KINGSPAN INSULATION LIMITED

OPENING STATEMENT, PHASE 2, MODULE 2

A. EXECUTIVE SUMMARY

1. Kingspan Insulation Limited ("**Kingspan Insulation**")[1] wishes to express again its deepest sympathies to the bereaved families, survivors and everyone affected by the tragic events which occurred at Grenfell Tower.

2. Paragraphs 3 to 14 below provide an overview of the detailed submissions made by Kingspan Insulation in this document.

K15 insulation used on Grenfell Tower

3. Kingspan Insulation had no role in the design or planning of the cladding system at Grenfell Tower and provided no specific advice to those working on Grenfell Tower around the use of its products.[2]

4. As appears from the evidence heard by the Grenfell Tower Inquiry (the "**Inquiry**"), a small quantity of K15 was purchased as a substitute for Celotex RS5000 insulation and made up around 5.2% (by area) of the rainscreen insulation purchased for use on Grenfell Tower. Kingspan Insulation was not aware of the use of K15 on Grenfell Tower until after the fire.[3]

Non-compliance of the refurbishment with the Building Regulations

5. The Building Regulations at the time of the refurbishment permitted the use of K15 on tall buildings provided that it was used as part of a cladding system which, as a system, could be shown to be compliant with Approved Document B of the Building Regulations ("**ADB**").[4]

[1] Kingspan Insulation Limited is the company within Kingspan Group responsible for sales of K15 in Great Britain. There are other companies within Kingspan Group with similar names which undertake similar operations in other jurisdictions and are not involved in the Grenfell Tower Inquiry.

[2] See paragraph 22 and footnote 37 below.

[3] See paragraphs 18 to 21 below.

[4] See paragraph 34 below.

6. Under ADB, neither PIR insulation nor K15 could be used with PE-cored ACM unless such use had been assessed as suitable under one of three routes to compliance.[5] None of these three routes was satisfied in respect of the Grenfell Tower refurbishment. The system was therefore not compliant with the relevant requirements of the Building Regulations and should not have been specified.[6]

7. None of the testing, certification or marketing literature which was current at the time of the supply of K15 for use on Grenfell Tower suggested that K15 was non-combustible or of limited combustibility or that if combined with PE-cored ACM cladding it would achieve compliance with the Building Regulations.[7]

The risks posed by PE-cored ACM regardless of the type of insulation

8. At the time of the refurbishment of Grenfell Tower, based on its Euroclass B classification, the Building Regulations would have permitted the type of PE-cored ACM used on Grenfell Tower on buildings over 18 metres, provided that it was used in combination with non-combustible or limited combustibility insulation (e.g. synthetic mineral fibre), without any testing of the safety of that system being required.[8]

9. Crucially, however, the full scale BS 8414 testing commissioned by the DCLG following the Grenfell Tower fire showed that the PE-cored ACM cladding system failed the BS 8414 test with both non-combustible and combustible insulation.[9] Furthermore, both the PE-cored ACM systems failed the BS 8414 tests very quickly and at materially the same speed (in under

[5] K15 was classified as a combustible product. Therefore, at the time of the refurbishment of Grenfell Tower, K15 could be used in accordance with ADB with a cladding system (i) which met the BR 135 criteria when tested to BS 8414; (ii) had been assessed as meeting those criteria via a desktop study; or (iii) had been assessed as compliant via the fire engineering approach.

[6] See paragraph 23 below.

[7] See paragraphs 28 to 34 below.

[8] The BBA certificate for the PE-cored ACM installed on Grenfell Tower stated that it achieved Euroclass B (equivalent to Class 0): {ARC00000678}. This meant that it could have been used on Grenfell Tower in compliance with the Building Regulations (the "linear route" in Diagram 40 of ADB) if it had been combined with non-combustible or limited combustibility insulation.

[9] This conclusion is further supported by medium scale ISO 13785 testing commissioned by Kingspan Insulation.

8 minutes), regardless of insulation type. This is a clear indicator that any PE-cored ACM cladding system would have been unsafe on Grenfell Tower, regardless of insulation type.[10]

10. Similarly, modelling undertaken by independent fire experts Efectis[11] indicates that given the PE-cored ACM cladding used, the course of the fire at Grenfell Tower would have been the same regardless of whether combustible insulation (PIR) or non-combustible (synthetic mineral fibre) insulation was used. Conversely, the Efectis modelling shows that if A2-rated ACM (limited combustibility) had been used (instead of a PE-cored ACM) in combination with PIR insulation, then the fire would not have spread over the building façade.[12] Both conclusions support the Inquiry's Phase 1 Report which indicates the primacy of the PE-cored ACM as the cause of the rapid fire spread during the Grenfell Tower fire.

11. The DCLG tests and the Efectis modelling both demonstrate the inherent danger of relying on individual product classifications, rather than full system testing, to determine the safety of cladding systems.[13]

Kingspan Insulation's review of product development and test results

12. The Grenfell Tower fire has rightly prompted calls for an industry wide comprehensive review of fire safety and building regulations. As a core participant in the Inquiry, Kingspan Insulation has comprehensively reviewed the product development, testing, certification and marketing of K15. Kingspan Insulation has identified process shortcomings during the period of 2005 to 2014 for which it sincerely apologises. These shortcomings did not affect the safety of Kingspan Insulation's products as used on Grenfell Tower, but nonetheless they

[10] See paragraph 73 below.

[11] Efectis' conclusions have been published in peer-reviewed journals (see footnote 81 below). Efectis' investigations were partially funded by Kingspan Insulation. Efectis has confirmed that Kingspan Insulation has not been involved in the results or conclusions of Efectis' work and Efectis have confirmed that their conclusions reflect their own independent findings: see e.g. *Reconstruction of Grenfell Tower fire. Part 3 – Numerical simulation of the Grenfell Tower disaster: Contribution to the understanding of the fire propagation and behaviour during the vertical fire spread*", Fire and Materials, volume 44, p. 55.

[12] See section F below.

[13] See paragraph 76 below.

fall short of the high standards which Kingspan Insulation sets itself. These historical shortcomings fall into two categories:

a. **Processes relating to Testing Protocols**: Gaps in internal process and oversight meant that a small number of BS 8414 and Class 0 tests on products that differed slightly from K15 "as sold" were used to support performance claims in the third party certification, marketing and technical advice relating to K15.[14] This should not have happened. Having recognised these issues, Kingspan Insulation has undertaken further testing which has validated the relevant performance claims.[15]

b. **Processes related to Product Marketing**: It is now clear that in the period prior to 2014/15, certain statements made in K15 product literature and advice provided to customers, were not sufficiently clear or emphatic in explaining the limitations of the BS 8414 testing undertaken by Kingspan Insulation. Such literature and advice should have explained that such testing related to a particular system and advised caution against applying the test too broadly.[16]

Comprehensive actions taken by the company in light of the shortcomings identified

13. In response to the shortcomings outlined above, Kingspan Insulation has invested significant resource and time to implement wide ranging changes to its processes and procedures to ensure the correct classification of its products.

14. As described more fully in section H, these include:

a. **Product traceability:** Kingspan Insulation has introduced a traceability requirement for K15 manufactured and/or supplied in the British market to ensure products are being used only in suitable applications.[17]

[14] See paragraphs 44 to 45 and 48 to 56 below where it is explained that reliance was placed on testing of "Old Technology" K15, on similar but not identical, phenolic products manufactured in a different jurisdiction, and on an R&D version of K15.

[15] *Ibid.*

[16] See paragraphs 63 to 65 below.

[17] See paragraphs 83 to 84 below.

b. **Fire testing protocols:** new protocols ensure product batch numbers are recorded in all test reports and that test reports clearly identify where a non-standard or trial product is being tested.[18]

c. **Performance Claims:** internal reviews have been undertaken to ensure the accuracy of all Declarations of Performance ("**DOP**s"), product marketing and labelling for insulation products manufactured and/or sold in Britain.[19]

d. **Transparency:** in 2018 Kingspan Insulation published (and continues to publish) on its website all Kingspan Insulation commissioned BS 8414 test reports of systems incorporating standard K15 including any tests which did not satisfy the requirements of BR 135.[20]

e. **Code of Conduct:** Kingspan Group has issued an updated Code of Conduct including a section specifically on Product and Service Information Communication and an underlying expectation that employees will "speak out" if they encounter any concerns.[21]

f. **Kingspan Assured:** this initiative aims to address issues identified in the Hackitt Report related to poor installation of construction products by third party installers.[22]

g. **Other:** Kingspan Insulation is also implementing a range of other changes including a new Change Management System ("**CMS**")[23]; new accreditation protocols to ensure product changes are fully reflected in any third-party certification[24]; and full engagement in a wide range of industry initiatives to generate systemic changes in the construction industry following the Grenfell Tower tragedy.[25]

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[18] See paragraphs 85 to 86 below.

[19] See paragraphs 87 to 88 below.

[20] See paragraph 89 below.

[21] See paragraph 91 below.

[22] See paragraph 94 below.

[23] See paragraphs 97 to 100 below.

[24] See paragraphs 95 to 96 below.

[25] See paragraph 101 below.

