

THE GRENFELL TOWER INQUIRY

MAX FORDHAM LLP CLOSING STATEMENT PHASE 1

Introduction

1. Max Fordham LLP (“**Max Fordham**”) and its representatives have been deeply moved by the courage and fortitude shown by the survivors and firefighters during the Phase 1 evidential hearing in giving their accounts of the terrible events of 14 June 2017 at Grenfell Tower. It has been vitally important for the accounts of the bravery and suffering of the survivors in particular to be heard, and for all those attending the hearing - and the public at large - to understand what the survivors have gone through.
2. The focus of this Closing Statement is on the evidence that relates to the mechanical and electrical (“**M&E**”) elements of the refurbishment of Grenfell Tower in which Max Fordham had some involvement. Max Fordham explained the nature and extent of that involvement in its Position Statement dated 9 February 2018 and in the witness statements provided to the Inquiry; it is also summarised briefly below. The particular M&E system which has been considered by the Inquiry’s experts during Phase 1, and which is discussed in this Closing Statement, is the smoke ventilation (extraction) system. This is referred to as an ‘active’ fire protection measure by the Inquiry’s fire safety engineering expert, Dr Barbara Lane.
3. The Inquiry’s experts recently issued supplemental / revised reports in late October and early November 2018 which addressed some of the oral and documentary evidence that has emerged since their initial reports in March and

April 2018. Although there have been significant developments from the initial reports in some areas of those supplemental / revised reports, they continue to be avowedly provisional in nature. The experts have highlighted (both in their reports and in oral evidence) many areas that require substantial further investigation before they are in a position to produce their Phase 2 reports. In addressing the current evidence in this Closing Statement, Max Fordham is cognizant that the experts' investigations are ongoing. It is hoped that this Closing Statement will assist the experts, and in particular Dr Lane, when considering the smoke ventilation system further during these Phase 2 investigations.

4. In that regard it is respectfully requested that the Phase 2 reports be issued sufficiently in advance of the relevant Phase 2 evidential hearings to enable the Core Participants to consider the contents of those reports together with their own experts. The issue of very substantial, and in some cases substantially changed, detailed expert reports so close to the hearing of the Phase 1 expert evidence has proved challenging. Whilst the work of this Inquiry is of course a matter of pressing urgency, nevertheless it is vital that Core Participants have sufficient time to consider the Inquiry's expert reports – and, crucially, the evidence underlying those reports – if they are to provide meaningful and properly considered assistance to the Inquiry in relation to these important issues.

Phase 1 - Issues and Determination

5. So far as fire spread is concerned, it is understood that the purpose of Phase 1 remains primarily to explore “*what happened on the night of 14 June 2017 and ... to establish where and how the fire occurred, how it spread so rapidly to the whole of the building and how the interior of the building became progressively affected by the development and spread of smoke*”.¹
6. For internal fire spread, the most relevant issue appears to be Issue 11(b)(ii) and (iii), namely:

¹ Opening Statement from Counsel to the Inquiry: Transcript 04.06.2018 page 9 lines 10-14.

“11(b): how did the fire progress and what contribution to its progress was made by (i) the construction of the exterior walls and surfaces etc. and (ii) the internal structure and condition of the building (including, for example, stairwells, shafts, vents, cavities, fire-stopping and pipework) (iii) other factors, including the effectiveness or lack of effectiveness of fire safety measures.”

7. Dr Lane identified the specific ambit of *her* Phase 1 preliminary report to be the identification of the active and passive fire protection measures within Grenfell Tower on 14 June 2017, including preliminary conclusions (where possible) as to the extent to which they:

7.1. failed to control the spread of fire and smoke; and

7.2. contributed to the speed at which the fire spread.

8. In her initial report (dated 12.4.2018) Dr Lane appeared to have reached a relatively firm conclusion in this regard that the smoke ventilation system “*did not operate as intended during the fire of 14 June 2017*”.² That conclusion has been widely reported in the media since. However, she has since revised that opinion in her recent Revised Report (5.11.2018), stating that she is now unable to reach any such conclusion as the matter requires ongoing investigation:

*“2.23.52 At this stage, I am not in a position to express any opinions on the operation of the system on the night and what impact that had on the spread of fire and smoke. I will complete this work when the resident evidence is completed. I have explained all the work that is in progress on this topic at the end of Appendix J of my expert report.”*³

9. This change of approach has in part been influenced by regard to the conclusions reached by BRE during its parallel investigation into the fire, as part of the

² See para 2.15.32, 2.22.9, 19.6.32, and Appendix J9.2.13.

³ It is noted that para 2.24.4 of Dr Lane’s Revised Report retains the same language as para 2.23.4 in her original report to the effect that the smoke ventilation system appears not to have operated as required. It is presumed that this is an oversight in light of the passage quoted above and has simply not been updated accordingly.

criminal investigation. BRE has formed the contrary conclusion to that initially reached by Dr Lane, namely:

“The smoke control system appears, based upon the physical evidence gathered, to have been operating.”⁴

