




Grenfell Tower Inquiry

Phase 1 – Recommendations

Professor Luke Bisby

Signed: 

Dated: 3rd April 2019

Contents

1.0	Remit.....	3
2.0	Recommendations	4
2.1	Identification and Removal of Cladding which is not Sufficiently Safe	4
2.2	Guidance (Specific)	6
2.3	Guidance (General)	8
2.4	The Hackitt Review and The Government’s “Ban on Combustible Materials”	10
2.5	Firefighter Activities and Operational Guidance	11
3.0	Scottish Building Standards (Fire Safety) Review Panel.....	13
3.1	Clarification of Guidance and Routes to Compliance	14
3.2	External Wall Cladding	14
3.3	Evacuation and Alarms.....	15
3.4	Automatic Fire Suppression (i.e. Sprinklers)	16
3.5	Scottish Government Response	16
4.0	Quantifying Adequate Fire “Safety” and Tolerable “Risk”	17

1.0 Remit

1. Further to Cathy Kennedy's email and letter of 15/01/2019, I am writing with respect to the Chairman's formulation of interim or Phase 1 recommendations.
2. I was asked to provide my comments on recommendations that are so urgent that they should be made now and prior to the completion of the Chairman's Phase 1 report. This is on the basis of the recommendation being: (1) obvious in the light of the evidence which has been heard at Phase 1; and (2) so urgent on grounds of public safety that it should not be deferred until either the publication of the Chairman's Phase 1 report or left to be addressed at the end of Phase 2.
3. I was also asked to offer thoughts on recommendations which could be based on the Chairman's findings and analysis in his Phase 1 report that should not be left to be addressed as final recommendations at the end of Phase 2.
4. I was asked to focus on recommendations in relation to **building regulations and building safety** and to consider this, in particular, in the context of MHCLG's position paper [CLG00019099].
5. I was asked to consider whether any further steps ought to be being taken in respect of the 457 high rise buildings that have been identified (by MHCLG) "with unsafe ACM cladding" in the interests of public safety.
6. I have considered the above within the context of the position papers from LFB, the MHCLG, the Home Office, the Mayor of London, and RBKC that were served on the Inquiry in October 2018, as well as the core participants' (CPs') submissions on interim recommendations served on the Inquiry in December 2018. The Inquiry has also provided me with a summary table of the various CPs' responses to the position papers and CP submissions on interim recommendations.
7. In addition, I was asked whether there were any particular matters which have arisen as part of my involvement with the Scottish Building Standards (Fire Safety) Review Panel, of which I was a member, that the Chairman should consider when formulating his recommendations.
8. The opinions I have expressed represent my true and professional opinion on the matters to which they refer. I have had regard to the evidence that is material to my discipline (including the oral testimony) and I can confirm that I have discharged my overriding duty to the Inquiry.
9. My Phase 1 (Supplemental) Expert Report¹ and oral testimony to the Inquiry^{2, 3}, provide detailed descriptions of my assessment of issues related to the initiation, growth, and spread of the Grenfell Tower fire. My comments in the current submission should be considered in parallel with these prior submissions and evidence.
10. In this submission I have attempted to restrict my comments to issues which fall within my own scope of work for Phase 1 of the Inquiry. However, in order to fully respond to the Chairman's requests, some of the opinions stated herein necessarily stray into areas that I intend to address in greater detail at Phase 2; i.e. legislation, building regulations, guidance, fire safety testing and certification, competence, and professionalism.

¹ [LBYS0000001]

² Expert Witness Presentations, 20th June 2018.

³ Expert Evidence, 21st November 2018.

2.0 Recommendations

11. In this section I provide a brief summary of my views on interim and Phase 1 recommendations for consideration by the Chairman. In some cases my rationale for making specific recommendations requires additional explanation; I have attempted to provide this to the extent possible within this brief submission, and noting my previous comments as regards straying into Phase 2 issues.

2.1 Identification and Removal of Cladding which is not Sufficiently Safe

12. As I have already made clear within my previous submissions, it is my opinion that the assembled evidence at Phase 1 clearly indicates that the polyethylene filled ACM rainscreen cassettes within Grenfell Tower's refurbishment cladding, and notably within the Tower's architectural crown, were, by a considerable margin, the primary cause of rapid and extensive fire spread at Grenfell Tower. **I believe it would be appropriate for the Chairman to comment on the central roles of the ACM rainscreen and architectural crown at Phase 1.**
13. It is my opinion, again based on the assembled evidence at Phase 1, that neither the specific prescriptive guidance of Approved Document B – Volume 2⁴ (hereafter referred to as ADB) nor the functional requirements of the Building Regulations 2010 were met by the fire safety provisions at Grenfell Tower.
14. Specifically, it is my opinion based on the available evidence that Grenfell Tower was non-compliant, both with the guidance in ADB and with the Building Regulations 2010, as regards (at least) the rainscreen products used, the rainscreen cavity insulation materials used, and the cavity barrier installation.
15. I have not seen any evidence to indicate that the refurbishment cladding system used at Grenfell Tower had been subjected to testing in accordance with BS 8414⁵, nor classified according to BR 135⁶, nor assessed via a desktop study by a suitably competent fire safety professional. **I believe it would be appropriate for the Chairman to comment on these non-compliances at Phase 1.**
16. As stated in my Phase 1 (Supplemental) Expert Report⁷ and reiterated during my oral testimony⁸, it is my opinion that a "stay put" evacuation strategy was not a credible component of any fire safety strategy for Grenfell Tower once the refurbishment cladding system had been installed. **I believe it would be appropriate for the Chairman to comment on this issue at Phase 1.**
17. Given the magnitude of the hazards associated with the use of polyethylene (PE) filled ACM cladding materials and the gravity of the consequences of a fire in a high-rise residential building incorporating them, **I believe it would be appropriate for the chairman to make recommendations with respect to the need for urgent removal of PE filled ACM rainscreen cassettes from existing buildings.**
18. Notwithstanding some specific criticisms noted in the following sections, I am broadly supportive of the various actions taken and guidance issued by MHCLG since the Grenfell

⁴ Approved Document B (fire safety) volume 2: buildings other than dwellinghouses (2006 edition incorporating the 2010 and 2013 amendments).