B. THE SCOPE AND PURPOSE OF THESE SUBMISSIONS

15. Kingspan Insulation understands that in Module 2 the Inquiry will undertake an "*in depth analysis of the cladding products used at Grenfell and their history in terms of testing / certification, product development, marketing and promotion, including any advice or recommendations given by manufacturers specific to Grenfell Tower*".[26] Further, the Inquiry stated that it will address in Module 2 the following issues in the Updated List of Issues dated September 2019: issues 2(a), 4(b), 4(d), 4(g)-(j), 4(m) and 4A.[27] This statement responds to these issues, and the summary of the Module's scope set out in the Inquiry's letter dated 22 November 2019.

16. This Opening Statement aims to assist the Inquiry in its investigations relevant to Module 2 and this breaks down into nine parts:

[26] Annex B, Letter from Inquiry dated 30 October 2019.

[27] It is not entirely clear to Kingspan Insulation whether this list remains accurate; Kingspan Insulation is not aware of any revised list having been circulated but subsequent correspondence has suggested that Issue 4A (whether in whole or in part) may be being addressed in later modules. Kingspan Insulation has included some limited submissions in relation to Issue 4A in this Opening Statement (particularly section "I" below) but, in any event, such submissions are relevant to the wider context surrounding Module 2.

C. THE USE OF K15 IN THE CLADDING SYSTEM ADOPTED FOR THE REBURBISHMENT OF GRENFELL TOWER

17. It is widely accepted that insulation should be added to tower blocks during cladding refurbishments in order to achieve compliance with the relevant requirements of Part L of the Building Regulations. Insulation is a vital part of any construction, both for environmental reasons and for the health and comfort of residents. This does not detract from the need properly to assess the fire performance of the cladding system. K15 is commonly used as an insulation because in addition to its low lambda value, it is lightweight, thin and easy to install.

18. It is understood from Professor Bisby's Report that the Celotex RS5080 (being the 80mm thick version of its RS5000 range of insulation) was installed on the spandrel beams of Grenfell Tower[28] whereas Celotex RS5100 (being 100mm thick) was installed on the columns of Grenfell Tower.[29] Since the fire, Kingspan Insulation has learned that 145 sheets of K15 were delivered by third party wholesalers to Grenfell Tower for use in place

[28] Professor Luke Bisby Expert Report – Phase 1: {LBYR00000001}, paragraph 286.

[29] *Ibid*, paragraph 284.

of Celotex RS5080 / RS5100 to bridge an apparent gap in availability of that specified product for a short period of time.[30]

19. On the basis of the information established to date, it is understood that K15 constituted roughly 5.2% (by area) of the rainscreen insulation boards ordered for use on the spandrel beams and columns of Grenfell Tower.[31] This is consistent with Professor Bisby's observation that "*the predominant form of rainscreen cavity thermal insulation found on spandrel beams during post-fire investigations of Grenfell Tower is … Celotex RS5000 PIR polymer foam insulation*"[32] and also BRE's finding in relation to the column insulation that K15 "*was only found in very limited quantities on the columns examined*".[33]

20. 96 of the 145 sheets of the K15 delivered to Grenfell Tower were ordered from Kingspan Insulation by SIG under purchase order 1000420396 dated 26 May 2015 and delivered to SIG on 28 May 2015.[34] Kingspan Insulation was not informed that those 96 sheets were intended for delivery to Grenfell Tower, and Kingspan Insulation only came to learn that K15 had been installed on Grenfell Tower after the fire as a result of a phone call from Mr Sanjay Gorasia, the Director / General Manager of the Ruislip branch of SIG.[35]

21. Kingspan Insulation became aware during the course of evidence in Phase 2 Module 1 that an additional 49 sheets of 100mm K15 were delivered to Grenfell Tower in September

[30] Harley purchase order to SIG for K15 dated 26 May 2015: {SIG00000012}; CCF invoice to Harley for K15 dated 10 September 2015: {CCF00000019}.

[31] This calculation is based on the disclosed purchase orders for Celotex RS5080 / RS5100 and K15: Harley purchase order to SIG for RS5080 dated 25 March 2015: {SIG00000010}; Harley purchase order to SIG for RS5100 dated 17 June 2015: {HAR00000781}; Harley purchase order to CCF for RS5000 dated 15 September 2015: {HAR00000457}; Harley purchase order to CCF for RS5000 dated 9 October 2015: {CCF00000011}; Harley purchase order to CCF for RS5100 and RS5080 dated 11 December 2015: {CCF00000009}; Harley purchase order to CCF for RS5100 and RS5080 dated 8 January 2016: {HAR00000583}; Harley purchase order to CCF for RS5000 dated 12 February 2016: {CCF00000021}; Harley purchase order to CCF for RS5100 dated 10 March 2016: {CCF00000024}; Harley purchase order to SIG for K15 dated 26 May 2015: {SIG00000012}; and CCF invoice to Harley for K15 dated 10 September 2015: {CCF00000019}. It is unclear whether all supplied insulation was installed on Grenfell Tower.

[32] Professor Luke Bisby Expert Report – Phase 1: {LBYR00000001}, paragraph 286.

[33] BRE Grenfell Tower Investigation (Report number: P109378-1000 Issue: 2) dated 20 February 2019: {MET00039807}, paragraph 66.1.2.

[34] Sales invoice and purchase orders for the supply of Kooltherm insulation (including K15) to SIG PLC dated 26 May 2015: {KIN00000103}; Delivery note of Kooltherm insulation (including K15) to SIG dated 27 May 2015: {KIN00000101}.

[35] First Witness Statement of Richard Burnley: {KIN00000554}, paragraphs 4.4 and 4.5.

2015. Based on the document {CCF00000019}, it appears that Harley Facades ordered this additional quantity of K15 from CCF on 10 September 2015. Having reviewed its own systems, Kingspan Insulation has identified that CCF ordered 210 sheets of K15 100mm on 11 September 2015 as part of purchase order 481439403.[36] This order was part of a standard stock order by CCF and Kingspan Insulation was not aware that part of this order was intended for delivery to Grenfell Tower.

22. Kingspan Insulation was not asked to, and did not provide, any specific advice about the suitability of K15 for use on Grenfell Tower.[37] The available product literature and third party certification for K15 available at the time of the refurbishment is set out in section D below. None of those materials suggested that K15 was non-combustible or of limited combustibility nor that if combined with PE-cored ACM cladding it would achieve compliance with the Building Regulations.

23. The Chairman found in his Phase 1 Report that "*on completion of the main refurbishment the external walls of the building did not comply with requirement B4(1) of Schedule 1 to the Building Regulations*".[38] This finding is consistent with the submissions Kingspan Insulation made in its Phase 1 Closing Statement.[39] Kingspan Insulation wishes to emphasise that despite the non-compliance of the system installed on Grenfell Tower, combustible thermoset insulation materials were capable of achieving compliance with the Building Regulations for buildings over 18 metres when used as a component of a cladding system that either meets the criteria given in BR 135, had received a successful desktop

[36] Fax from CCF to Kingspan Insulation including purchase order and order confirmation for Kooltherm products (including K15) dated 11 September 2015: {KIN00022607}.

[37] The U-value calculation for the use of K15 provided on 6 July 2012: {SEA00001338} did not provide advice as to the suitability of K15 for use on Grenfell Tower. As would be typical of most major cladding projects in the UK, U-value calculations were provided by Kingspan Insulation prior to any knowledge of the cladding being used (as there is no thermal value apportioned to the cladding element within calculations). This U-value calculation used a basic wall construction and a standard default correction for the fixings to determine the thickness of insulation required to achieve the desired U-value, acting as a rough guide to the designer. Calculations of a more specific nature are typically conducted at a later stage. Such calculations were not requested of Kingspan Insulation for the use of K15 on Grenfell Tower.

[38] Phase 1 Report, paragraph 26.6.

[39] Kingspan Insulation Phase 1 Closing Submissions: {INQ00000565}, pp.3-4 section 2.1.

study or when used as part of a building assessed in accordance with the fire engineering route.

D. TESTING, CERTIFICATION AND PROMOTION OF K15 AS USED ON GRENFELL TOWER

Testing

24. As at both May and September 2015, when K15 was supplied by SIG and CCF (respectively) for use on Grenfell Tower, K15 had achieved the following classification in relation to its fire performance:

    a. Class 0 as defined in the Building Regulations for England & Wales, its foil facer having been tested in accordance with BS 476 Parts 6 and 7; and

    b. Euroclass C-s1,d0 in accordance with BS EN ISO 13501-1.

