

4.29 Sprinkler protection requirements for parking spaces associated with Electric Vehicles (EV) charging stations (2022) – Updated December 4, 2024

Reference: 2022 NFPA 13 Section: 4.3.5, A.4.3.5(9) & Sections 19.1.2(1), 19.2.1.2.4(2)(3), 19.2.3.1.1(1); 2022 CFC 903.3.1.1 & 903.3.5

Purpose: To provide additional SFFD guidelines for sprinkler protection of parking spaces associated with electric vehicle (EV) charging stations not specifically addressed in 2022 NFPA 13. This bulletin applies for all occupancies (except R-3), having Level 3 or Level 4 EV charging stations. (This bulletin does not apply for Level 1 and Level 2 chargers). The intent of the higher-risk sprinkler protection for these specific EV charging parking spaces, in comparison to common (Non-EV) parking spaces which are required to be protected by an Ordinary Hazard (OH) sprinkler design density over a 1,500 SF area (per 2022 NFPA 13 Section 4.3.3.2 and Table 19.2.3.1.1), is to mitigate the additional potential higher-risk associated with the EV charging process while the charging station is connected to the EV via a charging port. Additional guidelines are also provided for parking space(s) associated with EV charging station(s) in partially sprinklered or non-sprinklered buildings.

The installation of new EV parking-charging stations in new and existing parking garages is not directly/adequately addressed in the current codes or standards. The EV's large battery (energy storage system—ESS) which can reach 100 kWh for cars with lithium-ion batteries, in combination with EV charging, is potentially a high fire hazard condition due to potential damage issues of batteries, potential thermal runaway, cascading ignition/fire, and difficulties of extinguishing of an inaccessible fire due to extreme temperatures and concealed batteries. EV charging in an enclosed space/structure potentially increases fire-life safety hazards to building occupants, structures, adjacent vehicles, and first responders.

Per the 2016 Edition of NFPA 13 Section 5.3.1 and A.5.3.1(1), automobile parking garages were required to have an Ordinary Hazard Group I (OH1) sprinkler design density with 0.15 GPM/SF over 1,500 SF (per Table 11.2.3.1.1). However, per the current 2022 NFPA 13 Sections 4.3.3.2 and A.4.3.3.2(2), automobile parking garages are now classified as Ordinary Hazard Group II (OH2) with 0.2 GPM/SF over 1,500 SF area (per Table 19.2.3.1.1). Note: It is NOT the intent of this bulletin to retroactively require a change of EXISTING automobile parking garages OH1 sprinkler design density (0.15/1500) to become OH2 with 0.2/1500 sprinkler design density. However, all NEW automobile parking garages not having EV charging stations, shall be designed per 2022 NFPA 13 with OH2 with 0.2/1500 sprinkler design density.

This bulletin does not apply to Mechanical-Access enclosed parking garages per 2022 CBC Section 406.6.4 which requires a separate specially engineered automatic sprinkler system on a case-by-case basis.

For the purpose of this bulletin – A Parking Space associated with an EV charging station is a space within a parking garage that is provided with an EV charging port. (A single charging station may provide EV charging capabilities for more than one parking space utilizing extension charging ports connected to the same charging station)

San Francisco Fire Department
Bureau of Fire Prevention & Investigation

Specific SFFD requirements:

