

8:45-10:15 Uhr

Vortrag 1

# BRAND SCHUTZ FORUM MÜNCHEN

22. November 2019

ANERKANNTE FORTBILDUNGSVERANSTALTUNG  
DER BAYERISCHEN INGENIEUREKAMMER-BAU

Hochhausbrand Grenfell Tower –  
Erkenntnisse für den Brandschutz  
mehrgeschossiger Gebäude

Referent:

Prof. Dr.-Ing. Michael Reick

Fachgebietsleiter Vorbeugender Brand- und  
Gefahrenschutz, Landesfeuerwehrverband Baden-  
Württemberg

Honorarprofessor der Hochschule Biberach  
Kreisbrandmeister des Landkreises Göppingen



90 Minuten, inkl. Diskussion

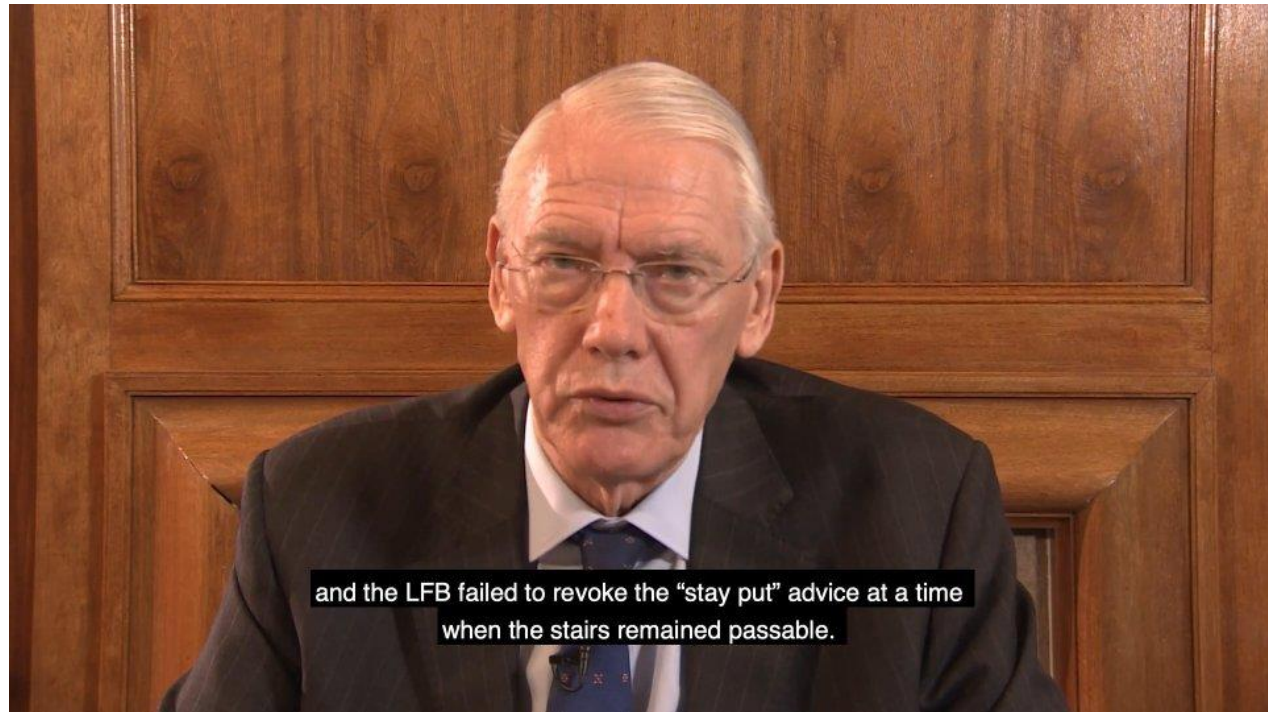
*Alle nachstehenden Bilder sind der  
offiziellen Homepage der  
Grenfell Tower Inquiry entnommen*



Grenfell Tower Fire – London - 14.06.2017

# Aufarbeitung

- ***14.06.2017 - Brandereignis***
- GTI, Phase 1 – Abschlussbericht Okt. 2019
- GTI, Phase 2 – Anhörungen ab 2020
- Parallel: Staatsanwaltschaftliche Ermittlungen
- Danach: Zivilrechtliche Verfahren
- Eingereicht: Zivilklage in den USA (Juni 2019)



# Fakten

- Baujahr 1972 / 2015+2016 Saniert
- 67 m hoch / 24 Stockwerke /
- 129 Wohnungen (6 pro Stockwerk von 4-23)
- 400 Bewohner
- Ein zentraler (geschützter) Treppenraum an einem (geschützten) Geschossflur

# Fakten

- 0050 Brandausbruch
- 0054 Notruf
- 0100 Eintreffen erster Löschzug
- 0114 Wasserabgabe
- 0120 „Feuer (in Küche) aus“
- ...
- 71 (72) + x Todesopfer / 70 Verletzte

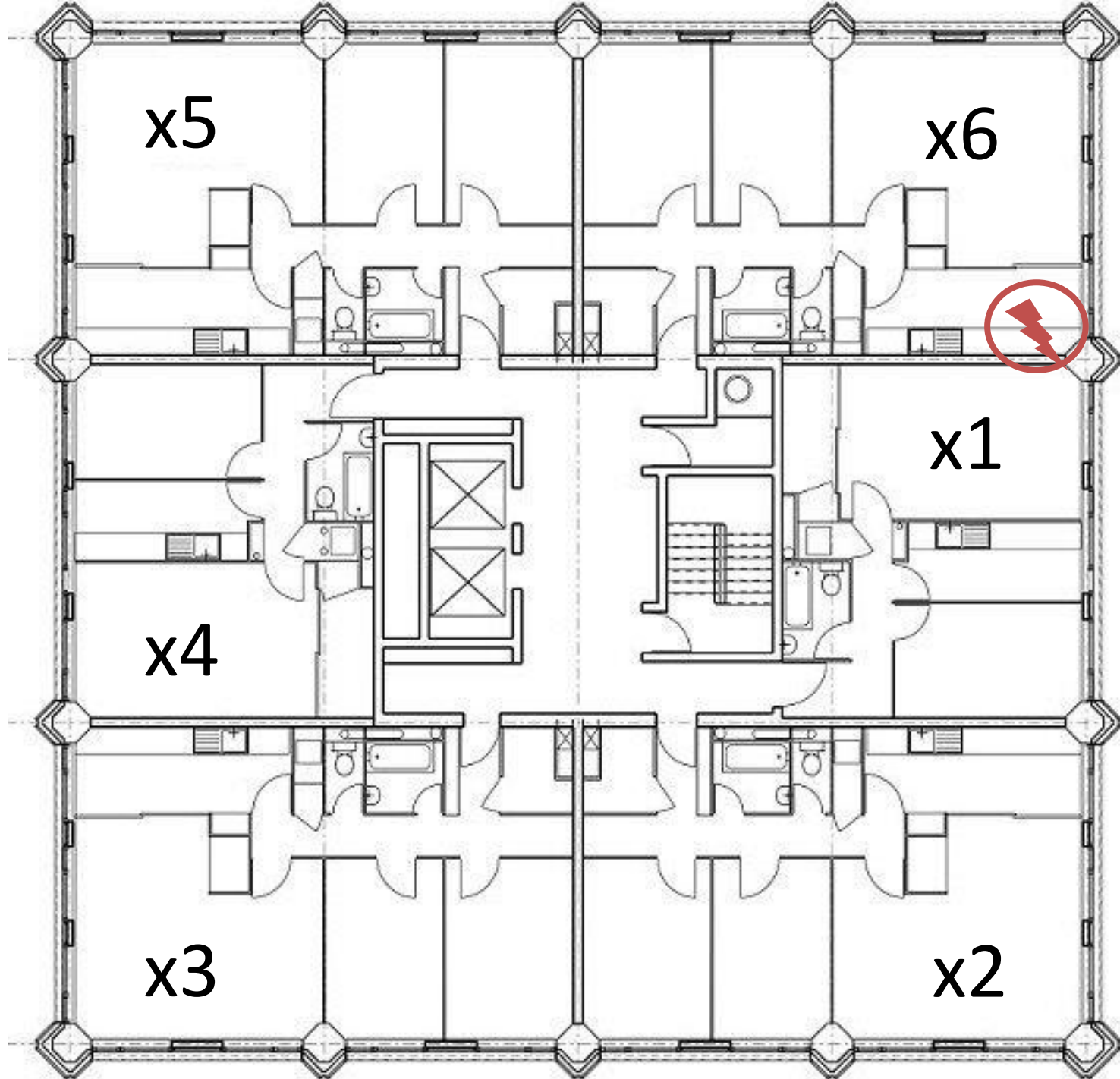
# Baumängel

- Aufzüge
- Entrauchungsanlage (Auslegung / Funktion)
- Trockene Steigleitung
- (Kein Gebädefunk)
- Brennbare Teile der Fassade (ACP)
- Brandschutztüren (T30 de facto nur T15)
- Fassade (ACP / Materialien / Fehlende Teile / ...)

# Sicherheitskonzept

- **Grundannahme:**  
**Brand in einer Nutzungseinheit!**  
**Brand auf einer Etage!**
- Stay Put Policy
- Nur ein innenliegender („geschützter“) Treppenraum ohne Vorraum und ohne Überdruckventilation
- Treppenraumtüren (T60) und Wohnungseingangstüren (T30)





