

OPUS 2

INTERNATIONAL

Grenfell Tower Inquiry

Day 66

November 5, 2020

Opus 2 International - Official Court Reporters

Phone: +44 (0)20 3008 5900

Email: transcripts@opus2.com

Website: <https://www.opus2.com>

1 Thursday, 5 November 2020
2 (10.00 am)
3 SIR MARTIN MOORE-BICK: Good morning, everyone. Welcome to
4 today's hearing.
5 Today we begin Module 2 of this phase of the
6 Inquiry, in which we're going to investigate the way in
7 which products intended for use in the construction
8 industry are manufactured, tested and sold, and in
9 particular the way in which the materials that were used
10 on the cladding of Grenfell Tower were presented to the
11 market.
12 We shall begin by listening to core participants' opening statements, but before we do that, I should like
13 formally to welcome Mr Ali Akbor to the panel.
14 Mr Akbor, who was recently appointed to the panel by the
15 Prime Minister, is embarking on his role today.
16 On behalf of Ms Istephan and myself, I should like
17 to welcome Mr Akbor as a fellow member of the panel. We
18 look forward to working with him and benefitting from
19 his experience, and we hope that he will find his new
20 role interesting and stimulating, as we both have.
21 Unfortunately, Mr Akbor is unable to be here in
22 person this morning because he and his family have
23 recently been isolating due to coronavirus. But he is
24 participating in the proceedings remotely, and we are in

1

1 constant communication with him.
2 With that introduction, I am going to invite
3 Mr Millett to make a brief opening statement on behalf
4 of the Inquiry.
5 Yes, Mr Millett.
6 Opening statement by COUNSEL TO THE INQUIRY
7 MR MILLETT: Thank you, Mr Chairman.
8 Mr Chairman, members of the panel, we now open
9 Module 2 of this phase of the Inquiry, and I would like
10 to begin by adding my own warm welcome and that of my
11 counsel team to Mr Ali Akbor, who joins the panel from
12 today.
13 Module 2 is all about the principal materials used
14 in the cladding system installed at Grenfell Tower as
15 part of the refurbishment in the years 2012 to 2016.
16 Those materials are: first, the Reynobond PE 55 cladding
17 or rainscreen panels manufactured and sold by Arconic;
18 second, the RS5000 insulation boards manufactured and
19 sold by Celotex; third, the Kingspan Kooltherm K15
20 insulation boards manufactured and sold by Kingspan;
21 fourth, the window infill panels made by Aluglaze; and
22 fifth, the Lamatherm cavity barriers manufactured and
23 sold by Siderise.
24 The specific issues that we will be investigating
25 are those contained in issue 4A of the Inquiry's updated

2

1 list of issues, which can be found on the website, but
2 they are as follows. Their title is: testing,
3 certification and classification, exterior wall
4 materials.
5 (a) What testing and/or certification and/or
6 classification had occurred in respect of the exterior
7 wall materials at Grenfell Tower, including the cladding
8 and insulation?
9 (b) Was any such testing and/or certification and/or
10 classification adequate and appropriate?
11 (c) Is the testing, certification and classification
12 regime for external wall materials fit for purpose?
13 We will also be examining, at issues 4(d) to (h) in
14 the updated list of issues, so far as concerns the
15 particular component elements of the cladding system
16 installed at Grenfell Tower, the following:
17 (d) Was the exterior of the building (including the
18 cladding, insulation, fixings and windows) compliant
19 with relevant building regulations, fire regulations,
20 other legislation, British Standards (including testing
21 requirements), guidance and industry practice?
22 (e) To the extent that it was compliant with such
23 regulations, legislation, British Standards, guidance,
24 et cetera, were any of those inadequate and, if so, in
25 what respect so far as relevant to the nature and

3

1 immediate causes of the fire and its spread?
2 (f) If not compliant in any respect, what elements
3 or aspects of the exterior of the building at the time
4 of the fire failed to comply with what elements or
5 aspects of what regulations, legislation,
6 British Standards, guidance, industry practice, and in
7 each case to what extent?
8 (g) Who was responsible for such failures?
9 (h) What advice or information was available, and
10 what assessments were made, about the components that
11 comprised the exterior of the building, their
12 fire safety, fire resistance and compliance with safety
13 standards (including information or advice from
14 manufacturers of relevant components)?
15 Turning to the topics for Module 2 in general terms,
16 in the first part of Module 2 we will be hearing from
17 witnesses for or from each of the manufacturers of the
18 principal materials. We will be investigating what they
19 did in order to subject those products to fire safety
20 tests; how those tests were set up and pursuant to what
21 requirements or guidance; how the results of those tests
22 were recorded and archived and who had access to them;
23 what information was provided by manufacturers to
24 certifying bodies and how certificates came to be issued
25 in the form that they were; how the marketing and

4

1 technical literature published to the UK construction
2 market by each manufacturer for each such product came
3 to be composed, and whether that literature presented
4 its fire classification and fire performance in a fair
5 and transparent manner; and what each manufacturer knew
6 about the specific application of its product for use in
7 the cladding system proposed for installation at
8 Grenfell Tower, and their role in selling and providing
9 such products to Studio E, Rydon and Harley for use in
10 that system.

11 We propose to take the evidence starting with
12 witnesses from Celotex, then Kingspan, then Aluglaze,
13 then Siderise, and then finally Arconic. We are likely
14 to take the evidence of Mr Stearne of SIG in either
15 December 2020 or January 2021.

16 Later in Module 2, we will hear witnesses from the
17 testing house, the BRE, in respect of the testing to
18 British Standard 8414 of the systems incorporating the
19 Celotex and Kingspan insulation products and the
20 classification of those systems.

21 We will also be hearing from the main certification
22 bodies, namely the British Board of Agrément, or BBA, in
23 respect of Arconic's Reynobond PE 55 panels, the one
24 certificate that pre-dated the fire, issued on
25 14 January 2008, and Kingspan's Kooltherm K15 insulation

5

1 products, namely five certificates running between
2 October 2008 and November 2015.

3 We will also hear from Herefordshire
4 building control, who, under the auspices of the Local
5 Authority Building Control, LABC, provided system
6 approval and registered detail certificates for
7 Kingspan K15 from May 2009 onwards.

8 We will also be hearing evidence from LABC in
9 Module 6, when there will be further and broader
10 examination of the testing and certification regime in
11 general and construction products more generally in
12 turn.

13 In Module 2, we will be examining with them the role
14 they played in the tests, how they interpolated the test
15 results, the extent of their audit or monitoring of the
16 manufacturers, and how each of the key certificates
17 involved in this Inquiry came to be composed and worded
18 as they were.

19 Turning, then, to the outline programme, by way of
20 an outline programme for Module 2, we will have the oral
21 opening statements from certain of the core participants
22 today and again on Monday, 9 November.

23 Next Tuesday, 10 November, we will have the benefit
24 of a presentation to be given by Dr Barbara Lane on the
25 subject of fire testing and classification. In that

6

1 presentation, she will explain the relevant fire
2 classifications and the applicable testing regimes and
3 methodologies, including those relating to national
4 class 0 and limited combustibility.

5 On Wednesday, 11 November, we will have the first of
6 our factual witnesses in Module 2, namely Jonathan Roome
7 of Celotex. The factual evidence for Module 2 will then
8 run until 1 February 2021. Hearings will cease for the
9 festive period from the evening of Thursday,
10 17 December, and will resume again on
11 Monday, 11 January 2021, and will then run until
12 1 February 2021, as I have said. There will be no
13 expert evidence at the end of Module 2.

14 I want to say something about Arconic, if I may. As
15 core participants know from the Inquiry's letter of
16 29 September 2020, on 25 November 2019 the Inquiry
17 indicated that it would be calling oral evidence from
18 six current or former employees of Arconic in Module 2,
19 three of whom are resident in France, namely
20 Claude Wehrle, Claude Schmidt and
21 Gwenaëlle Derrendinger; one of whom is resident in
22 Germany, namely Peter Froehlich; and two who are
23 resident in the United Kingdom, Deborah French and
24 Vince Meakins.

25 In January 2018, DLA Piper, Arconic's solicitors,

7

1 wrote to the Inquiry to raise the issue of Article 1 bis
2 of French law 68-678 of 26 July 1968 as modified in
3 1980. It's more commonly referred to as the French
4 Blocking Statute, or the FBS. This is a French law. It
5 provides as follows:

6 "Subject to international treaties or agreements and
7 applicable laws and regulations, any individual is
8 prohibited from requesting, seeking or disclosing, in
9 writing, orally or in any other form, documents or
10 information of an economic, commercial, industrial,
11 financial or technical nature with a view to
12 establishing evidence in foreign judicial or
13 administrative proceedings or in relation thereto."

14 Article 3 of the French Blocking Statute imposes
15 criminal sanctions for breach, being a maximum of
16 six months' imprisonment and/or a monetary fine. It
17 extends both to natural and to legal persons.

18 In January 2018, DLA Piper asserted that the French
19 Blocking Statute precluded Arconic from disclosing
20 a large number of relevant documents to the Inquiry.
21 They suggested that the Inquiry seek to enter into
22 an ad hoc agreement with the French government to
23 provide an exception to the prohibitions imposed by the
24 French Blocking Statute. While the Inquiry reserved its
25 position on the scope and the effect of the French

8

1 Blocking Statute and indeed continues to do so, in
2 April 2018 we were able to confirm that DLA Piper could
3 have a discussion with the competent French authorities
4 with a view to facilitating a discussion between
5 the Inquiry and representatives of the French Ministry
6 of Justice .

7 DLA Piper also encouraged the Inquiry to work with
8 the Metropolitan Police Service to see if a mechanism
9 could be found to obtain documentation via the
10 concurrent criminal investigation and in a way which
11 permitted it to be shared with the Inquiry. In the
12 light of that, the Inquiry worked closely with the
13 Metropolitan Police to gather witness statements and
14 a significant volume of relevant documents, and it did
15 so.

16 In March 2020 -- so this year -- DLA Piper said that
17 it would revisit the issue of the applicability of the
18 French Blocking Statute to the oral evidence of its
19 witnesses in light of the decision by
20 the Attorney General to extend the scope of her
21 undertaking, which was originally provided in
22 February 2020.

23 In early June 2020, DLA Piper asserted that the oral
24 evidence of the Arconic witnesses who will be called to
25 give evidence in Module 2 would engage the French

9

1 Blocking Statute. DLA Piper suggested that the Inquiry
2 should seek the assistance of Her Majesty's Government
3 in reaching an agreement with the French government in
4 order to overcome the constraints of the French Blocking
5 Statute. As a consequence, the Inquiry has sought
6 assistance in the Foreign, Commonwealth & Development
7 Office to explore the possibility for an agreement to be
8 reached between Her Majesty's Government and the French
9 government that would permit Arconic witnesses to attend
10 to give oral evidence to the Inquiry without risk of
11 prosecution under the French Blocking Statute .

12 The Inquiry has been in regular contact with the
13 Foreign, Commonwealth & Development Office since June
14 this year. Discussions continue. If the present
15 position changes, then of course core participants will
16 be informed at the earliest opportunity.

17 Notices under section 21 of the Inquiries Act 2005
18 have been served on Ms French and Mr Meakins within the
19 United Kingdom because they are within the
20 United Kingdom. They have instructed their own
21 solicitors, WilmerHale, who have told us that they have
22 accepted service of the section 21 notices on behalf of
23 Ms French and Mr Meakins and that those witnesses will
24 attend to give evidence. They have also told us that
25 Ms French and Mr Meakins have considered carefully the

10

1 risk of prosecution under the French Blocking Statute
2 and, having done so, are content to give evidence
3 pursuant to the section 21 notices without objection .

4 They have reserved the right to revisit the
5 application of the French Blocking Statute if and where
6 circumstances warrant it, but as they have told us, for
7 the avoidance of doubt, such circumstances are not at
8 this stage foreseen.

9 The same cannot be said for the Arconic witnesses
10 who are in France and Germany, namely Mr Wehrle,
11 Mr Schmidt, Ms Derrendinger in France and Mr Froehlich
12 in Germany. As to those individuals, we have taken
13 independent leading and junior counsel's advice. As
14 matters stand, we consider that there is no legal
15 mechanism for effecting valid service of a section 21
16 notice on a witness or potential witness for the Inquiry
17 outside the United Kingdom. Therefore, in consequence,
18 there is no basis on which an English court could or
19 would enforce such a notice. That is principally
20 because the proceedings of the Inquiry are not court
21 proceedings to which international conventions on
22 service of court documents apply.

23 Unlike the two UK-based Arconic witnesses, those
24 four non-UK Arconic witnesses are at the moment relying
25 on their risk of prosecution under the French Blocking

11

1 Statute as the reason for declining to come to
2 the Inquiry to give oral evidence. Neither Arconic nor
3 any of those witnesses has provided any evidence that
4 there is a real risk of prosecution under the French
5 Blocking Statute if they did attend to give oral
6 evidence to the Inquiry.

7 On the contrary, there are very sound reasons for
8 thinking that the risk of their prosecution by the
9 French prosecutor is very low indeed. Not only has
10 there been, to our knowledge, only one successful
11 prosecution under the French Blocking Statute in the
12 51 years since that statute was enacted, but it is hard
13 to think that the French prosecutor would wish to punish
14 those individuals for giving evidence before
15 a public inquiry in an erstwhile EU member state looking
16 into a notorious fire in which so many were killed.
17 That is all the more so where those witnesses have
18 extremely pertinent evidence to give about the product
19 principally implicated in the rapid and fatal spread of
20 the fire .

21 In the end, if Arconic and its witnesses seek to
22 stand on their strict legal rights and refuse to come to
23 give evidence, that is a matter for them. They may find
24 that the BSRs, other core participants, and indeed the
25 public generally take a dim view of their conduct

12

1 regardless of the legalities . Doubtless Arconic will
 2 have considered the impact of its witnesses' refusal to
 3 give evidence on how they are viewed in the world beyond
 4 this Inquiry, and in particular by the markets, both for
 5 their own products and the financial markets. Standing
 6 here, as I do, I can only urge Arconic and its witnesses
 7 to do the right thing and come and assist the Inquiry.

8 If they do not, then you are not completely
 9 powerless. The panel has at its disposal detailed
 10 documents from Arconic and witness statements from these
 11 witnesses. We will be showing the Arconic witnesses'
 12 statements and their documents to the public to tell the
 13 story of Arconic's role in selling their ACM PE panels
 14 to the UK construction industry, and particularly those
 15 involved in the Grenfell Tower refurbishment, as we have
 16 already heard from much of the evidence at Module 1.

17 Those witnesses, by not attending to explain their
 18 words and deeds at the time, run the risk of adverse
 19 inference and criticism . And although due account must
 20 of course be taken of their reasons for not attending,
 21 the countervailing absence of evidence of a real risk of
 22 prosecution under the French Blocking Statute may also
 23 weigh in the balance.

24 We have provided a six-day slot in the Module 2
 25 timetable for these four non-UK witnesses. At present,

13

1 that proposed slot runs from 14 January 2021, following
 2 the evidence of Ms French and Mr Meakins. If the four
 3 non-UK witnesses do not attend, then we will use some of
 4 those days to present the relevant evidence and the
 5 questions we would have asked them in what we intend to
 6 be a coherent way so that the public can understand what
 7 questions those witnesses would have had to answer. We
 8 may then be able to bring forward the remaining Module 2
 9 witnesses, but that timetabling will of course be kept
 10 under close review.

11 I should add that it is possible that we will need
 12 to recall , during the course of Module 6, later in this
 13 Inquiry, some witnesses who would have attended or will
 14 have attended to give evidence in Module 2.

15 I should also say something about Kingspan Kooltherm
 16 K15. As recently as 29 October, Kingspan's solicitors
 17 wrote to the Inquiry attaching a letter directly from
 18 Kingspan to the BRE saying that they were now
 19 withdrawing a number of their BS 8414 test reports and
 20 associated BR 135 reports. Kingspan's letter to the BRE
 21 said in terms that the very first test carried out on
 22 Kooltherm K15 in 2005 was not representative of the K15
 23 product which had been sold by them from 2006 onwards.
 24 That is to say the K15 tested in 2005 was essentially
 25 a different product to what was being sold after 2006.

14

1 It was also confirmed that the K15 product used in two
 2 further BS 8414 tests in 2014 was not representative of
 3 the K15 product then on the market. The letter says
 4 that this was prompted by discoveries of irregularities
 5 relating to the testing systems, the systems tested,
 6 which had in turn been prompted by requests from this
 7 Inquiry.

8 Now, this raises very serious questions about why
 9 Kingspan did not withdraw these reports at the earliest
 10 opportunity when it became aware of these issues and at
 11 the first sight of any material irregularity . The
 12 Inquiry has been and had been actively pursuing this
 13 line of investigation with Kingspan for some two years.
 14 Therefore, questions as to why these reports continued
 15 to be relied upon, why they were not withdrawn earlier
 16 as a precautionary measure, and the timing of this
 17 letter are matters we will have to explore in the
 18 evidence. Clearly, however, this is a matter of
 19 significant public importance, and will need to be
 20 investigated in this module and possibly at Module 6 as
 21 well.

22 Members of the panel, that was all I was proposing
 23 to say by way of opening Module 2 to you. We will now
 24 turn to hear opening statements from the core
 25 participants , starting with Team 1 of the BSRs,

15

1 represented by Ms Stephanie Barwise QC.

2 SIR MARTIN MOORE-BICK: Thank you very much, Mr Millett.

3 Now, before I invite Ms Barwise to address us, can
 4 I just remind everyone that, although we had been hoping
 5 to enable some of those representing core participants
 6 to address us in person, for reasons that I explained
 7 earlier in the week, the imposition of the lockdown
 8 makes it important for us to ensure that as few people
 9 as possible come through the building at any one time,
 10 and so we have asked all those concerned to make their
 11 opening statements to us remotely.

12 So at this point I'm going to invite Ms Barwise to
 13 address us. Before I do that, can I just make sure I've
 14 got contact with Ms Barwise.

15 Good morning, Ms Barwise.

16 MS BARWISE: Good morning, Mr Chairman.

17 SIR MARTIN MOORE-BICK: You can see me and I can see you.

18 MS BARWISE: Indeed, yes.

19 SIR MARTIN MOORE-BICK: And we can hear each other.

20 MS BARWISE: Good, yes.

21 SIR MARTIN MOORE-BICK: Right. Well, then, over to you.

22 Please make your opening statement, if you would.

23 Thank you.

24 Opening statement on behalf of BSRs Team 1 by MS BARWISE

25 MS BARWISE: Thank you very much, sir, and good morning,

16

1 Ms Istephan and Mr Akbor.

2 You have our written submissions. Our submissions
3 today will fall into four parts: first, an overview of
4 the crisis in industry so far as product testing and
5 marketing is concerned, and the manifestation of that
6 problem at Grenfell; second, a brief review of the
7 regulatory and testing regime; third, analysis of the
8 behaviour of the principal manufacturers in their
9 testing of the Grenfell products; and finally,
10 concluding remarks.

11 Starting with the overview, it is all too clear that
12 the manufacturers whose products were used at Grenfell
13 were untroubled by the safety of their products, and
14 some of them remain so, despite the disastrous fire.

15 I will address their written submissions in due
16 course, but it is of great concern that, even now,
17 Kingspan seeks to trivialise its wrongdoing and, despite
18 compelling evidence to the contrary, Arconic does not
19 even accept that it did anything wrong. Instead,
20 Arconic continues to perversely assert that its product
21 could have complied, even though that assertion is
22 undermined by the test evidence relating to the
23 Reynobond PE 55 cladding panel, which the Chairman has
24 in any event found non-compliant in Phase 1.

25 Siderise acknowledges that its cavity barriers are

17

1 incapable of being tested in a construction
2 representative of rainscreen cladding except in specific
3 tests, yet it fails to advertise that fact clearly in
4 its marketing materials.

5 The failure by these manufacturers to acknowledge
6 the seriousness of their behaviours, still less the
7 consequences, renders any other assertions they make
8 utterly hollow.

9 The serious implications raised by the
10 manufacturers' testing and promotion of the products
11 used at Grenfell, which includes the independence of
12 testing and certification bodies, require a radical
13 re-think of the current regulatory framework and testing
14 regimes. The supposedly independent test and
15 certification bodies acted in breach of the duties of
16 impartiality and accuracy imposed on them by
17 international standards, implemented in the UK by
18 British Standards.

19 The failings and susceptibility to abuse of the
20 large-scale fire testing regime are of the utmost
21 importance, since this regime underlies the Government's
22 building safety programme, which prescribes the extent
23 to which the combinations of products used on façades
24 are safe or not.

25 Critically, that programme currently allows on

18

1 high-rise residential buildings so-called flame
2 retardant, FR, polyethylene-cored cladding, albeit only
3 in conjunction with mineral wool insulation, and also
4 allows foam insulation, albeit only in conjunction with
5 A2-cored composite cladding. These may in fact be
6 dangerous combinations, given the inherent flaws in
7 large-scale testing, and the way in which it's been
8 abused to our knowledge from the very outset in 2005,
9 namely just before the introduction of large-scale
10 testing as an alternative route to compliance for both
11 cladding and insulation as a system. These combinations
12 certainly would not be permissible in new-builds or
13 overcladding now, since the amendment of the
14 Building Regulations in 2018 to prohibit the use of any
15 material below A2 in the façade.

16 A feature which dominates the events leading to the
17 use of products at Grenfell and therefore cannot be
18 ignored is the role of culture and competence within
19 both manufacturers and independent test or certification
20 bodies. This issue is yet more important than the often
21 asked question whether regulations should be changed
22 from permitting performance-based design to requiring
23 only prescriptive design. Both prescriptive and
24 performance-based design require great competence in the
25 designer. It should be remembered that, insofar as the

19

1 Grenfell designers considered routes to compliance at
2 all, they all considered that the prescriptive route was
3 being followed, and yet that still did not result in
4 compliance.

5 Perhaps the most sinister aspect of the events
6 leading to the product selection at Grenfell is the
7 manner in which the manufacturers well understood the
8 statutory regulation and guidance and sought to
9 circumvent it by clever marketing. So, for example, the
10 manufacturers Kingspan, Celotex and Arconic understood
11 the importance of and misconceptions about class 0
12 classification in the UK, and went out of their way to
13 advertise their products as having class 0, even though
14 in fact neither the Kingspan K15 or Celotex RS5000 and
15 TB4000 insulation, nor the PE 55 cladding panel used at
16 Grenfell in fact had class 0 classification.

17 What is more, class 0 was of no relevance whatsoever
18 to insulation, since the classification is only required
19 under the linear route for the surface of the cladding
20 panel, which was required to be class 0, whereas the
21 insulation was required to be of limited combustibility
22 throughout.

23 The manufacturers regarded so-called independent
24 certification, such as British Board of Agrément
25 certificates, known as BBA certificates, or Local

20

1 Authority Building Control, LABC, certificates , as mere
2 marketing tools and, as a result , those manufacturers
3 were anything but candid in their dealings with these
4 bodies.

5 Arconic, Kingspan and Celotex well understood that
6 the building control officer was the only obstacle to
7 getting their products on to high-rise buildings,
8 despite the use of such products over 18 metres being
9 a breach of the Building Regulations and ADB, if the
10 linear route was being followed. The means to
11 circumvent building control officers was by satisfying
12 them with a BBA or LABC certificate .

13 Yet worse, these manufacturers and their trade
14 associations appear to have lobbied institutions such as
15 the National House Building Council and the
16 Building Control Alliance , which give guidance to
17 industry and, in particular , the building control
18 sector. This enabled the manufacturers to in effect
19 rewrite the guidance provided by Approved Document B,
20 since they persuaded those institutions to produce
21 guidance, notably BCA's Technical Guidance Note 18,
22 first issued June 2014, and NHBC's July 2016 guidance on
23 the acceptability of combustible materials in common
24 wall constructions, including ACM, on high-rise
25 buildings. Both these pieces of guidance in some

1 respects contravened both the Building Regulations and
2 the guidance contained in ADB.

3 By way of brief scene-setting of the products used
4 in the façade at Grenfell :

5 First, the various forms of insulation , cladding
6 panel and cavity barriers were uniformly unsuitable for
7 use on a high-rise building, this despite the fact that
8 the certificates and marketing materials suggested they
9 were fit for such use.

10 Second, neither the insulation nor cladding panel
11 were of limited combustibility , as the insulation
12 undoubtedly should have been, and we submit the panels
13 should also have been, given the route to compliance
14 with Building Regulations being followed was the
15 so-called linear route under ADB.

16 Third, there were no valid tests in place justifying
17 the use of any of the insulation products nor the
18 cladding panel over 18 metres, and the other tests on
19 which BBA/LABC certificates were based were either not
20 genuinely carried out or not at all .

21 Starting with the insulation , both the insulation
22 manufacturers, Kingspan and Celotex, had carried out
23 large-scale testing , known as BS 8414 testing, in
24 a manner both they and those carrying out the tests
25 should have known to be improper, by either concealing

1 components designed to facilitate a pass and/or using
2 materials which were not as described in the test
3 reports.

4 The events which led to foam insulations being used
5 on Grenfell began in May 2005, when Kingspan carried out
6 a BS 8414 test shortly before the ADB consultation in
7 July . By the July consultation, Government proposed to
8 introduce the BS 8414 test as an alternative means to
9 compliance not only for the cladding panel, which is
10 already allowed as an alternative to ADB compliance, but
11 also for insulation , which had since 1992 been
12 unequivocally required to be of limited combustibility .

13 Kingspan in 2005 set the precedent that its
14 combustible polyurethane insulation , K15, could pass
15 a BS 8414 test for overcladding and masonry
16 construction. This test was not genuine, as I will
17 explain. This was the only BS 8414 test suggesting foam
18 insulation could be used over 18 metres for some
19 seven years, until 2012, when another insulation
20 manufacturer, Xtratherm, passed the test , a test result
21 which was also withdrawn following the fire at Grenfell .

22 Kingspan's BS 8414-1:2005 test is the only test
23 which had any relevance to the Grenfell Tower as at the
24 date of first supply of Kingspan to Grenfell in
25 May 2015. Kingspan's later apparently successful test

1 of K15 in July 2014 was of no relevance to Grenfell , as
2 it was under the BS 8414-2 test for cladding on a steel
3 frame.

4 It is not a defence for Kingspan to say, as it does
5 by its written submissions, that it was not aware of the
6 use of K15 on Grenfell until after the fire . Kingspan
7 has gone out of its way since 2005 to ensure that the
8 2005 BS 8414-1 test had the broadest possible
9 application, even though it's clear that BS 8414 is
10 a system-specific test and, by definition , not of
11 general application . Kingspan even sought to extend the
12 application of its BS 8414-1 test for masonry buildings
13 to steel-framed buildings, despite the fact of the
14 different BS 8414-2 test for that.

15 The fact that Kingspan did not specifically target
16 Grenfell as a project is irrelevant . All Kingspan's
17 actions over a prolonged period were designed to give
18 the impression that the 2005 test proved K15 could be
19 safely used over 18 metres, regardless of whether the
20 construction was the same or even close to that tested .

21 As to the relatively small amount of K15 on
22 Grenfell , we await the experts' opinion on the extent to
23 which K15 would have assisted rapid flame spread. Given
24 much was on the columns, it may be highly significant ,
25 given the way columns acted as chimneys, fuelled , as

1 Dr Lane reported in Phase 1, by the insulation within
 2 them.
 3 Furthermore, in a general sense, Kingspan’s actions
 4 were seminally causative, in that it was at this time
 5 regarded as the industry leader, and it set the
 6 precedent that combustible insulation could genuinely
 7 pass a BS 8414 test and so be used over 18 metres.
 8 The Inquiry should ignore Kingspan’s claims that it
 9 has successfully replicated the 2005 test in 2019,
 10 thereby demonstrating that K15 could have passed even
 11 without the significant distortion of the 2005 test
 12 which occurred.
 13 Mr Pargeter of Kingspan observes that the test
 14 conducted in June 2019 was not a perfect replica of the
 15 2005 test, and indeed how could it be, since Kingspan
 16 employees struggled some years after the test to
 17 identify precisely what components had been used in the
 18 2005 test.
 19 Furthermore, as the schedule of major changes
 20 Mr Pargeter exhibits to his third statement shows, the
 21 K15 product has undergone so many changes that it isn’t
 22 the same formula at all as that which was used in 2005.
 23 Kingspan’s willingness to suggest that a test many years
 24 later on what is in effect a completely different
 25 product demonstrates the 2005 test could have been

1 successful undermines their credibility .
 2 More bizarrely still , and as we heard from
 3 Mr Millett this morning, we learnt yesterday that
 4 Kingspan has only formally written to fire engineers on
 5 23 October 2020, some four days after receipt of the
 6 written opening submissions, to withdraw the 2005 test.
 7 We had suggested in our submissions that Kingspan
 8 had in fact withdrawn the test in 2019, because
 9 Mr Pargeter’s second statement at paragraph 2.4
 10 suggested as much, but it now transpires that the test
 11 had not formally been withdrawn. The 2005 test should,
 12 as Kingspan accepts, have been withdrawn in 2006, and
 13 frankly not relied upon in the first place, given the
 14 circumstances of its execution. This very belated
 15 withdrawal is not to Kingspan’s credit.
 16 Following the 2005 test, Celotex in May 2014 picked
 17 up the baton from Kingspan, using an essentially copycat
 18 method of passing the test on its RS5000 PIR insulation,
 19 only this time using a BS 8414-2 test for cladding on
 20 a steel frame, not masonry.
 21 Although this test was irrelevant to Grenfell, by
 22 November 2014, Celotex had identified Grenfell as
 23 a must-win bid, and made contact with Harley to secure
 24 the use of RS5000 on the project.
 25 As for the cladding panel, Arconic had carried out,

1 also in 2005, testing under the harmonised standard
 2 EN 13501-1 at a French government test house, including
 3 what is known as EN 13823 or the single burning item
 4 test , which, although smaller scale than the BS 8414
 5 test , nevertheless involves the construction of
 6 a mocked-up rig.
 7 Based on Arconic’s own assessment of the position ,
 8 it appears an artificial construction of the rig was
 9 used to obtain a B classification for the rivet version
 10 of Reynobond PE 55. The cassette version tested at the
 11 same time was given an E classification as the test had
 12 to be stopped.
 13 Although the cassette version of PE 55 was the one
 14 used at Grenfell , nevertheless Arconic’s artificial test
 15 of the riveted panel played a critical role in the story
 16 which led to Grenfell , as it was this test alone which
 17 Arconic chose to share with the BBA for the purpose of
 18 obtaining its BBA certificate , which gave a B
 19 classification to Reynobond PE 55. The certificate on
 20 its face appeared to apply to both riveted and cassette
 21 versions, and the first page featured a photo of
 22 a high-rise building supplied to BBA by Arconic.
 23 Each of these manufacturers fully appreciated the
 24 inherent flammability of their products, and its
 25 unsuitability for use over 18 metres, as illustrated by

1 events. The only reason to manipulate a test by secret
 2 modifications to the rig and/or by using materials or
 3 products which are unrepresentative of ordinary
 4 construction products is that you know the product will
 5 not pass unless you do.
 6 Celotex had acknowledged internally in
 7 November 2013, even before embarking on its BS 8414
 8 test , that, on one view, its product realistically
 9 shouldn’t be used behind most cladding panels because,
 10 in the event of a fire , it would burn.
 11 Turning briefly to the relevant regulatory regime,
 12 the issues within Module 2 require us to consider two
 13 relevant regimes: first , the regime governing the supply
 14 of products to the market by manufacturers and
 15 distributors ; second, the regime governing specifiers
 16 and contractors in selecting products.
 17 The regime governing manufacturers and distributors
 18 is contained in the Construction Products Regulation
 19 2013, which implements the European Council Directive
 20 known as the Construction Products Regulation 2011.
 21 That regulation requires that , where there is a European
 22 harmonised standard in existence for a product, then it
 23 must be CE marked and a declaration of performance must
 24 be drawn up for it . It is an offence not to draw up
 25 a declaration of performance or to fail to bring their

1 product into conformity with that declaration if
 2 manufacturers have reason to believe their product is
 3 not in conformity.
 4 If, however, there is no European Standard for the
 5 product, but instead there is a set of guidelines
 6 published by the European Organisation for Technical
 7 Approvals, then the manufacturer may apply for
 8 a European technical appraisal under those guidelines,
 9 but is not compelled to do so.
 10 CE marking is beneficial to manufacturers as it's
 11 like a passport which makes the products easily
 12 marketable within Europe, and it's beneficial to
 13 end-users because the mark guarantees the product meets
 14 European safety standards and complies with EU
 15 legislation .
 16 The second regime governs the designers and
 17 contractors. All construction work is potentially
 18 subject to the Building Act 1984, which provides for the
 19 publication of Building Regulations. Those regulations
 20 provide that relevant building work must comply with the
 21 five functional requirements in schedule 1 of the
 22 regulations. Those include, at B4, the requirement that
 23 the external walls shall adequately resist the spread of
 24 flame. Practical guidance as to how the functional
 25 requirements are to be achieved is contained in the

29

1 approved documents, with ADB relating to fire .
 2 The Building Act makes clear that compliance with
 3 the approved documents is not a complete defence to
 4 liability for non-compliance, and ADB makes clear that
 5 it's possible to justify compliance by means other than
 6 those contained in it .
 7 If ADB is followed, however, then it provides for
 8 three routes to compliance.
 9 First, the linear route in section 12.5 to 12.9,
 10 which at the time of Grenfell expressly required
 11 insulation to be limited combustibility, and by virtue
 12 of the health warning in 12.5, we submit that it also
 13 required that limited combustibility-cored cladding be
 14 used with a class 0 external surface. There was
 15 a debate about whether the core of the cladding panels
 16 should be limited combustibility, although industry
 17 guidance, in the form of BCA Guidance Note 18 issued in
 18 June 2014, made clear that the linear route required the
 19 panel to be of limited combustibility .
 20 The second route was that the criteria within
 21 a document called BR 135 must be satisfied, which set
 22 parameters for the large-scale BS 8414 test, principally
 23 in terms of maximum permissible temperature to be
 24 reached within the designated time.
 25 Third, a fire safety engineering approach. This was

30

1 expressed to be targeted at a specific element of the
 2 design which was either problematic or a complex
 3 structure, such as an airport terminal. Our regulations
 4 at the time of Grenfell therefore utilised
 5 a predominantly performance-based approach, telling
 6 designers what functionality was required rather than
 7 telling them how to achieve it, but also proffering
 8 a linear or prescriptive route. That performance versus
 9 prescriptive balance has shifted slightly with the 2018
 10 amendment to the Building Regulations prohibiting
 11 products which are less than A2.
 12 It's important to note that ADB did not provide for
 13 compliance by means of a desktop study. This was
 14 introduced by the BCA Guidance Note 18 and was defined
 15 as the opinion of a suitably qualified fire specialist
 16 that the cladding system proposed would meet the
 17 criteria of BR 135.
 18 Importantly, regulation 7 of the Building
 19 Regulations requires that products and materials are
 20 appropriate for the circumstances in which they are
 21 used. This is elaborated by appendix A of ADB, which
 22 requires that the product must either be in accordance
 23 with a design shown by test to be capable of meeting the
 24 performance required by British or European Standard, or
 25 have been assessed from test evidence by a UKAS

31

1 accredited laboratory using appropriate standards or
 2 design guidance. That guidance was the extended
 3 application or EXAP rules implemented in the UK by
 4 British Standards. The Fire Test Study Group also
 5 produced guidance on assessments of products in lieu of
 6 tests in June 2000.
 7 Both the EXAP and Fire Test Study Group guidance are
 8 clearly targeted at providing for the extrapolation of
 9 tests from one product to others within a family, as
 10 opposed to extending the results of an entire system
 11 test to another system.
 12 A means of extrapolating the large-scale test now
 13 exists in the form of BS 9414, but this did not exist at
 14 the time of Grenfell. This calls into question all
 15 desktop studies carried out.
 16 The sinister re-writing of the ADB guidance, which
 17 began with BCA's Guidance Note 18 introducing the
 18 concept of desktop studies, was inappropriate, in that
 19 there was at the time no means of extrapolating the
 20 results of a BS 8414 system test.
 21 Furthermore, the July 2016 guidance went yet further
 22 and contravened both the requirements of the
 23 Building Regulations and of ADB by introducing the
 24 ability to use combinations of highly flammable material
 25 over 18 metres, ACM and foam insulations, in a defined

32

1 wall build-up from inside to outside, but without the
2 need even for a desktop.