1. For **New Buildings**: Where a fire sprinkler system is required by code, the fire sprinkler system shall be designed per NFPA 13-2022 Extra Hazard Group II (EH2) with 0.40 GPM/SF over the parking space(s) associated with EV charging station(s). For area(s) less than 2,500 SF, the EH2 design area(s) are required to extend minimum 3-feet beyond the perimeter of the parking space(s). In this case, the design area(s) are not required to extend 15-feet beyond the perimeter of the parking space(s) as it is currently required by 2022 NFPA 13 Section 19.1.2(1).
2. For **Existing Buildings** with an existing sprinkler system which is required to protect NEW parking space(s) associated with EV charging station(s), the existing sprinkler system shall be required to be augmented to EH2 with 0.40 GPM/SF sprinkler design density over the parking space(s) associated with EV charging station(s) on a separate sprinkler permit. For area(s) less than 2,500 SF, the EH2 sprinkler design area(s) are required to extend minimum 3-feet beyond the perimeter of the parking space(s). In this case, the design area(s) are not required to extend 15-feet beyond the perimeter of the parking space(s) as it is currently required by 2022 NFPA 13 Section 19.1.2(1).
3. Where an existing, previously approved, fire sprinkler system cannot be augmented to meet the sprinkler design requirements noted in item (2) above (without upgrading the fire service and water supply), the sprinkler designer shall demonstrate to SFFD, the highest capability of the existing sprinkler system in terms of sprinkler water density and sprinkler spacing that is available for protection of the parking space(s) associated with EV charging station(s). This existing system would be acceptable in addition to providing one-hour fire-rated walls separation. The maximum continuous (single) fire-area to be separated by one-hour fire-rated walls, shall not exceed 1500 SF or seven (7) EV charging stations, whichever area is lesser.
4. The hydraulic calculation design criteria of an existing sprinkler system shall include all sprinklers within a minimum 2,500 square feet area of sprinkler operation, or the maximum area containing parking space(s) associated with EV charging station(s) extending 3 feet beyond the perimeter of the parking space(s), whichever is less, but not less than 1,500 SF that is required for Ordinary Hazard design density. (OH2 Per 2022 NFPA 13 Section and Table 19.2.3.1.1 with 0.2/1500 density, or OH1 per the previous 2016 NFPA 13 Section 5.3.1 and A.5.3.1(1) and 11.2.3.1.1 with 0.15/1500 density). The EH2 design area can be reduced from 2,500SF to NOT LESS THAN 2,000 SF if high-temp sprinklers or K-11.2 sprinklers are used at the ceiling per 2022 NFPA 13 Sections 19.2.3.2.6 or 19.2.3.2.7.

5. Where a fire sprinkler system is not required by code for new buildings, or was not provided in existing buildings, the parking space(s) associated with EV charging station(s) shall be separated on three (3) sides from all other areas within the garage/building by a minimum of a 1-hour fire-rated wall separation (1-hour fire barrier). The open side shall have a maximum of 10 feet dimension per each parking space, while maintaining the minimum code required egress/access distances/provisions required by 2022 CBC Chapter 10. The maximum continuous (single) fire-area to be separated by one-hour fire-rated walls, shall not exceed 1500 SF or seven (7) EV charging stations, whichever area is less.
6. New buildings with parking space(s) associated with EV charging station(s) having a continuous (single) area that is equal or greater than 1,500 SF shall be required to be provided with hose allowance of 500 GPM. while those with a parking space area that is less than 1,500 SF shall be required to be provided with hose allowance of 250 GPM, per EH2 Per 2022 NFPA 13 Section and Table 19.2.3.1.2. The total required hose stream of either 500-gpm or 250-gpm shall be taken from the point of connection with the city water main per Section 19.1.6.2 of 2022 NFPA 13. An inside hose stream is not required unless Class II hose stations are connected to the fire sprinkler system.
7. In new buildings that are equipped with a fire pump system, fire water storage tank, or both, calculations shall be provided to demonstrate that both the fire pump system and water storage tank are adequately sized to supply the required pressure, flow, and duration/quantity. See 2022 NFPA 13, Sections 19.1.5 and 19.1.6.
8. In existing partially sprinkler protected buildings that have a fire pump and hose valves for fire department use attached to the wet pipe system, the fire pump shall accommodate the sprinkler demand serving the EV parking spaces added to the 2019 NFPA 14 determined standpipe demand, and not including a separate hose stream demand. See 2022 NFPA 13, Section 19.1.6.4(3). The sprinkler designer shall demonstrate to SFFD, the highest capability of the existing sprinkler system to be augmented (highest density and sprinkler spacing and fire pump capability, without upgrading the fire service, fire pump and water supply). This would be acceptable in addition to providing one-hour fire-rated walls separation on three sides to reduce the overall continuous fire-area of the parking space(s) associated with EV charging station(s). The maximum continuous (single) fire-area to be separated by one-hour fire-rated walls, shall not exceed 1500 SF or seven (7) EV charging stations, whichever area is lesser.
9. New fire water storage tanks in new buildings shall be adequately sized to accommodate the fire sprinkler discharge demand for the hydraulically remote area serving the EV parking spaces for a duration of 90-minutes. If the fire water storage tank serves hose valves for fire department use, then an inside hose stream of 100-gpm shall be added to the sprinkler system demand. The fire water storage tank is not required to support any additional outside hose stream unless it is arranged to supply water to outside fire hydrants.
10. In existing buildings with existing water storage tanks, the sprinkler designer shall demonstrate to SFFD, the highest capability of the existing sprinkler system to be