# First Image of Fire

01:05



# First Evidence of Spread to Cladding

01:09





1:16



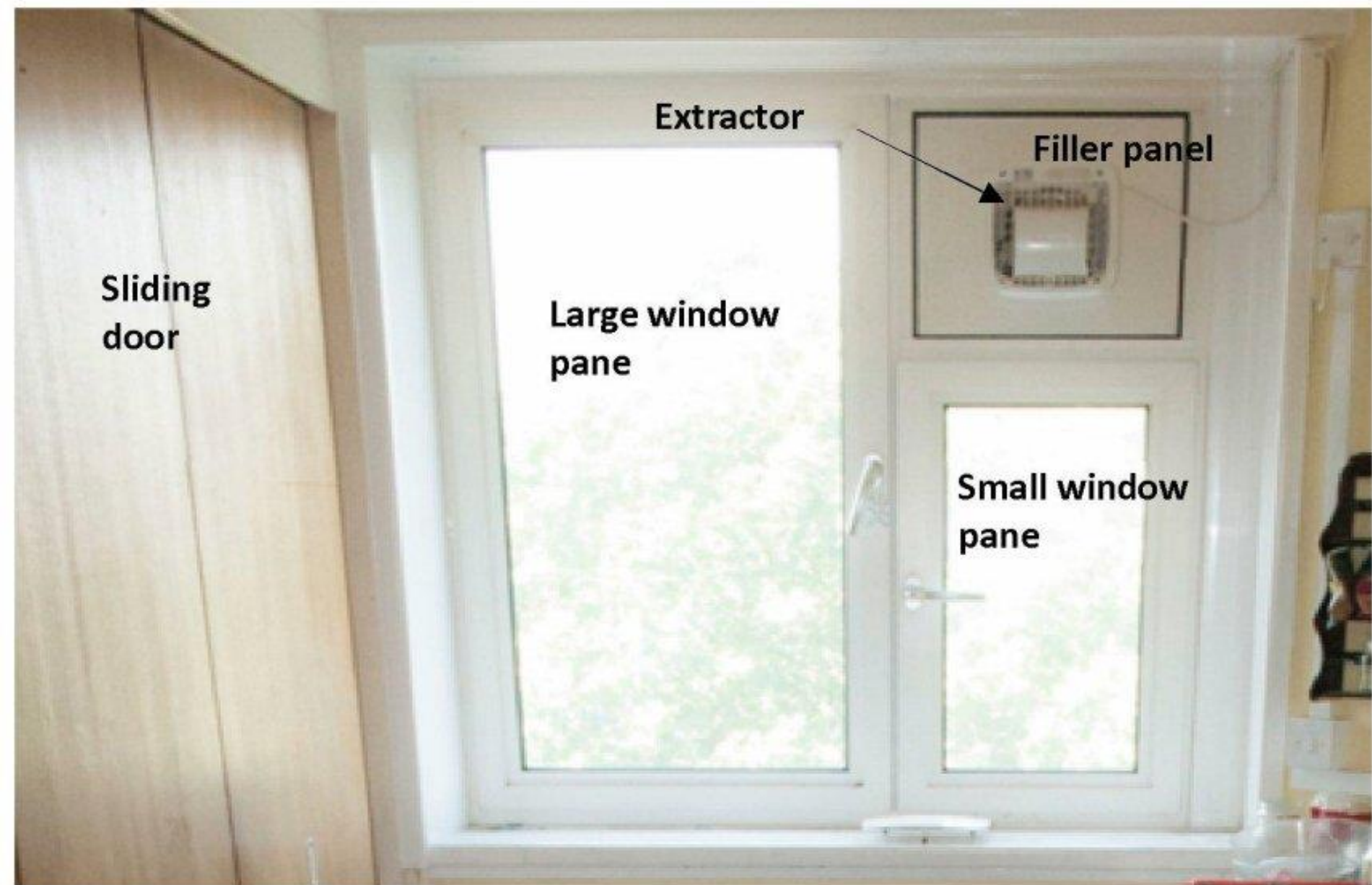
**Sliding  
door**

**Extractor**

**Filler panel**

**Large window  
pane**

**Small window  
pane**



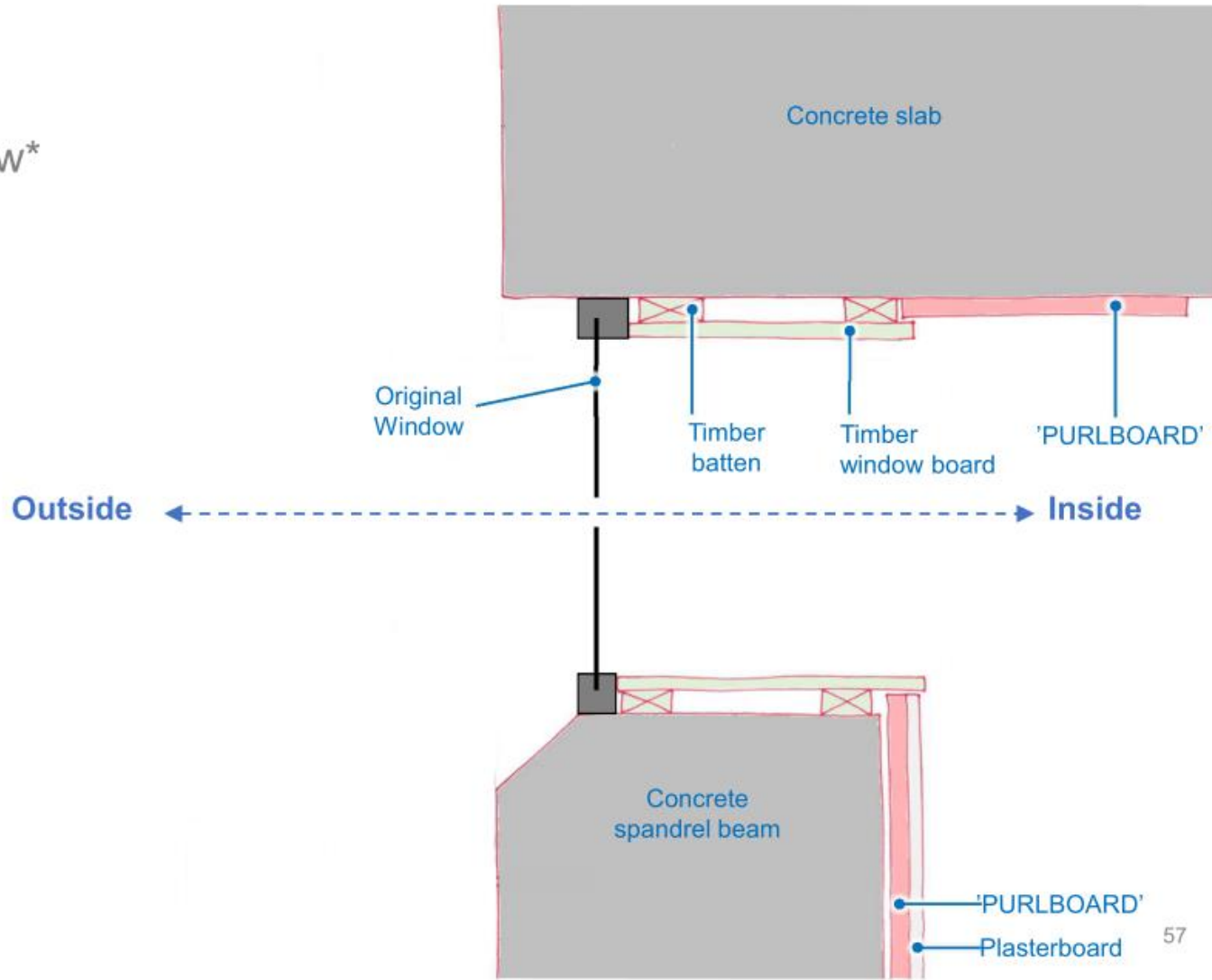
# Fire Spread to Top of East Face

01:29



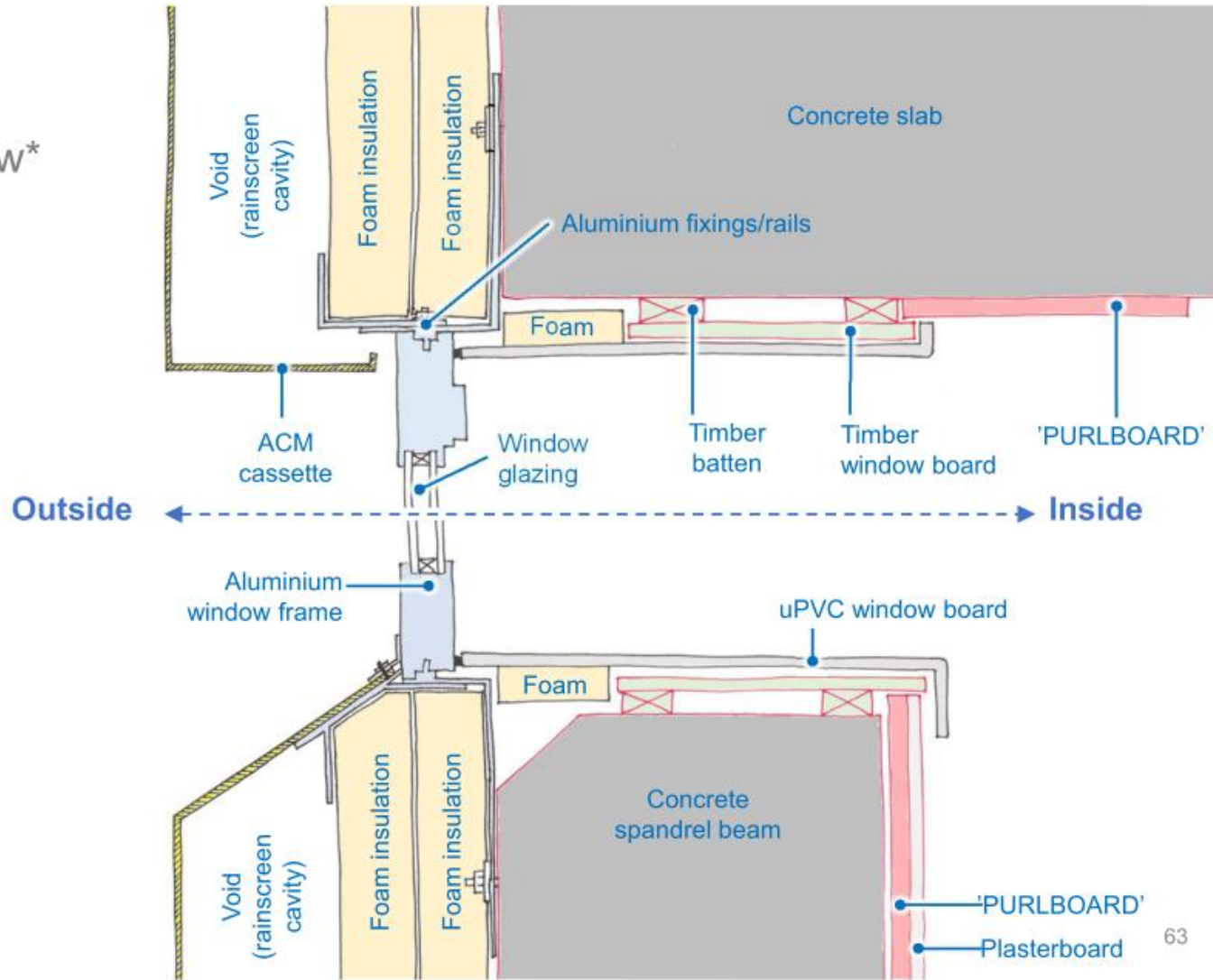
# Vertical Section

Through Kitchen Window\*



\*Indicative sketch – not to scale

