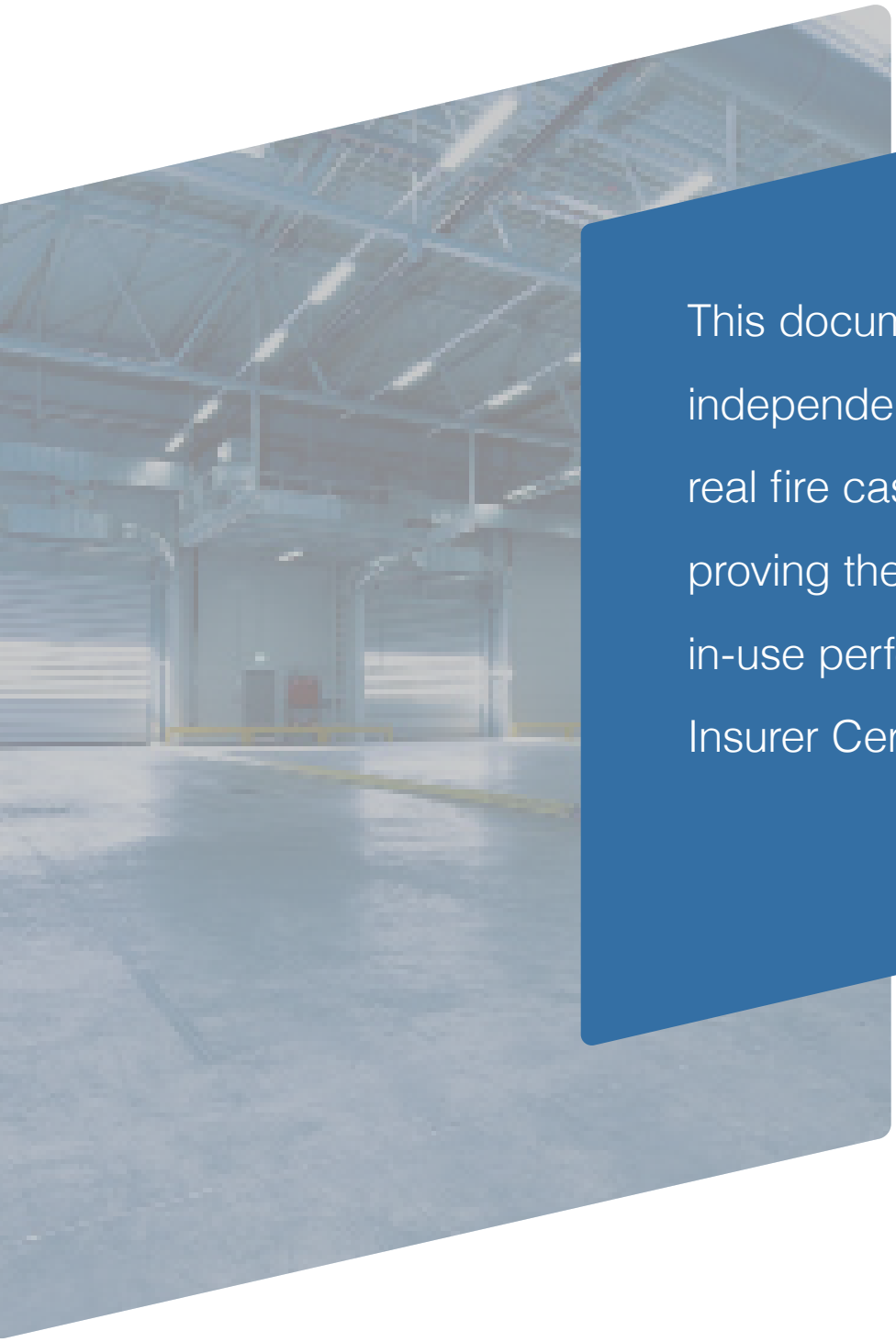
Real Fire Case Studies



This document details independently researched real fire case studies, proving the excellent in-use performance of Insurer Certified PIR panel systems.

EPIC
ENGINEERED PANELS IN CONSTRUCTION

THE PERFORMANCE OF PIR CORE SANDWICH PANELS IN REAL FIRE SITUATIONS

Introduction

One of the most convincing arguments for the use of PIR core sandwich panels is the way they react to fire in real building fire situations.

Independently 'Tenos' researched real fire case studies have proven the performance of PIR panel systems across the world. However, only UK based fires have been detailed herein.

