, 4) has an outstanding battery recall, or 5) shows a fault/batter warning light on dashboard", or other similar wording as approved.

7.4.5.2 Signage shall measure at least 18 inches by 12 inches in size and installed no farther than 20 feet from any electric vehicle charger.

7.4.5.3 Signage shall be visible and legible from every electric vehicle charger.

7.4.5.4 Multiple signs are permitted to meet the requirements of 7.5.4.2 through 7.5.4.3

7.4.6 Parking structures containing Electric Vehicle Charing Equipment shall provide an approved Pre-Incident Plan created in accordance with NFPA 1660.

7.4.7 *Reserved for compliance with NFPA 800, Battery Safety Code.*

A.7.4.4.5 As outlined in NFPA 70 110.27(B), protection from vehicle impact shall be so arranged and of such strength as to prevent such damage.

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

~~**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.**~~

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

~~**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**~~

Additional Proposed Changes

File Name	Description	Approved
20250604_NFPA_88A_2027_SD_TG2_-_Submittal.docx	20250604 NFPA 88A 2027 SD TG2 - Submittal	

Statement of Problem and Substantiation for Public Comment

This Public Input is being submitted on behalf of 2027 NFPA 88A Second Draft Task Group 2, assigned with the role of continuing work on the First Draft Task Group scope of "Consider the existing language of 7.1.5-7.1.8 pertaining to electric vehicle charging equipment. The task group will determine if changes to NFPA 88A for the existing language should be provided via a diverse and well-balanced group of both NFPA 88A TC members and interested parties. Efforts will be made to include as many outside voices, including NFPA 70 and other NFPA technical committees, with an emphasis on publicly-available data, for inclusion within the task group."

The Task Group evaluated numerous reports, data sources, and publicly available information as it related to electric vehicle charging equipment and the installation of said equipment within parking structures. The task group focused on finding reasonable, data-based solutions to address hazards

associated with electric vehicle charging equipment in parking structures. The scope of the committee was not to evaluate electric vehicles being parked in the structure in general.

Through the work of the Task Group, comprised of members from a variety of professions and entities, the content of this Public Input was established. The Task Group is cognizant of the variety of interested parties and worked to find reasonable standards for hazard reduction and mitigation. With that said, we understand that the following may be of special interest to those reviewing the public input: sprinkler protection, emergency shut offs, personal chargers.

The topic of sprinkler protection was reviewed, and basic expectations were provided. It was originally established that any parking structure containing electric vehicle charging equipment shall be protected with an NFPA 13 sprinkler system. During further discussion, there came to a point where the topic changed from sprinkler protection throughout to just within the area of equipment. While parking structures have always had some level of electrical supply and systems in the structure, adding these electric vehicle charging systems adds a potentially significant increase in number and/or capacity of electrical systems, potentially more than what the structures were designed to house. While the requirement of a sprinkler system is included, the Task Group also understood there are potentially other solutions that exist and provided the option for Performance-Base Design as protect the hazard associated with these systems. This gives property owners flexibility while ensuring that the hazards are mitigated.

Emergency shut offs were a continued topic, including both manual versus automatic and the location of such shut offs. While these systems are understood to have protective measures and built-in safeguards, the Task Group felt it important to provide an added level of protection for not only the building occupants but the first responders. Since every parking structure is unique, and each fire department may have varying procedures and limitations, the Task Group provided the Authority Having Jurisdiction with greater say in where these shut offs are located and how they can best support the first responders, so long as they meet basic requirements.

While the Task Group evaluated the use of designated electric vehicle charging equipment within parking structures, we felt it important to provide regulations on the utilization of personal chargers that patrons of the structure may utilize. Since the standard requires that electric vehicle charging equipment be listed in accordance with a variety of UL standards, the management of oversight of personal chargers brought by patrons seemed implausible to properly regulate. There would be no reasonable way, in the eyes of the task group, to monitor personal charger use in a parking structure to ensure that it was happening safely. Members discussed situations where patrons used unlisted equipment, numerous extension cords, or had other unsafe processes. We felt it important to address, in 7.4.2, that charging of electric vehicles shall only occur in designated areas (as defined) with approved electric vehicle supply equipment.

The Task Group worked diligently to provide the supplied Public Input and looks forward to reviewing throughout the standards development process.

Related Item

• First Draft Report

Submitter Information Verification

Submitter Full Name: Christopher Platz
Organization: Abington Township
Street Address:
City:
State:
Zip:
Submittal Date: Fri Jun 06 12:45:06 EDT 2025
Committee: GAR-AAA

7.4	**Electric Vehicle Charging Equipment**
7.4.1	**Compliance.** The installation of electric vehicle charging equipment, and charging of electric vehicles in parking structures, shall comply with 7.4.1 through 7.5.4.4.
7.4.1.1	The requirements listed shall be applicable to all new installations in both existing and new parking structures.
7.4.1.2	Electric Vehicle Charging Equipment equipped with Energy Storage Systems (ESS) shall also comply with the applicable regulations of NFPA 855, Standard for the Installation of Stationary Energy Storage Systems.
7.4.2	The charging of electric vehicles in parking structures shall only occur in Electric Vehicle Charging Areas utilizing approved EVSE.
7.4.3	**Listed.** The installation of electric vehicle charging equipment shall comply with *NFPA 70*.
7.4.3.1	Electric vehicle charging stations shall be listed and labeled in accordance with UL 2202, *Standard for Electric Vehicle (EV) Charging System Equipment*.
7.4.3.2	Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2594, *Standard for Electric Vehicle Supply Equipment*.
7.4.3.3	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*.
7.4.4	**Designated Area**. Electric vehicle charging equipment and supply equipment shall be installed in a designated approved area(s).
7.4.4.1	The designated electric vehicle charging area and electric vehicle charging supply area shall be located in a building or designated fire area with a 2-hour fire rated construction.
7.4.4.2	The parking structure shall be protected in the Electric Vehicle Charging Area and Electric Vehicle Charging Supply Area with an automatic sprinkler system designed in accordance with NFPA 13 and the following provisions. If the requirements can not be met, a performance-based design may be utilized that meets or exceeds the intent outlined in the prescriptive requirements and is designed in accordance with Chapter 5 of NFPA 5000.
7.4.4.2.1	Sprinklers shall be ceiling mounted
7.4.4.2.2	Sprinklers shall have a minimum nominal discharge density of 0.2 gpm/ft2
7.4.4.2.3	The sprinkler system shall have a shunt trip to de-energize all electric vehicle charging equipment within the building upon activation of the sprinkler system.
7.4.4.2.4	Non-sprinkled buildings protected with fire alarm systems shall have a shunt trip to de-energize vehicle charging equipment upon activation of heat detection devices above the Electric Vehicle Charging Area and Electric Vehicle Charging Supply Area.
7.4.4.3	Electric vehicle charging equipment shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects.

