



## **Sprinkler protection of garages for electric buses and trucks**

**September 2024**

The EFSN has published a position paper on the sprinkler protection of [car parks for electric cars](#). Based on fire testing conducted for the LASHFIRE project to identify adequate protection for marine car carriers, as well as anecdotal evidence and reasoned analysis, our position is that the current design (OH2 under EN 12845) used for car parks that house internal combustion engine cars is also adequate for electric cars.

We were asked what design criteria should be applied for the fire protection of garages for heavier electric vehicles, such as buses and trucks. A survey of our members did not yield any test data for this application. Table A.3 of EN 12845:2015 assigns HHP2 to bus depots. That requires a density of 10 mm/min over 260 m<sup>2</sup>. However, this table predates the introduction of electrically powered buses.

So far only FM has assessed the hazard classification of electrically powered buses and published design guidance. It does not call for any difference between battery powered or diesel powered buses, assigning Hazard Category 3. This can be protected with a wet system using K-160 EC upright sprinklers with the system sized to supply 12 mm/min over 140 m<sup>2</sup> from a minimum of six sprinklers. However, bus garages are normally not heated and in much of Europe therefore either require trace heating and insulation, or a dry system, with an increase in the design area to 330 m<sup>2</sup>.

	- DUNNY ROOMS	HC-2	- 7-10, Garages
Transport & Logistic	- Airport Terminal - Bus Stations - Train Stations - Ferry Port - Cruise Terminal - Bicycle Parks	HC-1	Data sheets to consider: - 7-11, Conveyors - 7-15, Garages - 7-29, Ignitable Liquid Storage in Portable Containers - 7-32, Ignitable Liquid Operations
	- Parking Garage - Car Parks	HC-3	- 7-93, Aircraft Hangars, Aircraft Manufacturing and Assembly Facilities, and Protection of Aircraft Interiors During Assembly
	- Car-Sized Vehicle Repair Garages and Assembly Operations Where Unfueled Vehicles are Repaired, Tested or Assembled - Truck Loading Docks - loading and unloading canopies - Package Delivery/Distribution Hubs - Cross docking areas - Aircraft Hangar, - Zeppelin Hangar	HC-3	- 8-3, Rubber Tire Storage - 8-9, Storage of Class 1, 2, 3, 4 and Plastic Commodities
Energy Service	- Gas and Oil Stations/Service Provider	HC-3	Data sheets to consider:

Table 2.3.1.10 Sprinkler Design Demands for Hazard Categories

Hazard Category	Ceiling Height up to 30 ft (9 m)		Ceiling Height 30-45 ft (9-13.5 m)		Ceiling Height 45-60 ft (13.5-18 m)		Ceiling Height 60-100 ft (18-30 m)	
	(gpm/ft <sup>2</sup> )/ft <sup>2</sup> [(mm/min)/m <sup>2</sup> ]							
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
HC-1	0.1/1500 (4/140) <sup>Note 1</sup>	0.1/1500 (4/140)	0.2/2500 (8/230)	0.2/3500 (8/330)	0.2/2500 (8/230)	0.2/3500 (8/330)	0.6/1200 (24/110)	Design guidance currently unavailable.
HC-2	0.2/2500 (8/230) <sup>Note 2</sup>	0.2/3500 (8/330)	0.2/2500 (8/230)	0.2/3500 (8/330)	0.2/2500 (8/230)	0.2/3500 (8/330)	0.6/1200 (24/110)	
HC-3	0.3/2500 (12/230) <sup>Note 2</sup>	0.3/3500 (12/330)	0.3/3600 (12/340)	0.3/4600 (12/430)	0.5/3000 (20/280)	0.5/4000 (20/370)	0.6/1200 (24/110)	

Note 1. The demand area for dormitories, residential, and dwelling type areas may be based on the largest room area, but not less than four sprinklers provided fire compartmentation with a minimum one hour fire rating is present. Treat corridors as rooms in making this determination.

Note 2. For HC-2 and HC-3 occupancies with ceiling heights not in excess of 30 ft (9.1 m) and protected by wet sprinkler systems, the designs for these occupancies can be reduced to the following when 160°F (70°C) K11.2EC (K160EC) upright or 160°F (70°C) K14.0EC (K200EC) upright sprinklers are being installed:

- K11.2EC: 0.30 gpm/ft<sup>2</sup> over 1500 ft<sup>2</sup> (12 mm/min over 140 m<sup>2</sup>). Ensure a minimum of 6 sprinklers in the design
- K14.0EC: 0.30 gpm/ft<sup>2</sup> over 1000 ft<sup>2</sup> (12 mm/min over 90 m<sup>2</sup>). Ensure a minimum of 4 sprinklers in the design

In The Netherlands around 1990 bus depots were fitted with sprinkler protection at the insistence of insurers. They were wet systems designed to OH3 or OH4. At the time, the buses were diesel-powered. More recently some have been powered by LNG buses and some are electrically powered. The sprinkler systems have never been changed. No sprinkler protected bus depot has been lost to fire but we do not have figures for the number of fires that have occurred. Currently the trend is to store buses outside. While this prevents damage to unprotected buildings, it does not prevent buses being destroyed by fire, as in these photographs.



Sprinkler systems are expected to control the fire and prevent spread but not necessarily to extinguish it. The Dutch Institute of Physical Safety, NIPV, recently published a report on how firefighters should approach fires in zero-emission buses, including those powered by hydrogen.<sup>1</sup>

In the UK the LPC Rules Technical Bulletin 229.T7a specifies HHP3 (12.5mm / 260m<sup>2</sup> wet or 12.5mm / 325m<sup>2</sup> dry) for the design of sprinkler systems to protect “Depots for buses, un-laden lorries and railway carriages”. This again does not specifically deal with electrically powered buses and the Technical Bulletin has not been formally reviewed for that purpose. The criteria are similar to those for FM but a little lower, particularly for higher ceilings.

<sup>1</sup> Incidentmanagement zero-emissiebussen, Nederlands Instituut Publieke Veiligheid, Arnhem, The Netherlands, July 2024 <https://nipv.nl/nieuws/handelingsperspectief-voor-incidentmanagement-bij-zero-emissie-busvervoer/>