Lakanal House – 2009 Fire

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Course Description

Lakenal House Fire 2009:
An examination of the causes for the development of the fire and conclusions drawn from the results
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Edward is the regional manager for LPCB, the testing and certification body within the BRE Group of companies.

Having Studied Fire Safety Engineering in Ireland he worked closely with building owners and local authorities on building compliance, before moving to the Middle East in 2010.

In his time in the Middle East Edward has worked as a technical manager focused on Site inspections an installations, system design and Fire Testing for a major manufacturer. After working in the fire protection industry in the UAE, coordinating and witnessing various fire test involving a range of systems. He has Joined BRE Global as regional Manager for the Middle East and North Africa. His experience has led to working with support from global colleagues while building relationships with local authorities and pursuing a network of peers within the region.
Content and Learning objective

1. Building overview
2. Building construction timeline
3. Scene examination
4. Reconstruction and computer modelling
5. Fire development and fire safety features
6. Prosecution under the RR(FS)O
Building overview
Building overview

- Constructed 1958-1960
  - Metropolitan Borough of Camberwell (later became Southwark)
  - Featured in Architects Journal
- Numerous refurbishments, including
  - Suspended ceiling introduced in corridor in 1980s
  - Security doors introduced in 1980s
  - Major refurbishment including window facades in 2006/2007
- Mixture of council rented and leasehold (right to buy) flats
Building layout

- 16 storeys
  - 14 accommodation stories
  - Undercroft and plant level
- Access corridors on odd numbered floors
- Escape balconies on even numbered floors
- Single staircase
  - 2 lifts (one working at time of fire)
  - Lobbies housing dry riser
- Cross ventilated lobbies and corridors
- Flats in ‘scissor’ arrangement
Building layout - Scissor Arrangement
Building layout - Scissor Arrangement

Figure 2 – Three-Dimensional diagram showing interlocking of flats and corridor
Flat layout

- Two storey maisonettes
- Bedrooms and bathroom on lower floor
  - On one ‘side’ of corridor
  - Access via corridor
    - Front door
    - Escape door
- Full height window façade sets on external envelope
- Living room and kitchen on upper floor
  - Across width of building and corridor
  - Emergency egress via two balconies
- Timber staircase within flat
  - Cuts into cross section of common corridor
Flat locations

79
65
53
37
Building construction timeline
Original Construction

- Part of Sceaux Gardens Estate
  - Construction 1955-1960

- LCC Means of Escape in Case of Fire 1954
  - Single staircase
  - Cross ventilated corridors
  - 2 means of escape from every accommodation room

- Showcased in Architects’ Journal 1960
  - State of the art
  - Best practice
1970s refurbishment work

- Windows replaced

- Records indicate:
  - timber frame window sets
  - Asbestoslux infill panels

- External surface of panels specified as ‘non-combustible’
1980s refurbishment work

- Installation of security doors
  - Impact on cross ventilation recognised
  - Requirement for minimum 0.5m² open grille area (+ 1m² manually opened) in approval

- Replacement of central heating system
- Introduction of suspended ceiling in common corridors

- Subsequent upgrading of suspended ceiling with ‘Panoflam’ ceiling panels
History of fires

- 1985
  - Flat 79
  - Significant damage to flat
    • Spalling of concrete
- 1988
  - Flat 95
  - Damage throughout flat
- 1997
  - Flat 81
  - Damage throughout flat

- Damage limited to flat of origin in all cases
2006-2007 refurbishment work

- Planned Preventative Maintenance
- Decent Homes

- Various repairs, renewals and redecoration works
- Renewal of windows
  - Removal of asbestos
  - Installation of new window sets
- Renewal of balcony doors
- Upgrade landlords electrics and rewiring in flats where required
- Installation of kitchen extractor fans
Scene Examination
Flat 65 – Origin and Cause

- Fire started in Bedroom 1
  - Room identified through witness testimony
  - Severe damage throughout room
- Arc mapping used
- Television identified as appliance first involved
- Faulty television switch identified as cause
- Accidental fire
Flat 65 – Fire development

- Severe fire throughout both floors
- Fully flashed over fire
- Limited damage to concrete structure
- Fire damage extending up external façade to flat above; Flat 79
9th Floor

- Severe smoke damage throughout
- Severe fire damage to front door of Flat 65
- Little fire damage to corridor
Flat 79

- Severe fire damage to lower floor
  - Significant damage to concrete structure
  - Internal staircase burnt away
  - Front door, escape door and corresponding frames burnt away
- Little damage to upper floor
  - Damage localised around staircase
  - Thick tarry smoke deposits on upper floor
  - Fatality in living room on upper floor
11th Floor

