



Introduction

While serious fires in car parks in the UK have hitherto been rare; in recent years, a number of very serious fires have occurred elsewhere in Europe e.g.:

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

Worryingly, 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 are expressing growing fears about the potential dangers posed by fires in modern motor vehicles and their methods of storage.

New Hazards

Of particular concern is the fact that the average family cars of today, including growing numbers of 'Sports Utility' vehicles and 'people carriers', have significant percentages of plastics and other combustibles in their construction. Added to this are worries about the growing demands for 'alternative fuels' such as: Liquefied Petroleum Gas (LPG) and Hydrogen. These fuels are not only explosive (as is petrol) but, compared to traditional fuels, there is very little known about how they might perform when involved in a real vehicle fire - especially in an enclosed space such as an underground car park.

¹ for buildings located within the inner London area, the requirements of the London Building Act 1939 Section 20 apply, this may require sprinklers in certain car parks e.g. enclosed or basement car parks.

In short, modern cars can burn very quickly producing much larger and hotter fires than was previously considered possible. Indeed, until recently, it was assumed to be unlikely that a fire could spread from one parked car to another. However, 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 parks¹.

Fire spread in open air car parks

At the Reading Festival in 2008, a fire spread to involve ten motor vehicles in one of the festival's open air car parks. Sixteen fire-fighters from Royal Berkshire Fire & Rescue Service together with local organisers fought to contain the fire that was started when a barbeque got out of hand.

In October 2008 nineteen holidaymakers' cars were destroyed in a fire at a car park near Gatwick airport which is believed to have been started deliberately. West Sussex Fire and Rescue Service was called to the Gatwick Road open air car park by a passer-by in the early hours of the morning. The blaze, which initially affected two cars, rapidly spread to another seventeen.



Monica Wills House before and after the fire and the underground car park

Monica Wills House, Bristol (above)

- 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' part of the care home was sprinklered to allow for extended travel distances. 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.

Photographs courtesy of Avon Fire & Rescue Service

Instead, reliance is placed upon 'passive protection' such as fire walls and doors; and smoke ventilation – either natural or mechanical systems. 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.

Along with a review of current relevant literature, fire statistics, computer modelling and studies of the fire behaviour of materials commonly used in car manufacture, the project team also carried out a number of realistic fire tests:

- ◆ Experimental study – fire spread between cars
- ◆ Experimental study – LPG fuelled vehicles
- ◆ Car stacker test

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 fire-fighters 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 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

In Germany: automatic car parks with more than 20 spaces must have an approved sprinkler system fitted

In Spain all such car parks must be protected by sprinklers

*Source: Eurofeu
'Position Paper on the Fire Protection of Car Parks: 2009'*



Modern Car Stacker - above & below



First Sprinkler Operated -13mins 6 secs. In total 3 sprinkler heads operate



Sprinkler test terminated after 1 hour of sprinkler operation

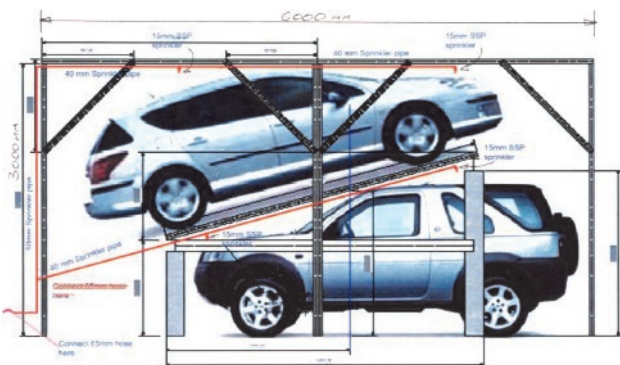
developers are turning to automated mechanical parking systems – commonly known as ‘car stackers’ – as a means of providing adequate storage facilities particularly beneath urban residential developments.

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 fire-fighters in accessing and fighting a fire in a car stacker, the provision of automatic fire suppression in all such developments should be considered essential



Aftermath - no concern regarding fire fighter safety
Photographs courtesy of BRE Global

Stacker Fire Test, Report No 256618. Copies can be downloaded from the BAFSA website at: <http://www.bafsa.org.uk/pdfs/publications/00000083.pdf>



Car stacker burn test **with** sprinklers

“..where a number of cars are burning simultaneously, the fire is exacerbated by heat-feedback and heat release rates in excess of 16 MW might be achieved for two or three cars..”

“Gas temperatures in the enclosed rig reached 1100°C in all the enclosure tests..”

Source: BRE Report: ‘Fire Spread in Car Parks’



Car stacker burn test **without** sprinklers test after 10min 10 secs
Photograph courtesy of BRE Global

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. It would be wise to select a contractor who is not only capable and competent but who also has an established track record and who can offer proof of compliance with an established quality assurance system.

Established Track Record – Sprinklers 99% Successful:

- Between 1994 and 2005 there were 3095 report fires in car parks in the UK.
- Of these, only 162 fires occurred where a fixed fire suppression system was present.
- Automatic fire sprinklers extinguished or contained 100 of these fires.
- In only 1% of cases, fire sprinklers operated but did not extinguish or contain the fire

Note: it is therefore to be assumed that the remainder were too small to actuate the sprinklers and either simply burned out or were extinguished quickly by persons using fire extinguishers etc.

Source: UK Fire Statistics

Case Study – St David’s Cardiff

The newly revamped and extended shopping centre in Cardiff, St David’s, is helping to transform the Southern end of the city centre and breathe life into what was previously an under-used area of the Welsh Capital.

St David’s is home to Wales’ first John Lewis store, a four storey, 280,000 sq ft department store - the largest outside of Oxford Street London and Wales’ biggest department store - that opened in September 2009.

Underneath John Lewis’ is a car park for 550 vehicles which has been fitted with a ‘high hazard’ ‘alternate’ sprinkler system in accordance BS EN 12845. A total of 735 sprinkler heads were installed with water supplied via twin electric pumps from a 178m³ tank in accordance with John Lewis’ company policy.

Photograph courtesy of John Lewis, Cardiff



St David’s Centre (John Lewis), Cardiff

What Sprinklers will do:

- Detect a fire
- Extinguish or control the fire
- Raise the alarm locally
- IMMEDIATELY PROTECT Life and Property
- And do so 24 hours a day, 365 days a year.



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