7.4.4.3.1 At least one emergency shutoff device or electrical disconnect shall be installed in approved locations not less than 6 m (20 ft) or more than 30 m (100 ft) from the electric vehicle charging device(s) that they serve.

7.4.4.3.2 Additional shutoff devices or electrical disconnects shall be permitted to be located less than 6 m (20 ft) or greater than 30 m (100 ft) from an individual dispenser, or as required by the Authority Having Jurisdiction.

7.4.4.3.3 Emergency shutoff devices or electrical disconnects shall disconnect power to all electric vehicle charging equipment; to all associated power, control, and signal circuits; to all other electrical distribution equipment in the electric vehicle charging area.

7.4.4.3.4 When more than one emergency shutoff device or electrical disconnect is provided, all devices shall be interconnected.

7.4.4.3.5 Resetting from an emergency shutoff condition shall require manual intervention.

7.4.4.3.6 The manner of resetting shall be approved.

7.4.4.3.7 The devices or disconnects shall be readily accessible to occupants and labeled with an approved sign stating “EMERGENCY ELECTRIC VEHICLE CHARGING EQUIPMENT SHUTOFF” or equivalent language.

7.4.4.4 The designated electric vehicle charging area and associated elements shall not interfere with or be within a designated emergency egress path.

7.4.4.4.1 The Electric Vehicle Charging Area shall be separated from any accessible means of egress as required by the AHJ to ensure safe egress under fire conditions but in no case less than 10 ft (3 m).

7.4.4.5* Electric vehicle charging equipment shall be protected from vehicle impact in accordance with NFPA 70.

7.4.4.6 The Electric Vehicle Charging Area shall be designed to prevent vehicle traffic from traveling through the charging area.

7.4.4.7 Electric Vehicle Charging cables shall be maintained in accordance with Manufacturer's Guidelines and NFPA 70B Chapter 33.

7.4.4.7.1 Electric Vehicle Charging cables shall be stored in a manner to prevent them from laying on the ground in the Electric Vehicle Charging Area and within egress paths.

7.4.4.7.2 Electric Vehicle Charging connectors shall be stored in their designed holder when not in use.

7.4.4.8 Electric Vehicle Charging Supply Area(s) shall be designed in accordance with NFPA 70 relative to the associated equipment being installed.

7.4.5 **Signage.** Signage shall be provided in accordance with 7.4.5.1 through 7.4.5.4.

7.4.5.1 Signage shall be posted at the Electric Vehicle Charging Area stating, “Charging of Electric Vehicles not permitted if vehicle has been: 1) damaged, 2) submerged in water, 3) exposed to fire/heat, 4) has an outstanding battery recall, or 5) shows a fault/batter warning light on dashboard”, or other similar wording as approved.

7.4.5.2 Signage shall measure at least 18 inches by 12 inches in size and installed no farther than 20 feet from any electric vehicle charger.

7.4.5.3 Signage shall be visible and legible from every electric vehicle charger.

7.4.5.4 Multiple signs are permitted to meet the requirements of 7.5.4.2 through 7.5.4.3

7.4.6 Parking structures containing Electric Vehicle Charing Equipment shall provide an approved Pre-Incident Plan created in accordance with NFPA 1660.

7.4.7 *Reserved for compliance with NFPA 800, Battery Safety Code.*

A.7.4.4.5 As outlined in NFPA 70 110.27(B), protection from vehicle impact shall be so arranged and of such strength as to prevent such damage.

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

~~**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.~~

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

~~**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.~~

Substantiation:

This Public Input is being submitted on behalf of 2027 NFPA 88A Second Draft Task Group 2, assigned with the role of continuing work on the First Draft Task Group scope of “Consider the existing language of 7.1.5-7.1.8 pertaining to electric vehicle charging equipment. The task group will determine if changes to NFPA 88A for the existing language should be provided via a diverse and well-balanced group of both NFPA 88A TC members and interested parties. Efforts will be made to include as many outside voices, including NFPA 70 and other NFPA technical committees, with an emphasis on publicly-available data, for inclusion within the task group.”

The Task Group evaluated numerous reports, data sources, and publicly available information as it related to electric vehicle charging equipment and the installation of said equipment within parking structures. The task group focused on finding reasonable, data-based solutions to address hazards associated with electric vehicle charging equipment in parking structures. The scope of the committee was not to evaluate electric vehicles being parked in the structure in general.

Through the work of the Task Group, comprised of members from a variety of professions and entities, the content of this Public Input was established. The Task Group is cognizant of the variety of interested parties and worked to find reasonable standards for hazard reduction and mitigation. With that said, we understand that the following may be of special interest to those reviewing the public input: sprinkler protection, emergency shut offs, personal chargers.

The topic of sprinkler protection was reviewed, and basic expectations were provided. It was originally established that any parking structure containing electric vehicle charging equipment

shall be protected with an NFPA 13 sprinkler system. During further discussion, there came to a point where the topic changed from sprinkler protection throughout to just within the area of equipment. While parking structures have always had some level of electrical supply and systems in the structure, adding these electric vehicle charging systems adds a potentially significant increase in number and/or capacity of electrical systems, potentially more than what the structures were designed to house. While the requirement of a sprinkler system is included, the Task Group also understood there are potentially other solutions that exist and provided the option for Performance-Base Design as protect the hazard associated with these systems. This gives property owners flexibility while ensuring that the hazards are mitigated.

Emergency shut offs were a continued topic, including both manual versus automatic and the location of such shut offs. While these systems are understood to have protective measures and built-in safeguards, the Task Group felt it important to provide an added level of protection for not only the building occupants but the first responders. Since every parking structure is unique, and each fire department may have varying procedures and limitations, the Task Group provided the Authority Having Jurisdiction with greater say in where these shut offs are located and how they can best support the first responders, so long as they meet basic requirements.

While the Task Group evaluated the use of designated electric vehicle charging equipment within parking structures, we felt it important to provide regulations on the utilization of personal chargers that patrons of the structure may utilize. Since the standard requires that electric vehicle charging equipment be listed in accordance with a variety of UL standards, the management of oversight of personal chargers brought by patrons seemed implausible to properly regulate. There would be no reasonable way, in the eyes of the task group, to monitor personal charger use in a parking structure to ensure that it was happening safely. Members discussed situations where patrons used unlisted equipment, numerous extension cords, or had other unsafe processes. We felt it important to address, in 7.4.2, that charging of electric vehicles shall only occur in designated areas (as defined) with approved electric vehicle supply equipment.