augmented (highest density and sprinkler spacing, fire pump capability and water storage tank capacity, without upgrading the fire service, fire pump, water storage tank and water supply). This would be acceptable in addition to providing one-hour fire-rated walls separation on three sides to reduce the overall continuous fire-area of the parking space(s) associated with EV charging station(s). The maximum continuous (single) fire-area to be separated by one-hour fire-rated walls, shall not exceed 1500 SF or 7 (Seven) EV charging stations, whichever area is smaller

11. Sprinklered buildings (fully or partially) with Level-3 charger(s) shall have a sprinkler waterflow switch connected to the building fire alarm system or to a sprinkler monitoring system. Upon the installation of new Level-3 charger(s) in existing sprinklered buildings without an existing sprinkler waterflow switch, and without a building fire alarm or a sprinkler monitoring system, shall be required to install a new sprinkler waterflow switch and a sprinkler monitoring system per the applicable codes. The sprinkler waterflow switch associated with the charger(s) area, upon activation, shall generate a signal to shut down the power for all charger(s) in the affected area.
12. If the specific requirements above cannot be met – the SFFD may allow for a performance based design that meets or exceeds the intent outlined in this bulletin, to be submitted for SFFD review and approval on a case-by-case basis. The applicant may request to have a Pre- Application meeting to discuss specific projects on a case-by case basis.

Examples:

EV Charging Station

EV charging Port

Assumed EV Parking space dimensions = 18 ft X 9 ft

18 ft

9 ft

Example # 1
 ONE separated EV parking space with typical dimensions of 18ftX9ft .

What is the required Design Area and How many sprinklers will be calculated?

EV Parking Area = 18 X 9 = 162 SF

Extended area for EH2 calculations per AB # 4.29: 3 ft beyond the perimeter =
 $(3+9+3) \times (3+18+3) = 15 \times 24 = 360 \text{ SF}$

Since 360 SF is less than the minimum 1,500 SF, the design area for the EH2 calcs shall be 360SF and the rest of the 1500 SF area which is (1500-360) = 1,140SF shall be calculated per OH2 for NEW buildings with (0.2/1500 density) OR per OH1 for Existing buildings with (0.15/1500 density)

The Design density for EH2 is 0.4 GPM/SF -
 Therefore:
 $360 \text{ SF} \times 0.4 \text{ GPM/SF} = 144 \text{ GPM}$
 $1,140 \text{ SF} \times 0.2 = 228 \text{ GPM}$ (For NEW Buildings)
 + 250 GPM hose allowance for OH2 = 622 GPM

OR
 $360 \text{ SF} \times 0.4 \text{ GPM/SF} = 144 \text{ GPM}$
 $1,140 \text{ SF} \times 0.15 = 171 \text{ GPM}$ (For Existing Buildings)
 + 250 GPM hose allowance for OH1 = 565 GPM

