Potential Perils of Modern Methods of Construction – a short introduction

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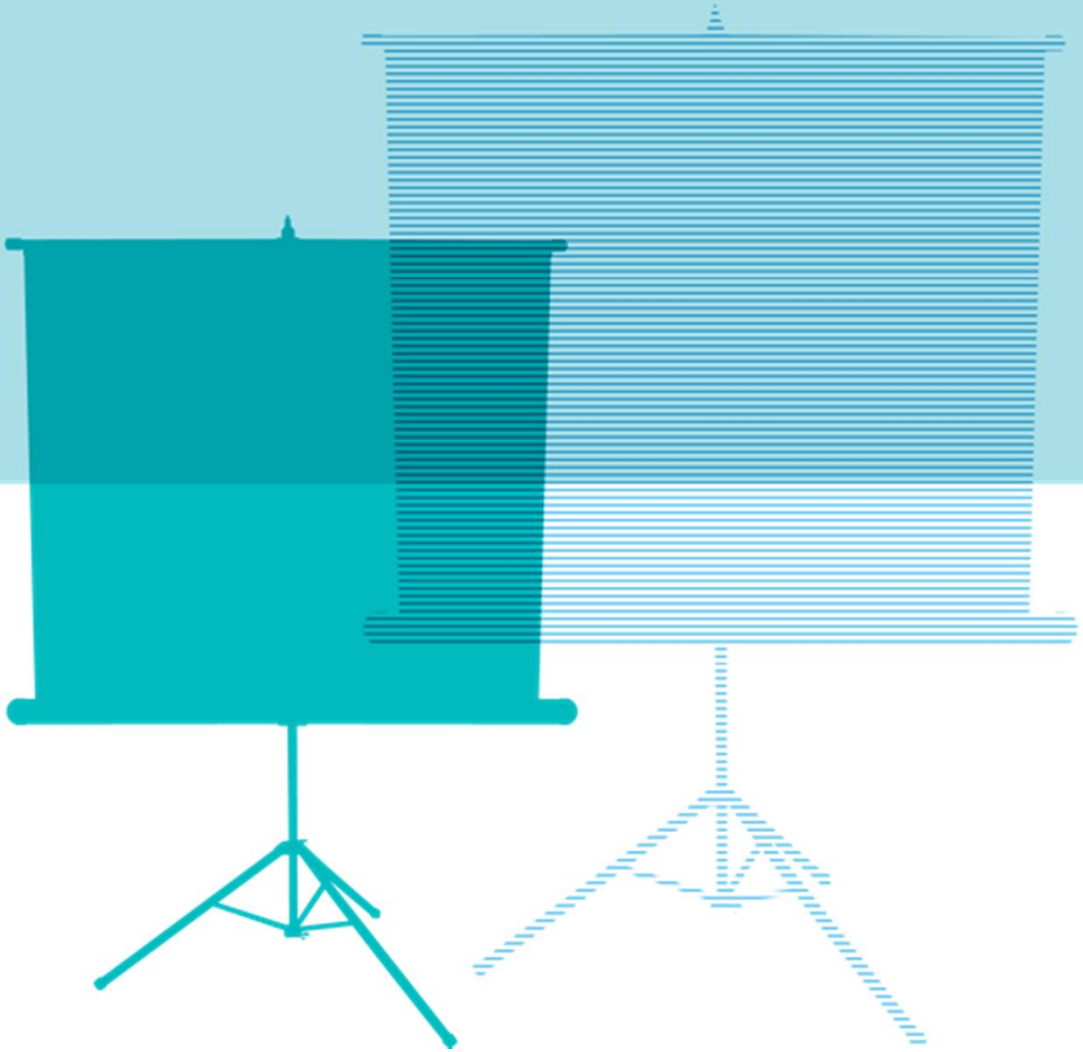
Part of the BRE Trust

Learning from the past



The Past and the Future

"Those who cannot remember the past, are condemned to repeat it,“

– From *Reason in Common Sense* 1905-1906. George Santayana (1863–1952), U.S. philosopher, poet.

London buildings before 1600

London ordinances of 1189 AD and 1212 AD tried to limit fire – by building with stone

A great fire in 1135 destroyed a great part of the City.

In the 1189 Ordinances Concerning Building, stone was made compulsory in the party-walls, but the rest of the buildings might be made of anything, and usually constructed of wood.

In 1212 a huge fire gutted a large area of London and the death toll was said to be 12,000.

This fire was known as the Great Fire of London until four centuries later.

A further ordinance was issued in 1212: “A decree made by the counsel of the citizens, for the setting into order of the city and to provide, by God’s help, against fire.”

London buildings around 1600

The need to limit fire was known in 1598

A Survey of London: Written in the Year 1598 by John Stow:

“ … the houses in it were built all of wood, contrary to Richard I.'s edict that London houses should be built of stone, to prevent fire …”

“the houses in London were builded in stone for defence of fire … but of later time for the winning of ground taken downe, and houses of timber set up in place”.

The (second) Great Fire of London September 2nd 1666

The (second) Great Fire of London September 2nd 1666

Buildings mostly half timbered and pitch covered medieval buildings, mostly with thatched roofs

Little could be done to stop the spread of the fire.