10. The physical evidence to which BRE refers is presumably its on-site investigation of all of the dampers within the AOVs that are in each lobby on the South and North side of the building; see Table 7 of the BRE interim report (9.3.2018)⁵. The BRE team appear to have examined in detail the extent to which each damper’s contact points on the frame edge contained smoke residue (indicating opening at some point during the course of the fire) or were clean (suggesting it was closed throughout). Dr Lane, at the time of compiling her original report, had only had the benefit of examining the internal shafts for observed smoke deposition between levels 6-11 (north shafts) and levels 8-11.
11. To date only BRE’s 73-page “interim report” has been disclosed to Core Participants. However, a much longer 413-page report from BRE was leaked to the Evening Standard. It remains, therefore, to be seen whether any further physical evidence has been gathered by BRE that is of relevance to its conclusion as to the operation of the smoke ventilation system.
12. The ability of either BRE or Dr Lane to reach a definitive conclusion as to the operation of the smoke ventilation system on the night of the fire appears now to be questionable in light of the recent revelation that crucial primary evidence on this issue has been lost during the course of the Metropolitan Police investigation. Dr Lane in her Appendix J notes at J11.1.8:

“System activation log: the smoke control system had the capability to log activation events as part of the HMI panel function. However, by the time the

⁴ MET00012525_001@29 para 47 and see also the para 190 of the 413 page BRE report, leaked to the Evening Standard, but as yet undisclosed as part of the Inquiry.

⁵ MET00012525_021, referred to by Dr Lane at App J9.5.15, J11.1.7(b) and J11.1.9.

data had been downloaded from the HMI panel, the log of events on the 14th June 2017 had been overwritten by subsequent events.”

13. She confirms at J9.1.8 that this was because “*data was not removed from site, and was unfortunately overwritten by entries from the days after the fire*”.
14. During her oral evidence on 26.11.2018 Dr Lane stated the following (pp175-176):

10 *Q. But you're unable to say on the night precisely which*
11 *pieces of equipment activated as the system activation*
12 *log in the HMI panel was overwritten by events after*
13 *14 June before it was seized --*

14 *A. That's correct.*

15 *Q. -- and therefore is no longer available to you. So we*
16 *don't have the data from the night; is that the point?*

17 *A. Yes. So very unfortunately, we don't know the order of*
18 *devices triggered.*

19 *The software being correct is one positive thing,*
20 *but then it means what it's controlling needs to*
21 *physically be able to perform also.*

22 *So there are two -- when you're checking a system in*
23 *terms of handing over a building: does the software*
24 *trigger the right devices at the right time, and can*
25 *they physically react to the programming?*

1 *Q. The fact that that data is not available from the night,*
2 *is that a significant gap in your knowledge in terms of*
3 *how the system operated?*

4 *A. I think it's very unfortunate.*

5 *Q. Do you think that's going to hamper a conclusion about*
6 *whether the system did operate properly, or do you think*
7 *there are other things you can look at to --*

8 *A. So it would have been the most useful piece of data, but*
9 *instead -- and I've listed everything out at the back of*
10 *appendix J -- there's all sorts of other data now I need*
11 *to consider: noise, physical observations up at the*
12 *roof, from the helicopter footage -- there's all pieces*
13 *of data now that I need to piece together to understand*
14 *if smoke indeed entered the shafts and left the shafts*
15 *at the roof, and, remember, down at level 2 above the*
16 *door.*

15. It is plain from Dr Lane's answers that the activation log would have revealed not just the floor upon which the smoke ventilation system ought to have initially

operated (closing the AOVs for the remaining floors), but also whether, subsequently during the course of the fire, any occasion upon which that automatic system was manually overridden, if indeed it was.

16. It remains entirely unclear as to how “*the most useful piece of data*” on this issue came to be “*overwritten*” by what Dr Lane describes as “*entries*” on the system occurring during “*the days*” after the fire. It also begs the question as to whether such entries were the product of the automatic operation of the system (left to itself) or whether they reflect manual intervention by those investigating or others.
17. This is vital information (as Dr Lane acknowledges) that must have been known to those investigating this fire from a very early stage of the investigation back in June 2017, but was apparently not shared with Dr Lane and her team. Dr Lane was certainly still of the view that such data would be available for her to examine at the time of writing her original 12 April 2018 report (see para 2.5.3(b)). Those representing Max Fordham have been chasing for production of the data log in June and August 2018 without any indication that the data had in fact been lost a year earlier. The full explanation and surrounding documentation relating to this issue needs to be disclosed as a matter of urgency.
18. Dr Lane sets out at Appendix J11 the various different lines of enquiry that she is now pursuing in order to attempt to determine the operation of the smoke ventilation system in the absence of this data. Whether the exercise of examining and piecing together such information is ultimately capable of filling the evidential gap left by the loss of the activation log data remains to be seen.
19. The concern is to avoid the temptation that arises, when faced with a loss of crucial and objective primary evidence, to overstate the forensic value and attach greater weight and accuracy to anecdotal recollections than they may justify. This is a case in point as witnesses have been asked to recall an enormous amount of detail in relation to the events on the night, when many have been obviously traumatised by such matters and in circumstances where the ability to recall precise timings, locations or the order in which events transpired is inevitably a

difficult exercise amidst what was going on inside Grenfell Tower. So extreme were the events that witnesses have been asked to recollect it is understandable that it is difficult to be accurate at what may at the time have seemed to be less significant details (i.e. observations as to noise, the type of smoke, as to whether doors were open/closed, as to what firefighters were doing etc.). The anecdotal evidence is, therefore, in many places quite mixed in nature. For present purposes, it is submitted that the Inquiry and its experts should be cautious as to the extent to which it can rely upon anecdotal recollections as the basis for the drawing of any definitive conclusion as to the operation of the smoke ventilation system. This is particularly in circumstances where very few witnesses appreciated how the system would operate in the event of a fire (for example, that it would only extract smoke on a single floor, not on multiple floors), nor would they be expected to do so⁶.