The Task Group worked diligently to provide the supplied Public Input and looks forward to reviewing throughout the standards development process.

Public Comment No. 25-NFPA 88A-2025 [New Section after 7.5]

7.6 Light Electric Vehicles

7.6.1

Parking and charging of *light electric vehicles* shall comply with the requirements of Section 7.6.1 through 7.6.4.

7.6.1.1

Where approved by the AHJ, parking and charging areas designated for only *safety-certified light electric vehicles* may be provided with protection in accordance with the manufacturer's listing and requirements, and an engineered analysis.

7.6.2

Parking of *light electric vehicles* shall be in designated areas as approved by the AHJ.

7.6.3

A designated area shall be provided for the charging of *light electric vehicles* in a location approved by the AHJ.

7.6.3.1

Light electric vehicle charging areas shall be separated from other portions of the building by 2 hour rated construction.

7.6.3.1.1

Where approved by the AHJ, the rated separation required by 7.6.3.1 may be reduced when an engineered analysis is provided.

7.6.3.2

Light electric vehicle charging areas shall be provided with fire detection systems.

7.6.3.3

Light electric vehicle charging areas shall be provided with an automatic fire sprinkler system.

7.6.3.4*

Ventilation shall be provided for enclosed *light electric vehicle* charging areas in accordance with Section 6.3.

A7.6.3.4

Ventilation should be provided to limit the build-up of flammable and toxic gases during normal operation. Ventilation is also intended to be utilized as a means of post-fire smoke evacuation by the responding fire department.

7.6.3.5

Light electric vehicle charging ports shall comply with NFPA 70.

7.6.3.5.1

Designated charging ports for *light electric vehicles* shall be located such that charging cords between the port and the *light electric vehicle* do not obstruct a means of egress.

7.6.4

Signage shall be provided to indicate designed areas for *light electric vehicle* parking and charging.

7.6.4.1

Signage stating, “NO LIGHT ELECTRIC VEHICLE PARKING OR CHARGING PERMITTED” shall be provided in areas where parking and charging of LEVs is restricted: (1) On every level, (2) In the stairwell, (3) In ramps, (4) In means of egress and adjacent to receptacles, and (5) As required by the AHJ.

Statement of Problem and Substantiation for Public Comment

There are no provisions for light electric vehicle (LEV) parking and charging. These devices have been linked to numerous fires and pose a fire risk. There is limited enforcement ability to determine the listing and maintenance of these devices therefore the task group determined compartmentation would be the best approach to mitigating the fire risk to occupants and the structure. The task group felt that a 2 hour rated separation was appropriate given the lack of regulation surrounding the number of LEVs within a charging area, separation distance between LEVs, and the variety of LEV manufacturers that can be expected in a publicly accessible charging area. However, given the ongoing advancement of research in this field, the allowance for acceptance of an engineering analysis provides the opportunity for an AHJ to accept newly developed data and/or alternative fire protection approaches. The task group agreed that regulations are needed to define conditions and locations for parking and charging of light electric vehicles. The intention is to create a designated area with increased passive and active fire protection systems to mitigate the risk of fire spread from light electric vehicles through the remainder of the structure.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 22-NFPA 88A-2025 [Section No. 3.3]	Definitions used in proposed regulation

Related Item

- CI-15

Submitter Information Verification

Submitter Full Name: Jennifer Hoyt
Organization: Code Red Consultants
Affiliation: NFPA 88A Task Group 1
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 13:04:33 EDT 2025
Committee: GAR-AAA

Public Comment No. 2-NFPA 88A-2025 [Section No. 7.5]

~~**7.5** – Energy Storage Systems (ESS).~~

~~Stationary ESS shall be installed in accordance with NFPA 855.~~

Statement of Problem and Substantiation for Public Comment

This section is not needed. All of the construction codes, NFPA 1, NFPA 101, NFPA 5000 and the IFC reference NFPA 855.

Related Item

• FR 12

Submitter Information Verification

Submitter Full Name: Scott Lang
Organization: Honeywell
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 03 11:02:22 EST 2025
Committee: GAR-AAA

Public Comment No. 6-NFPA 88A-2025 [Section No. 8.6]

8.6 Floor Drains.

Floor drains shall be designed, constructed, installed, and maintained to be able to effectively manage fire protection water volume runoff ~~and prevent clogging caused by fire damage debris~~ .

Statement of Problem and Substantiation for Public Comment

Task Group 5 recognized that as currently written created an enforcement gap. The rewording rectifies the gap.

Related Item

• PI 14 and FR 16

Submitter Information Verification

Submitter Full Name: Chris Towski
Organization: Cambridge Fire Department
Affiliation: IAFF
Street Address:
City:
State:
Zip:
Submittal Date: Sun Apr 13 11:01:20 EDT 2025
Committee: GAR-AAA

Public Comment No. 4-NFPA 88A-2025 [Section No. 9.1.2]

~~9~~ 5 .~~1.2~~ 7 Pay Stations.

~~9~~ 5 .~~1~~ 7 .~~2.~~ 1

Automated pay stations that are located within a parking structure but 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).

~~9~~ 5 .~~1~~ 7 .~~2.~~2

Pay stations located within an enclosed room or space shall be subject to the requirements of NFPA 88A as applicable.

~~9~~ 5 .~~1~~ 7 .~~2.~~ 3 Pay Station Entrance.

~~9~~ 5 .~~1~~ 7 .~~2.~~ 3.1

The entrance to the pay station room or space shall be made only from a sidewalk or other pedestrian way only.

~~9~~ 5 .~~1~~ 7 .~~2.~~ 3.2

Pedestrian access directly to a parking space or traffic lane to or from the pay station room or space shall not be permitted.

~~9~~ 5 .~~1~~ 7 .~~2.~~ 4 Vehicle Barriers.

~~9~~

5 .

~~1~~

7 .

~~2.~~

4.1 _

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).

~~9~~

5 .

~~1~~

7 .

~~2.~~

4.2 _

The vehicle barrier system shall be constructed in accordance with the structural provisions of *NFPA 5000* .

Statement of Problem and Substantiation for Public Comment

This section is better located in Chapter 5 as it is a general construction requirement for all parking structures.