Various laws had been enacted, obliging the parishes to provide buckets, ladders, squirts and fire hooks; but much of the equipment was rotten through neglect

Water supplies, away from the banks of the river, were scarce.

Gunpowder was used to blow up houses

Wooden houses and designs dating back to the medieval period were replaced with brick and stone buildings and owners began to insure their properties against fire damage.

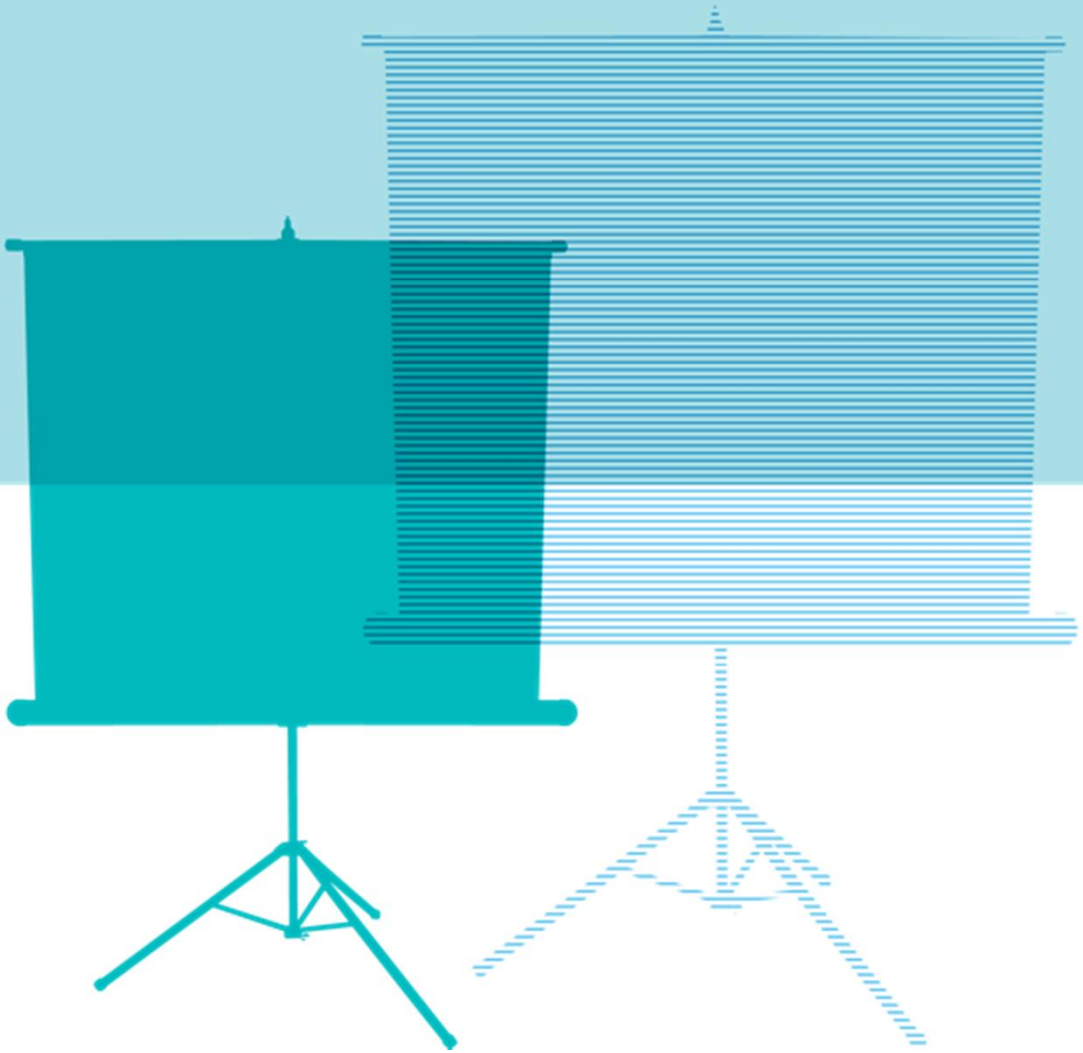
The new insurance companies realised that their losses could be minimised by employing men to put out fires.

Could it happen again?

(The BRE Innovation Park, so; no – not here!)

Incidents investigated

Completed buildings



Health Warning

The world is not about to end!

Manthorpe Avenue, Manchester 7th – 13th December 2007

- Timber frame block of flats
- Fire started by hot work (extension of exterior section of overflow pipe, heat transfer along pipe)
  - Detected 1-2 hours after completion
- Spread through timber construction and vapour membranes
- Construction detail allowed smouldering fires to readily propagate, develop and spread