20. For all of the reasons set out above, it is difficult to see how the Inquiry could reach at this stage even a preliminary conclusion as to the effectiveness of the smoke ventilation system nor as to whether it played any material contribution towards the spread of smoke within Grenfell Tower on 14 June 2017. There is insufficient evidence upon which to do so at this point in time, as now recognised by Dr Lane.
21. Similarly, whilst Dr Lane has expressed her opinions as to the extent to which the system did not “comply” with current statutory and regulatory guidance, that is not an issue which is identified for determination at Phase 1 of this Inquiry and it is clear that those opinions are avowedly provisional in nature, pending receipt of further evidence during Phase 2.
22. The remainder of this closing statement, therefore, seeks only to summarise the evidence that has been established to date, in the context of Max Fordham’s involvement in the refurbishment of Grenfell Tower. Further, more detailed representations are reserved pending receipt of Dr Lane’s final conclusions on these issues in Phase 2.

⁶ See as but one example: Dorgu 09.07.18 at pages 171-172,

Max Fordham's Involvement in the Refurbishment

23. Max Fordham is a building services consulting engineering practice specialising in the design of M&E systems. Max Fordham was engaged by the Kensington & Chelsea Tenant Management Organisation Ltd (**"the TMO"**) to provide consultancy services during the refurbishment in relation to building energy strategy, building acoustics, and various M&E systems.
24. Max Fordham was responsible for the early development of the pre-tender design, including the M&E elements of the Employer's Requirements. However, Max Fordham was not novated to the contractor to whom the TMO awarded the design and build contract, Rydon Maintenance Ltd (**"Rydon"**). Instead, Max Fordham continued to be engaged directly by the TMO to provide consultancy services after the contract award.
25. In accordance with the chosen design and build procurement route, the detailed design of the M&E systems was developed by the consultants and sub-contractors appointed by Rydon. In particular, Rydon engaged JS Wright & Co Ltd (**"JSW"**) to prepare the detailed designs and carry out the installation of the M&E works. Rydon and JSW, along with its smoke ventilation specialist, PSB UK (**"PSB"**), were therefore required to develop and complete the M&E designs, based on the Employer's Requirements.
26. Max Fordham's role during this phase of the refurbishment was to comment on the M&E design produced by Rydon/JSW with regard to compliance with the Employer's Requirements. Max Fordham's role was advisory, and it was not appointed to approve the M&E design and installation work, or to certify their completion or quality.

The Fundamental Fire Safety Principles

27. Before turning to consider the current evidence relating to the smoke ventilation system, this section first summarises what is not contentious, namely the fundamental principles that the Inquiry experts all agree applied to the design of

the fire protection measures in the refurbishment works in general, including those two systems.

28. There are **three fundamental principles** which were particularly important to the design of the fire protection measures in the refurbishment of Grenfell Tower, and which are vital to bear in mind when evaluating that design. Those principles are discussed in turn below; in short, they are as follows:

28.1. For refurbishment works of this nature, the Building Regulations 2010 require that, on completion of the refurbishment works, the building is no less compliant with the requirements of the Regulations than it was before the work was carried out. This is described for convenience as the ‘**non-worsening**’ principle;

28.2. The guidance and functional requirements in the relevant statutory legislation are **non-prescriptive**; and

28.3. Fire safety design for a high-rise residential building of the nature of Grenfell Tower is premised upon the **principle of compartmentation**.

The Non-Worsening Principle

29. Regulation 4(3) of the Building Regulations 2010 states:

*“(3) Building work shall be carried out so that, after it has been completed-
(a) any building which is extended or to which a material alteration is made ...
...complies with the applicable requirements of Schedule 1 or, where it did not comply with any such requirement, it is no more unsatisfactory in relation to that requirement than before the work was carried out.”*

30. This concept was put to Dr. Lane during the course of her oral evidence as the “*non-worsening principle*”,⁷ and this shorthand description is adopted for the purpose of these submissions.

⁷ Transcript 22/11/18 page 20 lines 11 to 22.

31. The Inquiry appointed Mr Colin Todd to report on the statutory and regulatory requirements in force over the lifetime of Grenfell Tower with a view to creating a regulatory framework which can be relied upon by all of the Inquiry's expert witnesses.⁸ Mr Todd has carried out a detailed review and analysis of those requirements in his report dated March 2018. He concludes at paragraph 2.66 that the Building Regulations required that, when the refurbishment work was completed, the building would be no less compliant with the relevant fire safety Requirements B1, B3, B4, and B5 of Part B of Schedule 1 to the Building Regulations 2010 (as amended) than it was prior to the refurbishment.
32. This 'non-worsening' principle was a fundamental principle that was applied to the design of the refurbishment works. It follows from Mr Todd's report that this design principle must inform the view that is taken by the Inquiry and its experts of the various elements of the refurbishment works to the existing building. This is because, as Mr Todd explains at paragraph 5.1.4 of his report, the Building Regulations apply not to buildings but to the work carried out to erect, extend, or materially alter a building; and they are not retrospective.
33. Consequently, Mr Todd explains, "*the Building Regulations do not require upgrading of fire precautions in existing buildings, but merely that, on completion of building work, the building is no less compliant with the requirements of the Regulations than it was before the work was carried out*" (paragraph 5.1.4, emphasis added).
34. This fundamental design principle is important when considering the changes to the smoke ventilation system and the dry riser which were introduced during the refurbishment of Grenfell Tower. It is important because the changes to those systems were inevitably and necessarily constrained by the physical infrastructure of the existing building.