3 It is now clear that Kingspan was actively involved
4 in the drafting of both pieces of guidance, as internal
5 email exchanges show. Kingspan was, in its own words,
6 "slowly educating" the NHBC and working with them to
7 produce BCA Technical Guidance Note 18 that promotes
8 BS 8414 and desktops.

9 Turning to the BS 8414 testing regime which underlay
10 the alternative route in the ADB guidance, and which
11 underlies the Government's building safety programme,
12 it's instructive to consider its history.

13 As at 2005, the consultation on ADB proposed the
14 BS 8414 test as an alternative route to compliance for
15 the insulation. This suggests we had forgotten what we
16 knew, namely that combustible insulation poses a threat
17 to life and needs to be of limited combustibility on
18 taller buildings.

19 Large-scale testing was initially suggested in 1988
20 by the first edition of BR 135 only for insulation,
21 because at that point in time combustible insulation was
22 permitted by the then in force ADB 1985, provided it was
23 encased in brick or block. The first edition of BR 135
24 recognised that even encased in brick or block,
25 insulation provided a risk of progressive fire spread

33

1 within the façade.

2 By the time the first large-scale test, Fire Note 9,
3 predecessor to BS 8414, was introduced, it was
4 an alternative means of compliance for the cladding
5 panel alone. That was because, by that time, the then
6 in force ADB 1992 required insulation must, without
7 exception, be limited combustibility over 18 metres.

8 ADB 2006, however, introduced large-scale testing as
9 an alternative means of compliance to the linear route
10 for both cladding panel and insulation. As we know, the
11 manufacturers were alive to this change and sought to
12 exploit it. It's ironic that the large-scale test first
13 proposed in order to protect life by recognising the
14 inherent risk in using combustible insulation at a time
15 when its use was not prohibited, has become a vehicle
16 for abusing the system and allowing combustible material
17 back onto walls at height.

18 As Dr Lane will give a presentation next week on
19 testing, I shall say only that which is necessary to
20 explain Kingspan and Celotex's abuse of the BS 8414
21 test.

22 The large-scale test consists of a rig 6 metres high
23 with a main wall and a side or wing wall. Both are
24 mocked up with cladding panels, cavity barriers and
25 insulation, with a crib containing the heat source in

34

1 the main wall. The test lasts 60 minutes from ignition,
2 with the heat source being extinguished after
3 30 minutes. The performance of the cladding system is
4 judged by reference to the criteria in BR 135 governing
5 maximum permissible temperatures allowable within
6 prescribed times. These are measured at two sets of
7 thermocouples running horizontally across the rig. If
8 these temperatures are exceeded or, importantly, the
9 flames overtop the rig, then the test is a fail.

10 However, as the BS 8414 tests themselves contain no
11 pass or fail criteria, whilst the system tested and the
12 time/temperature data is recorded in a test report, the
13 test can only be meaningfully interpreted by
14 a classification report from the test house which
15 confirms whether or not the criteria in BR 135 have been
16 met.

17 A further problem with the BS 8414 test, and indeed
18 the smaller-scale tests under BS EN 13501-1, is that
19 products may be assisted to pass using fire retardants,
20 which have the effect of delaying the time to ignition
21 and reducing flame spread in a test. But that is not
22 indicative of how the products will behave in a real
23 fire.

24 This practice of adding fire retardants is clear
25 from papers Saint-Gobain has, including its Northboro

35

1 research paper, which makes clear that this practice of
2 including retardants is not only hazardous to health and
3 the environment, but furthermore, it is done solely "in
4 order to pass unrealistic fire safety tests". This
5 stark fact alone calls into question the viability of
6 large-scale testing as a measure of fire safety.

7 The use of retardants to pass smaller-scale tests
8 also needs to be addressed. Both Kingspan and Celotex
9 have used fire retardants. As Paul O'Brart explained to
10 Celotex's management committee by his email of
11 13 August 2012, fire retardant is used in all Celotex
12 products. He expressed concerns that if levels of
13 retardance were lowered, he would have concerns about
14 the fitness for purpose of the product.

15 Kingspan have used fire retardant lacquer
16 specifically to ensure K15 passed BS 476, parts 6 and 7,
17 so the class 0 test, as Mr Pargeter admits by his third
18 statement.

19 The deficiencies in the BS 8414 methodology have
20 been well ventilated, not least that it's not reflective
21 of what Dr Lane calls real-life conditions in a façade,
22 namely test windows, vents and doors. That's
23 paragraph 01.120 of her Phase 1 report. Arup is also on
24 record as saying that it is practically impossible to
25 replicate the test construction on site.

36

1 Turning to the principal manufacturers' testing of
2 the Grenfell products, I start with Kingspan's 2005
3 BS 8414-1 test of K15 which, as I've said, was the only
4 relevant test prior to supply to Grenfell in May 2015.

5 This test was wholly invalid. The Inquiry will need
6 to establish precisely what materials were used in the
7 2005 test, because the BRE report is, as one of the
8 Kingspan employees said, quite ambiguous in some of its
9 descriptions.

10 It is, however, finally clear from Kingspan's
11 23 October 2020 letter to BRE that a non-combustible
12 cement fibre board was used as a cladding panel, and we
13 know that the cavity barriers were of a steel and
14 graphite construction not freely commercially available.

15 These materials were unrepresentative of ordinary
16 cladding construction, and particularly the cavity
17 barriers were of phenomenal efficacy, preventing the
18 flames from overtopping the rig as it appears they
19 otherwise would have done.

20 One of the BRE engineers who assisted at this test
21 recorded a seemingly falsified delayed set of timings in
22 his notes, as explained in our submissions. These made
23 the test seem credible when otherwise it would have been
24 apparent that the flames had reached 4 metres up the
25 6-metre rig after only five minutes of a 60-minute test,

37

1 thereby demonstrating that the test would have failed
2 but for the cavity barriers.

3 The 2005 test was rendered irrelevant a year after
4 it was carried out, since there was a huge change in K15
5 technology in 2006. The 2005 test was carried out using
6 old technology, whereas subsequent tests were carried
7 out using new technology. K15, after the technology
8 change in 2006, was a completely different product, with
9 poor performance in fire, as both Kingspan observers and
10 BRE, who carried out a test on new technology K15 in
11 2007, acknowledged.

12 Kingspan's observer referred to the rig as "a raging
13 inferno", and BRE made so-called unofficial comments
14 making clear the problem was not a system failure, but
15 that in fact the K15 product was fully involved in the
16 fire and continued to burn after the heat source was
17 extinguished. It is therefore disappointing that
18 Kingspan's submissions at paragraph 46 characterised the
19 2007 test on new tech K15 as a system failure, contrary
20 to what BRE told them at the time, as is recorded in
21 Kingspan's own internal 2008 report of that test.

22 Kingspan in its written opening submissions relies
23 on a successful test in 2014 to make the case that new
24 tech K15 could have passed the 2005 test. We now know
25 that that test has been withdrawn, but this test was

38

1 demonstrably irrelevant anyway, principally due to the
2 fact that it was under BS 8414-2 for steel frames, not
3 for overcladding masonry as the 2005 test was. It also
4 used a different cladding panel, namely terracotta, and
5 as Kingspan accept at paragraph 51 of their submissions,
6 the 2014 test was in any event not reflective of the K15
7 product because it utilised a research and development
8 version of K15.

9 As I said, Kingspan finally withdrew the 2014 test
10 formally by its letter 23 October 2020, but nevertheless
11 Kingspan relies on the fact of re-testing of K15 with
12 the terracotta panel in April 2015 to suggest that the
13 July 2014 terracotta test would have passed even if it
14 hadn't been a research and development version of K15.

15 A comparison of the test reports, however, for the
16 terracotta tests in July 2014 and April 2015 at
17 paragraph 48(b) and 53 of Kingspan's submissions shows
18 the tests were not like-for-like, in that the cladding
19 panel used and the cavity barriers were different, and
20 the cavity barriers fixed in a different method.
21 Kingspan's reliance on the 2015 test to justify the
22 withdrawn 2014 test therefore does not avail it. The
23 position remains that there was no valid BS 8414-1 test
24 of K15 at the time of first supply to Grenfell.

25 That Kingspan and possibly BRE had concerns as to

39

1 the circumstances of the K15 2005 test after it was
2 carried out is evidenced by the fact that, despite
3 recognising they needed to obtain a classification
4 report for the 2005 test, Kingspan failed to do this
5 until ten years after the test, by which time it was, as
6 a matter of industry practice, obsolete, since as
7 resolved by the Fire Test Study Group, tests expire
8 after five years.

9 Kingspan recognised internally that advertising K15
10 to have been certified for use above 18 metres was, in
11 its own words, "dodgy", given the lack of classification
12 report.

13 The other test results relied on by Kingspan were
14 class 0 results. Whilst these are wholly irrelevant to
15 insulation, Kingspan recognised the importance of these
16 in the UK market and wanted them recorded in the
17 all-important BBA certificates.

18 Kingspan's Mr Pargeter accepted in his second
19 witness statement that he knew from 2016 onwards K15
20 could not achieve class 0, but it now seems from his
21 third statement, paragraph 34(b), that the 2012 class 0
22 test had been assisted to pass using fire retardant.

23 As explained in our submissions, the 2012 tests were
24 regarded by Kingspan as their best ever and not
25 repeatable. That is little wonder if fire retardant had

40

1 been used.
 2 Kingspan appears to have no relevant class 0 results
 3 for K15 at the time it sought and obtained its first
 4 BBA certificate for K15 in October 2008, given the
 5 product had changed in 2006 and that, as Kingspan
 6 accepts by paragraph 40 of his submissions, the tests on
 7 the foil facer only as opposed to the whole product were
 8 undertaken in 2007.

9 Despite this practice of testing the foil facer only
 10 being described subsequently by its own employees
 11 variously as "a bit of a cheat" and "complete spin",
 12 Kingspan simply says it should have informed BBA of
 13 this, but nevertheless continues to rely on these and
 14 the 2016 tests as justifying K15's class 0
 15 certification. That's paragraphs 40 to 42 of their
 16 opening.

17 In fact, there were no relevant class 0 tests which
 18 could justify the BBA certificates. Tests in
 19 December 2008 were carried out on research and
 20 development versions of K15. Tests in 2009 were
 21 invalidated by the subsequent major product changes
 22 Mr Pargeter refers to.

23 Given Kingspan had used fire retardant to pass the
 24 2012 tests, the December 2013 BBA certificate in force
 25 at the first supply to Grenfell was also obtained on

1 a false premise.
 2 As Kingspan acknowledges, its change control
 3 procedures were lacking. This made it practically
 4 impossible to be sure of the precise characteristics of
 5 the product at any one time. Kingspan had to draw up
 6 a declaration of performance due to there being
 7 a harmonised European Standard in respect of its
 8 product. That, prior to Grenfell, July 2013, attributed
 9 a Euro class C-s1, d0. One wonders how Kingspan could
 10 be certain of the accuracy of such a declaration given
 11 the major changes in formulation of the product and its
 12 facers recorded in Mr Pargeter's schedule.

13 Kingspan's dealings with the BBA as certifying body
 14 reflect a complete lack of candour on Kingspan's part,
 15 as we've explained in our submissions, with Kingspan at
 16 pains to obtain a BBA certificate which, in its own
 17 words, would be "as open and delimiting as possible" by
 18 not confining the use of K15 to the construction used in
 19 the BS 8414 test. As BRE would themselves acknowledge
 20 by internal email from Mr Baker to one of his
 21 colleagues, "The market is starting to get very confused
 22 through clever marketing by Kingspan".

23 Meanwhile, within Kingspan, the tone was triumphal
 24 when certifiers such as BBA and LABC produced inaccurate
 25 statements about K15, such as LABC stating that K15 was

1 of limited combustibility. Even by its opening,
 2 however, Kingspan insists that the wording used by LABC
 3 to that effect was "not entirely clear". It wasn't
 4 unclear; it was simply wrong and indefensible.

5 Kingspan's would-be competitors, Saint-Gobain, noted
 6 Kingspan's "great focus on delivery of results,
 7 irrespective of the obstacles and setbacks". One of
 8 those obstacles was statutory compliance, which was
 9 swept away by a large amount of internal testing and
 10 external testing, which was, as one of Kingspan's
 11 employees would later say, necessary to "justify our
 12 lie".

13 Kingspan's opening is devoid of any mention of the
 14 highly irregular circumstances of the 2005 test, the
 15 absence for a decade of a classification report in
 16 respect of that test, nor the use of fire retardants in
 17 its class 0 testing, albeit these matters are attested
 18 to to a degree by witnesses and there is ample
 19 documentary evidence. Kingspan instead characterises
 20 its actions and failings as mere historical
 21 shortcomings.

22 Turning to Celotex, it at least recognises that the
 23 behaviours of its employees were unacceptable insofar as
 24 they procured the carrying out of the BS 8414-2 test in
 25 May 2014 in a wholly improper manner by using magnesium

1 oxide board, which is used in furnaces, to fortify the
 2 cavity barriers at the levels of the rig which were
 3 critical to satisfying the BR 135 criteria.

4 Celotex also went on to procure a misleading report
 5 from BRE which, apart from one photo, namely figure 18,
 6 which Celotex had sought to remove, concealed the way in
 7 which the test had been distorted.

8 The photo Celotex had sought to remove clearly shows
 9 the effect of the reinforced cavity barrier at the top
 10 of the rig. It stopped the flames dead in their tracks.
 11 Celotex also accepts that the understatement by it of
 12 lambda values was wrong. Celotex's position, however,
 13 is that albeit these actions were wrong, they were of no
 14 causative effect on the specification, supply and use of
 15 RS5000 at Grenfell.

16 Whilst of course Celotex's BS 8414-2 test on
 17 a Marley Eternit cement particle board and over a steel
 18 frame was of no relevance to the construction at
 19 Grenfell, and RS5000 should not have been specified,
 20 that doesn't detract from the fact that Celotex set out,
 21 very much as Kingspan did, to obtain a report with
 22 a broadest possible number of applications.

23 Mr Roper's research email in November 2013 at the
 24 outset, before Celotex testing began, makes this clear.
 25 He said Celotex wanted to test the worst case scenario,

1 and then extend it by an assessment report which would
2 broaden the scope of potential systems to which K15 was
3 applicable. Roper also noted that Kingspan had achieved
4 this by an LABC report stating K15 can "be used in
5 a variety of systems". Celotex followed suit by also
6 obtaining an LABC certificate using that exact wording,
7 wording which Celotex itself had suggested to LABC.

8 Furthermore, Celotex obtained a desktop from Exova
9 dated 26 May 2015 which purported to extend the test to
10 brickwork, terracotta, A1, laminates and aluminium
11 sheeting cladding, albeit the report does not in fact
12 conclude that PIR can safely be used with aluminium
13 sheeting.

14 On top of all this, Celotex specifically pursued
15 Grenfell. Celotex's email exchange in November 2014
16 makes clear that Grenfell was Celotex's number one
17 must-win bid. It is therefore wrong for Celotex to
18 suggest that its wrongful actions had no impact on the
19 selection and use of RS5000 at Grenfell.

20 We agree that Celotex did not give the assurances in
21 writing relating to the use of RS5000 at Grenfell which
22 Ray Bailey initially claimed they did. There is,
23 however, no evidence that Celotex advised the proposed
24 construction at Grenfell was wholly different to that in
25 which Celotex had tested RS5000 and so their product

45

1 should not be used. On the contrary, Mr Roome asked
2 Mr Anketell-Jones to send him drawings of Grenfell by
3 his email of 27 August 2014, and it was
4 Mr Anketell-Jones' evidence that he recalls Mr Roome
5 saying RS5000 could be used over 18 metres without
6 qualification.

7 Furthermore, we know from the email thread between
8 Celotex's head of technical, Rob Warren, and Mr Stearne
9 dated 2 April 2015, which I read out in our Module 1
10 opening, that when the distributors, SIG, asked what
11 Celotex advised when discrepancies between the proposed
12 construction and the construction in which RS5000 had
13 been tested arose, Mr Warren gave, in his words, both
14 Celotex's official view and his own view. The official
15 view was that the classification report only related to
16 the system tested. His own view was:

17 "Celotex do not try to second-guess what may or may
18 not be deemed suitable and if RS5000 is rejected we take
19 it on the chin. We have had conversations with NHBC and
20 are aware we will generally struggle to be accepted at
21 this time."

22 He ends by noting the degree of confusion amongst
23 building control surveyors. In other words, Celotex's
24 approach was to offer its product, see if it was
25 accepted, and not discourage its use, even in wholly

46

1 different constructions to that in which RS5000 had been
2 tested.

3 Given this, and Celotex's intention expressed from
4 the outset of the RS5000 project that it should be used
5 in the widest range of constructions possible, and their
6 desire to ensure their product was used on Grenfell, it
7 is not open to Celotex now to assert that their actions
8 had no causative impact on the selection and use of
9 RS5000 at Grenfell. Not least, their own marketing
10 data, whilst making reference to the specific system
11 tested, nevertheless also sought to give the product its
12 broadest possible application, for example the datasheet
13 which states RS5000 is the first PR insulation board to
14 successfully test to BS 8414-2, meets the criteria set
15 out in BR 135 and is therefore acceptable for use in
16 buildings above 18 metres in height.

17 Celotex cannot hide from the fact that its intention
18 was to mislead and to trade on specifiers' known lack of
19 understanding. This datasheet, along with other
20 material, was sent by Roome to Anketell-Jones on
21 27 August 2014. Anketell-Jones forwarded it by his
22 email 18 September 2014 to Neil Crawford during the
23 exchange concerning cavity barriers. It cannot
24 seriously be suggested that, given Celotex's strategy,
25 explained by Warren, which I have just read out,

47

1 Celotex's actions had no effect on the selection of
2 RS5000.

3 Furthermore, Celotex's subsequent carrying out in
4 April 2018 of a similar BS 8414-2 test to that carried
5 out in May 2014 does not prove that RS5000 could
6 legitimately have passed the test in 2014 even without
7 the interventions, since in addition to the differences
8 between the two tests admitted by Celotex, there is also
9 the fact of the changes in formulation of the product,
10 principally the polyol change in one of its production
11 lines in 2012.

12 Like Kingspan and Arconic, Celotex understood the
13 importance of being able to market RS5000 as class 0,
14 and it did so despite the fact that after 2012 it had
15 only achieved class 0 on one of its two production
16 lines.

17 Celotex and quite possibly Saint-Gobain have serious
18 questions to answer about how the culture which is
19 clearly prevalent within Celotex was allowed to take
20 hold and persist. Anyone within Celotex or Saint-Gobain
21 who knew RS5000 was identical to the FR5000 product,
22 which was not advertised as fit for use above 18 metres,
23 knew or should have known that RS5000 was inherently not
24 fit for use above 18 metres, and ought to have
25 questioned why a product not fit for use at height was

48

1 now simply being re-branded to suggest it was, but
 2 without intending to improve the product from
 3 a fire safety perspective.
 4 In any event, it's clear that some within Celotex
 5 became aware of the deceptive manner in which the
 6 May 2014 test had been carried out as early as
 7 October 2014. Debbie Berger's annotations on a version
 8 of the test report at this time make that clear.
 9 Jonathan Roome also sought to stop Celotex promoting
 10 RS5000 on NHBC projects in June 2015, and yet the
 11 product was not withdrawn until a few days after the
 12 Grenfell fire. This suggests a widespread culture
 13 within Celotex of ignoring compliance and, as we point
 14 out in our submissions, there had at the outset of the
 15 Celotex testing programme been a conscious decision by
 16 Celotex's management committee, MAG, to in effect adopt
 17 the Kingspan route.
 18 Celotex's behaviour towards certifying bodies and
 19 test houses was as poor as Kingspan's. The overwhelming
 20 likelihood is that Phil Clark of BRE, author of the 2014
 21 report and also involved in the 2005 test, assisted
 22 Celotex in understanding how to pass the test. But by
 23 November 2014, BRE was explaining to Celotex's Berger
 24 and Roome that attitudes were changing towards
 25 combustible insulation, pointing out that people had

1 "been burnt by K15 approvals in the past", and the focus
 2 of insulation companies on sales rather than life
 3 safety. This, however, did not prevent Celotex from
 4 continuing to press NHBC to accept RS5000 in the face of
 5 initially strong opposition from NHBC, who were aware of
 6 at least some of the flaws in the 2014 test.
 7 Last but not least, Arconic. It appears to have
 8 realised in 2005 that its PE product had poor
 9 performance in fire. This was the only explanation for
 10 Arconic's manipulation of the single burning item test
 11 of the riveted PE panel to achieve a class B. Arconic
 12 began formulating its strategy for the UK in 2006 at
 13 a meeting in Luton, when Arconic suggested the need for
 14 a BBA certificate was pressing in order to capture the
 15 public sector of the market, which accounted for 50% of
 16 the available market.
 17 It seems the fate of the UK was finally sealed at
 18 the Freiburg meeting in July 2011 between Messrs Wehrle
 19 and Froehlich of Arconic and Ritter of 3A Composites,
 20 who make Alucobond. They all noted the new regulations
 21 required a class B as the minimum in Europe, and that
 22 this would force PE out of the market in their view
 23 within the coming month.
 24 By 2013, Arconic had a clearly formulated marketing
 25 strategy of targeting architects and investors together

1 with main contractors and installers, pushing the
 2 aesthetics of the product on to architects through CPD.
 3 This was to be achieved with the assistance of six
 4 approved fabricators. The strategy appears to have
 5 succeeded, since by June 2014, Grenfell was on Arconic's
 6 list of projects in the pipeline which Debbie French was
 7 confident of winning, to achieve Arconic's recently
 8 increased UK sales forecasts.
 9 As already explained, Arconic had obtained its
 10 BBA certificate on a false premise, namely that RB 55 PE
 11 could be considered class 0. That certificate was shown
 12 to Harley in relation to Grenfell by Ms French in
 13 April 2014.
 14 Arconic had procured its BBA certificate by only
 15 providing to BBA its BS 476 test reports for Reynobond
 16 FR, not for the PE product. That was because RB 55 PE
 17 had no class 0 test results as at March 2007, despite
 18 that being of great concern to its then UK sales
 19 manager, who considered the lack of class 0 represents
 20 a misrepresentation to the market.
 21 Furthermore, as already explained, Arconic had also
 22 obtained its BBA certificate suggesting PE was class B
 23 by not showing to BBA its class E certificate for
 24 cassette panels, and yet on its face the certificate
 25 applied to both cassette and riveted product.

1 Arconic will have been well aware that if it was
 2 forced to declare a class E for the cassette version of
 3 RB 55 when the riveted version scored class B, this
 4 would call into question its B classification for the
 5 rivet. So it was. Arconic went out of its way not to
 6 share its class E rating with customers.
 7 In March 2010, Wehrle said in an internal email
 8 thread that the fact that the cassette panel doesn't
 9 achieve a B was "very confidential". Guy Sheidecker
 10 observed that "it shouldn't even have been mentioned".
 11 When Mr Wehrle was pressed on this within Arconic by
 12 Ms Moyses in July 2010, he said, "It's hard to make
 13 a note about this because we are not clean".
 14 Once the market did become aware of this disparity
 15 between riveted and cassette PE, Arconic was challenged
 16 on how this could be the case. The disparity suggested,
 17 as we know was the case, that the rivet test could not
 18 be quite genuine.
 19 Arconic was, from at latest 2009, monitoring
 20 cladding fires around the world: Bucharest in 2009,
 21 Mermoz and Tamweel Tower in 2012, Lacrosse Melbourne in
 22 2014, Torch Tower and The Address in Dubai in 2015,
 23 King Fahd Centre in Riyadh in 2015. Arconic breathed
 24 an internal sigh of relief every time the fire did not
 25 involve PE 55, but yet it knew that all composites react

1 the same way. Mr Wehrle had been warning Arconic of the
 2 dangers of PE for some time and, given their tracking of
 3 international fires , Arconic can hardly claim ignorance.
 4 Furthermore, this knowledge appears to have reached
 5 the highest levels within Arconic. In April 2015
 6 Mr Wehrle made clear to Diana Perreiah, American
 7 president of Arconic Building and Construction, that PE
 8 was Euro class C to E and, in his words, flammable, and
 9 as such could not be used above 8 to 10 metres,
 10 depending upon the country. This gives the lie to
 11 paragraph B1 of Arconic’s submissions that Arconic could
 12 not be reasonably expected to be familiar with the
 13 regime in other jurisdictions . Demonstrably, Arconic
 14 was so aware.
 15 Eventually, Arconic gave the instruction to no
 16 longer use PE on projects in France in May 2016 by
 17 Mr Flacon’s emailed instruction . But this came too
 18 late , considering at the very latest the American
 19 parent’s April 2015 knowledge of the product’s
 20 unsuitability at height, and Mr Wehrle’s June 2015 email
 21 to Mr Marichez stating all projects must be urgently
 22 switched to FR.
 23 No warning was however given to Grenfell, or indeed
 24 to other customers. On the contrary, Arconic’s letter
 25 to customers of December 2015 stated that both PR, PE

1 and FR were class 0, which was untrue, albeit noting
 2 that the reactions to fire of the two products were
 3 different . This was hardly the warning that the
 4 information known to Arconic would have justified .
 5 In view of all this , it is not open to Arconic to
 6 say, as it does in its written opening, that its role
 7 was merely a purveyor of product and it was for others
 8 to judge the suitability of it .
 9 Arconic actively pursued Grenfell Tower and was only
 10 successful, given that it was a public sector project,
 11 due to Arconic’s having a BBA certificate , which it had
 12 in turn only obtained in the terms which it did by
 13 failing to make proper disclosure of tests to BBA.
 14 To hear from Mr Millett this morning that Arconic’s
 15 witnesses domiciled outside the UK are threatening not
 16 to attend the Inquiry is something which the bereaved
 17 and survivors will struggle to comprehend, given their
 18 need to understand Arconic’s role in the disaster . It
 19 will reflect poorly not only on those Arconic employees
 20 as individuals but also on Arconic as a global company
 21 if those involved do not come to the Inquiry to tell
 22 what they know.
 23 By way of concluding remarks, we express our concern
 24 that the manufacturers are in general not humbled by the
 25 Grenfell fire and their behaviours are not altered by

1 it . Celotex at least admits some past wrongdoing, but
 2 they all seek to blame others.
 3 It is deeply troubling that Kingspan, having
 4 instigated a new business in 2018, Kingspan Façades, by
 5 which Kingspan will provide a prescriptive list of
 6 components for its own BS 8414 tested systems, working,
 7 it says, with a limited number of recommended suppliers.
 8 No one who has read the correspondence and test reports
 9 can be anything but horrified at the thought of Kingspan
 10 expanding its ability to attest products, which
 11 intention is made clear by paragraph 93 of Kingspan’s
 12 opening.
 13 What is needed is firm and independent scrutiny of
 14 Kingspan and other manufacturers, yet Kingspan is now
 15 trumpeting itself as a paragon of Hackitt-motivated
 16 virtue, whilst simultaneously giving the impression that
 17 it will continue to exploit the BS 8414 testing route.
 18 As Mr Pargeter’s K15 update report only three months
 19 after the Grenfell fire indicates, Kingspan, showing no
 20 remorse, was using its participation in the Government’s
 21 testing programme to enhance its own position. Pargeter
 22 said:
 23 "Test is anonymous, so a fire safety engineer won't
 24 be able to put it down as Kingspan ...
 25 "We will be looking at challenging the norms that

1 are associated with non-combustible.
 2 "We will be changing the gap to a 4mm and if we get
 3 a pass it's a credible alternative .
 4 "Danger that if we win the test , and Celotex PIR
 5 will then put the test in as they perform similar. We
 6 are looking for the next development to keep up ahead of
 7 the game ...
 8 "Strategy support 8414 test. Support use of
 9 Desktop studies ."
 10 Kingspan’s unrepentant arrogance is truly chilling .
 11 Bearing all this in mind, and in particular the
 12 degree to which independent certification and testing
 13 has also suffered from a lack of impartiality , accuracy
 14 and competence, we invite the panel to give careful and
 15 continuing consideration to whether urgent
 16 recommendations must be made before the end of Phase 2,
 17 including a recommendation that the Government should
 18 urgently review the premise of its building safety
 19 programme.
 20 Whilst we recognise the risks and difficulties in
 21 making individual recommendations, in circumstances
 22 where fundamental overhaul of the regulatory system and
 23 underlying testing regime is required and the Module 6
 24 evidence is yet to be heard, we nevertheless invite the
 25 panel to be required to make such immediate

1 recommendations as are necessary to secure public
2 safety .
3 Unless I may assist further, those are my
4 submissions.
5 SIR MARTIN MOORE-BICK: Well, thank you very much indeed,
6 Ms Barwise, that's very helpful and very thought
7 provoking.
8 We will take a short break now. We will keep it
9 down to ten minutes, and resume at 11.40.
10 Thank you very much.
11 (11.30 am)
12 (A short break)
13 (11.40 am)
14 SIR MARTIN MOORE-BICK: I'm now going to invite Mr Hockman
15 to make an opening statement on behalf of Arconic. Here
16 he comes.
17 Good morning. Good morning, Mr Hockman, can you see
18 me, can you hear me?
19 MR HOCKMAN: Good morning, sir. I can see you and hear you.
20 I hope you can see and hear me.
21 SIR MARTIN MOORE-BICK: We can, thank you. So it only
22 remains for me really to invite you to address us on
23 behalf of Arconic.
24 Opening statement on behalf of Arconic by MR HOCKMAN
25 MR HOCKMAN: Thank you, sir, and good morning to your

57

1 colleagues as well.
2 Before I begin my prepared remarks, I would like to
3 deal with two things by way of preliminary, if I may.
4 The first concerns the observations that Mr Millett
5 made during his opening address as to the attendance by
6 certain individuals to give evidence to the Inquiry.
7 I'm sad to say that I had no notice that he was going to
8 make those remarks, although I suspect that one or two
9 others may have had such notice, and this is obviously
10 not the moment to respond fully to what he said, but
11 I do want to make a few observations in relation to that
12 subject right at the outset.
13 There are three individuals, as we understand it,
14 not four, only one of whom is still employed by the
15 company we represent, who, having taken their own
16 separate legal advice, have, to date at least, declined
17 to attend to give oral evidence.
18 So far as the company is concerned, which we
19 represent, Mr Millett unfortunately misstated its
20 position by suggesting that it has failed to co-operate
21 with the Inquiry, something which I hope we would never
22 do.
23 As Mr Millett himself made clear, the Inquiry has
24 been in contact and we understand remains in contact
25 with the French government via the UK Foreign Office in

58

1 the hope of providing sufficient legal assurances to
2 enable the company's current and former employees to
3 give oral evidence to the Inquiry without the risk of
4 criminal prosecution. Whilst the company obviously
5 can't control whether any witnesses testify, the company
6 remains willing to do what it can to assist the Inquiry
7 in working with the French government.
8 So those are the remarks that I wanted to make about
9 that subject before I start.
10 The second thing, if I may, which I would like to
11 mention is the question of timing. Obviously -- and
12 I make absolutely no complaint about this, far from
13 it -- I'm starting my remarks I think roughly half
14 an hour later than was originally intended. On a dry
15 run last night, my prepared remarks took me just under
16 45 minutes to deliver, and so, sir, if it's acceptable
17 to you, I will aim to finish -- I think it's about 11.45
18 now -- by about 12.30 or 12.35. I will do my best
19 anyway. But, as I say, I won't be able to finish
20 precisely within the time originally allotted to me, and
21 I hope that you and your colleagues will understand
22 that.
23 SIR MARTIN MOORE-BICK: Mr Hockman, let me reassure you, we
24 are running behind time but that's not your fault.
25 MR HOCKMAN: So at the outset of these oral submissions on

59

1 behalf of the company, I do wish to reiterate once
2 again, if I may, our profound sense of regret in
3 relation to the Grenfell Tower fire and its terrible
4 consequences. We renew our sympathies to all those
5 affected, and we recognise the importance of this
6 Inquiry in providing a comprehensive account of the
7 causes and consequences of the fire, and a fair and
8 objective evaluation of the responsibilities of those
9 concerned. We continue to hope that those watching and
10 hearing these oral submissions will understand that, if
11 the Inquiry is to fulfil its remit, it must receive
12 representations from all participants, such as the
13 company we represent, and must give those
14 representations careful consideration if it's to arrive
15 at a true and just conclusion.
16 Now, in these submissions, I'm going to cover seven
17 headings: the supply of ACM, the use of ACM at
18 Grenfell Tower, the UK regulatory regime, testing, the
19 BBA certificate, and some wider factors.
20 So, firstly, the supply of ACM.
21 I want to begin by discussing the company's approach
22 to the supply of ACM PE, and to try to meet head-on some
23 of the serious criticisms which have been levelled
24 against us.
25 It's clear from the evidence to date that the

60

1 arrangements for supply of the ACM panels were made on
 2 the company's behalf by its UK representative,
 3 Deborah French. The objective features of these
 4 arrangements will, we anticipate, hardly be in dispute,
 5 including the fact that Ms French made available a copy
 6 of the BBA certificate . There can be no doubt that the
 7 decision as to the choice of product and method of
 8 fabrication was a matter for others, and not for her.

9 In the event, we know that the information provided
 10 by the company as to methods of fabrication was
 11 unfortunately not consulted by those involved in the
 12 Grenfell Tower refurbishment project. As a result ,
 13 there were numerous departures from the company's
 14 information, as outlined a long time ago by
 15 Dr Barbara Lane in her Phase 1 report at section 8.

16 On the tower itself , only two-thirds of the external
 17 surface comprised ACM PE, and, of that , at least 50% was
 18 comprised of panels fabricated in a fashion which can
 19 only be described as unorthodox. Indeed, as pointed out
 20 by Mr Hyett, the ACM PE used on the columns and crown of
 21 the tower were fabricated in a way which was entirely
 22 peculiar to Grenfell Tower, and which could not possibly
 23 have been anticipated by the company in a construction
 24 project of any kind. In relation to the more orthodox
 25 50%, even that was utilised within what I might call

1 an irregular building construction. There were numerous
 2 departures from regulatory guidance, including matters
 3 such as the absence of cavity barriers around window
 4 openings and so on. These deficiencies were not
 5 something which the company could have been expected to
 6 anticipate .

7 In their written opening statements to the Inquiry,
 8 and indeed in the oral comments that you heard earlier
 9 this morning, core participants have suggested that the
 10 company's employees were or must have been aware that
 11 ACM PE panels would contribute to the spread of fire .

12 We submit, however, that the correct question is
 13 whether there was an awareness that the panels could so
 14 contribute if the products were used within a cladding
 15 system that was not compliant with regulations or
 16 otherwise fit for purpose, and, if so, whether such
 17 awareness ought to be treated as a basis for criticism .

18 Without foreshadowing the evidence which will be
 19 heard in Module 2, the following four broad propositions
 20 are, we submit, beyond dispute:

21 Firstly , cladding systems came under increasing
 22 scrutiny because a number of fires had developed across
 23 the world involving such systems, even though the
 24 precise details of those systems were not known.
 25 However, it was also the case that the product was

1 capable of being used safely , even for high-rise
 2 residential applications , if the appropriate cladding
 3 system was designed and adequate safety precautions were
 4 incorporated into the building works. For example, as
 5 Professor Torero pointed out in his Phase 1 report at
 6 page 88, in those cases he mentions, where buildings had
 7 experienced large external fires , there were no
 8 significant injuries , let alone fatalities , given the
 9 wider construction features and fire protection systems
 10 involved in those buildings .

11 So it is important to recognise -- and this , as
 12 I say, is my first point -- that a product is not
 13 inherently dangerous nor unfit for sale merely because
 14 that product may be inappropriate for certain
 15 applications or may be unsafe if it is misused.

16 Secondly, even if there was the potential for misuse
 17 of the product, that did not impose any duty on the
 18 supplier of the product. It was reasonable for
 19 a company to conclude that it could rely on
 20 Building Regulations in the markets into which it sold,
 21 as well as the judgement of the professionals to whom it
 22 sold the products, to ensure that the product was being
 23 used appropriately for particular applications . The
 24 same conclusion was drawn by other suppliers who
 25 continued to supply ACM PE, who would indeed have

1 supplied it for use at Grenfell if the company had not
 2 done so.