⁵ BS 8414-1:2015, Fire performance of external cladding systems. Test methods for non-loadbearing external cladding systems applied to the masonry face of a building.

⁶ S. Colwell and T. Baker, "BR 135 Fire Performance of External Thermal Insulation for Walls of Multistorey Buildings," 3rd Edition, BRE, Watford, 2013.

⁷ Paragraph 752, [LBYS0000001].

⁸ Page 159, Transcript, Expert Evidence 21st November 2018.

Tower fire, as regards inspection and removal of combustible cladding materials (this includes both ACM rainscreen cladding^{9, 10} and other combustible cladding materials and products, including polymer foam insulation and composite sandwich panels¹¹).

19. **I would encourage the Chairman, in issuing his interim and Phase 1 recommendations, to offer broad support¹² to the MHCLG advice issued to building owners to date as regards identification and removal of unacceptably dangerous cladding materials, products, and systems.**
20. It is my opinion that any high-rise residential building with polyethylene filled ACM rainscreen cassettes or panels forming part of the external cladding should have these removed urgently.
21. I am concerned that the pace of remediation of buildings identified as incorporating unacceptably dangerous cladding is too slow, and that the Government appears thus far to have been unable to compel rapid remediation action (for deficient private buildings in particular). My concern is supported by the MHCLG data on affected buildings¹³.
22. I believe this to be – in part – a result of many within the construction industry not “doing the right thing”¹⁴ and in some cases failing to take responsibility for delivering (or having delivered) buildings with adequate safety. I believe this is also indicative of the absence of sufficiently rapid or robust legal mechanisms by which to hold designers and contractors to account for the quality of their work. I am likely to offer further comments on this issue at Phase 2.
23. It is noteworthy that the slow pace of remediation of buildings identified as incorporating unacceptably dangerous cladding may also be due – in part – to a lack of capacity within the cladding design and construction community to deal with the volume of remediation work required. This may also be due – in part – to an unwillingness to take on such work in the wake of the Grenfell Tower fire.
24. Regardless of the reasons for the apparent slow pace of remediation, it is to be expected that any and all buildings identified as incorporating unacceptably dangerous cladding would *immediately* be carefully managed under, for example, the National Fire Chief Council’s (NFCC) *Guidance to support a temporary change to a simultaneous evacuation strategy in purpose-built blocks of flats*¹⁵. I would consider any failure to implement these (or similar) measures a serious breach of responsibility.
25. **I would encourage the Chairman to make whatever interim or Phase 1 recommendations possible, and take whatever steps available, to enable the relevant authorities to compel building owners to expedite the remediation of buildings with**

⁹ Letter from Melanie Dawes, DCLG, 22nd June 2017.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/621449/170622_letter_to_LAs_and_HAs.pdf

¹⁰ Consolidated Advice for Building Owners, DCLG, 27th February 2018.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/684350/20180228_-_Update_and_consolidated_advice_for_building_owners_following_large-scale_testing.pdf

¹¹ Advice on external wall systems that do not incorporate Aluminium Composite Material, MHCLG, 18th December 2018.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765761/Expert_Panel_advice_note_on_non-ACM.pdf

¹² Notwithstanding specific comments (and criticisms) noted within this submission.

¹³ <https://www.gov.uk/guidance/aluminium-composite-material-cladding#acm-remediation-data>

¹⁴ <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2018-07-19/HCWS890/>

¹⁵ <https://www.nationalfirechiefs.org.uk/Simultaneous-evacuation-guidance>

unacceptably dangerous cladding, as identified and instructed by a competent fire safety professional.

26. **I would also encourage the Chairman to consider the possible legislative, legal, financial, and institutional root causes of the current slow pace of cladding remediation work¹⁶; I am likely to comment further on these issues at Phase 2.**

2.2 Guidance (Specific)

27. Both the version of ADB in effect at the time of the Grenfell Tower fire¹⁷ and the Government's recent amendment to the Building Regulations 2010 (i.e. the "Ban on Combustible Materials"¹⁸, see additional comments below) include restrictions on the use of combustible materials in or on the external walls of buildings above 18 metres. The 18 metre "trigger height" represents a historical consensus view, and I believe this to be associated with the ability of the Fire and Rescue Services to rescue building occupants externally using ladders available on fire appliances.
28. It is my opinion, based on my personal professional judgement and my interactions with a range of other experts in particular via the Scottish Building Standards (Fire Safety) Review Panel (see below), that this 18 metre trigger height could reasonably be reduced to 11 metres, both to improve fire safety outcomes in the relevant buildings and to bring English requirements in line with those likely to be recommended in Scotland. The 11 metre trigger height is semi-arbitrary but is *"related to the height which might be able to be covered by a ground mounted water jet from fire-fighting operations"*¹⁹.
29. **I encourage the Chairman to consider whether the trigger height for the most stringent fire safety requirements on cladding and external wall construction materials and products might reasonably be reduced, from 18 metres to 11 metres²⁰.**
30. I have previously stated my opinion that the architectural crown detail at the top of Grenfell Tower, and the cladding rainscreen materials and details at the top of the building's perimeter columns, played critical roles contributing to horizontal progression of fire spread *around* the building.