⁸ Letter of instruction from Ms Cathy Kennedy, the Deputy Solicitor to the Inquiry, to Mr Todd dated 13 November 2017.

35. This is not something upon which Dr Lane has currently expressed an opinion in her reports. She has sought only to compare what was designed and installed on 14 June 2017 by reference to the current statutory and regulatory guidance, irrespective of her conclusion that the original building was not, in any event, compliant with such guidance or legislation prior to the refurbishment works. Dr Lane has confirmed that she will only seek to address this issue, together with a consideration of industry practice, in Phase 2.⁹ Therefore, the concept of “compliance” and whether measures were or were not truly “compliant” with statutory/legislative guidance can only be properly determined at that stage, after consideration of the effect and operation of this non-worsening principle.

Statutory Guidance is Non-Prescriptive

36. The relevant statutory legislation which applied to the refurbishment works was the Building Regulations 2010 (as amended), and the underlying statutory guidance, Approved Document B. The applicable version of Approved Document B was the 2006 edition incorporating 2007, 2010, and 2013 amendments (referred to here as “**ADB 2013**” for ease and consistency).
37. The Building Regulations 2010 and ADB 2013 apply only to certain defined building work including where, as here, there is a “*material alteration*” to an existing building.
38. Mr Todd has explained that (by contrast to the regime prior to 1985), the Building Regulations are not prescriptive. Rather, they comprise guidance and functional requirements¹⁰ which provide “*great flexibility for the designer in the technical solutions that may be adopted for compliance with the Regulations*” (Todd, paragraph 5.1.10).
39. Again, that principle is of particular relevance to the refurbishment works because many of the technical solutions provided (including the changes to the smoke

⁹ Transcript 22/11/18 page 21 lines 1-7 and see Revised Report (20.11.2018 para 3.6.20 – 3.6.23.

¹⁰ Functional requirements are objectives that must be achieved; these are to be contrasted with prescriptive requirements which stipulate the technical detail of what must be provided (see Todd paragraphs 5.1.5 and 5.1.10). In the case of a functional requirement, the designer has flexibility as to the technical solution adopted to achieve the objective.

ventilation system, and the refurbishment of the dry riser) were bespoke solutions. This meant that there were alternative potential routes to compliance with the Building Regulations and ADB 2013 which could be adopted by the designer.¹¹ Mr Todd opined at paragraph 5.2.52 of his report that it is not uncommon in the case of smoke ventilation systems in the common parts of blocks of flats for the designer or building owner to meet the functional requirements of the Building Regulations 2010 in some other way instead of adopting the recommendations in ADB 2013.

40. Dr Lane emphasised during oral evidence generally that the Building Regulations 2010 and ADB 2013 are not prescriptive.¹² This is important again when it comes to considering the issue of “compliance”. For example, so far as mechanical smoke ventilation systems are concerned ADB 2013 states as follows:

“2.27 As an alternative to the natural ventilation provisions in paragraph 2.26, mechanical ventilation to the stair and/or corridor/lobby may be provided to protect the stair(s) from smoke. Guidance on the design of smoke control systems using pressure differentials is available in BS EN 12101-6:2005.”

41. The guidance is not mandating the use of pressure differentials for this purpose, nor is it suggesting that the British Standard referred to represents the only way in which they ought to be used.¹³
42. Accordingly, the use of the term “non-compliant” appears somewhat inapt when used to describe whether a system in use is covered by the statutory guidance in ADB 2013 or is similar to the systems described therein. The proper measure of compliance is whether the system meets the criteria within Schedule 1 of the Building Regulations 2010, something which is for consideration during the course of Phase 2.

¹¹ Todd, paragraphs 5.1.18 and 5.2.52.

¹² Transcript 22/11/18 page 19 line 7 to page 20 line 10 and page 107 line 19.

¹³ See Transcript 26.11.2018 pages 138-139 where Dr Lane seeks to distinguish between mechanical ventilation systems per se and those mechanical ventilation systems using pressure differentials.

The Compartmentation Principle

43. There is consensus amongst the experts that the applicable functional requirements for fire safety design for a high-rise residential building of the nature of Grenfell Tower are premised upon the principle of compartmentation.
44. This principle is described by Mr Todd at paragraph 5.1.56 of his report as follows:

“In blocks of flats, the requirements of B1 and B3 [of the Building Regulations 2010] are complementary in relation to the fundamental fire strategy. It is universally accepted that, in a block of flats, compliance with Requirement B3 necessitates that walls and floors of flats be substantially fire resisting, such that each flat is, effectively, a fire-resisting “box”, beyond which a fire within a flat should not be able to spread.”