- Severe damage along entire length of north corridor
  - Deep charring throughout height of corridor
- Suspended ceiling significantly damaged and large sections collapsed on floor
- Fire spread via suspended ceiling across lobby to south corridor
Flat 81

- Burning through at stairs and panel above front door
- Light tarry smoke deposition throughout flat
- Five fatalities in bathroom
Flat 37 and Flat 53

- Severe fire damage in one bedroom of each of the flats
- Limited damage beyond bedrooms to remainder of flats
- No clear route of fire spread from fires above to fires here
Reconstruction and Computer Modelling
Preliminary modelling and testing

- Standard tests
  - BS 476 Part 7 – Spread of flame
    • Window panels
    • Door panels
    • Balcony panels
  - BS 476 Part 15 – Heat Release
    • Window panels
  - BS 6853 Annex B2 – Smoke toxicity
    • Window panels
- Preliminary modelling of area around Lakanal
  - Westerly wind
  - Effect of buildings upwind
Reconstruction
Reconstruction data

Symbols:
- △ = Thermocouple tree or column on window (No. TCs)
- TC-A = Thermocouple tree letter
- W-A = Window letter
- 8 = Instrumented door (No. TCs)
- 4 = Instrumented panel (No. TCs)
- D-A = Door (and associated panel where applicable) letter
- ⭐ = Heat flux meter
Modelling fire spread and effect on victims

- Development in Flat 65
- Spread to Flat 79
- Flat 79
  - Conditions within flat
  - Development affecting compartmentation
- Flats 37 and 53
  - Standalone fires
- Fire severity in 11th floor corridor
- Smoke spread to Flat 81 bathroom
  - Conditions within bathroom
Modelling smoke spread effect on fire fighting

- Previous modelling used as source term
  - Introduction of smoke into Lakanal ‘system’
- Interaction of smoke with
  - Prevailing wind
  - Cross ventilation
  - Leakage paths
- Effect on conditions within main stairwell and lobbies
Fire development and fire safety features
Composite panels

- Compressed resin outer layers and foam insulation core
- Class 3
- No fire resistance

- Ignited under flame impingement from burning flat below
- Burnt through in 4-5 minutes
- Introduced flaming on inside of flats

- Introduced during refurbishment 2006-2007, replacing asbestos
Balcony-flat doors

- Glazed upper half
- Composite panel lower half
- Aluminium frame

- Not fire resisting

- Introduced during refurbishment 2006-2007
- Replacement for fire resisting doors (full height)
Suspended ceiling in common corridor

- Laminated particle board (fire retardant)
- Timber supporting structure
- No sub-division of void above
- Significant quantity of fuel in void above

- Ceiling panels did not support flaming
- Timber structure and fuel above contributed significantly

- Introduced in 1980s for central heating works
Front doors and escape doors

- Appeared to be FD30
- No smoke seals

- Allowed smoke travel
  - into corridors from flats
  - into flats from corridors
  - into stairwell from lobbies

- Piecemeal replacement over life of building
  - Some FD30, others not
Panels above front doors

- Timber
- Some fire resistance, possibly as much as 30 minutes against standard furnace
- Originally part of doorset between flat and corridor
- Communicating with suspended ceiling void once this was introduced
Boxing in under stairs

- Sheets of Supalux nailed to underside of timber stairs

- Negligible fire resistance
  - 2-3 minutes

- Original installation date not known
- Unlikely to be original, though similar arrangement previously in place
Corridor walls – fire resistance

- Concrete – likely 60 minutes FR
- Multiple penetrations in all flats
  - Original heating pipes
  - New heating pipes
  - Cabling
- Incomplete and absent fire stopping
- Allowed smoke to pass through
Corridor walls – reaction to fire

- Multiple layers of paint built up since original construction
- Some layers flame retardant
- Significant contribution to fuel load in corridor
Cross ventilation scheme

- Original feature
  - ‘State of the art’ at the time of construction
- Compromised by installation of security doors in 1980s
- Reduced ventilation area
  - Not enough free area to clear smoke
  - But not compartmented either
Bathroom extraction

- Original feature
- No separation of extraction between flats
  - Standard practice at time
- Provided route for smoke spread from Flat 53 to Flat 81
Flat 79 modifications

- Wall removed
- Risers in staircase removed
- Both done by occupant in mid 1990s
- Influenced fire spread
Prosecution of London Borough of Southwark under Regulatory Reform (Fire Safety) Order 2005
Reminder of Deficiencies

- No Fire Risk Assessment
- Composite panels in windows
- Doors onto balconies
- Front doors and escape doors
- Stairwell doors
- Suspended ceilings
- Panels above flat front doors
- Boxing in