¹⁶ In this context it is noteworthy that I am a Registered (Licenced) Professional Engineer (i.e. PEng) in Ontario (Canada), as well as a Chartered Structural Engineer (i.e. CEng) in the UK. As a Registered (Licenced) Professional Engineer, I am *legally bound* to uphold the Code of Ethics as defined in the Professional Engineers Act Ontario (<https://www.ontario.ca/laws/statute/90p28>). This *legislation* requires me to (amongst other things) act at all times with fidelity to public needs and with devotion to high ideals of personal honour and professional integrity. Furthermore, this legislation identifies that an act of professional misconduct includes: (1) failure to make reasonable provision for the safeguarding of life, health or property of a person who may be affected by the work for which the practitioner is responsible; and (2) failure to act to correct or report a situation that the practitioner believes may endanger the safety or the welfare of the public. I draw these duties to the Chairman's attention because in some cases my opinion about appropriate recommendations is based on a consideration of the available evidence *and* a professional ethical judgement; and because there is no equivalent code of ethics that legally binds (or protects) Chartered Engineers in England. As a Chartered Structural Engineer in the UK, and I am expected to abide by the Institution of Structural Engineers' (IStructE) Code of Conduct (<https://www.istructe.org/downloads/about-us/governance/code-of-conduct-and-guidance-jan2019.pdf>); the sentiments and provisions it sets out are similar to those set out in the Professional Engineers Act Ontario, however they are not supported by equivalent legislation. Sanctions for failing to abide by the IStructE Code of Conduct are set out in the Institution's Royal Charter, Bye-laws, Regulations and Standing orders (https://www.istructe.org/getattachment/about-us/governance/royal-charter-and-bye-laws/Royal-Charter-Bye-Laws-Regulations-and-Standing-Orders_Jan2019.pdf?lang=en-GB). It is my opinion that these legislative differences must be considered in any root cause analysis of the current situation in the UK.

¹⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/441669/BR_PDF_A_D_B2_2013.pdf

¹⁸ <http://www.legislation.gov.uk/ukxi/2018/1230/contents/made>

¹⁹ <https://www.gov.scot/publications/report-review-panel-building-standards-fire-safety-scotland/pages/7/>

²⁰ Noting my additional comments on the "ban on combustible materials" in the following sections.

31. Prior to the implementation of the Government's recent "ban on combustible materials", I was not aware of any English building regulations or statutory guidance specifically addressing the fire performance of such decorative features on the exterior of buildings, either above or below 18 metres. I will consider this issue in greater detail, specifically as regards pre-existing regulations and statutory guidance, at Phase 2.
32. **In the interim, I encourage the Chairman to consider recommending that building owners undertake inspections – by suitably competent fire safety professionals – of external decorative features installed on buildings above 18 metres (or possibly above 11 metres as noted previously) to identify the presence of high fire hazard materials and products, and to assess (and mitigate where necessary) any significant fire spread concerns that might exist.**
33. MHCLG have already identified what I consider to be an alarming number of buildings incorporating unacceptably "unsafe" cladding materials, products, and/or systems. It is conceivable (however unlikely, based on the evidence I have reviewed to date) that the external cladding systems on some of these buildings have been subjected to large-scale testing in accordance with BS 8414-1 or BS 8414-2 and subsequently classified according to BR 135.
34. Since the Grenfell Tower fire, a range of expert and core participant (CP) evidence presented to the Inquiry, in parallel with public debate within the construction industry, has criticised BS 8414 testing (and subsequent BR 135 classification) as unrealistic and – apparently by extension – inadequate.
35. In my opinion it is unfair and irrational to criticize *any* compliance test for being "unrealistic". A compliance test is simply a test; it is the manner in which the outcome(s) of a compliance test is applied by design professionals that is justifiably open to criticism.
36. I believe it is plainly obvious that BS 8414 tests cannot assess the impacts of various realistic cladding features, including but not limited to: windows, penetrations, specific building geometries, complex fixing and bracketing systems, variable placements of cavity barriers, gaps between panels or cassettes, and so on.
37. In this context it is noteworthy that BR 135 (3rd Edition) clearly states that: "This guide provides a basis for evaluating the fire performance of external cladding systems. It does not specify where this performance standard should be adopted; this is a matter for regulators and specifiers." BR 135 is therefore reasonably clear that application of its classifications to cladding systems installed on real buildings requires careful consideration by a suitably competent specifier and/or regulator.
38. Thus, while I agree that BS 8414 tests are unrealistic, I believe that this criticism fails to address the key problems associated with the use of BS 8414 tests by the construction industry. The key problem in my view is the inappropriate or incompetent application of BS 8414 test results by design professionals.
39. In my opinion, the responsibility to specify "where the BR 135 performance standard should be adopted" falls primarily with the cladding system designer. It follows from this that use of the BR 135 classification (by definition) necessitates the use of a "desktop assessment" by a suitably competent designer, to demonstrate the applicability of the testing classification to the specific system and building under consideration.
40. Furthermore, it follows logically that, because a BS 8414 test cannot precisely reproduce the conditions to be expected when a cladding system is installed on a real building, BR

135 ought therefore *never* be (or have been) used to provide a “blanket” classification for any combination of cladding materials, products, or systems.

