TENOS

FIRE SAFETY ENGINEERING CONSULTANTS

REPORT INTO A FIRE AT SPIDER TRANSPORT RATHNEW WICKLOW

Report for

Kingspan Ltd
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Important information

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Contents:

1	Introduction	4
2	Brief description of the building	5
3	The fire	7
4	The investigation	8
5	Opinion	10
6	Conclusions	11

Annexes:

A.1	Annex 1 – Kingspan construction drawings	12
A.2	Annex 2 – Still images from security cameras	14
A.3	Annex 3 - Photographs	18

1 Introduction

1.1 A fire occurred outside the Spider Transport Building, located at Unit 12, Charvey Lane, Rathnew, Wicklow, Ireland on 17th September 2008. Kingspan Ltd instructed Tenos Ltd to examine the building to determine the behaviour of any Kingspan products in the structure during the fire.

1.2 M Dennett of Tenos Ltd and S Cussen of Kingspan Ltd visited the building on 28th October 2008.

2 Brief description of the building

2.1 The Spider Transport building was located on an industrial estate in Rathnew, Wicklow. The Building was part of a series of purpose built units used for a variety of commercial purposes. Spider Transport occupied two units at the end of a terrace of buildings. The frontage of the units was two storeys high with toilets and kitchens at ground floor level and offices at first floor level. The two units that formed the Spider Transport warehouse were interconnected by a single wall opening at ground floor level.

2.2 The building consisted of a steel frame with the lower part of the external walls and all of the interior walls constructed of blockwork. The upper parts of the external walls consisted of Kingspan insulated panels (KS 1000 RW) with a core of PIR (Polyisocyanurate). These panels complied with LPCB (Loss Prevention Certification Board) Grade EXT-B to LPS 1181: 2003: PART 1: ISSUE 1 (Series of Fire Growth Tests for LPCB Approval and Listing of Construction Product Systems Part One: Requirements and Tests for Built-up Cladding and Sandwich Panel Systems for Use as the External Envelope of Buildings). The warehouse was separated from the front section of the building by fire resisting construction. The external blockwork wall was clad on the outside by a proprietary wall board the make of which was not known.

2.3 Drawing 1 at Annex 1 shows the detail of how the Kingspan insulated panels (KS 1000 RW) were fixed to the blockwork wall. Of particular note is that there is a design gap between the drip flashing and the bottom edge of the Kingspan insulated panels (KS 1000 RW). This gap above the drip flashing coupled with the corrugated profile of the Kingspan insulated panels (KS 1000 RW); (see photographs 7 and 8 at Annex 3); meant that the bottom of the insulating core of the Kingspan insulated panels (KS 1000 RW) was exposed to any flame impingement on that part of the blockwork wall and the cladding above.

2.4 A similar set of circumstances occurred above the up-and-over door between the head flashing and the bottom edge of the Kingspan insulated panels (KS 1000 RW) (see Drawing 2 at Annex 1)

2.5 The two up-and-over doors that were installed at the date of the fire had a double skin with a foam insulating filling. The type of insulation used for the filling was not known. The doors were not Kingspan products nor were they supplied or fitted by Kingspan.

2.6 Spider Transport used the premises as a warehouse and distribution point for general goods throughout the island of Ireland. The warehouse was fitted-out with racking on which mixed goods were stored in a variety of packaging. Drivers reported for duty in the early morning, loaded the goods and returned in the late evening.

2.7 At the date of the visit on 28th October 2008 the premises appeared to have a robust health and safety regime. The housekeeping was good and all fire doors appeared to be correctly rated and operated effectively.

2.8 An automatic fire alarm system using smoke detectors was installed throughout the premises.

2.7 There were a number of CCTV security cameras installed within and outside the premises. Two of the external CCTV security cameras recorded the start and development of the fire. Due to there being no lights on inside the premises at the time of the fire there were no internal images.

3 The fire

3.1 Spider Transport had parked a vehicle approximately across the front of the building in a location so that the vehicle prevented access to the two up and over doors by other vehicles. The vehicle was approximately 1m from the face of the building. The vehicle body was empty. It is understood that a flammable liquid had been poured over the interior of the cab of the vehicle and ignited.