25. As far as whole system tests are concerned, by May 2015, K15 had been part of four cladding systems tested to BS 8414-1 or BS 8414-2 which had satisfied the BR 135 criteria, as further detailed in section E below.[40] By the time of supply in September 2015, a further two BS 8414-2 tests of systems incorporating K15 had been undertaken, both of which satisfied the BR 135 criteria.[41] Each of these tests demonstrated that K15 was suitable for

[40] BRE Report BS 8414-1 test (Report Number: 220876) on 31 May 2005 (cement particle board cladding) (the "**2005 BS 8414 Test**"): {KIN00005356}; BRE Global Test Report BS 8414-2 test (Report number: 297099 issue 2) on 7 July 2014 (terracotta rainscreen cladding) (the "**2014 Terracotta Test**"): {KIN00000143} and BRE Global Classification Report (Report number: 291642 Issue 2) dated 14 April 2015: {KIN00000131}; BRE Global Test Report BS 8414-2 test (Report number: 302995 Issue 1) on 23 March 2015 (mineral composite grooved cladding panels): {KIN00000147} and BRE Global Classification Report (Report number: P100769-1000) dated 8 June 2015: {KIN00000144}; BRE Global Test Report BS 8414-2 test (Report number 303930 Issue 3) on 21 April 2015 (Taylor Maxwell Tampa terracotta tiles): {KIN00000593}; and BRE Global Classification Report (Report number: 297211 Issue 2) dated 3 July 2018: {KIN00000578} (originally issued in September 2015 and subsequently reissued).
As explained in paragraph 44 below, the 2005 BS 8414 Test was undertaken using Old Technology K15. As explained in paragraph 45 below, Kingspan Insulation has undertaken an equivalent (to the extent possible) test using New Technology K15 which satisfied the BR 135 criteria.
As explained in paragraph 51 below, the 2014 Terracotta BS 8414 Test was undertaken using a research and development version of K15. As explained in paragraphs 53 and 54 below, subsequent re-testing using market-standard K15 in more onerous systems using terracotta cladding have also satisfied the BR 135 criteria.

[41] BRE Global Test Report BS 8414-2 test (Report number: 303931 Issue 1) on 7 July 2015 (brick slip panels): {KIN00000150} and BRE Global Classification Report (Report number: P100576-1000) dated 13 November 2015: {KIN00014435}; BRE Global Test

use over 18 metres within the tested system in accordance with the Building Regulations. K15's suitability for use over 18 metres in various different cladding systems has been further confirmed by at least a further 11 BS 8414 tests undertaken since September 2015 which satisfied the BR 135 criteria.[42]

26. As far as Kingspan Insulation is aware, no cladding system incorporating PE-cored ACM panels (regardless of the insulation used, whether classified as combustible or non-combustible) has satisfied (or is capable of satisfying) the BR 135 criteria when tested to BS 8414. It is also notable that both of the DCLG BS 8414 tests of PE-cored ACM systems[43]

Report BS 8414-2 test (Report number P100838-1000 Issue 2) on 15 July 2015 (Gebrik panels): {KIN00000148} and BRE Global Classification Report (Report number P100838-1001 issue 2) dated 21 September 2015: {KIN00018577}.

[42] BRE Global Test Report BS 8414-2 test (Report number: P100184-1000 Issue 3) on 26 January 2016 (ArGeTon Tampa terracotta tiles): {KIN00000139} and BRE Global Classification Report (Report number P100184-1001 Issue 3) dated 2 December 2016: {KIN00015914}; BRE Global Test Report BS 8414-1 test (Report number P107017-1000 Issue 1) on 9 October 2017 (Mitsubishi Alpolic/fr ACM) {KIN00000141} and BRE Global Classification Report (Report number P107017-1001 Issue 2) dated 11 January 2017: {KIN00008578}; BRE Global Test Report BS 8414-1 test (Report number P109971-1000 Issue 1.0) on 9 October 2017 (Mitsubishi Alpolic A2 ACM): {KIN00000149} and BRE Global Classification Report (Report number P109971-1001 Issue 1.0) dated 4 April 2018: {KIN00000473}; BRE Global Test Report BS 8414-1 test (Report number P109973-1000 Issue 1.0) on 27 October 2017 (Mitsubishi Alpolic A2 ACM): {KIN00000472} and BRE Global Classification Report (Report number P109973-1001 Issue 1.0) dated 4 April 2018: {KIN00000470}; BRE Global Test Report BS 8414-1 test (Report number P109939-1000 Issue 1) on 7 November 2017 (Mitsubishi Alpolic/fr ACM): {KIN00000142} and BRE Global Classification Report (Report number P109939-1001 Issue 1) dated 11 January 2018: {KIN00008577}; Exova Test Report BS 8414-1 test (Report number DLR1448 Rev.0) on 3 December 2017 (3mm Aluminium Panels): {KIN00000477} and Exova Classification Report (Report number SR0810 Rev 0) dated 15 March 2018: {KIN00020327}; Exova Test Report BS 8414-1 test (Report number DLR1453 Rev.0) on 12 December 2017 (Mitsubishi Alpolic/fr ACM): {KIN00000465} and Exova Classification Report (Report number SR0811 Rev.0) dated 30 May 2018: {KIN00000464}; BRE Global Test Report BS 8414-2 test (Report number P109938-1000 Issue 2) on 5 February 2018 (Mitsubishi Alpolic A2 ACM): {KIN00000594} and BRE Global Classification Report (Report number P109938-1001 Issue 1) dated 14 August 2018: {KIN00000562}; BRE Global Test Report BS 8414-2 test (Report number P112065-1000 Issue 1) on 2 May 2018 (102.5mm Facing Brickwork): {KIN00020833} and BRE Global Classification Report (Report number P112065-1001 Issue 1) dated 31 October 2018: {KIN00001773}; BRE Global Test Report BS 8414-1 test (Report number P114679-1000 Issue 1) on 6 June 2019 (8mm Eternit Equitone Natura fibre cement tiles): {KIN00022315}and BRE Global Classification Report (Report number P114679-1001 Issue 1) dated 5 March 2020: {KIN00022317}; and Efectis Reaction to Fire BS 8414 -2 Test Report (Report number EUI-18-FF-000131) on 27 June 2019 (40mm Granite panels): {PROD0020242} and Efectis Fire Performance of External Thermal Insulation Classification Report (Report number EUI-18-000131 Issue 1) dated 25 June 2020: {PROD0020246}.

[43] https://www.gov.uk/government/publications/fire-test-report-dclg-bs-8414-test-no1; https://www.gov.uk/government/publications/fire-test-report-dclg-bs-8414-test-no2.

failed in under 8 minutes (because of flame height) irrespective of the insulation material used in the system, demonstrating the very grave risks posed by PE-cored ACM panels.

27. Kingspan Insulation continues to support the use of BS 8414 and other large scale tests as the most rigorous way to establish the safety of cladding systems. As the Inquiry is aware, there are at least four examples of cladding systems which would have been deemed to be compliant via the linear route to compliance (because they incorporate only cladding and insulation sold as non-combustible and/or limited combustibility) which have failed to satisfy the BR 135 criteria when tested to BS 8414.[44]

Certification and Promotion

28. In May and September 2015 when K15 was supplied by SIG and CCF, respectively, for use on Grenfell Tower, sources of information available about K15's suitability for use over 18 metres included the BBA certificate 08/4582 dated 17 December 2013, the LABC certificate EWWS165 dated 28 August 2013 and Kingspan Insulation's own product literature.

29. None of the testing, certification or marketing literature which was current at the time of the supply of K15 for use on Grenfell Tower suggested that K15 was non-combustible or of limited combustibility or that if combined with PE-cored ACM cladding it would achieve compliance with the Building Regulations.[45]

BBA certificate 08/4582

30. John Albon of the BBA explains in his evidence, "*it is important to recognise that BBA certificates are intended to be read by experienced building professionals with a thorough understanding of the subject*".[46] Kingspan Insulation agrees with that statement.

[44] Second Witness Statement of Adrian Pargeter: {KIN00020824}, paragraph 12.3(e); Exova BS 8414-1 Test Report (Reference DLR1537 Rev.0) dated 11 December 2018: {KIN00020847}.

[45] It is recognised that the LABC Type Approval for K15 issued in 2009 (and no longer valid at the time of supply of K15 to Grenfell Tower) stated that K15 "*could be considered as a material of limited combustibility*". See paragraphs 57 to 62 below.

[46] Third Witness Statement of John Albon: {BBA00010751}, paragraph 144.

31. At paragraph 8.2 of the K15 BBA certificate dated 17 December 2013[47] it was stated that "*When tested to BS 8414-1:2002, the following specific cladding construction met the criteria stated in BRE Report BR 135: 2013*" (emphasis added). The certificate makes clear that "*the test result relates only to this specific construction and a separate test would be required to establish the performance of any other combination of materials*" (emphasis added). Paragraph 8.3 of the certificate goes on to state that "*the product* [K15] *incorporated in the construction defined in section 8.2 can be used in buildings with a floor more than 18 m above ground level. Fire breaks should be used at every floor level.*"

LABC certificate EWWS165

32. The version of this certificate issued on 30 March 2015 was valid in May and September 2015.[48] This certificate explained that "*K15 has been successfully tested to BS 8414-1:2002 and BS 8414-2:2005, meeting the criteria set out in BR 135: 2013 and therefore is acceptable for use in buildings with storeys above 18m in height (subject to matching the explicit criteria identified in the tested specifications below and overall risk assessment of the finished building in relation to B4 – see scope above) as alternative compliance to AD B*" (emphasis added). The "*Scope of Registration*" specifies in bold type that "*An appropriate classification report and/or supplementary report MUST evidence suitability of the proposed makeup*".

Kingspan Insulation's own product literature and advice to clients

33. The Ninth Issue of Kingspan Insulation's own product literature dated March 2011 also provided information about the use of K15 over 18 metres.[49] Page 1 of the literature (which provided bullet points of key performance attributes) stated that K15 had been "*Successfully tested to BS 8414:2002, can meet the criteria within BR 135 and is therefore acceptable for use above 18 metres*". Further information concerning the construction used where the BR135 standard was met was provided to the market on page 6 of this marketing material (highlighting added):

[47] K15 BBA Certificate (Reference: 08/4582) dated 17 December 2013: {KIN00000454}.