41. The above assertion appears to have been partly recognized by the British Standards Institution (BSI), who have – subsequent to the Grenfell Tower fire – initiated the process of drafting BS 9414²¹ “Fire performance of external cladding systems – The application of results from BS 8414-1 and BS 8414-2 tests”. A draft of this document is currently under public consultation.
42. With regard to the above discussion, it is notable that Paragraph 12.5 of ADB (2006 edition incorporating the 2010 and 2013 amendments) states that “external walls should either meet the guidance given in paragraphs 12.6 to 12.9 or meet the performance criteria given in Fire performance of external thermal insulation for walls of multi storey buildings (BR 135) for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2:2005”.
43. ADB Paragraph 12.5 appears to have had the effect of enabling practitioners to believe that they could develop inappropriate “blanket” approvals based on BS 8414 testing for particular cladding materials, products, and system build ups.
44. Whilst I intend to comment on these issues in greater detail at Phase 2, the above comments provide necessary background for my immediate Phase 1 recommendations.
45. On the basis of the above, I believe that potential cladding fire spread risks may exist for existing buildings which incorporate cladding materials, products, and systems that have previously been specified and approved on the basis of BS 8414 testing and classification according to BR 135.
46. **I would therefore encourage the Chairman to consider recommending that any building which has been designed, approved, specified, or constructed on the basis of BS 8414 testing and BR 135 classification should be urgently inspected by a suitably competent fire safety professional, so as to ensure that application of the relevant BR 135 performance assessment is technically defensible under the particular circumstances of that building.**
47. Similar to my concern above as regards application of BS 8414/BR 135 to existing buildings, it may be the case that some existing buildings above 18 metres have been designed and approved on the basis of “desktop studies”, notionally supported by data from BS 8414 testing as outlined in Paragraph 12.5 of ADB. Evidence presented in the media and available to the Inquiry suggests that there is good reason to question the robustness and technical credibility of some such existing desktop assessments.
48. **On the basis of the above, I would encourage the Chairman to consider recommending that any building which has been designed, approved, specified, or constructed on the basis of a desktop study, supported by BS 8414 testing and BR 135 classification, should be urgently inspected by a suitably competent fire safety professional so as to ensure that the desktop assessment applied in design is technically robust and properly delivered in the completed building.**

2.3 Guidance (General)

49. While I have not commented in detail at Phase 1 on compliance testing and statutory guidance associated with external fire spread, other instructed experts to the Inquiry have

²¹ <https://standardsdevelopment.bsigroup.com/projects/2018-00521>

commented and opined on these issues in their Phase 1 reports²²; I therefore offer some brief opinions and recommendations on these matters. I intend to cover these issues in greater detail at Phase 2, to the extent that they fall within my scope of work.

50. With regard to MHCLG's actions and statements since the Grenfell Tower Fire, I disagree with their apparent stance²³ that the relevant provisions of Approved Document B (Volume 2) (2006 edition incorporating the 2010 and 2013 amendments) were unambiguous prior to the Grenfell Tower fire.
51. Here I am referring specifically to ambiguity around the applicability of ADB Paragraph 12.7 to materials other than "insulation", and the resulting applicability of the linked provisions given in ADB Diagram 40²⁴.
52. As far as I can ascertain, the closest that MHCLG have come to publicly acknowledging the potential ambiguities in Section 12 of ADB is in a footnote to a 22nd June 2017 letter authored by Melanie Dawes²⁵; this states (*italics added for emphasis*):
53. *"For the avoidance of doubt; the core (filler) within an Aluminium Composite Material (ACM) is an "insulation material/product", "insulation product", and/or "filler material" as referred to in Paragraph 12.7 ("Insulation Materials/Products") in Section 12 "Construction of external walls" of Approved Document B (Fire safety) Volume 2 Buildings other than dwelling houses. (The important point to note is that Paragraph 12.7 does not just apply to thermal insulation within the wall construction, but applies to any element of the cladding system, including, therefore, the core of the ACM)."*
54. I am aware that this ambiguity has been the source of disagreement and debate within the construction industry since the Grenfell Tower fire; experts to the Inquiry have also opined on this issue. However, I believe it is important to note that this perceived ambiguity was well known and specifically discussed within some parts of the cladding/construction industry at least as early as 2014²⁶.
55. Furthermore, it is my professional opinion that any perceived ambiguity in the specific wording of ADB Paragraph 12.7 cannot credibly be used to absolve design or construction professionals of responsibility for failings as regards installation of unacceptably dangerous external cladding on buildings. I base this opinion on the following three assertions:
56. (1) The Building Regulations 2010, supported by the Building Act 1984, are unambiguous as regards the relevant functional requirements and expectations on design and construction professionals in this regard;
57. (2) The Approved Documents are explicitly intended to provide guidance for "some of the more common building situations". It is my opinion that complete over-cladding of an un-sprinklered, 24 storey, single stair, predominantly social housing²⁷, high rise residential building with a highly combustible cladding system (most notably including a

²² <https://www.grenfelltowerinquiry.org.uk/evidence/dr-barbara-lanes-expert-report>