# Vertical Section Through Kitchen Window\*

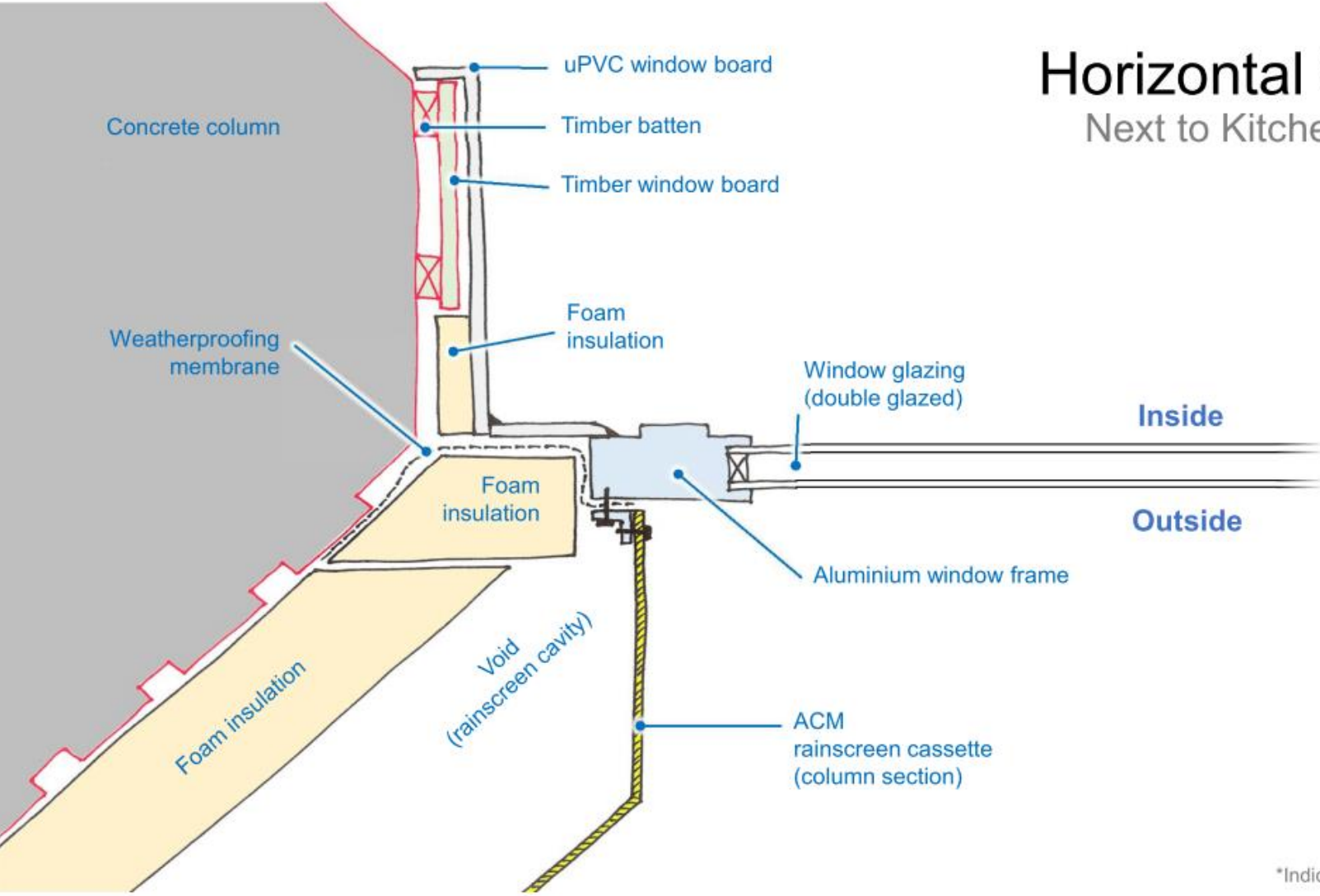


\*Indicative sketch – not to scale

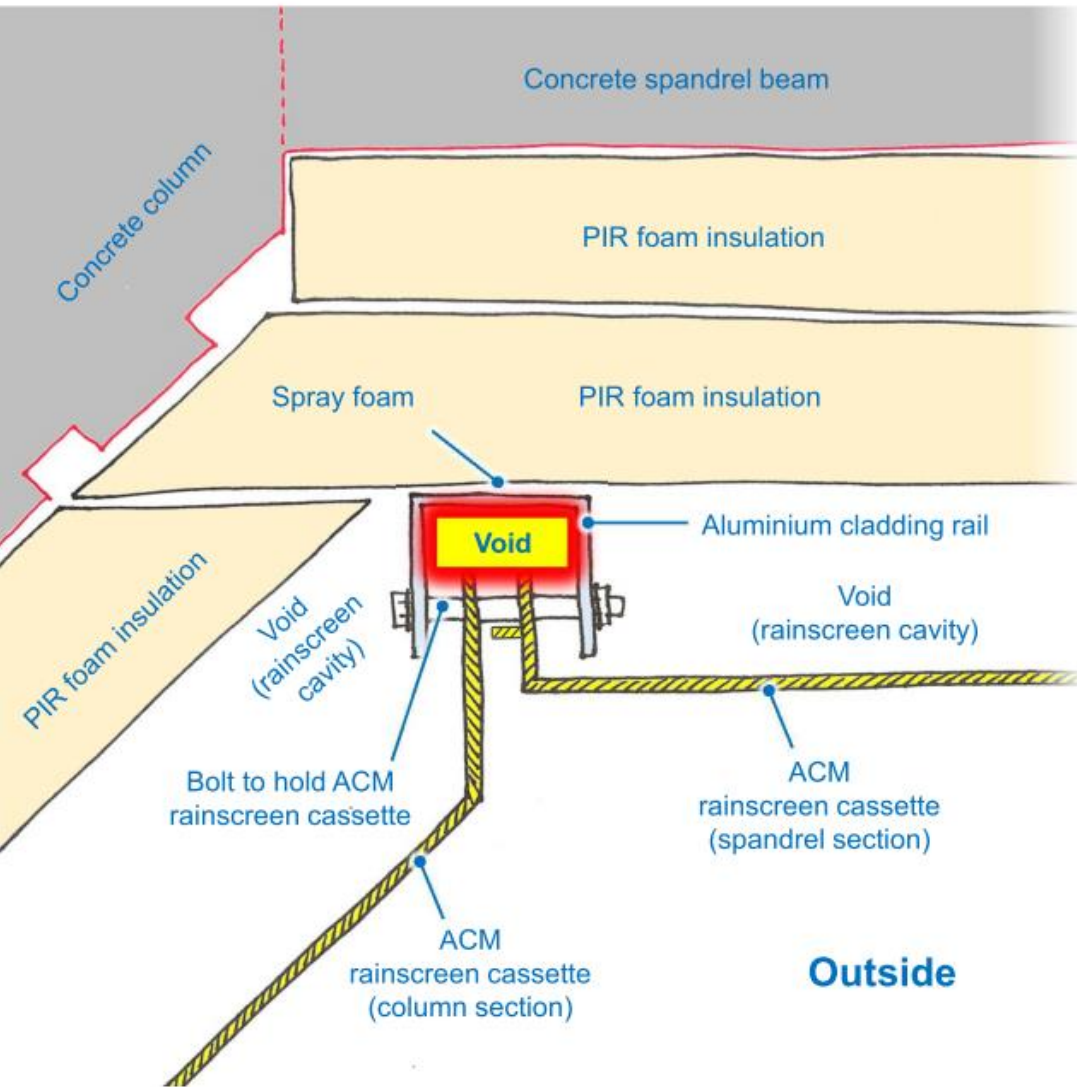


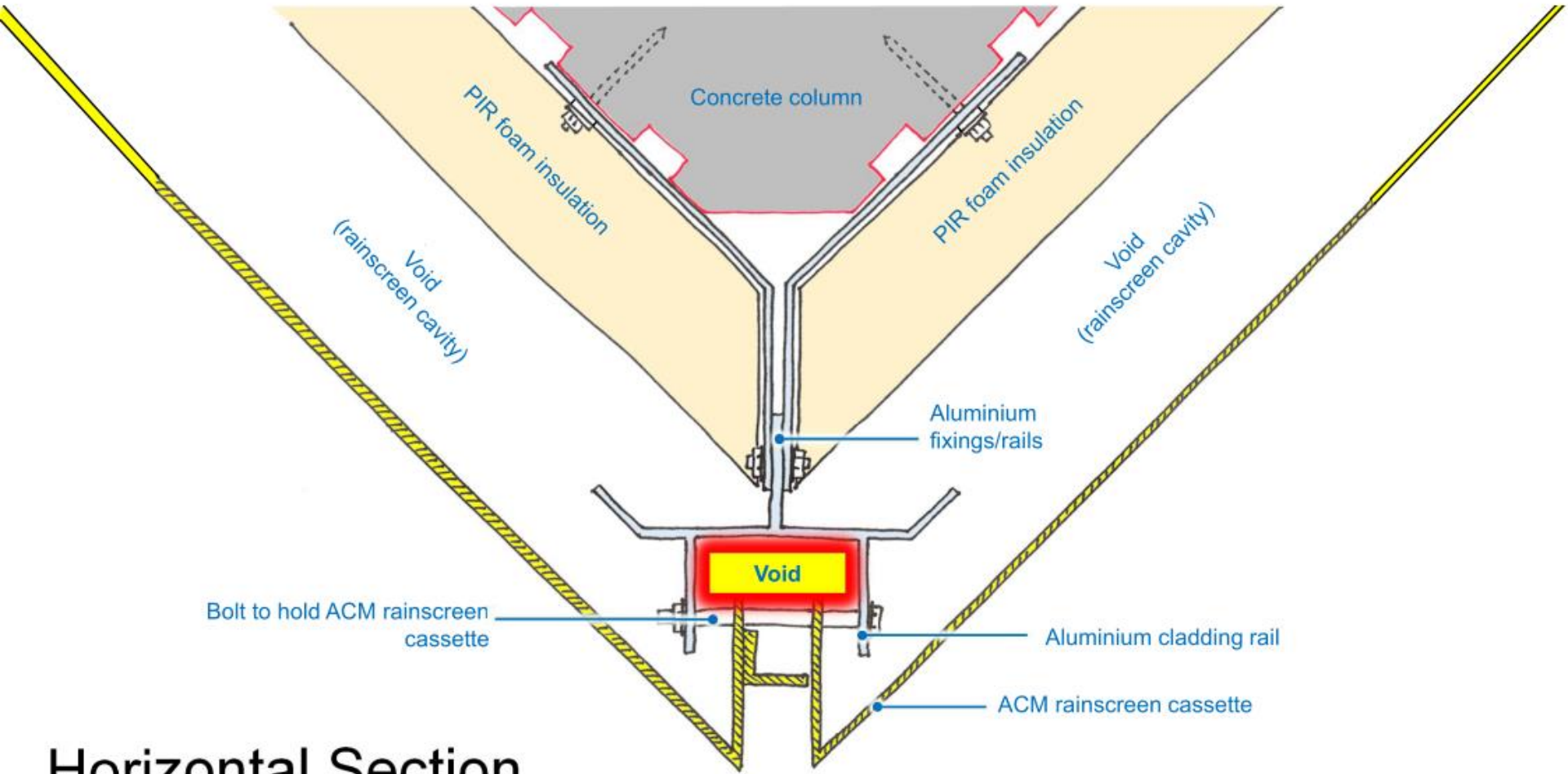
# Horizontal Section

Next to Kitchen Window\*



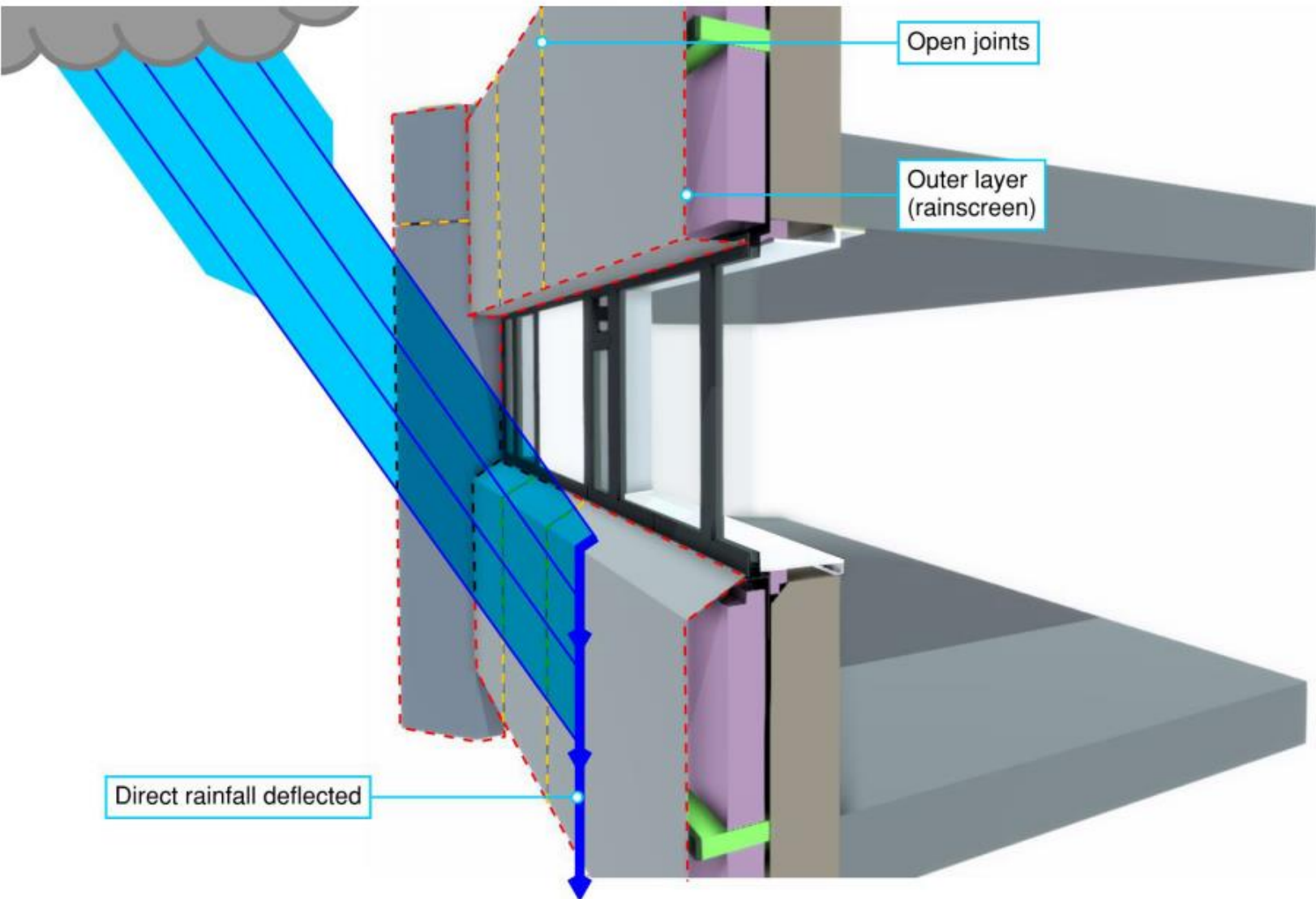
# Horizontal Section Below Kitchen Window\*





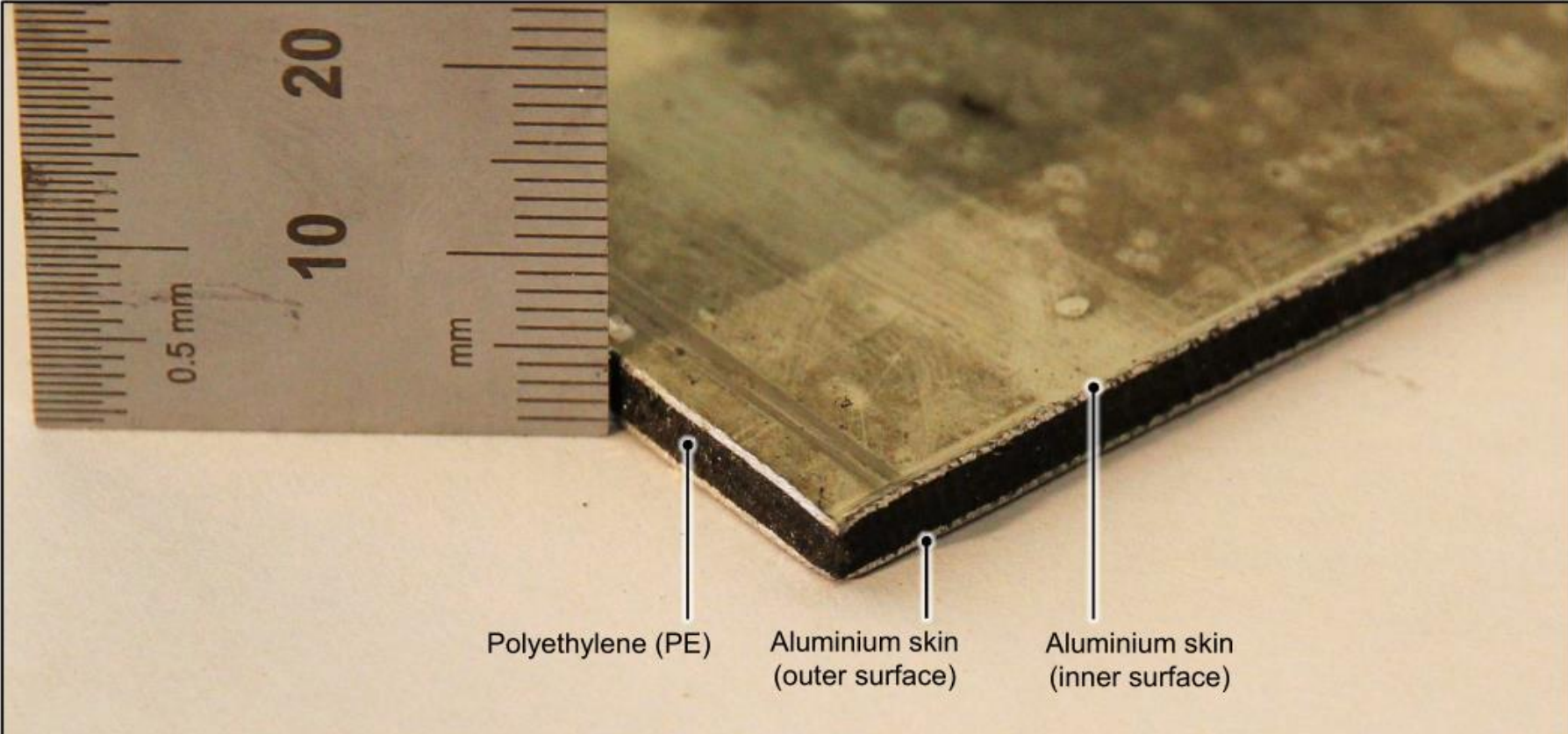
**Horizontal Section**  
at the Column Tip\*