3.2 Annex 2 shows a series of still images taken from an external CCTV security camera during the fire. It is not known if the timings shown on the CCTV were synchronised with national time but for the purposes of this investigation the important factor is the time during which the fire posed a hazard to the building. Image 1 shows the first ignition of something inside the cab of the vehicle at 01:20:29.

3.3 Only seconds later, at 01:20:38, the cab interior is fully involved in fire and within two minutes, at 01:22:14, flames were impinging on the building and there was initial production of fumes from the building cladding. At 01:24:02 and 01:28:09 there were significant step increases in fire development; fire had spread from the cab to the front of the vehicle body and a small flame was visible on the building cladding.

3.4 At approximately 01:33:19 there was an 'explosion' of debris from both sides and the top of vehicle; a fireball projected onto the building cladding and burning debris were expelled onto the building and the roadway. By 01:43:09 all of the vehicle cab and body were involved in flaming fire which resulted in significant destruction of both. The first firefighting jet was deployed at 01:45:39.

3.5 From the above it is clear that the building and particularly the Kingspan insulated panels (KS 1000 RW) were subjected to radiated heat from the fire from 01:20:38, when the cab interior was fully involved in fire until 01:45:39 when the first firefighting jet was deployed. A period of 25 minutes. Within that period there were long periods when the Kingspan insulated panels (KS 1000 RW) were subjected to prolonged flame impingement and three occasions when the fire increased significantly, once with 'explosive' force.

3.6 Radiated heat caused damage to the cladding of the blockwork wall and the Kingspan insulated panels (KS 1000 RW) above the blockwork wall and above both of the up-and-over doors (see Photographs1 & 2 at Annex 3).

3.7 The up-and-over door nearest to the front of the vehicle (on the right when looking at the building from outside), sustained heat damage both on the outside and the inside of the door (see Photographs 1 to 4 at Annex 3). There was also fire damage and smoke staining visible to the ceiling and walls of the 'tunnel' to which this door gave access. The Kingspan insulated panels (KS 1000 RW) above this door also showed significantly greater heat damage than the other panels damaged during the fire. In view of this pattern of damage, and the fact that the adjacent up-and-over door and 'tunnel' were relatively undamaged suggests that the heat flux projected onto the building was greatest towards the front of the vehicle and that the insulating core within the up and over door contributed to the fire.

4 The investigation

4.1 At the date of the visit on 28th October 2008 the two up-and-over doors had been replaced (see Photograph 5 at Annex 3).

4.2 An examination of the Kingspan insulated panels (KS 1000 RW) both above and at the sides of the up and over doors showed the outer and inner skins to be intact with no deformation. In fact it was extremely difficult to prise open the outer skins to examine the inner core.

4.3 The lower edges of the Kingspan insulated panels (KS 1000 RW) immediately above the up and over door on the right were prised open. The inner core had charred but had remained in-situ and there was no evidence of deformation or delamination (see Photographs 6 & 7 at Annex 3). In addition, there was no evidence that the core of the Kingspan insulated panels (KS 1000 RW) had assisted fire spread.

4.4 The proprietary wall board at the right side of the up and over door (adjacent to where the front of the vehicle had been) had cracked as a result of heat (see Photograph 8 at Annex 3). However, even at this location the outer and inner skins of the Kingspan insulated panels (KS 1000 RW) were found to be intact with no deformation (the distortion to the steel covering and drip flashing visible in the photograph were as a result of actions during the investigation on 28th October 2008).

4.5 The lower edges of the Kingspan insulated panels (KS 1000 RW), immediately above where the proprietary wall board had cracked with the heat, were prised open. The inner core had charred only at the edge nearest the roller-shutter door. The core had remained in-situ and there was no evidence of deformation or delamination (see Photographs 9 & 10 at Annex 3). In addition, there was no evidence that the core of the Kingspan insulated panels (KS 1000 RW) had assisted fire spread.

4.6 From the extent of the fire damage and smoke staining visible in Photographs 4 and 11 at Annex 3; to the up-and-over door; the ceiling and upper side walls of the 'tunnel' and the wall at first floor level; it would appear that the foam insulation within the up-and-over door contributed to the spread of the fire. For comparison purposes; see the lack of any damage to the ceiling and upper side walls of the 'tunnel' and the wall at first floor level at the adjacent unit shown at Photograph 14; where the up-and-over door had not been not subjected to the same radiated heat as the other door.