[48] K15 LABC Certificate (Reference EWW165) dated 30 March 2015: {LABC0000916}.

[49] K15 product literature, ninth issue dated March 2011: {KIN00000063}.

Kingspan **Kool**therm® K15 Rainscreen Board in the construction specified in the table below, when subjected to the British Standard fire test BS 8414: 2002 (Fire performance of external cladding systems. Test methods for non-load bearing external cladding systems applied to the face of a building), has achieved the result shown.

Construction	Result
6 mm non-combustible cladding fixed to an aluminium railing system at 600 mm centres, 40 mm ventilated cavity, 60 mm *Kingspan* **Kool**therm® K15 Rainscreen Board mechanically fixed to non-combustible substrate.	The tested product meets the criteria stated within BRE 135 (Fire performance of external thermal insulation for walls of multi storey buildings) and is therefore acceptable for use above 18 metres in accordance with the Building Regulations / Standards.

NB Fire stopping was provided by a ventilated rainscreen barrier system, comprising nominal 2.5 mm thick graphite-based intumescent strip bonded to nominal 0.6 mm thick galvanized steel sheet, and positioned 0.5 m and 4 m above the fire chamber on both the main face and the wing face.

34. Kingspan Insulation's standard advice to clients at the time of supply of K15 for use on Grenfell Tower clearly explained that K15 was neither non-combustible nor of limited combustibility. Kingspan Insulation understood that the linear route to compliance set out in section 12.7 of ADB was not applicable to the use of K15 over 18 metres. The standard advice explained that compliance with ADB could be achieved through BS 8414 testing. This advice also pointed to the BCA Technical Guidance Note "*Use of Combustible Cladding Materials on Residential Buildings*" (the "**BCA Technical Guidance Note**")[50] and the provision for the use of desktop studies as an alternative to full scale testing of the proposed cladding system in order to achieve compliance with ADB.

E. DEVELOPMENT, TESTING, CERTIFICATION AND PROMOTION OF K15 FROM 2005 TO 2014

35. The Inquiry has prompted Kingspan Insulation to review the product development, testing, certification and promotion of K15 between 2001 and 2020. This process has identified that certain shortcomings occurred historically in relation to the development, testing and promotion of this product.

[50] BCA Technical Guidance Note Issue 0 dated June 2014: {KIN00020830}; BCA Technical Guidance Note Issue 1 dated June 2015: {KIN00007081}.

The change in production process from “Old Technology” to “New Technology”

36. In 2006 Kingspan Insulation's production site in Pembridge, Herefordshire, adopted a new production technology which had originally been developed by a Dutch company called Marec which Kingspan Insulation had purchased in or around 2003.

37. This new manufacturing process was internally referred to as “New Technology” (or "Kesteren Technology" after the location of Marec's manufacturing site based in Kesteren, Holland.) New Technology (or Kesteren Technology) was the standard production technology used at the Kesteren site in September 2006 (as it had been prior to Kingspan Insulation's acquisition of the business in or around 2003). Kingspan Insulation transferred the production of the majority of its phenolic products (including K15) manufactured at the Kingspan Insulation site in Pembridge from pre-existing "Old Technology" to the New Technology. This was done by modifying the existing production line in Pembridge to suit the New Technology production process.

38. The transfer to New Technology was completed in September 2006.

Class 0 classification of New Technology K15

39. As part of the change of K15 to New Technology in September 2006, Kingspan Insulation relied on BS 476 testing undertaken on two products produced in Kesteren in order to understand the fire performance of New Technology K15. These products were called DL 2000 and DL 3300 and both of them achieved Class 0 when tested as a complete product.[51] The chemistry used to manufacture the foam used in these products was largely identical to that used in New Technology K15 albeit manufactured in Kesteren rather than Pembridge. The products used facers which differed to that used on New Technology K15.

[51] Warrington Fire Research BS 476-7 Test Report on DL3300 (Reference: 136015) dated 9 December 2003: {KIN00022645}; Warrington Fire Research BS 476-7 Test Report on DL2000 (Reference: 136016) dated 9 December 2003: {KIN00022643}; Warrington Fire Research BS 476-6 Test Report on DL3300 (Reference: 136017) dated 9 December 2003: {KIN00022647}; Warrington Fire Research BS 476-6 Test Report on DL2000 (Reference: 136018) dated 9 December 2003:{KIN00022646}; Warrington Fire Research Summary of Test Reports 136015 and 136017 (DL3300) dated 9 December 2003{KIN00022648}; Warrington Fire Research Summary of Test Reports 136016 and 136018 (DL2000) dated 9 December 2003: {KIN00022644}.

On the basis of this testing undertaken in Kesteren, Kingspan Insulation understood that New Technology K15 would also achieve a Class 0 classification. The transfer to New Technology was made on this basis without further testing relevant to New Technology K15 until May 2007.

40. In May 2007, BS 476-6 and BS 476-7 tests of the foil facer of New Technology K15 were undertaken.[52] These tests demonstrated that the product achieved Class 0 in accordance with the 2006 edition of ADB in England and Wales which requires that either "*the product or surface material of a composite product*" (emphasis added) achieve the necessary fire propagation index results.[53] It is unclear what reliance was placed on these tests at the time.

41. The BBA issued its certificate for K15 in October 2008.[54] As confirmed in paragraph 71 of the witness statement of John Albon of the BBA, the relevant test reports for DL 2000 and DL 3300 were provided to the BBA and they accepted these reports as evidence of K15's Class 0 classification as confirmed in K15's BBA certificate issued in October 2008.[55]

42. Subsequent testing of the facer of K15 in 2016[56] confirmed K15's Class 0 classification.

43. Kingspan Insulation accepts that it should not have relied upon tests conducted using similar but not identical products following the transfer to New Technology and accepts that K15's classification should have been based on testing of the specific product being

[52] The reports associated with these tests were not commissioned until 2009. The reason for this delay is not known. Bodycote Warringtonfire BS 476-6 test report (Reference: 164169) dated 24 August 2009: {KIN00000261}; Bodycote Warringtonfire BS 476-7 test report (Reference: 164170) dated 24 August 2009: {KIN00009134}.

[53] See also, for example, the Communities and Local Government paper "*The impact of European fire test and classification standards on wallpaper and similar decorative linings*" (March 2012) which explains at pp. 4-5 that "*BS 476 tests are material tests where the fire performance is determined by the characteristics of the surface of the material where as the SBI test is a test of the performance of the construction product in an arrangement representative of end use*" (emphasis added): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/6379/2107408.pdf

[54] K15 BBA Certificate (Reference 08/4582) dated 27 October 2008: {KIN00009383}.

[55] *Ibid.*

[56] BRE Global test report entitled, "BS 476-6:1989 + A1:2009 fire propagation test on 1963 facing" (test report no. P100160-1002-2, issue 1) dated 19 February 2016: {KIN00021682}; BRE Global test report entitled, "BS 476-7:1997 Surface spread of flame test on 1963 facing" (test report no. P100160-1002-1, issue 1) dated 29 February 2016: {KIN00021681}; Letter from BRE to Kingspan Insulation re Class 0 classification dated 19 February 2016: {KIN00000588}.

manufactured at Pembridge. Kingspan Insulation also accepts that it should have informed the BBA when it started to rely on the May 2007 foil facer tests to support K15's Class 0 classification. As further detailed in section H below, Kingspan Insulation is implementing a number of new internal protocols and changes to its CMS (change management system). The updated CMS will require testing of products prior to the implementation of any change that may impact a product's fire performance; and the accreditation protocol will require regular reviews of all third party certification and central storage of all relevant documentation to ensure transparency and internal accountability for certification.

The 2005 BS 8414 Test

44. In 2005 Old Technology K15 was used in the successful 2005 BS 8414 Test[57] which used a non-combustible façade.[58] This test result was used to promote New Technology K15. Kingspan Insulation recognises that a new BS 8414 test should have been carried out following the change to New Technology.

45. As detailed in paragraphs 10.32 and 10.33 of Adrian Pargeter's Second Witness Statement[59], Kingspan Insulation has subsequently conducted a further BS 8414-1 test designed to replicate (as closely as possible given product availability) the system tested in the 2005 BS 8414 Test but using New Technology K15. This replica test satisfied the BR 135

[57] Kingspan Insulation is aware that the Inquiry has asked Kingspan Insulation witnesses to explain in their witness statements why a BR 135 Classification Report for the 2005 BS 8414 Test was not commissioned from the BRE until September 2015. As far as Kingspan Insulation has been able to establish, a Classification Report was not commissioned at the time as it was not understood to be necessary given that the Test Report itself was sufficient to show that the BR 135 criteria had been met (see the Second Witness Statement of Adrian Pargeter: {KIN00020824}, paragraph 5.16). This understanding is confirmed in the witness statement of David Hoare of the BRE ({BRE00005622}, paragraph 73). Indeed, it is noted that the DCLG did not commission classification reports for its tests before saying that they had passed or failed. In any event, in September 2015, the BRE did provide a BR 135 Classification Report confirming that the 2005 BS 8414 Test had satisfied the criteria of BR 135 (Reference P101812-1000 Issue 1): {KIN00000134}.