3 The point has been made previously that the company
 4 had a small UK market share, with only one authorised
 5 sale agent. It must be the case, if one thinks about
 6 it , that a supplier of a product is reasonably entitled
 7 to proceed on the basis that those responsible for the
 8 use of the product will do so in a way that complies
 9 with any relevant regulatory regime. This must
 10 particularly be the case where, as in the supply of the
 11 product for Grenfell Tower, those responsible for the
 12 use of the product are persons such as architects and
 13 construction professionals , whose work is subject to
 14 regulatory oversight by building control officials .

15 A supplier of a product must also be reasonably
 16 entitled to proceed on the basis that an application of
 17 the regulatory regime in a particular jurisdiction will
 18 achieve a suitable outcome. The standards set by the
 19 relevant regulatory regimes are a matter for the
 20 lawmakers in each jurisdiction . Insofar as it may be
 21 suggested, as it has been, that there were deficiencies
 22 within the UK regime, or with the way it was implemented
 23 by those involved in the refurbishment of
 24 Grenfell Tower, it cannot be reasonable, we say, to
 25 suggest that the company should have identified those

1 deficiencies and should already have withdrawn ACM PE
 2 from the UK market.
 3 Insofar as the company is concerned, the UK regime
 4 was an overseas regime, and it regulated not the supply
 5 of the product but the building and refurbishment work.
 6 The company was entitled to proceed on the basis that
 7 the UK regulatory regime would ensure that a suitable
 8 outcome would be achieved by those responsible for the
 9 building works. Moreover, as I shall emphasise, that
 10 regime would itself have prevented the Grenfell tragedy
 11 if only it had been properly complied with by those on
 12 whom the relevant duties lay.
 13 So that was my second broad observation.
 14 The third, which is briefer, is this: that the
 15 company did make clear, we say, via the BBA certificate,
 16 that the fire performance of a product cannot be judged
 17 in isolation, but must ultimately be assessed as one
 18 component of an overall wall assembly. Therefore, it
 19 was both permissible and appropriate -- and I shall have
 20 a lot more to say about this -- for the company to rely
 21 in promoting its product on the class 0 classification
 22 or certification.
 23 Fourthly, and with the benefit of hindsight, we now
 24 know of course that the product was misused at
 25 Grenfell Tower as one component of a unique

1 refurbishment that tragically failed in so many ways to
 2 comply with applicable regulations. But that is a fact
 3 that neither the company, nor perhaps other
 4 manufacturers of single component parts of a cladding
 5 system, could have been expected to know at the time.
 6 It's worth noting that, at the time the product was sold
 7 for use as one component at Grenfell Tower, there was no
 8 awareness of any fires involving Reynobond PE that had
 9 resulted in any loss of life or significant injuries.
 10 So we say, at the conclusion of this section of my
 11 submissions, that it would not be correct, despite the
 12 allegations made by others, to criticise employees
 13 within the company on the basis that they were, as it
 14 has been suggested, seeking to exploit the UK
 15 marketplace.
 16 Now my next heading: the use of ACM at
 17 Grenfell Tower.
 18 The first and quite general point to make is that,
 19 just as ACM PE panels were widely used both in this
 20 country and abroad, so was their physical nature widely
 21 known and understood. We annexed to our written
 22 submissions a paper summarising the evidence currently
 23 available, that's to say at the time, as to industry
 24 knowledge of the characteristics of ACM PE prior to the
 25 Grenfell Tower fire. It's a remarkable feature of the

1 evidence within Phase 2 that hardly any of the witnesses
 2 called to date were prepared to acknowledge an awareness
 3 of the combustible nature of the core of the panel,
 4 though some admitted to an awareness that the core was
 5 plastic and some, but fewer, admitted that it was
 6 therefore combustible. The Inquiry may take the view
 7 that those who profess ignorance of these matters do so
 8 with their own interest to protect.
 9 We know from the evidence of Professor Bisby that
 10 the challenging nature of the core would have been
 11 widely known among those concerned with fire safety, and
 12 in Professor Bisby's Phase 1 report at paragraph 431, he
 13 acknowledges that PE materials are known to be highly
 14 combustible, something which in his oral evidence on
 15 21 November 2018 he confirmed.
 16 So a responsible specifier would have taken into
 17 account the combustible nature of ACM PE when selecting
 18 the combination of materials to use on the external
 19 façade.
 20 Moreover, the Inquiry may take the view that,
 21 irrespective of the precise state of knowledge of
 22 individual witnesses and of their subjective evidence on
 23 that point, there is a more fundamental consideration:
 24 since no one concerned with the choice or use of ACM PE
 25 could have been unaware of the existence of the core, it

1 would follow that anyone responsible for the choice or
 2 the use of it had the option to check the combustibility
 3 of the core, whether by asking the manufacturer
 4 directly, which the evidence shows to have occurred on
 5 other projects, or by some other means, such as looking
 6 at test results available on the websites of testing and
 7 regulatory bodies, et cetera. None of those responsible
 8 for the refurbishment can escape their share of
 9 responsibility by claiming ignorance or lack of
 10 information.
 11 In the case of Rydon, the main contractor, whose
 12 written opening is particularly critical of the company
 13 whom we represent, their attention was expressly drawn
 14 to the issue by the email relating to the "Lakanal
 15 moment", and even this did not suffice to induce them to
 16 ensure that the regulatory regime was complied with.
 17 It's also indisputable that alternative options were
 18 available, including not only non-combustible
 19 insulation, but significantly less combustible cladding
 20 panels, including those which were fire retardant,
 21 an option of which any reader of the BBA certificate
 22 would have been aware.
 23 For example, the company at that time offered ACMFR
 24 as well as, I think, ACM A2 products, both of which were
 25 more fire retardant. In respect of such options, it's

1 worth noting that at the material time the company was
2 reducing the price difference between its ACM PE and
3 ACM FR panels.

4 The evidence has also shown that a zinc composite
5 material with a fire retardant core had originally been
6 specified for use at Grenfell Tower. The white Aluglaze
7 infill panels were, we understand, also available in
8 fire retardant form.

9 Above all, of course, the market was wholly familiar
10 with the concept of non-combustible insulation, the only
11 kind previously used in high-rise applications. Those
12 who ultimately selected ACM PE for use at Grenfell Tower
13 cannot credibly claim to have been ignorant of the
14 availability of more fire retardant alternatives,
15 particularly having originally specified one such
16 alternative, only to change the specification later in
17 order, at least in part, to save money.

18 The Inquiry may have been struck in the course of
19 Module 1, we respectfully submit, by the growing body of
20 evidence to the effect that quite simply no or no
21 adequate thought was given in the design, fabrication
22 and installation of the cladding system to compliance
23 issues in relation to fire. Indeed, it seems that few,
24 if any, of those involved even managed to read the
25 BBA certificate or, if they did, managed to read beyond

1 the first page.

2 There was a reference by Mr Ashton of Exova to
3 further analysis of the cladding issue to be carried out
4 at a later stage, but as everyone concerned was or
5 should have been aware, that further analysis never took
6 place, nor was there any other evaluation, least of all
7 in the local authority building control function, of the
8 fire safety implications of the chosen combination and
9 configuration of the materials used.

10 This, we would submit, must be the central and
11 perhaps shocking conclusion for the Inquiry to draw as
12 it enters into its consideration of Phase 2, Module 2.

13 I think I'm still on track in timing terms, and
14 I turn to my next section, which is entitled: the UK
15 regulatory regime.

16 That regime, as we all know, applies to the
17 construction and refurbishment of a building, and
18 accordingly will be relevant to those who are
19 responsible for the building work. It does not apply to
20 those who manufacture and supply materials chosen by
21 those who are involved in the building work. The
22 suitability of a particular building product necessarily
23 depends on the context in which it's used, and it is
24 those who design and carry out the construction and
25 refurbishment work who will have knowledge of that

1 context, and who can reasonably be expected to have
2 a detailed knowledge of the regime itself, which it
3 would not be reasonable to expect of a manufacturer in
4 any jurisdiction, particularly in a foreign
5 jurisdiction.

6 The role of the company that we represent was
7 essentially to supply a product which required
8 fabrication before use in a particular construction
9 context. The company made recommendations, it is true,
10 as to how to fabricate the product if the rivet or
11 cassette version were to be adopted, but it was for
12 others to decide which method to adopt for the
13 fabrication of the product, how to fit the fabricated
14 product to the external surface of the tower, what other
15 components to combine with it, and in every respect how
16 to carry out the refurbishment. It was the
17 responsibility of others to take appropriate steps to
18 achieve compliance with part B4 of the regulations.

19 There appears to be a suggestion that the company
20 intended that its products would achieve compliance
21 within the UK by reference to what has been called the
22 linear route. This suggestion, we say, is clearly
23 untenable for a number of reasons.

24 In the first place, the company was in no position
25 to formulate objectives in relation to the UK regulatory

1 regime in which it had no expertise.

2 Secondly, however, it is self-evident that
3 compliance with the linear route would not only require
4 conformity with paragraph 12.6 of Approved Document B,
5 relating to the external surfaces of walls, but also
6 compliance with paragraph 12.7, relating to the
7 requirement that any insulation product, et cetera,
8 should be of limited combustibility, which of course the
9 insulation used at Grenfell was not.

10 The failure to follow the linear route by those
11 whose duty it was to do so was, we submit, the root
12 cause of the spread of the fire.

13 It is clear, therefore, that those who were
14 responsible for the design and construction of
15 Grenfell Tower failed adequately to analyse the
16 regulatory regime and to determine how they were to
17 comply with it.

18 It was not within the company's knowledge that any
19 particular UK entity or individual working on the
20 Grenfell project was making compromise decisions in
21 respect of the refurbishment or failing to comply with
22 regulatory requirements.

23 Consequently, the company was not in a position to
24 determine if the state of the UK regime was such that
25 continued sale of ACM PE was problematic, and it was

1 entitled to rely on the fact and belief that its product
2 would be used in a safe manner in accordance with
3 statutory building controls.

4 Although the refurbishment works incorporating the
5 installation of the cladding system at Grenfell failed
6 to achieve compliance, it cannot be inferred from this
7 that any and all construction projects with cladding
8 systems including ACM PE would have failed in this
9 respect.

10 As Mr Hyett said on Tuesday of this week --
11 {Day34/179} -- it is possible for cladding systems as
12 a whole to be compliant even when including combustible
13 products, and it is therefore possible that a building
14 incorporating ACM PE, but designed to be in compliance
15 with the regulatory regime and including all appropriate
16 features such as cavity barriers and non-combustible
17 insulation, would have been in compliance.

18 There are two examples before us showing that it is
19 possible for a building designed in compliance with the
20 regime to be constructed. The first is at Taplow on the
21 Chalcoats Estate, where the cladding system comprised
22 Reynobond ACM PE cladding in rivet fabrication and with
23 Rockwool insulation. The fire did not spread across the
24 outside of the building because of the overall cladding
25 system used. The precise features in the cladding

1 system and the construction of the building, most
2 notably the firebreaks, limited the fire to a small
3 area.

4 Another relevant example is the fire in 2010 at
5 Sudbury House, Wandsworth, I think a 24-storey tower
6 clad in ACM PE, this time fabricated as cassette with
7 mineral wool insulation, which CEP, who were involved in
8 that construction, I think, have confirmed was
9 contained, just like the fire at Taplow House.

10 Before leaving the topic of the regulatory regime,
11 let me add one further comment concerning the
12 Construction Products Regulations, because we have noted
13 that the original suggestion in written openings that
14 the company was in breach of the Construction Product
15 Regulations has now, as you will have seen, been
16 abandoned, it being accepted that there was no relevant
17 harmonised standard for the product. In other words --
18 and this is a comment of perhaps wider significance --
19 an allegation of wrongdoing, which had been made, turns
20 out to be a case of a business making legitimate
21 commercial choices.

22 Now, I want to say something about product testing.
23 I'm afraid this is going to be a little bit technical,
24 but that's unavoidable.

25 Let me first distinguish between testing with regard

1 to the national class and testing under the system of EN
2 classification .

3 Testing under BS 476, parts 6 and 7, which can lead
4 to an outcome of national class 0, is testing in
5 relation to the unfabricated sample of a product. That
6 is the product that the company that we represent
7 manufactures and supplies. It does not involve a test
8 of the fire performance of a fabricated product, in
9 other words rivet or cassette or otherwise, incorporated
10 into a particular wall assembly. Therefore, NCO, which
11 can be the outcome of a 476 test, is a classification in
12 relation to an unfabricated product and
13 a classification, moreover, in relation, as Mr Hyett
14 carefully explained, to the surface of the unfabricated
15 product.

16 Therefore, as shown by other BBA certificates
17 evidenced by the Inquiry -- and, again, this was
18 confirmed by Mr Hyett -- an NCO classification can be
19 achieved alongside various different EN classifications .

20 Now, the EN classification, the European system, is
21 a test of the panels, in particular EN 13823, in
22 a particular mocked-up system. The system in which the
23 panels are assembled may vary from one test to another,
24 not just in terms of the method of fixing, whether rivet
25 or cassette, but also in terms of the substrate used,

1 the size of the cavity, the arrangement of the panels,
2 and other things.

3 So, if, for example, an EN B classification is
4 achieved, it shows that the product is capable --
5 capable -- of achieving EN B in a particular system when
6 fabricated in a particular way. But given the nature of
7 EN testing, a classification such as EN B does not mean
8 and it cannot be treated as achievable in all
9 circumstances.

10 Indeed, because the EN 13823 test relates to the
11 testing of a product fabricated in a particular way in
12 a mocked-up system, which may vary from one test to
13 another, two or more EN classification reports can
14 co-exist in relation to the same product at the same
15 time. It follows from all of the above that the time to
16 test the potential use of the product in a particular
17 context must be at the point of system assembly and by
18 applying one of the routes to compliance.

19 Now, in this case we know that in 2005, and again in
20 2011, panels of the ACM PE product, configured in
21 a particular mocked-up system, achieved EN B. That
22 shows that the product was capable of achieving an EN B,
23 and although subsequent EN testing involving the product
24 in which the particular mocked-up systems will have
25 varied, and indeed the particular method of fabrication,

1 although on that EN testing, EN B was not achieved, this
2 is not inconsistent with the fact that in 2005 and 2011
3 EN B was achieved, and therefore that the product was
4 capable of achieving that result. The variable was not
5 the product; it was the system into which it was
6 incorporated.

7 This point is in fact illustrated by the written
8 openings of certain core participants which have
9 referred to variations in the width of the cavities
10 between the cladding panels and any substrate. Whilst
11 there is no scientific evidence as to what the effect of
12 that difference would be, it's right to note that
13 variations of this kind are inherent in a process
14 whereby the tested system will vary from test to test.
15 Indeed, the width of the cavity may be only one of the
16 differences between the tested systems. The systems in
17 which the panels are assembled may also vary in terms of
18 matters such as the method of fixing and fabrication,
19 the substrate used, the arrangement of the panels,
20 et cetera, and the fact that these features may vary
21 from one test to another is a feature of the EN testing
22 process.

23 What's important is that the CSTB, the recognised
24 testing body in France, nonetheless confirmed and
25 published on its website the relevant test results,

77

1 including those showing that, in a given system, an EN B
2 result could be achieved, as well as others less
3 favourable. The Inquiry has documentary evidence
4 showing that a range of EN classifications was shared by
5 the company both internally and externally.

6 Against that background, let me turn -- my fifth
7 topic, I think it is -- to the BBA certificate, and let
8 me deal with that in as much detail as I need to.

9 Insofar as behaviour in relation to fire is
10 concerned, let me stress at the outset that the
11 BBA certificate went no further than to certify as to
12 the surface of an unfabricated panel, and contained
13 a range of caveats as to the fire performance of
14 a fabricated panel in a particular cladding system.

15 The first page of the certificate, as you know,
16 describes the panels as aluminium polyethylene
17 composite -- no two ways about that, everybody reading
18 the certificate, even the front page, would know that
19 the core was polyethylene -- and states that a panel may
20 be regarded as having a class 0 surface, and it refers
21 the reader to section 6.

22 In section 6, at section 6.1, we see that when
23 a sample of a standard PE product was subjected to
24 an EN test, it received a B classification, and was
25 therefore capable of achieving that classification.

78

1 That did not mean, as I've tried to explain, that
2 an EN B classification would be achievable in all
3 circumstances and irrespective of the method of
4 fabrication and other features of the cladding system.

5 Section 6.2 of the certificate then deals separately
6 with the testing of a fire retardant sample.

7 Section 6.3 then states that both products, that is both
8 FR and PE, may be regarded as having a class 0 surface
9 in relation to Approved Document B.

10 Then, crucially, section 6.5 states that, for
11 resistance to fire, the performance of a wall
12 incorporating the product is not covered by the
13 certificate, and that the performance of the wall
14 incorporating the product can only be determined by
15 further tests.

16 Then the certificate, at section 6.6, states that
17 cavity barriers should be incorporated behind the
18 cladding, as required by national Building Regulations,
19 and that particular attention should be paid to
20 preventing the spread of fire within a building
21 breaching the cladding system through windows and door
22 openings.

23 It follows that the BBA certificate is cautiously
24 worded. The reference to class 0 is expressly related
25 to the surface of the product, and the certificate as

79

1 a whole limits itself to specific examples of product.
2 Moreover, clear advice is given that the fire resistance
3 of a cladding system incorporating the product is not
4 covered by the certificate, but must be subject to
5 further testing.

6 As you know, and I'll mention this quite briefly,
7 these limitations are consistent with guidance contained
8 in Approved Document B, paragraph 16, which itself
9 restates the importance of checking any reference to the
10 surface spread of flame to make sure that it's suitable
11 to the construction to be used, and emphasises that
12 small differences in detail, such as differences in the
13 fixings, may significantly affect the rating. That's in
14 Approved Document B itself.

15 Now, the assertion in section 6.3 of the certificate
16 that the product may be regarded as having a class 0
17 surface in relation to Approved Document B is obviously
18 a reference to paragraph 12.6 of the guidance and
19 diagram 40, and so the certificate was simply setting
20 out that, since the product was capable of achieving the
21 requisite European class, it could be treated for the
22 purpose of compliance with the guidance as achieving the
23 requisite national class.

24 We do acknowledge, as other core participants have
25 stressed, that under European testing, some fabricated

80

1 versions of the product failed to achieve a B
 2 classification . But for the reasons I've tried to set
 3 out, that was not inconsistent with the NCO
 4 certification , being a certification relating to the
 5 surface of the product which, in a particular system and
 6 when fabricated in a particular way, had been shown to
 7 be capable of achieving the B classification .

8 As I've mentioned already, we know that the BBA were
 9 willing to certify NCO for products with
 10 an EN classification much lower than EN B.

11 Let me add that the BBA certificate was issued
 12 following a lengthy period of wide-ranging discussions
 13 between the company and the BBA, and in the course of
 14 those discussions it was agreed that the certificate
 15 would relate to the surface of the relevant ACM
 16 products, both PE and FR, rather than to a sample
 17 cladding system containing a number of different
 18 components, of which the ACM would have been but one.
 19 We know that from the evidence of Mr Albon of the BBA.
 20 It was made clear to the BBA in the course of these
 21 discussions that, for the purpose of fixing the ACM
 22 panels, two possible methods could be employed, rivet
 23 and cassette , which were alternative methods of
 24 fabrication and fixing , and did not affect the nature of
 25 the product itself .

1 Since the certificate was to confirm that the
 2 external surface of the product could be treated as
 3 national class 0 for the purpose of diagram 40, this
 4 conclusion would have remained unchanged even if the BBA
 5 had been provided, for example, with information on the
 6 fire performance of the core material standing alone, or
 7 even with information as to the fire performance of the
 8 product when fabricated or fixed in a particular way,
 9 whether rivet or cassette , because -- to repeat -- the
 10 certificate was simply to confirm that the external
 11 surface of the product could be classified as national
 12 class 0.

13 Please remember that the company also had available
 14 to it at the time class 0 results in respect of another
 15 product called RB 33, which had thinner aluminium skins
 16 but a thicker PE core than RB 55. That you can see from
 17 Dr Lane's table of results , her appendix E at page E3,
 18 and it was surely a legitimate inference that RB 55 PE
 19 would achieve class 0 if RB 33 with a thicker core but
 20 thinner aluminium skins had done so.

21 On the basis of all this , the BBA itself determined
 22 that it was appropriate to issue the certificate in the
 23 terms in which it was issued, and in particular that the
 24 product could be regarded as having a class 0 surface .

25 I might add that we know that the BBA consulted

1 various external bodies, including the CSTB, in order to
 2 check and confirm that it was justified in issuing the
 3 certificate in these terms.

4 In the light of the express warning in section 6.5
 5 of the certificate , no one could reasonably or
 6 justifiably assume that the performance of a wall
 7 incorporating the product, whether fabricated and fixed
 8 by rivet or cassette , would necessarily correspond with
 9 the test results provided.

10 So, for all these reasons, I'm afraid we do not
 11 accept that the categorisation of the product as NCO or
 12 the BBA certificate itself misled the UK market.
 13 Indeed, we say that since the certificate related to the
 14 reaction to fire of the surface and the potential spread
 15 of fire across that surface, the NCO classification in
 16 the certificate would not have changed in the light of
 17 further fire performance information following the issue
 18 of the certificate unless the fire performance of the
 19 surface were to have changed, which it did not.

20 An EN test result relating to the fire performance
 21 of the product in a particular cladding system would
 22 demonstrate and demonstrate only that the product was,
 23 as part of that system, capable of achieving
 24 a particular EN result, and therefore further EN results
 25 would not have impacted on the classification contained

1 in the BBA certificate unless any such result
 2 demonstrated that the product itself was incapable of
 3 achieving that classification .

4 So we say, with great respect, that the ENE result
 5 emphasised elsewhere in a system involving cassette
 6 fabrication , as, for example, at Sudbury, did not
 7 detract from the fact that the product was capable of
 8 achieving EN B in an appropriate system, and that
 9 therefore the NCO classification remained appropriate.

10 Now I'm on my final and relatively brief heading,
 11 and all I want to do at this stage is to remind
 12 the Inquiry, if I may, please, of a series of events
 13 which, although crucial in terms of the eventual and
 14 terrible outcome, were nonetheless events in which, on
 15 any view, the company which we represent had no
 16 involvement at all .

17 The first of these events was the start of the fire
 18 in flat 16. The Inquiry has dealt with this in its
 19 Phase 1 report. Obviously no responsibility can attach
 20 to the company for the start of the fire .

21 The second point concerns the extent, if any, of the
 22 fire safety precautions available within flat 16 and the
 23 remained remainder of the tower, on which you have heard
 24 and will continue to hear evidence concerning
 25 deficiencies in such precautions. Among other obvious

1 points are the absence of a sprinkler system or other
2 means of extinguishing fire within the individual flats ,
3 including flat 16.

4 The next point is the escape of fire into the
5 cladding system, and this is important. There can be no
6 doubt that if the escape of the fire had been prevented
7 or even delayed sufficiently to enable firefighters to
8 extinguish it within the flat , then the Grenfell tragedy
9 would simply not have occurred. It should never be
10 forgotten that, on the evidence, a delay of
11 an additional few minutes in the escape of the fire
12 would have enabled the fire service to extinguish it
13 whilst still in the flat , without any of the terrible
14 consequences which followed. Indeed, the stay-put
15 policy was based on the assumption that this would
16 occur.

17 The Inquiry in its Phase 1 report found that the
18 firefighters entered the kitchen of flat 16 only
19 five minutes after the fire broke out, and in your
20 Phase 1 report, you found that it was the use of
21 combustible material surrounding the windows and the
22 absence of cavity barriers manifestly required by the
23 regulatory regime which prevented the containment of the
24 fire within flat 16 for those vital few additional
25 minutes.

1 Next I would like to make brief reference in this
2 review of wider factors to the expert evidence that it
3 was the combustible insulation which could well have
4 been the first major component of the cladding system to
5 ignite and which therefore played a key role in
6 precipitating the ignition of the ACM panels. The
7 importance of the presence of the combustible insulation
8 emerges clearly from the comparison that we have drawn
9 with Taplow and with Sudbury, where ACM panels were
10 utilised in conjunction with non-combustible insulation.

11 So I would respectfully remind the Inquiry that it's
12 already clear that the kind of tragedy which occurred at
13 Grenfell could only have occurred as a result of
14 a unique combination of factors , including the
15 combination and configuration of the materials used in
16 the refurbishment, the failure of compartmentation and
17 of other internal systems, and the undue reliance, one
18 has to say, on the stay-put policy , among other factors.

19 Just to remind you that we attempted to assist
20 the Inquiry as to the involvement and interaction of
21 many of these factors in the schedule which we submitted
22 as part of our written closing at the conclusion of
23 Phase 1.

24 So, in my very brief conclusion, we would invite the
25 Inquiry in due course to conclude that the principal

1 cause of the Grenfell tragedy was the failure by those
2 responsible for the refurbishment of the tower
3 holistically to consider fire performance as mentioned
4 above, and we will be urging the Inquiry, against that
5 background, not to criticise a single product
6 manufacturer for continuing to sell a product which had
7 been in widespread use for many years, and which could
8 properly have been used at height in the context of
9 building works which achieved the necessary regulatory
10 compliance.

11 Thank you very much.
12 SIR MARTIN MOORE-BICK: Thank you very much, Mr Hockman.

13 At this stage, I'm going to invite Mr Orr to address
14 us on behalf of Celotex. So can we see if Mr Orr can be
15 brought on to the screen, please.

16 MR ORR: Good afternoon, Mr Chairman. Can you see me and
17 hear me?

18 SIR MARTIN MOORE-BICK: Yes, and can you see and hear me?

19 MR ORR: I can see and hear you, sir .

20 SIR MARTIN MOORE-BICK: Good, thank you.

21 Now, before you begin, I'm very conscious of the
22 fact that we are running behind time as indicated in the
23 timetable which I think you were sent. So the question
24 I want to ask you is this: it's just after 12.30 now.
25 You have been allotted an hour, and I certainly don't

1 want to cut you down at all . If you start now, I think
2 I'm going to have to ask you to find a convenient moment
3 around 1 o'clock, give or take, to break your statement.
4 Another possibility -- although I'm not pressing you on
5 this by any means -- is that we take an early lunch now
6 and give you an uninterrupted hour starting , let's say,
7 at 1.30.

8 I know you weren't expecting to be asked that
9 question, but do you have a preference?

10 MR ORR: Mr Chairman, I'm really in your hands. If the
11 panel would prefer me to deliver my statement in one go,
12 I would be content with that, but I do think I could
13 start now and find a convenient moment around 1 o'clock.

14 SIR MARTIN MOORE-BICK: All right. Well, it is a bit early,
15 isn't it, to have lunch, so shall we do that? If you'd
16 like to start now, and I will leave it to you to find
17 a convenient moment round about 1 o'clock at which you
18 would be happy to break your statement when you get
19 there.

20 MR ORR: I'm grateful, sir .

21 SIR MARTIN MOORE-BICK: Right, thank you.

22 Opening statement on behalf of Celotex by MR ORR

23 MR ORR: So, Mr Chairman, panel members, can I start by
24 thanking the Inquiry for this opportunity to make
25 an opening statement at the commencement of Module 2.

1 I wish at the outset, on behalf of Celotex, to
2 reiterate its deepest sympathy to the bereaved families,
3 survivors and everyone affected by the tragic fire at
4 Grenfell Tower.

5 Celotex has, from the very start of this Inquiry,
6 endorsed the need to ascertain what caused the fire and
7 ensure that no such tragedy occurs again. Celotex is
8 and has throughout been committed to providing its full
9 co-operation and assistance to the Inquiry. It
10 recognises the urgent need to ensure that public
11 confidence in the safety of high-rise residential
12 buildings, and in the construction industry as a whole,
13 is fully restored. The work of this Inquiry is
14 fundamental to achieving that objective.

15 Celotex has provided the Inquiry with a written
16 opening submission for Module 2. That sets out its
17 position on the Module 2 issues in full. It provides
18 references to relevant documents and to the evidence of
19 witnesses who gave evidence in Module 1. I understand
20 that it is now available on the Inquiry's website for
21 those who may be interested in reading it.

22 In this oral opening statement, I propose to
23 highlight the following points: first, Celotex's role in
24 the refurbishment of Grenfell Tower; second, Celotex's
25 investigations following the fire; third, the

89

1 Building Regulations at the time of the refurbishment;
2 fourth, the marketing and supply of the Celotex products
3 that were used in the refurbishment; and finally and
4 fifthly, the testing and marketing of Arconic's
5 Reynobond PE cladding panels.

6 Turning then first to identify the nature of
7 Celotex's role.

8 Celotex is a manufacturer of polyisocyanurate
9 insulation, known as PIR. Two of Celotex's products
10 were used in the refurbishment at Grenfell Tower: first,
11 a product known as RS5000, this was used as insulation
12 in the rainscreen cladding system; second, a product
13 known as TB4000 was, Celotex understands, used to fill
14 gaps in the window surrounds at Grenfell Tower.

15 PIR is widely used in the construction industry.
16 Its high insulation value helps building designers and
17 contractors to meet modern energy conservation
18 requirements. PIR is an organic product which, in
19 common with all organic products, will combust under
20 certain conditions. The combustible nature of PIR was
21 or should have been known to construction professionals
22 considering the use of Celotex insulation. The
23 combustible nature of the product was clearly
24 highlighted in Celotex's health and safety datasheet to
25 which readers of Celotex's website and of its product

90

1 literature were directed.

2 The Building Regulations in force at the time of the
3 Grenfell Tower refurbishment permitted combustible
4 insulation to be used in high-rise residential
5 buildings. There were additional requirements that had
6 to be met when using combustible insulation in
7 a building over 18 metres. But provided those
8 requirements were met, PIR was acceptable for use in
9 such buildings.

10 The construction or refurbishment of a building over
11 18 metres involves a number of construction industry
12 professionals from a variety of disciplines. They are
13 responsible for ensuring that the building works comply
14 with the Building Regulations. That responsibility does
15 not and cannot realistically fall on the manufacturer of
16 an individual product such as Celotex. That indeed was
17 the position in respect of Grenfell Tower. Celotex was
18 not part of the design or construction team on the
19 Grenfell Tower refurbishment. Celotex did not design or
20 construct the rainscreen cladding system at
21 Grenfell Tower. Its sole role was as the manufacturer
22 of insulation which was supplied, through third-party
23 distributors, for the refurbishment.

24 The distinction between a building designer and
25 contractor on the one hand and a product manufacturer on

91

1 the other is fundamental, and we respectfully suggest
2 needs to be borne in mind.

3 Can I turn, then, to Celotex's investigations
4 following the fire.

5 None of the key Celotex personnel involved in the
6 testing, certification and marketing of the Celotex
7 products used at Grenfell Tower remain employed by
8 Celotex. Mr O'Sullivan, Celotex's current managing
9 director, joined Celotex on 1 May 2016, after the
10 Celotex products used in the refurbishment were
11 supplied.

12 In the immediate aftermath of the Grenfell Tower
13 fire, and in view of the focus on the role played by the
14 rainscreen cladding system on the tower, Celotex
15 suspended the sale of RS5000 pending further clarity,
16 and set about ascertaining the relevant facts concerning
17 the supply of that product for the refurbishment. This
18 work was directed by Mr O'Sullivan, with the assistance
19 of Celotex's lawyers, Linklaters.

20 In the course of this work, certain matters came to
21 light concerning the testing, certification and
22 marketing of Celotex's products which were previously
23 unknown to Celotex's current management. This included
24 issues concerning the testing of RS5000 prior to its
25 launch in August 2014, and the declaration of lambda

92

1 values, which are a measure of insulating capacity, for
2 certain Celotex products.

3 Once established, these matters were promptly
4 announced by notices on Celotex's website and reported
5 to the relevant authorities, including testing and
6 certification bodies, the Ministry of Housing,
7 Communities and Local Government, Trading Standards and
8 the Metropolitan Police. In addition, Celotex made
9 a full report of these matters to the Inquiry.

10 Celotex also instructed Linklaters to undertake
11 a comprehensive review of all relevant documentation and
12 other available evidence to ascertain as fully as
13 possible the circumstances in which RS5000 was tested,
14 launched and marketed. The results of that review were
15 set out in a summary paper which Celotex provided to
16 the Inquiry in September 2018, together with a witness
17 statement from Mr O'Sullivan. In his witness statement,
18 Mr O'Sullivan gives first-hand evidence of relevant
19 events after he joined Celotex, and an account of other
20 relevant matters discerned from Celotex's documents.

21 Now, following the emergence of the matters I have
22 mentioned, Celotex was concerned to establish whether
23 they gave rise to any safety issues. It conducted
24 extensive due diligence in relation to the testing of
25 its products, and it commissioned additional fire safety

93

1 testing of both its 4000 and 5000 ranges of insulation.
2 That testing confirmed that those products achieved the
3 classifications that they were stated to have at the
4 time of the Grenfell Tower refurbishment.

5 Celotex recognises that the matters which emerged
6 during its investigations involved inappropriate and
7 unacceptable conduct on the part of a number of
8 employees. This was of real concern to Celotex's
9 current management. Some of the employees involved had
10 already left the company. Those who remained were the
11 subject of disciplinary proceedings. Six employees
12 resigned between December 2017 and March 2018.

13 Sir, panel members, Celotex has sought to learn from
14 this experience. It has taken concerted steps to ensure
15 that no such situation occurs again. Those steps
16 include: recruiting new technical and operational
17 management, designing and implementing changes and
18 improvements to lambda and other testing processes,
19 designing new quality assurance systems with the
20 assistance of a new quality assurance manager, and
21 reviewing and improving training procedures. Celotex
22 recognises that this is an ongoing process. It is
23 committed to continuous improvement.

24 Celotex has given careful consideration to whether
25 the matters which emerged following the Grenfell Tower

94

1 fire concerning the testing, certification and marketing
2 of its products had any impact on the specification and
3 use of those products at Grenfell Tower. On the
4 evidence, there is, we submit, no basis for believing
5 that those matters did have any impact on the
6 specification and use of the products at Grenfell Tower.
7 This point is addressed in Celotex's written opening
8 submission. I will also deal with it in this oral
9 opening statement.

10 I need, though, first, to outline the relevant
11 Building Regulations that were in force at the time of
12 the Grenfell Tower refurbishment.

13 At the time of that refurbishment, the
14 Building Regulations permitted the use of combustible
15 insulation in buildings over 18 metres in height. The
16 statutory guidance set out in volume 2 of Approved
17 Document B, known as ADB2, provided four routes to
18 compliance for a rainscreen cladding system:

19 First, the linear route which involved compliance
20 with the requirements of sections 12.6 to 12.9 of ADB2.

21 Second, testing the complete cladding system in
22 accordance with British Standard 8414 in order to
23 demonstrate that the system met the performance criteria
24 given in the report produced by the Building Research
25 Establishment on the fire performance of cladding

95

1 systems known as BR 135.

2 Third, obtaining a desktop study from a suitably
3 qualified fire specialist confirming that the complete
4 cladding system would meet the performance criteria
5 given in BR 135 if it was tested to BS 8414.

6 Fourth, carrying out a holistic fire engineering
7 study, taking into account the adequacy of fire
8 prevention measures in the building and other factors
9 affecting fire spread, to demonstrate that the cladding
10 system would adequately resist the spread of fire over
11 the walls.

12 Now, the linear route to compliance was only
13 available if each of the individual components in the
14 cladding system met specified standards of fire
15 performance. In particular, under the linear route, the
16 insulation needed to be of limited combustibility. If
17 combustible insulation like PIR was being used, the
18 linear route was not available. One of the other three
19 routes to compliance would then need to be followed.

20 That is clear from ADB2, and it would be helpful if
21 we could have on the screen at this stage the particular
22 page from ADB2. The reference for that is
23 {CLG00000224/96}.