45. The compartmentation principle underpins the entire framework of the ADB 2013 guidance, which provides that:
- 45.1. Fires do not normally start in two different places in a building at the same time; initially a fire will create a hazard only in the part in which it starts and it is unlikely, at that stage, to involve a large area (ADB 2013, B1.iii); and
- 45.2. The measures set out in Section 8 (B3) of ADB require a high degree of compartmentation. Therefore the assumption is that the fire is generally contained in the flat of origin and the probability of fire spread beyond the flat of origin is low, so simultaneous evacuation of the whole building is unlikely to be necessary (ADB 2013, B1§2.3(a)).
46. The compartmentation principle therefore supports and permits the ‘stay put’ policy, whereby occupants of other flats not affected by a fire in one flat should be safe to stay in their own flat rather than evacuating. The rationale for this policy is that evacuation could lead those occupants from a place of safety into an area

of danger; it could also hinder firefighting operations and hamper evacuation of those residents directly affected by the fire. As Dr Lane indicates it is based upon “Defend in Place” firefighting which assumes that those firefighting operations directed towards the single flat/lobby will extinguish the fire at an early stage.¹⁴

47. Dr. Lane has repeatedly emphasised that the total loss of compartmentation caused by the external cladding fire at Grenfell Tower would have overwhelmed any of the other layers of fire protection in place at such a building, however compliant they may or may not have been with legislative or regulatory requirements:

2 *Q. You say that Grenfell Tower should never have been*
3 *handed over with this rainscreen system in circumstances*
4 *where a stay-put strategy was in place; is that correct?*
5 *A. That's correct.*
6 *Q. Does that opinion assume that all other active and*
7 *passive measures in the tower were fully functional and*
8 *in working order?*
9 *A. I don't think it's possible, with the external wall*
10 *construction that there was, to mitigate the type of*
11 *fire that those materials cause, and that's a whole*
12 *combination of active and passive fire protection*
13 *measures, and their condition. I don't think it's*
14 *possible to mitigate that type of fire, which is why*
15 *I said the building should not have been handed over in*
16 *that condition.*

48. Any consideration of whether the design/operation of the smoke ventilation system may have contributed towards the spread of fire/smoke at Grenfell Tower must necessarily be viewed within this context, namely a multi-storey “fire event” the scale of which falls outside of the ambit of current fire safety design guidance.¹⁵ The importance of the compartmentation principle for the smoke ventilation system is discussed in more detail in the following section of this Closing Statement.

¹⁴ Revised Report (20.11.2018) para 2.19.15 and 3.2.27).

¹⁵ Revised Report (20.11.2018) para 2.24.3 and 3.5.57.

Smoke Ventilation System

Introduction

49. In this section, Max Fordham sets out:
- 49.1. A description of the smoke ventilation system that was originally installed at Grenfell Tower;
 - 49.2. A description of the bespoke smoke ventilation system that was designed by specialists PSB and installed by JSW as part of the refurbishment, insofar as Max Fordham is able;
 - 49.3. Discussion of the currently available evidence about the operation of the smoke ventilation system at the outset of the fire;
 - 49.4. Discussion of the currently available evidence about the operation of the smoke ventilation system once the fire had spread.

The Original Smoke Ventilation System

50. The smoke ventilation system was originally installed when Grenfell Tower was constructed in the 1970s. It was originally a natural ventilation system, the operation of which relies on entirely natural forces to move air and smoke through the defined routes in the building. It therefore relied upon the differences in density between air/smoke mixtures at different heights, with hot smoky air being drawn up and extracted through the higher level North side vents in each lobby.
51. At some point in time that system was supplemented with mechanical fans that could be activated by the fire brigade in an emergency to increase the “push/pull” effect of the system in order to clear smoke from a single floor at a time. Dr. Lane describes this as being natural ventilation until the Fire Brigade switched on a mechanical extract system, albeit strictly speaking it was a bespoke mechanical system that simply relied on natural ventilation when not under the control of the

Fire Brigade.¹⁶ It was her opinion that this system did not comply with the statutory guidance in place at the time.¹⁷

PSB's Smoke Ventilation System

52. Dr Lane has confirmed in her reports and oral evidence that ADB 2013 only requires a designer to anticipate a fire starting in, and contained within, a single location, and therefore the smoke ventilation system need only be designed to disperse smoke from a single common lobby (rather than multiple lobbies on multiple levels).¹⁸
53. Dr Lane has sought in her Revised Report and oral evidence to compare the PSB design with that of a depressurisation system, as described within BS EN 12101-6:2005 ("the British Standard"). The basis for doing so appears to be that PSB's design involves the use of pressure differentials and one such differential was stated within its Technical Submission (PSB00000214) to maintain a pressure difference of -25Pa between the stairs and the lobby when the stair door was closed.¹⁹
54. Max Fordham do not understand the PSB design to constitute a depressurisation system of the type described within the British Standard (which as it states is more typically used for basements). The fundamental principle of a depressurisation system as described within that British Standard is that the system is configured such that smoke is extracted from the source of the fire, rather than from any connecting space. That is not the arrangement at Grenfell Tower and it is difficult to see how such a system could conceivably be applied to the building, given its physical constraints and layout, without quite considerable structural refurbishment. The PSB system is instead a bespoke system, that seeks to adopt some (but only some) of the criteria contained within that British Standard, where considered to be appropriate by PSB, as specialists

¹⁶ Transcript 26.11.2018 page 128.

¹⁷ Transcript 26.11.2018 page 135-136.

¹⁸ Transcript 26.11.2018 page 136.

¹⁹ Revised Report (20.11.2018) Appendix J – J5.2.2.

in the design of such systems, to do so. Indeed, Mr Todd opined that “*tailor made*” solutions are not uncommon (at paragraphs 5.2.41(iv)(e) and 5.2.52 of his report).