[58] Witness statement of Adam Heath: {KIN00008834}, see paragraphs 11.52 and 11.53 where it is explained that Kingspan Insulation now understands that the cladding used during the 2005 BS 8414 testing was probably fibre cement board rather than cement particle board recorded in the test report. As far as Kingspan Insulation has been able to establish, this was a simple recording error.

[59] Second witness statement of Adrian Pargeter: {KIN00020824}.

criteria.[60] Thus, whilst Kingspan Insulation recognises that a re-test of the 2005 BS 8414 Test should have been undertaken following the change to New Technology K15, the replica test demonstrates that the system incorporating New Technology K15 was able to pass, and did pass, an equivalent BS 8414 full system test. Kingspan Insulation regrets that such a re-test was not undertaken contemporaneously as part of the change of process, but emphasises that this omission did not result in any safety issues as evidenced by the successful re-testing.

BS 8414 Tests in 2007/08

46. The document review has also revealed that when New Technology K15 was tested to BS 8414-2 in December 2007 as part of a system incorporating aluminium cladding panels, the system performed poorly and Kingspan Insulation employees involved in these tests commented on the potential role of New Technology K15 in these tests.

47. However, Kingspan Insulation considered that the failure of the system tested to BS 8414-2 in December 2007 was attributable to the inadequacies of the wider system being tested rather than to the use of New Technology K15.[61] The system tested differed significantly from that tested in the 2005 BS 8414 Test. These differences in the system included the use of a steel frame rig as part of the BS 8414-2 test conducted in December 2007, the details of the façade construction and the use of aluminium cladding. Tests such as these are a vital part of research and development in which test failures are normal and expected.

[60] BRE Global Test Report BS 8414-1 test (Report number P114679-1000 Issue 1) on 6 June 2019 (8mm Eternit Equitone Natura fibre cement tiles): {KIN00022315}; and BRE Global Classification Report (Report number P114679-1001 Issue 1) dated 5 March 2020: {KIN00022317}.

[61] See internal Kingspan Insulation email correspondence with subject "FALCON PANEL K15 fire test notes" dated 18 January 2008: {KIN00020908}. This conclusion was further supported by Kingspan Insulation's understanding that (i) a similar system that replaced K15 with synthetic mineral fibre insulation was tested to BS 8414-2 on 18 January 2008 and also failed to meet the BR 135 classification criteria: see Kingspan Insulation Technical Report dated January 2008:{KIN00022019} ; and (ii) a further test of a similar system using K15 was undertaken in April 2008 and changes in the system meant that it was much closer to meeting the BR 135 criteria.

BS 8414 Testing in 2014

48. In 2014, Kingspan Insulation conducted two BS 8414-2 tests using systems incorporating K15:

    a. BS 8414-2 test undertaken in March 2014 combining K15 with Trespa HPL panels (the "**2014 Trespa Test**")[62]; and

    b. BS 8414-2 testing undertaken in July 2014 combining K15 with Terracotta tiles (the "**2014 Terracotta Test**").[63]

49. The 2014 Trespa Test did not meet the BR 135 criteria and the associated test report was shared with fire engineers conducting desktop studies of systems incorporating K15 in order to assist their understanding of how K15 might perform in systems similar to that used in the 2014 Trespa Test. Beyond that, the test report for the 2014 Trespa Test has not been referenced in K15 literature or in either the BBA or LABC certification of K15.[64]

50. The 2014 Terracotta Test did satisfy the BR 135 criteria and the associated test report was provided to customers and their fire engineers to support K15's specification in similar systems over 18 metres. The 2014 Terracotta Test was referenced in the BBA certificate 14/5134 issued on 8 October 2015[65] and amended on 16 November 2015[66], and in the 2014-2016 issues of K15's LABC Registered Detail Certificate EWW165 and EWWS165.[67] It was also referenced in Kingspan Insulation's Route to Compliance bulletins (from August 2015) and in K15 literature (from July 2015), along with a number of other BS 8414 tests which had been successfully undertaken by those dates.

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[62] BRE Global Test Report BS 8414-2 (Report number293940 Issue 1) dated 26 June 2014: {KIN00000140}.

[63] BRE Global Test Report BS 8414-2 (Report number 297099 Issue 2) dated 14 April 2015: {KIN00000143}.

[64] The 2014 Trespa Test Report was uploaded to the Kingspan Insulation website in Summer 2018 as part of Kingspan Insulation's commitment to uploading to its website all reports of BS 8414 tests incorporating K15 (including those which failed to satisfy the BR 135 criteria). It was subsequently removed in March 2019.

[65] K15 BBA Certificate (Reference 14/5134) dated 8 October 2015: {KIN00000490}.

[66] K15 BBA Certificate (Reference 14/5134) amended on 16 November 2015: {KIN00008372}.

[67] K15 LABC Certificate No. EW165 Issue dated 20 August 2014: {KIN00006232}; K15 LABC Certificate No. EWW165 Issue dated 9 March 2015: {KIN00012265}; K15 LABC Certificate No. EWW165 Issue dated 30 March 2015: {KIN00006494}.

51. The document review exercise conducted to assist the Inquiry has confirmed that the 2014 Trespa and Terracotta Tests were undertaken using a research & development formulation of K15 which used a solstice blowing agent and a 50 micron unperforated facer (compared to the standard blowing agent and 25 micron perforated facer used in standard K15). These tests were conducted on this specification of K15 because it was planned that Kingspan Insulation would migrate K15 to this specification as part of its launch of a lower lambda Kooltherm range of products. This new range became known as the K100 range, although K115 (which would have been the name assigned to the K15 version in this product range) was never launched as a product.

52. The divergence from the use of standard K15 for the two tests conducted in 2014 was not made clear to the BRE who conducted the tests and the use of non-standard K15 was not specified in the BRE test reports for the 2014 Trespa and Terracotta Tests. The 2014 Terracotta Test, as described in K15's BBA and LABC certificates, was therefore described as having been undertaken on a system incorporating K15, implying that standard K15 was used. Kingspan Insulation discontinued its reliance on the 2014 Terracotta Test in March 2019 when it was removed from its website and product literature. By March 2019, the 2014 Trespa Test was no longer being provided for the purpose of consideration as part of desktop studies as the revised regulations no longer provided for such methods of compliance.

53. Kingspan Insulation confirms, however, that the differences in technology used to produce the phenolic foam for these two tests will have had very little, if any, impact on the outcome of those tests.[68] As regards the 2014 Trespa Test, Kingspan Insulation undertook a replica test using standard K15 on 24 July 2019 which, like the original 2014 Trespa Test, failed to meet the BR 135 criteria.[69] For the 2014 Terracotta Test, Kingspan Insulation's conclusion is confirmed by the fact that that the BS 8414-2 testing conducted in April

[68] As explained in detail in the Second Witness Statement of Adrian Pargeter: {KIN00020824}, paragraphs 10.37 to 10.42.

[69] A test report relating to this test was commissioned at the time of testing but has not yet been received.

2015[70] and in January 2016[71], using standard K15 and terracotta cladding systems met the criteria of BR 135, thus supporting the use of K15 in those systems over 18 metres. These two tests were arguably of more onerous constructions than the 2014 Terracotta Test as they were conducted using 140mm of K15, meaning that there was a greater volume of combustible material and greater heat retention in the tested systems than in the 2014 Teracotta Test. The test reports for each of the terracotta tests undertaken in April 2015 and January 2016 were also referenced in K15's third party certification and product literature (including Routes to Compliance).

54. In addition, Kingspan Insulation has conducted comparative ISO 13785-1 testing of the research and development version of K15 used in both the 2014 Trespa and Terracotta Tests and standard K15. These are described in paragraphs 3.34 to 3.36 of Adrian Pargeter's Third Witness Statement. These tests demonstrate that had standard K15 been used in the 2014 BS 8414 Tests, the outcomes would have been very similar.

55. Kingspan Insulation deeply regrets that the precise nature of the tested product was not made clear on the face of the test reports in relation to the 2014 Trespa and Terracotta Tests.

56. As detailed further in paragraph 87 below and in paragraph 3.79(c) of Adrian Pargeter's Third Witness Statement, Kingspan Insulation has now implemented strict internal guidelines requiring that all batch numbers are recorded in test reports and that it is made clear on the face of any test report if a research and development product is being tested or if the tested product otherwise differs from the standard product on the market.

[70] BRE Global Test Report BS 8414-2 (Report number 303930 Issue 3) dated 3 July 2018: {KIN00000593}; BRE Global Classification Report (Report number 297211 Issue 2) dated 3 July 2018: {KIN00020511}.

[71] BRE Global Test Report BS 8414-2 (Report number P100184-1000 Issue 3) dated 28 November 2016: {KIN00000139}; and BRE Global Classification (Report number P100184-1001 Issue 3) dated 2 December 2016: {KIN00000132}.