Manthorpe Avenue, Manchester
Ad-hoc tests on samples

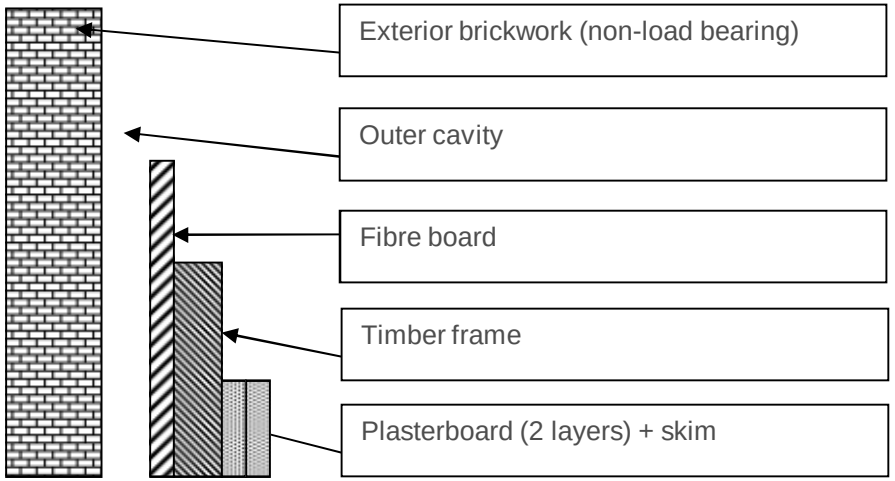
Manthorpe Avenue, Manchester 7th – 13th December 2007

- Demolition required six days after fire breakout in order to ascertain extinguishment
- Brigade forced to commit resources to this incident for 6 days
- Collapsed unburned roof trusses

Marston Way, Upper Norwood 25th – 26 December 2007

- Timber frame block of flats
  - Constructed in 1970s
  - Refurbished post 2000 (including
- Fire started deliberately in bedroom
- Initial attendance by fire brigade, fire believed extinguished
- Fire had spread into cavity after burning through uPVC window frame
  - Smouldering bitumen impregnated fibre board
- Fire spread throughout structure, eventually requiring demolition

Marston Way, Upper Norwood
25th – 26 December 2007



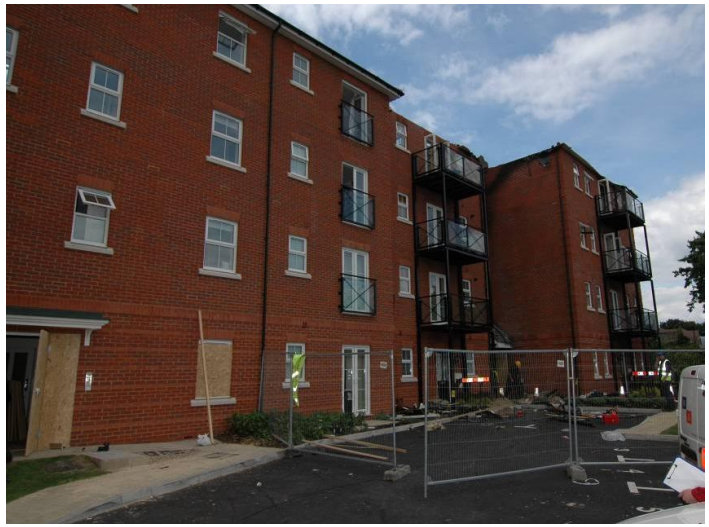
Royal Marsden Hospital, London 2nd January 2008

- Brick, block & concrete original building
- In process of being extended
- Steel framed tower constructed to conceal service riser
- Fire broke out in vicinity of tower
- Destroyed roof and plant space beneath
- Smoke spread into building through windows penetrating tower
- Fire brigade forced to attack fire using neighbouring rooftops

Royal Marsden Hospital, London
2nd January 2008

Lancaster Square, Ilford
9th June 2008

- Concrete block of flats
- Timber truss rafter roof
- Fire in common stairwell
- Broke out of window into roof soffit
- Spread throughout roof
- Residents first became aware of fire as collapsing roof sections fell in through ceiling
  - Rescued from windows and balconies – common areas impassable