4.7 Photograph 12 at Annex 3 shows the interior of the Kingspan insulated panels, above the new up and over door. The smoke staining above the top of the door was limited to the surface of the cladding, suggesting that it was as a result of the smoke produced from the insulation in the door. There was no evidence that the core of the Kingspan insulated panels (KS 1000 RW) had had assisted fire spread.

4.8 Photograph 13 at Annex 3 shows the interior of the Kingspan insulated panels (KS 1000 RW), at the side of the up and over door. The smoke staining was limited to the surface of the cladding at high level and at a similar level to that of the interior blockwork wall. If the Kingspan insulated panels had contributed to the fire or assisted spread, there would have been fire damage from a point at the top of the external blockwork wall i.e. approximately in line with and above the point where the fire extinguisher sign was fixed to the steel column shown in Photograph 13. This again suggests that the smoke staining was as a result of the smoke produced from the insulation in the up and over door. There was no evidence that the core of the Kingspan insulated panels (KS 1000 RW) had assisted fire spread.

4.9 Photograph 14 at Annex 3 shows the interior of the second 'tunnel' (similar image to Photographs 4 & 11) that showed no signs of smoke staining on the ceiling of the 'tunnel' or on the wall above. Photographs 15 and 16 show the interior of the first floor offices (clad with Kingspan insulated panels) showing internal damage limited to dirty footprints. It is clear from these photographs that the smoke created by the vehicle fire and from the roller-shutter door did not enter the interior of the warehouse or the offices via the Kingspan insulated panels (KS 1000 RW).

5 Opinion

5.1 Although this fire stared external to the building, the images from the CCTV security cameras show the extent to which this fire was a hazard to the building. In fact the radiated heat was sufficient to ignite the insulation in one of the up and over doors and thereby cause smoke and heat to penetrate the door and cause damage to the interior of the warehouse.

5.2 Clearly, the Kingspan insulated panels (KS 1000 RW) were subjected to the same radiated heat as the roller-shutter door and to periods of direct flame impingement.

5.3 The edges of the Kingspan insulated panels immediately above the up and over door were subjected to the radiated heat from the burning vehicle and the heat from the burning insulation within the up-and-over door. Drawing 1 at Annex 1 shows the detail of how the Kingspan insulated panels (KS 1000 RW) were fixed to the blockwork wall. Of particular note is that there is a design gap between the drip flashing and the bottom edge of the Kingspan insulated panels (KS 1000 RW). This gap above the drip flashing coupled with the corrugated profile of the Kingspan insulated panels (KS 1000 RW); (see photographs 7 and 8 at Annex 3); meant that the bottom of the insulating core of the Kingspan insulated panels (KS 1000 RW) was exposed to any flame impingement on that part of the blockwork wall and the cladding above. Although the core of the Kingspan insulated panels (KS 1000 RW) above the up-and-over door charred, there was no delamination of the skins of the panels and the insulation remained in place.

5.4 The lower edges of the Kingspan insulated panels (KS 1000 RW), immediately above the proprietary wall had also charred at the edge nearest the up-and-over door; where there was a gap between the head flashing and the bottom edge of the Kingspan insulated panels (KS 1000 RW) (see Drawing 2 at Annex 1). However, the core had remained in-situ and there was no evidence of deformation or delamination. There were no signs of any spread of heat via the cores of the Kingspan insulated panels (KS 1000 RW) to any point within the building and no signs of spread within the cores of those panels.