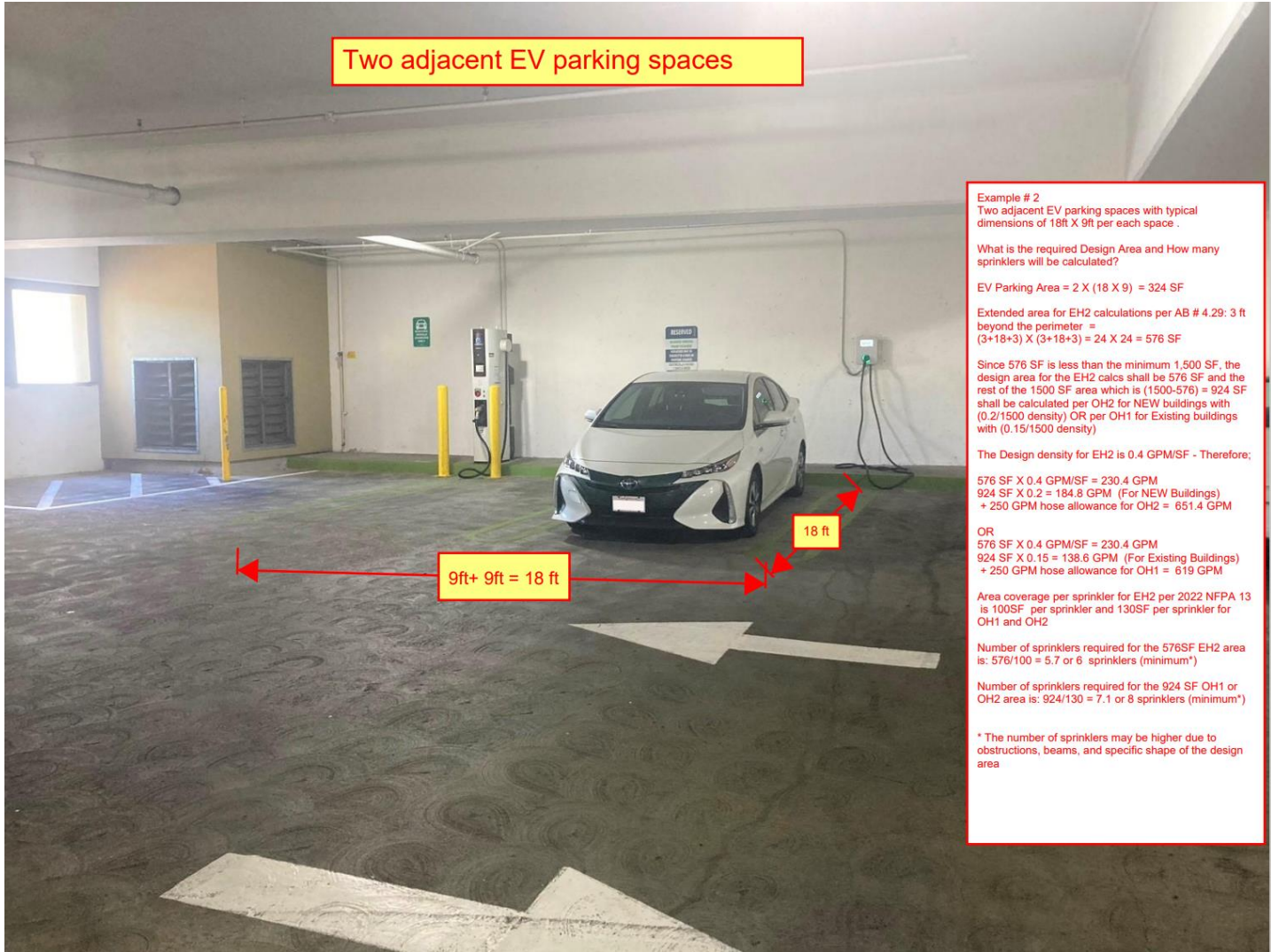
Area coverage per sprinkler for EH2 per 2022 NFPA 13 is 100SF per sprinkler and 130SF per sprinkler for OH1 and OH2

Number of sprinklers required for the 360SF EH2 area is: $360/100 = 3.6$ or 4 sprinklers (minimum*)

Number of sprinklers required for the 1,140SF OH1 or OH2 area is: $1,140/130 = 8.7$ or 9 sprinklers (minimum*)

* The number of sprinklers may be higher due to obstructions, beams, and specific shape of the design area

Two adjacent EV parking spaces



Example # 2
Two adjacent EV parking spaces with typical dimensions of 18ft X 9ft per each space .

What is the required Design Area and How many sprinklers will be calculated?