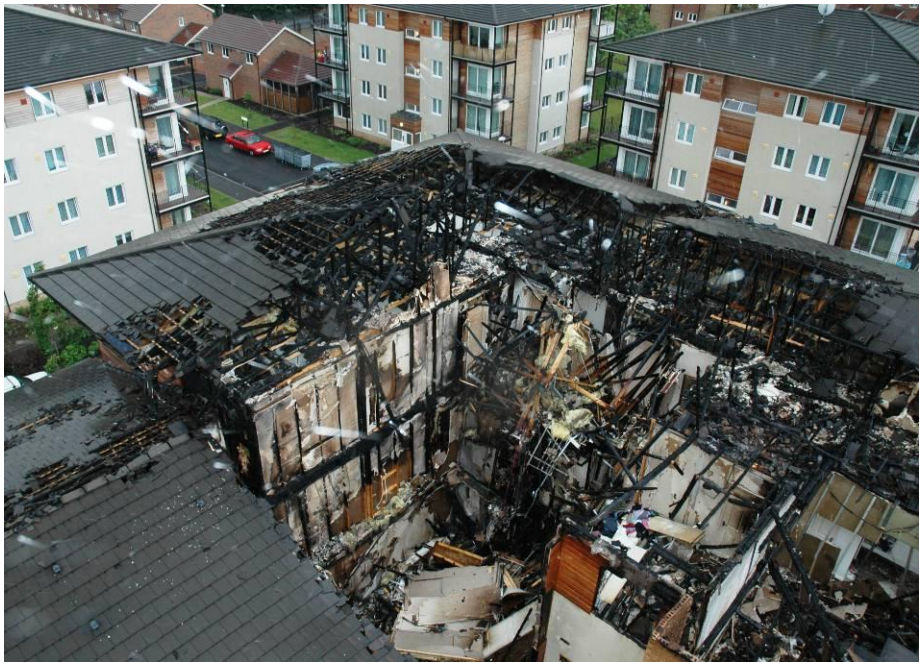


Lancaster Square, Ilford
9th June 2008

Bennett Close, Hounslow
10th June 2008

- Timber frame block of flats
- Fire started from discarded cigarette outside
- Spread up through timber frame
- Building collapsed from central staircase
- Brigade decision to evacuate immediately upon arrival meant no casualties
  - Learnt from experience at Marston Way

Bennett Close, Hounslow
10th June 2008



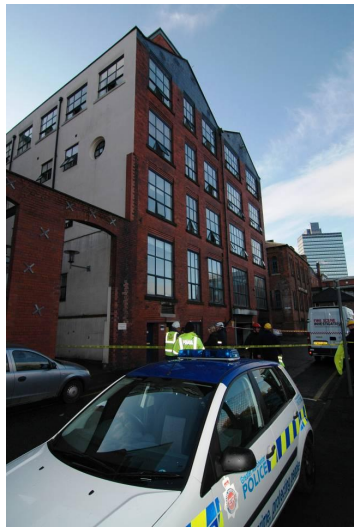
CPW Furniture, Rye
10th July 2008

- Steel frame and sandwich panel furniture warehouse
- Fire broke out in waxing booth
- Brigade entered but forced to retreat by heat - some injured
- Fire appeared smaller than actually true due to level of insulation
- Combination of insulation and fuel loading produced extreme temperatures
  - Total destruction of structure

CPW Furniture, Rye
10th July 2008

Ancoats, Manchester
6th November 2008

- Luxury apartments over enclosed semi-basement car park
- Converted tobacco factory
  - Unusual ceiling layout in car park
- Two cars completely destroyed
  - Two further cars damage by radiant heat
- Smoke and fire spread into upper floors though:
  - Poorly designed smoke shaft
  - Burnt soil pipes through timber structure
- Residents unaware of fire prior to brigade attendance



Ancoats, Manchester
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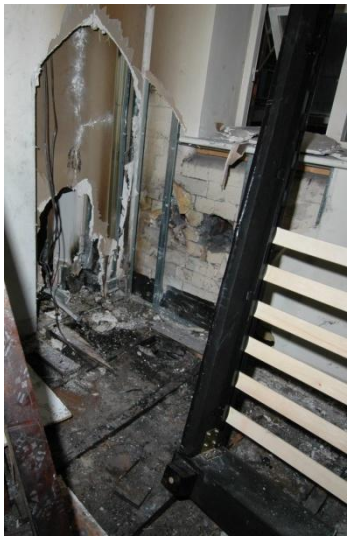


Waterfront Apts, Manchester
7th April 2009

- Timber frame flats
- Modular construction
- Fire started in electrical cupboard
- Spread into cavity
- Total of 12 apartments over 4 floors were affected

Waterfront Apts, Manchester 7th April 2009

- GMFRS report only being able to deal with incident due to experience with Manthorpe Avenue
- Keeping ahead of fire
- Building significantly structurally damaged by fire
- Prohibition notice from April 2009 to January 2010

Premier Inn, Silverstone
5th July 2010

- Timber frame hotel
- Extended over a number of years
  - Extensions required additional services to be laid through roof
  - Service penetrations poorly fire stopped
  - Junction between walls and roof poorly fire stopped
- Fire started in external linen store
  - Likely to have spread into structure through plastic airbricks and combustible soffit, although too damaged to ascertain