LABC certification

57. Kingspan Insulation received its first LABC certification relating to K15 in May 2009 in the form of a document titled "System Approval – External Walls of Rainscreen Cladding Incorporating Kingspan Kooltherm K15 Insulation Board" (the "**2009 K15 LABC System Approval**").[72]

Reference to "Limited combustibility" in isolation

58. As part of its document review exercise, Kingspan Insulation has examined the content of these LABC documents and has identified that the 2009 K15 LABC System Approval states that K15 "*can be considered as a material of limited combustibility*". Taken in isolation, the description of K15 by the LABC as "*a material of limited combustibility*" could be misinterpreted. This is because "Limited Combustibility" was a defined term in ADB (until recently) and a product would only be of "Limited Combustibility" if it was classified as A2 s3 d2 or better or met any of the other criteria in Table A7 of these documents. K15 does not come within these classifications and so does not come within the definition of "Limited Combustibility" for the purposes of ADB.[73]

Reference to "limited combustibility" in context

59. Under the heading "Requirement B4: External Fire Spread" the certificate states that "*Since K15 can be considered a material of limited combustibility, it is suitable for use in all situations shown on Diagram 40 of Approved Document B Volume 2, including those parts of a building more than 18m above the ground. In the latter circumstances, the cladding system and the substrate to which the insulation is applied must also meet the requirement for limited combustibility*" (emphasis added).

60. Thus, the certificate does not say that K15 is a material of "Limited Combustibility" in isolation; rather Kingspan Insulation's understanding is that LABC was stating that K15 can be considered as a material of "Limited Combustibility" for the purposes of compliance

[72] LABC System Approval – External Walls of Rainscreen Cladding Incorporating Kingspan Kooltherm K15 Insulation Board: {KIN00005561}.

[73] K15 achieves Class 0 when its foil is tested to BS 476 Parts 6 and 7 and it achieves a Euroclass Classification of C-s1,d0.

with the Building Regulations (i.e. the linear route to compliance may be adopted), **but only** if used with cladding panels that are classified as being of "Limited Combustibility". This stipulation for the cladding panels to be “Limited Combustibility” was a more onerous standard than the “Class 0” classification required by Diagram 40 of ADB[74] and so it would appear that, by balancing different factors, LABC’s assessment was compensating for the fact that K15 was not of “Limited Combustibility” by requiring the cladding system to meet a higher standard. Thus, for example, the LABC analysis set out in this certificate would **not** have permitted K15 to be used with a PE-cored ACM cladding system of the type used on Grenfell Tower because those cladding panels were only “Class 0” / Euroclass B (according to their BBA certificate) and were not of “Limited Combustibility”.

61. Kingspan Insulation accepts that the wording used by Herefordshire Building Control was not entirely clear. The accreditation protocol which Kingspan Insulation is currently implementing is being designed to ensure that any future instances of unclear drafting would be queried with the certifying body.

62. The wording used in the 2009 LABC Type Approval was not included in the LABC Registered Detail issued on 28 August 2013[75] or the version of that certificate dated 30 March 2015[76] which was valid at the time of supply of K15 for use on Grenfell Tower.

Promotion

63. It is now clear that certain statements made in early K15 product literature issued prior to 2014, trade press advertisements and bespoke advice provided to Kingspan Insulation clients were not sufficiently clear or emphatic in specifying the limitations of the 2005 BS 8414 Test Report as regards its support for the use of K15 over 18 metres. The promotional material should have made it more obvious to clients that the 2005 BS 8414 Test report

[74] ADB, Diagram 40 permitted cladding panels meeting Class 0 to be used over 18 metres in circumstances where the insulation is of Limited Combustibility; the LABC assessment allowed K15 to be used behind panels of Limited Combustibility, but not behind cladding panels which only met the lower Class 0 standard.

[75] K15 LABC Registered Detail certificate dated 28 August 2013: {KIN00010440}.

[76] K15 LABC Certificate (Reference EWW165) dated 30 March 2015: {LABC0000916}.

related to a particular system and advised caution against applying the 2005 BS 8414 Test too broadly.

64. From 2014 onwards, the BCA Technical Guidance Note[77] provided an explanation for the industry as to how to determine whether or not a cladding system complied with ADB and introduced the concept of desktop studies. Kingspan Insulation provided technical advice regarding the use of K15 which reflected the information provided in the BCA Technical Guidance Note. Ultimately, however, the use of K15 was a matter for designers and architects concerned with the cladding on a particular construction.

65. From August 2015 onwards, Kingspan Insulation published its "Routes to Compliance Technical Bulletins" which set out in an easy to understand format the requirements of the Building Regulations as regards the use of combustible materials over 18 metres. These bulletins explained that K15 could not be supported by way of the linear route to compliance, but that it could be used if it: was part of a BR 135 compliant system if the specific system had been successfully tested to BS 8414; was the subject of a specific desktop study opining that the proposed system would satisfy the BR 135 criteria if tested; or had been subject to a fire engineering assessment.

F. KINGSPAN INSULATION'S TESTING AND INDEPENDENT MODELLING OF PE-CORED ACM CLADDING SYSTEMS WITH DIFFERENT INSULATION TYPES FOLLOWING THE GRENFELL TOWER FIRE

66. As part of its efforts to understand the fire at Grenfell Tower and the role played by the combustible insulation in that fire, Kingspan Insulation commissioned nine ISO 13785-1 medium scale system tests to complement the BS 8414 testing undertaken by the DCLG.[78] Kingspan Insulation has also commissioned a significant programme of large scale (BS 8414) testing of systems incorporating K15, the scope and frequency of which has been increased following the Grenfell Tower fire.[79] These tests have allowed Kingspan Insulation

[77] BCA Technical Guidance Note 18 Issue 0 dated June 2014: {KIN00020830}.

[78] See Appendix B of Adrian Pargeter's Second Witness Statement: {KIN00020870}

[79] See footnote 42. The tests undertaken on 9 and 27 October 2017 were commissioned by Mitsubishi. Since the Grenfell Tower fire, Kingspan Insulation has also commissioned the following tests: Exova Test Report BS 8414-2 (Report number DLR1515 Rev.0)

to collate more empirical evidence and further understand K15's fire performance in a range of tested systems. The results of such testing continue to demonstrate that, when used in suitable systems, K15 remains a safe and efficient product for use in high rise cladding systems.

67. Kingspan Insulation has also provided partial funding to Efectis to undertake independent computer modelling research (known as Computational Fluid Dynamics) to understand the progression of the fire at Grenfell Tower and the contribution of different elements of the cladding and of building contents to the fire spread and to "*provide valuable information for those involved in future projects*".[80]

68. This research is directly relevant to the Inquiry's investigation into the role played by each element of the cladding system and building contents during the fire at Grenfell Tower, as referred to in paragraph 23.52 in Part 4 of the Phase 1 Report.

69. As explained in the published papers, Efectis' modelling was undertaken in a number of stages:

    a. first by creating models of three of the abovementioned ISO 13785-1 tests (medium-scale) and validating the results by comparison with the observations and data from those tests;

    b. second by creating larger-scale models of three of the DCLG-sponsored BS 8414 tests and validating the results by comparison with the data from those tests; and

    c. finally by creating a full-scale model of Grenfell Tower and the fire itself followed by validation of the model by comparison with the observational evidence of the actual fire as detailed in the Inquiry's Phase 1 Expert Reports.

on 30 April 2018 (Alpolic A2 ACM): {KIN00001771}; Exova Test Report BS 8414-2 (Report number DLR1567 Rev.0) on 18 July 2018 (Alpolic A2 ACM): {KIN00020835}; Exova Test Report BS 8414-2 (Report number DLR1547 Rev.0) on 5 August 2018 (Dri-Design 2mm aluminium cassette): {KIN00021697}; BRE Global Test Report BS-8414 test on 24 July 2019 (Trespa Meteon FR) (report not yet received from BRE); Exova Test Report BS 8414-1 (Report number DLR1709 Rev.0) on 4 November 2019 (Trespa Meteon FR): {KIN00022314}.

[80] Phase 1 Report paragraph 23.62.

70. The models were created using performance data from published sources for the materials involved. For each stage the arrangement of those materials in the specific test or as they were on Grenfell Tower, was also an input to each model.

71. Using this validated model of the Grenfell Tower fire, Efectis then undertook further modelling to understand the specific contribution of different elements of the cladding and building contents, including how the use of alternative materials would have impacted the fire spread.