²³ <https://www.parliament.uk/documents/commons-committees/communities-and-local-government/2017-19-Correspondence/Correspondence-from-Minister-of-State-for-Housing-regarding-combustible-materials-01-05-18.pdf>

²⁴ I note that much of this ambiguity has already been addressed by a series of *Amendments to the Approved Documents* issued in November 2018: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760526/AD_Bv2_vB_amend.pdf

²⁵ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/621449/170622_letter_to_LAs_and_HAs.pdf

²⁶ <https://www.parliament.uk/documents/commons-committees/communities-and-local-government/Correspondence/Letter-to-Chair-from-Centre-for-Window-and-Cladding-Technology-re-Combustible-materials-10-May-2018.pdf>

²⁷ <https://doi.org/10.1016/j.firesaf.2013.07.002>

polyethylene-filled ACM rainscreen, along with polymer foam thermal insulation), is clearly *not* a “more common building situation” – thus rendering ADB non-applicable to the design of the over-cladding system at Grenfell Tower; and

58. (3) I believe it is reasonable to expect that any suitably competent design or construction professional, when faced with ambiguity in specific clauses of ADB (or any other statutory guidance), must consider this ambiguity in light of all other relevant clauses within the guidance, and must then make design and construction decisions that err on the side of caution and conservatism, rather than ignorance, cost, speed, convenience, or convention. In the case of ADB Paragraph 12.7, when considered in conjunction with Paragraph 12.5 – as is explicitly required in accordance with ADB Paragraph 0.4 – designers are required to consider material and product characteristics that present external fire spread risks (and that may not be addressed by the potentially less stringent restrictions given in ADB Diagram 40).
59. I will offer additional comments on the above three points at Phase 2.
60. **I believe it would be beneficial for the Chairman to encourage MHCLG to openly acknowledge the ambiguities within Section 12 of Approved Document B (2006 edition incorporating the 2010 and 2013 amendments), but also to articulate – to the extent that the Chairman agrees with my assertions (1)-(3) above – that such ambiguity (perceived or otherwise) cannot be used to excuse incompetent or negligent cladding design or construction professionals as regards application of combustible cladding materials on buildings above 18 metres.**
61. **To specifically address my assertion (3) above, I would encourage the Chairman to recommend that ADB be, as default, rendered non-applicable to the design and construction of any “building work” (subject to the requirements imposed by Schedule 1 of the Building Regulations) in or on any existing building which would not itself be compliant with the Approved Documents (were the building designed and built according to current guidance).**
62. In the case of the Grenfell Tower refurbishment, an un-sprinklered residential block of flats with a height greater than 30 metres, which would not have been compliant as a new-build design with the version of ADB that was in force at the time of the refurbishment cladding design, the above recommendation would (presumably and in principle) have had the effect of requiring a full and detailed assessment, by suitably competent and responsible designers, of the ability of all aspects of the building refurbishment (including its cladding) to meet the functional requirements set out in the Building Regulations 2010.
- 2.4 The Hackitt Review and The Government’s “Ban on Combustible Materials”**
63. Since the Grenfell Tower fire, the government has commissioned a review of Building Regulations and Fire Safety by Dame Judith Hackitt, supported by a team of civil servants.
64. The final report (referred to hereafter as the Hackitt Review) was published in May 2018²⁸. Notwithstanding some specific concerns which I intend to address in more detail at Phase 2, I am broadly in agreement with the Hackitt review’s diagnosis of the problems within the construction sector. I am also broadly in agreement with the philosophy of the Hackitt Review’s proposed strategy to address these problems; the practicalities of which have yet to be set out or actioned across the sector.

²⁸ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf

65. Since the Grenfell Tower fire, the government has acted to update²⁹ the relevant clauses of ADB and has also acted to prohibit (by law³⁰) the use of any material that is not Class A2 (in accordance with BS EN 13501) or better within the external walls of buildings above 18 metres.
66. This latter action has involved an amendment to the Building Regulations 2010. As a consequence, the 2018 “ban on combustible materials” is a rigid legal requirement. The government appear to have specifically and intentionally circumvented their own functionally-based system of building regulations in order to impose this ban.
67. This circumvention of the functional system of building regulations effectively forces designers to follow the letter of the law on this aspect of fire safety design, and it therefore appears to now be the case that no amount of rational justification or performance engineering can make the use of combustible materials acceptable (notwithstanding a list of specific material and product exceptions given within the amendment).
68. It is my opinion that this approach (i.e. the ban) undermines the “outcomes based” approach to fire safety that is supported by the Hackitt Review. More importantly in the context of the current submission, it means that designers may be able to (continue to) avoid taking responsibility for their designs by simply following the letter of the law.
69. While “a ban” may be politically appealing under the circumstances, I am concerned that, by promoting a regulatory approach wherein designers are discouraged from being competent and taking responsibility for their designs, the manner of its implementation could lead to unintended and negative consequences across the construction sector, and could undermine the “culture change” repeatedly called for in the Hackitt Review.
70. **I believe it would be appropriate for the chairman to request that government take regulatory actions to ensure that any new or existing prescriptive building regulations or statutory guidance do not unintentionally detract from the responsibility (or liability) of designers and contractors for the performance (and safety) of their designs.**

2.5 Firefighter Activities and Operational Guidance

71. As I have described above, and in my expert reports and oral testimony to date, it is my opinion that the functional requirements of the Building Regulations 2010 were not met by the refurbishment cladding system at Grenfell Tower. This view is broadly in line with those expressed by Inquiry experts Dr Barbara Lane and Professor Jose Torero.
72. As a consequence of the resulting rate and extent of external fire spread at Grenfell Tower, conventional firefighting approaches (which a fire service might train for and adopt when fighting a fire in a high-rise residential building) were quickly and catastrophically overwhelmed.
73. Without commenting on the compliance of the specific firefighting provisions provided at Grenfell Tower, as defined for instance within ADB or required by the Building Regulations, it is my opinion that any such firefighting provisions, even diligently and competently designed and delivered, are unlikely to have proven adequate to fight the external fire resulting (primarily) from burning of the PE-filled ACM rainscreen cassettes.