Related Item

• FR-19

Submitter Information Verification

Submitter Full Name: Kevin Hall
Organization: American Fire Sprinkler Association
Street Address:
City:
State:
Zip:
Submittal Date: Fri Mar 14 14:12:40 EDT 2025
Committee: GAR-AAA

Public Comment No. 17-NFPA 88A-2025 [Section No. 9.2.4.1]

9.2.4.1*

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

Task Group 4 created a Second Draft Input that describes the fire protection for Parking Systems as OH 2, which is a density of 0.2 gpm/sf.

The NFPA Research Foundation Phase 1 and 2 reports show Heat Release Rate charts from different vehicle fires over an average of a 60 minute fire with Peak HRR of 8 to 9 MW that last for about 5 minutes and then decrease to below 4 MW. A high average HRR can be deduced to be 4 MW over the course of one hour. Using scientific thermodynamic calculations show that, in order to absorb the entire heat of 4 MW over one hour, will require a sprinkler density of 0.25 gpm/sf. This demonstrates that the proposed OH 2 will absorb only about 80 % of the generated heat.

For Parking System specifically with their limited accessibility we should adopt a 100 % heat absorption. (A detailed thermodynamic calculation for above can be presented upon request)

The proposal is to increase the OH 2 with 0.2 gpm/sf to 0.25 gpm/sf per vehicle.

Additional Proposed Changes

File Name	Description	Approved
NFPA_88A_Chapter_9_May_25_2025_GH.docx	Public Comment Gerhard Haag June 3, 2025	
Occupancy_Classifications_and_PArking_Structures.pdf	Occupancy Classification Article	

Statement of Problem and Substantiation for Public Comment

This proposal would absorb the entire heat generated by a 4 MW fire instead of only 80% with OH2 as currently proposed

Related Item

• Task Group 4 input

Submitter Information Verification

Submitter Full Name: Gerhard Haag
Organization: Robotic Parking Systems Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Tue Jun 03 10:39:42 EDT 2025
Committee: GAR-AAA

NFPA 88A, Chapter 9 Task Group Current Draft – Input for Committee Discussion on:

Sprinkler Density for Parking Systems – Chapter 9 May 24 / 2025

The physical dimensional set-up of Parking Systems, from Stackers to Mechanical to Automated Systems can be considered to be very similar, due to the sizes of vehicles. This is not unlike the dimensional description of spacing in conventional Parking Structures.

Therefore, this input should be considered applicable to all 3 Parking Systems. This is also supported by the Figures [9.1.3. for all 3 Systems] as shown in the proposed Task Group draft to Chapter 9.

The topic of this document concerns to the Sprinkler Density for Parking Systems.

As basis for the determination of the Sprinkler Density will be used a Science Based Technical Calculation in conjunction with Phase 1 and Phase 2 Reports as recently published by the NFPA Research Foundation.

These Reports show Heat Release Rate Charts (HRR) with an approximate maximum HRR of 9 MW for a short period of time. Over the course of the fires of about 60 minutes, these maximums are stretching for about 5 minutes. Whereas the average HRR is below 3 to 4 MW.

Assuming a high steady average of 4 MW over 60 minutes, we then can utilize the physical laws of thermodynamics to calculate the amount of water needed to evaporate the heat generated by such a fire.

Referring to the paper “OCCUPANCY CLASSIFICATIONS AND PARKING STRUCTURES” by Melisa Rodriguez, PE, SET as published in ‘Sprinkler Age’ in November/December 2024, (and attached here below), a physics based scientific calculation was provided to cover a 4 MW fire. This calculation however is based on a 65 % absorption of the generated heat resulting in 0.16 gpm/ft^2 .

The author further shows that the OH2 value of 0.2 gpm/ft^2 is well above the calculated density.

However, why would we settle for 65 % absorption of a fire when we can show conclusively that a 100 % heat absorption would eliminate all of the generated heat of the fire.

For this reason, I propose a Committee discussion and determination to apply a 100% heat absorption for a 4MWHr vehicle fire by applying scientific based thermodynamic laws resulting in a sprinkler density of:

(0.16 / 65) x 100 = 0.2462 gpm/ft^2 , rounded to 0.25 and replacing the OH2 value of 0.20.

The respective draft language would then be:

9.2.2.1*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ~~ordinary hazard group 2~~ **with a density of 0.25 gpm/ft^2** and except as modified below ~~9.3.2.1~~ **in a. to d.**

9.3.2.1.2*. An automatic sprinkler system shall be provided in accordance with NFPA 13, ~~ordinary hazard group 2~~ **with a density of 0.25 gpm/ft^2** and except as modified below ~~9.3.2.1~~ **in a. to d.**

9.4.5.1.3. An automatic sprinkler system shall be provided in accordance with NFPA 13, ~~ordinary hazard group 2~~ **with a density of 0.25 gpm/ft^2** and except as modified below ~~9.3.2.1~~ **in a. to d.**

Gerhard Haag / Robotic Parking Systems Inc.

See Page 34, https://issuu.com/sprinklerage/docs/sprinklerage241112

Public Comment No. 5-NFPA 88A-2025 [Section No. A.1.5]

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; and 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, emergency evacuation devices, 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. A parking garage 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 1660's crisis/disaster/emergency management and business continuity/continuity of operations programs should be referenced where developing an emergency plan. For considerations pertaining to people with disabilities and their functional needs, see the NFPA publication, Emergency Evacuation Planning Guide for People with Disabilities.

Statement of Problem and Substantiation for Public Comment

Emergency evacuation devices should be included in this description. Information for emergency evacuation devices can be found in the Emergency Evacuation Planning Guide referenced along with NFPA 1660.

Related Item

• Public Input #30

Submitter Information Verification

Submitter Full Name: Jessica Hubert
Organization: Guardian Services Inc.
Affiliation: Disability Access Review and Advisory Committee
Street Address:
City:
State:
Zip:
Submittal Date: Thu Apr 03 11:42:27 EDT 2025
Committee: GAR-AAA

Committee Input No. 15-NFPA 88A-2024 [Detail]

7.4 Light electric vehicles.

7.4.1* Parking and charging of *light electric vehicles* shall comply with the requirements of Section 7.4.1 through 7.4.4.

7.4.1.1 Where approved by the authority having jurisdiction, parking and charging areas designated for only *safety-certified light electric vehicles* may be provided with protection in accordance with all of the following:

(1) the product's listing

(2) the manufacturer's written instructions

(3) an engineering analysis.

7.4.2 Parking of *light electric vehicles* shall be in designated area as approved by the authority having jurisdiction.

7.4.3 A designated area shall be provided for the charging of *light electric vehicles* in a location approved by the authority having jurisdiction.