24 The relevant provision here is section 12.7 of ADB2,
25 and what that makes clear is that any insulation product

96

1 used in the external wall construction of a building
 2 over 18 metres had to be of limited combustibility if
 3 one was following the linear route to compliance.
 4 Now, PIR was clearly not of limited combustibility .
 5 That was apparent from the definition of "limited
 6 combustibility" in appendix A of ADB2, to which
 7 section 12.7 refers .
 8 In general terms, a product was only of limited
 9 combustibility if it was non-combustible, for example if
 10 it was a totally inorganic material such as concrete or
 11 was classified as class A1 or class A2 under European
 12 standards. That did not include PIR.
 13 Industry guidance available at the time of the
 14 refurbishment emphasised that PIR did not meet the
 15 requirements of section 12.7 of ADB2. For example,
 16 Technical Guidance Note 18 issued by the
 17 Building Control Alliance stated that thermosetting
 18 insulants , which include PIR, do not meet the limited
 19 combustibility requirements of ADB2 and so should not be
 20 accepted as meeting ADB2, paragraph 12.7. That's
 21 specifically referred to in Celotex's written opening
 22 submission at paragraph 35(4).
 23 It therefore was or should have been clear to any
 24 designer or contractor that if they were following the
 25 linear route, PIR could not be used. Indeed, Mr Hyett,

1 the Inquiry's architectural expert, confirmed in his
 2 evidence earlier this week that any reasonably competent
 3 architect would have known that PIR products were not
 4 compliant with the linear route. If therefore PIR was
 5 to be used at Grenfell Tower, any designer or contractor
 6 should have known that one of the other routes to
 7 compliance had to be followed. Each of those routes to
 8 compliance required the fire performance of the cladding
 9 system as a whole to be considered.
 10 That brings me to the second of the four routes
 11 I mentioned. This involved testing the complete
 12 cladding system to BS 8414. Now, that is a substantial
 13 undertaking, requiring construction of the system on
 14 a full -scale test rig which is then subjected to a fire
 15 load simulating a fire escaping from a window. There
 16 are only a small number of testing houses in the UK with
 17 the capability to conduct such tests .
 18 At the time of the Grenfell Tower refurbishment, it
 19 was standard practice to widen the scope of application
 20 of a BS 8414 test by way of a field of application
 21 report or a desktop study. These studies enable
 22 building designers and contractors to extrapolate the
 23 results of a BS 8414 test of a particular cladding
 24 system to determine whether a system containing
 25 different components would, if tested, meet the

1 performance criteria under BR 135.
 2 Now, BSR Team 1 appears to suggest in its opening
 3 submission that desktop studies were not a permitted
 4 route to compliance. That, we submit, is wrong. All
 5 four of the routes to compliance I have identified were
 6 well established by the time that insulation and
 7 cladding products were purchased for the Grenfell Tower
 8 refurbishment. They were identified in industry
 9 guidance available at the time, including the technical
 10 guidance note issued by the Building Control Alliance to
 11 which I have referred . Furthermore, Mr Hyett has
 12 confirmed in both his expert report and his oral
 13 evidence this week that all four routes to compliance,
 14 including desktop studies , were available at the time of
 15 the Grenfell Tower refurbishment.
 16 Now, during Module 1 there was much discussion about
 17 class 0. This is a national fire performance
 18 classification for individual construction products. At
 19 the time of the Grenfell Tower refurbishment, class 0
 20 was relevant to the specification and use of cladding
 21 products on the external surface of an exterior wall
 22 under the linear route to compliance. That appears from
 23 section 12.6 of ADB2, which required the external
 24 surfaces of walls to be classified as class 0 which, as
 25 I've said, is a national classification , or

1 alternatively class B or better under European
 2 standards.
 3 It is clear from section 12.6 that these
 4 classifications -- that is class 0 or alternatively
 5 class B or better -- applied only to the external
 6 surface of the wall. They did not apply to the
 7 insulation that was installed within a cladding system
 8 behind the exterior cladding panels. Under the linear
 9 route to compliance, insulation in the cladding system
 10 was required to be of limited combustibility , as I've
 11 explained.
 12 ADB2 made clear that class 0 and limited
 13 combustibility were different concepts and were not
 14 interchangeable. Each of these terms was separately
 15 identified in ADB2. Class 0 was determined by specific
 16 fire tests under British Standard 476-6 and 7, whereas
 17 limited combustibility was defined, as I've said, in
 18 appendix A of ADB2.
 19 The various routes to compliance I have mentioned
 20 should have been known to the construction professionals
 21 involved in the refurbishment of Grenfell Tower. The
 22 relevant provisions of the Building Regulations and ADB2
 23 were well established, having been in force since 2006.
 24 They were well publicised in industry guidance available
 25 at the time, including the technical guidance note

1 I have mentioned.
 2 However, the evidence given in Module 1 now shows
 3 that the construction professionals involved in the
 4 Grenfell Tower refurbishment were unaware of,
 5 disregarded or otherwise failed to follow the
 6 requirements of ADB2 when designing and constructing the
 7 cladding system at Grenfell Tower. They gave no proper
 8 consideration to which, if any, potential route to
 9 compliance they were following. Importantly, they had
 10 no regard to the fact that the insulation and other
 11 components of the cladding system were combustible, and
 12 they did not consider what impact that had on compliance
 13 of the cladding system with Building Regulations. Nor
 14 did they undertake any assessment of the fire
 15 performance of the cladding system they were proposing
 16 to install, whether by way of a desktop study or
 17 otherwise, despite the linear route to compliance not
 18 being available.
 19 These failings on the part of the designers,
 20 contractors and fire safety consultants were
 21 fundamental, and they should have been identified by
 22 RBKC building control. However, that did not happen.
 23 None of these matters was Celotex's responsibility.
 24 Sir, I'm now moving to a new topic, the supply of
 25 the Celotex products used in the refurbishment. So,

101

1 sir, that may be a convenient moment.
 2 SIR MARTIN MOORE-BICK: Yes. If that's convenient to you,
 3 I suggest we stop there, and we will resume at
 4 2 o'clock, if that's all right.
 5 MR ORR: Thank you.
 6 SIR MARTIN MOORE-BICK: We will look forward to seeing you
 7 then.
 8 MR ORR: Thank you.
 9 SIR MARTIN MOORE-BICK: Good, thank you very much.
 10 2 o'clock, then, please.
 11 (12.57 pm)
 12 (The short adjournment)
 13 (2.00 pm)
 14 SIR MARTIN MOORE-BICK: Yes. Now, I hope that we're going
 15 to have Mr Orr back on the screen any moment.
 16 MR ORR: Mr Chairman, I hope I am on the screen.
 17 SIR MARTIN MOORE-BICK: Ah. Thank you, Mr Orr. Yes, you
 18 are now full size on the screen.
 19 Right, are you ready to carry on?
 20 MR ORR: Yes, I am, thank you.
 21 SIR MARTIN MOORE-BICK: Good, thank you. Then off you go,
 22 thank you very much.
 23 MR ORR: Thank you.
 24 So I am now turning to my fourth topic, which is the
 25 supply of the Celotex products used in the

102

1 refurbishment, and I start with RS5000.

2 Now, prior to August 2014, Celotex marketed no
 3 products for use in buildings over 18 metres. In
 4 May 2014, a cladding system incorporating RS5000 was
 5 successfully tested to BS 8414 by the Building Research
 6 Establishment. Following that test, Celotex marketed
 7 RS5000 for use in multi-component rainscreen cladding
 8 systems from August 2014 onwards.

9 The product literature produced by Celotex for
 10 RS5000 included a product datasheet, a rainscreen
 11 application datasheet, a specification guide, and
 12 a cladding compliance guide.

13 This literature made the following six points clear:

14 First, that ADB2 provided an alternative route to
 15 compliance for cladding systems through meeting the
 16 performance criteria in BR 135 by testing to BS 8414.

17 Second, that a BS 8414 test was a system test. To
 18 achieve classification under BR 135, the cladding system
 19 must have been tested to the full test duration
 20 requirements of BS 8414.

21 Third, that a classification under BR 135 applies
 22 only to the system as tested and detailed in the
 23 classification report, and that when specifying or
 24 checking a system, it is important to check that the
 25 classification documents cover the end-use application.

103

1 Fourth, that RS5000 had been incorporated in
 2 a rainscreen cladding system which had been successfully
 3 tested to BS 8414 and met the performance criteria in
 4 BR 135. As a result, RS5000 was suitable for use in
 5 buildings over 18 metres.

6 Fifth, however, that this fire performance and
 7 classification only related to the rainscreen cladding
 8 system tested to BS 8414.

9 Finally, sixth, that any changes to the components
 10 of the cladding system listed in the product literature
 11 would need to be considered by the building designer.

12 Now, those points clearly identified for building
 13 designers and contractors the matters they would need to
 14 bear in mind if using RS5000 in a cladding system on
 15 a building over 18 metres. Indeed, the rainscreen
 16 cladding compliance guide explained that it provided
 17 a step-by-step guide to an alternative route to
 18 compliance for ADB2.

19 Could I ask to have that put on the screen, it is
 20 {CEL00001239}. If we could start by going to page 2 of
 21 the document, and if we could zoom in on the upper part
 22 of the document, it's the paragraph exactly there. Now,
 23 what that paragraph says is what I've just said: that
 24 this guide provides a step-by-step guide to
 25 an alternative route to compliance for ADB2.

104

1 Then if we could move to page 3, and if we could
 2 zoom in on the top right-hand part of the document, the
 3 third column of text says:
 4 "The performance of the system under investigation
 5 is evaluated against three criteria :
 6 "External fire spread.
 7 "Internal fire spread.
 8 "Mechanical performance."
 9 Then it goes on to say:
 10 "The classification applies only to the system as
 11 tested and detailed in the classification report. The
 12 classification report can only cover the details of the
 13 system as tested. It cannot state what is not covered.
 14 When specifying or checking a system it is important to
 15 check that the classification documents cover the
 16 end-use application."
 17 Then if we can go to the fourth and final page of
 18 this document -- it is a relatively short document and
 19 not difficult to read or comprehend -- again, on the top
 20 of the document, in the second column, there's a heading
 21 "Celotex RS5000". That then sets out a description
 22 which it says comprises the system tested. Then in the
 23 final column of text, again it repeats the warning that:
 24 "Any changes to the components listed and
 25 construction method set out in figure 4 will need to be

1 considered by the building designer."
 2 Finally to note that, on the bottom of this page,
 3 the compliance guide, if we could move down to the
 4 bottom part of the page, contains a bibliography which
 5 lists the ADB2, BS 8414 and BR 135 guidance.
 6 Thank you.
 7 So moving on, then, from the literature itself, what
 8 is important to note is that it was Celotex's policy and
 9 practice always to send out the rainscreen cladding
 10 compliance guide, which I've just explained, when
 11 responding to queries about the use of its insulation in
 12 buildings over 18 metres. This information was
 13 therefore widely disseminated amongst customers and
 14 potential customers, and indeed it was shared with
 15 Harley, as I will come on to describe.
 16 The consequence is that any construction
 17 professional who read the Celotex product literature
 18 would have known that the BR 135 classification achieved
 19 by RS5000 applied only to the cladding system tested by
 20 Celotex, and any changes to the components of the system
 21 described in the product literature would need to be
 22 carefully assessed in order to ensure that the product
 23 was suitable for use in a system with different
 24 components.
 25 The product literature also referred to other

1 performance characteristics of RS5000, including its
 2 BREEAM rating and its class 0 classification. That
 3 should not have been a cause for confusion. As any
 4 competent construction professional should have known,
 5 class 0 is not relevant to determining compliance of
 6 insulation used in a rainscreen cladding system on
 7 a building over 18 metres, albeit that it can be
 8 a relevant indicator of a product's reaction to fire for
 9 other purposes.
 10 At this stage, I need to refer back to the
 11 investigations carried out by Celotex after the
 12 Grenfell Tower fire.
 13 In the course of those investigations, Celotex's
 14 current management learned that there were certain
 15 differences between the rainscreen cladding system
 16 incorporating RS5000 which had been tested by the BRE in
 17 May 2014 and the description of that system in the BRE's
 18 test and classification reports issued following the
 19 test and described in the RS5000 product literature.
 20 This is fully addressed in the summary paper which
 21 Celotex provided to the Inquiry as an appendix to
 22 Mr O'Sullivan's witness statement.
 23 Once this issue had come to the attention of
 24 Celotex's current management, it was announced on
 25 Celotex's website and reported to the relevant

1 authorities and the Inquiry, as I've said. It involved
 2 unacceptable conduct on the part of a number of former
 3 employees. The tested system should clearly have been
 4 described accurately in both the BRE reports and in
 5 Celotex's product literature.
 6 In order to determine whether the misdescription of
 7 the test system gave rise to any safety issues, Celotex
 8 commissioned another BS 8414 test replicating as closely
 9 as possible the system described in the BRE reports and
 10 the RS5000 product literature. This further test was
 11 carried out in April 2018. It showed that the re-tested
 12 system met the performance criteria in BR 135. The
 13 results of this test were announced to the market and
 14 others on 2 May 2018.
 15 Celotex accepts, as I have said, that the system
 16 tested in May 2014 should have been accurately described
 17 in the product literature and the BRE reports, and
 18 I have explained the steps that Celotex took when this
 19 issue was discovered by its current management.
 20 However, there is no reason to believe that the
 21 misdescription of the tested system had any impact at
 22 all on the specification and use of RS5000 in the
 23 Grenfell Tower refurbishment. The rainscreen cladding
 24 system described in Celotex's product literature and in
 25 the BRE reports, as well as the system actually tested

1 in May 2014, were so substantially different from the
 2 rainscreen cladding system installed on Grenfell Tower
 3 that the BRE’s certification of RS5000 was simply not
 4 relevant to the external wall construction at
 5 Grenfell Tower. As a result, no construction
 6 professional could have relied on the BRE reports or
 7 Celotex’s product literature as demonstrating compliance
 8 of the rainscreen cladding façade at Grenfell Tower.
 9 This was confirmed by Dr Lane in her Phase 1 expert
 10 report. It has also been confirmed by Mr Hyett in his
 11 expert evidence this week.

12 It is, moreover, clear from the evidence of the
 13 Studio E, Harley and Rydon witnesses in Module 1 that no
 14 reliance was in fact placed by any designer or
 15 contractor on the description of the tested system in
 16 Celotex’s product literature or the BRE classification
 17 report. That evidence is addressed in paragraphs 52 to
 18 72 of Celotex’s written opening submission, together
 19 with the evidence of Celotex’s role in the specification
 20 and supply of RS5000 for use at Grenfell Tower. That is
 21 the issue to which I now turn.

22 There are four key points I would like to mention
 23 here.

24 First, Celotex FR5000 was specified for use in the
 25 Grenfell Tower project in 2012. That was before the

109

1 launch of RS5000. FR5000 was not marketed for use in
 2 buildings over 18 metres. It was specified for
 3 Grenfell Tower without Celotex’s knowledge and without
 4 any communication with Celotex. It appears to have been
 5 identified for the project by Max Fordham, and
 6 incorporated into the NBS specification by Studio E,
 7 without any regard to fire safety or compliance with
 8 ADB2.

9 Second, Celotex was first contacted by Harley about
 10 the use of insulation for Grenfell Tower in June and
 11 July 2014. At that stage, Celotex informed Harley that
 12 it did not yet have a product suitable for consideration
 13 on a building over 18 metres.

14 Third, after the marketing launch of RS5000,
 15 Mr Roome, who was then Celotex’s major projects and
 16 specification manager, sent Harley a full set of the
 17 RS5000 product literature, including the rainscreen
 18 cladding compliance guide. As a result, Harley had more
 19 than sufficient information about RS5000 to understand
 20 what factors it would need to consider when assessing
 21 compliance of the rainscreen cladding system that it was
 22 designing and installing at Grenfell Tower.

23 Fourth, in February 2015 there were a number of
 24 further email exchanges between Celotex and Harley.
 25 These concerned the calculation of U-values, which are

110

1 relevant to determining the thickness of insulation
 2 required for a rainscreen cladding system. They were
 3 not concerned with determining compliance of the
 4 cladding system with Building Regulations. That, as
 5 I have said, was not something on which a product
 6 manufacturer could advise, and was not Celotex’s
 7 responsibility.

8 Now, the evidence given in Module 1 shows that
 9 despite Celotex having made its product literature
 10 available to the designers and contractors involved in
 11 the Grenfell Tower refurbishment, none of them read that
 12 information with any care, if they read it at all. With
 13 two exceptions, the Harley and Studio E witnesses all
 14 confirmed that they did not read the literature at all
 15 or, if they did read it, they acknowledged that they did
 16 not do so carefully. They consequently paid no heed to
 17 the warnings given by Celotex about the need to ensure
 18 that any changes from the tested system described in
 19 Celotex’s product literature were considered by the
 20 building designer.

21 The two exceptions that I need to mention are
 22 Mr Ray Bailey, who was the sole director of Harley, and
 23 Mr Crawford of Studio E.

24 Mr Ray Bailey suggested that he had relied on
 25 a Celotex sales brochure, but it is apparent, we say,

111

1 from his evidence that, insofar as he read any of the
 2 Celotex product literature, he didn’t do so carefully.
 3 He claimed to have relied on a reference in the product
 4 literature to RS5000 having class 0 fire performance
 5 throughout, but that was irrelevant to assessing
 6 compliance of the insulation for a cladding system in
 7 a building over 18 metres, as I’ve explained.

8 Mr Ray Bailey also claimed in evidence that Celotex
 9 had signed off on the use of RS5000 at Grenfell Tower
 10 after carrying out a desktop study, and he claimed that
 11 that desktop study had been given to Mr Anketell-Jones,
 12 who was Harley’s design manager. However, no such
 13 desktop study has been disclosed by anyone to this
 14 Inquiry, and Mr Bailey admitted in further questioning
 15 that he had never seen such a study.

16 His evidence about Celotex signing off on the use of
 17 RS5000 and providing a desktop study to Harley was
 18 denied in terms by other Harley witnesses, including
 19 Mr Ben Bailey and Mr Anketell-Jones. Mr Ben Bailey said
 20 that he was given no assurances by Celotex as to the use
 21 of RS5000 in combination with the cladding panels used
 22 at Grenfell Tower. Mr Anketell-Jones, who indeed was
 23 the person within Harley with primary responsibility for
 24 ensuring compliance of the rainscreen cladding system,
 25 confirmed in his evidence that he had no discussions

112

1 with Celotex about the suitability of RS5000 for
2 Grenfell Tower, and that he was unaware of any desktop
3 assessment having been carried out for the
4 Grenfell Tower project.

5 So far as Mr Crawford is concerned, he claimed in
6 evidence that he had been misled by the RS5000
7 datasheet. However, we submit that his evidence cannot
8 be reconciled with his witness statement, where he said
9 that he had no specific recollection of reviewing the
10 datasheet. Mr Crawford also could not explain how he
11 had failed to appreciate the need to assess differences
12 between the system proposed to be installed at
13 Grenfell Tower and the system tested by Celotex, if he
14 had in fact read Celotex's product literature.

15 The Inquiry may consider that the evidence given by
16 Mr Ray Bailey and Mr Crawford on these points was
17 unsatisfactory and self-serving. Celotex submits that
18 it was not credible and is not reliable.

19 Rydon, however, tries to rely on the evidence of
20 Mr Ray Bailey and Mr Crawford to argue in its written
21 opening submission that Celotex is responsible for the
22 specification and use of RS5000 at Grenfell Tower,
23 rather than the designers and contractors. This, in our
24 submission, is a misplaced attempt by Rydon to avoid
25 responsibility for its own failings and the failings of

113

1 the designers and contractors for which Rydon is liable
2 as the main contractor on the project.

3 In considering Rydon's argument, it is necessary to
4 bear in mind the nature and extent of Rydon's own
5 responsibility for the non-compliance of the cladding
6 façade at Grenfell Tower. As the main contractor, Rydon
7 was contractually obliged to design and carry out the
8 refurbishment works in accordance with the
9 Building Regulations. Although Rydon engaged Studio E
10 and Harley as subcontractors, it remained responsible as
11 the main contractor for the design and construction of
12 the rainscreen cladding system and for ensuring that
13 that system complied with Building Regulations.

14 Despite this, Rydon had no experience or capability
15 to ensure that the cladding system was compliant.
16 No one at Rydon working on the refurbishment or, it
17 would appear, in Rydon more generally had any knowledge
18 or expertise in relation to fire safety, façade design
19 and construction, or regulatory compliance.

20 Rydon's witnesses also admitted that, despite Rydon
21 relying completely on subcontractors to ensure
22 compliance with Building Regulations, Rydon had no
23 processes to satisfy itself as to the competence of the
24 subcontractors that it used. As a result, neither
25 Studio E nor Harley were subjected to any or any

114

1 adequate due diligence process before they were engaged
2 by Rydon.

3 To compound matters, Rydon decided not to engage
4 Exova or any other fire safety consultant on the
5 Grenfell Tower project, despite Mr Lawrence, who was
6 Rydon's contracts manager, acknowledging in his evidence
7 that a fire safety consultant was essential on projects
8 of any complexity. It appears that this decision by
9 Rydon was driven by its desire to cut costs, which was
10 a major consideration for Rydon on this project, given
11 its miscalculation when tendering which meant that its
12 bid was understated by more than £200,000.

13 Rydon's attempt to shift responsibility onto Celotex
14 for its own failings is, Celotex submits, misconceived.
15 The evidence of Mr Ray Bailey and Mr Crawford is
16 unreliable for the reasons I have given. That evidence
17 cannot be taken at face value or to demonstrate reliance
18 by Harley or Studio E on anything said by Celotex in its
19 product literature.

20 Rydon also relies on the evidence of Mr Hoban, who
21 was the RBKC building control officer responsible for
22 checking compliance of the Grenfell Tower refurbishment
23 works. However, Mr Hoban's evidence does not support
24 Rydon's argument. It does not, we submit, demonstrate
25 any meaningful reliance on anything said by Celotex in

115

1 its product literature. Rather, it demonstrates
2 Mr Hoban's complete failure to carry out his function as
3 a building control officer with any degree of
4 competence.

5 Mr Hoban was assigned to the Grenfell Tower
6 refurbishment despite having a full workload and being
7 very ill-equipped for the role. He had no previous
8 experience of high-rise residential overcladding
9 projects. He had received no training on fire
10 performance in external wall construction, or the
11 fire safety classification of cladding materials. He
12 did not know what a BS 8414 test was, and he had never
13 read BR 135. He told his line manager, Mr John Allen,
14 that he was overstretched and he asked for help.
15 However, he was given no help.

16 Although Mr Hoban said he had checked the
17 suitability of the insulation used in the rainscreen
18 cladding system, his evidence on this was very confused.
19 He said that he had looked at either the Celotex or
20 Local Authority Building Control websites, but he was
21 unsure which website he had viewed and he could not
22 explain what information he had looked at on either
23 website.

24 Insofar as he saw anything, it is clear from his
25 evidence that he gave it no careful consideration.

116

1 In fact , he admitted that he never investigated
2 precisely why RS5000 was suitable for use in a building
3 over 18 metres, and he accepted that that was a serious
4 failing on his part.

5 When giving evidence last week, Ms Menzies was
6 particularly critical of Mr Hoban's failure to check
7 compliance of the products used in the cladding system.
8 She said that interrogating product literature was
9 a core function of a building control officer , and that
10 Mr Hoban should have understood that BS 8414 was
11 a system test and that he therefore needed carefully to
12 check the precise combination of materials used in the
13 cladding system. Mr Hoban, however, did not do that.

14 In short, Rydon's attempt to shift responsibility
15 onto Celotex is without merit and should, Celotex
16 submits, be rejected.

17 This brings me to TB4000. I can deal with this
18 shortly.

19 TB4000 is a general-purpose insulation board. It is
20 invariably bought in large quantities and different
21 thicknesses by distributors and builders' merchants as
22 a stock item. In December 2017, the Inquiry informed
23 Celotex that TB4000 had been found in window surrounds
24 at Grenfell Tower. The product had apparently been
25 glued to the underside of uPVC windows. It appears that

117

1 the TB4000 used at Grenfell Tower had been purchased by
2 SD Plastering, one of Rydon's subcontractors, from
3 a Travis Perkins outlet. Celotex did not know and had
4 no means of knowing that TB4000 was purchased and used
5 at Grenfell Tower in this way.

6 The decision to use TB4000 seems to have been taken
7 by Rydon in consultation with SD Plastering. The
8 decision appears to have been based on the product's
9 perceived ability to prevent bowing of window surrounds,
10 but without any regard to fire safety. Neither Rydon
11 nor SD Plastering considered whether use of TB4000 in
12 the window surrounds was compliant with the
13 Building Regulations or the guidance in ADB2.

14 Mr Lawrence, who, as I have said, was Rydon's
15 contracts manager, admitted in evidence that Rydon was
16 itself responsible for ensuring that use of TB4000 in
17 the window surrounds complied with Building Regulations,
18 because, he accepted, there was no other designer
19 involved in that aspect of the refurbishment on whom
20 Rydon could rely. This was therefore all down to Rydon.

21 However, neither Mr Lawrence nor anyone else at
22 Rydon investigated whether TB4000 was in fact suitable
23 for use in the window surrounds. As a result,
24 Mr Lawrence did not know that TB4000 was not a material
25 of limited combustibility, and he did not know that it

118

1 could not be used in the exterior wall construction,
2 unless the construction was shown to meet the
3 performance criteria in BR 135 or a holistic
4 fire engineering analysis was undertaken.

5 In short, we submit that responsibility for the
6 non-compliant use of TB4000 lies squarely with Rydon,
7 and not with Celotex.

8 Finally, Mr Chairman, I would like to say a few
9 words about Arconic.

10 Arconic manufactured, marketed and supplied the
11 Reynobond PE panels used as the cladding façade at
12 Grenfell Tower. The Inquiry's already found in its
13 Phase 1 report that these panels were the principal
14 reason for the devastating spread of fire up, down and
15 around the tower on 14 June 2017. These panels were
16 made of aluminium composite material, and they had
17 a core of unmodified polyethylene. Polyethylene is
18 highly flammable.

19 Unlike PIR, which could safely be used in compliance
20 with the Building Regulations in a cladding system, with
21 an appropriate combination of other components,
22 Reynobond PE could not safely be used in any cladding
23 system on a high-rise residential building. That was
24 demonstrated by the BS 8414 tests carried out by the
25 Department for Communities and Local Government

119

1 following the Grenfell Tower fire. Those tests showed
2 that cladding systems incorporating ACM panels with a PE
3 core failed to meet the BR 135 criteria, irrespective of
4 the kind of insulation with which the panels were
5 combined. The tests failed even when non-combustible
6 mineral wool insulation was used in a cladding system
7 with ACM PE panels.

8 By contrast, the tests carried out by the Department
9 for Communities and Local Government showed that
10 a cladding system combining Celotex RS5000 with an ACM
11 panel with a class A2 filler did in fact meet the BR 135
12 criteria. The experts appointed by the Department for
13 Communities and Local Government accordingly concluded
14 that PIR insulation could safely be used in a cladding
15 system with class A2 panels on residential buildings at
16 any height.

17 Now, although Reynobond panels with an A2 core were
18 available at the time of the Grenfell Tower
19 refurbishment, Arconic did not actively promote them.
20 The evidence suggests that Arconic did not do so because
21 it was concerned to ensure that its products remained
22 competitive in the UK, and its Reynobond PE panels were
23 cheaper than panels with an A2 or fire retardant core.

24 Arconic's documentary and other evidence is
25 summarised in Celotex's written opening submission at

120

1 paragraphs 85 through to 112. The Arconic evidence is
 2 summarised to the same effect in the written opening
 3 submissions of the two BSR legal teams. That evidence
 4 shows that, over an extended period, Arconic misled both
 5 the BBA and the market about the true fire performance
 6 of Reynobond PE panels.

7 The story begins with Arconic’s concealment of the
 8 results of a test it had carried out of Reynobond PE in
 9 cassette form when it applied for a certificate from the
 10 BBA in respect of Reynobond. Tests carried out by
 11 Arconic in 2005 under European standards had revealed
 12 a significant disparity between the fire performance of
 13 Reynobond PE in rivet form, which achieved class B, and
 14 Reynobond PE in cassette form, which failed the test
 15 completely and could only be classified as class E. It
 16 was Reynobond PE in cassette form that was used at
 17 Grenfell Tower.

18 Although Arconic was required by its contract with
 19 the BBA to disclose full particulars of all test data
 20 available on Reynobond, it provided the BBA only with
 21 copies of the test report for the rivet variant. It
 22 represented to the BBA that that test result was
 23 representative of the fire performance of Reynobond PE,
 24 however the product was fabricated.

25 As a result, when the BBA issued its certificate in

121

1 2008, it certified that Reynobond PE could be regarded
 2 as having a class 0 surface, based on the class B
 3 classification achieved by the rivet variant. The BBA
 4 has confirmed in witness statements provided to this
 5 Inquiry that, if it had known that the fire performance
 6 of the cassette variant was different to that of the
 7 rivet variant, it would have based its certification of
 8 Reynobond PE on the Euro class test results for each
 9 variant of the product. In that event, the cassette
 10 variant would have been restricted to buildings of less
 11 than 18 metres in height. The cassette panels could
 12 therefore not have been used at Grenfell Tower, and the
 13 tragedy of 14 June 2017 would not have occurred.

14 Now, further Euro class testing carried out by
 15 Arconic after the issue of the BBA certificate confirmed
 16 that the cassette variant only ever achieved class E.
 17 Those tests also demonstrated from 2014 onwards that the
 18 rivet variant only achieved class C. As a result, from
 19 2014 onwards, the product could not be said to have
 20 a class 0 surface, whatever its form of fabrication.

21 Despite this, Arconic continued marketing Reynobond
 22 PE in the United Kingdom as having a class 0 surface on
 23 the strength of the BBA certificate.

24 Throughout this period, Arconic ignored increasingly
 25 strident warnings from Mr Wehrle, the head of Arconic’s

122

1 sales technical support team, about the dangerous nature
 2 of Reynobond PE and the unsuitability of the product for
 3 use on any building façade of whatever height.

4 Mr Wehrle urged the company’s management to move all
 5 of its ACM business to fire retardant panels, but his
 6 advice was rejected, apparently on the ground that it
 7 was regarded by Arconic’s management as technical and
 8 anti-commercial. I quote there from an internal Arconic
 9 email of 29 June 2015.

10 Arconic steadfastly refuses to acknowledge any
 11 deficiency in its approach to the testing, marketing and
 12 supply of Reynobond PE. Celotex submits that the
 13 position Arconic has adopted in its opening for Module 2
 14 is untenable. I make the following particular points:

15 First, Arconic appears now to acknowledge that
 16 a cladding system incorporating Reynobond PE would not
 17 pass a BS 8414 test. However, Arconic continues to
 18 argue that the specification and use of Reynobond PE at
 19 Grenfell Tower could theoretically be justified by
 20 a holistic fire engineering report. That is completely
 21 unrealistic, given the fire propagation characteristics
 22 of Reynobond PE.

23 Second, Arconic argues that it was neither necessary
 24 nor relevant for it to provide the 2005 cassette test
 25 result to the BBA when applying for a certificate from

123

1 the BBA. That is simply untenable. Arconic’s contract
 2 with the BBA expressly required disclosure of all test
 3 data then available, as I’ve said.

4 Third, Arconic argues that once the BBA certificate
 5 was issued, there was no need for additional fire
 6 performance information regarding the surface of
 7 Reynobond PE to be disclosed to the BBA unless the fire
 8 performance of the surface of the product had changed,
 9 which it did not. That also is untenable. Arconic was
 10 expressly obliged by its ongoing contracts with the BBA
 11 immediately to notify the BBA of any new or additional
 12 information concerning Reynobond PE.

13 Fourth, Arconic argues that it was not in a position
 14 to determine if the state of the UK regulatory regime
 15 was such that continued sale of Reynobond PE was
 16 problematic, and that it was entitled to rely on what it
 17 describes as its belief that its product would be used
 18 in a safe manner. That also is untenable, in the light
 19 of the extensive documentary evidence showing that
 20 Arconic knew that Reynobond PE was unsafe and should not
 21 be used on building façades. Arconic’s documents show
 22 that it deliberately sought to leverage the difference
 23 between UK and European fire safety standards so as to
 24 continue selling Reynobond PE in the United Kingdom
 25 after it had been forced to stop selling that product in

124

1 countries that applied European standards.
 2 Arconic claims in its written opening that it has,
 3 from the outset, endeavoured to co-operate with this
 4 Inquiry, both as regards the provision of information
 5 and as regards oral evidence. However, Arconic appears
 6 to be hiding behind the French Blocking Statute to
 7 prevent its witnesses from attending to give evidence
 8 before this Inquiry. This makes Arconic's claim of
 9 co-operation a hollow one.
 10 Arconic's stance is odd, given that it specifically
 11 sought and obtained an extension of the
 12 Attorney General's undertaking in March 2020 on the
 13 ground that Arconic's witnesses would be giving evidence
 14 on behalf of the company, and that the company therefore
 15 also needed the benefit of an undertaking from
 16 the Attorney General.
 17 Arconic's reliance on the French Blocking Statute
 18 is, we suggest, plainly inappropriate given the public
 19 importance of the issues being examined by this Inquiry
 20 and the major role that Arconic's cladding panels played
 21 in the spread of fire on 14 June 2017. It is a matter
 22 of deep concern to Celotex that Arconic should be
 23 seeking to hide behind the French Blocking Statute in
 24 these circumstances.
 25 Celotex urges the Inquiry to continue its efforts to

125

1 achieve a resolution of this matter with the French
 2 authorities. It also invites Arconic to abandon its
 3 reliance on the French Blocking Statute so as to
 4 demonstrate that Arconic truly is intent on co-operating
 5 with this Inquiry.
 6 Sir, that only leaves me to thank you for this
 7 opportunity to make this opening statement.
 8 SIR MARTIN MOORE-BICK: Well, thank you very much, Mr Orr,
 9 it's been very helpful and interesting to hear what you
 10 have to say. Thank you very much indeed.
 11 Right, the next statement is going to be made by
 12 Mr Webb on behalf of Kingspan, so perhaps he could come
 13 up on the screen.
 14 Good afternoon, Mr Webb.
 15 MR WEBB: Good afternoon.
 16 SIR MARTIN MOORE-BICK: You can see and hear me all right,
 17 can you?
 18 MR WEBB: Yes, I can, sir.
 19 SIR MARTIN MOORE-BICK: Good. Well, we can see you and hear
 20 you very well, so please make your statement on behalf
 21 of Kingspan.
 22 Thank you.
 23 Opening statement on behalf of Kingspan by MR WEBB
 24 MR WEBB: Mr Chairman, members of the panel, this is the
 25 first time that Kingspan Insulation Limited has made

126

1 an oral statement to the Inquiry. This module will also
 2 be the first time that any of the employees of the
 3 company have given evidence to the Inquiry.
 4 The first thing I wish to say is that everyone at
 5 Kingspan Insulation has been deeply shocked by the
 6 devastating and appalling tragedy of 14 June 2017. It
 7 is a tragedy which resulted in the death of 72
 8 individuals, and the terrible suffering of so many other
 9 people.
 10 I speak on behalf of all those employed by the
 11 company and its representatives when I say that we all
 12 wish to express our profound sorrow that this disaster
 13 occurred, and to offer our deepest sympathies to the
 14 bereaved families, the survivors, the residents, and to
 15 everyone affected by the tragedy. It was a tragedy that
 16 should never have happened.
 17 Kingspan Insulation welcomes and supports the
 18 vitally important work of the Inquiry in its efforts to
 19 determine what went wrong and why. The company has
 20 worked hard to respond fully to all the questions asked
 21 of it, and it will continue to do so.
 22 Kingspan Insulation has set out its position
 23 concerning the content of Module 2 in its detailed
 24 written opening statement. That opening statement draws
 25 upon the evidence provided in 15 witness statements and

127

1 over 21,000 documents provided by the company to
 2 the Inquiry.
 3 Although Kingspan Insulation had no knowledge until
 4 after the tragedy that any of its insulation had been
 5 used in the refurbishment of the façade of
 6 Grenfell Tower, it's now clear that a limited amount of
 7 K15 phenolic insulation product was used during the
 8 refurbishment, when there were gaps in the availability
 9 of the specified insulation, Celotex RS5000 PIR. It's
 10 also now clear that another of its insulation products,
 11 TP10, was used in some window reveals.
 12 The company has looked in detail at its processes
 13 and procedures and has identified some important process
 14 shortcomings, particularly in relation to the way that
 15 three BS 8414 tests, one undertaken in 2005 and two in
 16 2014, were conducted and relied upon for the marketing
 17 of K15. However, further testing undertaken in 2015,
 18 2016 and since the fire has supported and validated the
 19 performance claims made historically in respect of those
 20 three earlier tests. The company is confident,
 21 therefore, that at the time of the Grenfell Tower
 22 refurbishment, these shortcomings did not affect the
 23 safety of any cladding system incorporating K15 which
 24 relied upon those three BS 8414 tests.
 25 Nevertheless, the shortcomings should not have

128

1 happened, and Kingspan Insulation offers a full and
 2 sincere apology for them. These issues have been set
 3 out in the witness statements of the company's
 4 employees, and in its written opening statement.
 5 Kingspan Insulation also wishes to make two
 6 important submissions at the outset, which are dealt
 7 with more fully in section F of its written statement.
 8 First, testing and peer-reviewed research carried
 9 out since the tragedy indicates that the PE-cored ACM
 10 cladding used on Grenfell Tower was unsafe and should
 11 not have been used on tall buildings.
 12 Second, the testing and research carried out
 13 indicates that the devastating spread of the fire was
 14 caused by the presence of that PE-cored ACM cladding,
 15 and that the outcome of the fire would not have been
 16 different in any material way if non-combustible mineral
 17 fibre insulation had been used behind that cladding
 18 instead of PIR.
 19 The company welcomes the detailed consideration of
 20 these important issues, including by the experts
 21 instructed by the Inquiry, in the coming modules.
 22 We recognise that the Inquiry is a dynamic process
 23 where evidence is heard and examined, and that core
 24 participants will have an opportunity to comment upon
 25 that evidence in closing submissions. However tempting

1 it might be to respond today to certain points raised in
 2 the opening statements of others, we will wait until the
 3 actual evidence has been heard in full, and will respond
 4 to that evidence by way of closing submissions in due
 5 course.
 6 My oral statement today will therefore be short, and
 7 will focus on the following six points:
 8 First, who is Kingspan Insulation and what is K15?
 9 Second, how did K15 come to be used in the
 10 refurbishment?
 11 Third, how did PE-cored ACM cladding come to be used
 12 on Grenfell Tower?
 13 Fourth, what issues arise from the fact that such
 14 cladding and such insulation were used?
 15 Fifth, the testing, certification and promotion of
 16 K15.
 17 Sixth, what Kingspan Insulation has done since this
 18 tragedy.
 19 So turning to the first point: who is
 20 Kingspan Insulation and what is K15?
 21 Kingspan Insulation is a company within the Kingspan
 22 Group responsible for the sale of Kooltherm K15
 23 insulation in Great Britain. K15 is a type of rigid
 24 board insulation made from phenolic foam.
 25 Insulation is a vital part of any construction, both

1 for environmental reasons and for the health and comfort
 2 of its residents. It's widely accepted in the industry
 3 that insulation should be added to buildings during
 4 cladding refurbishment. Relevant requirements in
 5 respect of the conservation of energy are set out in
 6 part L of the Building Regulations.
 7 The Building Regulations at the time of the
 8 refurbishment of Grenfell Tower permitted the use of K15
 9 on tall buildings provided that it was used as part of
 10 a cladding system which could be shown to be compliant
 11 with Approved Document B or with the BCA
 12 Technical Guidance Note 18.
 13 As the Inquiry has heard, at the relevant time,
 14 Approved Document B provided for three routes to
 15 compliance for any cladding system. The so-called
 16 linear route to compliance could be used if the
 17 insulation was classified as limited combustibility or
 18 as non-combustible. K15 was not classified as either
 19 and so could not have been used under the linear route.
 20 There were two other routes to compliance in
 21 Approved Document B. The second route required that the
 22 particular cladding system meet the criteria given in
 23 BR 135 when tested to BS 8414. The third route required
 24 assessment of the building as a whole by a fire
 25 engineer. The BCA Technical Guidance Note 18 also

1 allowed for compliance via desktop study.
 2 It is clear that none of these four routes were
 3 followed by those responsible for the design of the
 4 refurbishment of Grenfell Tower.
 5 Furthermore, as was concluded in the Phase 1 report,
 6 the functional requirements set by B4(1) of schedule 1
 7 to the Building Regulations, which requires that the
 8 external walls adequately resist the spread of fire, was
 9 not met. As was noted in the report, this was
 10 a submission that had been made by Kingspan Insulation
 11 in its Phase 1 closing submissions.
 12 It's important to note that Kingspan Insulation was
 13 not asked to provide and did not provide any advice to
 14 those responsible for the refurbishment about the
 15 suitability of K15 for use on Grenfell Tower with
 16 PE-cored ACM cladding. Indeed, the company did not know
 17 that any of its K15 product had been used on
 18 Grenfell Tower until after the fire had occurred.
 19 That brings me to the second issue: how did K15 come
 20 to be used in the refurbishment?
 21 The first point to note is the insulation specified
 22 by those responsible for the refurbishment of
 23 Grenfell Tower was Celotex RS5000 PIR and not K15
 24 phenolic insulation. Since the fire, Kingspan
 25 Insulation has learned and the Inquiry has heard that

1 there appear to have been supply problems in respect of
2 the Celotex product during the refurbishment, and that
3 in total 145 sheets of K15 were delivered by third-party
4 suppliers, SIF and CCF, to Grenfell Tower because of
5 short gaps in the availability of Celotex RS5000. Some
6 of those K15 sheets were supplied in May and the rest in
7 September 2015.

