GRENFELL TOWER INQUIRY

WRITTEN OPENING SUBMISSIONS FOR PHASE 2, MODULE 2 ON BEHALF OF BUILDING RESEARCH ESTABLISHMENT

1. These written opening submissions are submitted by Building Research Establishment ("**BRE**") pursuant to the Deputy Solicitor's request dated 15 September 2020. BRE became a core participant on 21 January 2020 following BRE's earlier provision of documents and witness statements to assist with Phase 2, Module 2 concerning '*Cladding products – testing/certification, product marketing*'. BRE has expertise in the testing and classification of cladding systems.

2. These written submissions address the following matters:

    a. BRE's expertise and role in the testing of cladding systems;

    b. The testing regime to be followed by suppliers of cladding systems or components in cladding systems prior to installation on buildings;

    c. The cladding systems installed on Grenfell Tower and the inapplicability of classifications obtained by Kingspan and Celotex; and

    d. The difference between classification and certification.

3. Before addressing these four points, BRE wishes to express its deep-felt sympathies to those who lost loved ones at Grenfell Tower and to the survivors of the tragedy.

A. <u>BRE's expertise and role in testing</u>

4. BRE is a world-leading, multi-disciplinary, building science centre with a mission to improve buildings and infrastructure through research and knowledge generation. BRE generates new knowledge through independent research. This is used to create the products, standards and qualifications that help to ensure that buildings, homes and communities are safe, efficient, productive, sustainable and enjoyable places to be. BRE's

customers use its expertise and services to deliver their social, environmental and economic goals. BRE Global Limited is the testing, classification and certification body within BRE. BRE Global Limited works in a broad range of areas, with the largest being fire and security. In this area, BRE Global Limited carries out two key types of work: (i) research, typically for UK Government Departments and within the EU, and (ii) testing, classification and certification of construction products for manufacturers. Profits from BRE Group Limited's business activities are gift-aided to BRE Trust, which in turn invests in research projects for the public benefit, carried out by BRE, other research partners and by a number of universities across the UK.

5. BRE had no involvement in the testing or classification of the cladding systems installed on Grenfell Tower before the tragic fire there on 14 June 2017. After the tragedy, BRE was approached by the (then) Department for Communities and Local Government to provide fire safety expertise and support to address the urgent issues associated with the broader public safety matters that were emerging from the Metropolitan Police's investigation into the fire. This assistance was focused on the identification of the different types of Aluminium Composite Material ("**ACM**") panels used on buildings across the UK.

6. BRE's expertise may assist the Inquiry with, in particular, Issue 4A in the Updated List of Issues dated September 2019:

> *4A. Testing, certification and classification – exterior wall materials*
>
> *a) What testing and/or certification and/or classification had occurred in respect of the exterior wall materials at Grenfell Tower, including the cladding and insulation?*
>
> *b) Was any such testing and/or certification and/or classification adequate and appropriate?*
>
> *c) Is the testing, certification and classification regime for external wall materials fit for purpose?*

7. BRE has disclosed documents that set out the criteria to which external cladding systems are required to be tested. It has also provided to the Inquiry reports of tests sponsored by Core Participants, Kingspan Insulation Limited ("**Kingspan**") and Celotex Limited ("**Celotex**"), in which cladding systems different from those installed on Grenfell Tower

were tested at BRE for their fire performance. BRE notes that Kingspan was the manufacturer of Kingspan Kooltherm K15 and Celotex was the manufacturer of Celotex RS5000, which were (interchangeably) a component in the cladding systems installed on Grenfell Tower.

8. These short written submissions aim to summarise the testing regime that should have been completed for the cladding systems installed on Grenfell Tower. These submissions also address: (i) the BRE Classification Reports that resulted from tests commissioned by Kingspan and Celotex of cladding systems in which K15 or RS5000 was a component, and (ii) why the tests to which these Classification Reports related are not, do not purport to be and cannot be a substitute for tests that should have been carried out on the cladding systems installed on Grenfell Tower. As far as BRE is aware, prior to installation on Grenfell Tower, no manufacturer or supplier had obtained classification for the cladding systems installed.