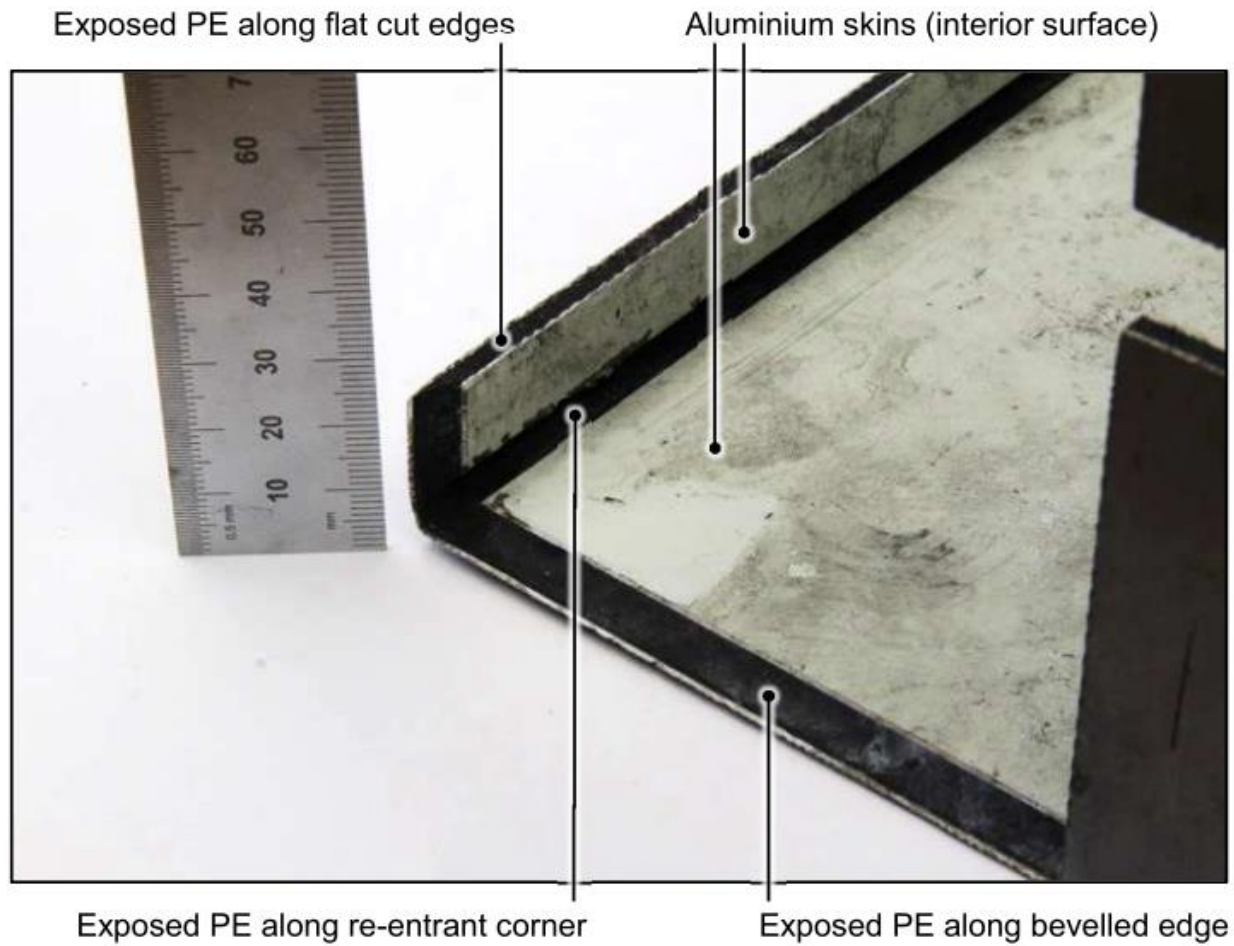
# Rainscreen system: Outer layer



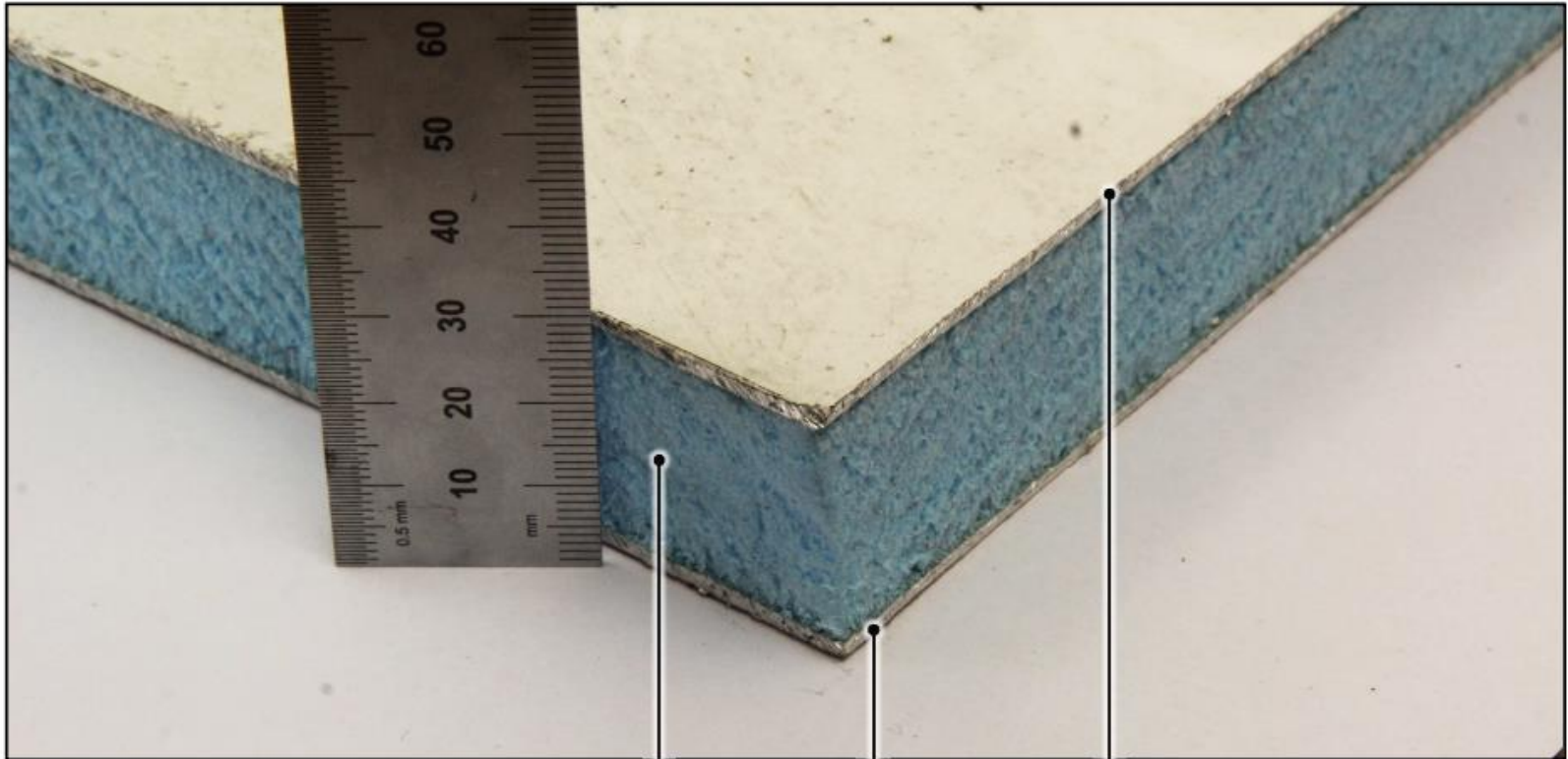
# Reynobond PE

Rainscreen Cassettes & Architectural Panelling





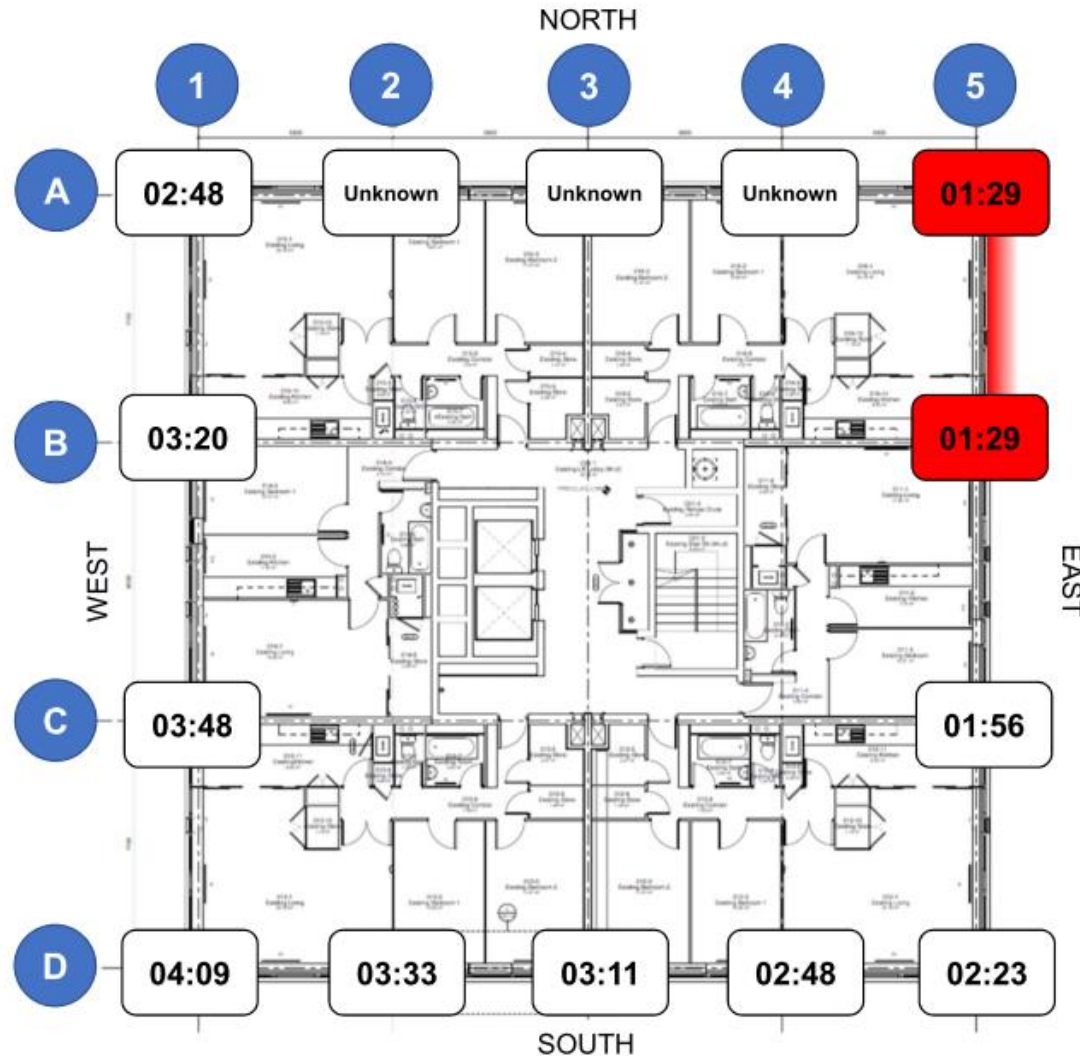
# Window Infill Panels



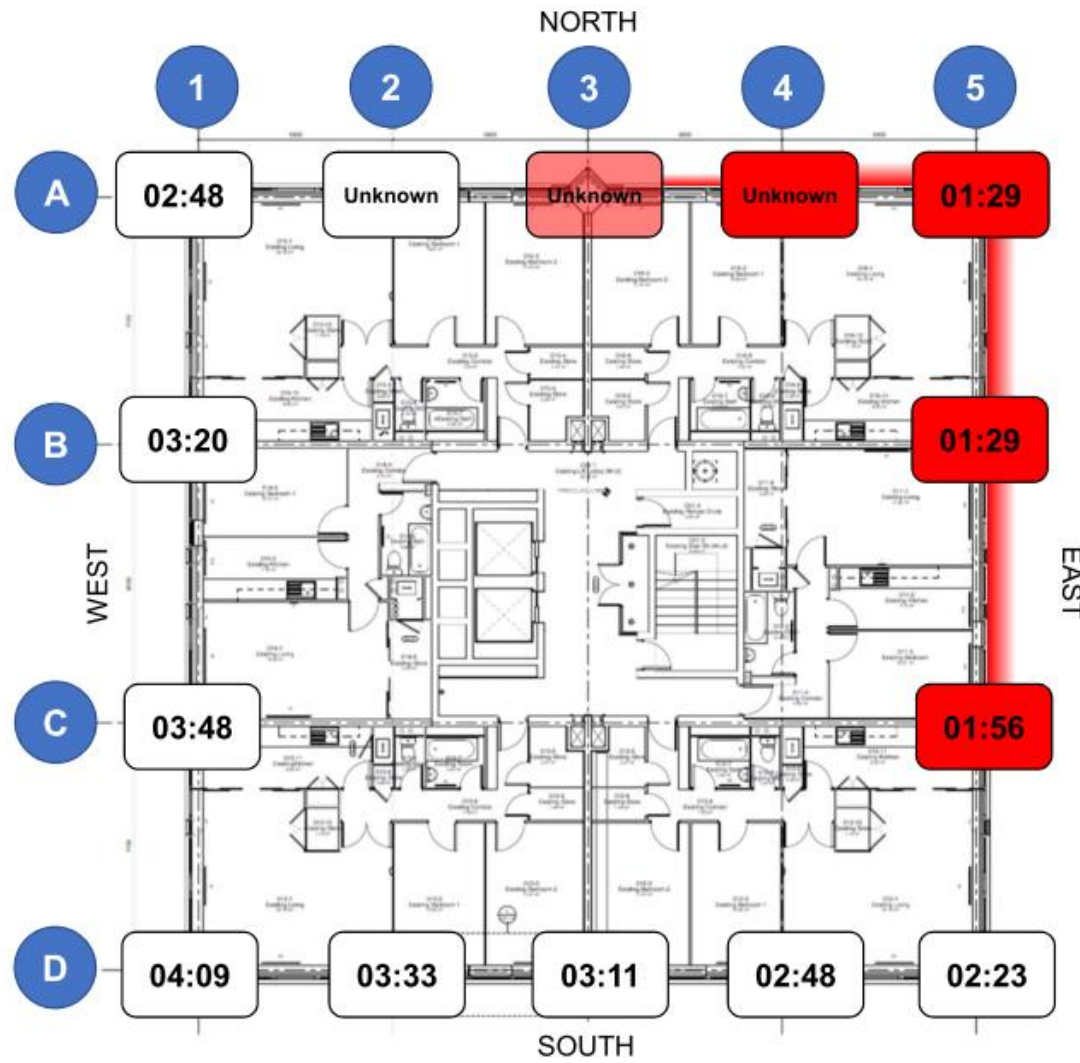
PS foam insulation  
core

Aluminium  
sheet

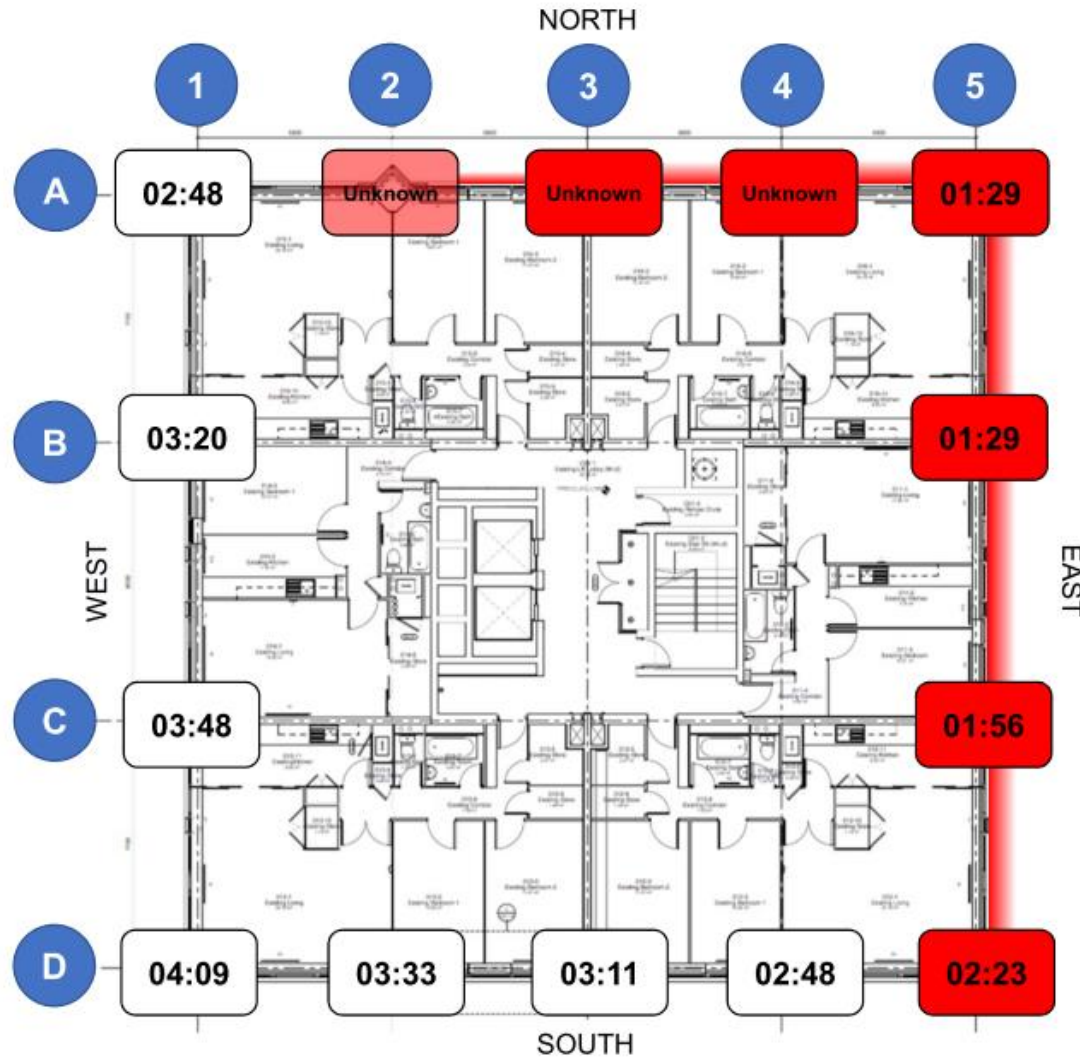