Premier Inn, Silverstone
5th July 2010

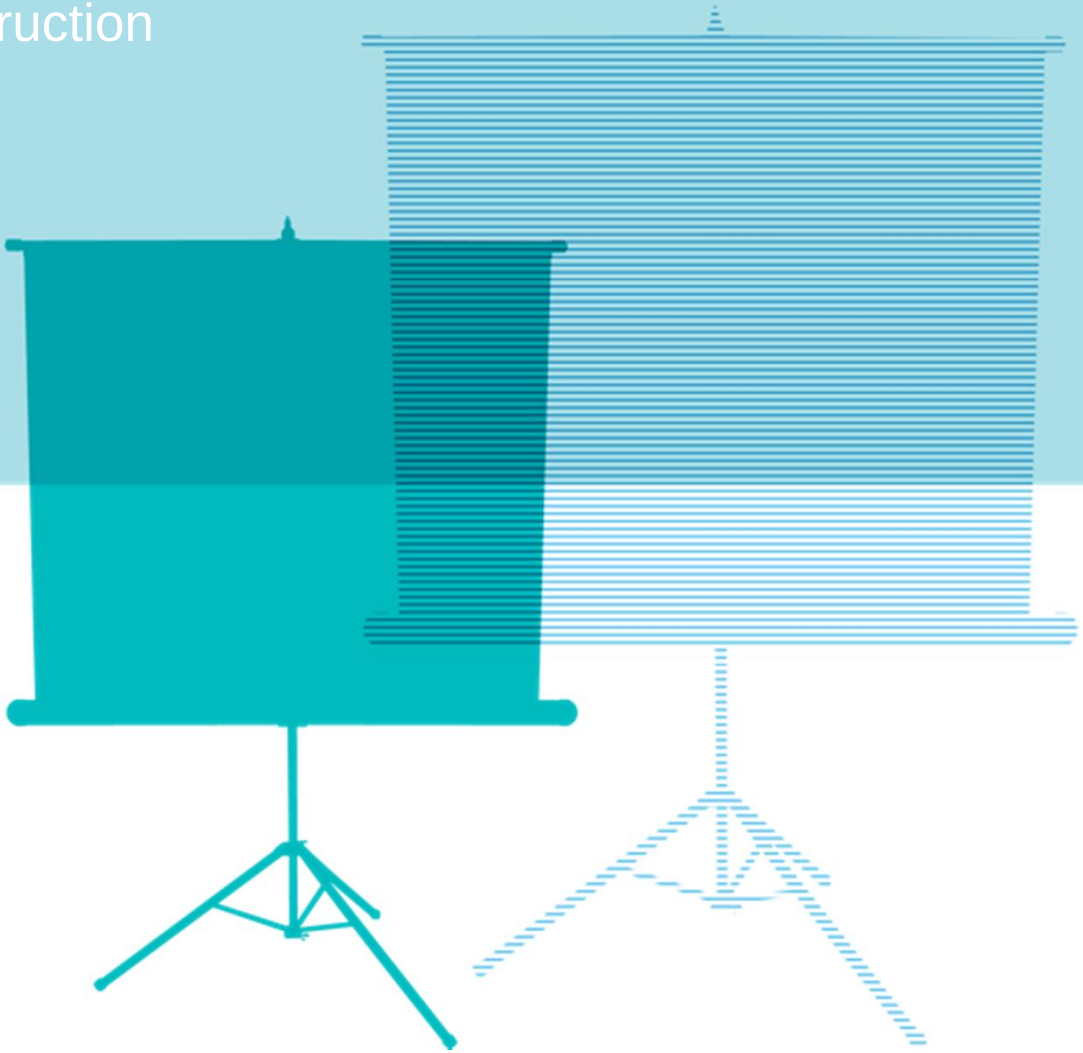
Indescon Court, London
22nd March 2011

- Purpose built flats, built 2009
- Concrete structure and numerous cladding systems
  - Cladding systems extended onto surfaces of balconies
- Fire occurred on a balcony
  - Cigarette in plastic cup
  - Involved combustible insulation around balcony
- Significant fire development on outside of building

Indescon Court, London
22nd March 2011

Incidents investigated

Buildings under construction



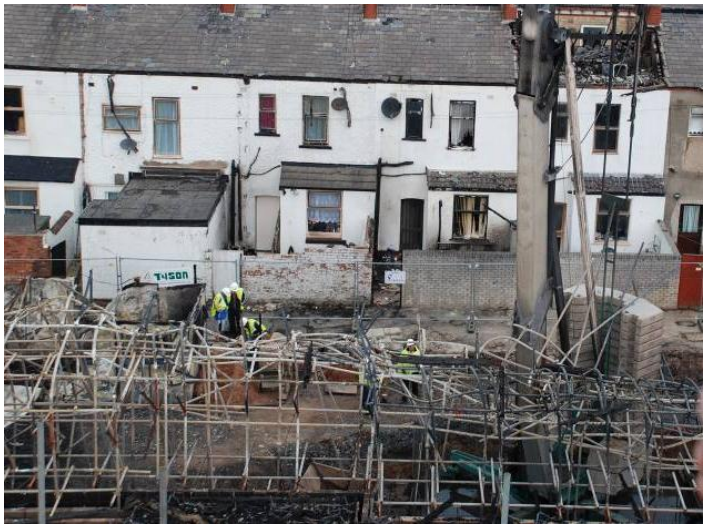
Beaufort Park, Colindale 12th July 2006

- Timber frame flats under construction
- Fire started in lower floors
- Cause unknown
- Timber frame engulfed and consumed in 6 minutes
- Due for occupation two days later