55. It is understood that the PSB design shares similar principles to established design solutions for mechanical smoke ventilation systems, such as the BRE Shaft and Colt Shaft systems. Dr. Lane stated that she was not in a position, during oral evidence, to accept that similarity when it was put to her as she had insufficient knowledge and information, having not carried out a comparison of the three systems, in order to give an opinion either way.²⁰
56. Dr Lane was, though, prepared to accept that such other systems could comply with the functional requirements of the Building Regulations (as distinct from the statutory guidance as to how those requirements *may* be met) if they were designed and installed appropriately.²¹ As identified at the outset of this document, the issue of whether the PSB design complies or not with legislative provisions or regulatory guidance remains an ongoing work in progress to be continued in Phase 2 of this Inquiry. It is an issue that falls to be considered in light of the non-worsening principle, as noted above.

The Operation of the Smoke Ventilation System at the Onset of the Fire

57. Dr Lane states at Appendix J10.1.13-14 that it is most likely that the smoke ventilation system activated on the 4th floor at the point that the autodialler sent a signal to Tunstall at 00:55. This is the only objective data that is available to the Inquiry in light of the loss of the HMI activation log (see above). The BRE *post facto* examination of the dampers for the 4th floor was impeded by water damage attributable to the firefighting operations. BRE found each of the dampers on this floor to be closed and noted the following observation:

²⁰ Transcript 26.11.2018 pages 150 – 151.

²¹ Transcript 26.11.2018 pages 151 lines 6-8.

*“Water damage to all dampers but smoke residues on supply dampers only. Smoke pattern on extract dampers showed contact points on edge of frames had lower smoke residues.”*²²

58. Dr Lane refers²³ to the evidence of resident Mr Ahmed that he noticed smoke coming from the 4th lobby into the stair by 01:21. She states that this indicated that the smoke ventilation system was not functioning as intended. Yet this conclusion is inconsistent with the body of firefighter evidence that suggests that the lobby to the 4th floor was relatively free of smoke (notwithstanding the fire in Flat 16) in the early stage (i.e. up to 2am): see, for example, the evidence of Batterbee (28.6.2018 p108), O’Hanlon (4.7.2018 pp92-94), Dorgu (9.7.2018 p100), Hippel (19.7.2018 pp25-26), Stern (19.7.2018) p145, and Desforges (31.7.2018 pp177-181). Professor Purser appears to have reached a slightly different conclusion, more consistent with that firefighter evidence,²⁴ and Dr Lane explained in response to questioning on this point that the matter was still under consideration, as she wanted to evaluate carefully all of the evidence as to how conditions changed at each location within Grenfell Tower..
59. Mr Farhad Neda’s evidence is that the smoke ventilation system was making a loud noise when he and his parents returned to their flat on the 23rd floor shortly after 00.52. This was around the same time as the fire was reported to the Fire Brigade by the resident of Flat 16, and the alarm on the smoke ventilation system was actuated. Given that Mr Neda lived on the top floor of the tower, it is possible that the noise he heard could have been the sound of the fans at roof level extracting the smoke from the 4th floor. This is a point for further consideration in Phase 2.
60. Dr Lane refers at Appendix J9.2.8 and J9.3.2 to her team’s preliminary conclusion that the smoke ventilation system would not have responded correctly in the event of activation of the smoke detector on Ground Level or Level 1. She states that *“the control software appears to have been programmed such that power could*

²² MET00012525_0022

²³ At paragraph 14.4.57(g) of Dr Lane’s Revised Report.

²⁴ At paragraph 21 of Prof. Purser’s Revised Report he opines that the lobbies and stairs were smoke-free until around 01.30/01.35 and that the stair was relatively clear of smoke until around 02.00.

not be supplied to these specific AOVs”, whilst acknowledging at Appendix J9.2.12 that this conclusion cannot be confirmed without full records of Lakehouse’s maintenance testing. It is unclear (and Dr Lane has not explained) what precisely it was in the software that led Dr Lane’s team to draw this conclusion. Max Fordham will comment further if appropriate once it has been given access to this software.

The Operation of the Smoke Ventilation System following Failure of Compartmentation

61. The way in which the system operated after activation remains unclear on the evidence currently available, as now acknowledged by Dr Lane in her Revised Report (20.11.2018). At some point in time, however, it appears that the dampers on floor 4 were closed and those on floor 11 were opened, as that is how BRE found them upon their examination after the fire. It is not clear as to why the two dampers on the lower South Side of the lobby on floor 18 were still open or why a single damper was observed to be slightly open on floor 7 and on floor 23. As Dr Lane concludes, these are matters that will have to be considered in light of the evidence of how the system was maintained. It is, though, noted for present purposes that the dampers *did* appear to be operating in May 2017 upon inspection by Lakehouse (LAK00000042_0001).

62. So far as the LFB involvement on the night of the fire is concerned, it is of note that in her original report Dr. Lane reached the conclusion on the evidence she had read that: *“There is evidence the fire service attempted to take control of the system but were unable to successfully do so”*. She concluded:

“2.22.11....Therefore, had the smoke control system operated correctly and the fire service been able to take control, they might have used the system to sequentially vent smoke from the lobbies on each floor of Grenfell Tower.”

2.22.12 I consider that this system under the control of the fire service could have provided some assistance to improving the conditions for means of escape and firefighting within the lobbies and therefore the stair.²⁵

²⁵ Dr Lane original report (12.4.2018) para 2.22.9 – 2.22.12.