72. Efectis has set out the findings of this modelling in a series of papers in the peer-reviewed "Fire and Materials" and "Fire Technology" journals, copies of which have previously been shared with the Inquiry.[81]

73. The independent testing and modelling undertaken by Efectis has demonstrated that:

    a. Even without flashover occurring in flat 16, the temperatures at the window of that flat were probably over 600 degrees centigrade. At such temperatures, it was immaterial which material caught fire first as every possible fire route out of flat 16 would have been equally inevitable, including "fall-out" of the window, which is something that witnesses observed;[82]

[81] *'Study of fire behaviour of façade mock-ups equipped with aluminium composite material-based claddings, using intermediate-scale test method'*, Fire and Materials, Vol 42, Issue 5 (22 May 2018): {KIN00000468}; *'Numerical simulation of the fire behaviour of façade equipped with aluminium composite material-based claddings—Model validation at intermediate scale*', Fire and Materials Vol 43 Issue 7 (29 July 2019); *'Numerical simulation of the fire behaviour of façade equipped with aluminium composite material-based claddings-Model validation at large scale*', Fire and Materials Vol 43 Issue 8 (11 September 2019); *'Reconstruction of Grenfell Tower fire. Part 1: Lessons from observations and determination of work hypotheses'*, Fire and Materials Vol 44 Issue 1 (17 November 2019); *'Reconstruction of Grenfell Tower fire. Part 2: A numerical investigation of the fire propagation and behaviour from the initial apartment to the façade*', Fire and Materials Vol 44 Issue 1 (17 November 2019); *'Reconstruction of Grenfell Tower fire. Part 3—Numerical simulation of the Grenfell Tower disaster: Contribution to the understanding of the fire propagation and behaviour during the vertical fire spread*', Fire and Materials Vol 44 Issue 1 (17 November 2019); *'Reconstruction of the Grenfell Tower Fire – Thermomechanical Analysis of Window Failure during the Grenfell Tower Disaster*', Fire Technology (April 2020); and *'Reconstruction of the Grenfell Tower Fire – Part 4: Contribution to the Understanding of fire propagation and behaviour during horizontal fire spread*' Fire and Materials 2020; 1-27 September 2020.

[82] In Phase 1 his oral evidence, Professor Torero's evidence was that the internal fire had the capacity to ignite any of the components in the window surround and it is difficult to articulate the precise sequence of ignition: Transcript 20 November 2018, pp. 73-83.

b. The heat output from the burning content of the apartments made a significant contribution to the speed of the initial vertical fire spread up the east face of Grenfell Tower (their effect on later fire spread has not been modelled);

c. The influence of the PE-cored ACM was so dominant that there would have been no material difference in the rate of fire spread if the PIR insulation had been replaced with non-combustible synthetic mineral wool insulation[83], a finding which is also supported by the DCLG BS 8414 tests[84] and the ISO 13785 testing undertaken by Kingspan Insulation.[85]

d. The fire would not have spread over the façade had A2-ACM been used instead of PE-cored ACM in a system using PIR insulation; and

e. The fire barriers that were installed had a significant effect in reducing the rate of fire spread up the east face of the Tower, but were ultimately bypassed by the burning PE-cored ACM (their effectiveness on later fire spread has not been modelled).

74. In addition, Kingspan Insulation respectfully draws the Inquiry's attention to the fires that took place at the Lacrosse Building in Melbourne on 25 November 2014 and at the Torre Ambar building in Madrid on 30 August 2020. In the Lacrosse Building, the fire spread rapidly on a building insulated by synthetic mineral fibre behind PE-cored ACM panels.[86] Similarly, the Torre Ambar building was also insulated by synthetic mineral fibre and, on the basis of information currently available, was clad in PE-cored ACM panels.[87]

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[83] This has been ascertained by running the modelling by replacing the PIR insulation in the cladding system with synthetic mineral wool insulation. The rate of fire spread in fact increased in this comparative model using synthetic mineral wool insulation. See "*Reconstruction of Grenfell Tower fire. Part 3—Numerical simulation of the Grenfell Tower disaster: Contribution to the understanding of the fire propagation and behaviour during the vertical fire spread*." Fire and Materials 2020; 44; 35-57; *'Reconstruction of the Grenfell Tower Fire – Part 4: Contribution to the Understanding of fire propagation and behaviour during horizontal fire spread'* Fire and Materials, 2020; 1-27.

[84] https://www.gov.uk/government/publications/fire-test-report-dclg-bs-8414-test-no1; https://www.gov.uk/government/publications/fire-test-report-dclg-bs-8414-test-no2.

[85] See Appendix B of the Second Witness Statement of Adrian Pargeter: {KIN00020870}.

[86] https://www.melbourne.vic.gov.au/sitecollectiondocuments/mbs-report-lacrosse-fire.pdf.

[87] Kingspan Insulation has received photos of Torre Amber building showing that its construction incorporated synthetic mineral fibre insulation.

75. **Conclusion**: Kingspan Insulation considers that the DCLG testing and the Efectis modelling are both crucial to a proper understanding of the dangers inherent in reliance on the "linear route" to compliance (which relies on small scale testing of materials in order to categorise them as combustible, non-combustible or limited combustibility), rather than on empirical whole system testing. Kingspan Insulation welcomes the Inquiry's commitment to investigate these issues, including under Issue 4A of the Updated List of Issues.

76. Kingspan Insulation will make detailed submissions at the appropriate time in respect of its position that large scale testing has many advantages compared to the linear route to compliance. At this stage, and in the context of the specific materials installed on Grenfell Tower, Kingspan Insulation draws the Inquiry's attention to the fact that the BBA certificate for the PE-cored ACM cladding panels installed on Grenfell Tower suggested that it achieved Euroclass B (equivalent to Class 0). This meant that based on the linear route to compliance set out in Diagram 40 of ADB at the time, the product could be used over 18 metres in conjunction with, for example, synthetic mineral fibre insulation, without further testing or assessment. The DCLG testing has indicated that PE-cored ACM is incapable of meeting the BR 135 criteria when tested to BS 8414 regardless of the insulation used – i.e. including when combined with non-combustible synthetic mineral fibre. This is evidence of the inherent danger of relying only on individual product classifications, rather than full system testing, to determine future fire safety policy and regulation on high rise buildings.

77. In Module 6, Kingspan Insulation will make detailed submissions as to the utility and importance of large scale testing which continues to be recognised in other jurisdictions, including in certain jurisdictions in Continental Europe where a new test standard (based on BS 8414 and similar standards) is being developed for testing cladding systems for use in high rise buildings.

G. CONCLUSION IN RESPECT OF THE SAFETY OF K15

78. Kingspan Insulation recognises the shortcomings it has identified in respect of the historical testing and marketing of K15 in this jurisdiction. However, Kingspan Insulation's position is that those shortcomings do not detract from the fact that K15 can (and could at all material times) form part of a safe cladding system for use on high rise buildings when it is installed

as part of a cladding system which has been successfully tested in large scale tests (BS 8414 and similar tests).

79. Furthermore, this is not merely the position of Kingspan Insulation. It is also the position adopted by many other regulatory bodies in different jurisdictions around the world. Regulatory regimes support the use of K15 in high rise buildings with suitable cladding systems in the Republic of Ireland, certain jurisdictions in Continental Europe, New Zealand, the Middle East and North America.

80. Kingspan Insulation's confidence in K15's suitability for use with appropriate cladding systems is based on 18 successful full scale BS 8414 tests.[88]

H. A SUMMARY OF VARIOUS INITIATIVES THAT KINGSPAN INSULATION HAS UNDERTAKEN AND CONTINUES TO UNDERTAKE INTERNALLY TO ENSURE THAT PAST SHORTCOMINGS CANNOT BE REPEATED

81. The review of K15 undertaken since the Grenfell Tower fire has uncovered historical shortcomings in the testing, certification and promotion of K15. The Hackitt Report has also assisted in identifying industry wide trends which need to change. In order to address these shortcomings and trends, Kingspan Insulation has invested significant resource and time to introduce wide ranging improved processes and procedures to ensure the safety and correct classification of its products.

82. Further information in respect of these initiatives is provided at paragraphs 3.79 to 3.95 of the Third Witness Statement of Adrian Pargeter.

Product traceability initiative

83. In January 2019, Kingspan Insulation introduced a traceability requirement for K15 manufactured and/or sold in Great Britain (both directly by Kingspan Insulation and via distributors) to ensure that Kingspan Insulation can trace specific projects for which relevant products are being supplied. Such traceability provides Kingspan Insulation with

[88] See footnotes 40, 41 and 42 above.

visibility on the intended use of its products and aims to protect against the sale of K15 into applications which are not permitted by the Building Regulations.

84. A similar initiative is being introduced for some other Kingspan Insulation products.

Fire testing protocols

85. Kingspan Insulation has implemented a protocol and guidance on best practice as regards test reports. This requires that product batch numbers are recorded in all test reports and that test reports record clearly where non-standard product is being tested. The objective of this protocol is to ensure that the historical instances of confusion as to whether standard or non-standard-K15 had been tested are avoided.

86. Kingspan Insulation has also implemented internal protocols for BS 8414 and SBI test standards which specify how particular testing results (including failures) should be dealt with and how many repeat results are required in order to claim a certain classification including a change to any classification value. Kingspan Insulation is implementing similar protocols for other relevant fire tests.

Performance Claims

87. Kingspan Insulation has undertaken internal reviews of all thermal insulation products manufactured and/or sold in Great Britain to ensure the accuracy of associated product marketing literature, information provided on the Kingspan Insulation website, product labelling and all DOPs in relation to those products.

88. As part of its review of its Change Management System or CMS (see paragraphs 97 to 100 below), Kingspan Insulation will require that reviews similar to those described in paragraph 87 above are undertaken on a regular basis going forward to ensure that any required changes to marketing literature, DOPs and/or labels arising from product changes or updated testing are made on a timely and consistent basis and that products are always accurately described.

Transparency

89. Kingspan Insulation has published all BS 8414 test reports of systems incorporating standard K15 on its website including any tests which did not satisfy the requirements of BR 135. Kingspan Insulation has been determined to show transparency in its initiatives since the Grenfell Tower fire to ensure that product users have all relevant information available for their consideration as to product suitability and system compliance.