Aluminium  
sheet



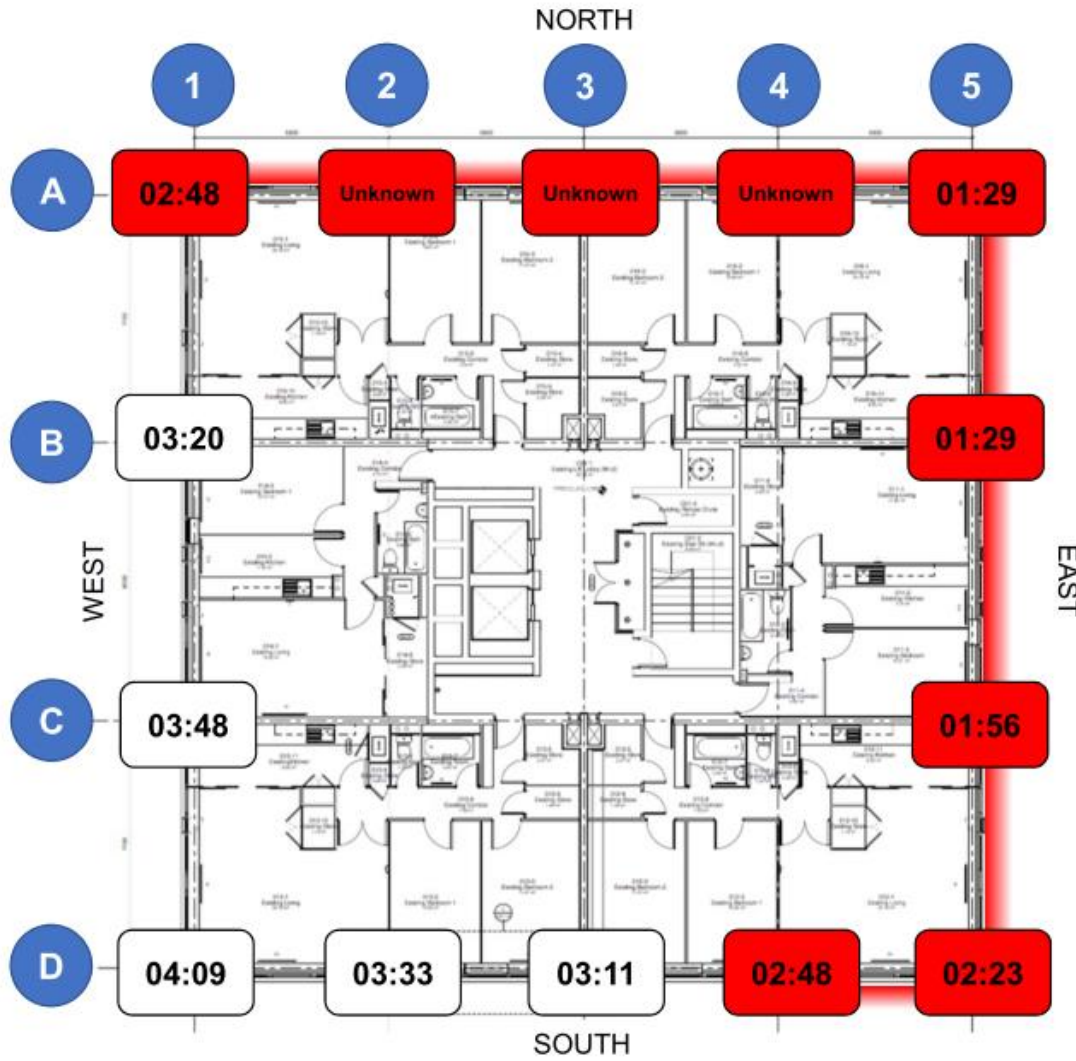




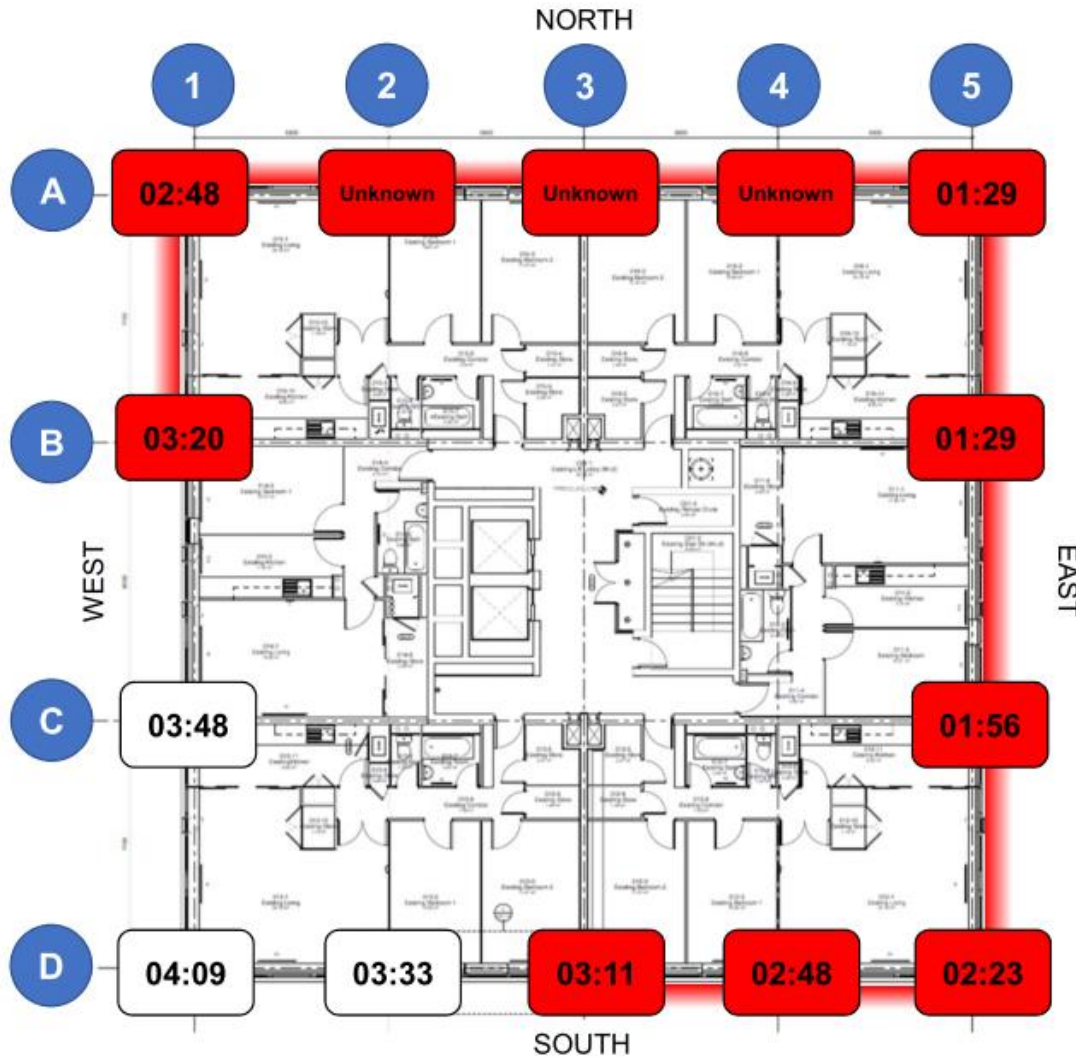
01:56



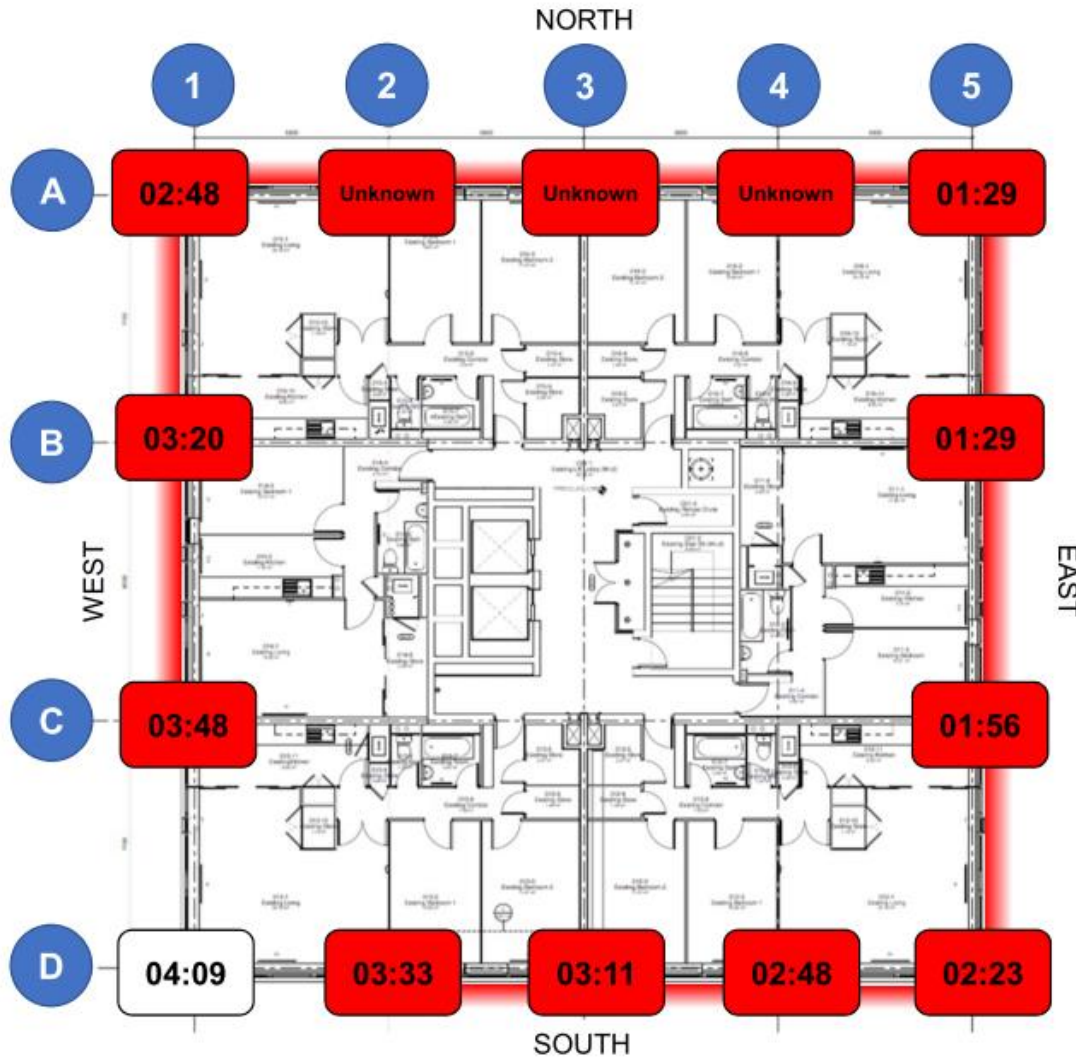
02:23



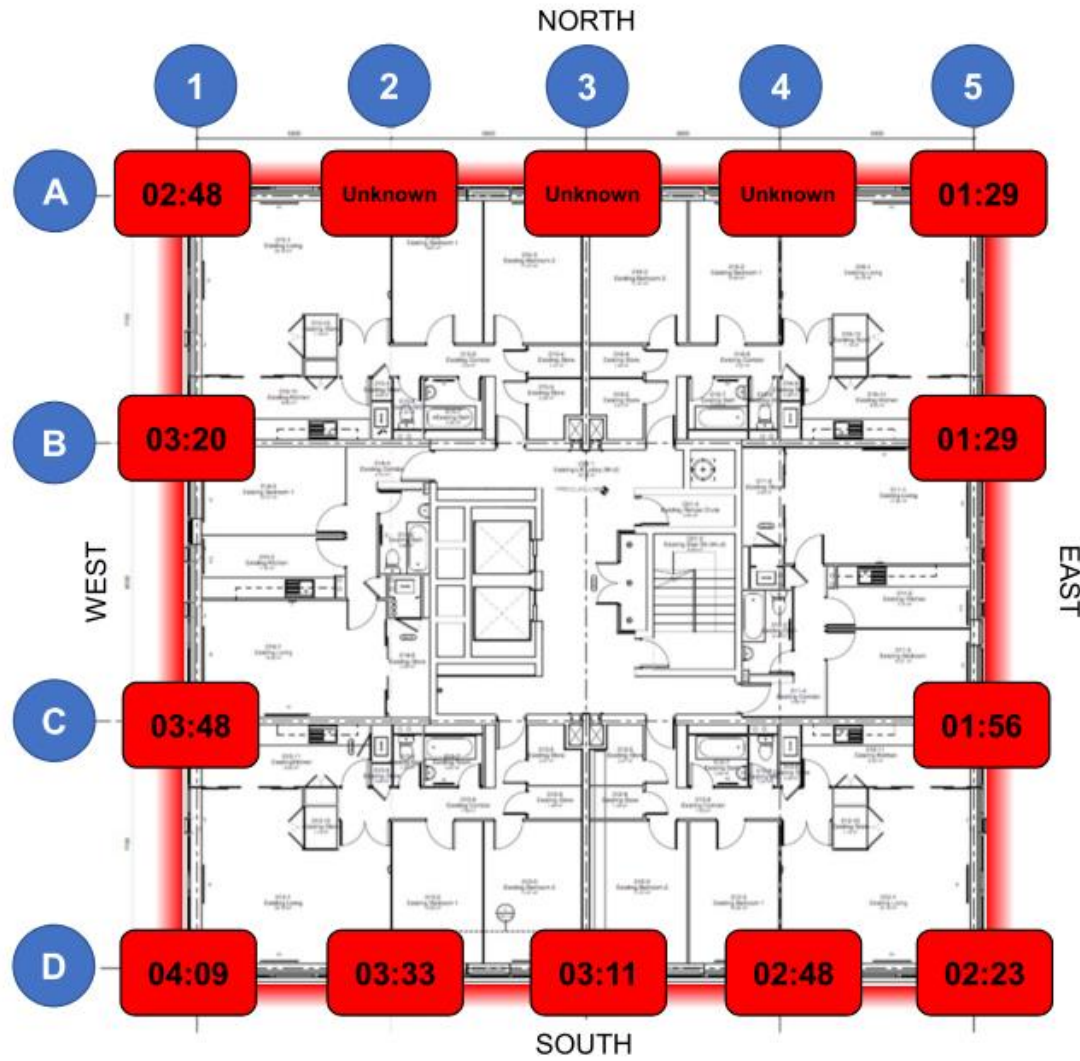
02:48



03:20



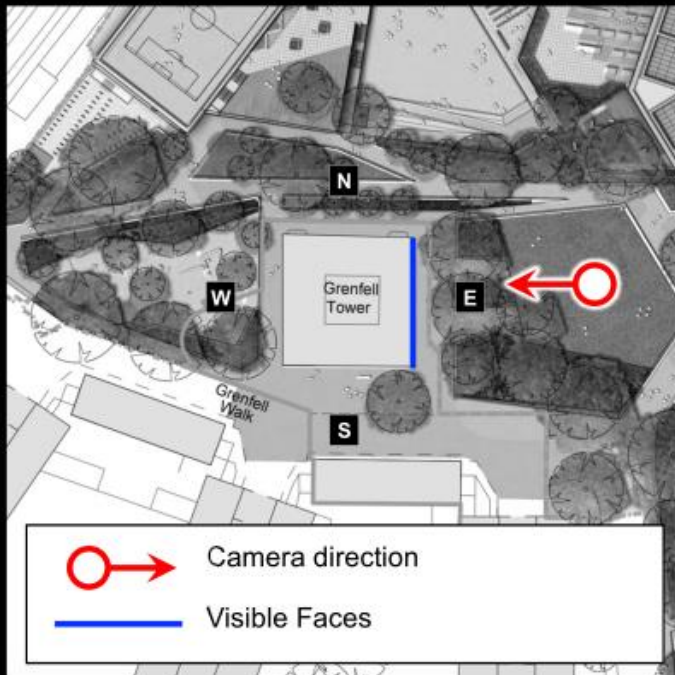
03:48

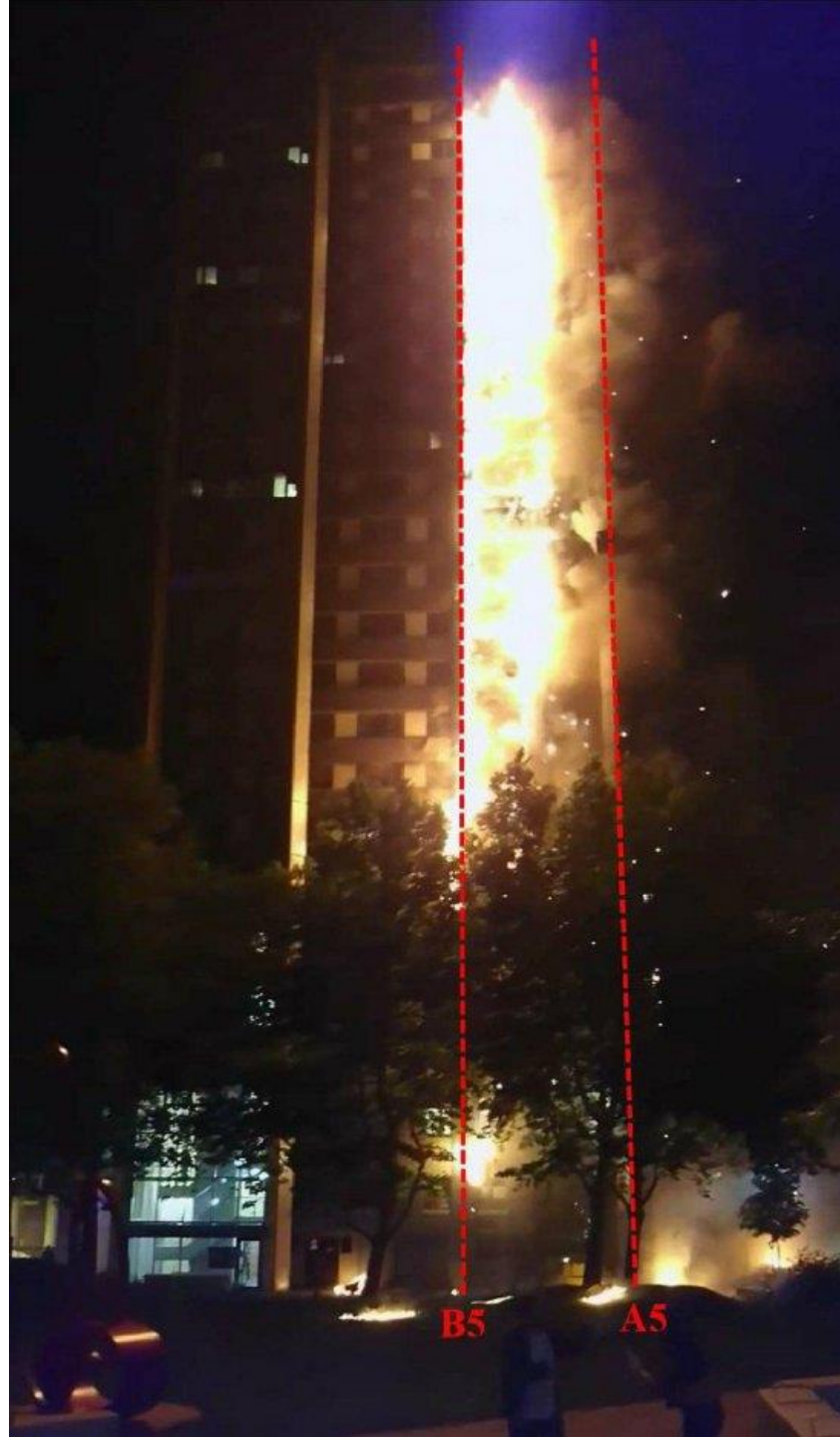


04:09

# Image 1

Sometime between  
01:29 and 01:56 (closer to 01:29)