63. The firefighter evidence has not, however, identified any concerted effort was in fact made to operate the smoke ventilation system in this way in tackling the spread of fire and smoke at Grenfell Tower. The CCTV footage of the ground floor lobby shows there were only momentary interactions with the HMI smoke control panel, each lasting only a matter of seconds, from WM Watson (who opened the panel) and WM Dowden.
64. The generic risk assessment for fighting fires in high rise buildings, GRA 3.2, is clear that any interference with a high rise building's ventilation system should only be undertaken by the Incident Commander upon taking advice from either the building's designated "responsible person"²⁶ or from appropriately trained Fire and Rescue Authority personnel.²⁷
65. There has been no evidence to indicate that any attempt was made during the night by any of the Incident Commanders to seek advice from either the building's responsible person (whoever that may be) or from appropriate trained Fire and Rescue Authority personnel. To the contrary, all appear (save for WM Dowden) to have accepted at face value being told or overhearing others stating that the system was not working, without seeking themselves to confirm that was in fact the case or seek expert advice or assistance.
66. SM Egan stated that he was specifically mobilised to attend the fire in the role of "Fire Safety Officer", which he explained in his statement was to advise the Incident Commander of ways to assist the situation such as using a smoke ventilation system.²⁸ However, his evidence was that whilst he booked in as such, he was almost immediately reassigned by GM Welch to take control of fire survival guidance.²⁹ There is no evidence that any other individual was allocated to perform this Fire Safety Officer role or specifically advise the Incident Commander as to the use of the smoke ventilation system on the night of the fire.

²⁶ Within the meaning of Regulation 3 of the Regulatory Reform (Fire Safety Order) 2005, namely the person who has control of the premises (as occupier or otherwise) or the owner of the premises.

²⁷ LFB00001255_0031

²⁸ MET00007515_0002 and see also Transcript 3.7.2018 page 92 lines 2-9.

²⁹ Transcript 3.7.2018 page 88.

67. As above, in the absence of any trained person using the system, the only evidence of firefighters actually interacting with the HMI panel is momentary, and somewhat confused.
68. It appears, however, that at some stage that night the system was in fact overridden and turned from automatic mode to manual mode: see Dr Lane's Revised Report Appendix J Figure J.86 (annotated photograph MET00018915). SM Egan reports seeing the panel in this manual condition (i.e. switched to "on" rather than "auto") when he was in the foyer during the night of the fire (although the precise timing of that cannot be ascertained with certainty).³⁰
69. It is apparent from the CCTV footage that WM Dowden was at the panel doing something to it at around 02:02³¹ albeit in his evidence he denied activating it. The CCTV shows that he then went immediately to the ground floor lift lobby and inserted one if not two keys successively into the yellow override switch. It is unclear whether he actually *turned* the key to successfully activate that override switch. Dr Lane was asked about that in her oral evidence:

1 *Based on your review of the software and how the*
2 *system was supposed to operate, what would be the effect*
3 *of that, of putting the key into the ground floor?*
4 *A. Well, it depends what the condition at the main HMI*
5 *panel was, and I don't know if it was in on or not when*
6 *he did that.*
7 *Q. If it was in on, would the effect of him putting his key*
8 *into the yellow key switch mean that it was diverted to*
9 *operate on the ground floor?*
10 *A. Theoretically, yes. It should've opened the vents at*
11 *ground floor.*

70. The difficulty is that it appears now to be impossible to obtain any conclusive or reliable objective evidence about the operation of the smoke ventilation system on the night due to the loss of the activation log data (see above).

³⁰ Transcript 4.7.2018 page 2.

³¹ INQ00000343; see also Transcript 20.09.18 page 163, line 8.

71. This regrettable loss of vital and pertinent evidence creates a considerable evidential gap. It prevents the Inquiry from establishing precisely what was done to operate the smoke ventilation system and when. Anecdotal recollections are unlikely to compensate for this absence for the reasons expressed above.
72. Those representing Max Fordham have requested access to all of the smoke ventilation system's data. However, such access is understood to be awaiting the finalisation of access instructions that were currently being checked by Dr Lane's team.
73. Accordingly, Max Fordham will make submissions, if appropriate, in Phase 2 following its technical evaluation of the data, once access to that data has been provided.

Smoke Spread

74. In the absence of reliable objective evidence from the HMI panel, Dr Lane has relied³² on the oral evidence of Mr Farhad Neda that smoke was leaking from the smoke shaft vents on the 23rd floor (Transcript 18/10/18 pages 41-42). Mr Neda's evidence was that this began around 30 minutes after his call at 01.10 to the TMO, i.e. around 01.30 – 01.40 (Transcript 18/10/18 page 42, line 2), by which time the fire had spread to the 23rd floor (Lane, paragraph 2.10.18). Dr Lane states at paragraph 2.23.43 that this *"could indicate a significant failure of the smoke control system to prevent contamination of compartments away from the fire compartment"*. Dr Lane has not yet considered any other potential explanations for what Mr Neda says he witnessed at that time - such as, for example, attempts by LFB to operate the smoke control system or interact with the HMI panel (referred to at paragraph 2.23.57 of her report). The CCTV footage shows firefighter interaction with the control panel at 01.40. Dr Lane has confirmed that she will consider those and any other alternative explanations when she continues her investigations in Phase 2.³³ Dr Lane has not yet addressed the evidence in the

³² At paragraph 2.23.43 of Dr Lane's Revised Report.

