

THE GRENFELL TOWER INQUIRY

MAX FORDHAM LLP

OPENING STATEMENT

PHASE 2 MODULE 3 TOPIC 3 – SMOKE CONTROL

1. Introduction

- 1.1. Max Fordham LLP (“MF”) continues to support the work of this Inquiry, and notes the extensive work that has gone into the preparation of expert evidence for Topic 3 of this Module, with the aim of answering some of the questions left over from Phase 1. MF will endeavour to assist the Inquiry, as it has done thus far, in its task of seeking to understand what happened at Grenfell Tower and what lessons can be learned from this tragedy.
- 1.2. MF has set out its role in the refurbishment project at Grenfell Tower previously, albeit in different contexts, for Phase 1 and for Phase 2 Module 1.
- 1.3. MF is a building services consulting engineering practice specialising in the design of mechanical and electrical (“**M&E**”) systems. MF does not build, make or supply products, and only designs or specifies performance criteria for M&E systems for buildings.
- 1.4. MF 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 (including the smoke control system (“**the SCS**”)) at Grenfell Tower.
- 1.5. MF’s role during the project was split into two distinct periods, either side of the award of the design and build contract to Rydon, namely:

- (a). Period 1: Early development of the pre-tender design, including preparation of the relevant M&E elements of the Employer's Requirements.
- (b). Period 2: Provision of consultancy services directly to the TMO, after JS Wright & Co. Ltd ("**JSW**") was engaged by Rydon to prepare the detailed designs and carry out the installation of the M&E works. JSW in turn engaged PSB UK Ltd ("**PSB**"), leading smoke control specialists, to design the upgrade to the SCS.

1.6. These two periods are considered below so far as they relate to MF's involvement in the upgrade of the SCS at Grenfell Tower.

2. Pre-Tender development of designs for upgrading the SCS

- 2.1. MF was engaged as a consultant by the TMO under the standard terms ACE Agreement 1: Design (2009 ed. 2nd revision) incorporating ACE Schedule of Services Part G (c) services G2.1 to G2.8 – mechanical and electrical engineering (performance design in buildings) ("**the Appointment**").
- 2.2. The upgrading of the SCS was originally recommended by another M&E engineering consultancy, Aecom, in a specification it prepared for the TMO in October 2011 for purposes pre-dating the planned refurbishment of Grenfell Tower. MF was asked in July 2012 to incorporate this proposed upgrade into the Stage C report that MF was in the process of preparing at that time.
- 2.3. This led to the development of initial proposals by MF for an upgrade of the SCS, whereby the existing SCS (a natural ventilation system in which air was naturally drawn into lobbies and then extracted via shafts)¹ would be changed into a fully mechanised system using new automated dampers and upgraded fans. These proposals were developed by MF with input from Exova, who was leading the fire engineering strategy for the building, and set out by MF in the following documents:

- (a). Section U14 of the Stage D report, titled "*Smoke Extract*";²
- (b). Smoke Control Proposals dated 21 October 2013;³ and

¹ There was a mechanical element to this "push/pull" system in that fans were available for use *by the fire service* in an emergency in order to increase the rate of air supply or extraction.

² {MAX00023618_0011}

(c). Section U10 of the Employer's Requirements for MEP Services (dated 16 October 2013).⁴

2.4. Such were the physical constraints of the existing building, most specifically the size of the cross-sectional area of the shafts themselves, that it was not possible to bring any upgraded SCS into compliance with current standards within the scope of the works. To have done so would have required fundamental alteration of the shafts themselves, which were at the structural core of the building.

2.5. In drawing up these proposals in close consultation with Exova, MF was working to what Dr Lane described as the "*non worsening principle*" in Regulation 4(3) of the Building Regulations 2010, which provides as follows:

"(3) Building work shall be carried out so that, after it has been completed-

(a) any building ... to which a material alteration is made...

(b) ...

(c) ...

complies with the applicable requirements of Schedule 1⁵ or, where it did not comply with any such requirement, is no more unsatisfactory in relation to that requirement than before the work was carried out."

2.6. The intention was to go further than simply 'not worsening' what was already in place; it was proposed to improve the SCS significantly, so that it would be more effective in facilitating means of escape. Means of escape must be understood in the context of what was foreseeable at the time (in accordance with the principle of compartmentation) namely a fire in a single apartment on a single floor of the building.⁶

2.7. This was clearly understood by RBKC Building Control when they considered the proposals, as evidenced by Paul Hanson's memorandum dated 6 December 2013 {MAX00001447}. Mr Hanson explains in that memorandum that he understood that "*it*

³ {MAX00017304_0068}

⁴ {MAX00000960_0031}

⁵ Schedule 1 to the Building Regulations 2010, namely B1-B5 so far as fire safety is concerned.