6 Conclusions

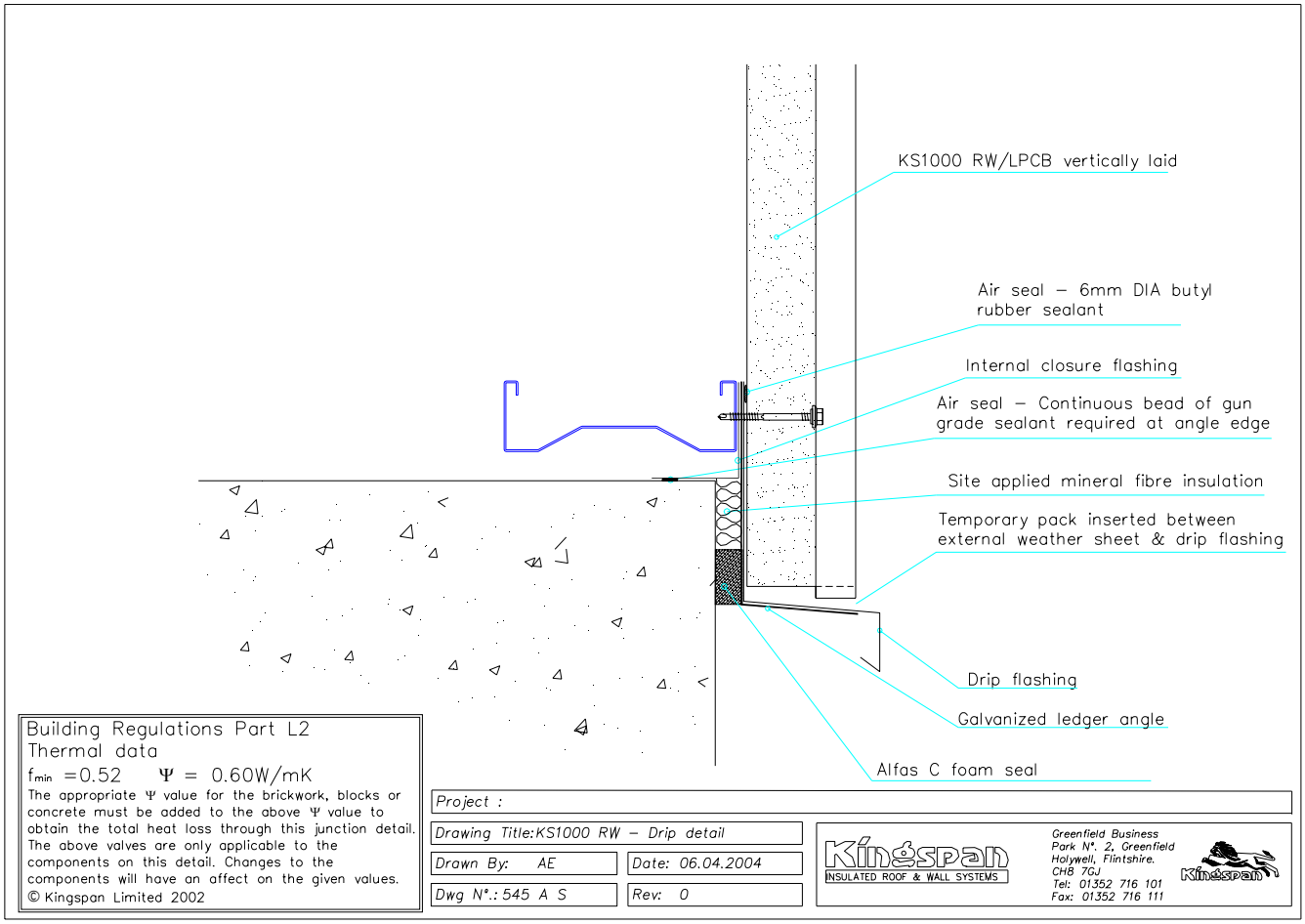
6.1 This fire occurred when two people appeared to pour a flammable liquid into the cab of a vehicle and ignite it. The vehicle was parked approximately 1m from the face of the building and adjacent to two up and over doors. The fire developed very quickly so that within 10 seconds the whole of the vehicle cab was ablaze and within two minutes flames were impinging on the building. There were three 'step' developments in the intensity of the fire and at one point there was an 'explosion' of debris from both sides and the top of vehicle; a fireball projected onto the building cladding and burning debris were expelled onto the building and the roadway. The fire burned uncontrolled for over 25 minutes before the first firefighting jet was deployed. Within that period there were long periods when the Kingspan insulated panels (KS 1000 RW) were subjected to direct flame impingement and three occasions when the fire increased significantly, once with 'explosive' force.

6.2 Although the design gap between the drip flashing and the bottom edge of the Kingspan insulated panels (KS 1000 RW - LPCB approved to LPS 1181 Grade EXT-B) coupled with the corrugated profile of the outer skins of the panels; meant that the bottom of the insulating core was exposed to any flame impingement on that part of the blockwork wall and the cladding above; there was no delamination of the skins of the panels and the insulation remained in place. The integrity of the Kingspan insulated panels (KS 1000 RW - LPCB approved to LPS 1181 Grade EXT-B) was maintained even immediately above the up and over door that suffered severe charring.