7.4.3.1 Charging areas shall be separated from other portions of the building by 2 hour rated construction.

7.4.3.2 Charging areas shall be provided with fire detection systems.

7.4.3.3 Charging areas shall be provided with an automatic fire sprinkler system.

7.4.3.4* Ventilation shall be provided for enclosed charging areas in accordance with Section 6.3.

7.4.3.5 Charging ports shall comply with NFPA 70.

7.4.3.5.1 Designated charging ports for *light electric vehicles* shall be located such that charging cords between the port and the *light electric vehicle* do not obstruct a means of egress.

7.4.4 Signage shall be provided to indicate designed areas for parking and charging.

7.4.4.1 Signage stating, "NO LIGHT ELECTRIC VEHICLE PARKING OR CHARGING PERMITTED" shall be provided in areas where parking and charging of LEVs is restricted:

(1) On every level

(2) In the stairwell

(3) In ramps

(4) In means of egress and adjacent to receptacles, as required by the AHJ

Submitter Information Verification

Committee: GAR-AAA

Submittal Date: Tue Oct 01 17:23:26 EDT 2024

Committee Statement

Committee Statement: The committee created this committee input to permit further work on this topic at Second Draft. During the discussion on these PI's it was determined that NFPA 1 has requirements on this topic via the 2024 edition. Further, requirements pertaining to golf carts were not included in the PI submissions, but was deemed to be an important topic for review. Finally, definitions on this topic require review to determine if coordination with other NFPA documents is warranted. A task group will continue work on this topic and provide a report to the technical committee at Second Draft.

Response Message: CI-15-NFPA 88A-2024

Public Input No. 37-NFPA 88A-2024 [New Section after 3.3]

Public Input No. 38-NFPA 88A-2024 [New Section after 3.3]

Public Input No. 39-NFPA 88A-2024 [Chapter 7]

Public Input No. 40-NFPA 88A-2024 [New Section after A.3.3.6.3]

Public Input No. 41-NFPA 88A-2024 [New Section after A.3.3.6.3]

Ballot Results

This item has not been balloted

Committee Input No. 10-NFPA 88A-2024 [New Section after 3.3.2]

NEW DEFINTIONS FOR ELECTRIC VEHICLE CHARGING EQUIPMENT AREAS

3.3.3 Electric Vehicle Charging Equipment Area. The location(s) of electric vehicle supply equipment and designated spot for its use, including the equipment/vehicles it is attached to.

3.3.4 Electric Vehicle Charging Supply Area. The location(s) of equipment and systems designed to distribute electricity to EVSE and Electric Vehicle Charging Equipment, including but not limited to transformers, switch gears, and similar equipment.

Submitter Information Verification

Committee: GAR-AAA

Submittal Date: Tue Oct 01 16:22:03 EDT 2024

Committee Statement

Committee Statement: The committee created this Committee Input to allow the task group to continue work at this topic, in conjunction with the CI created for PI-49. The task group that has provided this input will review these comments and determine possible changes for the technical committee to consider at the Second Draft meeting.

Response Message: CI-10-NFPA 88A-2024

Public Input No. 50-NFPA 88A-2024 [New Section after 3.3.2]

Ballot Results

This item has not been balloted

Committee Input No. 9-NFPA 88A-2024 [Sections 7.1.5, 7.1.6, 7.1.7, 7.1.8]

Sections 7.1.5, 7.1.6, 7.1.7, 7.1.8

7. 4 Electric Vehicle Charging Equipment

7.4. 1 Compliance . The installation of electric vehicle charging equipment, and charging of electric vehicles in parking structures, shall comply with 7.4.1 through 7. 5 .4.4.

7.4.1.1 The requirements listed shall be applicable to all new installations in both existing and new parking structures.

7.4.1.2 Electric Vehicle Charging Equipment equipped with Energy Storage Systems (ESS) shall also comply with the applicable regulations of NFPA 855, Standard for the Installation of Stationary Energy Storage Systems.

7.4.2 The charging of electric vehicles in parking structures shall only occur in Electric Vehicle Charging Areas utilizing approved EVSE.

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

~~7.1.6~~ – 4.3.1 Electric vehicle charging stations shall be listed and labeled in accordance with UL 2202, *Standard for Electric Vehicle (EV) Charging System Equipment* .

~~7.1~~ 4 .~~7~~ 3.2 ~~Electric vehicle charging system equipment shall be listed and labeled in accordance with UL 2594,~~ ~~*Standard for Electric Vehicle Supply Equipment*~~ .

7.~~1.8~~ – 4.3.3 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* .

7.4.4 Designated Area . Electric vehicle charging equipment and supply equipment shall be installed in a designated approved area(s).

7.4.4.1 The designated electric vehicle charging area and electric vehicle charging supply area shall be located in a building or designated fire area with a 2-hour fire rated construction.

7.4.4.2 The parking structure shall be protected throughout with an automatic sprinkler system designed in accordance with NFPA 13 and the following provisions. If the requirements can not be met, a performance-based design may be utilized that meets or exceeds the intent outlined in the prescriptive requirements and is designed in accordance with Chapter 5 of NFPA 5000.

7.4.4.2.1 Sprinklers shall be ceiling mounted

7.4.4.2.2 Sprinklers shall have a minimum nominal discharge density of 0.3 gpm/ft2

7.4.4.2.3 The sprinkler system shall have a shunt trip to de-energize all electric vehicle charging equipment within the building upon activation of the sprinkler system.

7.4.4.3 Electric vehicle charging equipment shall be provided with one or more clearly identified emergency shutoff devices or electrical disconnects.

7.4.4.3.1 At least one emergency shutoff device or electrical disconnect shall be installed in approved locations not less than 6 m (20 ft) or more than 30 m (100 ft) from the electric vehicle charging device(s) that they serve.

7.4.4.3.2 Additional shutoff devices or electrical disconnects shall be permitted to be located less than 6 m (20 ft) or greater than 30 m (100 ft) from an individual dispenser, or as required by the Authority Having Jurisdiction.

7.4.4.3.3 Emergency shutoff devices or electrical disconnects shall disconnect power to all electric vehicle charging equipment; to all associated power, control, and signal circuits; to all other electrical equipment in the electric vehicle charging area.

7.4.4.3.4 When more than one emergency shutoff device or electrical disconnect is provided, all devices shall be interconnected.

7.4.4.3.5 Resetting from an emergency shutoff condition shall require manual intervention.

7.4.4.3.6 The manner of resetting shall be approved.

7.4.4.3.7 The devices or disconnects shall be readily accessible to occupants and labeled with an approved sign stating “EMERGENCY ELECTRIC VEHICLE CHARGING EQUIPMENT SHUTOFF” or equivalent language.