EV Parking Area = 2 X (18 X 9) = 324 SF

Extended area for EH2 calculations per AB # 4.29: 3 ft beyond the perimeter =
 $(3+18+3) \times (3+18+3) = 24 \times 24 = 576 \text{ SF}$

Since 576 SF is less than the minimum 1,500 SF, the design area for the EH2 calcs shall be 576 SF and the rest of the 1500 SF area which is $(1500-576) = 924 \text{ SF}$ shall be calculated per OH2 for NEW buildings with $(0.2/1500 \text{ density})$ OR per OH1 for Existing buildings with $(0.15/1500 \text{ density})$

The Design density for EH2 is 0.4 GPM/SF - Therefore;

$576 \text{ SF} \times 0.4 \text{ GPM/SF} = 230.4 \text{ GPM}$
 $924 \text{ SF} \times 0.2 = 184.8 \text{ GPM}$ (For NEW Buildings)
+ 250 GPM hose allowance for OH2 = 651.4 GPM

OR

$576 \text{ SF} \times 0.4 \text{ GPM/SF} = 230.4 \text{ GPM}$
 $924 \text{ SF} \times 0.15 = 138.6 \text{ GPM}$ (For Existing Buildings)
+ 250 GPM hose allowance for OH1 = 619 GPM

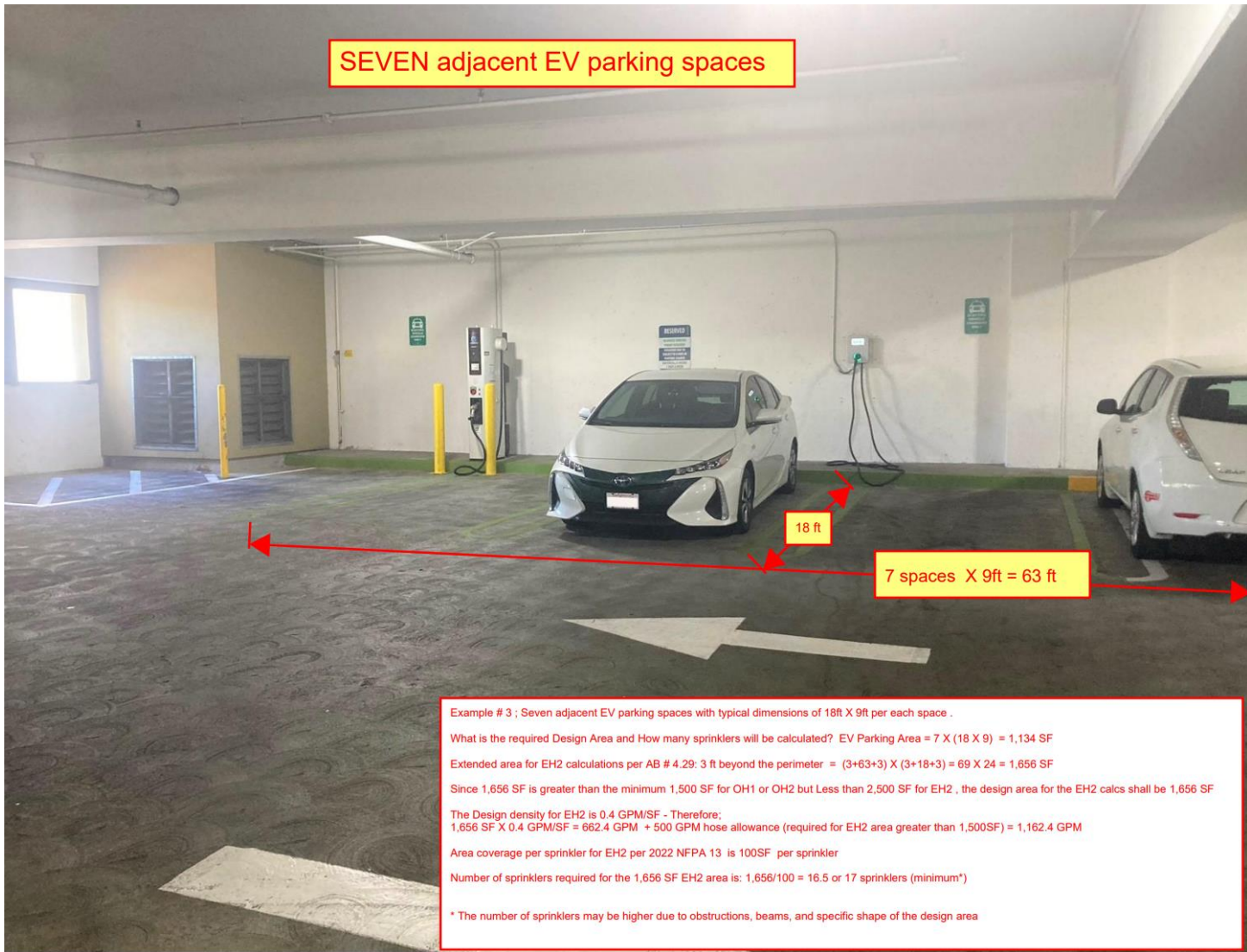
Area coverage per sprinkler for EH2 per 2022 NFPA 13 is 100SF per sprinkler and 130SF per sprinkler for OH1 and OH2