These are listed below:

- Wharfedale Hospital, UK
- Clifton Comprehensive School, UK
- R A Wood Adhesives, UK
- Food Preparation Facility, UK
- Suffolk Food Hall, UK
- Eagle Global Logistics, Thurrock, UK
- Undercroft Car Park, Northern Ireland

These case studies cover the performance of PIR panel systems in different applications across the United Kingdom.

Further reading

EPIC has produced a wide range of guidance information. Please visit our web site http://www.epic.uk.com for more detail.

Overall conclusions

In every case, the PIR core panels have been found to have performed beyond their specification, with no evidence of contribution to fire spread.

- None of the fires were propagated within the PIR core
- The dominant influence on fire severity was the contents of the building
- No evidence was found to indicate that PIR panels increased the risk of fire spread
- Fire severity was not significantly influenced by the PIR panel

Wharfedale Hospital, UK

A fire occurred at a hospital under construction. The building was steel framed with concrete floors. The first and second floors were clad with PIR insulated panels approved by LPCB to EXT-B of LPS 1181 Part 1. At the date of the fire, the ground floor cladding had not yet been installed and the ground level was open sided.

It was thought that the fire was started deliberately by adhesive being poured over slabs of insulating material which were stored on the ground floor.

The fire was discovered by on-site security staff and a call was made to the fire service who brought the fire under control within 40 minutes.

The heat generated by the fire was significant, as evidenced by cracking of the concrete floor above the fire and the distortion of steel beams that had been protected by a fire resisting intumescent coating.

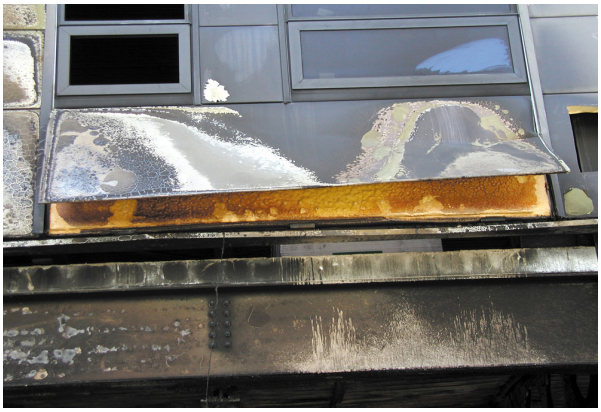
The fire service found light smoke but no fire spread on the upper floors of the building. They also reported that although the joint between the floor and first floor walls had not been fire stopped there was no fire spread within the PIR core material.

Conclusions

In spite of a very severe fire at ground level (sufficient to damage the concrete floors and distort fire protected steel beams) the cores of the insulated panels:

- Did not ignite; and
- Did not promote fire spread

Photograph 1 shows the fire area. Photograph 2 shows where the flame damaged outer skin of the bottom panel has been lifted to inspect the slight charring of PIR core beneath.



Clifton Comprehensive School, UK

At the time of the fire, the construction of Clifton Comprehensive School in Rotherham had just been completed. A significant quantity of equipment (computers and laboratory equipment, etc.) had been installed, but the building was not yet in use by the school. The roof of the building was constructed of PIR insulated roof panels.

The fire started in an enclosed passageway linking two open air plant areas on the roof. There was scaffolding at the rear of the premises which gave access to the roof and the fire was thought to have been caused by the accidental or malicious ignition of roof sealant.

Photograph 2 shows the empty drum thought to have contained the roof sealant, and holes made in the partition system by the fire service to check that the fire had been completely extinguished.

The plastic and glass components of the fire alarm and light fittings had shattered/melted and although delamination of the inner skin of the insulated panels occurred, the core and outer skin remained undistorted. The deformation of the purlins immediately above the seat of the fire indicated that this was a very hot fire.

The classrooms were separated from the passageway by compartment walls. The fire did not spread to the classrooms and fire fighters observed only light smoke in some of these rooms. There was no indication of any heat or smoke migration through the insulation of the roofing sheets and the fire service commented that the roofing panels did not contribute to the fire spread.

Conclusion

- The insulated roof panels did not contribute to the cause of the fire
- The insulated roof panels did not contribute to fire spread to any other area of the building and assisted in containing the fire.

Photograph 1 shows the main school building.
Photograph 2 & 3 show the area where the fire started and the apex of the roof respectively (with some discolouratioon in the area subject to direct flame attack but no evidence of fire spread).