7.4.4.4 The designated electric vehicle charging area and associated elements shall not interfere with or be within a designated emergency egress path.

7.4.4.4.1 The Electric Vehicle Charging Area shall be separated from any accessible means of egress as required by the AHJ to ensure safe egress under fire conditions but in no case less than 10 ft (3 m).

7.4.4.5* Electric vehicle charging equipment shall be protected from vehicle impact in accordance with NFPA 70.

7.4.4.6 The Electric Vehicle Charging Area shall be designed to prevent vehicle traffic from traveling through the charging area.

7.4.4.7 Electric Vehicle Charging cables shall be maintained in accordance with Manufacturer's Guidelines.

7.4.4.7.1 Electric Vehicle Charging cables shall be stored in a manner to prevent them from laying on the ground in the Electric Vehicle Charging Area and within egress paths.

7.4.4.7.2 Electric Vehicle Charging connectors shall be stored in their designed holder when not in use.

7.4.4.8 Electric Vehicle Charging Supply Area(s) shall be designed in accordance with NFPA 70 relative to the associated equipment being installed.

7.4.5 Signage. Signage shall be provided in accordance with 7.4.5.1 through 7.4.5.4.

7.4.5.1 Signage shall be posted at the Electric Vehicle Charging Area stating, “Charging of Electric Vehicles not permitted if vehicle has been: 1) damaged, 2) submerged in water, 3) exposed to fire/heat, 4) has an outstanding battery recall, or 5) shows a fault/batter warning light on dashboard”, or other similar wording as approved.

7.4.5.2 Signage shall measure at least 18 inches by 12 inches in size and installed no farther than 20 feet from any electric vehicle charger.

7.4.5.3 Signage shall be visible and legible from every electric vehicle charger.

7.4.5.4 Multiple signs are permitted to meet the requirements of 7.5.4.2 through 7.5.4.3

7.4.6 Parking structures containing Electric Vehicle Charing Equipment shall provide an approved Pre-Incident Plan created in accordance with NFPA 1620.

7.4.7 *Reserved for compliance with NFPA 800, Battery Safety Code.*

A.7.4.4.5 As outlined in NFPA 70 110.27(B), protection from vehicle impact shall be so arranged and of such strength as to prevent such damage.

Submitter Information Verification

Committee: GAR-AAA

Submittal Date: Tue Oct 01 16:18:10 EDT 2024

Committee Statement

Committee Statement: The committee created this Committee Input to allow the task group to continue work at this topic. As provided, the committee had concerns regarding specific sprinkler design densities in the absence of cited technical data. Concerns were also raised regarding the need for specific separation criteria. Finally, several NFPA MOS items were noted that require additional review and modification. The task group that has provided this input will review these comments and determine possible changes for the technical committee to consider at the Second Draft meeting.

Response Message: CI-9-NFPA 88A-2024

Public Input No. 49-NFPA 88A-2024 [Sections 7.1.5, 7.1.6, 7.1.7, 7.1.8]

Ballot Results

This item has not been balloted

Committee Input No. 11-NFPA 88A-2024 [New Section after 7.1.6]

TITLE OF NEW CONTENT

7.1.7.1 Output cables shall not be located within 10’ to an exit.

Submitter Information Verification

Committee: GAR-AAA

Submittal Date: Tue Oct 01 16:26:42 EDT 2024

Committee Statement

Committee Statement: The committee created this Committee Input to allow the task group to continue work at this topic in conjunction with actions taken on PI-49 and PI-50. The task group that has provided this input will review these comments and determine possible changes for the technical committee to consider at the Second Draft meeting.

Response Message: CI-11-NFPA 88A-2024

Public Input No. 10-NFPA 88A-2024 [New Section after 7.1.6]

Ballot Results

This item has not been balloted

Committee Input No. 18-NFPA 88A-2024 [New Section after 9.2]

9.2 Stacker Parking

9.2.1. Stacker Parking Systems with or without EVs and/or EV charging stations shall be in accordance with 9.2.1 through 9.2.2.

9.2.1.1*. Spacing and location of Stacker units shall be in accordance with the following criteria (a – c).

(1) **EV's shall be allowed on ground level of a Stacker unit only. EV's shall be allowed on the upper level when the vehicle parking platform at the top level is solid and non-combustible.**

(2) **The maximum number of Stacker unit rows shall be no greater than two (2). (*Figure 9.2.1.1.b*).**

(3) **Rows and columns of Stacker units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (*Figure 9.2.1.1.c).***

A9.2.1.1 (a). The upper-level vehicle platform must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

A9.2.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be "nested" vehicles is restricted.

9.2.2. Fire Protection for single level stacker units shall be in accordance with 9.2.2.1.

9.2.2.1*. An automatic sprinkler system shall be provided in accordance with 9.2.2.1(a – g).

(1) **Fire sprinkler systems may be wet, dry, single interlock preaction or deluge. Double interlock preaction systems are not allowed.**

(2) **Fire sprinkler system design density shall be 0.20 gpm/ft^2 (8.2 lpm/m^2).**

(3) **Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed. Modifiers for dry and single interlock preaction systems shall apply.**

(4) **Maximum area of coverage per sprinkler shall be 130 ft^2/spk (12 m^2/spk).**

(5) **Maximum sprinkler spacing shall be 12 ft (3.7 m).**

(6) **Sprinklers shall be Quick Response.**

(7) **Sprinkler temperature shall be intermediate.**

(8) **Hose allowance shall be 250 gpm (950 lpm) for a duration of 60 minutes when EVs are present.**

A9.2.2.1 (a). Double interlock preaction systems are not allowed due to the inherent delay in actual water delivery from a sprinkler. While dry systems can also have delays in activation, typically such delays are limited to 60 seconds or less. Double interlock can have times well beyond 60 seconds based on the type of detection system(s) used which contradicts the early suppression fast response methodology for protection of this type of hazard.

A9.2.2.1 (g). This criterion is only required over the Stacker unit area plus a 15 ft (4.6 m) perimeter. The balance of the parking area without Stackers may be in accordance with

NFPA 13.

9.3 Multi-Level Stacker Parking

9.3.1*. Multi-Level Stacker Parking systems with or without EV and/or EV charging stations shall be in accordance with 9.3.1 – 9.3.2.

9.3.1.1. Spacing and location of Multi-Level Stacker (greater than 2) units shall be in accordance with the following criteria (a - d).