Number of sprinklers required for the 576SF EH2 area is: $576/100 = 5.7$ or 6 sprinklers (minimum*)

Number of sprinklers required for the 924 SF OH1 or OH2 area is: $924/130 = 7.1$ or 8 sprinklers (minimum*)

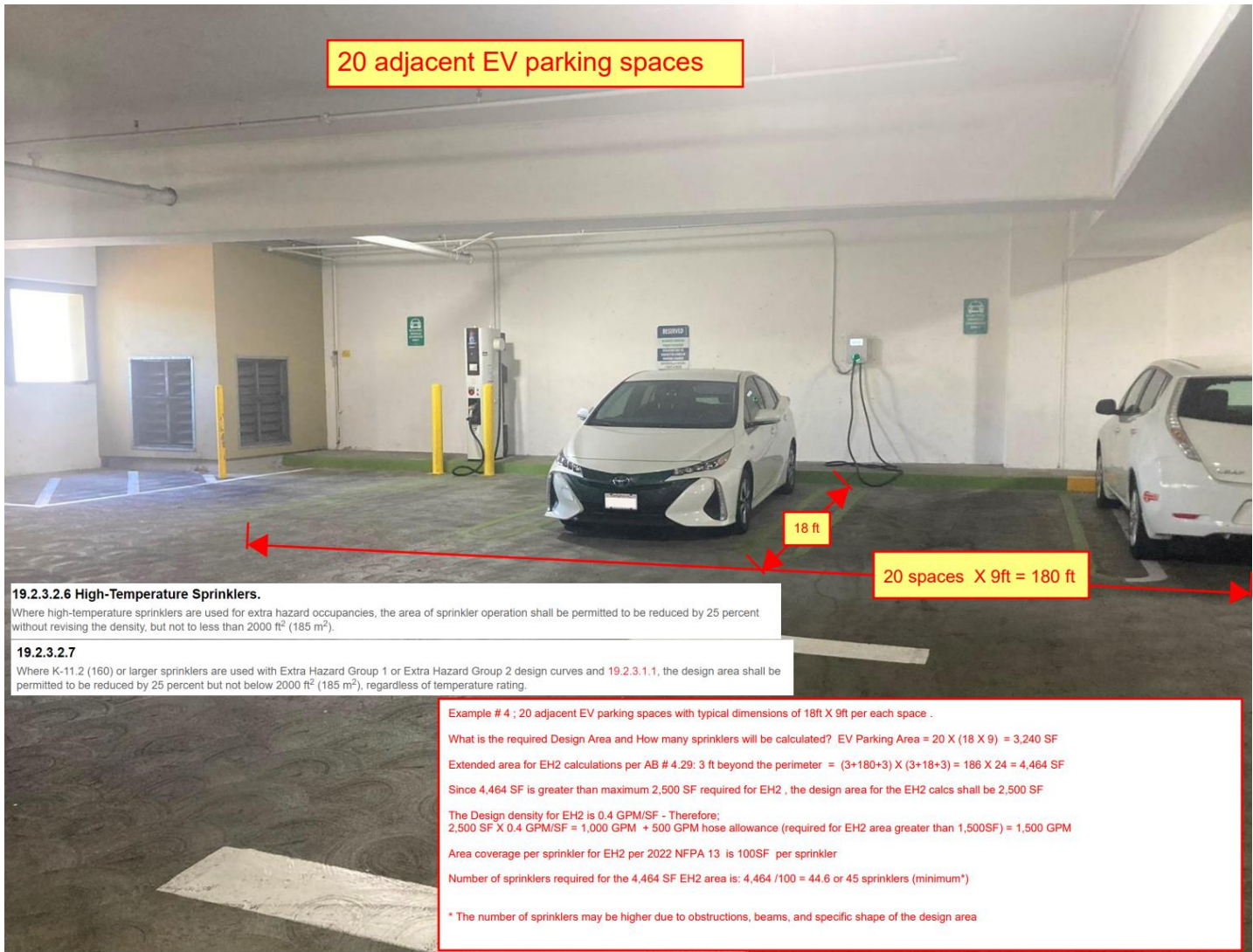
* The number of sprinklers may be higher due to obstructions, beams, and specific shape of the design area