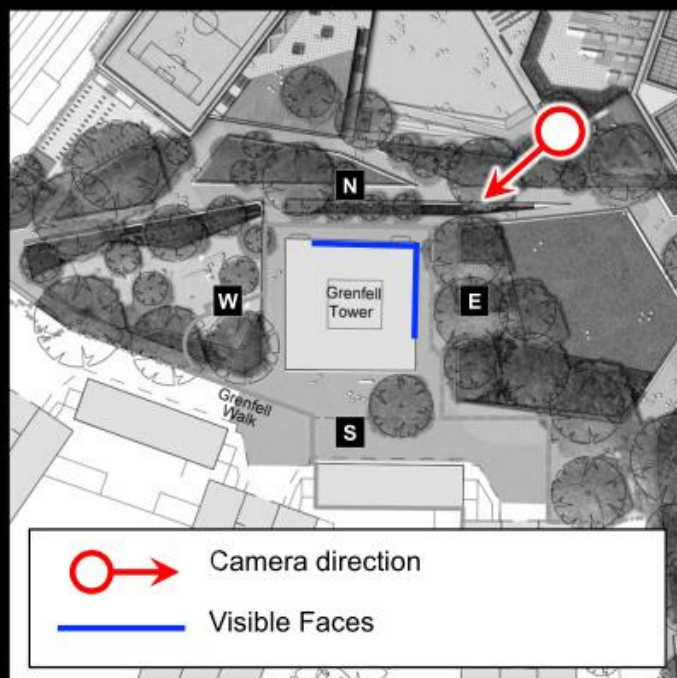






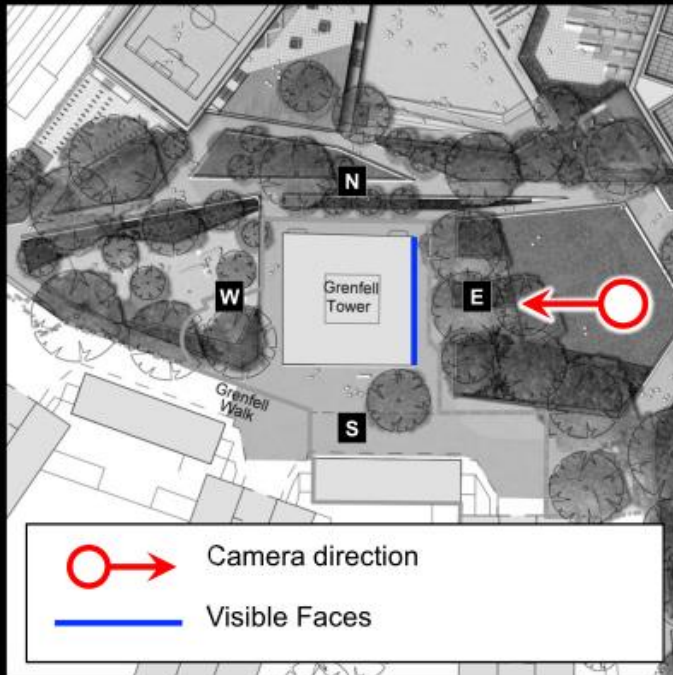
# Image 2

Sometime between  
01:56 and 02:23 (closer to 01:56)



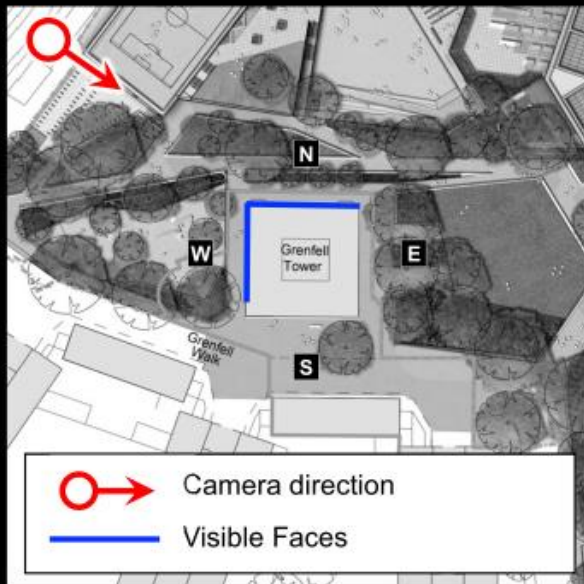
# Image 3

Sometime between  
01:56 and 02:23 (closer to 02:23)



# Image 7

Sometime between  
01:29 and 01:56  
(estimate)







04:20 BST



04:43 BST



05:16 BST



North

West



South



East



# BS9991 Fire safety in the design, management and use of residential buildings – Code of practice

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Whilst a simultaneous evacuation is normally unnecessary (see E.1 regarding stay put strategy), there will be some occasions where operational conditions are such that **the fire and rescue service decide to evacuate the building**. In these situations the occupants of the building will need to use the common stair, sometimes whilst fire-fighting is in progress. As such, the measures in this British Standard for the protection of common stairs are designed to ensure they remain available for use over an extended period.

## 26.1.1 General

In residential buildings designed with a stay put strategy (see E.1), additional protection to the staircase should be provided in the form of a smoke control system.



## 27 Fire resistance

### COMMENTARY ON CLAUSE 27

*For the purposes of complying with the recommendations for means of escape in case of fire, a 30 min period of fire resistance is generally considered adequate. However, increased periods of fire resistance might be necessary: firstly to allow a fire in a dwelling to burn out while occupants of other dwellings remain in place (see E.1 regarding stay-put strategy), and secondly to provide adequate safety for fire-fighting.*

## 29.2 External fire spread over the external faces of buildings

External walls should be constructed using a material that does not support fire spread and therefore endanger people in or around the building.

Flame spread over or within an external wall construction should be controlled to avoid creating a route for rapid fire spread bypassing compartment floors or walls.

**This is particularly important where a stay put strategy (see E.1) is in place.**

Combustible materials should not be used in cladding systems and extensive cavities.


External wall surfaces near other buildings should not be readily ignitable, to avoid fire spread between buildings.


# Fire Action - GRENFELL TOWER




There is a "stay put" policy for residents unless the fire is in or affecting your flat

## IF YOU DISCOVER A FIRE IN YOUR FLAT/BLOCK

- 
1. Leave at once shutting the doors behind you.
  2. Use the staircase and exit the building.

- 
3. Telephone the Fire Brigade by dialling "999" or "112" and advise -  
" Fire at Grenfell Tower, Lancaster West Estate, W11 1TQ"  
Wait for the Fire Brigade to arrive. Do not re-enter the building

## IF YOU ARE SAFELY WITHIN YOUR FLAT & THERE IS A FIRE ELSEWHERE IN THE BLOCK

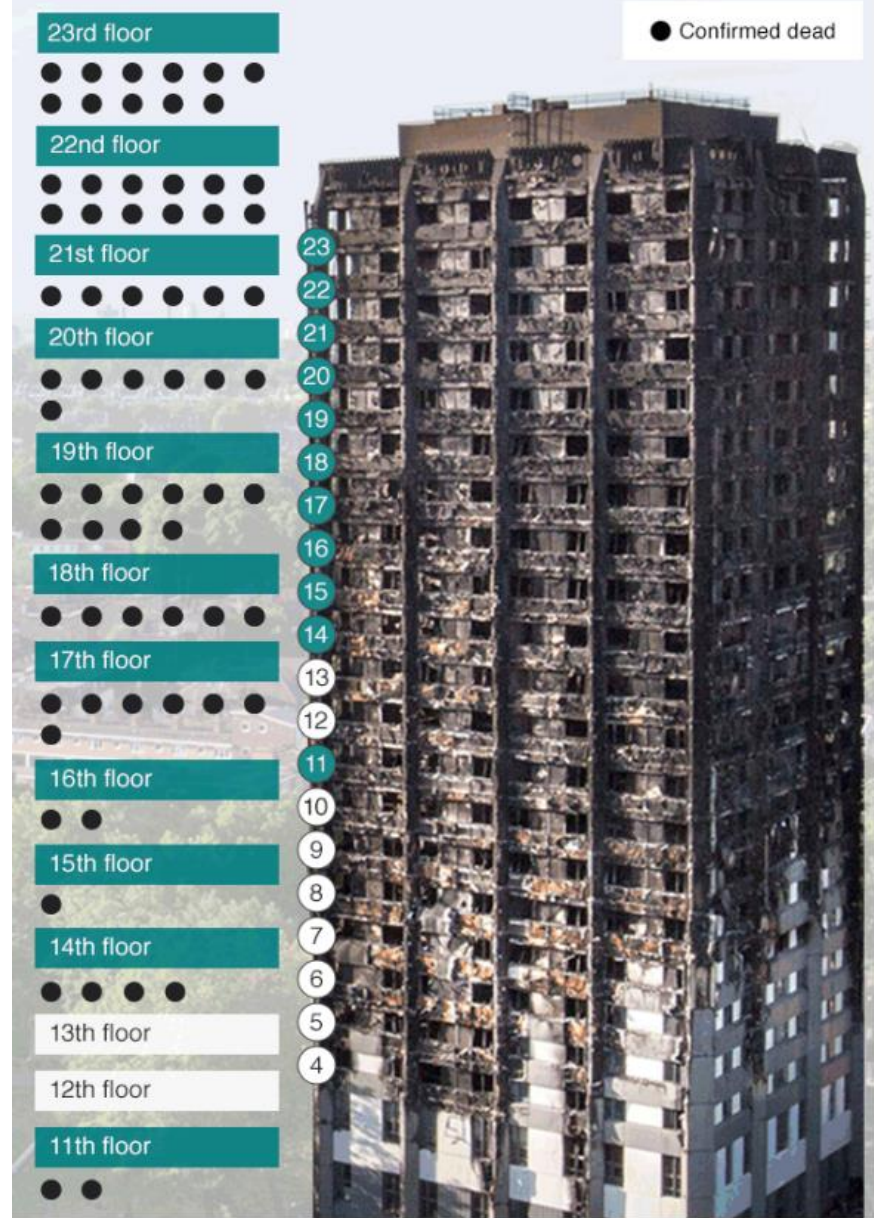


You should initially be safe to stay in your flat keeping the doors and windows closed.



<b>Time period</b>	<b>Residents evacuated in time period</b>	<b>Levels from which residents escaped in time period (no. of occupants from each level in brackets)</b>
00:58 – 01:18	34	3(2), 4(12), 5(2), 6(1), 8(4), 12(1), 13(10) and Unknown (1)
01:19 – 01:38	110	1(6), 2(3), 3(2), 5(10), 6(2), 7(11), 8(8), 9(13), 10(3), 11(7), 12(3), 13(7), 14(3), 15(6), 16(6), 17(9), 18(2), 19(3), 20(2), 21(1) and Unknown (3)
01:39 – 01:58	20	1(2), 4(3), 6(6), 7(3), 10(1), 11(2), 20(2) and Unknown (1)
01:59 – 02:58	24	3(4), 5(2), 9(2), 11(1), 12(3), 14(4), 15(1), 19(3), 20(1) and 23(2)
02:59 – 03:55	24	12(5), 15(1), 16(2), 18(8), 21(6) and 22(2)
03:56 – 04:47	9	10(6) and 11(3)
04:48 – 08:07	2	10(1) and 11(1)

# Where the Grenfell Tower fire victims lived



Graphic does not include Victoria King, 71, and her daughter, Alexandra Atala, 40, who also died in the blaze, details of where they lived have not been released. Baby Logan Gomes, who was stillborn in hospital on 14 June after his parents escaped the tower block, has also been recorded by police as a victim of the fire. They include people visiting friends and family in the block.