⁶ See Approved Document B ("ADB") 2013 which states that "*Fires do not normally start in two different places in a building at the same time*" (at para B1.iii), and that "*measures in Section 8 (B3) provide a high degree of compartmentation and therefore a low probability of fire spread beyond the flat of origin*" (at para 2.3). This principle is set out at para 2.2.15(a) of Dr Lane's Module 3 Report on the Lobby Smoke Control System dated 21 May 2021 ("**Dr Lane's report**") {BLARP20000035_0014}.

is not proposed to redesign the system to a modern standard of performance as this is likely to require larger riser shafts, the incorporation of which falls outside the intended scope of the works.” The approach of RBKC in the case of an existing building was explained in Mr Hanson’s memorandum as follows:

“provided that the performance of the existing system is not made any worse, the building regulations would not require the system to be upgraded”.

- 2.8. The challenge was to demonstrate the improvement that could be achieved by the proposed upgrade to the SCS, because this required establishing the baseline performance of the existing SCS in circumstances where it was not functioning properly and only limited documentation was available. MF sought to obtain information from both the TMO and from those maintaining the existing SCS (RGE Services), but was unable to obtain any previous approval of the system, or otherwise establish performance parameters as a basis for carrying out such a comparison.
- 2.9. Two alternative methodologies for establishing the performance of the existing SCS were therefore considered by MF in consultation with Exova and the TMO, namely (1) undertaking hand calculations based on a theoretical baseline level of expected performance of the existing SCS; and (2) Computational Fluid Dynamics (“**CFD**”) modelling. Ultimately, the TMO instructed MF on 31 March 2014 to proceed with hand calculations {MAX00004366_0001}.
- 2.10. On this basis MF produced the Smoke Ventilation Analysis (Rev A on 6th May 2014; Rev B on 13th May 2014)⁷ in which the flow of the existing SCS was theoretically calculated to be between 1.1 to 1.2m³/s. The target flow rate proposed for the new SCS was 5.0 m³/s. As is explained in Matt Cross-Smith’s witness statement, this was a figure obtained from Hugh Mahoney of PSB during early stage discussions that Mr Cross-Smith held with PSB in order to check the sense and efficacy of the proposed upgrade.⁸ Those discussions were held recognising that whomever was awarded the design and build contract would have to engage a smoke control specialist sub-contractor, such as PSB, to develop MF’s initial design concept proposals into a

⁷ {MAX00002335_0001}

⁸ Matt Cross Smith Statement, paragraph 47 {MAX00017304_0012}

technical design for construction. The target flow rate of 5.0 m³/s represented Mr Mahoney's view as to what was achievable in light of his considerable experience and expertise in this field.

- 2.11. As Dr Lane appears to have appreciated in her report, MF's initial concept design was a worked-up proposal for the upgrading of the SCS: it did not represent a developed design, nor did it ever become the basis of one. The Employer's Requirements made clear under the heading "*Design Responsibility*" that any design information was "*for guidance only*" and was not to be relied upon by any contractor subsequently appointed to carry out the work. The position was set out in no uncertain terms (emphasis as per the document) as follows:

*"The Contractor is ultimately responsible for **ALL** of the design and shall therefore verify, adopt, develop & complete the design based on the requirements of this specification."* {MAX00000960_0005}

- 2.12. As it transpired, once JSW was engaged by Rydon to carry out the design and installation work, and JSW, in turn, engaged PSB to carry out the specialist smoke control design, the design of the upgraded SCS changed significantly from that originally outlined by MF. In those matters PSB, and particularly Hugh Mahoney, were true experts, and very well recognised in the industry as such. The ultimate design PSB prepared was based on that acquired experience and expertise.

- 2.13. Additionally, it seems that MF's Smoke Ventilation Analysis {MAX00002335_0001} (referred to above) was not forwarded by the TMO to Building Control, and was in any event superseded by the SCS design that PSB developed. From the award of the contract to Rydon, all further discussions with Building Control as to the SCS were led by Rydon, JSW, and PSB, albeit that MF was kept apprised of what was going on.

3. Post award of design and build contract to Rydon

- 3.1. MF was not novated to Rydon after the contract award and therefore had no role in developing (amongst other matters) the design of the upgrade to the SCS. Instead, MF remained engaged as a direct consultant to the TMO to review and comment upon Contractor's Proposals, to carry out periodic site surveys (agreed at a set limit of 12 visits) in order to check for conformity with the Employer's Requirements, and to observe the commissioning process.
- 3.2. JSW provided MF with PSB's technical submission for the new design in January 2015, in advance of it being sent to Building Control. MF responded with queries and also forwarded this to Exova for comments because PSB proposed a fundamentally different solution to that outlined by MF at initial concept stage and Exova was leading on fire strategy and fire engineering.⁹ PSB's technical submission was provided by Rydon to Building Control on 19 January 2015. MF was made aware by JSW on 24 June 2015 that PSB's proposed upgrade to the SCS had been approved by Building Control.
- 3.3. The detailed design of the upgrade to the SCS lay outside MF's expertise, hence recourse to PSB for advice on the initial proposals. MF understood that, not only were PSB (and particularly Hugh Mahoney) renowned experts in this field, but that both Mr Mahoney and Paul Hanson of RBKC Building Control were contributors to one of the key industry guidance documents, the Smoke Control Association Guide "*Guidance on smoke control to common escape routes in apartment buildings (flats and maisonettes)*", published in 2012. MF also understood that Exova was aware of and involved in the discussions relating to the approval of the design of the upgrade to the SCS, albeit MF's contact with Exova was relatively limited after contract award as this now fell to Rydon.
- 3.4. Accordingly, whilst MF did raise questions throughout the period up to and during commissioning as to the design and installation of the upgrade to the SCS, in order to check general conformity with the design intent encapsulated by the Employer's Requirements, MF did not have detailed involvement in the development of either the