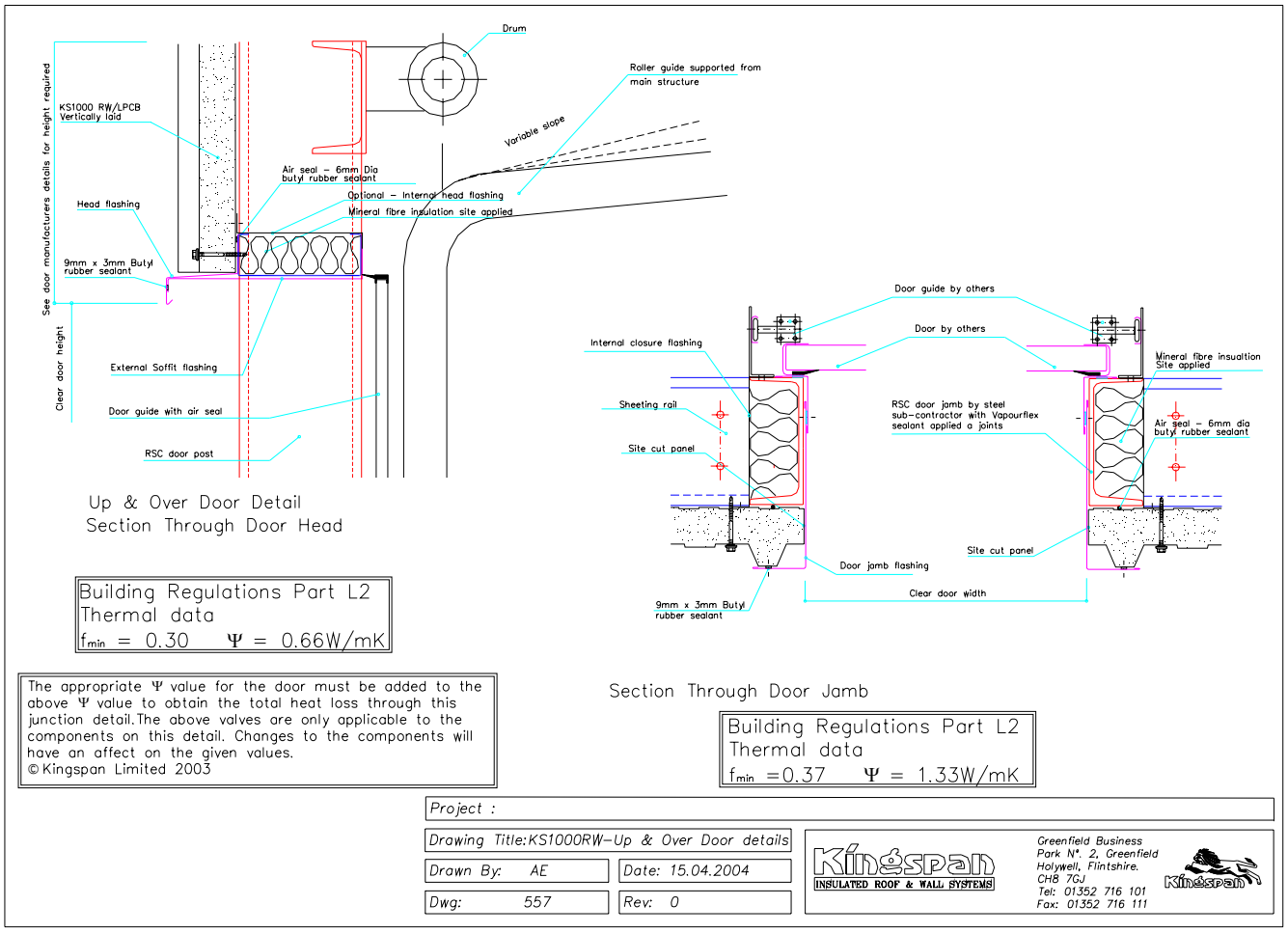
6.3 There were no signs of any spread of heat via the cores of the Kingspan insulated panels (KS 1000 RW) to any point within the building and no signs of spread within the cores of those panels

6.4 From the evidence available to date there is no indication that the Kingspan insulated panels (KS 1000 RW - LPCB approved to LPS 1181 Grade EXT-B) contributed to the damage caused by this fire