SEVEN adjacent EV parking spaces



Example # 3 ; Seven adjacent EV parking spaces with typical dimensions of 18ft X 9ft per each space .
What is the required Design Area and How many sprinklers will be calculated? EV Parking Area = 7 X (18 X 9) = 1,134 SF
Extended area for EH2 calculations per AB # 4.29: 3 ft beyond the perimeter = (3+63+3) X (3+18+3) = 69 X 24 = 1,656 SF
Since 1,656 SF is greater than the minimum 1,500 SF for OH1 or OH2 but Less than 2,500 SF for EH2 , the design area for the EH2 calcs shall be 1,656 SF
The Design density for EH2 is 0.4 GPM/SF - Therefore;
1,656 SF X 0.4 GPM/SF = 662.4 GPM + 500 GPM hose allowance (required for EH2 area greater than 1,500SF) = 1,162.4 GPM
Area coverage per sprinkler for EH2 per 2022 NFPA 13 is 100SF per sprinkler
Number of sprinklers required for the 1,656 SF EH2 area is: 1,656/100 = 16.5 or 17 sprinklers (minimum*)
* The number of sprinklers may be higher due to obstructions, beams, and specific shape of the design area

20 adjacent EV parking spaces



19.2.3.2.6 High-Temperature Sprinklers.

Where high-temperature sprinklers are used for extra hazard occupancies, the area of sprinkler operation shall be permitted to be reduced by 25 percent without revising the density, but not to less than 2000 ft² (185 m²).

19.2.3.2.7

Where K-11.2 (160) or larger sprinklers are used with Extra Hazard Group 1 or Extra Hazard Group 2 design curves and 19.2.3.1.1, the design area shall be permitted to be reduced by 25 percent but not below 2000 ft² (185 m²), regardless of temperature rating.

Example # 4 ; 20 adjacent EV parking spaces with typical dimensions of 18ft X 9ft per each space .

What is the required Design Area and How many sprinklers will be calculated? EV Parking Area = 20 X (18 X 9) = 3,240 SF

Extended area for EH2 calculations per AB # 4.29: 3 ft beyond the perimeter = (3+18+3) X (3+18+3) = 186 X 24 = 4,464 SF

Since 4,464 SF is greater than maximum 2,500 SF required for EH2 , the design area for the EH2 calcs shall be 2,500 SF