Beaufort Park, Colindale 12th July 2006

Talbot Road, Blackpool
24th April 2009

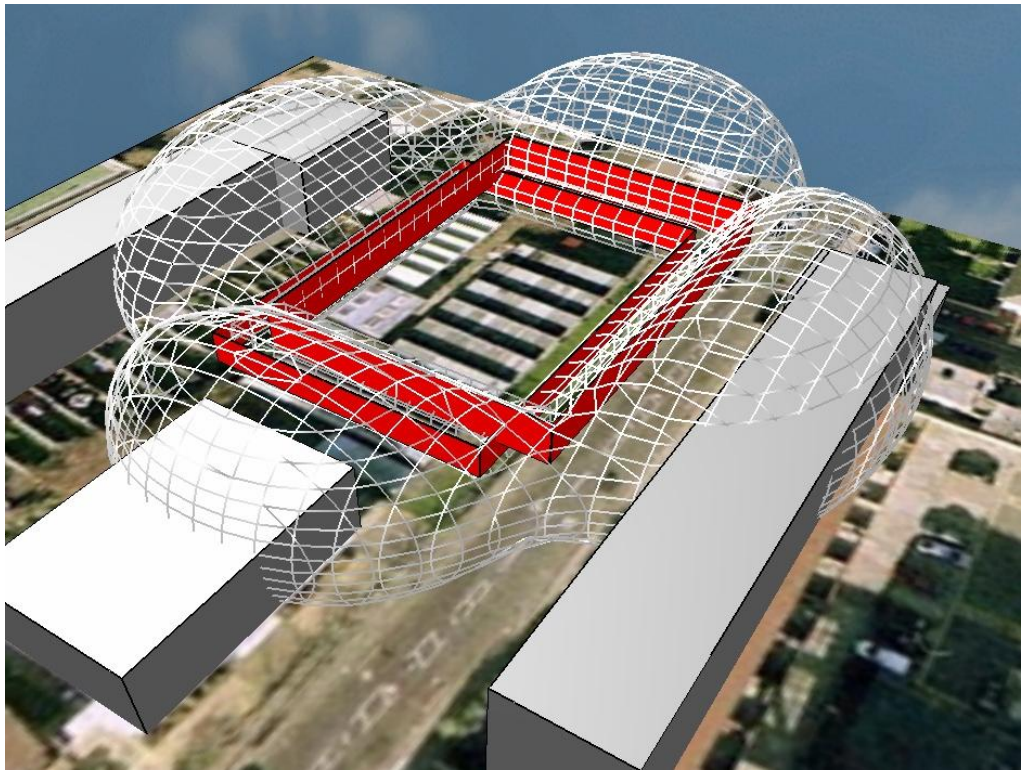
- Timber frame flats under construction
- Fire started on ground floor
- Deliberate ignition
- Timber frame fully involved in 6 minutes
- 20 surrounding properties involved in the incident
  - BA teams had to be deployed to each
  - LFRS nearly overwhelmed



Carisbrooke Gardens, Peckham 26th November 2009

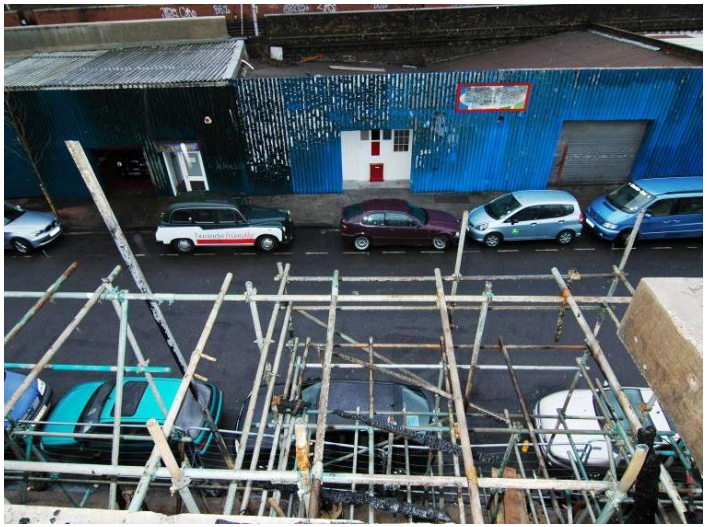
- Timber frame flats under construction
- Fire started on ground floor
- Cause under investigation
- Wind driven fire
- 5 additional premises involved
- Significant radiated heat emitted by fire
  - Difficult for LFB
  - Escape routes could have been affected

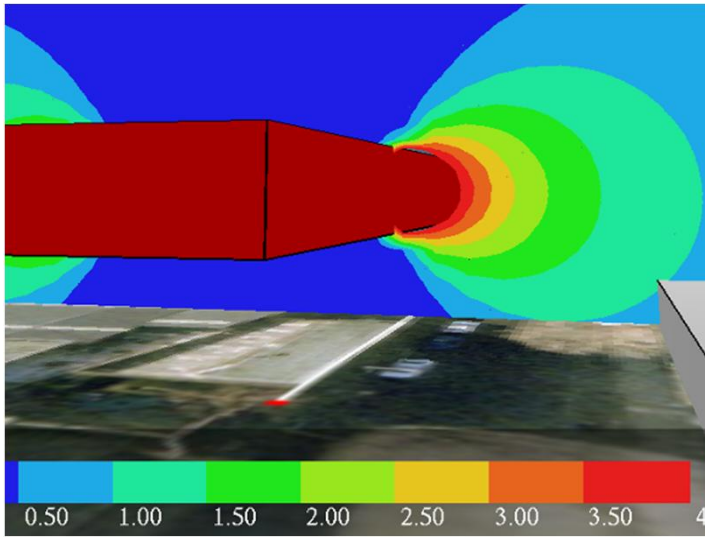
Carisbrooke Gardens, Peckham
26th November 2009



Camberwell Station Road, Camberwell 6th January 2010

- Mixed material flats under construction
- Fire started on second floor
- Cause under investigation
- No significant wind involved
- Significant radiated heat emitted by fire
  - Difficult for LFB
- Nearby premises suffered heat damage only