8 On the information currently available, it appears
9 that K15 constituted 5.2% by area of the rainscreen
10 insulation boards ordered for use in the refurbishment.
11 As I have said, at no stage did anyone involved in the
12 refurbishment ask Kingspan Insulation for advice as to
13 whether K15 should be used on the tower with PE-cored
14 ACM, and the company had no knowledge that K15 had been
15 used until after the fire.

16 The only contact that seems to have been made with
17 Kingspan Insulation in respect of the refurbishment was
18 a request for a single U-value calculation in July 2012.
19 That is a calculation of the thickness of insulation
20 needed to meet a specified thermal performance
21 requirement. That request made no reference to the type
22 of cladding being proposed. Kingspan Insulation heard
23 nothing more and had no other contact with those
24 responsible for the design of the refurbishment. As we
25 know, a decision was subsequently made to use the

133

1 Celotex PIR product.

2 As I've said, K15 was not classified as either
3 non-combustible nor of limited combustibility, and so
4 could not be used in the refurbishment via the linear
5 route to compliance. There was nothing in any of the
6 K15 product literature or third-party certification
7 current at the time of the refurbishment which stated
8 that K15 could be used under the linear route.

9 In short, no steps appeared to have been taken by
10 those responsible for the refurbishment to consider
11 whether PIR or K15 could be used in conjunction with
12 PE-cored ACM in a manner which was compliant with
13 Approved Document B or Technical Guidance Note 18. Had
14 that vital question been considered, the conclusion
15 would have been that PE-cored ACM could not be used with
16 the Celotex product or K15 unless verified by
17 a full-scale testing, a desktop study or a
18 whole-building fire engineering assessment. None of
19 those routes were followed by those responsible for the
20 refurbishment.

21 The third issue which arises is this: how did
22 PE-cored ACM cladding come to be used on Grenfell Tower?

23 Kingspan Insulation's understanding of the evidence
24 so far is that the BBA certificate for the PE-cored ACM
25 cladding used in the refurbishment stated that it

134

1 achieved Euro class B. The effect of this is that, in
2 principle, the linear route to compliance permitted the
3 use of PE-cored ACM cladding on tall buildings without
4 any further testing or fire engineering assessment,
5 provided that it was used in conjunction with
6 non-combustible or limited combustibility insulation.

7 The fundamental issue here is that, following the
8 Grenfell Tower fire, the testing commissioned by the
9 Department for Communities and Local Government
10 demonstrated that the PE-cored ACM cladding failed the
11 large-scale BS 8414 fire tests both when combined with
12 PIR insulation and when combined with non-combustible
13 synthetic mineral fibre insulation. These were not
14 marginal fails; they were out and out failures of the
15 test. Both systems failed in under eight minutes
16 because of flame height.

17 In other words, despite its apparent Euro class B
18 classification, the PE-cored ACM cladding system used
19 for Grenfell Tower was incapable of meeting the safety
20 standards set by BR 135, regardless of whether
21 non-combustible mineral fibre installation or PIR
22 insulation was installed behind it. This strongly
23 indicates that the PE-cored ACM cladding was not safe
24 for use, regardless of the type of insulation with which
25 it was combined.

135

1 The fourth issue is this: what issues arise from the
2 fact that PE-cored ACM cladding and PIR and phenolic
3 insulation were used in the refurbishment?

4 The first question which arises here and which this
5 module will be exploring is how and why the PE-cored ACM
6 cladding could ever have been certified as Euro class B
7 when in fact it failed, and failed so badly, to pass any
8 of the large-scale BS 8414 fire tests, regardless of the
9 type of insulation used behind it.

10 The second question, therefore, is whether the
11 linear route to compliance is fit for purpose, or
12 whether instead it is better to carry out large-scale
13 fire tests to ensure that the cladding system as a whole
14 can meet the relevant requirements of the Building
15 Regulations.

16 It's appreciated that opinions may be divided on
17 this issue but Kingspan Insulation believes that one of
18 the lessons to be learned from this tragedy is that it
19 is inherently safer to test any particular cladding
20 system as a whole rather than to assume that it would be
21 safe because each component has passed, or has
22 apparently passed, some smaller-scale test. We
23 understand that the value of large-scale testing will be
24 considered in Module 6, and we welcome that.

25 The third question which follows from the failure of

136

1 the PE-cored ACM cladding systems to pass BS 8414 tests
 2 when used with non-combustible mineral fibre insulation
 3 is this: would the nature or speed or spread of the
 4 Grenfell Tower fire have been any different had
 5 synthetic mineral fibre been used behind the PE-cored
 6 ACM cladding instead of PIR or phenolic insulation?
 7 This third question is of course an issue of very real
 8 importance, not least in terms of understanding the
 9 impact of different insulation types in cladding fires.

10 The DCLG tests show that a system using PE-cored ACM
 11 plus synthetic mineral fibre insulation failed just as
 12 quickly as the system using PIR insulation.
 13 Furthermore, extensive computer modelling undertaken by
 14 independent fire experts, Efectis, and published in
 15 a series of peer-reviewed academic papers, shows that
 16 the influence of the PE-cored ACM cladding was so
 17 dominant in the Grenfell Tower fire that replacing the
 18 PIR insulation with synthetic mineral fibre insulation
 19 would not have made any material difference to the
 20 nature or extent of the fire. That research was partly
 21 funded by Kingspan Insulation, but it was entirely
 22 independent of the company.

23 That research also shows that if A2-rated ACM, ie
 24 limited combustibility cladding, had been used with PIR
 25 insulation, then the fire would not have spread over the

1 building façade. It therefore appears to
 2 Kingspan Insulation from the evidence currently
 3 available that the decision to use PE-cored ACM cladding
 4 had the gravest possible consequences, regardless of
 5 what decision was then taken in respect of the type of
 6 insulation to be installed behind it.

7 Ultimately it will be a matter for the experts
 8 instructed by the Inquiry to provide their independent
 9 opinion evidence on these issues, and we look forward to
 10 the Inquiry examining these important issues in depth in
 11 due course.

12 Fifth, I come to the testing, certification and
 13 promotion of K15.

14 As at May 2015, when the first K15 sheets were
 15 delivered for use on Grenfell Tower, four systems
 16 incorporating K15 had been tested to BS 8414 and had
 17 successfully met the BR 135 criteria. By the time of
 18 the second supply of K15 for use in the refurbishment in
 19 September 2015, two more cladding systems incorporating
 20 K15, so six in total, had been successfully tested to
 21 BS 8414. A further 11 successful BS 8414 tests had been
 22 undertaken since September 2015 involving cladding
 23 systems using K15.

24 However, the tragedy of the Grenfell Tower fire has
 25 caused Kingspan Insulation to review in detail the

1 product development, testing, certification and
 2 promotion of K15. As I have said, this review has
 3 identified some important process shortcomings,
 4 particularly in relation to the way certain tests of
 5 cladding systems undertaken in 2005 and 2014 were
 6 conducted and relied upon for the marketing of K15.
 7 Those issues have been set out in the witness statements
 8 provided by the company's employees and have been
 9 summarised in its written opening statement.

10 In particular, as to the testing, it's recognised
 11 that there were production process changes after the
 12 original 2005 BS 8414 test, and that a new test should
 13 have been carried out following these changes. However,
 14 that 2005 test has now been replicated as closely as is
 15 possible using current standard K15 and it passed.

16 It's also recognised that another of the six
 17 successful tests undertaken by September 2015, namely
 18 a 2014 test using a terracotta cladding system, had used
 19 a research and development variant of K15 and so that
 20 test should not have been relied upon. However, two
 21 further BS 8414 tests of similar terracotta systems
 22 using current standard K15 were undertaken in 2015 and
 23 2016 and both also passed and met the criteria in
 24 BR 135.

25 The four other BS 8414 tests which had been carried

1 out by September 2015 were all successful tests of
 2 cladding systems using current standard K15.

3 Some shortcomings in respect of K15 marketing and
 4 product literature have also been identified, which
 5 again have been set out in the witness statement and in
 6 the opening statement.

7 As at today's date, a total of 15 BS 8414 tests of
 8 cladding systems incorporating current standard K15 have
 9 successfully met the criteria used by BR 135. That
 10 includes three tests using A2 ACM panels as well.
 11 Kingspan Insulation is confident that ADB-compliant
 12 cladding systems that incorporate K15 are safe.
 13 Furthermore, many regulatory regimes around the world
 14 allow the use of suitably tested systems incorporating
 15 K15 on tall buildings.

16 It is important to emphasise that a large-scale fire
 17 test such as BS 8414 is a test of the entire cladding
 18 system. A failed BS 8414 test therefore means that the
 19 cladding system as a whole has failed, but it does not
 20 necessarily follow that there is a problem with the
 21 insulation. An example of this is the failed BS 8414
 22 test carried out in 2007 on a Sotech system using K15.
 23 Certain individuals at Kingspan Insulation were
 24 naturally very concerned about this failure and
 25 expressed their concerns in emails, some of which have

1 been quoted in the written submissions of other core
2 participants .

3 What has received less attention , however, is the
4 fact that a very similar if not identical Sotech
5 cladding system was tested shortly afterwards using
6 non-combustible synthetic mineral fibre insulation
7 instead of K15, and that also failed the test . That's
8 set out in paragraph 46 of our written statement.

9 The reality is that such failed tests demonstrate
10 that the BS 8414 system was working robustly in
11 identifying that some cladding systems were not capable
12 of passing the test , regardless of the type of
13 insulation used behind them.

14 The sixth issue I would like to mention is the
15 initiatives taken by the company since the tragedy.

16 Kingspan Insulation has implemented wide-ranging
17 improvements of its processes and procedures, addressing
18 the specific shortcomings that it has identified
19 historically , but also improving its procedures
20 generally . These changes have been set out in witness
21 evidence and summarised in the written opening statement
22 provided by the company.

23 They include, briefly : first , improvements to
24 product traceability ; second, the introduction of a new
25 protocol and guidance on fire testing; third, a review

141

1 of the marketing literature and performance claims
2 relating to its insulation products; fourth, the
3 publication on its website of all BS 8414 test reports
4 of systems incorporating standard K15, whatever the
5 outcomes of those tests ; fifth , new marketing protocols;
6 sixth , a new code of conduct; seventh, improved
7 technical support provided under the Kingspan assured
8 technical support programme; eighth, a new accreditation
9 protocol governing new or amended certification
10 procedures; and ninth, improved change management
11 procedures.

12 Finally , I conclude by saying that
13 Kingspan Insulation is committed to assisting this
14 Inquiry to get to the truth as to both how and why this
15 tragedy occurred, and what can and should be done to
16 ensure that no future tragedies of this nature can
17 occur . The company will continue to support the work of
18 the Inquiry at every step of the way.

19 So, Mr Chairman, thank you, and thank you for the
20 opportunity to make these submissions.

21 SIR MARTIN MOORE-BICK: Well, thank you very much, Mr Webb.
22 It's certainly been very interesting and helpful to hear
23 from you, so thank you again.

24 Now, the next person to address us is Mr Sawtell,
25 who is going to make an opening statement on behalf of

142

1 the British Board of Agrément.

2 So good afternoon, Mr Sawtell, you are there.

3 MR SAWTELL: Good afternoon, sir, yes, indeed.

4 SIR MARTIN MOORE-BICK: You can see me, I can see you; yes?

5 MR SAWTELL: Yes, indeed.

6 SIR MARTIN MOORE-BICK: And we can hear each other, so
7 that's good.

8 Well, would you like to go ahead and make your
9 statement . I am sorry we are running a bit late , but
10 you shouldn't feel at all under any pressure from me, at
11 least , of time, and we will take a break after we have
12 completed your opening statement. So when you are
13 ready.

14 Opening statement on behalf of the British Board of Agrément
15 by MR SAWTELL

16 MR SAWTELL: Thank you.

17 Mr Chairman, madam, sir, I represent the British
18 Board of Agrément and I'm here to provide you with my
19 opening oral submissions.

20 The BBA expresses its deepest sympathy to the
21 bereaved, victims and survivors of the Grenfell Tower
22 fire . As an organisation, it is committed to helping
23 improve construction safety to prevent such a tragedy
24 from occurring in the future.

25 Part of the purpose of the Inquiry is to examine the

143

1 decisions relating to the design, construction and
2 refurbishment of Grenfell Tower. It is also to examine
3 the guidance and industry practice relating to
4 construction works on such high-rise residential
5 buildings .

6 An essential aspect of the commitment to prevent
7 this tragedy recurring is to look critically at these
8 issues and to determine what can be improved.

9 The founding purpose of the BBA was to provide
10 an independent, authoritative source of data on the
11 performance of construction materials and their
12 suitability for use in clearly defined applications . It
13 is in that spirit the BBA has engaged with and
14 contributed to the efforts to prevent such a tragedy
15 happening again. The BBA led evidence to the
16 Hackitt Inquiry and to the parliamentary committee set
17 up to consider its findings . The BBA has agitated for
18 a full adoption of the Hackitt Report's findings, which
19 it enthusiastically endorses. The BBA has also provided
20 evidence to the Metropolitan Police as part of their
21 investigation . The BBA has disclosed a number of
22 documents and provided several witness statements to
23 this end. It has been and it continues to be ready to
24 provide what assistance it can.

25 To consider what the BBA does, the Agrément Board

144

1 itself was established by the Government in 1966
 2 following building failures attributed to the
 3 inappropriate use of construction materials. The
 4 Agrément Board became the BBA in 1982, at the same time
 5 as it became a self-funding, non-profit distributing
 6 company with no formal government association.

7 Part of the function of the BBA is to issue agrément
 8 certificates in respect of building materials.
 9 A certificate states the BBA's opinion as to a product's
 10 compliance or contribution to compliance with the
 11 particular Building Regulations noted in the
 12 certificate. Fire safety is one part of the content of
 13 a certificate.

14 In the witness statement evidence provided by the
 15 BBA, and in particular the first witness statement of
 16 John Albon, it describes what the relationship is
 17 between a BBA certificate and the relevant Building
 18 Regulations and product safety standards.

19 Each certificates maps the applicable
 20 Building Regulations considered in the BBA's assessment.
 21 The Building Regulations themselves are supported by
 22 approved documents, which provide guidance on measures
 23 to allow a construction to satisfy the relevant
 24 regulatory requirements.

25 In terms of fire safety, products are certified by

1 reference to Approved Document B. Approved Document B
 2 set out systems for classifying the reaction to fire
 3 properties of a product using either a national or
 4 a European classification system. It then sets out
 5 a minimum class deemed to satisfy particular types of
 6 application.

7 Diagram 40 of Approved Document B defines
 8 permissible areas of use on a building for products
 9 based on their reaction to fire characteristics.
 10 Materials achieving class 0 can be used in the same
 11 locations as those achieving Euro class B. The test
 12 methods set out in BS 476 are the ones used to achieve
 13 class 0, and the tests defined in BS EN 13501 are used
 14 to achieve Euro class B.

15 BS 476 and BS EN 13501 test different things, but
 16 both result in a reaction to fire classification. Both
 17 tests are acceptable when making a decision about
 18 reaction to fire when considering diagram 40, and in
 19 terms of its application in the approved document, the
 20 two classifications are functionally equivalent, even if
 21 they are different tests.

22 A certificate does not extend to individual
 23 applications. It is a summary allowing a designer of
 24 a structure to make an informed decision on the
 25 performances of a product. A BBA certificate therefore

1 draws the designer's or specifier's attention to the
 2 relevant standards applicable to that product, and this
 3 includes but is not limited to fire safety. It provides
 4 an independent opinion as to performance of that product
 5 assessed against those standards.

6 The BBA's processes that lead to this opinion are
 7 themselves independently reviewed by UKAS.
 8 A BBA certificate therefore affords confidence to
 9 a specifier or designer as to the assertions made by
 10 a product's manufacturer about their product's
 11 properties. A BBA certificate provides a summary of the
 12 information necessary to make a decision on
 13 an individual application.

14 But a BBA certificate must be read in its entirety.
 15 They are intended to be technically robust but also
 16 concise. It is self-evidently not possible to fit all
 17 of the relevant information required by a designer or
 18 specifier on the first page. In a short section in the
 19 first page, it will refer to the contents of the
 20 certificate itself.

21 The BBA's relationship with certificate holders is
 22 contractual. A certificate is based on the documentary
 23 material that is provided by the supplier, and the
 24 applicant certificate holder pays a fee to the BBA for
 25 initial assessment and, if appropriate, certification

1 and subsequent inspections. Pursuant to its contract,
 2 the supplier has obligations to make disclosure of any
 3 testing that has been carried out. Any changes to the
 4 composition of the material also have to be reported
 5 under the contract by the manufacturer.

6 The effectiveness of the certification process is
 7 therefore based on certificate holders observing the
 8 terms of their certification contract in good faith,
 9 both during the initial assessment process and during
 10 ongoing surveillance, as well as rigorousness of the
 11 BBA's own assessment, certification and inspection
 12 processes. It is particularly important that
 13 manufacturers disclose to the BBA all test results and
 14 other information that may be relevant to the assessment
 15 of the product.

16 The standard certification process of the BBA has
 17 been set out in a number of its witness statements and
 18 is summarised in its opening statement, and I would
 19 refer the Inquiry to that.

20 If I turn to the certified products that are being
 21 considered by the Inquiry.

22 The BBA had issued certificates in respect of two of
 23 the materials used in the refurbishment of
 24 Grenfell Tower which are an issue for this Inquiry:
 25 firstly, Kingspan Kooltherm K15; secondly,

1 Reynobond architecture wall cladding panels, covering
 2 both the standard and fire retardant grades of the
 3 product, and the BBA understands that this was marketed
 4 as Reynobond 55 PE. The BBA has detailed in its
 5 evidence to the Inquiry the process in which those
 6 product manufacturers applied for certification, the
 7 documentation that was provided with their applications,
 8 and the subsequent surveillance, reviews and updates of
 9 the certificates.

10 The two products were first certified in 2008.
 11 Kingspan first applied for certification in 2003, and
 12 Alcoa, as Arconic was then known, applied in 2006. The
 13 evidence, therefore, also shows the evolution of the BBA
 14 as an organisation in the timeframe since those
 15 applications were made, with greater levels of
 16 supervision, training and continuing development
 17 evolving over time within a more formal structure, and
 18 this is a process that has continued since June 2017 as
 19 well.

20 Turning first to Kingspan K15.

21 The K15 certificate went through a number of
 22 re-issues from 2008 to 2013, before a new certificate
 23 was issued in 2015. The wording on the certificate was
 24 changed on each occasion. So the history of the
 25 certification of Kingspan K15 illustrates the different

149

1 measures the BBA put in place to ensure the certificate
 2 wording is not capable of misinterpretation.

3 On 30 October 2020, after the BBA submitted its
 4 written opening statement, and before the BBA had seen
 5 Kingspan's opening statement, Kingspan wrote to the BBA
 6 advising them that they will be withdrawing three
 7 BS 8414 test reports from circulation. The BBA has been
 8 in direct contact with Kingspan, and Kingspan's opening
 9 statement has subsequently been amended as well. The
 10 BBA certificate for Kingspan K15 was already in the
 11 process of being re-issued at the instigation of
 12 Kingspan. Pending further information from Kingspan,
 13 the current Kingspan certificate has, as a result, been
 14 suspended in accordance with the BBA's procedures, and
 15 the BBA's website is in the process of being updated to
 16 reflect the suspension of the certificate.

17 I will now turn to Arconic Reynobond.

18 There was one certificate for Reynobond architecture
 19 wall cladding panels. The history of the information
 20 provided to the BBA by Alcoa, then Arconic, compared to
 21 the information actually in the BBA's possession has
 22 been of great concern to the BBA. The witness statement
 23 of Brian Moore, a former executive director of the BBA,
 24 and the first witness statement of John Albon, head of
 25 approvals for construction products, details the

150

1 information that was not provided to the BBA about the
 2 reaction to fire properties of Reynobond.

3 At the time that Alcoa applied for certification, it
 4 had in its possession a report that stated that the
 5 cassette version of the product had a significantly
 6 worse fire classification rating to the riveted version.
 7 Alcoa was aware at the time of the original assessment
 8 that the cassette version should have been classified as
 9 E at the time of the initial BBA assessment.

10 When Alcoa was presented with draft certificates by
 11 the BBA, it did not correct them to show that there was
 12 a very significant difference between the riveted and
 13 cassette versions. Alcoa never provided this
 14 information to the BBA prior to the Grenfell Tower fire.

15 The BBA was not advised in advance of any
 16 significant changes to the specification of the product
 17 during the lifetime of the certificate. It was in fact
 18 a BBC journalist who alerted the BBA to the fact that
 19 the core to a Reynobond PE product had been changed in
 20 2015. Mr Brian Moore describes in his witness statement
 21 the subsequent enquiries that the BBA carried out.

22 In November 2018, the BBA was provided with advance
 23 disclosure of appendix O of Dr Barbara Lane's report,
 24 which was approximately a month before publication. The
 25 BBA was concerned about the discrepancy between the

151

1 information that Dr Lane was provided with by Arconic
 2 and the information they had been provided with by Alcoa
 3 or Arconic during the certification process. Dr Lane
 4 referred to a number of documents relevant to
 5 certification that the BBA had not seen. At the same
 6 time, the BBA had further documents that Dr Lane had
 7 apparently not seen.

8 In short, the BBA were not provided with relevant
 9 fire test results by Arconic either when Reynobond was
 10 originally certified or when the certificate was
 11 subsequently reviewed.

12 Once the BBA became aware of the existence of
 13 additional technical information that had been withheld,
 14 it entered into a series of correspondence seeking
 15 clarification. As Arconic were unable to explain the
 16 failure to provide this information to the BBA's
 17 satisfaction, the certificate was suspended on
 18 16 November 2018 and subsequently withdrawn on
 19 28 February 2019.

20 If the information made available to Dr Lane was
 21 made available to the BBA either during the application
 22 process or afterwards, the BBA would have either
 23 re-issued or amended the certificate to reflect the
 24 distinction between the FR and PE core and the riveted
 25 and cassette forms of the product. Had the reports that

152

1 Dr Lane referred to been made available to the BBA, it
 2 would have written or updated the certificate to provide
 3 the correct classifications and to place these in the
 4 context of Approved Document B. If the BBA had known
 5 that the cassette version of the product was class E and
 6 achieved a different reaction to fire classification to
 7 a riveted version, which was class C, the certificate
 8 would have shown both the differences between the two
 9 versions and reflected those fire classifications .

10 The BBA understands that the Reynobond cladding used
 11 on the refurbishment of Grenfell Tower had a smoke
 12 silver /pure white Duragloss surface coating. As noted
 13 in section 6.1 of the certificate , the fire test
 14 provided to the BBA was in respect of a grey/green
 15 Duragloss 5000 coating. The certificate confirmed that
 16 these performances may not be achieved by other colours
 17 of the product. The Reynobond cladding therefore used
 18 in the refurbishment at Grenfell Tower was not covered
 19 by a BBA certificate , as that certificate did not cover
 20 the colours of the product used on the building.

21 In its opening statement, the BBA has commented on
 22 proposals for change. The BBA has made changes to its
 23 processes, certificate wording and training before and
 24 after the fire at Grenfell Tower. It has also commented
 25 on Dr Barbara Lane's proposals. Some of the points that

1 Dr Lane has made, such as the references to class 0,
 2 hinge on the way in which Approved Document B is worded,
 3 and this is not for the BBA, as an independent
 4 certifier , to comment on. Similarly, the BBA does not
 5 provide a value judgement as to the merits or worth of
 6 different fire testing methods.

7 The BBA has now moved to a position of carrying out
 8 its own surveillance across all products. The way in
 9 which the BBA trains its staff has evolved, and
 10 a significant amount of technical staff 's time is
 11 devoted to building technical knowledge. The
 12 effectiveness of the BBA's training and competence of
 13 the staff involved is examined by UKAS, its
 14 accreditation body.

15 The BBA does not agree that fire test data and
 16 classification reports for a product be provided as part
 17 of the certificate , and this is to prevent a certificate
 18 becoming overly long or difficult to use, the BBA does
 19 now reference fire test reports on which the certificate
 20 content is based to enable a specifier to make their own
 21 assessment of the results . The BBA would again
 22 emphasise that certificates are concise documents and
 23 that they must be read in their entirety .

24 As for failed fire test results , the BBA suggest
 25 that testing on developmental versions of a product has

1 no relevance to classification . If a particular product
 2 has failed to meet a testing standard, but the designers
 3 amend it so that the product then meets the standard
 4 following a further test , the original failed test may
 5 not be relevant. If , however, a final version of
 6 a product has been tested a number of times with
 7 different results , the BBA would expect to be provided
 8 with these tests , and this is relevant to a product
 9 certificate .

10 Again, the BBA is clear in this position that if it
 11 had been provided with all the information in Arconic's
 12 possession, both at the time the certificate for
 13 Reynobond architecture wall cladding panels were issued
 14 and afterwards, it would have made a material difference
 15 to the content of that certificate .

16 So as to reduce the likelihood of information being
 17 omitted from disclosure or presented in a misleading
 18 way, the BBA's contracts are being reviewed. The BBA
 19 itself has made proposals to support a process of
 20 certification and to ensure that the information
 21 provided to the certification body is as accurate as
 22 possible.

23 These are details in the BBA's written opening
 24 statement and they are two-fold. Firstly , to reinforce
 25 the contractual obligation of candour when providing

1 information to a certification body with a duty of fair
 2 presentation, buttressed by the criminal law if false or
 3 misleading information is provided. This would be
 4 an ongoing obligation to cover changes to the certified
 5 product. Secondly, to clarify and improve whistleblower
 6 protection for an employee of a product manufacturer.

7 To conclude the BBA's opening position, it is
 8 important for specifiers and designers to have
 9 independent verification of the properties of a product
 10 and its performance in relation to prevailing safety
 11 standards. This is not only in relation to its reaction
 12 to fire but its other material properties.

13 There are three parts to this, however.

14 The first is that relevant fire safety standards
 15 against which a product is being assessed should be
 16 clear and relevant. Without this, the yardstick that
 17 the certifying body is comparing the product against is
 18 not as unambiguous or likely to promote better fire
 19 safety outcomes as it ought to be.

20 Secondly, the information that the certifying body
 21 is provided with must be accurate and free from material
 22 omissions.

23 Thirdly, the systems and processes that a certifying
 24 body has in place must be robust, its training and
 25 expertise must be of a high standard and the

1 certificates that it provides must be independent.
 2 The BBA will provide its best assistance to
 3 the Inquiry. It will do what it can to prevent
 4 a recurrence of this tragedy. The BBA has closely
 5 considered the Phase 1 report. It will carefully
 6 consider the evidence presented in this module, and it
 7 will comment as appropriate at that conclusion. In due
 8 course, the BBA will implement any recommendations that
 9 the Inquiry will propose.

10 SIR MARTIN MOORE-BICK: Thank you very much indeed.

11 I think at this point in the afternoon we will take
 12 a short break. When we come back at 3.35, we will hear
 13 from counsel for the Fire Brigades Union.

14 So 3.35, please. Thank you.

15 (3.25 pm)

(A short break)

17 (3.35 pm)

18 SIR MARTIN MOORE-BICK: Good. Well, now, the next person to
 19 address us will be Mr Seaward on behalf of the Fire
 20 Brigades Union. So could we have Mr Seaward up, please.

21 Good afternoon.

22 MR SEAWARD: Good afternoon, Mr Chairman.

23 SIR MARTIN MOORE-BICK: You can see me clearly and hear me
 24 well enough?

25 MR SEAWARD: Yes, I can see you and hear you.

1 SIR MARTIN MOORE-BICK: Very good.
 2 Now, you are going to make an opening statement on
 3 behalf of the FBU; is that right?

4 MR SEAWARD: Yes, indeed.

5 SIR MARTIN MOORE-BICK: So when you are ready, let's start.

6 Opening statement on behalf of the Fire Brigades Union
 7 by MR SEAWARD

8 MR SEAWARD: Thank you, Mr Chairman, Ms Istephan and
 9 Mr Akbor of the panel, and your assessors,
 10 Professor Nethercot and Mr Montgomery.

11 The Fire Brigades Union, the FBU, remains humbled by
 12 the Grenfell Tower disaster and committed to a full and
 13 open Inquiry with the BSRs at its heart.

14 The documentary evidence disclosed for Module 1 and
 15 confirmed by the oral evidence given so far shows
 16 widespread ignorance, neglect and/or complacent
 17 assumption amongst those engaged in the construction of
 18 the rainscreen cladding system for the façades and crown
 19 of Grenfell Tower, both of the increased fire hazards
 20 associated with the rainscreen cladding system and of
 21 the relevant Building Regulations and guidance in
 22 Approved Document B, and of the associated testing
 23 certification and classification regime. It seems
 24 no one involved in the construction project thought
 25 fire. It was always assumed to be someone else's job,

1 with the result that the increased fire risk of the
 2 rainscreen cladding system was almost completely
 3 overlooked. How did this situation arise? How can it
 4 be avoided in future?

5 In Module 2, the FBU understands the Inquiry intends
 6 to undertake an investigation into the testing,
 7 certification and classification of specific external
 8 wall materials used on Grenfell Tower, including, as the
 9 CTI has confirmed this morning, whether the testing,
 10 certification and classification regime was fit for
 11 purpose.

12 One notes the inevitable overlap with Module 6 and
 13 are grateful for that clarification.

14 Dr Lane has already reported her opinion in
 15 section 11 of her main report that the entire building
 16 envelope system was non-compliant with the functional
 17 requirements of B4 and B3 of the Building Regulations,
 18 that some of the cavity barriers used in the
 19 refurbishment of GT were not classified for the required
 20 fire performance by ADB 2013, and she listed the
 21 products, the use of which were fundamentally
 22 non-compliant, and thereby provides a focus for
 23 Module 2. These products included the Reynobond ACP
 24 polyethylene, PE, cassette panels, and the thermal
 25 insulation boards attached to the original concrete

1 wall, Celotex RS5000 and Kingspan K15.

2 Also fundamentally non-compliant were several other
 3 important products used in the rainscreen cladding
 4 system: the Aluglaze styrofoam core insulating panels
 5 installed between the windows and by the kitchen extract
 6 vents; the Kingspan TP10 insulation specified for
 7 insulation around the kitchen extract fans; the Celotex
 8 and Kingspan polymeric insulation boards, eg TB4000 and
 9 TP10, used to insulate the window reveals and close the
 10 new cavity formed between the old and new infill panels
 11 between windows; and the Siderise Lamatherm RH25 G
 12 cavity barriers. These all played a part, allowing the
 13 spread of fire out of flat 16, back into the other flats
 14 as it spread over Grenfell Tower, and these will not be
 15 overlooked.

16 Turning to the expert evidence for Module 2, Dr Lane
 17 has confronted the complexities and described the
 18 requirements of the Building Regulations, the guidance
 19 in ADB and the fire tests relating to a rainscreen
 20 cladding system in appendix F of her Phase 1 report.
 21 She did so to provide a detailed understanding of the
 22 requirement at the time of the Grenfell Tower fire, and
 23 also to provide a basis for formulating future changes,
 24 saying, importantly, "What is important now is to remove
 25 any means for loose interpretation of the fire safety

1 requirements regarding external wall construction".
 2 But the explanatory note issued by the Government
 3 soon after the Grenfell Tower fire did just that. This
 4 was the DCLG's note 4, which provided another means for
 5 loose interpretation, by conflating the polyethylene
 6 core of the ACP panels with insulation materials by
 7 labelling it "filler material", and thereby applying the
 8 requirements in section 12.7 of ADB for insulation
 9 materials instead of those in section 12.6, external
 10 wall surfaces. Dr Lane has explained the error of this
 11 approach. This note 4 exemplifies the inadequacy of
 12 a piecemeal approach to revising the guidance in ADB.