²⁹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760526/AD_Bv2_vB_amend.pdf

³⁰ <http://www.legislation.gov.uk/ukxi/2018/1230/contents/made>

74. As a consequence, and notwithstanding a number of relevant criticisms of the London Fire Brigade's activities on the night that have been raised during the Inquiry's proceedings (and that clearly ought to be used as important opportunities for learning and improvement), the London Fire Brigade were faced with a fire scenario for which they appear to have been unprepared and that they were unable to effectively control or extinguish.
75. I am in full agreement with the expert evidence submitted by Professor Jose Torero that the initial fire event (i.e. prior to spreading to the external cladding) was of a kind that, from a fire safety design perspective, must be expected within a residential kitchen.
76. There has been considerable discussion during the Inquiry to date as to when, during the Grenfell Tower fire, (1) the stay put policy "failed", and when the London Fire Brigade ought to have (2) realised that it had failed, and (3) altered their firefighting and rescue tactics accordingly.
77. In my Phase 1 (Supplemental) Expert Report I have stated my opinion that:
78. *"On the basis that fire compartmentation was not a credible component of any fire safety strategy once the refurbishment cladding had been installed at Grenfell Tower, it follows logically that a "stay put" policy was also not a credible component of any fire safety strategy once the refurbishment cladding had been installed".*
79. This is based on an assertion that it is not the breaching of compartments *during a fire event* that renders a stay put fire evacuation strategy inadequate. Rather, any design feature that undermines a stay put evacuation strategy, to the extent that building occupants can neither (1) "choose to remain safely on their own floor" nor (2) be "free to reach safety in any other part of the building via the staircase"³¹, has caused a stay put strategy to fail.
80. The stay put policy therefore failed before the fire broke out in Flat 16 of Grenfell Tower; it failed as soon as the refurbishment cladding was installed because neither of the above two safety conditions was any longer defensible.
81. **I believe it would be appropriate for the Chairman to comment on this issue at Phase 1, particularly so as to ensure the safety of people living and working in other buildings with stay put fire evacuation strategies.**
82. I offer no comments on when (or whether) the London Fire Brigade ought to have realised that stay put had failed and/or altered their firefighting and rescue tactics; this falls outside my own scope of work and competence, and I leave this issue for other Inquiry experts who have the requisite knowledge and experience of firefighting tactics and training.
83. I have, however, stated in my Phase 1 (Supplemental) Expert Report that:
84. *"The question of when firefighting water (i.e. the 'covering jet') was first applied to the exterior of Grenfell Tower, as well as the manner and precise location of its application, speaks to the ability (or otherwise) of firefighters to contain and extinguish a cladding fire of this nature early on and with a hose stream. I believe that this is relevant to informing future firefighting tactics and procedures in the case of external cladding fires."*
85. The London Fire Brigade's 24th October 2018 position statement "Actions since the Grenfell Tower Fire" discusses a number of activities underway to update both training and

³¹ Paragraph 3.2.11, Expert Witness Report (Supplemental) - Dr Barbara Lane [BLAS0000003]

operational guidance as regards firefighting in high rise buildings generally, and firefighting in the context of cladding fires more specifically. For instance, this document states that:

86. *“The LFB is... reviewing various operational response options in terms of its ability to fight fires in high rise properties”, that this includes “supporting the development of National Operational Guidance (NOG) for high rise fire fighting post Grenfell”, and that “this is being progressed via a number of working groups”.*
87. Given the large number other buildings in the UK that have already been identified as incorporating unacceptably dangerous cladding materials, and the resulting need for fire brigades to adequately prepare to fight fires in such buildings, **I believe it would be appropriate for the Chairman to suggest that the noted fire and rescue service reviews and new operational guidance be expedited insofar as this is possible.**

3.0 Scottish Building Standards (Fire Safety) Review Panel

88. In this section I offer comments in response to the Chairman’s specific question as to whether there are any particular matters which have arisen as part of my involvement with the Scottish Building Standards (Fire Safety) Review Panel that he should consider when formulating any interim or Phase 1 recommendations.
89. It is important to note that legislation relating to building regulations is devolved to the Scottish Government³², and that it differs in some respects from legislation in England.
90. It is also noteworthy that the Scottish Technical Handbooks³³, while similar in structure and style to the Approved Documents in England, differ in a number of ways that are not insignificant as regards fire safety design of external cladding (and indeed other aspects of fire safety design). I will not comment on these specific differences here, however it is important to be aware that differences exist in both approach and terminology.
91. The Review Panel on Building Standards (Fire Safety) in Scotland³⁴ was established by the Scottish Ministerial Working Group on Building and Fire Safety³⁵ in September 2017 as part of their response to the Grenfell Tower fire. The Review Panel met on four occasions during the subsequent 16 months, with the agreed notes of the Review Panel’s discussions also reviewed by an international group of fire safety regulators.
92. The Review Panel issued a set of recommendations for public consultation in June 2018³⁶, the outcomes of which are publicly available from the Scottish Government³⁷.
93. A set of post-consultation final recommendations was agreed at the most recent Review Panel meeting in December 2018, and these were immediately conveyed to the (Scottish) Ministerial Working Group on Building and Fire Safety.
94. In this section I provide *selected outcomes* of the Review Panel’s work. I have selected these particular outcomes either because they support other opinions already expressed within this submission, or because they may be of immediate interest to the Chairman. I