Marketing protocols

90. Kingspan Insulation is developing a marketing protocol which will outline the process and responsibilities for both technical and marketing teams in relation to product marketing materials as well as a more automated revision control and change history record.

Code of Conduct

91. Kingspan Group has issued an updated Code of Conduct including a section specifically on Product and Service Information Communication which sets out Kingspan Group's high expectations as to the accuracy of all business communications, especially in respect of product information and promotion. The Code of Conduct also encourages a "speak out" culture in which employees are expected to voice any concerns or queries.

BS 8414 and ISO 13785 testing

92. Since the Grenfell Tower fire, Kingspan Insulation has commissioned 14 BS 8414 tests[89] and a series of ISO 13785 tests of systems incorporating K15 in order better to understand its performance in a range of cladding systems.

93. Kingspan Group is building its own specialist fire research centre which will allow it to undertake a wide spectrum of fire tests on its products, and systems in which they are incorporated, in accordance with relevant small, intermediate and large scale, national and international test standards.

[89] See footnote 79 above.

Kingspan Assured Technical Support

94. The Hackitt Report identified that installation of products on site is often not in accordance with manufacturer guidelines or tested systems. In response to this particular area of weakness identified by Dame Judith Hackitt, Kingspan Insulation has implemented its Kingspan Assured program. This initiative provides a centralised online repository of information around four key information pillars: Roles & Responsibilities, Regulation & Guidance, Quality Assurance, and Competence and builds on the existing technical support provided by Kingspan Insulation. In particular it anticipates the employment of Field Technicians who will work with customers to provide tool box talks, training and onsite inspections of projects in which Kingspan Insulation products have been installed in walling applications.

Accreditation Protocol

95. The accreditation protocol which Kingspan Insulation is implementing will outline the required process for any new or amended third party certification. The protocol will assign responsibility for each certificate internally, requiring sign off of a certificate's accuracy and completeness. Regular reviews of certificates will also be required. A further element of the protocol (which has already been implemented) is the creation and use of central storage locations for documents relevant to each certification, ensuring transparency and visibility of all relevant documents across the business.

96. In a similar manner, a protocol setting out the processes for any changes to be made to the BBA Advanced Quality Plans for Kingspan Insulation products is also being designed. This will aim to assign responsibility internally to ensure that any product changes are reflected in the product's Advanced Quality Plan and therefore its certification.

Change Management and Innovation Development Systems at Kingspan Insulation

97. Improvements to existing products and the development of new products within Kingspan Insulation has historically been managed through two internal systems: (i) the CMS has been used to record and manage the implementation of relatively minor changes to existing products (e.g. producing a new thickness within certified boundaries or changing the line speed on a machine); and (ii) the Product and Process Development System (between the mid-1990s and 2014) and the Innovation Development System (the "**IDS**") since then, to manage more significant changes e.g. those that might impact entire product ranges or the introduction of a new product.

98. Both systems set out detailed processes by which any changes need to be signed off across relevant departments within Kingspan Insulation, including by the Technical Services team as regards any changes required to testing or certification as a result of the proposed change.

99. As a result of its work to support the Inquiry's investigations, Kingspan Insulation has identified instances (such as the change from Old Technology to New Technology K15) where changes have been made to product manufacturing recipes and procedures without records of appropriate testing having been completed on the changed product in advance of such change in order to understand its impact on the product's fire performance.

100. Kingspan Insulation is therefore taking steps to ensure that additional systems are incorporated within existing CMS and IDS procedures to ensure that the impact of any changes to product manufacture are properly considered and any necessary testing is undertaken prior to product changes being implemented, to the extent this does not already occur. In particular, Kingspan Insulation has engaged an external consultant who is currently undertaking a formal scoping exercise to develop best in class systems and processes, supported through new IT infrastructure, which will support Kingspan Insulation's endeavour to ensure the utmost rigour in the testing and classification of products in respect of their fire safety performance.

Kingspan Insulation's participation in and support of industry wide initiatives and working groups

101. Kingspan Insulation also fully supports and is actively participating in industry efforts to create safer buildings and to generate systemic changes in the construction industry. As part of these efforts, Kingspan Insulation has actively participated in various reviews and consultations aimed at reviewing the regulatory regimes in the various UK jurisdictions. These are described in detail in paragraph 4.16 of Adrian Pargeter's Second Witness Statement and paragraph 3.95 of his Third Witness Statement.

I. THE REMAINING MODULES OF PHASE 2

The Regulatory Regime and the Wider Industry – Modules 2 and 6

102. Paragraphs 33.8 and 34.7 of the Phase 1 Report explain that the Inquiry intends to investigate in Phase 2 the methods of testing and certification of materials used in high rise buildings and also investigate the effectiveness of the prescriptive (linear) regime set out in the Buildings Regulations in relation to high rise buildings. The Inquiry's letter to Core Participants on 30 October 2019 stated that Module 2 would include consideration of Issue 4A of the Updated List of Issues dated 25 September 2019 which includes at (c), the issue of whether "*the test, certification and classification regime for external wall materials [is] fit for purpose*". Whether or not it remains the intention of the Inquiry to consider issue 4A as part of Module 2, Kingspan Insulation understands that certain related issues will be considered as part of Module 6. Kingspan Insulation welcomes this review and makes some limited observations below in relation to these issues, not least in case this is of any assistance to the Inquiry's planning of evidence.

103. Kingspan Insulation respectfully submits that consideration of Issue 4A should be conducted on an industry-wide basis, incorporating all of the products which may be used in rainscreen systems and investigating how they might interact with each other, as safe

systems are more than just the sum of their parts.[90] This accords with the findings of the Hackitt Report which calls for a "*systems-approach*".

104. Kingspan Insulation would respectfully submit that in order to get a full understanding of fire safety across the wider construction industry any such review should include:

a. investigating the methods of testing and certifying all materials used in cladding systems (including synthetic mineral fibre and other products classified as non-combustible or limited combustibility) and considering whether the prescriptive regime based on small-scale testing prescribed in current regulations is the most effective way to ensure building safety;

b. considering fire safety in the overall context of healthy buildings, building energy performance, and lifetime sustainability; and

c. gathering evidence from industry participants beyond those connected to the refurbishment of Grenfell Tower. This would include, for example:

i. building designers, architects, engineers, test houses and other professional bodies engaged in interpreting the regulations and advising their clients;

ii. contractors involved in the construction of high rise buildings; and

iii. construction products manufacturers (including synthetic mineral fibre and other manufacturers of non-combustible products) whose wider test evidence may be highly informative in this regard and whose products make up a significant proportion of the "construction industry".

[90] Such investigations should recognise that safety of cladding systems over 18 metres depends on the entire system installed including cavity barriers, the cladding and insulation materials and details such as the gaps between the cavity barriers and the gaps between the cladding panels. As explained in the Second Witness Statement of Adrian Pargeter: {KIN00020824}, paragraph 12.3(e), Kingspan Insulation is aware of a number of BS 8414 tests of systems incorporating only non-combustible or limited combustibility cladding and insulation which failed to meet the BR 135 criteria. A further example is provided in test report DLR1537 Rev.0: {KIN00020847} which was conducted on a similarly non-combustible (and therefore automatically compliant system) installed on Little Venice Towers in London and which failed to meet the BR 135 criteria.

105. Such a wider analysis would ensure that the Inquiry is able properly to address any systemic issues across the industry, reflecting Dame Hackitt's call for wider industry reform, as well as the fitness for purpose of the current Building Regulations.

The contribution of different elements of the cladding system – Module 7

106. The Phase 1 Report makes clear that the contribution to the fire spread of components of the cladding system other than the PE-cored ACM remains unresolved.[91] The Inquiry's letter of 30 October 2019 confirms that, amongst other issues, Phase 2 Module 7 will address "*Results from testing of cladding components and final conclusions on the relative contributions of the cladding design and materials to the fire spread at Grenfell Tower*".

107. Kingspan Insulation welcomes and supports the Chairman's proposals to investigate and understand these complex issues. Kingspan Insulation submits that any such investigations must be firmly supported by scientific expert evidence and have regard to all relevant published peer-reviewed research on this topic, together with the research of the Inquiry's appointed experts. In particular, Kingspan Insulation welcomes detailed consideration by the Inquiry's experts as to whether the use of non-combustible insulation in conjunction with the PE-cored ACM cladding used would have made any material difference to the spread of the fire.

108. Kingspan Insulation recognises the importance of the Inquiry's work in seeking to understand what happened at Grenfell, and in seeking to prevent any future tragedies of this nature. Kingspan Insulation will continue to support the Public Inquiry's work, and in parallel support the process of improved oversight and regulatory reform needed across the wider building industry.

[91] See paragraph 23.52 of the Phase 1 Report where the Chairman concludes "*I am satisfied that … the principal reason why the flames spread so rapidly up the building was the presence of the ACM panels with polyethylene cores … I also think it is more likely than not that the presence of PIR and phenolic foam insulation boards … contributed to the rate and extent of vertical flame spread, but it is not possible at this stage to quantify the extent of their respective contributions*". The need for further investigation in respect of these issues was emphasised in Paragraphs 23.4, 23.32, 23.41, 33.6 and 34.8 of the Phase 1 Report.

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Tim Green

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