B. The testing regime

B1. Building regulations, Approved Document B, and classification to BR 135

9. Buildings must be designed and constructed in a way that meets building regulations. Building regulations are periodically updated by Parliament. Currently in force are the Building Regulations 2010, which were in force when cladding systems were installed on Grenfell Tower; albeit that these regulations have been amended since that time. Regulation 7 of the Building Regulations 2010 concerns the 'Materials and workmanship' in building work. Schedule 1 to the Building Regulations 2010 sets out various requirements for building work. Part B of Schedule 1 concerns fire safety. The Building Act 1984 gives the Secretary of State power to approve and issue documents containing practical guidance with respect to the requirements contained in building regulations. Concerning compliance with fire safety, the Secretary of State has approved and issued 'Approved Document B'. This document is periodically updated. Evidence of compliance with Approved Document B is evidence of compliance with the fire safety requirements in the Building Regulations 2010.

10. Different buildings must satisfy different fire safety requirements, for example due to a difference in height. Different buildings are comprised of different elements, for example not all buildings have external cladding. Where external cladding is an element of a multi-

storey building, the applicable fire performance criteria are set by BR 135. The full title of BR 135 is 'Fire Performance of External Thermal Insulation for Walls of Multistorey Buildings'. BR 135 was first published by Her Majesty's Stationary Office in 1988, and later became a guidance document cited in Approved Document B. BR 135 was developed by BRE when BRE was a government-owned laboratory and has since been updated periodically by BRE.[1] The current edition of BR 135 (Third Edition) was updated by BRE's Sarah Colwell and Tony Baker and was funded by BRE Trust. This Third Edition was published in 2013. It is often cited as 'BR 135: 2013'.

11. A cladding system that performs to the criteria in BR 135 satisfies Approved Document B, and thus is taken to meet the fire safety requirements in the Building Regulations 2010.[2] When a cladding system satisfies the criteria in BR 135 it is said to have been 'classified' to BR 135. Either a cladding system satisfies the criteria or it does not; the result is binary. When BRE is the testing house, it will (if asked) issue a Classification Report to the test sponsor to evidence classification to BR 135 where it has been obtained. BRE's role as the test house is to set fire to the cladding system installed by the test sponsor at BRE's test site, to observe how it performs, to record the results, and then to issue a Classification Report if the system passes and a report is required by the test sponsor.[3]

12. There are two methodologies for testing cladding systems to generate the data for assessment against the BR 135 criteria. One is the methodology set out in BS 8414 Part 1, which applies to non-load-bearing external cladding systems to be fitted onto masonry buildings. The other is the methodology set out in BS 8414 Part 2, which applies to non-load-bearing external cladding systems to be fitted onto steel-framed buildings.[4] BS 8414 Parts 1 and 2 are periodically updated. The editions in place when the cladding systems were installed on Grenfell Tower are often cited as 'BS 8414-1: 2002' and 'BS 8414-2: 2005', respectively. Grenfell Tower is a masonry building, therefore the test methodology in BS 8414-1: 2002 would have applied had any entity sought classification of the cladding systems installed on the tower.

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[1] For further detail, see the Witness Statement of BRE's Deborah Smith, dated 10 July 2019, paragraphs 20 to 29.
[2] For further detail, see the Second Witness Statement of BRE's Tony Baker, dated 11 September 2020, paragraph 5.
[3] For further detail, see the Witness Statement of Deborah Smith, paragraphs 42 to 60 and 67.
[4] For further detail: *ibid,* paragraphs 30 to 41 and 67.

B2. Cladding systems

13. The phrase 'cladding system' is used to describe a combination of components. A cladding system typically comprises: a steel frame, sheathing boards, breather membrane, plasterboard, vapour control layer, insulation, fixings, brackets and railing systems, cavity barriers, fire breaks and external rainscreen. It is important to realise that the interaction between these different components determines the overall fire performance of the cladding system against the BS 8414 test methods. If a component is changed, the system is no longer the same system. If a component is moved, it is no longer the same system. Substituting RS5000 for K15 results in a different cladding system. Substituting ACM cladding panels for non-combustible rainscreen panels results in a different cladding system. Such substitutions potentially affect overall fire performance.[5] Therefore, one must always talk about the classification of the *specific* cladding system tested, and classification is limited to that *specific* system. There is no such thing as classification to BR 135 of an individual component of a cladding system, such as RS5000 or K15.