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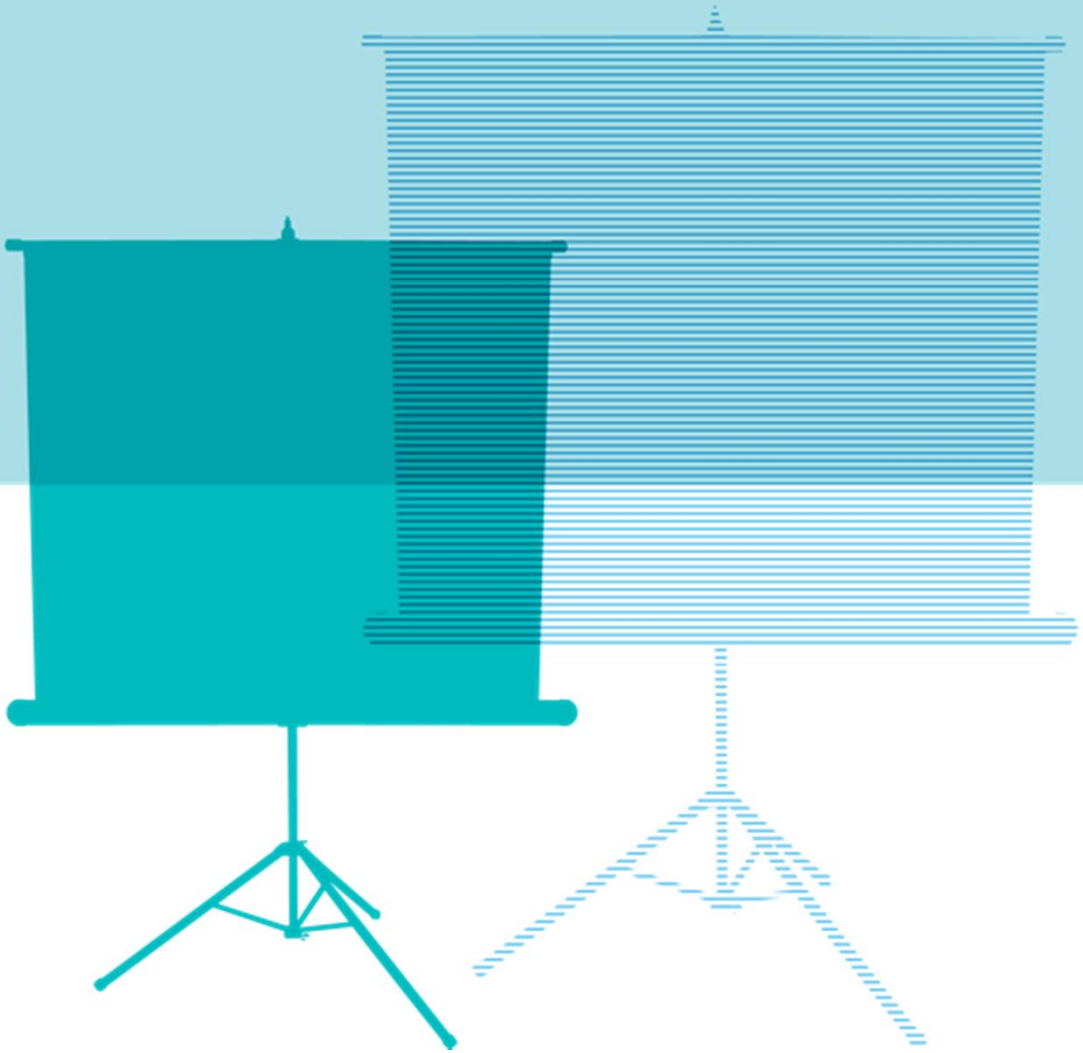
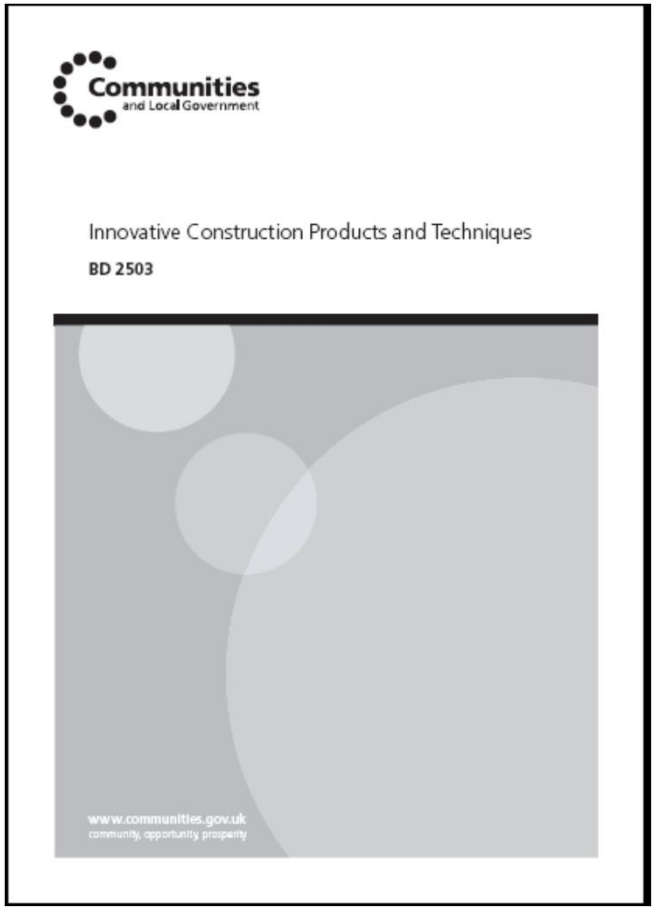
Recent research