(1) **EV's shall be allowed on ground level of Stacker unit only. EV's shall be allowed on upper levels with Stacker units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Stacker unit.**

(2) **The maximum number of Stacker unit rows shall be no greater than two (2). (*Figure 9.3.1.1.b*).**

(3) **Rows and columns of Stacker units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (*Figure 9.3.1.1.c).***

(4) **T [SS1] [SS2] he maximum height of any Stacker unit shall be five levels. Additional levels shall be allowed when horizontal barriers [SS3] are installed at every 5 th level.**

A9.3.1.1 (a). The upper-level vehicle platform must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

> ***A9.3.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be "nested" vehicles is restricted.***
>
> ***A9.3.1.1 (d) When Stacker unit has solid vehicle platforms the horizontal barrier will be complete by filling in the flue space between units.***

9.3.2. Fire Protection for Multi-Level Stacker units shall be in accordance with NFPA 13 except as modified in 9.3.2.1.

9.3.2.1*. An automatic sprinkler system shall be provided in accordance with 9.3.2.1(a – h)

(1) **Fire sprinkler systems may be wet, dry, single interlock preaction or deluge.**

(2) **Fire sprinkler system design density shall be 0.20 gpm/ft ^{2} (8.2 lpm/m ^{2}).**

(3) **Area of Operation shall be 1,500 ft ^{2} (139 m ^{2}). Reduction in area for use of Quick Response sprinklers is not allowed.**

(4) **Maximum area of coverage per sprinkler shall be 130 ft ^{2} /spk (12 m ^{2} /spk).**

(5) **Maximum sprinkler spacing shall be 12 ft (3.7 m).**

(6) **Sprinklers shall be Quick Response.**

(7) **Sprinkler temperature shall be intermediate.**

(8) **Hose Allowance shall be 250 gpm (950 lpm) for 90 minutes when EVs are present.**

> ***A9.3.2.1 (a). Double interlock preaction systems are not allowed due to the inherent delay in actual water delivery from a sprinkler. While dry systems can also have delays in activation, typically such delays are limited to 60 seconds or less. Double interlock can have times well beyond 60 seconds based on the type***

of detection system(s) used which contradicts the early suppression fast response methodology for protection of this type of hazard.

A9.3.2.1 (g). This criterion is only required over the Stacker unit area plus a 15ft perimeter. The balance of the parking area without Stackers may be in accordance with NFPA 13.

9.3.2.1.1*. When horizontal barriers are installed, the sprinkler system under each barrier shall be installed in accordance with 9.3.2.1 (a – h).

A9.3.2.1.1. This includes proof calculations for every level separated by a horizontal barrier. This ensures that the most demanding level is being calculated since the system may be fed from overhead or in a standpipe configuration.

9.4 Mechanical Parking System

9.4.1. Mechanical Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.4.1 through 9.4.2.

9.4.1.1. Spacing and location of Mechanical Parking Systems shall be in accordance with the following criteria (a - d).

(1) EV's shall be allowed on ground level of Mechanical Parking Systems only. EV's shall be allowed on upper levels with Mechanical Parking System units that have non-combustible solid vehicle parking platforms at each level throughout the entire vertical Mechanical Parking System unit.

(2) The maximum number of Mechanical Parking System unit rows shall be no greater than two (2). (*Figure 9.4.1.1.b*).

(3) Rows and columns of Mechanical Parking System units shall be arranged limiting the number of exposures to adjacent parking spaces to not greater than three (3). (*Figure 9.4.1.1.c).*

(4) The maximum height of any Mechanical Parking System unit shall be five levels. Additional levels shall be allowed when horizontal barriers are installed at every 5 th level.

A9.4.1.1 (a). The upper-level vehicle platform must be solid and made of non-combustible material in order to prevent heat from a fire below impinging directly to the underside of a vehicle directly above.

A9.4.1.1 (b and c). By limiting the number of exposures or targets around a vehicle the opportunity for there to be "nested" vehicles is restricted.

A9.4.1.1 (d) When a Stacker unit has solid vehicle platforms the horizontal barrier will be complete by filling in the flue spaces between each unit.

9.4.1.2. The designated exit location for Mechanical Parking systems shall be designed to prevent vehicle drivers and passengers from coming into physical contact with the parking system's equipment, machinery, energizing elements, and other moving parts of the system.

9.4.2. Fire Protection for Mechanical Parking System units shall be in accordance with NFPA 13 except as modified in 9.4.2.1.

9.4.2.1*. An automatic sprinkler system shall be provided in accordance with 9.4.2.1(a – h)

(1) Fire sprinkler systems may be wet, dry, single interlock preaction or deluge.

(2) Fire sprinkler system design density shall be 0.20 gpm/ft^2 (8.2 lpm/m^2).

(3) Area of Operation shall be 1,500 ft^2 (139 m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

(4) Maximum area of coverage per sprinkler shall be 130 ft^2/spk (12.1 m^2/spk).

(5) Maximum sprinkler spacing shall be 12 ft (3.7 m).

(6) Sprinklers shall be Quick Response.

(7) Sprinkler temperature shall be intermediate.

(8) Hose Allowance shall be 250 gpm (950 lpm) for 90 minutes when EVs are present. A minimum of 100 gpm (379 lpm) shall be applied to inside hose demand.

A9.4.2.1 (a). Double interlock preaction systems are not allowed due to the inherent delay in actual water delivery from a sprinkler. While dry systems can also have delays in activation, typically such delays are limited to 60 seconds or less. Double interlock can have times well beyond 60 seconds based on the type of detection system(s) used which contradicts the early suppression fast response methodology for protection of this type of hazard.

A9.4.2.1 (g). This criterion is only required over the Mechanical Parking System unit area plus a 15ft perimeter. The balance of the parking area without a Mechanical Parking System may be in accordance with NFPA 13.

9.4.2.1.1*. When horizontal barriers are installed, the sprinkler system under each barrier shall be installed in accordance with 9.4.2.1 (a – h).

A9.4.2.1.1. This includes proof calculations for every level separated by a horizontal barrier. This ensures that the most demanding level is being calculated since the system may be fed from overhead or in a standpipe configuration.

9.4.3.1.1. Flue Sprinklers shall be provided at every vehicle platform level. A minimum of three (3) flue sprinklers shall be provided in each flue space on both sides of the vehicle platform. Sprinklers shall be located within 12 inches (305 mm) from the front and back of each vehicle platform with a maximum distance between sprinklers of 10 ft (3.7 m). *Figure 9.4.3.1.1.*

9.4.3.1.1.1. Flue sprinklers shall be calculated separately from the overhead sprinkler system. The two (2) most demanding levels of sprinklers shall be calculated flowing a minimum 20 gpm (76 lpm).

9.4.3.1.1.2. A total hose demand of 250 gpm (950 lpm) with a 90-minute duration shall be added to the flue sprinkler system calculations with a minimum of 100 gpm (379 lpm) of the total hose demand added for inside use.