A.1 Annex 1 – Kingspan construction drawings



Drawing 1. Detail of fixing of cladding to blockwork wall and drip flashing



Drawing 2. Detail of fixing of cladding and head flashing above up and over door

A.2 Annex 2 – Still images from security cameras

Video recording during the fire on 17th September 2008



Image 1. Security Video time 01:20:29 - first ignition



Image 2. Security Video time 01:20:38 – cab interior fully involved

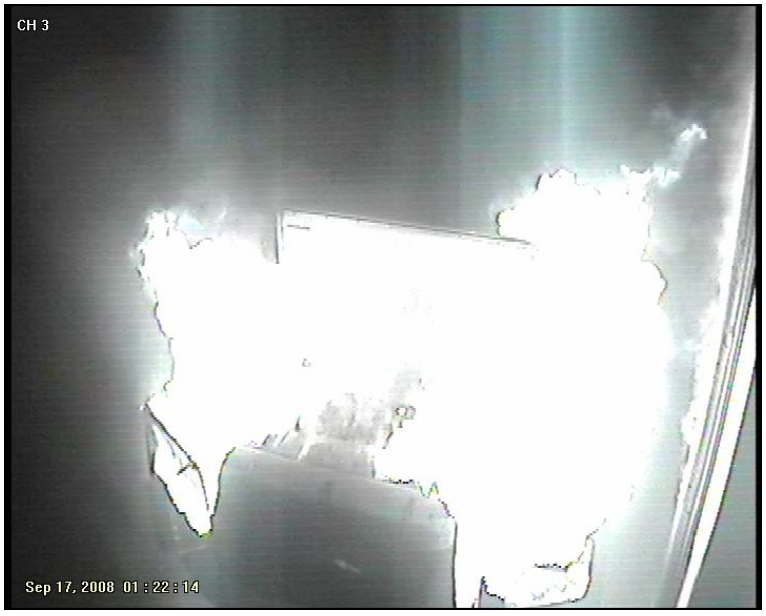


Image 3. Security Video time 01:22:14 – flames impinging on building and initial production of fumes from building cladding

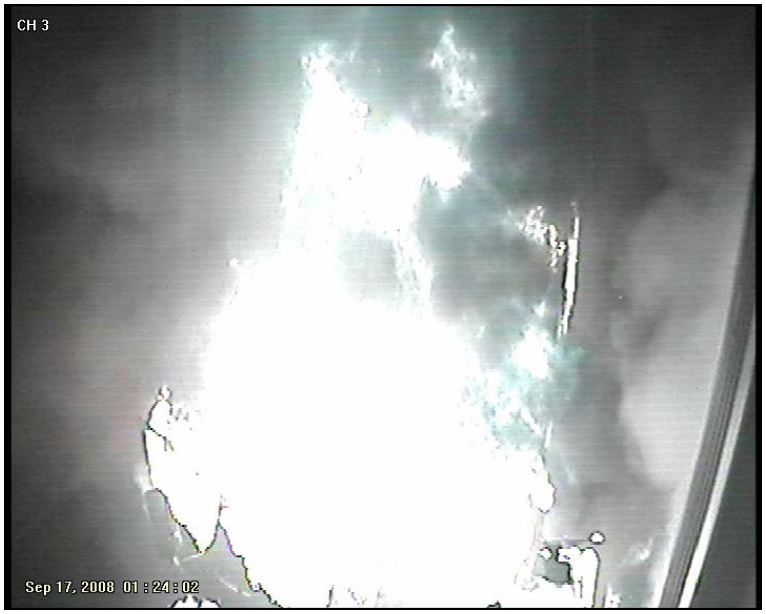


Image 4. Security Video time 01:24:02 – significant increase of fire development in the vehicle