³² <https://www.legislation.gov.uk/asp/2003/8/contents>

³³ <https://www.gov.scot/policies/building-standards/monitoring-improving-building-regulations/>

³⁴ <https://www.gov.scot/publications/building-standards-fire-safety-review-panel-minutes-index/>

³⁵ <https://www.gov.scot/groups/ministerial-working-group-building-and-fire-safety/>

³⁶ <https://www.gov.scot/binaries/content/documents/govscot/publications/report/2018/06/report-review-panel-building-standards-fire-safety-scotland/documents/00537771-pdf/00537771-pdf/govscot%3Adocument>

³⁷ <https://consult.gov.scot/local-government-and-communities/compliance-and-enforcement-and-fire-safety/results/buildingstandardscomplianceandfiresafetyconsultation-analysisreport.pdf>

have copied the relevant recommendations, paraphrased explanatory text from the minutes and submissions of the Review Panel, and selectively added italics for emphasis.

3.1 Clarification of Guidance and Routes to Compliance

Recommendations 1 and 2
1. The current structure of mandatory functional standards supported with performance based or prescriptive guidance in the Technical Handbooks works and should be retained.
2. The Technical Handbooks should make clearer the status, functions and limitations of the guidance.

95.

96. The Review Panel agreed that the (Scottish) Technical Handbooks should make clearer the status, functions, and limitations of their guidance; in particular to clarify that:

97. the guidance contained within the Technical Handbooks indicates only one, or sometimes more than one, means of complying with the relevant functional mandatory building standards and that other approaches may be acceptable, especially those working from first principles;

98. for the majority of projects, it is envisaged that following the Technical Handbooks will be the usual means of showing that compliance with the mandatory standards has been achieved;

99. due to the generic nature of the Technical Handbooks they cannot cover all building designs, and in some cases it may not be appropriate to follow the guidance; in such cases the designer will be required to show that compliance with the building standards will be achieved in the completed building;

100. even where the guidance is applicable, the designer may choose a different means of showing that the building standards have been met;

101. for buildings outwith the scope of the technical handbooks they may in some cases continue to provide some useful guidance; and

102. “trade offs” and “compensatory features” may not always be appropriate where the building design offers compliance with the functional standards, although not precisely following the guidance.

3.2 External Wall Cladding

Recommendation 4
4. Changes are needed to the simple guidance on external cladding, cavities and fire spread on external walls (2.4 – 2.7):
4.1 Any building with a storey at over 11m above the ground should require A2 or better.
4.2 All entertainment and assembly buildings, residential care homes and hospital of any height should also be A2 or better.
4.3 BS8414 (and BR135) would remain as an alternative method of providing evidence to show compliance.
4.4 It is unhelpful and unnecessary to retain the British Standards as well as the European Standards in the guidance for “reaction to fire” tests.

103.

104. The Review Panel discussed the recent “ban on combustible materials” implemented in England. *The members reconfirmed the recommendations made in their report published in June 2018 and did not support implementation of a similar ban in Scotland.*
105. The Panel recommended that the Technical Handbooks be revised to *restrict the components of external wall cladding systems (including any insulation material exposed within a cavity) on all high rise buildings with a storey over 11 metres above ground level (both domestic and non-domestic) to materials and products achieving an (Euroclass) A1 or A2 classification.*
106. It was recommended that the Technical Handbooks should *retain the option for external wall cladding systems to showing compliance through use of BS 8414 and BR 135, accompanied by the requisite professional judgement.*
107. It was stressed that, as with any fire test, *BS 8414 and BR 135 are only indicators of performance and required understanding and interpretation by competent professionals.*
108. The Panel recommended that use of BS 9414 (currently under development by BSI, as previously noted) should be included in revised guidance.
109. It was recommended that the new tighter restrictions should also apply to *external wall cladding on new entertainment and assembly buildings* regardless of storey height, as well as to external wall cladding on *new multi-storey residential care and hospital buildings* regardless of storey height.

3.3 Evacuation and Alarms

Recommendation 5

5. Changes are needed to the simple guidance on Escape (2.9). In domestic buildings over 18m there should be:

5.1 Two stairways.

5.2 Fire service activated evacuation sounders in each floor.

- 110.
111. The Review Panel agreed that *the strategy of “defend in place / stay put” should be the first option and that in virtually every case this would be sufficient³⁸.*
112. Existing high rise domestic buildings with a single stair and a storey at a height of over 18 metres should not be considered inadequately safe, provided that all the fire safety features required for “defend in place/stay put” are fully functioning. It was therefore considered not appropriate to require such stairways to be retrospectively added to such buildings, as investment in alternative safety strategies could be more beneficial.
113. The majority view of the Review Panel was that *a two stair approach could not be endorsed from a fire safety or operational firefighting perspective.* A minority view was expressed that provision of a second stair provided an important (additional) level of redundancy should “defend in place/stay put” fail.
114. The review panel recommended that evacuation sounders that could be activated by Scottish Fire and Rescue Service should be installed in each flat of high rise domestic

³⁸ Virtually all flat fires are extinguished within the flat of origin. However there have been at least two Scottish tower blocks which have had to be fully evacuated due to flame spread on the outside of the building.

buildings with a storey over 18 metres above ground, to enable for floor by floor evacuation or evacuation of the entire building³⁹.