# Fire Protection Measure: Location of an internal fire fighting main

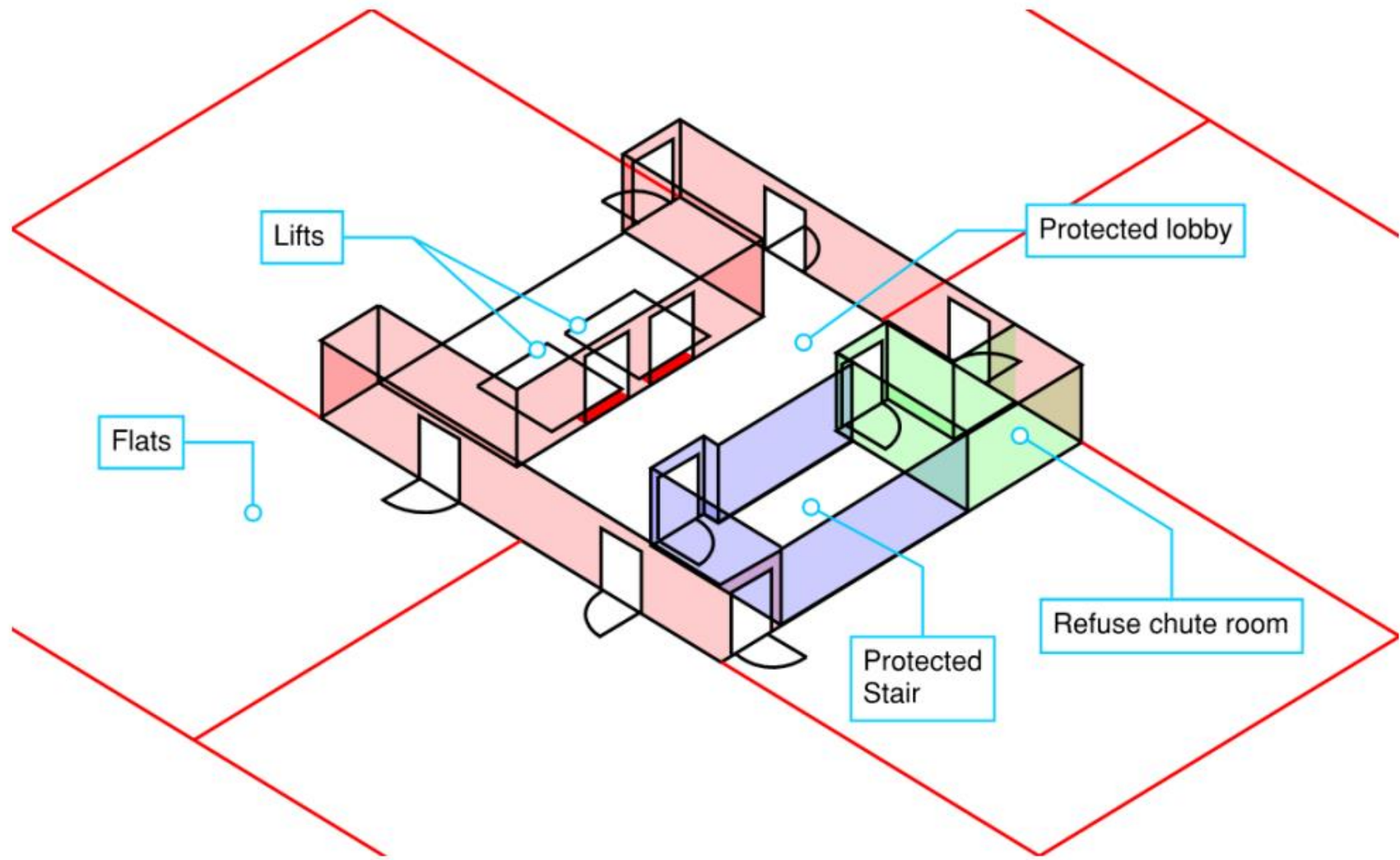
Original guidance for location - lobby



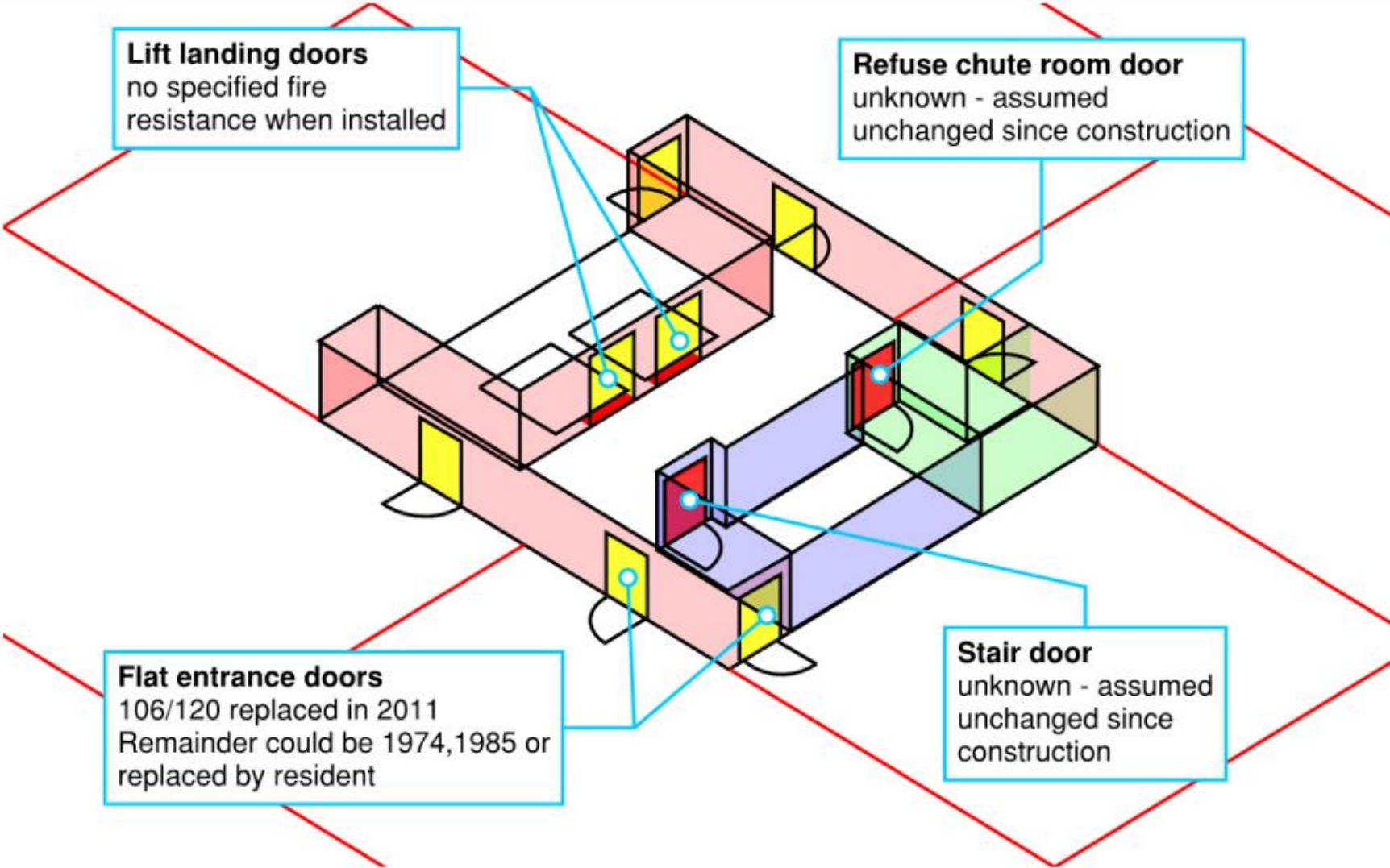
Current guidance for location - Stair



# Required location of Fire doors in Grenfell Tower



# Conclusion – Condition on night of 14<sup>th</sup> June 2017





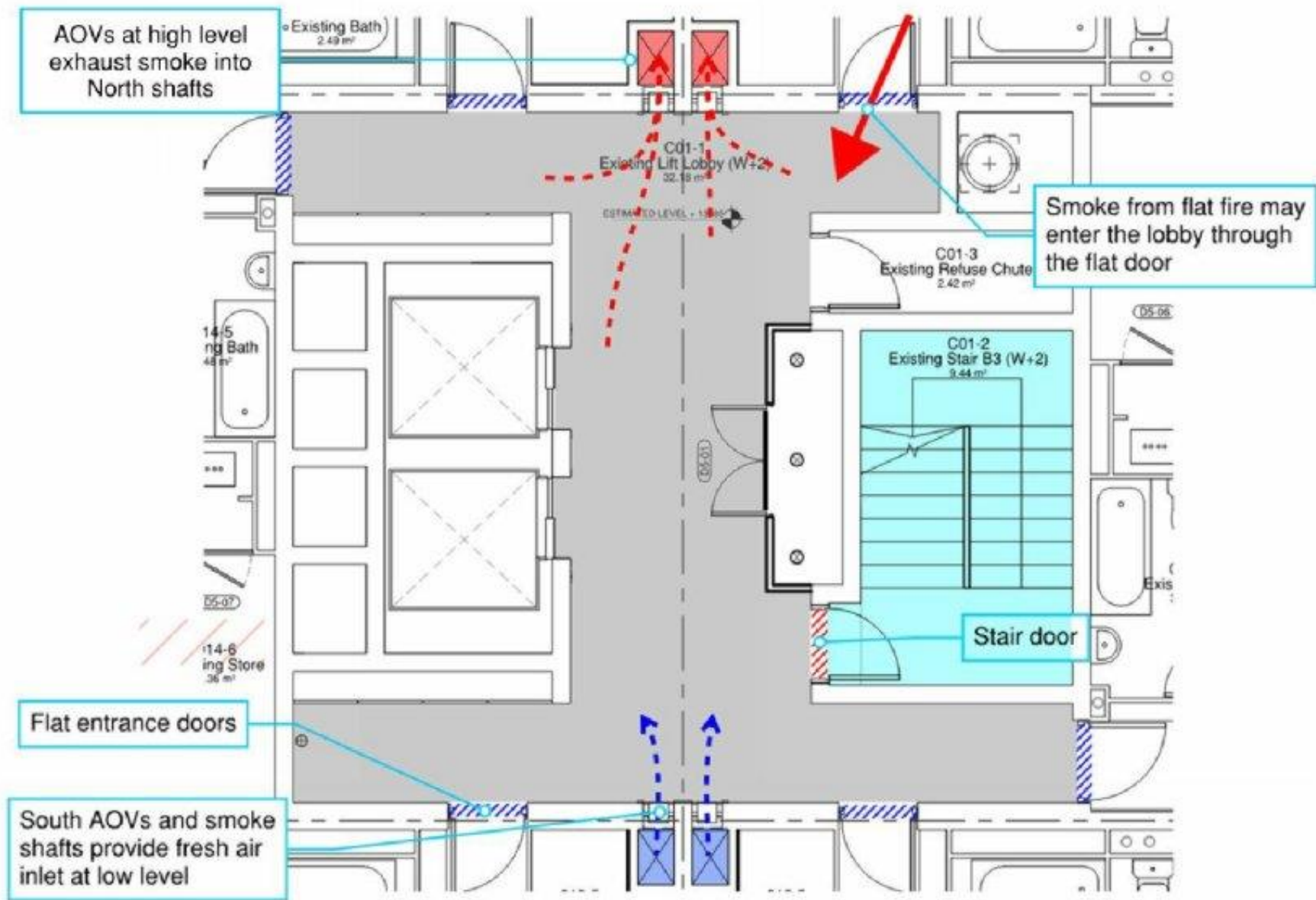
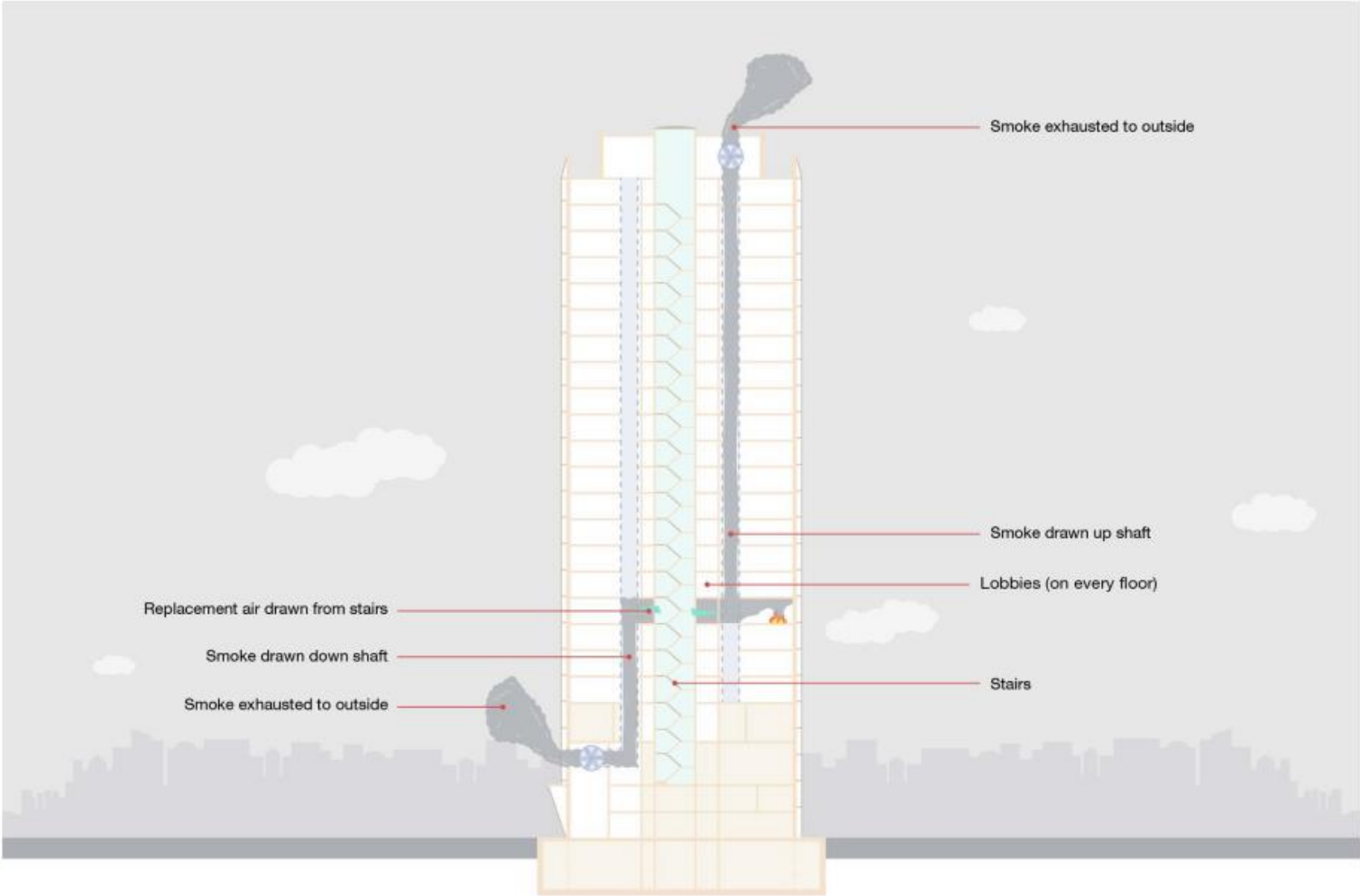


Figure J.5: Operation of the original smoke ventilation system on the fire floor, overlaid on an excerpt from SEA00010474.

# Operation of the combined lobby environmental and smoke control system



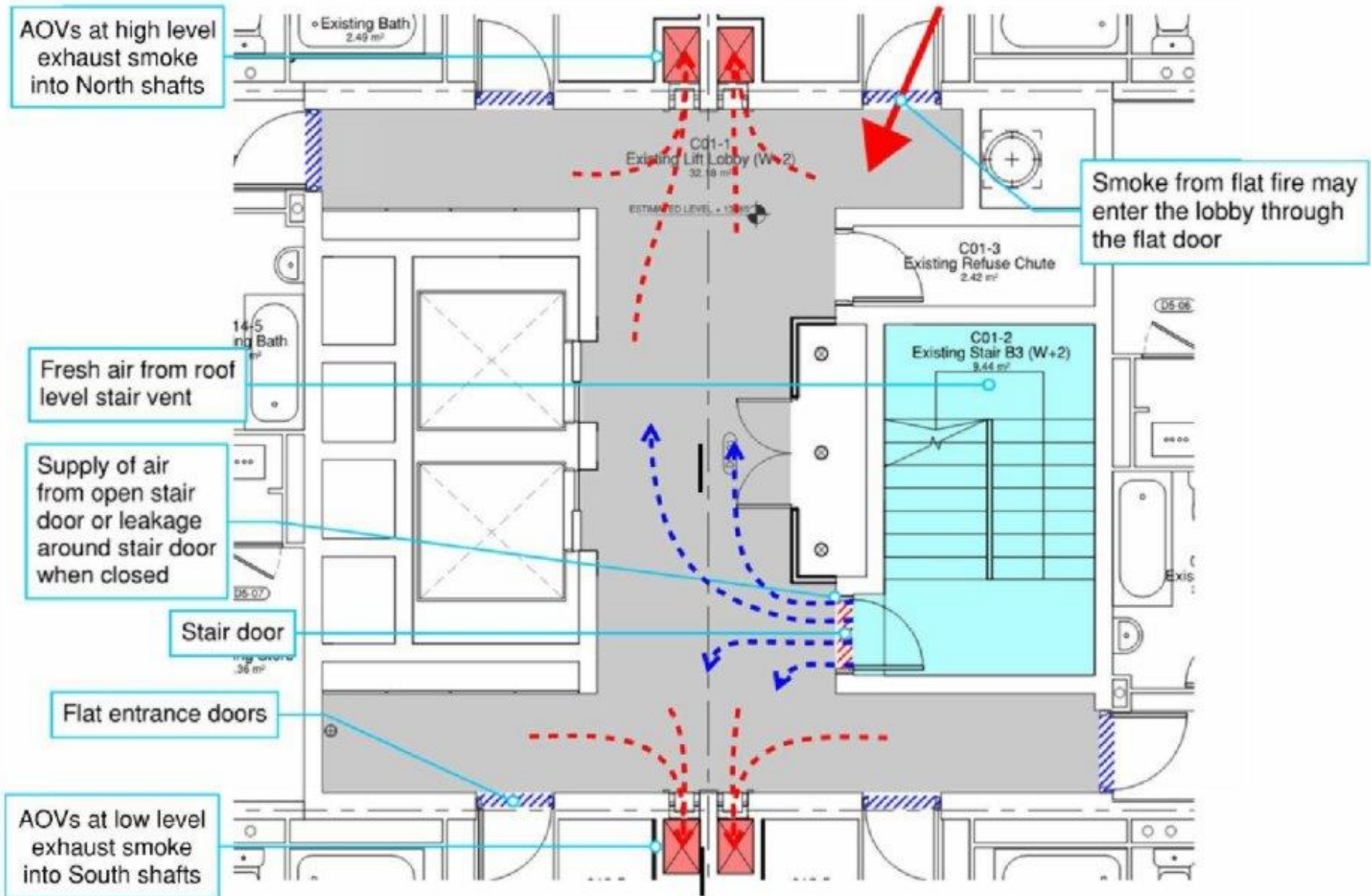
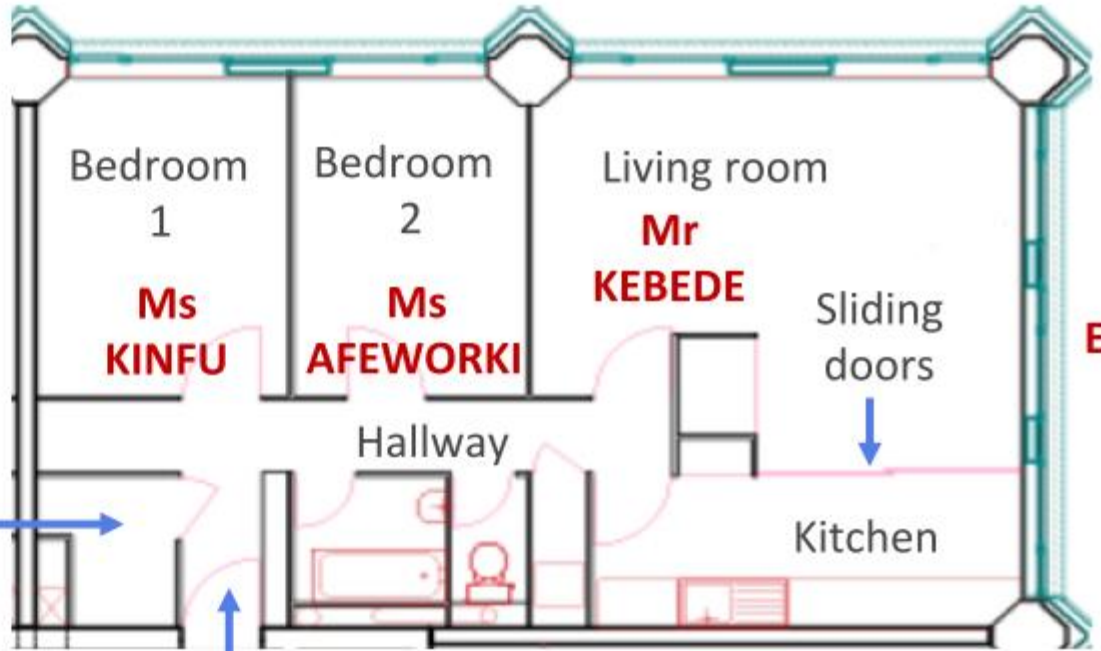


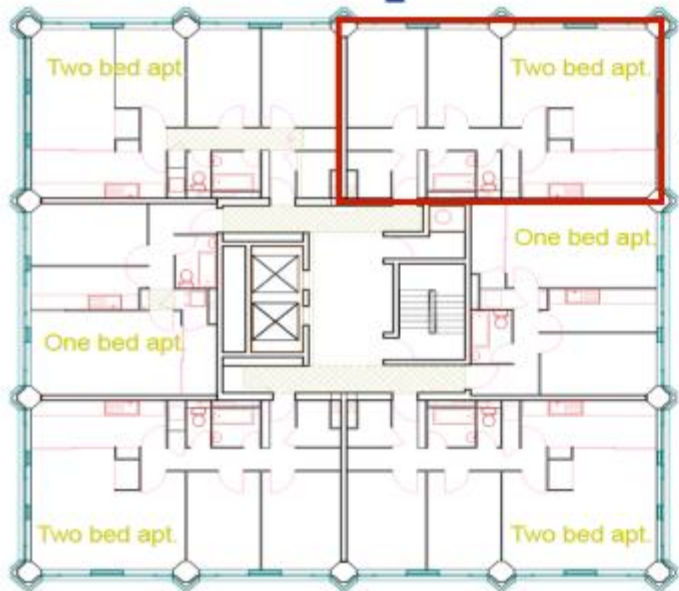
Figure J.7: Operation of the refurbished smoke ventilation system on the fire floor, overlaid on an excerpt from SEA00010474.