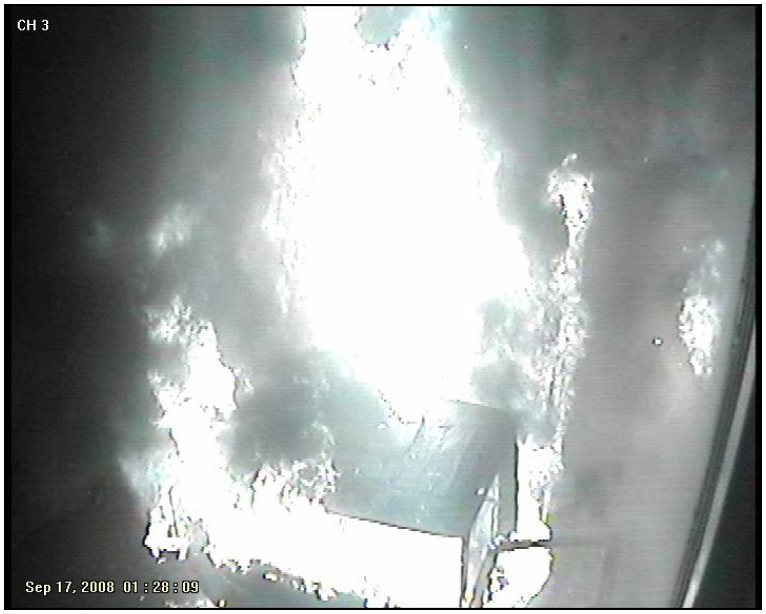


Image 5. Security Video time 01:28:09 – further significant increase of fire development in the vehicle with fire spread from the cab to the front of the vehicle body – small flame on building cladding



Image 6. Security Video time 01:33:19 – 'explosion' of debris from both sides and top of vehicle – fireball projected onto building cladding and burning debris expelled onto building and roadway



Image 7. Security Video time 01:43:09 – all of vehicle cab and body involved with significant destruction of both



Image 8. Security Video time 01:45:39 – first firefighting jet deployed

A.3 Annex 3 - Photographs

Photographs taken shortly after the fire on 17th September 2008



Photograph 1. The part of the premises occupied by Spider Transport extended from the gable at the left to the downspout adjacent to the 'To Let' sign at the right.



Photograph 2. The van had been parked approximately one metre from the wall of the premises. Note discolouration of the wall covering immediately adjacent to the vehicle cab. The up and over door on the left was still operational after the fire.



Photograph 3. Heat damage to the full face of the up and over door and to the lower edges of the Kingspan insulated panels (KS 1000MR) above the blockwork wall and above the up and over door.



Photograph 4. Interior of the up and over door showing evidence of heat damage at low level, increasing at the top of the door and smoke staining to the underside of the mezzanine floor 'tunnel'. The wall opening to the right gave access to the adjacent unit also occupied by Spider Transport. The roller-shutter door to that unit is in the open position.

Photographs taken during visit on 28th October 2008



Photograph 5. The front of the building on 28th October 2008. Both of the up and over doors had been replaced as had the broken windows.



Photograph 6. The lower edges of the panels immediately above the up and over door being prised open. Charred insulation, which had remained in-situ throughout the fire, fell from the insulated panel as this work was being done.



Photograph 7. The charred insulation that had remained in place throughout the fire above the up and over door.



Photograph 8. The lower edges of the Kingspan insulated panels (KS 1000MR) immediately above the blockwork wall adjacent to where the vehicle cab had been after the edging had been pulled away. The proprietary wall board had cracked as a result of heat.



Photograph 9. The lower edges of the Kingspan insulated panels (KS 1000MR) immediately above the blockwork wall immediately adjacent to where the vehicle cab had been. The insulation had only charred at the edge nearest the up and over door.



Photograph 10. Close-up of the insulation exposed in Photograph 9 above.



Photograph 11. Similar view to Photograph 4 above, showing the interior of the new up and over door, typical goods on racking and smoke staining to the wall above the 'tunnel' that separated the warehouse from the first floor offices.



Photograph 12. The interior of the Kingspan insulated panels, above the new up and over door, showing smoke staining from the original fire. This is the interior of the area shown in photographs a 6 and 7 above



Photograph 13. The interior of the Kingspan insulated panels, at the side of the new up and over door, showing smoke staining at high level from the original fire. This is the interior of the area shown in photographs at 8, 9 and 10 above.



Photograph 14. The interior of the second 'tunnel' (similar image to Photograph 11) showing no signs of smoke staining on the ceiling of the 'tunnel' or on the wall above.

Photographs taken shortly after the fire on 17th September 2008 (internal first floor)



Photograph 15. The interior of the first floor offices (clad with Kingspan insulated panels) showing internal damage limited to dirty footprints.



Photograph 16. The interior of the first floor offices (clad with Kingspan insulated panels) showing internal damage limited to dirty footprints.