13 For a long time before the Grenfell Tower disaster,
 14 ADB needed wholesale review and revision, not piecemeal
 15 amendment, to provide the construction industry with
 16 useful guidance on how to meet the functional
 17 requirements of regulations B3 and B4(1) and (2) when
 18 re-cladding existing high-rise residential buildings.

19 Rainscreen cladding systems can be beneficial by
 20 increasing thermal efficiency and keeping buildings dry,
 21 but, as now seems obvious, they can increase the risk of
 22 fire unless carefully designed and installed. The
 23 authors of note 4 did not conquer the complexities of
 24 ADB, neither did those involved in the refurbishment of
 25 Grenfell Tower. There must, the FBU submits, be

161

1 a reason why the designers of the rainscreen cladding
 2 system at Grenfell Tower, including architects and
 3 cladding specialists, did not understand the relevant
 4 sections of the ADB.

5 The FBU submits there are three major factors: (1)
 6 the breathtaking failure of the design team to read and
 7 understand guidance; (2) the complexity of that
 8 guidance; and (3) the inadequacies of the testing,
 9 certification and classification regime. These issues,
 10 like the modules for this Inquiry, are all interlinked.
 11 They all reflect the culture of complacency referred to
 12 in our opening submissions for Module 1.

13 As to the first, the breathtaking failure of the
 14 design team to read and understand the guidance, and
 15 without repeating the transcript references set out in
 16 the FBU's written opening submissions for Module 2,
 17 Andrzej Kuszell did not re-acquaint himself with
 18 regulations B3 and B4 and so could not supervise
 19 Bruce Sounes.

20 Mr Sounes had not heard of the phrase "limited
 21 combustibility", and could not recall if he was aware
 22 that buildings over 18 metres had different guidance.
 23 He did not recall reading section 9 of appendix B to ADB
 24 during the GT project. He did not know the potential
 25 routes to compliance under ADB at the time of the GT

162

1 project and could not confirm which route was actually
 2 followed.

3 Neil Crawford assumed it was the linear route,
 4 meaning sections 12.6 to 12.9 of ADB, although he never
 5 discussed this with anyone.

6 Tomas Rek was not aware of the general principle
 7 that insulation in walls of buildings with a storey more
 8 than 18 metres above ground level should be of limited
 9 combustibility, and couldn't define a material of
 10 limited combustibility.

11 Kevin Lamb did not know what route to compliance was
 12 taken at Grenfell Tower. He knew that insulation
 13 products needed to be class 0, but he didn't know they
 14 had to be of limited combustibility.

15 Reading the guidance would have helped, and better
 16 training for these members of the design team would have
 17 helped.

18 As to the second factor identified above, the
 19 complexity of that guidance, the Inquiry may find the
 20 complexity of the guidance in ADB contributed to the
 21 Grenfell Tower disaster itself. The complexity is
 22 demonstrated both by the misfired note 4 published by
 23 the Government post-Grenfell, and the widespread
 24 ignorance of the design team on the Grenfell Tower
 25 project. The existence of so many high-rise residential

163

1 buildings with what is now recognised to be dangerous
 2 cladding up and down the country may support such
 3 a conclusion.

4 Dr Lane and her team have now undertaken a wholesale
 5 review of the guidance in ADB, and she has recommended
 6 a spate of necessary revisions. The FBU submits the
 7 Government should have conducted a wholesale review of
 8 the guidance in ADB long before the Grenfell Tower
 9 disaster, prompted by the inquests into the fatal fires
 10 at Shirley Towers and Lakanal House.

11 As to the third, the inadequacies of the testing,
 12 certification and classification regime, and
 13 commensurate with the complexity of the guidance in ADB,
 14 the testing and certification regime was mind-boggling.
 15 Dr Lane describes a range of different testing methods
 16 that could be adopted to enable a material or product to
 17 be certified as passing either national class standards,
 18 ie British Standard testing, or European standards. She
 19 summarises them in several tables in her appendix F.

20 The Inquiry may find that this added layer of
 21 complexity deterred both the practitioners in the design
 22 team on the Grenfell Tower project and those responsible
 23 for enforcing the regulations from engaging with the
 24 documents such as BR 135, and led them instead to rely
 25 on the contradictory guidance in diagram 40: no need to

164

1 read the book; just look at the pictures .
 2 The Chairman cited with approval at 21.62 of his
 3 Phase 1 the opinions of Professor Bisby and
 4 Professor Torero, who were at pains to emphasise the
 5 complexity of the rainscreen cladding system in terms of
 6 the interactions between its various components when
 7 exposed to fire . The Chairman expressed his intention
 8 to investigate the extent to which those complexities
 9 were recognised and understood by those in the design of
 10 the refurbishment, and the extent to which the current
 11 evaluation and testing regime is capable of ensuring
 12 that they are properly accessed.

13 Consistently with Professors Torero and Bisby,
 14 Dr Lane testified last week that with a rainscreen
 15 cladding system affixed to the façades and crown,
 16 Grenfell Tower was a complex building. This should have
 17 been recognised at the time by those involved in its
 18 refurbishment. Dr Lane should know that many of the
 19 victims of the Grenfell Tower disaster, and I include
 20 injured firefighters among them, have read and welcomed
 21 her reports and respect her painstaking determination to
 22 unravel these complexities.

23 I turn to the public interest in testing these
 24 building materials.

25 The Chairman of the panel has already confirmed this

165

1 public interest in his Phase 1 report. Central
 2 Government has long recognised the public interest in
 3 understanding how building products react when exposed
 4 to fire , testing products with its own research arms
 5 such as the Building Research Establishment, BRE, and
 6 regulating the use of building materials. As far back
 7 as the Great Fire of London in 1666, the city was
 8 rebuilt in accordance with new building regulations
 9 requiring the use of stone and brick instead of wood.

10 The Government has long known of the risks
 11 associated with cladding systems and the need for proper
 12 testing of building materials. MPs took a close
 13 interest through the 1999 inquiry on cladding after
 14 fires at Knowsley Heights in 1991 and Garnock Court in
 15 1999. The select committee reported on 5 January 2000
 16 on the potential risks which could be posed by
 17 fire spread involving external cladding systems,
 18 including a shorter period available for escape from the
 19 building, thus potentially endangering life ,
 20 disproportionate difficulties in firefighting ,
 21 disproportionate damage to the building. If only those
 22 words had been properly heeded.

23 The select committee in 2000 noted:

24 "... the responsible attitude taken by the major
 25 cladding manufacturers towards minimising the risks of

166

1 excessive fire spread which had been impressed upon us
 2 throughout this inquiry."

3 That's paragraph 18 of the committee's first report,
 4 and concluded that all external cladding systems should
 5 be required either to be entirely non-combustible, or to
 6 be proven through full -scale testing not to pose
 7 an unacceptable level of risk in terms of fire spread.
 8 That's paragraph 20.

9 But the rainscreen cladding system constructed for
 10 Grenfell Tower met neither of those standards, being
 11 neither non-combustible nor proven through full -scale
 12 testing not to pose an unacceptable level of risk in
 13 terms of fire spread. Where was the responsible
 14 attitude impressed upon the 1999 inquiry? How did the
 15 cladding industry and all those involved in the GT
 16 refurbishment come to assume without proof that highly
 17 combustible building materials could be used on
 18 high-rise residential buildings, the paradigm of
 19 a high-risk building?

20 This brings me to the independence of the
 21 certification bodies.

22 Testing, certification and classification bodies
 23 should be independent of the construction industry,
 24 including the manufacturers of cladding materials. This
 25 has long been recognised. For example, in its annual

167

1 report for the year ending 31 March 1999 -- the day it
 2 ceased to be a non-departmental public body, an NDPB, as
 3 they're known, sponsored by a government department, and
 4 was then afforded greater autonomy -- the British Board
 5 of Agrément declared, under the heading "Background" --
 6 I don't cite it at all , just extracting the relevant
 7 bits -- the BBA was established to provide construction
 8 industry decision-makers with independent information on
 9 product performance through its agrément certificates ,
 10 stimulating safe innovation by manufacturers.

11 Instead, and perhaps relying on the responsible
 12 attitude noted by the select committee in paragraph 18
 13 of the first report cited above, these bodies appear to
 14 have lost their independence from the cladding and
 15 construction industry. Why did this happen?

16 The Inquiry may consider it relevant that:

17 (a) when these bodies lost their public funding,
 18 they became reliant upon their commercial sponsors for
 19 their running costs. This caused an inevitable loss of
 20 apparent if not at all independence and may account for
 21 some loss of rigour.

22 (b) further evidence of a loss of independence is
 23 the involvement of construction product manufacturers on
 24 the board of the BBA. For example, Mr Ankers, chief
 25 executive of the Construction Products Association, CPA,

168

1 served on the board of governors of the BBA from
2 25 November 1999 until after the Grenfell Tower
3 disaster. Who is the CPA? It claims on its website to
4 be the leading organisation that represents and
5 champions construction product manufacturers and
6 suppliers.

7 Equally, Mr Harper, a former group chief executive
8 of Celotex Group Limited, so served from 15 November
9 2007 until 31 March 2016, chairing the BBA's board from
10 2008. Celotex in this context needs no introduction.

11 The FBU asks how, if at all, were these conflicts of
12 interest resolved within the BBA? The BBA produced
13 certificates which beggar belief. Was the noble public
14 interest purpose for which the BBA was established
15 displaced to further the interests of its sponsors from
16 the construction industry?

17 Likewise the Inquiry may consider it relevant to
18 investigate why the BRE allowed itself to be constrained
19 by confidentiality agreements in the use it could make
20 of test fails. Did they safeguard the test sponsors'
21 proprietary information at the expense of the public
22 interest in learning from the test results?

23 The FBU will ask the Inquiry to find that the
24 learning from tests, both successful and failed, should
25 have been made readily available to those in the

169

1 fire safety community, including all the different
2 testing, certification and classification bodies, as
3 well as designers of rainscreen cladding systems,
4 fire safety consultants and those working in
5 building control and in fire safety departments.

6 The FBU hopes the Inquiry will investigate the
7 underlying causes for the ignorance, neglect and/or
8 complacent assumption of most of those involved at all
9 stages of the Grenfell Tower refurbishment. Those
10 underlying causes lie at the heart of the Inquiry, and
11 may include:

12 Introducing private approved inspectors in 1984 and
13 extending their use in 1997.

14 Amending the Building Regulations and the ADB
15 guidance from 1985 but failing to clarify the guidance
16 following the Shirley Towers and Lakanal House fires, to
17 explain the fire safety requirements of the increasingly
18 prevalent rainscreen cladding systems seeking thermal
19 efficiency, but ignoring the correlative increased fire
20 risk.

21 Cuts to the enforcement agencies, both
22 building control, fire authorities and housing
23 authorities, reducing their ability to enforce standards
24 and respond effectively to the new challenges of
25 rainscreen cladding systems; near constant attacks upon

170

1 the public sector, including fire and local housing
2 authorities.

3 Privatisation of and the encroaching influence of
4 the construction industry upon the testing and
5 certification bodies, the BRE in 1997 and the BBA in
6 1999.

7 The lack of publicly funded non-industry research
8 into changing risks posed by new construction methods
9 and systems.

10 The introduction of the Fire Safety Order, which
11 ignored the structure and exterior buildings, failed to
12 address the particular fire safety requirements of
13 residential buildings.

14 The introduction of the housing health and safety
15 rating system in 2004 with no commensurate increase in
16 housing authorities' budgets to enable them to provide
17 enough environmental health practitioners to consider
18 the fire hazards associated with rainscreen cladding
19 systems.

20 The concurrent deregulation agenda, making it easy
21 for the construction industry to minimise yet hard for
22 the enforcing agencies to ensure compliance.

23 The abolition of the Central Fire Brigade's Advisory
24 Council in 2004 and the failure of successor bodies to
25 advise on the increasing fire risks associated with

171

1 thermal insulation and the rainscreen cladding systems.

2 Finally, the failure of national and local
3 government and of the testing and certification bodies
4 to monitor the development of risks as highlighted by
5 cladding fires in the UK and abroad.

6 Although postponed to Module 6, it's imperative, the
7 FBU submit, that these underlying causes are then
8 addressed with the same vigour and attention to detail
9 as the Inquiry has applied in Phase 1 and in Module 1 of
10 Phase 2.

11 So, in conclusion, the multiple failures of the
12 testing, certification and classification regime in
13 operation before the Grenfell Tower disaster were due to
14 a combination of the failure of Government to undertake
15 a wholesale review of the guidance in ADB; the failure
16 of the testing, certification and classification bodies
17 to retain independence from their commercial sponsors;
18 the failure of the design team to confront and
19 understand either the guidance or the testing,
20 certification and classification regime; the failure of
21 Government to regulate the installation of rainscreen
22 cladding systems.

23 As presaged by Dame Judith Hackitt, as seen with the
24 design and construction companies reviewed in Module 1,
25 the FBU suggests it will become clear in Module 2, in

172

1 the context of construction product manufacturers and
 2 suppliers, that companies cannot be trusted to regulate
 3 themselves.
 4 Thank you, Mr Chairman.
 5 SIR MARTIN MOORE-BICK: Well, thank you very much,
 6 Mr Seaward. That was very interesting and helpful,
 7 thank you.
 8 Now, our final speaker this afternoon is
 9 Ms Studd QC, who is going to address us on behalf of the
 10 Mayor of London.
 11 Yes, hello, Ms Studd.
 12 MS STUDD: Good afternoon, Mr Chairman.
 13 SIR MARTIN MOORE-BICK: I take it you can see me and hear
 14 me?
 15 MS STUDD: I can, yes.
 16 SIR MARTIN MOORE-BICK: Good. We can see and hear you, so
 17 when you are ready, we shall look forward to hearing
 18 what you have to say.
 19 Opening statement on behalf of the Mayor of London by
 20 MS STUDD
 21 MS STUDD: Thank you.
 22 Mr Chairman, in a letter to the Mayor dated
 23 3 August 2020, you wrote:
 24 "The Inquiry's terms of reference are limited to
 25 matters directly relating to the fire and do not include

173

1 the influence of social background and race on the
 2 allocation of social housing."
 3 You went on:
 4 "I have always made it clear, however, that if in
 5 the course of the investigations the panel finds that
 6 factors of that kind played a part in any of the
 7 decisions under consideration, it will make that clear
 8 in its report."
 9 Since the last time the core participants made
 10 submissions before you, through the impact of the
 11 COVID-19 pandemic, the brutal killing of George Floyd,
 12 and the welcome interest in profile of the Black Lives
 13 Matter movement, we are reminded of the racial and
 14 socio-economic inequalities present in our society,
 15 which must not be ignored by this Inquiry as a potential
 16 factor in influencing attitudes and behaviours during
 17 the Grenfell Tower refurbishment project. The Mayor
 18 raises these issues here and now, although appreciating
 19 that these matters will probably continue to apply in
 20 relation to the later modules in this Inquiry. However,
 21 it must be at the forefront of any examination of
 22 decision-making throughout the Inquiry's investigations
 23 in relation to its terms of reference.
 24 Of the many public concerns that fall to be examined
 25 and considered by this Inquiry, it is perhaps the visual

174

1 imagery of the Grenfell Tower cladding on fire on
 2 14 June 2017 which remains imprinted in the public
 3 memory and causes continuing anxiety to many.
 4 The post-fire testing of the cladding and the
 5 results of those tests, taken together with the images
 6 that we all saw, both at the time and in the aftermath
 7 of the fire, has had significant and long-lasting impact
 8 on the ability of residents living in buildings with
 9 unsafe cladding systems, whatever their height, and
 10 throughout the United Kingdom, to feel safe in their
 11 homes.
 12 Current enquiries reveal that there are 179
 13 buildings in London above 18 metres in height where
 14 aluminium composite cladding still requires removal.
 15 Additionally, 2,784 buildings have been registered with
 16 the Government Building Safety Fund for the removal of
 17 dangerous, non-ACM cladding. You can see, Mr Chairman,
 18 that the full scale of the problem is vast.
 19 But returning to London, there are a significant
 20 number of tall buildings in London. Those who work or
 21 reside in them need to know that safety is the first
 22 priority for those responsible for construction and
 23 refurbishment. The financial cost must not be permitted
 24 to take priority over safety.
 25 During this module, the Inquiry will be examining

175

1 the procurement, use and marketing of the cladding
 2 products used at the Grenfell Tower. As
 3 Dame Judith Hackitt commented in her introduction to her
 4 final report, the debate continues to run about whether
 5 or not aluminium cladding is used for thermal
 6 insulation, weatherproofing, or as an integral part of
 7 the fabric, fire safety and integrity of the building.
 8 This illustrates the siloed thinking that is part of the
 9 problem we must address. It is clear that in this type
 10 of debate, the basic intent of fire safety has been
 11 lost.
 12 Mr Chairman, it became apparent from the evidence
 13 that you heard in Phase 2, Module 1 that the corporate
 14 core participants concerned in the refurbishment of the
 15 Grenfell Tower may have had different priorities than
 16 the safety of the residents and their visitors when they
 17 were considering the appropriate materials to use in the
 18 refurbishment. Those different priorities resulted in
 19 the catastrophic results with which we are now so
 20 tragically familiar.
 21 Mr Chairman, you reached a conclusion in the Phase 1
 22 report that there was compelling evidence that the
 23 external walls of the building failed to comply with
 24 requirement B4(1) of schedule 1 to the Building
 25 Regulations 2010, in that they did not adequately resist

176

1 the spread of fire , having regard to the height, use and
2 position of the building. In fact , your conclusion
3 stated on the contrary: that they actively promoted it.
4 It will be necessary for this module to look back and
5 understand why it was that combustible cladding came to
6 be installed on the Grenfell Tower.

7 This module, focusing as it does on testing ,
8 certification , product marketing and promotion is
9 fundamental to assessing accountability . The Inquiry
10 will have to consider the evidence provided by a number
11 of core participants as to their responsibility for
12 undertaking, evaluating and making public in their
13 literature the detailed results of fire performance
14 testing , and their explanations as to whether, and if so
15 to what extent, fire performance testing and safety was
16 regarded as being secondary to commercial
17 competitiveness and profit . If , as the Mayor
18 anticipates , this was the case, then the Inquiry will
19 need to consider what measures it can recommend that
20 would prevent organisations from adopting such warped
21 and dangerous priorities in the future .

22 This should necessarily encompass both specific
23 recommendations related to building safety and general
24 recommendations applicable to this and other safety
25 critical sectors. It is an unfortunate fact that the

177

1 demonstrable shortcomings the Inquiry is uncovering are
2 not limited to the building cladding sector. In recent
3 years, for example, we have seen aeroplane and car
4 manufacturers putting profit ahead of safety. The
5 effect of recommendations made in this Inquiry must
6 impact more widely to compel a safety - first approach
7 across all industries within both the public and private
8 sectors .

9 The Mayor has already shared his concerns with the
10 Government about the appropriateness of using
11 assessments in lieu of tests , or desktop studies as they
12 are more readily known. The Inquiry is very familiar
13 with the criticisms made of these assessments by
14 Dame Judith Hackitt, both in her interim and in her
15 final report, and the Mayor invites the Inquiry to
16 robustly examine this issue and establish how it was
17 that this method, with its lack of transparency and use
18 of inaccurate or inadequate data, came to be used to
19 test suitability of insulation and cladding systems.

20 Looking forward, the Mayor would ask the Inquiry to
21 make recommendations to support those made by
22 Dame Judith Hackitt, so as to ensure the development of
23 a clearer , more transparent and more effective
24 specification and testing regime for construction
25 products. To that he would add the need for the results

178

1 of testing to be readily accessible to the public and
2 open to scrutiny to promote transparency.

3 The Mayor invites the Inquiry to make interim
4 recommendations to ensure that vital changes can be
5 implemented with some urgency on grounds of safety.

6 He also supports the Government's ban on combustible
7 materials on external walls, but would urge you also to
8 consider a recommendation to ban its use on all
9 buildings, regardless of height and use.

10 The Mayor seeks to lead by example. Since
11 September 2019, in new housing developments on Greater
12 London Authority land delivered through the London
13 Development Plan, there is a requirement for the
14 provision of sprinklers in new flats , control over the
15 use of combustible materials in buildings of any height,
16 and compulsory registration of white goods to enable
17 effect to be given to product recall . By way of
18 example, the Mayor will be working with a development
19 partner to build in excess of 800 homes at
20 St Ann's Hospital site in Haringey, which will be
21 developed under this criteria .

22 The Mayor wishes just to return briefly to what
23 I have said earlier towards the beginning of this
24 opening about the scenes indelibly imprinted in the
25 minds of many, but most particularly the bereaved,

179

1 survivors and relatives . In this very emotive part of
2 the Inquiry, the bereaved, survivors and relatives need
3 and deserve candour, transparency and honesty from all
4 the relevant core participants . They of course remain
5 at the heart of this Inquiry and they need to have their
6 questions answered.

7 Mr Chairman, that's all I have to say by way of
8 opening.

9 SIR MARTIN MOORE-BICK: Well, thank you very much indeed,
10 and we will certainly be considering all those
11 suggestions very carefully . Thank you.

12 That, I think, brings us to a close for this
13 afternoon. We shan't be sitting tomorrow because we
14 don't sit on Fridays, but we will take up the mantle
15 again on Monday morning, when we will hear further from
16 other core participants making their opening statements.

17 So that's all for today. 10 o'clock on Monday,
18 please. Thank you.

19 (4.10 pm)

20 (The hearing adjourned until 10 am
21 on Monday, 9 November 2020)

180

1 INDEX

2 Opening statement by COUNSEL TO THE2
INQUIRY

3

4 Opening statement on behalf of BSRs16
Team 1 by MS BARWISE

5 Opening statement on behalf of57
Arconic by MR HOCKMAN

6

7 Opening statement on behalf of88
Celotex by MR ORR

8 Opening statement on behalf of126
Kingspan by MR WEBB

9

10 Opening statement on behalf of the143
British Board of Agrément by
MR SAWTELL

11

12 Opening statement on behalf of the158
Fire Brigades Union
by MR SEAWARD

13

14 Opening statement on behalf of the173
Mayor of London by MS STUDD

15

16

17

18

19

20

21

22

23

24

25

181

182

A	81:7 83:23 84:3,8 89:14 146:10,11	107:20 109:17 172:8	agenda (1) 171:20	139:16,23 140:4 141:7,19 144:2,19 147:15 148:4 149:13 153:24 160:2,23 179:6,7	anyone (6) 48:20 68:1 112:13 118:21 133:11 163:5	approval (2) 6:6 165:2
a1 (2) 45:10 97:11	acknowledge (6) 18:5 42:19 67:2 80:24 123:10,15	addressing (1) 141:17	agent (1) 64:5	altered (1) 54:25	anything (6) 17:19 21:3 55:9 115:18,25 116:24	approvals (3) 29:7 50:1 150:25
a2 (9) 19:15 31:11 68:24 97:11 120:11,15,17,23 140:10	acknowledged (3) 28:6 38:11 111:15	adequacy (1) 96:7	agitated (1) 144:17	alternative (14) 19:10 23:8,10 33:10,14 34:4,9 56:3 68:17 69:16 81:23 103:14 104:17,25	apart (1) 44:5	approved (23) 21:19 30:1,3 51:4 72:4 79:9 80:8,14,17 95:16 131:11,14,21 134:13 145:22 146:1,1,7,19 153:4 154:2 158:22 170:12
a2cored (1) 19:5	acknowledges (3) 17:25 42:2 67:13	adequate (4) 3:10 63:3 69:21 115:1	ago (1) 61:14	alternatives (2) 100:1,4	appalling (1) 127:6	approximate (1) 151:24
a2rated (1) 137:23	acknowledging (1) 115:6	adequately (5) 29:23 72:15 96:10 132:8 176:25	agree (2) 45:20 154:15	alternatively (2) 100:1,4	apparent (6) 37:24 97:5 111:25 135:17 168:20 176:12	april (9) 9:2 39:12,16 46:9 48:4 51:13 53:5,19 108:11
abandon (1) 126:2	acm (60) 13:13 21:24 32:25 60:17,17,20,22 61:1,17,20 62:11 63:25 65:1 66:16,19,24 67:17,24 68:23,24 69:2,3,12 72:25 73:8,14,22 74:6 76:20 81:15,18,21 86:6,9 120:2,7,10 123:5 129:9,14 130:11 132:16 133:14 134:12,15,22,24 135:3,10,18,23 136:2,5 137:1,6,10,16,23 138:3 140:10	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	agreed (1) 81:14	alternatives (1) 69:14	apparently (5) 23:25 117:24 123:6 136:22 152:7	architect (1) 98:3
abandoned (1) 74:16	across (6) 35:7 62:22 73:23 83:15 154:8 178:7	admitted (7) 48:8 67:4,5 112:14 114:20 117:1 118:15	agreement (3) 8:22 10:3,7	although (20) 13:19 16:4 26:21 27:4,13 30:16 58:8 73:4 76:23 77:1 84:13 88:4 114:9 116:16 120:17 121:18 128:3 163:4 172:6 174:18	appear (4) 21:14 114:17 133:1 168:13	architects (4) 50:25 51:2 64:12 162:2
ability (5) 32:24 55:10 118:9 170:23 175:8	act (2) 18:15 24:25	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	agreements (2) 8:6 169:19	always (3) 106:9 158:25 174:4	appeared (2) 27:20 134:9	architectural (1) 98:1
able (5) 9:2 14:8 48:13 55:24 59:19	acted (2) 18:15 24:25	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	agrmnt (11) 5:22 20:24 143:1,14,18 144:25 145:4,7 168:5,9 181:10	alcoabond (1) 50:20	appears (17) 27:8 37:18 41:2 50:7 51:4 53:4 71:19 99:2,22 110:4 115:8 117:25 118:8 123:15 125:5 133:8 138:1	architecture (3) 149:1 150:18 155:13
abolition (1) 171:23	actions (7) 24:17 25:3 43:20 44:13 45:18 47:7 48:1	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	ah (1) 102:17	aluglaze (4) 2:21 5:12 69:6 160:4	appendix (9) 31:21 82:17 97:6 100:18 107:21 151:23 160:20 162:23 164:19	archived (1) 4:22
above (12) 40:10 47:16 48:22,24 53:9 69:9 76:15 87:4 163:8,18 168:13 175:13	aeroplane (1) 178:3	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	ahead (3) 56:6 143:8 178:4	aluminium (8) 45:10,12 78:16 82:15,20 119:16 175:14 176:5	applicant (1) 147:24	arconic (87) 2:17 5:13 7:14,18 8:19 9:24 10:9 11:9,23,24 12:2,21 13:1,6,10,11 17:18,20 20:10 21:5 26:25 27:15,22 48:12 50:7,11,13,19,24 51:9,14,21 52:1,5,11,15,19,23 53:1,3,5,7,11,13,15 54:4,5,9,19,20 57:15,23,24 119:9,10 120:19,20 121:1,4,11,18 122:15,21,24 123:8,10,13,15,17,23 124:4,9,13,20 125:2,5,22 126:2,4 149:12 150:17,20 152:1,3,9,15 181:5
abroad (2) 66:20 172:5	aesthetics (1) 51:2	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	aim (1) 59:17	among (2) 53:6,18 86:18 165:20	application (17) 5:6 11:5 24:9,11,12 32:3 47:12 64:16 98:19,20 103:11,25 105:16 146:6,19 147:13 152:21	arconics (26) 5:23 7:25 13:13 27:7,14 50:10 51:5,7 53:11,24 54:11,14,18 90:4 120:24 121:7 122:25 123:7 124:1,21 125:8,10,13,17,20 155:11
absence (5) 13:21 43:15 62:3 85:1,22	affect (3) 80:13 81:24 128:22	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	airport (1) 31:3	amongst (3) 46:22 106:13 158:17	applies (3) 70:16 103:21 105:10	area (2) 74:3 133:9
absolutely (1) 59:12	affect (2) 111:6 171:25	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	akbor (7) 1:14,15,18,22 2:11 17:1 158:9	amount (4) 24:21 43:9 128:6 154:10	apply (6) 11:22 27:20 29:7 70:19 100:6 174:19	areas (1) 146:8
abuse (2) 18:19 34:20	affected (3) 60:5 89:3 127:15	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	albeit (7) 19:2,4 43:17 44:13 45:11 54:1 107:7	ample (1) 43:18	applying (3) 76:18 123:25 161:7	argue (2) 113:20 123:18
abused (1) 19:8	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	alive (1) 34:11	analyse (1) 72:15	appointed (2) 1:15 120:12	argues (3) 123:23 124:4,13
abusing (1) 34:16	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	analysis (4) 17:7 70:3,5 119:4	appraisal (1) 29:8	argument (2) 114:3 115:24
academic (1) 137:15	affected (3) 60:5 89:3 127:15	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegations (1) 66:12	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	appreciate (1) 113:11	arise (3) 130:13 136:1 159:3
accept (4) 17:19 39:5 50:4 83:11	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	appreciated (2) 27:23 136:16	arises (2) 134:21 136:4
acceptability (1) 21:23	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	appreciating (1) 174:18	arms (1) 166:4
acceptable (4) 47:15 59:16 91:8 146:17	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	approach (8) 30:25 31:5 46:24 60:21 123:11 161:11,12 178:6	arose (1) 46:13
accepted (9) 10:22 40:18 46:20,25 74:16 97:20 117:3 118:18 131:2	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	appropriately (1) 63:23	around (7) 52:20 62:3 88:3,13 119:15 140:13 160:7
accepts (4) 26:12 41:6 44:11 108:15	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7	appropriateness (1) 178:10	arrangement (2) 76:1 77:19
access (1) 4:22	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		arrangements (2) 61:1,4
accessed (1) 165:12	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		arrive (1) 60:14
accessible (1) 179:1	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		arrogance (1) 56:10
accordance (6) 31:22 73:2 95:22 114:8 150:14 166:8	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		article (2) 8:1,14
accordingly (2) 70:18 120:13	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		artificial (2) 27:8,14
account (6) 13:19 60:6 67:17 93:19 96:7 168:20	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accountability (1) 177:9	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accounted (1) 50:15	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accreditation (2) 142:8 154:14	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accredited (1) 32:1	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accuracy (3) 18:16 42:10 56:13	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accurate (2) 155:21 156:21	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
accurately (2) 108:4,16	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
achievable (2) 76:8 79:2	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
achieve (15) 31:7 40:20 50:11 51:7 52:9 64:18 71:18,20 73:6 81:1 82:19 103:18 126:1 146:12,14	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
achieved (21) 29:25 45:3 48:15 51:3 65:8 75:19 76:4,21 77:1,3 78:2 87:9 94:2 106:18 121:13 122:3,16,18 135:1 153:6,16	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		
achieving (13) 76:5,22 77:4 78:25 80:20,22	affected (1) 96:9	admits (2) 36:17 55:1 67:4,5 112:14 114:20 117:1 118:15	allegation (1) 74:19	and (9) 3:5,5,9,9 8:16 23:1 28:2 158:16 170:7		

arup (1) 36:23
ascertain (2) 89:6 93:12
ascertaining (1) 92:16
ashton (1) 70:2
ask (6) 87:24 88:2
104:19 133:12 169:23
178:20
asked (9) 14:5 16:10
19:21 46:1,10 88:8
116:14 127:20 132:13
asking (1) 68:3
asks (1) 169:11
aspect (3) 20:5 118:19
144:6
aspects (2) 4:3,5
assembled (2) 75:23
77:17
assembly (3) 65:18
75:10 76:17
assert (2) 17:20 47:7
asserted (2) 8:18 9:23
assertion (2) 17:21
80:15
assertions (2) 18:7
147:9
assess (1) 113:11
assessed (5) 31:25
65:17 106:22 147:5
156:15
assessing (3) 110:20
112:5 177:9
assessment (15) 27:7
45:1 101:14 113:3
131:24 134:18 135:4
145:20 147:25
148:9,11,14 151:7,9
154:21
assessments (4) 4:10
32:5 178:11,13
assessors (1) 158:9
assigned (1) 116:5
assist (4) 13:7 57:3 59:6
86:19
assistance (8) 10:2,6
51:3 89:9 92:18 94:20
144:24 157:2
assisted (5) 24:23 35:19
37:20 40:22 49:21
assisting (1) 142:13
associated (7) 14:20
56:1 158:20,22 166:11
171:18,25
association (2) 145:6
168:25
associations (1) 21:14
assume (3) 83:6 136:20
167:16
assumed (2) 158:25
163:3
assumption (3) 85:15
158:17 170:8
assurance (2) 94:19,20
assurances (3) 45:20
59:1 112:20
assured (1) 142:7
attach (1) 84:19
attached (1) 159:25
attaching (1) 14:17
attacks (1) 170:25
attempt (3) 113:24
115:13 117:14
attempted (1) 86:19
attend (6) 10:9,24 12:5

14:3 54:16 58:17
attendance (1) 58:5
attended (2) 14:13,14
attending (3) 13:17,20
125:7
attention (6) 68:13
79:19 107:23 141:3
147:1 172:8
attest (1) 55:10
attested (1) 43:17
attitude (3) 166:24
167:14 168:12
attitudes (2) 49:24
174:16
attorney (3) 9:20
125:12,16
attributed (2) 42:8
145:2
audit (1) 6:15
august (7) 36:11 46:3
47:21 92:25 103:2,8
173:23
auspices (1) 6:4
author (1) 49:20
authorised (1) 64:4
authoritative (1) 144:10
authorities (8) 9:3 93:5
108:1 126:2 170:22,23
171:2,16
authority (5) 6:5 21:1
70:7 116:20 179:12
authors (1) 161:23
autonomy (1) 168:4
avail (1) 39:22
availability (3) 69:14
128:8 133:5
available (30) 4:9 37:14
50:16 61:5 66:23
68:6,18 69:7 82:13
84:22 89:20 93:12
96:13,18 97:13
99:9,14 100:24 101:18
111:10 120:18 121:20
124:3 133:8 138:3
152:20,21 153:1
166:18 169:25
avoid (1) 113:24
avoidance (1) 11:7
avoided (1) 159:4
await (1) 24:22
aware (15) 15:10 24:5
46:20 49:5 50:5
52:1,14 53:14 62:10
68:22 70:5 151:7
152:12 162:21 163:6
awareness (5) 62:13,17
66:8 67:2,4
away (1) 43:9

B

b (51) 3:9 21:19
27:9,18 50:11,21
51:22 52:3,4,9 72:4
76:3,5,7,21,22 77:1,3
78:1,24 79:2,9
80:8,14,17 81:1,7,10
84:8 95:17 100:1,5
121:13 122:2
131:11,14,21 134:13
135:1,17 136:6
146:1,1,7,11,14 153:4
154:2 158:22 162:23
168:22

b1 (1) 53:11
b3 (3) 159:17 161:17
162:18
b4 (4) 29:22 71:18
159:17 162:18
b41 (3) 132:6 161:17
176:24
back (7) 34:17 102:15
107:10 157:12 160:13
166:6 177:4
background (4) 78:6
87:5 168:5 174:1
badly (1) 136:7
bailey (10) 45:22
111:22,24
112:8,14,19,19
113:16,20 115:15
baker (1) 42:20
balance (2) 13:23 31:9
ban (2) 179:6,8
barbara (4) 6:24 61:15
151:23 153:25
barrier (1) 44:9
barriers (17) 2:22 17:25
22:6 34:24 37:13,17
38:2 39:19,20 44:2
47:23 62:3 73:16
79:17 85:22 159:18
160:12
barwise (12)
16:1,3,12,14,15,16,18,20
57:6 181:4
based (10) 22:19 27:7
85:15 118:8 122:2,7
146:9 147:22 148:7
154:20
basic (1) 176:10
basis (9) 11:18 62:17
64:7,16 65:6 66:13
82:21 95:4 160:23
baton (1) 26:17
bba (133) 5:22 20:25
21:12 27:17,18,22
40:17 41:4,12,18,24
42:13,16,24 50:14
51:10,14,15,22,23
54:11,13 60:19 61:6
65:15 68:21 69:25
75:16 78:7,11 79:23
81:8,11,13,19,20
82:4,21,25 83:12 84:1
121:5,10,19,20,22,25
122:3,15,23 123:25
124:1,2,4,7,10,11
134:24 143:20
144:9,13,15,17,19,21,25
145:4,7,15,17 146:25
147:8,11,14,24
148:13,16,22
149:3,4,13
150:1,3,4,5,7,10,20,22,23
151:1,9,11,14,15,18,21,22
152:5,6,8,12,21,22
153:1,4,10,14,19,21,22
154:3,4,7,9,15,18,21,24
155:7,10,18 157:2,4,8
168:7,24
169:1,12,12,14 171:5
bbalabc (1) 22:19
bbas (14) 145:9,20
147:6,21 148:11
150:14,15,21 152:16
154:12 155:18,23