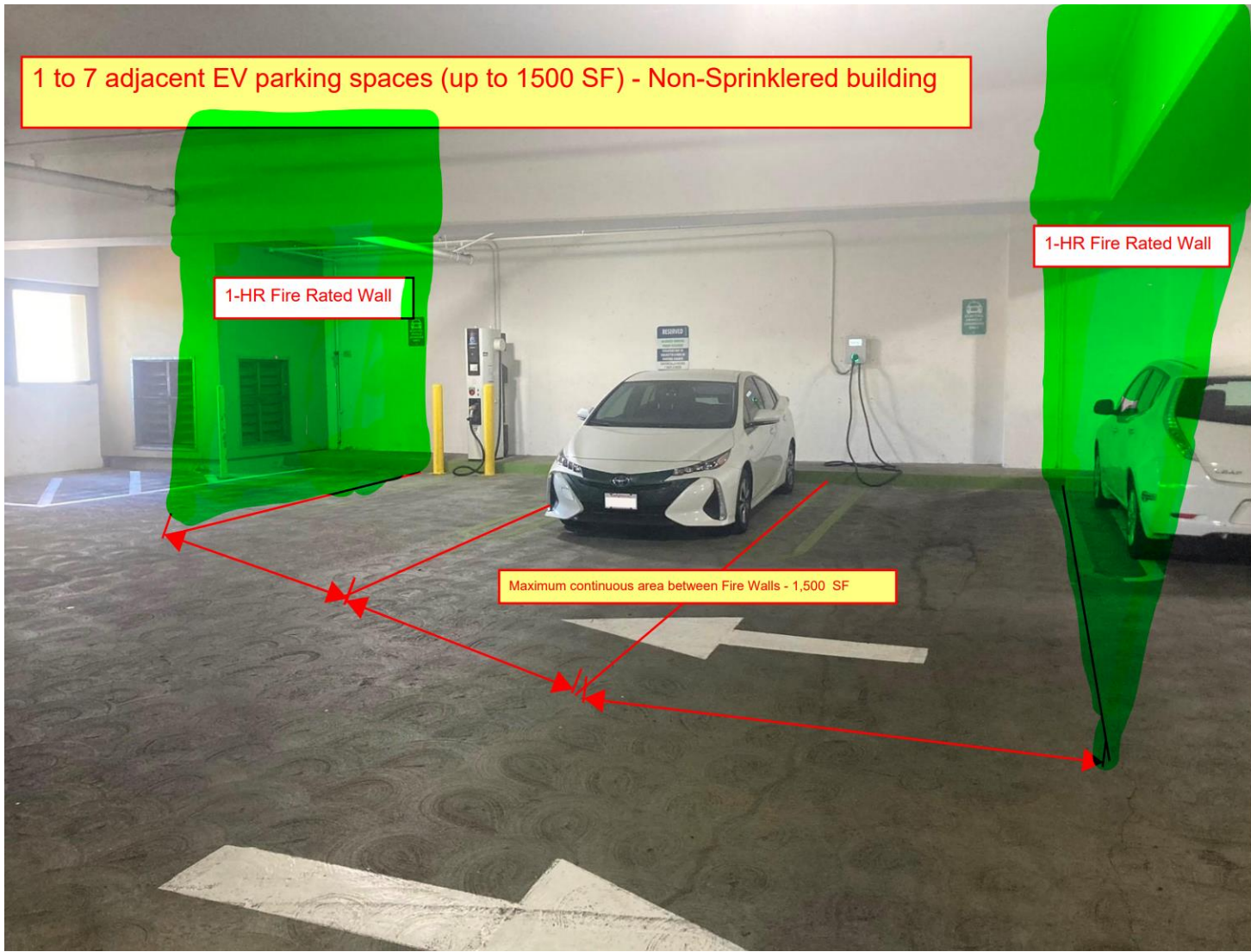
The Design density for EH2 is 0.4 GPM/SF - Therefore;

2,500 SF X 0.4 GPM/SF = 1,000 GPM + 500 GPM hose allowance (required for EH2 area greater than 1,500SF) = 1,500 GPM

Area coverage per sprinkler for EH2 per 2022 NFPA 13 is 100SF per sprinkler

Number of sprinklers required for the 4,464 SF EH2 area is: 4,464 /100 = 44.6 or 45 sprinklers (minimum*)

* The number of sprinklers may be higher due to obstructions, beams, and specific shape of the design area



Single (1) EV parking space separated from other EV parking spaces - Non-Sprinklered building

