



# Sprinklers in Car Parks

Following major fires in car parks around the world, it is now recognised that “Designers should seriously consider sprinkler provision to avoid multiple vehicle fires, resulting in huge insurable losses and the possible loss of life”.

## WARNING SIGNS

While serious fires in car parks here in the UK had hitherto been rare; major fires in car parks have occurred elsewhere:

- Gretchenbach, Switzerland – 7 firefighters were killed and a housing block collapsed.
- Ivry-sur-Seine, Paris – 200 cars were destroyed.

On the evening of 31st December 2017 a fire occurred at the Kings Dock multi-storey car park in Liverpool and the blaze led to the loss of over 1,150 vehicles. The fire so affected the structure of the building that demolition was required. As a result of their investigations, Merseyside Fire & Rescue Service has stated: “Designers should seriously consider sprinkler provision to avoid multiple vehicle fires, resulting in huge insurable losses and the possible loss of life”.

In each case, a single car fire spread to other vehicles parked nearby, creating large conflagrations that eventually resulted in serious structural failure and collapse of the buildings concerned. As a result, fire-fighters and other building professionals have been expressing fears about the potential dangers posed by fires in modern motor vehicles and their methods of storage.

## NEW HAZARDS

It is a fact that the average family motorcar of today, including growing numbers of ‘Sports Utility’ vehicles and ‘people carriers’, have significant percentages of plastics and other combustibles in their construction. In short, modern cars can burn very quickly producing much larger and hotter fires than was previously considered possible.

However, for many years it was assumed unlikely that a fire could spread from one parked car to another but this can no longer be relied on to be the case.

## BUILDING REGULATIONS

Guidance on the fire precautions considered necessary in the design and construction of car parks can be found in the Approved Document B to the Building Regulations for England and Wales (ADB) and Scottish Technical Standards. This guidance currently does not require sprinklers to be installed in car parks.

Instead, reliance is placed upon smoke ventilation either natural or mechanical systems; or ‘passive protection’ such as fire walls and doors. However, this guidance was based on fire tests carried out in the 1960s and on cars which are very different from those manufactured today!

This lack of up-to-date knowledge has led to concerns that current UK building standards are no longer entirely appropriate for modern day car park risks – particularly where innovative mechanical parking systems are being installed such as ‘car stackers’.

## GOVERNMENT CONCERNS

In 2006, Communities & Local Government (CLG) Sustainable Buildings Division commissioned the Building Research Establishment (BRE) to carry out a 3-year project looking at the problems associated with fires in car parks. The research provides valuable information for designers and other building professionals about the hazards and risks associated with modern motor cars. This research has resulted in the publication of: ‘Fire Spread in Car Parks’ BD2552’ published in 2010 by CLG.

Of particular interest, the report highlights the fact that the provision of an automatic fire sprinkler system can restrict an outbreak of fire to the vehicle of origin – and thus allow safe entry for firefighters to fully extinguish any remnants of a fire.

Indeed, without some form of early fire suppression, a fire may develop and spread quickly, producing very high temperatures and large volumes



7

FIREFIGHTERS  
DEAD

GRETSCHENBERG

200  
CARS  
LOST

PARIS

1150  
VEHICLES  
DESTROYED

LIVERPOOL

1

FATALITY  
&

22

CARS BURNT OUT

BRISTOL

of smoke, which might create conditions too dangerous for fire-fighters to even enter the property.

#### MODERN STORAGE METHODS

With increasing economic pressure on land use, combined sometimes with planning restrictions imposed in relation to off-road car parking, many developers are turning to automated mechanical parking systems – commonly known as ‘car stackers’ – as a means of providing adequate storage facilities particularly beneath urban residential developments.

There is a wide range of car stacker types but they all, necessarily, result in a higher density of vehicles parked than in a traditional car park.

The potential fire loads and risks are clearly significantly higher than can be considered ‘normal’ and, because of the dangers posed to firefighters in accessing and fighting a fire in a car stacker, the provision of automatic fire suppression in all such developments should be considered an essential life safety feature. Indeed countries such as Germany and Spain have introduced legislation requiring sprinklers in these types of car parks.