Innovative Construction Products and Techniques


Communities
and Local Government

Innovative Construction Products and Techniques

BD 2503

www.communities.gov.uk
community, opportunity, prosperity

This report provides information on a range of issues concerning Innovative Construction Products and Techniques (ICPT), with particular regard to the fire safety and robustness of new and emerging products and systems.

The overall aim of the project is to assist in ensuring that construction innovation is embraced and encouraged in a way that maintains the required levels of fire safety and structural integrity.

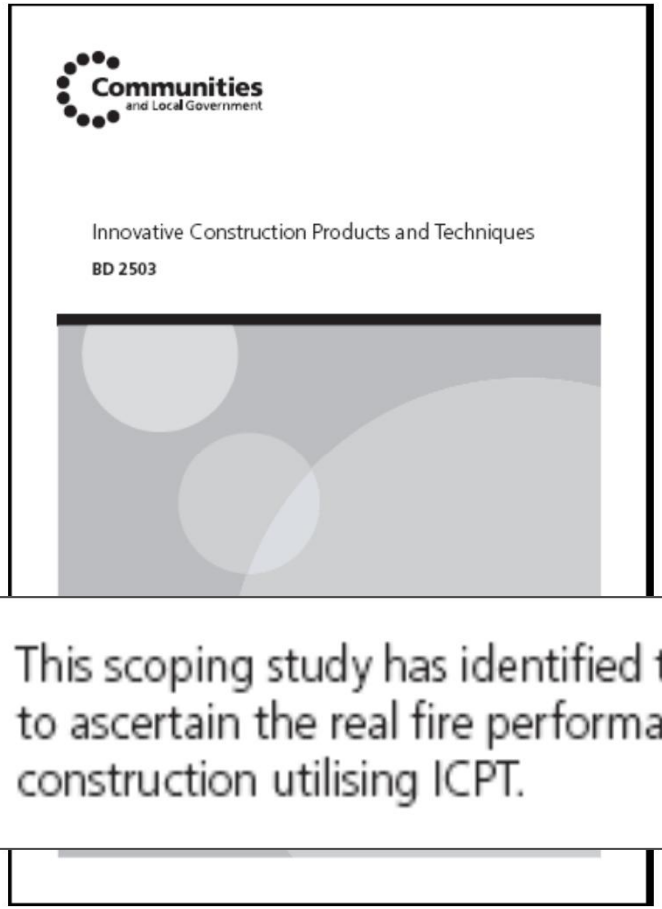
This report details the various types of ICPT and considers their comparative use by the market.

A steering group of representative stakeholders provided invaluable input to the project and considered a range of issues including fire spread, integrity of compartmentation, cavity barriers, external cladding, structural insulated panel systems (SIPS) and workmanship.

This scoping study has identified the need to undertake more detailed work to ascertain the real fire performance of several modern methods of construction utilising ICPT.

http://www.communities.gov.uk/documents/planningandbuilding/pdf/628281.pdf

Innovative Construction Products and Techniques



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Structural Insulated Panel systems (SIPs)

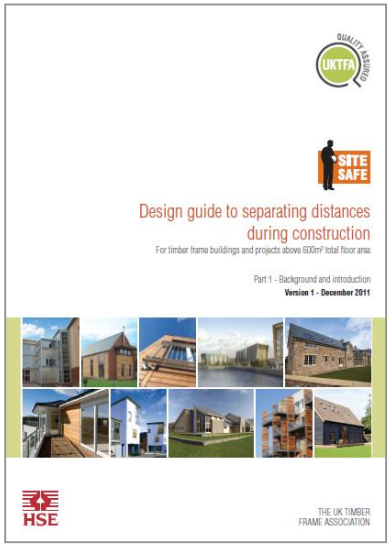
- Experimental research programme
  - Full scale tests
- Compared PUR and EPS filled panels
- Both capable of meeting recommendations of Approved Document B
- EPS more reliant on fire resistance of plasterboard than PUR
- Need to consider impact of service penetrations into panels

Engineered timber floor joists

- Experimental research programme
- Failure of engineered floor joists will occur more rapidly than in traditional timber
- Performance is dependent on the thickness of plasterboard specified for the required fire resistance period
  - Capable of surviving burnout provided suitable fire resistance of plasterboard

Conclusions

- Fire resistance must be carefully considered
- Combined properties of materials
- Cavity barriers
- Specialist systems come with specialist guidance
  - Follow the guidance!
  - Also applies to trades and DIY
- Every form of construction comes with risk
  - Be aware of the risks
  - Make sure they are appropriate to the application



Workmanship is crucial!

Thank you

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