⁹ Para 50 of Matt Cross-Smith's statement {MAX00017304_0017}.

design or the installation process. The extent and nature of MF's involvement in this period of the project is best exemplified by paragraph 53 of Matt Cross-Smith's statement¹⁰.

- 3.5. The M&E works were subject to detailed inspection and monitoring by a designated Clerk for the M&E Works, Tony Batty, and this did not, therefore, form part of MF's role.
- 3.6. MF was provided with the minutes of the JSW Progress Meeting on 3 November 2015,¹¹ which confirmed that all dampers, control panels, wiring and smoke heads had been installed to the existing floors 4-23 and that secondary supply routes had been confirmed following a meeting with Building Control.
- 3.7. In February 2016, MF provided comments {MAX00005990} on the SCS aspects of PSB's Technical Submission No. 4 {MAX00002440}, all of which were addressed by PSB and incorporated into its updated Technical Submission No. 5) dated 25 February 2016. MF made some further comments about the environmental mode of operation of the SCS {MAX00006024} which were addressed by JSW {MAX00006032}. MF witnessed PSB's testing and commissioning of the SCS, which included the use of smoke canisters triggering smoke detectors and also the consequent operation of dampers on several of the floors. MF also witnessed PSB's demonstration of the manual override at the ground floor HMI panel to the London Fire Brigade. MF did not have any involvement in the ongoing maintenance of the system after practical completion.

4. Issues for Module 3

- 4.1. The reports on the SCS prepared by Dr Barbara Lane and Mrs Beryl Menzies are very substantial and Dr Lane's report has been received only relatively recently. We are still working through the detail and, consequently, do not advance submissions on either report at this stage.

¹⁰ {MAX00017304_0018}.

¹¹ {MAX00002348}

- 4.2. Plainly, Dr Lane’s report makes significant criticisms in relation to PSB’s design and the installation and commissioning process, which will be the subject of further exploration during the course of this stage of the Inquiry. MF will take the opportunity of putting questions to Dr Lane and Mrs Menzies on such matters in due course, and with the benefit of hearing the witness evidence from Mr Mahoney and Mr Hanson in particular.
- 4.3. MF would ask the Inquiry to consider, in exploring this part of the evidence, the following matters:
- (a). The original design intent: the upgrade to the SCS was never intended nor required by anyone to result in a system that could conceivably cope with the smoke demands imposed upon it by an external cladding fire that had ascended 19 floors of the building within the space of half an hour, and which continued to envelope the building thereafter without any abatement. As set out above, the design parameters established by ADB 2013 were for an SCS that could facilitate means of escape during a fire in a single apartment on a single floor of the building in accordance with the principle of compartmentation.
 - (b). Accordingly, some caution must be applied to the analysis of anecdotal recollections of evidence of smoke, or the extent of smoke within lobbies at various times, without certainty as to the origin of the smoke being described. Such caution is particularly important in the absence of the best evidence as to the actual operation of the SCS itself, namely its data log (the evidence as to which has been overwritten as Dr Lane explained in oral evidence during the Phase 1 hearing).
 - (c). The fact that all designs of smoke control systems are necessarily, and reasonably, based upon the principle of compartmentation that was so obviously overcome by the nature and extent of the cladding fire at Grenfell Tower.
 - (d). The “*no worsening principle*”, that is central to the application of the Building Regulations to any material alteration to an existing building. Mr Todd states at paragraph 5.1.4 of his report dated March 2018 that, for an existing building, Regulation 4(3) does not require the upgrading of fire precautions to comply

with current standards, as long as the building is left no less compliant with the requirements of the Building Regulations than it had been before the work was carried out.¹² It appears that Dr Lane’s opinions as to regulatory compliance are based, in part, upon (i) her own different interpretation of that provision (which she fairly acknowledges at paragraph 9.4 of her earlier Regulation 38 report), and (ii) inferences and assumptions she has had to draw by reason of the difficulties she perceives with the way Regulation 4(3) is drafted.¹³

Dated 25 June 2021

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¹² {CTAR00000001_0039}

¹³ Dr Lane Report “The lobby smoke control system at Grenfell Tower” Section 10 para 10.2.1 {BLARP20000036_0004} and report “Regulation 38 Fire Safety Information” (Version 2, updated 23 October 2020) Section 9.4 {BLARP20000021_0065-67}.