3.4 Automatic Fire Suppression (i.e. Sprinklers)

Recommendation 6

6. The requirement for Automatic fire suppression systems (2.15) should be extended to some additional building groups:

6.1 HMOs used for “care” 24/7 and HMOs with 10 or more residents.

6.2 Flats provided it can be done with simpler installations.

6.3 Single detached dwellings should not be included.

115.

116. The review panel noted that Scotland should learn from the Welsh experience of a recent mandatory requirement for automatic fire suppression systems in domestic buildings, particularly in terms of challenges around water supply and system specification.

117. A requirement for automatic fire suppression systems in domestic-scale buildings used for “care” 24/7 and multiple household dwellings with 10 or more residents was recommended.

3.5 Scottish Government Response

118. On 20th December 2018, The Scottish Minister for Local Government, Housing, and Planning, Kevin Stewart MSP, confirmed – via correspondence with all Review Panel members – that The Scottish Government plans to take action in the following areas (quoting directly):

119. *“Extending the application of automatic fire suppression systems in flatted accommodation,*

120. *Including a requirement for automatic fire suppression systems in larger multi-occupancy dwellings and those which provide care,*

121. *Removal of references to BS 476 as related to reaction to fire classification,*

122. *Reducing the trigger height from 18 m to 11 m for the use of A1 or A2 cladding in new high rise domestic buildings,*

123. *Extending the range of new buildings that require cladding with a classification of A1 or A2 to include entertainment and assembly buildings as well as residential care buildings and hospital buildings, with limited size based exceptions,*

124. *Measures to improve evacuation, using Scottish Fire and Rescue Service operated sound alerts,*

125. *Two escape stairs in new high rise residential buildings⁴⁰,*

126. *Standalone guidance on new, altered or extended houses, hospitals, residential care buildings and enclosed shopping centres and*

127. *The development of a (Scottish national) Fire Engineering “hub”.”*

³⁹ A practical means to implement this recommendation, including the development of relevant standards and protocols, has yet to be outlined; however, I understand that BSI have, in principle, agreed to draft the necessary standard(s).

⁴⁰ It should be noted that this action was not majority supported by the Review Panel.

128. All documentation associated with the activities of the Review Panel is publicly available via the Scottish Government website⁴¹.

4.0 Quantifying Adequate Fire “Safety” and Tolerable “Risk”

129. Since the Grenfell Tower fire, both the Government and the Hackitt review have repeatedly stated that the aim of their various activities is to “ensure that residents are safe, and feel safe”⁴².
130. However, such statements are misleading and, I believe, counterproductive to an evidence-based and effective response to the Grenfell Tower fire. They are also counter to the approach of making risk *as low as reasonably practicable* which is repeatedly identified within the Hackitt review.
131. *Being safe* and *feeling safe* are different objectives. It is possible for people to feel safe whilst being in significant danger. Conversely, it is possible for people to feel in danger whilst being relatively safe.
132. When considering issues of safety from a technical perspective, it is important to be explicit about whether the objective is to make people *feel* safe, or rather to deliver an *adequate* or *tolerable level* of safety.
133. Absolute safety cannot be achieved. I believe that we must acknowledge that there is always the chance, however slight, that something might go wrong.
134. Many other safety-critical industries have methods to recognise, quantify, and minimise risk. Ultimately however, each industry has to make hard decisions about what level of risk is acceptable. Safety in buildings ought to be considered similarly (at least in principle, if not in practice).
135. It is for this reason that the functional requirements of the Building Regulations 2010 are expressed in such terms as (for example): “the external walls of the building shall *adequately* resist the spread of fire over the walls and from one building to another”. It is left for the suitably competent design professional to determine whether the provisions made within any design are *adequate* under the circumstances.
136. That the government continues to repeat that it will “ensure that residents are safe, and feel safe” is therefore impractical, technically false, and in my view damaging to evidence-based provision of improved safety within the built environment; it fails to acknowledge the reality of managing risk in buildings, and it discourages a rational discourse about the levels of risks that are acceptable or tolerable in England’s high rise buildings.
137. A similar criticism can be made of the Hackitt Review’s use of the terminology “higher risk residential buildings (HRRBs)”⁴³. I do not accept that such buildings do (or ought to) present higher risks. Rather, such buildings may present unique fire hazards, and the consequences of a fire may also be higher. I believe that it is incumbent on the suitably competent designer to consider the specific fire safety hazards at play and their potential consequences, and to aim for *risk equity* across the built environment regardless of building type, height, and occupancy. It cannot be an acceptable design objective that tall

⁴¹ <https://www.gov.scot/publications/building-standards-fire-safety-review-panel-minutes-index/>

⁴² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf

⁴³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf

residential buildings (or for example, social housing) present higher risks to occupants than low rise or commercial buildings.

138. **In drafting any interim recommendations and his Phase 1 report, I urge the Chairman to use technically precise and intentional language around “safety” and “risk”, so as to encourage all stakeholders (including Government) to engage in a meaningful conversation about what level of risk is acceptable for residents of any building. Public resources can then be appropriately allocated to attempt to achieve these objectives.**