³³ Transcript 26.11.2018, page 168 lines 4-11

BRE report which suggests that there was a problem with one of the dampers on 23rd floor.

75. Further, it is surprising that Dr Lane surmises that the smoke ventilation system may have contributed to smoke spread on the basis of Mr Neda's evidence alone³⁴ when:

75.1. The weight of evidence strongly suggests that smoke spread was caused by the opening of doors from Flat 6 on each floor, as explained by Professor Purser.³⁵ Indeed, in her oral evidence Dr Lane aligned internal early spread of smoke in the lobbies with external flame progression (Transcript 26/11/18 page 38);

75.2. There is considerable evidence from the residents that self-closing devices were either not fitted or were not operational on many flat doors, meaning that it is likely that many doors were left open following evacuation of residents;

75.3. It is likely that the doors to flats that were subject to flash-over conditions failed, as Professor Torero explained in his oral evidence.³⁶ Dr Lane herself is critical of the integrity of the flat entrance doors (Lane, paragraph 2.21.5);

75.4. There is a great deal of evidence that stair doors were propped open by firefighting equipment;³⁷

75.5. The doors to flats and to the stair doors were therefore being opened and closed, and in some cases left or propped open, throughout the night in circumstances where there were approx. 100 internal flat fires throughout the building (as Professor Purser opined in his oral presentation);³⁸ and

³⁴ Mr Neda's evidence is the only eye witness account of smoke coming out of these vents, so far as Max Fordham is aware.

³⁵ Paragraph 21 of Prof. Purser's Revised Report.

³⁶ Transcript 20.11.18 page 180.

³⁷ See e.g. paragraph 153 of Prof. Purser's Revised Report.

³⁸ Transcript 29.11.18 page 24 line 13.

- 75.6. Dr Lane's own view is that the stair doors may have failed to prevent the spread of smoke to the protected single stair due to several factors, one of which is her finding that some stair doors may have lacked the fire resistance integrity of 60 minutes duration required by ADB 2013 (Lane, paragraph 2.22.3).
76. Dr Lane has indicated that she will be considering the evidence of Mr Neda in conjunction with the other matters set out in Appendix J – J11 as part of Phase 2.³⁹
77. Given the magnitude and extent of this fire, and the evidence that multiple lobbies became smoke-logged in many cases within half an hour of the original fire in Flat 16 but in all cases by 02.00 (Purser, paragraph 21), it was inevitable that smoke would enter the stairwell from multiple floors, with each occurrence of a stairwell door opening. It would therefore seem considerably more likely that smoke spread was caused by the factors listed above, than by any problem with the smoke ventilation system, of which there is limited evidence.
78. Once the fire spread out of the kitchen window of Flat 16 and ignited the cladding at 01.09,⁴⁰ a chain of events was set in motion which rapidly led to an uncontrolled fire taking hold of the external façade and spreading to the top of the building by 01.27.⁴¹ Professor Torero has explained in his Revised Report that, by this time, the building was operating outside the conditions contemplated by the regulatory framework (Torero, page 4, lines 74-82). He says that, as the fire propagated to the top of the building, it spread into flats on the 5th, 12th and 22nd floors (Torero, page 5 lines 124-135. Professor Purser estimates that, ultimately, there were approx. 100 internal flat fires throughout the building,⁴² on multiple floors.
79. Professor Torero states at paragraph 5.3.2.3.6 of his updated Report that:

³⁹ Transcript 20.11.2018.

⁴⁰ Paragraph 381 of Prof. Bisby's Revised Report.

⁴¹ Paragraph 381 of Prof. Bisby's Revised Report.

⁴² Transcript 29.11.18 page 24 line 13.

“A correctly designed and specified [smoke control] system would be sized to perform within the framework of a contained single compartment fire, with the intention of maintaining a single lobby as passable. Given the scale of the event and the number of lobbies that were simultaneously compromised by smoke ingress, a fully functioning, compliant system would have provided negligible benefits to egressing occupants, thus any discussion of its compliance or functionality is secondary in the context of the Grenfell Tower fire.”
(JTOS0000001_0106)

80. Professor David Purser has reported that he is working with Professor Anna Stec to analyze soot samples from the vents and ducts of the smoke control system to determine how it functioned during the fire, and whether it presented a mechanism for smoke spread between lobbies on different floors.⁴³ He states that this will be covered in his report in Phase 2.

Conclusions

81. In its Opening Statement Max Fordham questioned the extent to which many of the matters under consideration by Dr Lane in her original report could properly be capable of determination (even on a preliminary basis) during Phase 1. Despite an extensive investigation by her and her team and some of the other experts concerned, this issue remains work in progress.
82. Even the issue of contribution towards smoke spread is one that is incapable, at present, of determination, in light of the loss of significant evidence and also the countervailing evidence that exists as to how the system may or may not have operated on that night.
83. However, from the experts’ conclusions it is clear that, whatever answer is reached to the preceding matters, any causal impact of the smoke ventilation system is likely to have had “*negligible benefits to egressing occupants*” as

⁴³ Paragraphs 146-147 of Report of Prof. Purser dated 5 November 2018.

concluded by Professor Torero, when set against the unprecedented and unforeseen scale and ferocity of this fire.

Dated 6 December 2018

SIMON ANTROBUS QC

*Crown Office Chambers,
Temple, London*

LYNNE McCAFFERTY QC

*4 Pump Court,
Temple, London*