#### SYSTEM DESIGN AND INSTALLATION

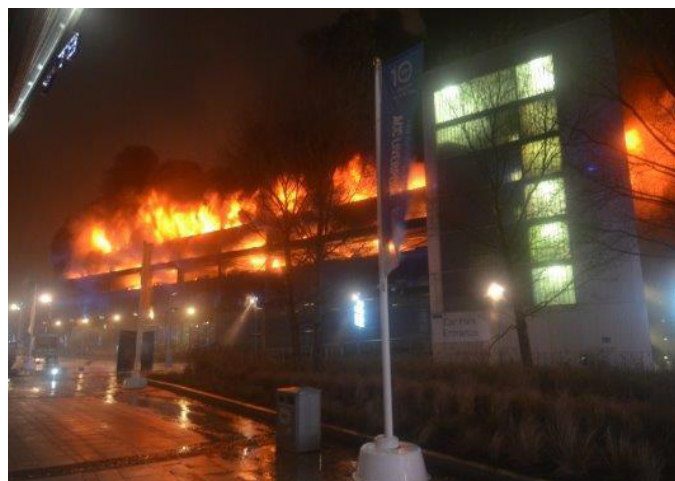
There is nothing mysterious about sprinkler systems and the high reliability and effectiveness of these systems has come about over the years by strict adherence to the sprinkler rules and design standards.

Car parks should therefore be protected by automatic fire sprinklers in accordance with BS EN 12845 with particular care and consideration given to the risks of freezing.

When selecting contractors to design and install sprinkler systems it is essential to choose only those who are capable and competent with established track records and who can offer proof of compliance with an established quality assurance system.

#### MONICA WILLS HOUSE, BRISTOL

- In December 2006, a fire occurred at a newly constructed residential care home with underground car parking in Bristol.
- In accordance with established principles for alternate compliance in support of building regulations (Approved Document B) the residential portion of the premises was sprinklered to allow for extended travel distances. However, the car park was not sprinklered as this is not required by Approved Document B.
- Fire destroyed 22 cars and spread to upper levels via external windows.
- One person died as a result of smoke inhalation – 60 residents were evacuated.
- A residential sprinkler system prevented the spread of fire into the residential area and, no doubt, saved many more lives.



BAFSA together with BRE Global has conducted experimental work on car stacking risks and this provides useful information. Copies of this report can be downloaded from the BAFSA website.

#### EXPERIMENTAL STUDY OF FIRE SPREAD IN CAR PARKS BY BRE GLOBAL:

A test rig was constructed, measuring 6m x 12m, with space for four cars but leaving one vacant parking space. The structure was enclosed at high level but with low level ventilation.

In test number one, without sprinklers and with small to medium sized family cars, fire spread from the car of origin (car 1) to involve all three vehicles. It took twenty minutes to involve car 2; however, only twenty-one minutes from ignition to involve car 3 when the test was terminated to avoid serious damage to monitoring equipment! Nevertheless, with the data gathered revealing a ‘peak heat release rate’ of 16 megawatts, this test clearly revealed the ability of this type of fire to spread to other vehicles and severely damage buildings.

Similarly in test number 3, but this time using medium to large vehicles, the fire spread to all three cars taking just nine minutes to involve car 2 and a further 1 minute to involve car 3. Once again, because of the rapid fire spread, the test was terminated early thus avoiding costly damage to the calorimeter.

#### TEST WITH SPRINKLERS

However, in test number two, again with a similar arrangement to tests number one and three, the opportunity was taken to install a sprinkler system and observe the results; therefore the rig was provided with a sprinkler system, designed as closely as possible to replicate a typical underground car park sprinkler system, to BSEN 12845:2004 ‘Ordinary Hazard 2’. After ignition, the first sprinkler head operated after four minutes and subsequently all heads within the rig operated; but in this case, the fire did not spread to either car 2 or car 3. The test was terminated after one hour with the fire dying down.

*Fire Spread in Car Parks’ BD2552’ published in 2010 by CLG*

*If you have a question or seek advice regarding automatic water-based fire suppression systems, please email the team : [ian.gough@bafsa.org.uk](mailto:ian.gough@bafsa.org.uk) or [joe.mcafferty@bafsa.org.uk](mailto:joe.mcafferty@bafsa.org.uk). If they do not have an answer for you, they will know someone who has! FAQs can be found at [bafsa.org.uk/sprinkler-systems/faqs/](http://bafsa.org.uk/sprinkler-systems/faqs/)*

British Automatic Fire Sprinkler Association

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