156:7 169:9
bbc (1) 151:18
bca (5) 30:17 31:14
33:7 131:11,25
bcas (2) 21:21 32:17
bear (2) 104:14 114:4
bearing (1) 56:11
became (7) 15:10 49:5
145:4,5 152:12 168:18
176:12
become (3) 34:15 52:14
172:25
becoming (1) 154:18
before (26) 1:13 12:14
16:3,13 19:9 23:6 28:7
44:24 56:16 58:2 59:9
71:8 73:18 74:10
87:21 109:25 115:1
125:8 149:22 150:4
151:24 153:23 161:13
164:8 172:13 174:10
began (4) 23:5 32:17
44:24 50:12
beggar (1) 169:13
begin (6) 1:5,12 2:10
58:2 60:21 87:21
beginning (1) 179:23
begins (1) 121:7
behalf (31) 1:17 2:3
10:22 16:24
25:15,23,24 60:1 61:2
87:14 88:22 89:1
125:14 126:12,20,23
127:10 142:25 143:14
157:19 158:3,6
173:9,19
181:3,5,6,8,9,11,13
behave (1) 35:22
behaviour (3) 17:8
49:18 78:9
behaviours (4) 18:6
43:23 54:25 174:16
behind (13) 28:9 59:24
79:17 87:22 100:8
125:6,23 129:17
135:22 136:9 137:5
138:6 141:13
being (31) 8:15 14:25
18:1 20:3 21:8,10
22:14 23:4 35:2 41:10
42:6 48:13 49:1 51:18
63:1,22 74:16 81:4
96:17 101:18 116:6
125:19 133:22 148:20
150:11,15 155:16,18
156:15 167:10 177:16
belated (1) 26:14
belief (3) 73:1 124:17
169:13
believe (2) 29:2 108:20
believes (1) 136:17
believing (1) 95:4
below (1) 19:15
ben (2) 112:19,19
beneficial (3) 29:10,12
161:19
benefit (3) 6:23 65:23
125:15
benefitting (1) 1:19
bereaved (6) 54:16 89:2
127:14 143:21 179:25
180:2
berger (1) 49:23

bergers (1) 49:7
best (3) 40:24 59:18
157:2
better (5) 100:1,5
136:12 156:18 163:15
between (29) 6:1 9:4
10:8 46:7,11 48:8
50:18 52:15 69:2
74:25 77:10,16 81:13
91:24 94:12 107:15
110:24 113:12 121:12
124:23 145:17
151:12,25 152:24
153:8 160:5,10,11
165:6
beyond (3) 13:3 62:20
69:25
bibliography (1) 106:4
bid (3) 26:23 45:17
115:12
bis (1) 8:1
bisby (3) 67:9 165:3,13
bisbys (1) 67:12
bit (4) 41:11 74:23
88:14 143:9
bits (1) 168:7
bizarrely (1) 26:2
black (1) 174:12
blame (1) 55:2
block (2) 33:23,24
blocking (19)
8:4,14,19,24 9:1,18
10:1,4,11 11:1,5,25
12:5,11 13:22
125:6,17,23 126:3
board (18) 5:22 20:24
37:12 44:1,17 47:13
117:19 130:24
143:1,14,18 144:25
145:4 168:4,24
169:1,9 181:10
boards (5) 2:18,20
133:10 159:25 160:8
bodies (19) 4:24 5:22
18:12,15 19:20 21:4
49:18 68:7 83:1 93:6
167:21,22 168:13,17
170:2 171:5,24
172:3,16
body (10) 42:13 69:19
77:24 154:14 155:21
156:1,17,20,24 168:2
book (1) 165:1
borne (1) 92:2
both (53) 1:21 8:17
13:4 19:10,19,23
21:25 22:1,21,24
27:20 32:7,22 33:4
34:10,23 36:8 38:9
46:13 51:25 53:25
65:19 66:19 68:24
78:5 79:7,7 81:16 94:1
99:12 108:4 121:4
125:4 130:25
135:11,15 139:23
142:14 146:16,16
148:9 149:2 153:8
155:12 158:19 163:22
164:21 169:24 170:21
175:6 177:22 178:7,14
bottom (2) 106:2,4
bought (1) 117:20
bowing (1) 118:9

br (29) 14:20 30:21
31:17 33:20,23
35:4,15 44:3 47:15
96:1,5 99:1
103:16,18,21 104:4
106:5,18 108:12
116:13 119:3 120:3,11
131:23 135:20 138:17
139:24 140:9 164:24
bre (24) 5:17 14:18,20
37:7,11,20
38:10,13,20 39:25
42:19 44:5 49:20,23
107:16 108:4,9,17,25
109:6,16 166:5 169:18
171:5
breach (4) 8:15 18:15
21:9 74:14
breaching (1) 79:21
break (7) 57:8,12
88:3,18 143:11
157:12,16
breathed (1) 52:23
breathtaking (2)
162:6,13
bream (1) 107:2
bres (2) 107:17 109:3
brian (2) 150:23 151:20
brick (3) 33:23,24 166:9
brickwork (1) 45:10
brief (6) 2:3 17:6 22:3
84:10 86:1,24
158:6,11 171:23
181:12
bring (2) 14:8 28:25
brings (5) 98:10 117:17
132:19 167:20 180:12
britain (1) 130:23
british (17) 3:20,23 4:6
5:18,22 18:18 20:24
31:24 32:4 95:22
100:16 143:1,14,17
164:18 168:4 181:10
broad (2) 62:19 65:13
broaden (1) 45:2
broader (1) 6:9
broadest (3) 24:8 44:22
47:12
brochure (1) 111:25
broke (1) 85:19
brought (1) 87:15
bruce (1) 162:19
brutal (1) 174:11
bs (81) 14:19 15:2
22:23 23:6,8,15,17,22
24:2,8,9,12,14 25:7
26:19 27:4 28:7 30:22
32:13,20 33:8,9,14
34:3,20 35:10,17,18
36:16,19 37:3 39:2,23
42:19 43:24 44:16
47:14 48:4 51:15
55:6,17 75:3 96:5
98:12,20,23
103:5,16,17,20
104:3,8 106:5 108:8
116:12 117:10 119:24
123:17 128:15,24
131:23 135:11 136:8

137:1 138:16,21,21
139:12,21,25
140:7,17,18,21 141:10
142:3 146:12,13,15,15
150:7
bsr (2) 99:2 121:3
bsrs (5) 12:24 15:25
16:24 158:13 181:3
bucharest (1) 52:20
budgets (1) 171:16
build (1) 179:19
builders (1) 117:21
building (133) 3:17,19
4:3,11 6:4,5 16:9
18:22 19:14
21:1,6,9,11,15,16,17
22:1,7,14 27:22
29:18,19,20 30:2
31:10,18 32:23 33:11
46:23 53:7 56:18 62:1
63:4,20 64:14 65:5,9
70:7,17,19,21,22
73:3,13,19,24 74:1
79:18,20 87:9 90:1,16
91:2,7,10,13,14,24
95:11,14,24 96:8
97:1,17 98:22 99:10
100:22 101:13,22
103:5 104:11,12,15
106:1 107:7 110:13
111:4,20 112:7
114:9,13,22 115:21
116:3,20 117:2,9
118:13,17 119:20,23
123:3 124:21
131:6,7,24 132:7
136:14 138:1
145:2,8,11,17,20,21
146:8 153:20 154:11
158:21 159:15,17
160:18 165:16,24
166:3,5,6,8,12,19,21
167:17,19 170:5,14,22
175:16 176:7,23,24
177:2,23 178:2
buildings (39) 19:1
21:7,25 24:12,13
33:18 47:16 63:6,10
89:12 91:5,9 95:15
103:3 104:5 106:12
110:2 120:15 122:10
129:11 131:3,9 135:3
140:15 144:5
161:18,20 162:22
163:7 164:1 167:18
171:11,13
175:8,13,15,20
179:9,15
buildup (1) 33:1
burn (2) 28:10 38:16
burning (2) 27:3 50:10
burnt (1) 50:1
business (3) 55:4 74:20
123:5
butressed (1) 156:2

C

c (4) 3:11 53:8 122:18
153:7
calculation (3) 110:25
133:18,19
call (2) 52:4 61:25

called (5) 9:24 30:21 67:2 71:21 82:15	77:15 79:17 85:22 159:18 160:10,12	124:4 134:24 145:9,12,13,17 146:22,25	characterised (1) 38:18 characterises (1) 43:19 characteristics (5) 42:4 66:24 107:1 123:21 146:9	153:10,17 155:13 158:18,20 159:2 160:3,20 161:19 162:1,3 164:2 165:5,15 166:11,13,17,25 167:4,9,15,24 168:14 170:3,18,25 171:18 172:1,5,22 175:1,4,9,14,17 176:1,5 177:5 178:2,19	30:2,4,18 33:3 35:24 36:1 37:10 38:14 43:3 44:24 45:16 49:4,8 53:6 55:11 58:23 60:25 65:15 72:13 80:2 81:20 86:12 96:20,25 97:23 100:3,12 103:13 109:12 116:24 128:6,10 132:2 155:10 156:16 172:25 174:4,7 176:9	comfort (1) 131:1 coming (2) 50:23 129:21 commencement (1) 88:25 commensurate (2) 164:13 171:15 comment (5) 74:11,18 129:24 154:4 157:7 commented (3) 153:21,24 176:3 comments (2) 38:13 62:8 commercial (5) 8:10 74:21 168:18 172:17 177:16 commercially (1) 37:14 commissioned (3) 93:25 108:8 135:8 commitment (1) 144:6 committed (5) 89:8 94:23 142:13 143:22 158:12 committee (6) 36:10 49:16 144:16 166:15,23 168:12 committees (1) 167:3 common (2) 21:23 90:19 commonly (1) 8:3 commonwealth (2) 10:6,13 communication (2) 2:1 110:4 communities (5) 93:7 119:25 120:9,13 135:9 community (1) 170:1 companies (3) 50:2 172:24 173:2 company (53) 54:20 58:15,18 59:4,5 60:1,13 61:10,23 62:5 63:19 64:1,3,25 65:3,6,15,20 66:3,13 68:12,23 69:1 71:6,9,19,24 72:23 74:14 75:6 78:5 81:13 82:13 84:15,20 94:10 128:1,12,20 129:19 130:21 132:16 133:14 137:22 141:15,22 142:17 145:6 companys (9) 59:2 60:21 61:2,13 62:10 72:18 123:4 129:3 139:8 compared (1) 150:20 comparing (1) 156:17 comparison (2) 39:15 86:8 compartmentation (1) 86:16 compel (1) 178:6 compelled (1) 29:9 compelling (2) 17:18 176:22 competence (6) 19:18,24 56:14 114:23 116:4 154:12 competent (3) 9:3 98:2 107:4 competitive (1) 120:22
calling (1) 7:17	cef (1) 133:4	147:8,11,14,20,21,22,24 148:7 149:21,22,23 150:1,10,13,16,18 151:17 152:10,17,23 153:2,7,13,15,19,19,23 154:17,17,19 155:9,12,15	cheaper (1) 120:23 cheat (1) 41:11 check (6) 68:2 83:2 103:24 105:15 117:6,12 checked (1) 116:16 checking (4) 80:9 103:24 105:14 115:22 chief (2) 168:24 169:7 chilling (1) 56:10 chimneys (1) 24:25 chin (1) 46:19 choice (3) 61:7 67:24 68:1 choices (1) 74:21 chose (1) 27:17 chosen (2) 70:8,20 circulation (1) 150:7 circumstances (11) 11:6,7 26:14 31:20 40:1 43:14 56:21 76:9 79:3 93:13 125:24 circumvent (2) 20:9 21:11 cite (1) 168:6 cited (2) 165:2 168:13 city (1) 166:7 clad (1) 74:6 cladding (202) 1:10 2:14,16 3:7,15,18 5:7 17:23 18:2 19:2,5,11 20:15,19 22:5,10,18 23:9 24:2 26:19,25 28:9 30:13,15 31:16 34:4,10,24 35:3 37:12,16 39:4,18 45:11 52:20 62:14,21 63:2 66:4 68:19 69:22 70:3 73:5,7,11,21,22,24,25 77:10 78:14 79:4,18,21 80:3 81:17 83:21 85:5 86:4 90:5,12 91:20 92:14 95:18,21,25 96:4,9,14 98:8 12:23 99:7,20 100:7,8,9 101:7,11,13,15 103:4,7,12,15,18 104:2,7,10,14,16 106:9,19 107:6,15 108:23 109:2,8 110:18,21 111:2,4 112:6,21,24 114:5,12,15 116:11,18 117:7,13 119:11,20,22 120:2,6,10,14 123:16 125:20 128:23 129:10,14,17 130:11,14 131:4,10,15,22 132:16 133:22 134:22,25 135:3,10,18,23 136:2,6,13,19 137:1,6,9,16,24 138:3,19,22 139:5,18 140:2,8,12,17,19 141:5,11 149:1 150:19	155:9,12,15 159:12,15 19:19 20:24 41:15 56:12 65:22 81:4,4 92:6,21 93:6 95:1 109:3 122:7 130:15 134:6 138:12 139:1 142:9 147:25 148:6,8,11,16 149:6,11,25 151:3 152:3,5 155:20,21 156:1 158:23 159:7,10 162:9 164:12,14 167:21,22 170:2 171:5 172:3,12,16,20 177:8 certified (9) 40:10 122:1 136:6 145:25 148:20 149:10 152:10 156:4 164:17 certifier (1) 154:4 certifiers (1) 42:24 certify (2) 78:11 81:9 certifying (6) 4:24 42:13 49:18 156:17,20,23 cetera (4) 3:24 68:7 72:7 77:20 chairing (1) 169:9 chairman (24) 2:7,8 16:16 17:23 87:16 88:10,23 102:16 119:8 126:24 142:19 143:17 157:22 158:8 165:2,7,25 173:4,12,22 175:17 176:12,21 180:7 chalcots (1) 73:21 challenged (1) 52:15 challenges (1) 170:24 challenging (2) 55:25 67:10 champions (1) 169:5 change (8) 34:11 38:4,8 42:2 48:10 69:16 142:10 153:22 changed (7) 19:21 41:5 83:16,19 124:8 149:24 151:19 changes (20) 10:15 25:19,21 41:21 42:11 48:9 94:17 104:9 105:24 106:20 111:18 139:11,13 141:20 148:3 151:16 153:22 156:4 160:23 179:4 changing (3) 49:24 56:2 171:8	claimed (5) 45:22 112:3,8,10 113:5 claiming (1) 68:9 claims (5) 25:8 125:2 128:19 142:1 169:3 clarification (2) 152:15 159:13 clarify (2) 156:5 170:15 clarity (1) 92:15 clark (1) 49:20 class (82) 7:4 20:11,13,16,17,20 30:14 36:17 40:14,20,21 41:2,14,17 42:9 43:17 48:13,15 50:11,21 51:11,17,19,22,23 52:2,3,6 53:8 54:1 65:21 75:1,4 78:20 79:8,24 80:16,21,23 82:3,12,14,19,24 97:11,11 99:17,19,24 100:1,4,5,12,15 107:2,5 112:4 120:11,15 121:13,15 122:2,2,8,14,16,18,20,22 135:1,17 136:6 146:5,10,11,13,14 153:5,7 154:1 163:13 164:17 classification (72) 3:3,6,10,11 5:4,20 6:25 20:12,16,18 27:9,11,19 35:14 40:3,11 43:15 46:15 52:4 65:21 75:2,11,13,18,20 76:3,7,13 78:24,25 79:2 81:2,7,10 83:15,25 84:3,9 99:18,25 103:18,21,23,25 104:7 105:10,11,12,15 106:18 107:2,18 109:16 116:11 122:3 135:18 146:4,16 151:6 153:6 154:16 155:1 158:23 159:7,10 162:9 164:12 167:22 170:2 172:12,16,20 classifications (8) 7:2 75:19 78:4 94:3 100:4 146:20 153:3,9 classified (9) 82:11 97:11 99:24 121:15 131:17,18 134:2 151:8 159:19 classifying (1) 146:2 claud (2) 7:20,20 clean (1) 52:13 clear (41) 17:11 24:9	clever (2) 178:23 clearly (14) 15:18 18:3 32:8 44:8 48:19 50:24 71:22 86:8 90:23 97:4 104:12 108:3 144:12 157:23 clever (2) 20:9 42:22 clg000022496 (1) 96:23 close (5) 14:10 24:20 160:9 166:12 180:12 closely (4) 9:12 108:8 139:14 157:4 closing (4) 86:22 129:25 130:4 132:11 coating (2) 153:12,15 code (1) 142:6 coexist (1) 76:14 coherent (1) 14:6 colleagues (3) 42:21 58:1 59:21 colours (2) 153:16,20 column (3) 105:3,20,23 columnns (3) 24:24,25 61:20 combination (8) 67:18 70:8 86:14,15 112:21 117:12 119:21 172:14 combinations (4) 18:23 19:6,11 32:24 combine (1) 71:15 combined (4) 120:5 135:11,12,25 combining (1) 120:10 combust (1) 90:19 combustibility (30) 7:4 20:21 22:11 23:12 30:11,16,19 33:17 34:7 43:1 68:2 72:8 96:16 97:2,4,6,9,19 100:10,13,17 118:25 131:17 134:3 135:6 137:24 162:21 163:9,10,14 combustibilitycored (1) 30:13 combustible (28) 21:23 23:14 25:6 33:16,21 34:14,16 49:25 67:3,6,14,17 68:19 73:12 85:21 86:3,7 90:20,23 91:3,6 95:14 96:17 101:11 167:17 177:5 179:6,15 come (15) 12:1,22 13:7 16:9 54:21 106:15 107:23 126:12 130:9,11 132:19 134:22 138:12 157:12 167:16 comes (1) 57:16

competitiveness (1) 177:17
 competitors (1) 43:5
 complacency (1) 162:11
 complacent (2) 158:16 170:8
 complaint (1) 59:12
 complete (7) 30:3 41:11 42:14 95:21 96:3 98:11 116:2
 completed (1) 143:12
 completely (7) 13:8 25:24 38:8 114:21 121:15 123:20 159:2
 complex (2) 31:2 165:16
 complexities (4) 160:17 161:23 165:8,22
 complexity (8) 115:8 162:7 163:19,20,21 164:13,21 165:5
 compliance (76) 4:12 19:10 20:1,4 22:13 23:9,10 30:2,5,8 31:13 33:14 34:4,9 43:8 49:13 69:22 71:18,20 72:3,6 73:6,14,17,19 76:18 80:22 87:10 95:18,19 96:12,19 97:3 98:7,8 99:4,5,13,22 100:9,19 101:9,12,17 103:12,15 104:16,18,25 106:3,10 107:5 109:7 110:7,18,21 111:3 112:6,24 114:19,22 115:22 117:7 119:19 131:15,16,20 132:1 134:5 135:2 136:11 145:10,10 162:25 163:11 171:22
 compliant (10) 3:18,22 4:2 62:15 73:12 98:4 114:15 118:12 131:10 134:12
 complied (5) 17:21 65:11 68:16 114:13 118:17
 complies (2) 29:14 64:8
 comply (7) 4:4 29:20 66:2 72:17,21 91:13 176:23
 component (7) 3:15 65:18,25 66:4,7 86:4 136:21
 components (16) 4:10,14 23:1 25:17 55:6 71:15 81:18 96:13 98:25 101:11 104:9 105:24 106:20,24 119:21 165:6
 composed (2) 5:3 6:17
 composite (5) 19:5 69:4 78:17 119:16 175:14
 composites (2) 50:19 52:25
 composition (1) 148:4
 compound (1) 115:3
 comprehend (2) 54:17 105:19
 comprehensive (2) 60:6 93:11

comprised (4) 4:11 61:17,18 73:21
 comprises (1) 105:22
 compromise (1) 72:20
 compulsory (1) 179:16
 computer (1) 137:13
 concealed (1) 44:6
 concealing (1) 22:25
 concealment (1) 121:7
 concept (2) 32:18 69:10
 concepts (1) 100:13
 concern (6) 17:16 51:18 54:23 94:8 125:22 150:22
 concerned (17) 16:10 17:5 58:18 60:9 65:3 67:11,24 70:4 78:10 93:22 110:25 111:3 113:5 120:21 140:24 151:25 176:14
 concerning (9) 47:23 74:11 84:24 92:16,21,24 95:1 124:12 127:23
 concerns (9) 3:14 36:12,13 39:25 58:4 84:21 140:25 174:24 178:9
 concerted (1) 94:14
 concise (2) 147:16 154:22
 conclude (5) 45:12 63:19 86:25 142:12 156:7
 concluded (3) 120:13 132:5 167:4
 concluding (2) 17:10 54:23
 conclusion (13) 60:15 63:24 66:10 70:11 82:4 86:22,24 134:14 157:7 164:3 172:11 176:21 177:2
 concrete (2) 97:10 159:25
 concurrent (2) 9:10 171:20
 conditions (2) 36:21 90:20
 conduct (5) 12:25 94:7 98:17 108:2 142:6
 conducted (5) 25:14 93:23 128:16 139:6 164:7
 confidence (2) 89:11 147:8
 confident (3) 51:7 128:20 140:11
 confidential (1) 52:9
 confidentiality (1) 169:19
 configuration (2) 70:9 86:15
 configured (1) 76:20
 confining (1) 42:18
 confirm (5) 9:2 82:1,10 83:2 163:1
 confirmed (18) 15:1 67:15 74:8 75:18 77:24 94:2 98:1 99:12 109:9,10 111:14 112:25 122:4,15 153:15 158:15 159:9

165:25
 confirming (1) 96:3
 confirms (1) 35:15
 conflating (1) 161:5
 conflicts (1) 169:11
 conformity (3) 29:1,3 72:4
 confront (1) 172:18
 confronted (1) 160:17
 confused (2) 42:21 116:18
 confusion (2) 46:22 107:3
 conjunction (5) 19:3,4 86:10 134:11 135:5
 conquer (1) 161:23
 conscious (2) 49:15 87:21
 consequence (3) 10:5 11:17 106:16
 consequences (5) 18:7 60:4,7 85:14 138:4
 consequently (2) 72:23 111:16
 conservation (2) 90:17 131:5
 consider (17) 11:14 28:12 33:12 87:3 101:12 110:20 113:15 134:10 144:17,25 157:6 168:16 169:17 171:17 177:10,19 179:8
 consideration (11) 56:15 60:14 67:23 70:12 94:24 101:8 110:12 115:10 116:25 129:19 174:7
 considered (17) 10:25 13:2 20:1,2 51:11,19 98:9 104:11 106:1 111:19 118:11 134:14 136:24 145:20 148:21 157:5 174:25
 considering (6) 53:18 90:22 114:3 146:18 176:17 180:10
 consistent (1) 80:7
 consistently (1) 165:13
 consists (1) 34:22
 constant (2) 2:1 170:25
 constituted (1) 133:9
 constrained (1) 169:18
 constraints (1) 10:4
 construct (1) 91:20
 constructed (2) 73:20 167:9
 constructing (1) 101:6
 construction (83) 1:7 5:1 6:11 13:14 18:1 23:16 24:20 27:5,8 28:4,18,20 29:17 36:25 37:14,16 42:18 44:18 45:24 46:12,12 53:7 61:23 62:1 63:9 64:13 70:17,24 71:8 72:14 73:7 74:1,8,12,14 80:11 89:12 90:15,21 91:10,11,18 97:1 98:13 99:18 100:20 101:3 105:25 106:16 107:4 109:4,5

114:11,19 116:10 119:1,2 130:25 143:23 144:1,4,11 145:3,23 150:25 158:17,24 161:1,15 167:23 168:7,15,23,25 169:5,16 171:4,8,21 172:24 173:1 175:22 178:24
 constructions (3) 21:24 47:1,5
 consultant (2) 115:4,7
 consultants (2) 101:20 170:4
 consultation (4) 23:6,7 33:13 118:7
 consulted (2) 61:11 82:25
 contact (8) 10:12 16:14 26:23 58:24,24 133:16,23 150:8
 contacted (1) 110:9
 contain (1) 35:10
 contained (9) 2:25 22:2 28:18 29:25 30:6 74:9 78:12 80:7 83:25
 containing (3) 34:25 81:17 98:24
 containment (1) 85:23
 contains (1) 106:4
 content (6) 11:2 88:12 127:23 145:12 154:20 155:15
 contents (1) 147:19
 context (8) 70:23 71:1,9 76:17 87:8 153:4 169:10 173:1
 continue (9) 10:14 55:17 60:9 84:24 124:24 125:25 127:21 142:17 174:19
 continued (7) 15:14 38:16 63:25 72:25 122:21 124:15 149:18
 continues (6) 9:1 17:20 41:13 123:17 144:23 176:4
 continuing (5) 50:4 56:15 87:6 149:16 175:3
 continuous (1) 94:23
 contract (5) 121:18 124:1 148:1,5,8
 contractor (8) 68:11 91:25 97:24 98:5 109:15 114:2,6,11
 contractors (10) 28:16 29:17 51:1 90:17 98:22 101:20 104:13 111:10 113:23 114:1
 contracts (4) 115:6 118:15 124:10 155:18
 contractual (2) 147:22 155:25
 contractually (1) 114:7
 contradictory (1) 164:25
 contrary (6) 12:7 17:18 38:19 46:1 53:24 177:3
 contrast (1) 120:8
 contravened (2) 22:1 32:22

contribute (2) 62:11,14
 contributed (2) 144:14 163:20
 contribution (1) 145:10
 control (22) 6:4,5 21:1,6,11,16,17 42:2 46:23 59:5 64:14 70:7 97:17 99:10 101:22 115:21 116:3,20 117:9 170:5,22 179:14
 controls (1) 73:3
 convenient (5) 88:2,13,17 102:1,2
 conventions (1) 11:21
 conversations (1) 46:19
 cooperate (2) 58:20 125:3
 cooperating (1) 126:4
 cooperation (2) 89:9 125:9
 copies (1) 121:21
 copy (1) 61:5
 copycat (1) 26:17
 core (37) 1:12 6:21 7:15 10:15 12:24 15:24 16:5 30:15 62:9 67:3,4,10,25 68:3 69:5 77:8 78:19 80:24 82:6,16,19 117:9 119:17 120:3,17,23 129:23 141:1 151:19 152:24 160:4 161:6 174:9 176:14 177:11 180:4,16
 coronavirus (1) 1:24
 corporate (1) 176:13
 correct (4) 62:12 66:11 151:11 153:3
 correlative (1) 170:19
 correspond (1) 83:8
 correspondence (2) 55:8 152:14
 cost (1) 175:23
 costs (2) 115:9 168:19
 couldnt (1) 163:9
 council (3) 21:15 28:19 171:24
 counsel (4) 2:6,11 157:13 181:2
 counsels (1) 11:13
 countervailing (1) 13:21
 countries (1) 125:1
 country (3) 53:10 66:20 164:2
 course (21) 10:15 13:20 14:9,12 17:16 44:16 65:24 69:9,18 72:8 81:13,20 86:25 92:20 107:13 130:5 137:7 138:11 157:8 174:5 180:4
 cover (6) 60:16 103:25 105:12,15 153:19 156:4
 covered (4) 79:12 80:4 105:13 153:18
 covering (1) 149:1
 covid19 (1) 174:11
 cpa (2) 168:25 169:3
 cpd (1) 51:2
 crawford (8) 47:22 111:23 113:5,10,16,20 115:15 163:3

credibility (1) 26:1
 credible (3) 37:23 56:3 113:18
 credibly (1) 69:13
 credit (1) 26:15
 crib (1) 34:25
 criminal (4) 8:15 9:10 59:4 156:2
 crisis (1) 17:4
 criteria (22) 30:20 31:17 35:4,11,15 44:3 47:14 95:23 96:4 99:1 103:16 104:3 105:5 108:12 119:3 120:3,12 131:22 138:17 139:23 140:9 179:21
 critical (5) 27:15 44:3 68:12 117:6 177:25
 critically (2) 18:25 144:7
 criticise (2) 66:12 87:5
 criticism (2) 13:19 62:17
 criticisms (2) 60:23 178:13
 crown (3) 61:20 158:18 165:15
 crucial (1) 84:13
 crucially (1) 79:10
 cs1 (1) 42:9
 cstb (2) 77:23 83:1
 cti (1) 159:9
 culture (4) 19:18 48:18 49:12 162:11
 current (17) 7:18 18:13 59:2 92:8,23 94:9 107:14,24 108:19 134:7 139:15,22 140:2,8 150:13 165:10 175:12
 currently (4) 18:25 66:22 133:8 138:2
 customers (5) 52:6 53:24,25 106:13,14
 cut (2) 88:1 115:9
 cuts (1) 170:21

D

d (1) 3:17
 d0 (1) 42:9
 damage (1) 166:21
 dame (4) 172:23 176:3 178:14,22
 danger (1) 56:4
 dangerous (6) 19:6 63:13 123:1 164:1 175:17 177:21
 dangers (1) 53:2
 data (7) 35:12 47:10 121:19 124:3 144:10 154:15 178:18
 datasheet (7) 47:12,19 90:24 103:10,11 113:7,10
 date (5) 23:24 58:16 60:25 67:2 140:7
 dated (3) 45:9 46:9 173:22
 day (1) 168:1
 day34179 (1) 73:11
 days (3) 14:4 26:5 49:11
 dclg (1) 137:10
 dclgs (1) 161:4

dead (1) 44:10
 deal (4) 58:3 78:8 95:8 117:17
 dealings (2) 21:3 42:13
 deals (1) 79:5
 dealt (2) 84:18 129:6
 death (1) 127:7
 debate (3) 30:15 176:4,10
 debbie (2) 49:7 51:6
 deborah (2) 7:23 61:3
 decade (1) 43:15
 december (7) 5:15 7:10 41:19,24 53:25 94:12 117:22
 deceptive (1) 49:5
 decide (1) 71:12
 decided (1) 115:3
 decision (12) 9:19 49:15 61:7 115:8 118:6,8 133:25 138:3,5 146:17,24 147:12
 decisionmakers (1) 168:8
 decisionmaking (1) 174:22
 decisions (3) 72:20 144:1 174:7
 declaration (6) 28:23,25 29:1 42:6,10 92:25
 declare (1) 52:2
 declared (1) 168:5
 declined (1) 58:16
 declining (1) 12:1
 deeds (1) 13:18
 deemed (2) 46:18 146:5
 deep (1) 125:22
 deepest (3) 89:2 127:13 143:20
 deeply (2) 55:3 127:5
 deficiencies (5) 36:19 62:4 64:21 65:1 84:25
 deficiency (1) 123:11
 define (1) 163:9
 defined (5) 31:14 32:25 100:17 144:12 146:13
 defines (1) 146:7
 definition (2) 24:10 97:5
 degree (4) 43:18 46:22 56:12 116:3
 delay (1) 85:10
 delayed (2) 37:21 85:7
 delaying (1) 35:20
 deliberately (1) 124:22
 delimiting (1) 42:17
 deliver (2) 59:16 88:11 138:15 179:12
 delivery (1) 43:6
 demonstrable (1) 178:1
 demonstrably (2) 39:1 53:13
 demonstrate (8) 83:22,22 95:23 96:9 115:17,24 126:4 141:9
 demonstrated (5) 84:2 119:24 122:17 135:10 163:22
 demonstrates (2) 25:25 116:1
 demonstrating (3) 25:10 38:1 109:7

denied (1) 112:18
 department (5) 119:25
 120:8,12 135:9 168:3
 departments (1) 170:5
 departures (2) 61:13
 62:2
 depending (1) 53:10
 depends (1) 70:23
 depth (1) 138:10
 deregulation (1) 171:20
 derrendering (2) 7:21
 11:11
 describe (1) 106:15
 described (11) 23:2
 41:10 61:19 106:21
 107:19 108:4,9,16,24
 111:18 160:17
 describes (5) 78:16
 124:17 145:16 151:20
 164:15
 description (3) 105:21
 107:17 109:15
 descriptions (1) 37:9
 deserve (1) 180:3
 design (26) 19:22,23,24
 31:2,23 32:2 69:21
 70:24 72:14 91:18,19
 112:12 114:7,11,18
 132:3 133:24 144:1
 162:6,14 163:16,24
 164:21 165:9
 172:18,24
 designated (1) 30:24
 designed (6) 23:1 24:17
 63:3 73:14,19 161:22
 designer (12) 19:25
 91:24 97:24 98:5
 104:11 106:1 109:14
 111:20 118:18 146:23
 147:9,17
 designers (15) 20:1
 29:16 31:6 90:16
 98:22 101:19 104:13
 111:10 113:23 114:1
 147:1 155:2 156:8
 162:1 170:3
 designing (4) 94:17,19
 101:6 110:22
 desire (2) 47:6 115:9
 desktop (19) 31:13
 32:15,18 33:2 45:8
 56:9 96:2 98:21
 99:3,14 101:16
 112:10,11,13,17 113:2
 132:1 134:17 178:11
 desktops (1) 33:8
 despite (18) 17:14,17
 21:8 22:7 24:13 40:2
 41:9 48:14 51:17
 66:11 101:17 111:9
 114:14,20 115:5 116:6
 122:21 135:17
 detail (6) 6:6 78:8 80:12
 128:12 138:25 172:8
 detailed (9) 13:9 71:2
 103:22 105:11 127:23
 129:19 149:4 160:21
 177:13
 details (4) 62:24 105:12
 150:25 155:23
 determination (1)
 165:21
 determine (7) 72:16,24

98:24 108:6 124:14
 127:19 144:8
 determined (3) 79:14
 82:21 100:15
 determining (3) 107:5
 111:1,3
 deterred (1) 164:21
 detract (2) 44:20 84:7
 devastating (3) 119:14
 127:6 129:13
 developed (2) 62:22
 179:21
 development (13)
 10:6,13 39:7,14 41:20
 56:6 139:1,19 149:16
 172:4 178:22
 179:13,18
 developmental (1)
 154:25
 developments (1)
 179:11
 devoid (1) 43:13
 devoted (1) 154:11
 diagram (5) 80:19 82:3
 146:7,18 164:25
 diana (1) 53:6
 didnt (2) 112:2 163:13
 difference (6) 69:2
 77:12 124:22 137:19
 151:12 155:14
 differences (7) 48:7
 77:16 80:12,12 107:15
 113:11 153:8
 different (32) 14:25
 24:14 25:24 38:8
 39:4,19,20 45:24 47:1
 54:3 75:19 81:17
 98:25 100:13 106:23
 109:1 117:20 122:6
 129:16 137:4,9
 146:15,21 149:25
 153:6 154:6 155:7
 162:22 164:15 170:1
 176:15,18
 difficult (2) 105:19
 154:18
 difficulties (2) 56:20
 166:20
 diligence (2) 93:24
 115:1
 dim (1) 12:25
 direct (1) 150:8
 directed (2) 91:1 92:18
 directive (1) 28:19
 directly (3) 14:17 68:4
 173:25
 director (3) 92:9 111:22
 150:23
 disappointing (1) 38:17
 disaster (9) 54:18
 127:12 158:12 161:13
 163:21 164:9 165:19
 169:3 172:13
 disastrous (1) 17:14
 discerned (1) 93:20
 disciplinary (1) 94:11
 disciplines (1) 91:12
 disclose (2) 121:19
 148:13
 disclosed (4) 112:13
 124:7 144:21 158:14
 disclosing (2) 8:8,19
 disclosure (5) 54:13