9.4.3.1.2*. Flue sprinkler protection shall be zoned vertically.

9.4.3.1.3*. Flue sprinkler protection shall have a maximum of five (5) levels per zone.

9.5 Fully Automated Parking System

9.5.1. Fully Automated Parking systems with or without EVs and/or EV charging stations shall be in accordance with 9.5.1 through 9.5.4.

9.5.1. Occupant Safety

9.5.1.1. All vehicle occupants shall be required to enter and exit the vehicle at a designated terminal.

9.5.1.2. In parking systems that do not provide physical barriers or terminals, a parking attendant shall transport the vehicle from a designated passenger drop-off and pick-up area, prohibiting vehicle occupants from coming in contact with the parking system's equipment, machinery, energizing elements, and other moving parts of the system.

9.5.2. Terminals.

9.5.2.1. 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.

9.5.2.2. Terminals shall be designed in accordance with the other relevant provisions of this standard.

9.5.2.3. Terminals shall be considered an incidental use area to the entire parking system.

9.5.2.4*. Terminal 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.

9.5.2.5. 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.

9.5.2. Fire Service and Maintenance Access.

9.5.2.1. Access shall be provided in accordance with Table 9.5.2.1.

Table 9.5.2.1 Parking Equipment Access Dimensional Criteria

Feature	Dimensional Criteria
Minimum horizontal dimension of any walkway, landing, or platform	36 in. (560 mm) clear
Minimum stair or ramp width	36 in. (560 mm) clear between r
Minimum tread width	36 in. (560 mm) clear
Minimum tread depth	10 in. (255 mm)
Maximum riser height	9 in. (230 mm)
Handrails are permitted to terminate, at the required height, at a point directly above the top and bottom risers.	
Maximum height between landings	12 ft (3660 mm)
Minimum headroom	6 ft 8 in. (2030 mm)
Minimum width of door openings	36 in. (560 mm) clear

9.5.2.2. Horizontal walkways for access shall be provided at intervals of 20 ft (6 m) vertically and 100 ft (30 m) horizontally.

9.5.2.3. Travel distance to the exterior or to an enclosed stair shall not exceed 400 ft [SS1] (122 m).

9.5.2.4. A minimum of one exterior door shall be provided at grade for every required stair.

9.5.2.5.* An automatic retrieval system shall be provided for cars that are not readily accessible to fire department operations. Cars shall be capable of being moved to approved designated locations.

A9.5.2.5. Fully Automated Parking Systems have limited accessibility to upper levels of parking and therefore are more difficult for fire department access and operations. An automatic retrieval system allows the fire department to have adequate access to the vehicle(s) involved.

9.5.2.6. A ventilation system that continuously provides a minimum of two air changes per hour shall be provided.

9.5.3. Fire Protection Systems.

9.5.3.1. An automatic sprinkler system shall be installed in a parking structure with Fully Automated Parking Systems in accordance with NFPA 13 except as modified in 9.5.3.1 (a – h).

(1) Fire sprinkler systems may be wet, dry, single interlock preaction or deluge.

(2) Fire sprinkler system design density shall be 0.20 gpm/ft^2 (8.2 lpm/m^2).

(3) Area of Operation shall be 1,500 ft^2 (139m^2). Reduction in area for use of Quick Response sprinklers is not allowed.

(4) Maximum area of coverage per sprinkler shall be 130 ft^2/spk (12 m^2/spk).

(5) Maximum sprinkler spacing shall be 12 ft (3.7 m).

(6) Sprinklers shall be Quick Response.

(7) Sprinkler temperature shall be intermediate.

(8) Hose Allowance shall be 250 gpm (950 lpm) for 90 minutes when EVs are present. A minimum of 100 gpm (379 lpm) shall be applied to inside hose demand.

A9.5.3.1 (a). Double interlock preaction systems are not allowed due to the inherent delay in actual water delivery from a sprinkler. While dry systems can also have delays in activation, typically such delays are limited to 60 seconds or less. Double interlock can have times well beyond 60 seconds based on the type of detection system(s) used which contradicts the early suppression fast response methodology for protection of this type of hazard.

9.5.3.1.1. Flue Sprinklers shall be provided at every vehicle platform level. A minimum of three (3) flue sprinklers shall be provided in each flue space on both sides of the vehicle platform. Sprinklers shall be located within 12 inches (305 mm) of the front and back of each vehicle platform with a maximum distance between sprinklers of 10 ft (3.7 m). *Figure 9.5.3.1.1.*

9.5.3.1.1.1. Flue sprinklers shall be calculated separately from the overhead sprinkler system. The two (2) most demanding levels of sprinklers shall be calculated flowing a minimum 20 gpm (76 lpm).

9.5.3.1.1.2. A total hose demand of 250 gpm (950 lpm) with a 90-minute duration shall be added to the flue sprinkler system calculations with a minimum of 100 gpm (379 lpm) of the total hose demand added for inside use.

9.5.3.2*. Flue sprinkler protection shall be zoned vertically.

9.5.3.2.1*. Flue sprinkler protection shall have a maximum of five (5) levels per zone.

9.5.3.3.* Standpipes shall not be required in Fully Automated Parking Systems greater than 5 stories high or 75 ft (23 m) from the lowest point of fire department access and the highest occupied level. Standpipe design and installation shall be in accordance with NFPA 14.

9.5.3.4. Fire alarm systems shall not be required in parking structures with Fully Automated Parking Systems that are protected in accordance with NFPA 13 except as modified in 9.5.3.

Submitter Information Verification

Committee: GAR-AAA

Submittal Date: Wed Oct 02 10:17:24 EDT 2024

Committee Statement

Committee Statement: The committee has created this CI to permit further work on this topic at Second Draft. The task group has developed the content presented in PI-71 with a significant amount of research and input from external sources including FPE's and organizations doing research on these types of systems including with electric vehicles. The task group has been reconstituted and will continue to engage with additional experts and interested parties to further develop the material prior to the Second Draft meeting. New requirements for NFPA 88A should rely on data and technical reports, including, but not limited to, the upcoming NFPA FPRF report (Phase 3, when provided), for technical substantiation of design and installation requirements. The task group will also provide referenced figures within this submission for review during the Second Draft phase. Finally, several NFPA MOS items were noted in the PI and will require review and evaluation by the task group. The committee welcomes Public Comment on this topic.

Response Message: CI-18-NFPA 88A-2024

Public Input No. 71-NFPA 88A-2024 [New Section after 9.2]

Ballot Results

This item has not been balloted