NORTH



EAST

N



W

Flat 16

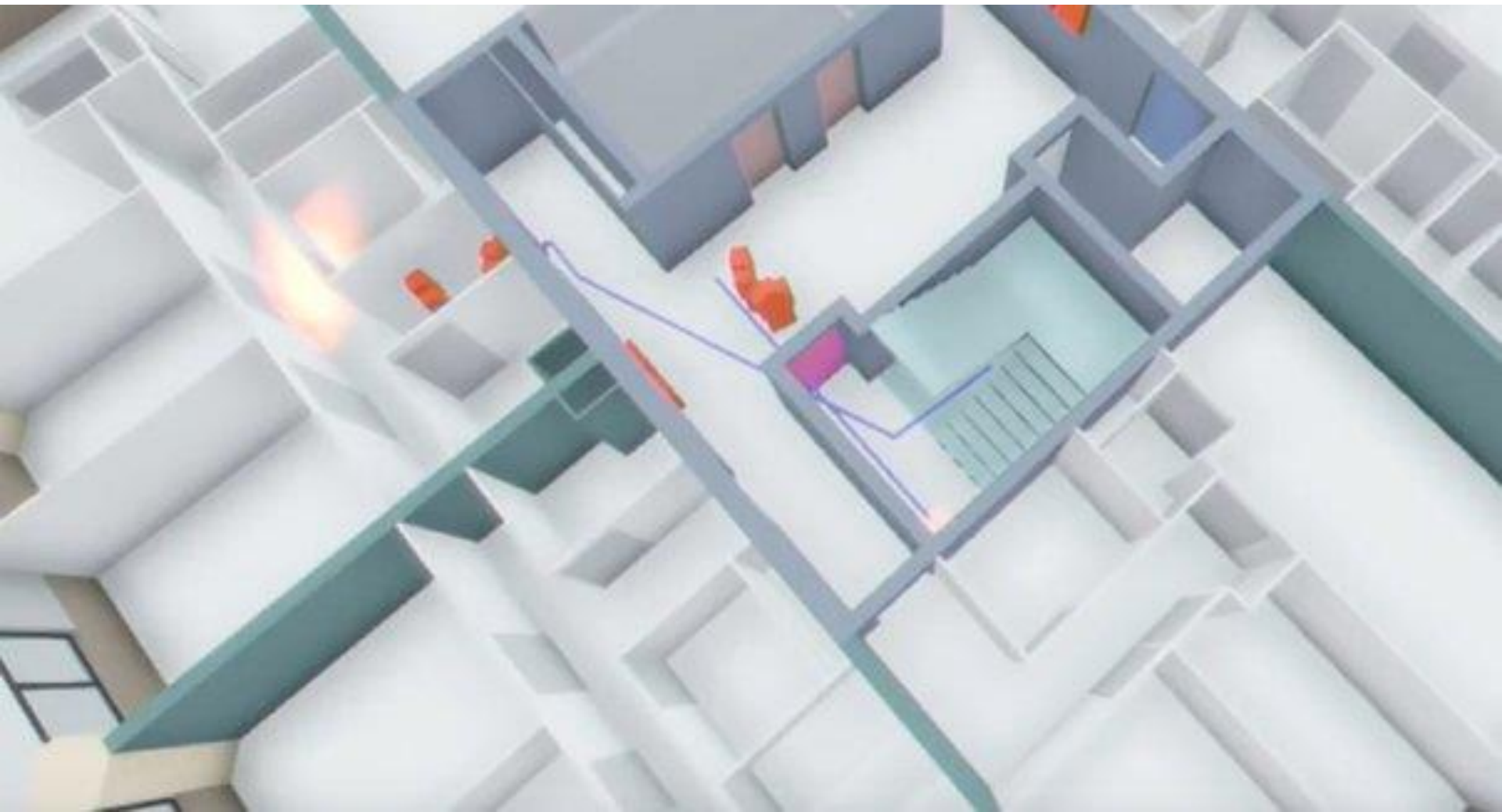
E

S



## Initial deployment of London Fire Brigade to Grenfell Tower.

Resource code	Station	Time of deployment	Recorded Time of arrival
G271	North Kensington	00:55:14	00:59:28
G272	North Kensington	00:55:14	00:59:24
G331	Kensington	00:55:14	01:08:33
G362	Hammersmith	00:59:12	01:08:27





Fire fighters break down the door of flat 16 at approximately 01:07:23.

Fire fighters open the door of the kitchen of flat 16 for the first time at approximately 01:14:16





Baton associated  
with sliding doors

Microwave

Tall fridge freezer

Washing machine

Kitchen  
window

Cooker

Sink

Possible kettle

Old Freezer

Possible toaster

Small Fridge





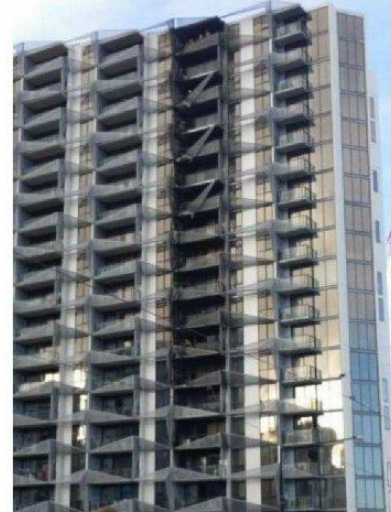
(a) The Torch Building (Dubai) during the fire



(b) The Torch Building (Dubai) after the fire



(c) The Lacrosse Building (Melbourne) during the fire



(d) The Lacrosse Building (Melbourne) after the fire

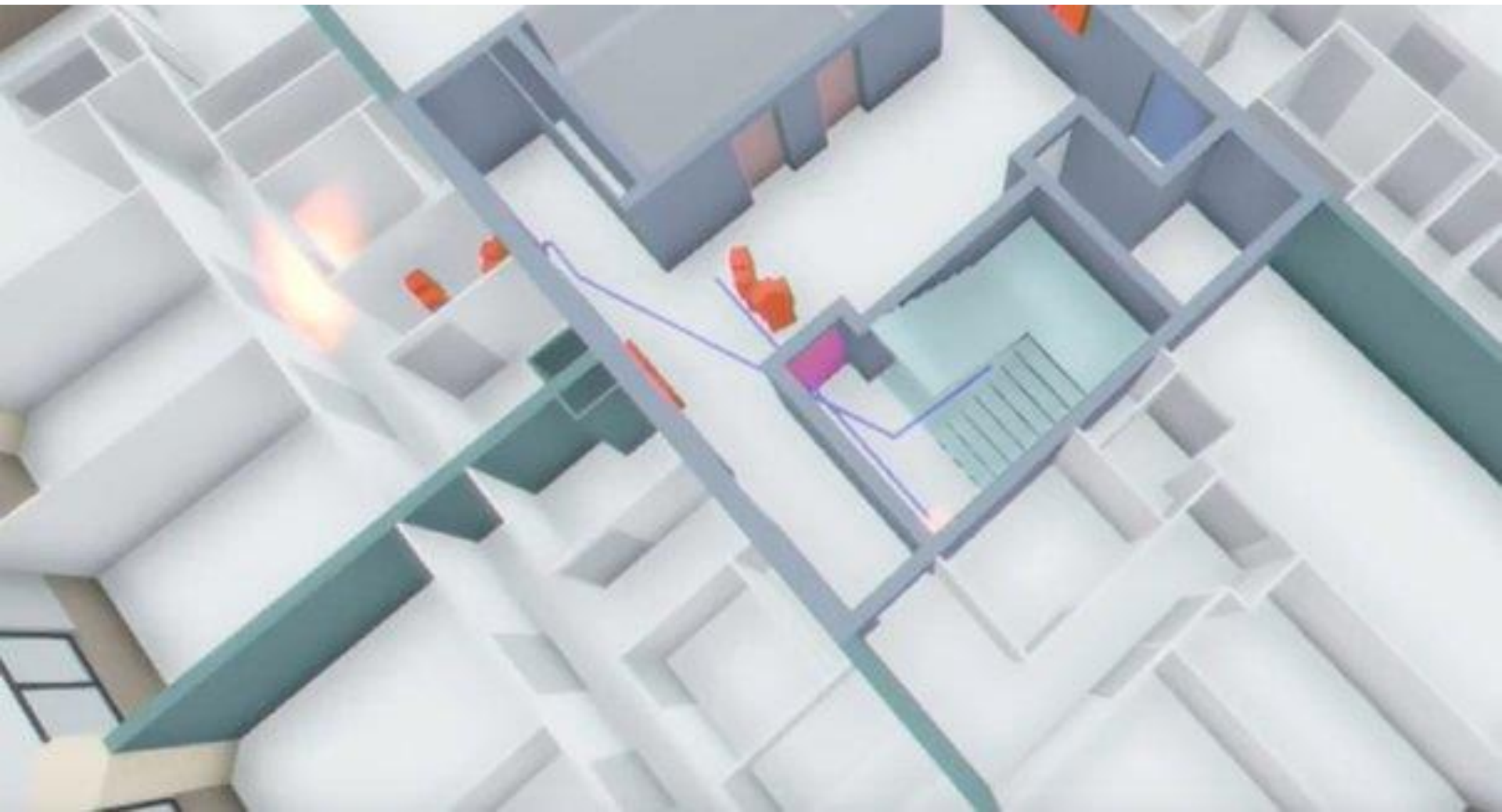


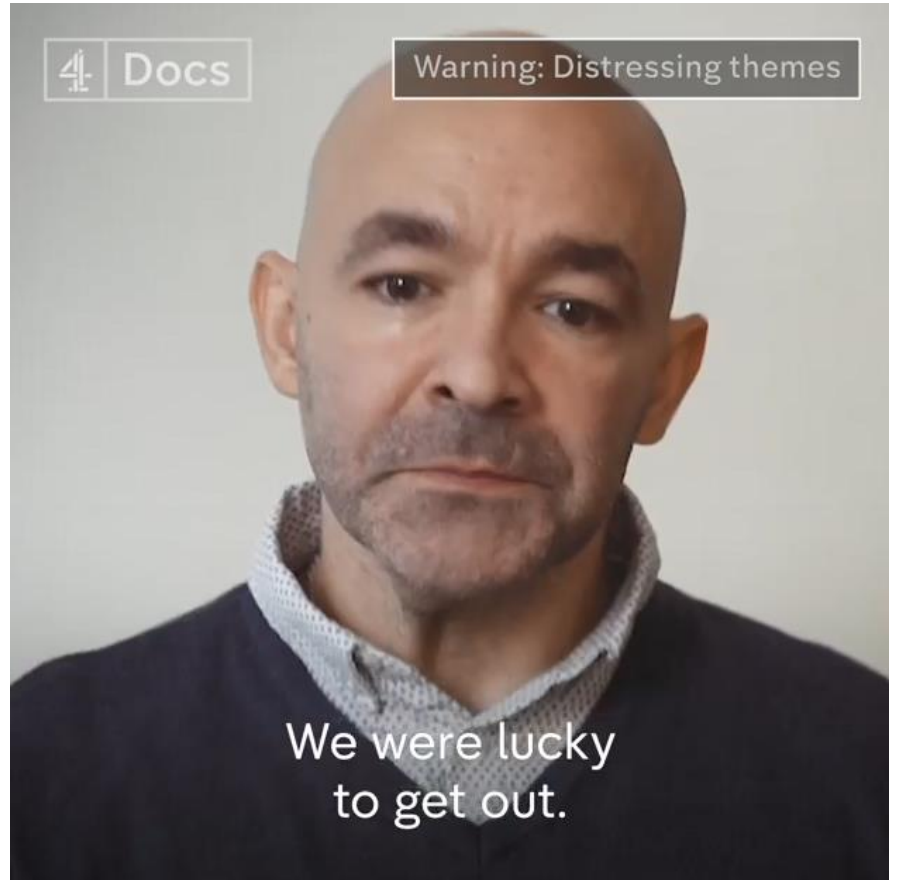
(e) The Address Building (Dubai) during the fire



(f) The Address building (Dubai) after the fire







4 Docs

Warning: Distressing themes

We were lucky  
to get out.

# **Grenfell Tower** Inquiry

## **GRENFELL TOWER INQUIRY: PHASE 1 REPORT OVERVIEW**

REPORT of the PUBLIC INQUIRY into the  
FIRE at GRENFELL TOWER  
on 14 JUNE 2017

Chairman: The Rt Hon Sir Martin Moore-Bick  
October 2019

## The loss of compartmentation and the spread of fire through the tower

- 2.14 In **Chapter 24** I consider the evidence relating to the penetration of the building by fire and smoke and the rapid loss of compartmentation. The fire on the outside of the building quickly entered many flats and smoke spread rapidly through the interior of the building. As a result, effective compartmentation was lost at an early stage. Compartmentation failed because:
- The intensity of the heat was such that the glass in the windows inevitably failed, allowing the fire to penetrate flats.
  - Extractor fan units in the kitchens had a propensity to deform and become dislodged, providing a point of entry.
  - A number of key fire protection measures inside the tower failed. Although some fire doors held back the smoke, others did not. Some were left open and failed to close because they lacked effective self-closing devices; others were broken down by firefighters or wedged open with firefighting equipment.
- 2.15 The spread of fire and smoke within the tower is described in **Chapter 25**. Many lobbies had started to fill with smoke by around 01.20 and some were significantly smoke-logged by 01.40. By 02.00 a significant number were heavily smoke-logged. Until around 01.50 there was less smoke in the stairs; by then 168 people had been able to escape. After that time the stairs started to fill with smoke, particularly at lower levels. At some levels the smoke was thick and the heat considerable. By 02.20 the smoke in the stairs did pose a risk to life, but the stairs were not absolutely impassable to all even after that time.

33.1 Phase 1 of the Inquiry has been concerned with investigating the cause of the fire, its subsequent development and the steps taken by the LFB and the other emergency services in response to it. In the course of it I have touched on the training given to the firefighters and CROs in relation to responding to fires in high-rise buildings and other incidents of a kind that may generate a significant number of calls from people seeking advice and assistance. Phase 2 will involve a more detailed examination of certain aspects of the management of the LFB (in particular its understanding of modern methods of construction and of the way in which some of the materials currently in use behave when exposed to fire) and the steps that were taken to train its officers to respond to fires in high-rise buildings. However, the evidence put before me in Phase 1 is already sufficient to demonstrate that a number of improvements can be made both in the way in which high-rise residential buildings are designed, constructed, approved and managed and in the way in which fire and rescue services respond to fires in such buildings.

## 2 Use of combustible materials

33.6 It is clear that the use of combustible materials in the external wall of Grenfell Tower, principally in the form of the ACM rainscreen cladding, but also in the form of combustible insulation, was the reason why the fire spread so quickly to the whole of the building. Surveys