B3. Achieving classification

14. There are two ways in which a cladding system can achieve classification to BR 135:[6]

    a. **Testing in a fire test**: using the applicable BS 8414 method, if the system satisfies the BR 135 criteria, that specific cladding system will have achieved classification to BR 135; or

    b. **Extended field of application**: in very limited circumstances, classification may be given where past tests provide sufficient data to demonstrate that a variation of a very similar cladding system would meet the performance criteria in BR 135.

15. The entity that procures a test of a cladding system is known as the 'test sponsor'. The test is carried out by a testing house, such as BRE. If the results of the test show that the cladding system meets the criteria of BR 135, the associated Classification Report will be produced by the testing house, if the test sponsor wants such a report. Typically, the test sponsor is the supplier of the cladding system itself, or the manufacturer of a component who wishes to market the component to suppliers of cladding systems. The Classification

[5] Second Witness Statement of Tony Baker, paragraph 6.
[6] For further detail: *ibid*, paragraphs 7 to 17.

Report evidences fire safety performance to the BR 135 criteria only for the specific tested system. BRE's Classification Reports state this, usually at paragraph 5.3 of the report:

> "***Field of application***
>
> *This classification is valid only for the system as installed and detailed in Section 2 of this classification report and the associated details found in the related test reports, referenced in Section 4*"

16. The alternative route to classification, by an extended field of application, is reliant on similar cladding systems already having been classified to BR 135. For example, where a test sponsor has undertaken, say, five tests at BRE each of which resulted in classification to BR 135, the test sponsor can take data derived from those tests to a fire consultant. An extended field of application can be modelled in a desk-top study that extrapolates the test data and applies them to systems that have not been tested. BRE has provided such assessments based on test evidence, if so engaged. There are a number of other such assessment and consultancy providers including, for example, Warrington Fire and International Fire Consultants. Private companies may have procured a desk-top study to establish an extended field of application in pursuance of their private commercial needs. Separately, the British Standards Institution (also known as BSI) may publish for general use British Standards that record permissible substitutions within cladding systems. A wide data set is needed. At the time of the Grenfell Tower fire, there was no British Standard providing an extended field of application for systems tested to BS 8414 Parts 1 or 2. Subsequently, BSI published BS 9414:2019, which came into effect on 30 September 2019. This British Standard provides for limited extended fields of application in cladding systems.

C. <u>The cladding systems installed on Grenfell Tower</u>

<u>C1. The cladding systems installed</u>

17. BRE understands that the cladding systems installed on Grenfell Tower by Harley Facades basically comprised:

    Two layers of 80mm thick foil-faced Celotex RS5000 PIR (or Kingspan K15 phenolic) insulation with stone wool vertical cavity barriers, stone wool open state horizontal cavity

barriers with intumescent strip and Reynobond Aluminium Composite Material (ACM) with a polyethylene core rainscreen cassettes.

18. These cladding systems were not tested by BRE to BS 8414 Part 1 prior to their installation. Nor were they assessed in any desk-top study to provide an extended field of application. As such, these cladding systems had not been classified to BR 135 by BRE.

C2. Kingspan's and Celotex's classifications to BR 135

19. Kingspan was the test sponsor of a BS 8414 Part 1 test that took place on 31 May 2005 at BRE's site in Hertfordshire. BS 8414-1: 2002 was in force. The cladding system's performance pursuant to that test methodology was recorded at the time in BRE Global Test Report 220876. After that test, Kingspan did not request a Classification Report until 2015. In 2015, Kingspan requested a Classification Report, which was provided in the form of BRE Classification Report No. P101812-1000.[7] This Classification Report applied the data in BRE Global Test Report 220876 to BR 135's performance criteria. The result was that the specific cladding system tested on 31 May 2005 was classified to BR 135.