- Fire stopping in corridor walls
- Multiple layers of paint on corridor walls
- Cross ventilation
- Bathroom extraction system
- Modifications within flats
No Fire Risk Assessment

- No fire risk assessment of Lakanal had been carried out prior to 3rd July 2009

- Despite Lakanal having been identified as being one of the highest risk blocks on the Sceaux Gardens Estate due to its external façade
Composite panels

- Performance much less than ought to have been
  - Class 3 instead of Class 0
- Promoted floor-to-floor fire spread in the building

BUT

- LB Southwark were led to believe these panels were compliant
  - Building manual
  - FENSA certificates
Balcony-flat doors

- Ought to have been fire resisting (were originally timber FD30)
- Provided negligible fire resistance due to composite panels

BUT

- No specific guidance on the balcony arrangement at the time (sleeping accommodation guide)
- Balconies only an alternative means of escape (assuming corridor protected)
Suspended ceilings in corridors

- Timber structure introduced a very large fuel load into the corridor space
- There was no subdivision of the void above the corridor

Noting…

- Inspection would have had to look above ceiling
- But ceiling was provided with inspection hatches and ceilings were opened up during 2006/7 refurbishment
Front doors and escape doors

- Appeared to be FD30
- Had clearly been replaced piecemeal over the life of the building (due to damage to doors)
  - Various door constructions
  - Some hollow core doors
- No strips or seals found on any doors
Stairwell doors

- Appeared to be FD30
- No strips or seals found on any doors
Panels above front doors

- Likely to have been compliant at time of build
- Became non-compliant upon introduction of suspended ceiling

BUT

- Would have required identification as part of intrusive inspection as well as a means of identifying the period of fire resistance provided
Boxing in under stairs

- Negligible fire resistance
  - 2-3 minutes
- Fell so far short of passive fire protection guidance that any professional seeing these ought to have identified a problem
Corridor walls – fire resistance

- Found to be inadequate in areas relevant to the deaths during the fire
- However little evidence collected in areas remote from fire
Corridor walls – reaction to fire

- Multiple layers of paint built up since original construction
- Significant fuel load in corridor

BUT

- Building manual indicated that corridors had been painted Class 0
Cross ventilation scheme

- Original feature
  - ‘State of the art’ at the time of construction
- Compromised by installation of security doors in 1980s
  - Reduced ventilation area
    • Not enough free area to clear smoke
    • But not compartmented either

BUT

- No specific guidance on cross ventilation at the time
Bathroom extraction

- Original feature
- No separation of extraction between flats
  - Standard practice at time
  - Provided route for smoke spread from Flat 53 to Flat 81

**BUT**

- Not fire protection
- Also located within flats (but a common aspect of the premises)
Flat 79 modifications

- Wall removed
- Risers in staircase removed
- Both done by occupant in mid 1990s
- Influenced fire spread

**BUT**

- Located entirely within flat – not covered by the Order
Flat 79

- 1 victim
- Fire spread via external façade from Flat 65
- Confusion between victim and 999 operator
- 5 victims
- 2 floors above floor of fire origin
- Along corridor from Flat 79
- Significant fire spread
- Delays in firefighters gaining access
Plea and Sentencing

- LB Southwark pleaded guilty to all charges
  - Failure to carry out a risk assessment
  - Specific failings in relation to
    - The risk of fire spreading more than it ought to
    - Means of escape being compromised
    - Means for firefighting being compromised
  - The building was in a poor state of repair

- Ordered to pay £570,000
  - £270,000 fine (1/3 discount from £400,000 for a local authority)
  - £300,000 costs
Conclusions
Conclusions

– Building considered ‘state of the art’ when built
– Featured in Architects’ Journal
– Large number of issues crept in over a number of years
– Overall worsening of conditions through years of neglect
– No one single factor sufficient to have caused death in isolation
Prosecution decision – On the one hand...

- The offences committed were both numerous and extremely serious

- The offences were not causative of the deaths (i.e. they alone were not responsible for the deaths)

- But had these offences not occurred, five of the six deaths would have been prevented.
Prosecution decision – On the other hand…

- At the time of the fire, Lakanal was only one example of the issues that were endemic across the housing sector
  - Lack of concern for fire safety (it won’t happen to me)
  - Lack of awareness concerning the Order

- This could have happened to any local authority or housing association in the UK

- But improvements have stemmed from changing mindsets – they are not hardwired
Prosecution decision – On the other hand…

- The London Borough of Southwark has gone on to become one of the leading local authorities in terms of fire safety.

- It has invested heavily in ensuring the highest standards of fire safety for residents in its premises.
Thank you