R A Wood Adhesives, UK

A fire occurred at R A Wood Adhesives completely destroying the part of the building occupied by that business in Staffordshire. The R A Wood Adhesives' facility was adjacent to another business where the two occupancies were separated by a compartment wall. The roof across both occupancies was constructed using PIR core panels.

The aftermath of the fire demonstrated that the fire compartment wall performed its intended function in preventing fire spread to the business next door, which was able to continue trading. In this case, the PIR cored insulated panel insulation had been continuous over the top of the compartment wall.

An examination, carried out on the panel interface at the head of the wall, showed that the PIR core had charred to form a stable and effective seal between the steel skins of the sandwich panel to prevent fire transmission to the protected side of the wall

The fire was sufficiently intense to have subjected the party wall between the adjacent tenancies to a level of exposure equivalent to at least 60 minutes in a standard fire resistance test. The charring exhibited by the PIR core material indicated the formation of a sufficiently stable char within the panel to provide an effective fire stop between the steel skins of the cladding panels at the head of the compartment party wall.

Conclusions

- The findings of the site inspection provide evidence that the PIR core panel provided sufficient resistance to fire propagation and erosion to such an extent that the functional requirement of the UK Building Regulations (Regulation B3) was satisfied without providing a 300mm wide band of limited combustibility material to replace the PIR core where the panel passes over a compartment wall.

Photograph 1 shows the aftermath of the fire and the performance of the compartment wall.
Photograph 2 shows the interior of the adjacent business to be unaffected by the fire.


CERAMIC WALL
& FLOOR TILES
halfords

Food Preparation Facility, UK

The building provides in-flight food preparation facilities for airline operating from Heathrow.

The fire occurred in the first floor men's changing area, containing rows of steel lockers, fitted with clear plastic doors. The fire was confined to a relatively small area but generated a localised severity equivalent to over 30 minutes exposure in a standard fire resistance test.

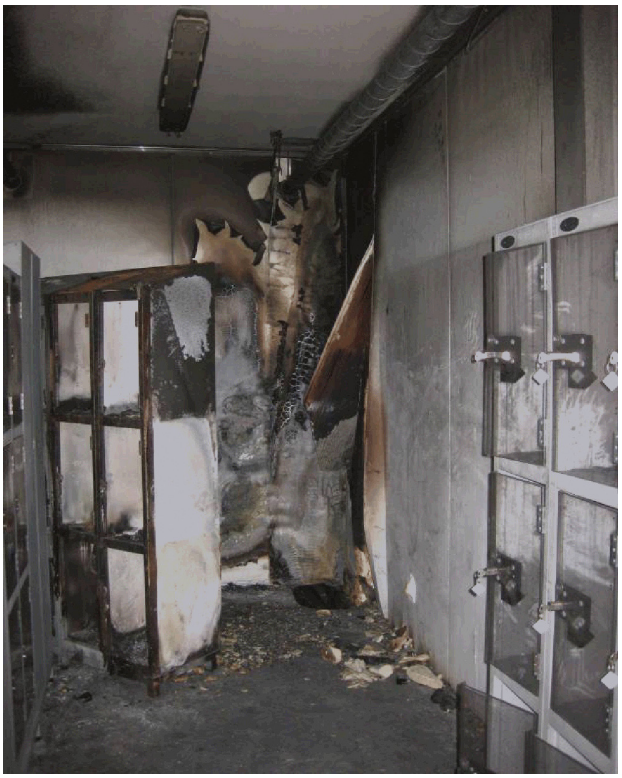
The room construction comprised of a timber floor incorporating ply-web engineered joists supported off a steel frame. The walls consisted PIR core panels. The ceiling above the room was of timber joist construction which was under-drawn with two layers of fire resisting plasterboard.

During their operations the fire service cut open the wall panels (as above). This is standard practice to ensure that there is no continuing burning within the construction or voids. It was evident that where the fire service had opened up the panels there was evidence of only very limited charring of the PIR core with no suggestion of any fire propagation within the core material.

Conclusion

- The sections of the wall panels that were subject to direct contact with the fire suffered surface distortion and superficial charring of the PIR core material. However, there was no evidence of fire propagation within the core material.
- Whilst there was some fire spread beyond the room of the fire origin, this was via the void in the timber floor. The PIR panels provided an effective barrier to fire spread, ie. there was no fire spread through the panels into adjacent areas.

The photograph to the right shows the undamaged exterior of the building. Photographs 2 & 3 (below) show the cut-open wall panels indicating no fire propogation.