20. The cladding system tested on 31 May 2005 is not the same cladding system installed on Grenfell Tower. Although one of the cladding systems on Grenfell Tower contained Kingspan's K15, in common with the system tested on 31 May 2005, multiple components differed between these systems. Just by way of example, the system tested contained a non-combustible cladding panel, whereas the cladding systems installed on Grenfell Tower contained ACM cladding panels, which are combustible.[8] The insulation thickness was also only 60mm thick in the test as opposed to 160mm thick (2 layers each 80mm thick) on Grenfell Tower.

21. Celotex was the test sponsor of a test on 2 May 2014. The test methodology was BS 8414-2: 2005. The test was recorded in BRE Global Test Report 295369 and classification to BR 135 was recorded in BRE Classification Report No. 295255.

22. Again, although one of the cladding systems on Grenfell Tower contained Celotex's RS5000, in common with the system tested on 2 May 2014, multiple components differed.

[7] For further detail, see the Witness Statement of BRE's Stephen Howard, dated 15 July 2019, paragraphs 234 to 269.
[8] Second Witness Statement of Tony Baker, paragraph 3.

Again, the system tested contained a non-combustible cladding panel, whereas the cladding systems installed on Grenfell Tower contained ACM cladding panels, which are combustible. The insulation thickness was also only 100mm thick in the test as opposed to 160mm thick (2 layers each 80mm thick) on Grenfell Tower. Further, the cladding system was tested against BS 8414-2: 2005, which is applicable to steel-framed buildings; not BS 8414-1: 2002 which is applicable to masonry buildings such as Grenfell Tower.

23. Celotex's witness evidence submitted to the Inquiry shows that Celotex's cladding system tested on 2 May 2014 contained an additional component that was not declared by Celotex to BRE, namely a 6mm magnesium oxide board.[9] The cladding system that achieved classification was a system containing that 6mm magnesium oxide board. BRE does not understand why a test sponsor would wish to conceal a component in a cladding system tested. In any event, a system with or without this 6mm magnesium oxide board is different from the systems installed on Grenfell Tower. The fire performance of Celotex's system with or without this 6mm magnesium oxide board does not assist in measuring the fire performance of the cladding systems installed on Grenfell Tower.

24. Separately, BRE has noted that events at both Kingspan and Celotex surrounding their respective tests on 31 May 2005 and 2 May 2014, and as described in their witness evidence in this Inquiry, disclose basic misunderstandings about how the testing regime for external cladding systems functions to ensure safe and compliant building work.[10]

D. The difference between classification and certification

25. The title of Phase 2, Module 2 is '*Cladding products – testing/certification, product marketing*'. The testing regime outlined in these written submissions concerns classification. This is a different process entirely from certification. Certification is an ongoing scheme whereby the certifier, which may be BRE or a number of other organisations, regularly audits the manufacturing and supply process for particular products or systems so as to ensure that quality and performance are consistent, so far as possible. By contrast, the test and classification process represents a snapshot in time – it refers only to the particular test system containing the products installed by the test sponsor at the time

[9] For example, Jamie Hayes' Witness Statement, dated 12 March 2019, paragraphs 62 to 66.
[10] Second Witness Statement of Tony Baker, paragraphs 18 to 25.

of the test – and BRE might have no further relationship with the products, systems or test sponsor involved thereafter.[11]

E. Concluding remarks

26. The cladding systems installed on Grenfell Tower differed from the cladding systems tested at BRE with Kingspan and Celotex as the test sponsors. These tests and the Classification Reports that resulted from them are not, do not purport to be and cannot be a substitute for tests that should have been carried out on the cladding systems installed on Grenfell Tower. As far as BRE is aware, prior to installation on Grenfell Tower, no manufacturer or supplier had obtained classification for the cladding systems installed.

27. BRE remains ready to assist the Inquiry.

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[11] Witness Statement of Stephen Howard, paragraph 14; First Witness Statement of Tony Baker, dated 12 July 2019, paragraph 11; and Witness Statement of Deborah Smith, paragraphs 2 and 61 to 70.