Suffolk Food Hall, UK

The fire occurred at approximately 5am in an electrical equipment area located on a mezzanine level directly below the roof.

The roof was constructed from large section timber portal beams, supporting PIR cored insulated panels.

The fire occurred along the whole mezzanine level, involving all exposed combustible materials and including the timber supporting structure of the roof. The fire impacted on the main roof structure where the 15mm depth of charring of timbers was equivalent to what would be expected in a standard fire resistance test at approximately 23 minutes duration and at which time the furnace temperature would be approximately 800°C.

On locating the area of the fire the attending fire service cut a hole through the roof construction directly above the fire and in the location of the damage shown in the above image to ventilate the area. The images show the hole which was cut (which has been temporarily re-covered). The effect of the heat of the fire on the PIR core can be seen showing delamination of the exposed steel skin of the sandwich panel from the core, the formation of a carbon char layer and unaffected material at greater depth in the section which has been insulated from the fire.

Notably, the fire spread in the building was constrained to the mezzanine plant area and the combustible materials therein. Outside of this area, roof timbers were scorched, but not charred, indicating that temperatures were reduced to less than 450°C and PIR roof panels were not delaminated indicating clearly that the fire had not been propagated by the PIR core of the sandwich panel.

Conclusions

- The fire was sufficiently intense to have subjected the roof membrane and wall separating the plant area from the retail space to a level of exposure equivalent to approximately 20-25 minutes in standard fire resistance test.
- Fire spread did not occur from the mezzanine plant area to the rest of the building.
- The PIR core material of the roof sandwich panels did not transmit fire from one side of the walls enclosing the plant area to the other.

Photograph 1 & 2 shows:
A. Vent cut in roof by fire service
B. Vents cut in wall by fire service
C. Temporary roof covering hole in roof
D. PIR core showing delamination lower surface and extent of through-thickness charring
E. Cut edge of lower steel skin of sandwich panel


A
B
B


C
D
E

Eagle Global Logistics, Thurrock, UK

The fire originated in a large logistics warehouse occupied by Eagle Global Logistics (EGL) in Thurrock, which contained mixed goods stacked on the floor and on high bay racking.

Another warehouse was situated adjacent to EGL (approximately 9 metres away) and the walls and roof of both buildings were clad in PIR insulated panels.

The fire started in the south end of the building and burned for two days and two nights, and it is clear from the photographs shown (below) that the fire was very severe.

Despite the duration and severity of the fire, significant areas of insulated cladding panels remained with only limited damage to core material indicating that the PIR core material did not promote fire spread.

Conclusion

- The insulated cores of the panels did not ignite and did not transfer heat damage to the interior of the building.
- There was no evidence to indicate that the PIR insulated panel cores promoted fire spread or that fire spread through the panel cores beyond the region of severe burning of the building contents.

Photographs 1 & 2 show the collapsed south-end of the building and roof-sheeting hanging from severly damaged steelwork.
Photographs 3 & 4 show the undamaged adjacent building (interior and exterior respectively).

Undercroft Car Park, Newry, Northern Ireland

An engine bay fire in a parked car occurred in a large ground level undercroft car park below the first floor retail level of a large supermarket.

The overall footprint area of the building is approximately 11,500m2 with the ground level undercroft car park occupying a slightly smaller footprint of approximately 11,200m^2. The majority of the car park possesses a flat soffit at 3.14m above floor level that has been created by the installation of 125mm thick PIR cored sandwich panels.

The PIR cored sandwich panels were subjected to a period of fire exposure lasting at least 8 minutes and resulting in a period of sustained flame impingement. The sandwich panels exposed to these conditions sustained damage in terms of removal of the paint coating together with distortion and delamination of the exposed steel skin of the panels away from the PIR core, but the flames did not penetrate the structure, thus maintaining the safety of shoppers and staff.

Conclusions

- The PIR cored sandwich panels were subject to a period of fire exposure lasting at least eight minutes and resulting in a period of sustained flame impingement directly above the fire and gas temperatures to a distance away from the fire sufficient to destroy plastic light fittings.
- The sandwich panels exposed to these conditions sustained damage in terms of removal of the paint coating together with distortion and delamination of the exposed steel skin of the panels away from the PIR core.
- There was no evidence of joints between panels opening up and no PIR core material had been exposed.
- There was no evidence of fire propagation within the panes.

Photograph 1 shows the front elevation of the building from the main road and the corner of the building that was closest to the fire location. Photograph 2 shows the flame impact on the soffit lining.

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