124:2 148:2 151:23
 155:17
 discourage (1) 46:25
 discovered (1) 108:19
 discoveries (1) 15:4
 discrepancies (1) 46:11
 discrepancy (1) 151:25
 discussed (1) 163:5
 discussing (1) 60:21
 discussion (3) 9:3,4
 99:16
 discussions (5) 10:14
 81:12,14,21 112:25
 disparity (3) 52:14,16
 121:12
 displaced (1) 169:15
 disposal (1) 13:9
 disproportionate (2)
 166:20,21
 dispute (2) 61:4 62:20
 disregarded (1) 101:5
 disseminated (1) 106:13
 distinction (2) 91:24
 152:24
 distinguish (1) 74:25
 distorted (1) 44:7
 distortion (1) 25:11
 distributing (1) 145:5
 distributors (5)
 28:15,17 46:10 91:23
 117:21
 divided (1) 136:16
 dla (7) 7:25 8:18
 9:2,7,16,23 10:1
 document (25) 21:19
 30:21 72:4 79:9
 80:8,14,17 95:17
 104:21,22
 105:2,18,18,20
 131:11,14,21 134:13
 146:1,1,7,19 153:4
 154:2 158:22
 documentary (6) 43:19
 78:3 120:24 124:19
 147:22 158:14
 documentation (3) 9:9
 93:11 149:7
 documents (20) 8:9,20
 9:14 11:22 13:10,12
 30:1,3 89:18 93:20
 103:25 105:15 124:21
 128:1 144:22 145:22
 152:4,6 154:22 164:24
 dodgy (1) 40:11
 does (19) 17:18 24:4
 39:22 45:11 48:5 54:6
 70:19 75:7 76:7 91:14
 115:23,24 140:19
 144:25 146:22
 154:4,15,18 177:7
 doesnt (2) 44:20 52:8
 domiciled (1) 54:15
 dominant (1) 137:17
 dominates (1) 19:16
 done (7) 11:2 36:3
 37:19 64:2 82:20
 130:17 142:15
 dont (3) 87:25 168:6
 180:14
 door (1) 79:21
 doors (1) 36:22
 doubt (3) 11:7 61:6
 85:6

doubtless (1) 13:1
 down (7) 55:24 57:9
 88:1 106:3 118:20
 119:14 164:2
 dr (22) 6:24 25:1 34:18
 36:21 61:15 82:17
 109:9 151:23
 152:1,3,6,20 153:1,25
 154:1 159:14 160:16
 161:10 164:4,15
 165:14,18
 draft (1) 151:10
 drafting (1) 33:4
 draw (3) 28:24 42:5
 70:11
 drawings (1) 46:2
 drawn (4) 28:24 63:24
 68:13 86:8
 draws (2) 127:24 147:1
 driven (1) 115:9
 dry (2) 59:14 161:20
 dubai (1) 52:22
 due (13) 1:24 13:19
 17:15 39:1 42:6 54:11
 86:25 93:24 115:1
 130:4 138:11 157:7
 172:13
 duragloss (2) 153:12,15
 duration (1) 103:19
 during (16) 14:12 47:22
 58:5 94:6 99:16 128:7
 131:3 133:2 148:9,9
 151:17 152:3,21
 162:24 174:16 175:25
 duties (2) 18:15 65:12
 duty (3) 63:17 72:11
 156:1
 dynamic (1) 129:22

E

efforts (3) 125:25
 127:18 144:14
 eg (1) 160:8
 eight (1) 135:15
 eighth (1) 142:8
 either (16) 5:14
 22:19,25 31:2,22
 116:19,22 131:18
 134:2 146:3
 152:9,21,22 164:17
 167:5 172:19
 elaborated (1) 31:21
 element (1) 31:1
 elements (3) 3:15 4:2,4
 else (1) 118:21
 elses (1) 158:25
 elsewhere (1) 84:5
 email (13) 33:5 36:10
 42:20 44:23 45:15
 46:3,7 47:22 52:7
 53:20 68:14 110:24
 123:9
 emailed (1) 53:17
 emails (1) 140:25
 embarking (2) 1:16 28:7
 emerged (2) 94:5,25
 emergence (1) 93:21
 emerges (1) 86:8
 emotive (1) 180:1
 emphasise (4) 65:9
 140:16 154:22 165:4
 emphasised (2) 84:5
 97:14
 emphasises (1) 80:11
 employed (4) 58:14
 81:22 92:7 127:10
 employee (1) 156:6
 employees (17) 7:18
 25:16 37:8 41:10
 43:11,23 54:19 59:2
 60:10 66:12 94:8,9,11
 128:3 127:2 129:4
 139:8
 en (33) 27:2,3 35:18
 75:1,19,20,21
 76:3,5,7,7,10,13,21,22,23
 77:1,1,3,21 78:1,4,24
 79:2 81:10,10
 83:20,24,24 84:4,8
 146:13,15
 enable (8) 16:5 59:2
 85:7 98:21 154:20
 164:16 171:16 179:16
 enabled (2) 21:18 85:12
 enacted (1) 12:12
 encased (2) 33:23,24
 encompass (1) 177:22
 encouraged (1) 9:7
 encroaching (1) 171:3
 end (4) 7:13 12:21
 56:16 144:23
 endangering (1) 166:19
 endeavoured (1) 125:3
 ending (1) 168:1
 endorsed (1) 89:6
 endorses (1) 144:19
 ends (1) 46:22
 enduse (2) 103:25
 105:16
 endusers (1) 29:13
 energy (2) 90:17 131:5
 enforce (2) 11:19
 170:23

enforcement (1) 170:21
 enforcing (2) 164:23
 171:22
 engage (2) 9:25 115:3
 engaged (4) 114:9
 115:1 144:13 158:17
 engaging (1) 164:23
 engineer (2) 55:23
 131:25
 engineering (6) 30:25
 96:6 119:4 123:20
 134:18 135:4
 engineers (2) 26:4
 37:20
 english (1) 11:18
 enhance (1) 55:21
 enough (2) 157:24
 171:17
 enquiries (2) 151:21
 175:12
 ensure (22) 16:8 24:7
 36:16 47:6 63:22 65:7
 68:16 89:7,10 94:14
 106:22 111:17
 114:15,21 120:21
 136:13 142:16 150:1
 155:20 171:22 178:22
 179:4
 ensuring (5) 91:13
 112:24 114:12 118:16
 165:11
 enter (1) 8:21
 entered (2) 85:18
 152:14
 enters (1) 70:12
 enthusiastically (1)
 144:19
 entire (3) 32:10 140:17
 159:15
 entirely (4) 43:3 61:21
 137:21 167:5
 entirety (2) 147:14
 154:23
 entitled (6) 64:6,16
 65:6 70:14 73:1
 124:16
 entity (1) 72:19
 envelope (1) 159:16
 environment (1) 36:3
 environmental (2)
 131:1 171:17
 equally (1) 169:7
 equivalent (1) 146:20
 error (1) 161:10
 erstwhile (1) 12:15
 escape (5) 68:8
 85:4,6,11 166:18
 escaping (1) 98:15
 essential (2) 115:7
 144:6
 essentially (3) 14:24
 26:17 71:7
 establish (3) 37:6 93:22
 178:16
 established (6) 93:3
 99:6 100:23 145:1
 168:7 169:14
 establishing (1) 8:12
 establishment (3) 95:25
 103:6 166:5
 estate (1) 73:21
 et (4) 3:24 68:7 72:7
 77:20

eternit (1) 44:17
 eu (2) 12:15 29:14
 euro (9) 42:9 53:8
 122:8,14 135:1,17
 136:6 146:11,14
 europe (2) 29:12 50:21
 european (18) 28:19,21
 29:4,6,8,14 31:24 42:7
 75:20 80:21,25 97:11
 100:1 121:11 124:23
 125:1 146:4 164:18
 evaluated (1) 105:5
 evaluating (1) 177:12
 evaluation (3) 60:8 70:6
 165:11
 even (29) 17:16,19,21
 20:13 24:9,11,20
 25:10 28:7 33:2,24
 39:13 43:1 46:25 48:6
 52:10 61:25 62:23
 63:1,16 68:15 69:24
 73:12 78:18 82:4,7
 85:7 120:5 146:20
 evening (1) 7:9
 event (6) 17:24 28:10
 39:6 49:4 61:9 122:9
 events (8) 19:16 20:5
 23:4 28:1 84:12,14,17
 93:19
 eventual (1) 84:13
 eventually (1) 53:15
 ever (3) 40:24 122:16
 136:6
 every (3) 52:24 71:15
 142:18
 everybody (1) 78:17
 everyone (6) 1:3 16:4
 70:4 89:3 127:4,15
 evidence (113) 5:11,14
 6:8 7:7,13,17 8:12
 9:18,24,25 10:10,24
 11:2 12:2,3,6,14,18,23
 13:3,16,21 14:2,4,14
 15:18 17:18,22 31:25
 43:19 45:23 46:4
 56:24 58:6,17 59:3
 60:25 62:18 66:22
 67:1,9,14,22 68:4
 69:4,20 77:11 78:3
 81:19 84:24 85:10
 86:2 89:18,19
 93:12,18 95:4 98:2
 99:13 101:2
 109:11,12,17,19 111:8
 112:1,8,16,25
 113:6,7,15,19
 115:6,15,16,20,23
 116:18,25 117:5
 118:15 120:20,24
 121:1,3 124:19
 125:5,7,13 127:3,25
 129:23,25 130:3,4
 134:23 138:2,9 141:21
 144:15,20 145:14
 149:5,13 157:6
 158:14,15 160:16
 168:22 176:12,22
 177:10
 evidenced (2) 40:2
 75:17
 evolution (1) 149:13
 evolved (1) 154:9
 evolving (1) 149:17

exact (1) 45:6
 exactly (1) 104:22
 examination (2) 6:10
 174:21
 examine (3) 143:25
 144:2 178:16
 examined (4) 125:19
 129:23 154:13 174:24
 examining (4) 3:13 6:13
 138:10 175:25
 example (16) 20:9
 47:12 63:4 68:23 74:4
 76:3 82:5 84:6 97:9,15
 140:21 167:25 168:24
 178:3 179:10,18
 examples (2) 73:18 80:1
 exap (2) 32:3,7
 exceeded (1) 35:8
 except (1) 18:2
 exception (2) 8:23 34:7
 exceptions (2)
 111:13,21
 excess (1) 179:19
 excessive (1) 167:1
 exchange (2) 45:15
 47:23
 exchanges (2) 33:5
 110:24
 execution (1) 26:14
 executive (3) 150:23
 168:25 169:7
 exemplifies (1) 161:11
 exhibits (1) 25:20
 exist (1) 32:13
 existence (4) 28:22
 67:25 152:12 163:25
 existing (1) 161:18
 exists (1) 32:13
 exova (3) 45:8 70:2
 115:4
 expanding (1) 55:10
 expect (2) 71:3 155:7
 expected (4) 53:12 62:5
 66:5 71:1
 expecting (1) 88:8
 expense (1) 169:21
 experience (4) 1:20
 94:14 114:14 116:8
 experienced (1) 63:7
 expert (7) 7:13 86:2
 98:1 99:12 109:9,11
 160:16
 expertise (3) 72:1
 114:18 156:25
 experts (5) 24:22
 120:12 129:20 137:14
 138:7
 expire (1) 40:7
 explain (9) 7:1 13:17
 23:17 34:20 79:1
 113:10 116:22 152:15
 170:17
 explained (15) 16:6
 36:9 37:22 40:23
 42:15 47:25 51:9,21
 75:14 100:11 104:16
 106:10 108:18 112:7
 161:10
 explaining (1) 49:23
 explanation (1) 50:9
 explanations (1) 177:14
 explanatory (1) 161:2
 exploit (3) 34:12 55:17

66:14
 explore (2) 10:7 15:17
 exploring (1) 136:5
 exposed (2) 165:7 166:3
 express (3) 54:23 83:4
 127:12
 expressed (5) 31:1
 36:12 47:3 140:25
 165:7
 expresses (1) 143:20
 expressly (5) 30:10
 68:13 79:24 124:2,10
 extend (5) 9:20 24:11
 45:1,9 146:22
 extended (2) 32:2 121:4
 extending (2) 32:10
 170:13
 extents (1) 8:17
 extension (1) 125:11
 extensive (3) 93:24
 124:19 137:13
 extent (11) 3:22 4:7
 6:15 18:22 24:22
 84:21 114:4 137:20
 165:8,10 177:15
 exterior (9) 3:3,6,17
 4:3,11 99:21 100:8
 119:1 171:11
 external (27) 3:12 29:23
 30:14 43:10 61:16
 63:7 67:18 71:14 72:5
 82:2,10 83:1 97:1
 99:21,23 100:5 105:6
 109:4 116:10 132:8
 159:7 161:1,9 166:17
 167:4 176:23 179:7
 externally (1) 78:5
 extinguish (2) 85:8,12
 extinguished (2) 35:2
 38:17
 extinguishing (1) 85:2
 extract (2) 160:5,7
 extracting (1) 168:6
 extrapolate (1) 98:22
 extrapolating (2)
 32:12,19
 extrapolation (1) 32:8
 extremely (1) 12:18

F

f (4) 4:2 129:7 160:20
 164:19
 faade (12) 19:15 22:4
 34:1 36:21 67:19
 109:8 114:6,18 119:11
 123:3 128:5 138:1
 faades (5) 18:23 55:4
 124:21 158:18 165:15
 fabric (1) 176:7
 fabricate (1) 71:10
 fabricated (13) 61:18,21
 71:13 74:6 75:8
 76:6,11 78:14 80:25
 81:6 82:8 83:7 121:24
 fabrication (12) 61:8,10
 69:21 71:8,13 73:22
 76:25 77:18 79:4
 81:24 84:6 122:20
 fabricators (1) 51:4
 face (4) 27:20 50:4
 51:24 115:17
 facer (2) 41:7,9
 facers (1) 42:12

facilitate (1) 23:1
 facilitating (1) 9:4
 factor (2) 163:18
 174:16
 factors (9) 60:19
 86:2,14,18,21 96:8
 110:20 162:5 174:6
 factual (2) 7:6,7
 fahd (1) 52:23
 fail (3) 28:25 35:9,11
 failed (30) 4:4 38:1
 40:4 58:20 66:1 72:15
 73:5,8 81:1 101:5
 113:11 120:3,5 121:14
 135:10,15 136:7,7
 137:11 140:18,19,21
 141:7,9 154:24
 155:2,4 169:24 171:11
 176:23
 failing (4) 54:13 72:21
 117:4 170:15
 failings (6) 18:19 43:20
 101:19 113:25,25
 115:14
 fails (3) 18:3 135:14
 169:20
 failure (19) 18:5
 38:14,19 72:10 86:16
 87:1 116:2 117:6
 136:25 140:24 152:16
 162:6,13 171:24
 172:2,14,15,18,20
 failures (4) 4:8 135:14
 145:2 172:11
 fair (3) 5:4 60:7 156:1
 faith (1) 148:8
 fall (3) 17:3 91:15
 174:24
 false (3) 42:1 51:10
 156:2
 falsified (1) 37:21
 familiar (4) 53:12 69:9
 176:20 178:12
 families (2) 89:2 127:14
 family (2) 1:23 32:9
 fans (1) 160:7
 far (9) 3:14,25 17:4
 58:18 59:12 113:5
 134:24 158:15 166:6
 fashion (1) 61:18
 fatal (2) 12:19 164:9
 fatalities (1) 63:8
 fate (1) 50:17
 fault (1) 59:24
 favourable (1) 78:3
 fbs (1) 8:4
 fbu (11) 158:3,11 159:5
 161:25 162:5 164:6
 169:11,23 170:6
 172:7,25
 fbus (1) 162:16
 feature (3) 19:16 66:25
 77:21
 featured (1) 27:21
 features (6) 61:3 63:9
 73:16,25 77:20 79:4
 february (5) 7:8,12 9:22
 110:23 152:19
 fee (1) 147:24
 feel (2) 143:10 175:10
 fellow (1) 1:18
 festive (1) 7:9
 few (7) 16:8 49:11

58:11 69:23 85:11,24
 119:8
 fewer (1) 67:5
 fibre (9) 37:12 129:17
 135:13,21
 137:2,5,11,18 141:6
 field (1) 98:20
 fifth (6) 2:22 78:6 104:6
 130:15 138:12 142:5
 fifthly (1) 90:4
 figure (2) 44:5 105:25
 fill (1) 90:13
 filler (2) 120:11 161:7
 final (7) 84:10
 105:17,23 155:5 173:8
 176:4 178:15
 finally (11) 5:13 17:9
 37:10 39:9 50:17 90:3
 104:9 106:2 119:8
 142:12 172:2
 financial (3) 8:11 13:5
 175:23
 find (8) 1:20 12:23
 88:2,13,16 163:19
 164:20 169:23
 findings (2) 144:17,18
 finds (1) 174:5
 fine (1) 8:16
 finish (2) 59:17,19
 fire (230) 3:19
 4:1,4,12,12,19
 5:4,4,24 6:25 7:1
 12:16,20 17:14 18:20
 23:21 24:6 26:4 28:10
 30:1,25 31:15 32:4,7
 33:25 34:2
 35:19,23,24
 36:4,6,9,11,15 38:9,16
 40:7,22,25 41:23
 43:16 49:3,12 50:9
 52:24 54:2,25
 55:19,23 60:3,7 62:11
 63:9 65:16 66:25
 67:11 68:20,25
 69:5,8,14,23 70:8
 72:12 73:23 74:2,4,9
 75:8 78:9,13
 79:6,11,20 80:2 82:6,7
 83:14,15,17,18,20
 84:17,20,22
 85:2,4,6,11,12,19,24
 87:3 89:3,6,25 92:4,13
 93:25 95:1,25
 96:3,6,7,9,10,14
 98:8,14,15 99:17
 100:16 101:14,20
 104:6 105:6,7
 107:8,12 110:7 112:4
 114:18 115:4,7
 116:9,11 118:10
 119:4,14 120:1,23
 121:5,12,23 122:5
 123:5,20,21
 124:5,7,23 125:21
 128:18 129:13,15
 131:24 132:8,18,24
 133:15 134:18
 135:4,8,11 136:8,13
 137:4,14,17,20,25
 138:24 140:16 141:25
 143:22 145:12,25
 146:2,9,16,18 147:3
 149:2 151:2,6,14

152:9 153:6,9,13,24
 154:6,15,19,24
 156:12,14,18
 157:13,19
 158:6,11,19,25
 159:1,20
 160:13,19,22,25
 161:3,22 165:7
 166:4,7,17 167:1,7,13
 170:1,4,5,17,19,22
 171:1,10,12,18,23,25
 173:25 175:1,7
 176:7,10 177:1,13,15
 181:12
 firebreaks (1) 74:2
 firefighters (3) 85:7,18
 165:20
 firefighting (1) 166:20
 fires (10) 52:20 53:3
 62:22 63:7 66:8 137:9
 164:9 166:14 170:16
 172:5
 firm (1) 55:13
 first (62) 2:16 4:16 7:5
 14:21 15:11 17:3
 21:22 22:5 23:24
 26:13 27:21 28:13
 30:9 33:20,23 34:2,12
 39:24 41:3,25 47:13
 58:4 63:12 66:18 70:1
 71:24 73:20 74:25
 78:15 84:17 86:4
 89:23 90:6,10
 95:10,19 103:14
 109:24 110:9 123:15
 126:25 127:2,4 129:8
 130:8,19 132:21 136:4
 138:14 141:23 145:15
 147:18,19
 149:10,11,20 150:24
 156:14 162:13 167:3
 168:13 175:21
 firsthand (1) 93:18
 firstly (4) 60:20 62:21
 148:25 155:24
 fit (10) 3:12 22:9
 48:22,24,25 62:16
 71:13 136:11 147:16
 159:10
 fitness (1) 36:14
 five (5) 6:1 29:21 37:25
 40:8 85:19
 fixed (3) 39:20 82:8
 83:7
 fixing (4) 75:24 77:18
 81:21,24
 fixings (2) 3:18 80:13
 flacons (1) 53:17
 flame (6) 19:1 24:23
 29:24 35:21 80:10
 135:16
 flames (4) 35:9
 37:18,24 44:10
 flammability (1) 27:24
 flammable (3) 32:24
 53:8 119:18
 flat (8) 84:18,22
 85:3,8,13,18,24
 160:13
 flats (3) 85:2 160:13
 179:14
 flaws (2) 19:6 50:6
 floyd (1) 174:11

foam (5) 19:4 23:4,17
 32:25 130:24
 focus (5) 43:6 50:1
 92:13 130:7 159:22
 focusing (1) 177:7
 foil (2) 41:7,9
 follow (4) 68:1 72:10
 101:5 140:20
 followed (11) 20:3
 21:10 22:14 30:7 45:5
 85:14 96:19 98:7
 132:3 134:19 163:2
 following (26) 3:16 14:1
 23:21 26:16 62:19
 81:12 83:17 89:23,25
 92:4 93:21 94:25
 97:3,24 101:9
 103:6,13 107:18 120:1
 123:14 130:7 135:7
 139:13 145:2 155:4
 170:16
 follows (5) 3:2 8:5
 76:15 79:23 136:25
 force (7) 33:22 34:6
 41:24 50:22 91:2
 95:11 100:23
 forced (2) 52:2 124:25
 fordam (1) 110:5
 forecasts (1) 51:8
 forefront (1) 174:21
 foreign (5) 8:12 10:6,13
 58:25 71:4
 foreseen (1) 11:8
 foreshadowing (1)
 62:18
 forgotten (2) 33:15
 85:10
 form (10) 4:25 8:9
 30:17 32:13 69:8
 121:9,13,14,16 122:20
 formal (2) 145:6 149:17
 formally (4) 1:16
 26:4,11 39:10
 formed (1) 160:10
 former (5) 7:18 59:2
 108:2 150:23 169:7
 forms (2) 22:5 152:25
 formula (1) 25:22
 formulate (1) 71:25
 formulated (1) 50:24
 formulating (2) 50:12
 160:23
 formulation (2) 42:11
 48:9
 fortify (1) 44:1
 forward (6) 1:19 14:8
 102:6 138:9 173:17
 178:20
 forwarded (1) 47:21
 found (7) 3:1 9:9 17:24
 85:17,20 117:23
 119:12
 founding (1) 144:9
 four (15) 11:24 13:25
 14:2 17:3 26:5 58:14
 62:19 95:17 98:10
 99:5,13 109:22 132:2
 138:15 139:25
 fourth (11) 2:21 90:2
 96:6 102:24 104:1
 105:17 110:23 124:13
 130:13 136:1 142:2
 fourthly (1) 65:23

fr (9) 19:2 51:16 53:22
 54:1 68:23 69:3 79:8
 81:16 152:24
 fr5000 (3) 48:21 109:24
 110:1
 frame (3) 24:3 26:20
 44:18
 frames (1) 39:2
 framework (1) 18:13
 france (5) 7:19 11:10,11
 53:16 77:24
 frankly (1) 26:13
 free (1) 156:21
 freely (1) 37:14
 freiburg (1) 50:18
 french (41) 7:23
 8:2,3,4,14,18,22,24,25
 9:3,5,18,25
 10:3,4,8,11,18,23,25
 11:1,5,25 12:4,9,11,13
 13:22 14:2 27:2
 51:6,12 58:25 59:7
 61:3,5 125:6,17,23
 126:1,3
 fridays (1) 180:14
 froehlich (3) 7:22 11:11
 50:19
 front (1) 78:18
 fuelled (1) 24:25
 fulfil (1) 60:11
 full (13) 89:8,17 93:9
 102:18 103:19 110:16
 116:6 121:19 129:1
 130:3 144:18 158:12
 175:18
 fullscale (4) 98:14
 134:17 167:6,11
 fully (8) 27:23 38:15
 58:10 89:13 93:12
 107:20 127:20 129:7
 function (4) 70:7 116:2
 117:9 145:7
 functional (5) 29:21,24
 132:6 159:16 161:16
 functionality (1) 31:6
 functionally (1) 146:20
 fund (1) 175:16
 fundamental (7) 56:22
 67:23 89:14 92:1
 101:21 135:7 177:9
 fundamentally (2)
 159:21 160:2
 funded (2) 137:21 171:7
 funding (1) 168:17
 furnaces (1) 44:1
 further (28) 6:9 15:2
 32:21 35:17 57:3
 70:3,5 74:11 78:11
 79:15 80:5 83:17,24
 92:15 108:10 110:24
 112:14 122:14 128:17
 135:4 138:21 139:21
 150:12 152:6 155:4
 168:22 169:15 180:15
 furthermore (13)
 25:3,19 32:21 36:3
 45:8 46:7 48:3 51:21
 53:4 99:11 132:5
 137:13 140:13
 future (5) 142:16
 143:24 159:4 160:23
 177:21

G

g (2) 4:8 160:11
game (1) 56:7
gap (1) 56:2
gaps (3) 90:14 128:8
 133:5
garnock (1) 166:14
gather (1) 9:13
gave (8) 27:18 46:13
 53:15 89:19 93:23
 101:7 108:7 116:25
general (11) 4:15 6:11
 9:20 24:11 25:3 54:24
 66:18 97:8 125:16
 163:6 177:23
generally (5) 6:11 12:25
 46:20 114:17 141:20
generalpurpose (1)
 117:19
generals (1) 125:12
genuine (2) 23:16 52:18
genuinely (2) 22:20
 25:6
george (1) 174:11
germany (3) 7:22
 11:10,12
get (4) 42:21 56:2
 88:18 142:14
getting (1) 21:7
give (23) 9:25 10:10,24
 11:2 12:2,5,18,23 13:3
 14:14 21:16 24:17
 34:18 45:20 47:11
 56:14 58:6,17 59:3
 60:13 88:3,6 125:7
given (41) 6:24 19:6
 22:13 24:23,25 26:13
 27:11 40:11 41:4,23
 42:10 47:3,24 53:2,23
 54:10,17 63:8 69:21
 76:6 78:1 80:2 94:24
 95:24 96:5 101:2
 111:8,17 112:11,20
 113:15 115:10,16
 116:15 123:21
 125:10,18 127:3
 131:22 158:15 179:17
gives (2) 53:10 93:18
giving (4) 12:14 55:16
 117:5 125:13
global (1) 54:20
glued (1) 117:25
goes (1) 105:9
going (15) 1:6 2:2 16:12
 57:14 58:7 60:16
 74:23 87:13 88:2
 102:14 104:20 126:11
 142:25 158:2 173:9
gone (1) 24:7
good (26) 1:3
 16:15,16,20,25
 57:17,19,25
 87:16,20 102:9,21
 126:14,15,19
 143:2,3,7 148:8
 157:18,21,22 158:1
 173:12,16
goods (1) 179:16
governing (5)
 28:13,15,17 35:4
 142:9
government (28) 8:22
 10:2,3,8,9 23:7 27:2
 56:17 58:25 59:7 93:7
 119:25 120:9,13 135:9
 145:1,6 161:2 163:23
 164:7 166:2,10 168:3
 172:3,14,21 175:16
 178:10
governments (4) 18:21
 33:11 55:20 179:6
governors (1) 169:1
governs (1) 29:16
grades (1) 149:2
graphite (1) 37:14
grateful (2) 88:20
 159:13
gravest (1) 138:4
great (8) 17:16 19:24
 43:6 51:18 84:4
 130:23 150:22 166:7
greater (3) 149:15
 168:4 179:11
grenfell (175) 1:10 2:14
 3:7,16 5:8 13:15
 17:6,9,12 18:11 19:17
 20:1,6,16 22:4
 23:5,21,23,24
 24:1,6,16,22 26:21,22
 27:14,16 30:10 31:4
 32:14 37:2,4 39:24
 41:25 42:8 44:15,19
 45:15,16,19,21,24
 46:2 47:6,9 49:12
 51:5,12 53:23 54:9,25
 55:19 60:3,18
 61:12,22 64:1,11,24
 65:10,25 66:7,17,25
 69:6,12 72:9,15,20
 73:5 85:8 86:13 87:1
 89:4,23 90:10,12
 91:3,17,19,21 92:7,12
 94:4,25 95:3,6,12
 98:5,18 99:7,15,19
 100:21 101:4,7 107:12
 108:23
 109:2,5,8,20,25
 110:3,10,22 111:11
 112:9,22
 113:2,4,13,22 114:6
 115:5,22 116:5 117:24
 118:1,5 119:12
 120:1,18 121:17
 122:12 123:19
 128:6,21 129:10
 130:12 131:8
 132:4,15,18,23 133:4
 134:22 135:8,19
 137:4,17 138:15,24
 143:21 144:2 148:24
 151:14 153:11,18,24
 158:12,19 159:8
 160:14,22 161:3,13,25
 162:2 163:12,21,24
 164:8,22 165:16,19
 167:10 169:2 170:9
 172:13 174:17 175:1
 176:2,15 177:6
greygreen (1) 153:14
ground (3) 123:6
 125:13 163:8
grounds (1) 179:5
group (6) 32:4,7 40:7
 130:22 169:7,8
growing (1) 69:19
gt (4) 159:19 162:24,25
 167:15

guarantees (1) 29:13
guidance (64) 3:21,23
 4:6,21 20:8
 21:16,19,21,21,22,25
 22:2 29:24 30:17,17
 31:14
 32:2,2,5,7,16,17,21
 33:4,7,10 62:2
 80:7,18,22 95:16
 97:13,16 99:9,10
 100:24,25 106:5
 118:13 131:12,25
 134:13 141:25 144:3
 145:22 158:21 160:18
 161:12,16
 162:7,8,14,22
 163:15,19,20
 164:5,8,13,25
 170:15,15 172:15,19
guide (9) 103:11,12
 104:16,17,24,24
 106:3,10 110:18
guidelines (2) 29:5,8
guy (1) 52:9
gwenaelle (1) 7:21

H

h (2) 3:13 4:9
hackitt (6) 144:16,18
 172:23 176:3
 178:14,22
hackittmotivated (1)
 55:15
hadnt (1) 39:14
half (1) 59:13
hand (1) 91:25
hands (1) 88:10
happen (2) 101:22
 168:15
happened (2) 127:16
 129:1
happening (1) 144:15
happy (1) 88:18
hard (4) 12:12 52:12
 127:20 171:21
hardly (4) 53:3 54:3
 61:4 67:1
haringey (1) 179:20
harley (18) 5:9 26:23
 51:12 106:15 109:13
 110:9,11,16,18,24
 111:13,22
 112:17,18,23
 114:10,25 115:18
harleys (1) 112:12
harmonised (4) 27:1
 28:22 42:7 74:17
harper (1) 169:7
having (18) 11:2 20:13
 54:11 55:3 58:15
 69:15 78:20 79:8
 80:16 82:24 100:23
 111:9 112:4 113:3
 116:6 122:2,22 177:1
hazardous (1) 36:2
hazards (2) 158:19
 171:18
head (3) 46:8 122:25
 150:24
headings (4) 66:16 84:10
 105:20 168:5
headings (1) 60:17
headon (1) 60:22

health (6) 30:12 36:2
 90:24 131:1 171:14,17
hear (23) 5:16 6:3
 15:24 16:19 54:14
 57:18,19,20 84:24
 87:17,18,19
 126:9,16,19 142:22
 143:6 157:12,23,25
 173:13,16 180:15
heard (13) 13:16 26:2
 56:24 62:8,19 84:23
 129:23 130:3 131:13
 132:25 133:22 162:20
 176:13
hearing (7) 1:4 4:16
 5:21 6:8 60:10 173:17
 180:20
hearings (1) 7:8
heart (3) 158:13 170:10
 180:5
heat (3) 34:25 35:2
 38:16
heed (1) 111:16
heeded (1) 166:22
height (15) 34:17 47:16
 48:25 53:20 87:8
 95:15 120:16 122:11
 123:3 135:16 175:9,13
 177:1 179:9,15
heights (1) 166:14
hello (1) 173:11
help (2) 116:14,15
helped (2) 163:15,17
helpful (5) 57:6 96:20
 126:9 142:22 173:6
helping (1) 143:22
helps (1) 90:16
here (9) 1:22 13:6 57:15
 96:24 109:23 135:7
 136:4 143:18 174:18
herfordshire (1) 6:3
hide (2) 47:17 125:23
hiding (1) 125:6
high (3) 34:22 90:16
 156:25
highest (1) 53:5
highlight (1) 89:23
highlighted (2) 90:24
 172:4
highly (6) 24:24 32:24
 43:14 67:13 119:18
 167:16
highrise (15) 19:1
 21:7,24 22:7 27:22
 63:1 69:11 89:11 91:4
 116:8 119:23 144:4
 161:18 163:25 167:18
highrisk (1) 167:19
himself (2) 58:23
 162:17
hindsight (1) 65:23
hinge (1) 154:2
historical (1) 43:20
historically (2) 128:19
 141:19
history (3) 33:12 149:24
 150:19
hoban (5) 115:20
 116:5,16 117:10,13
hobans (3) 115:23
 116:2 117:6
hoc (1) 8:22
hockman (9)

57:14,17,19,24,25
 59:23,25 87:12 181:5
hold (1) 48:20
holder (1) 147:24
holders (2) 147:21
 148:7
holistic (3) 96:6 119:3
 123:20
holistically (1) 87:3
hollow (2) 18:8 125:9
homes (2) 175:11
 179:19
honesty (1) 180:3
hope (8) 1:20 57:20
 58:21 59:1,21 60:9
 102:14,16
hopes (1) 170:6
hoping (1) 16:4
horizontally (1) 35:7
horrified (1) 55:9
hospital (1) 179:20
hour (3) 59:14 87:25
 88:6
house (8) 5:17 21:15
 27:2 35:14 74:5,9
 164:10 170:16
houses (2) 49:19 98:16
housing (7) 93:6 170:22
 171:1,14,16 174:2
 179:11
however (39) 15:18
 29:4 30:7 34:8 35:10
 37:10 39:15 43:2
 44:12 45:23 50:3
 53:23 62:12,25 72:2
 101:2,22 104:6 108:20
 112:12 113:7,19
 115:23 116:15 117:13
 118:21 121:24 123:17
 125:5 128:17 129:25
 138:24 139:13,20
 141:3 155:5 156:13
 174:4,20
huge (1) 38:4
humbled (2) 54:24
 158:11
hyett (7) 61:20 73:10
 75:13,18 97:25 99:11
 109:10

I

identical (2) 48:21
 141:4
identified (13) 26:22
 64:25 99:5,8 100:15
 101:21 104:12 110:5
 128:13 139:3 140:4
 141:18 163:18
identify (2) 25:17 90:6
identifying (1) 141:11
ie (2) 137:23 164:18
ignite (1) 86:5
ignition (3) 35:1,20
 86:6
ignorance (6) 53:3 67:7
 68:9 158:16 163:24
 170:7
ignorant (1) 69:13
ignore (1) 25:8
ignored (4) 19:18
 122:24 171:11 174:15
ignoring (2) 49:13
 170:19

ill (1) 80:6
illequipped (1) 116:7
illustrated (2) 27:25
 77:7
illustrates (2) 149:25
 176:8
im (17) 16:12 57:14
 58:7 59:13 60:16
 70:13 74:23 83:10
 84:10 87:13,21
 88:2,4,10,20 101:24
 143:18
imagery (1) 175:1
images (1) 175:5
immediate (3) 4:1
 56:25 92:12
immediately (1) 124:11
impact (11) 13:2 45:18
 47:8 95:2,5 101:12
 108:21 137:9 174:10
 175:7 178:6
impacted (1) 83:25
impartiality (2) 18:16
 56:13
imperative (1) 172:6
implement (1) 157:8
implemented (5) 18:17
 32:3 64:22 141:16
 179:5
implementing (1) 94:17
implements (1) 28:19
implicated (1) 12:19
implications (2) 18:9
 70:8
importance (10) 15:19
 18:21 20:11 40:15
 48:13 60:5 80:9 86:7
 125:19 137:8
important (21) 16:8
 19:20 31:12 63:11
 77:23 85:5 103:24
 105:14 106:8 127:18
 128:13 129:6,20
 132:12 138:10 139:3
 140:16 148:12 156:8
 160:3,24
importantly (4) 31:18
 35:8 101:9 160:24
impose (1) 63:17
imposed (2) 8:23 18:16
imposes (1) 8:14
imposition (1) 16:7
impossible (2) 36:24
 42:4
impressed (2) 167:1,14
impression (2) 24:18
 55:16
imprinted (2) 175:2
 179:24
imprisonment (1) 8:16
improper (2) 22:25
 43:25
improve (3) 49:2 143:23
 156:5
improved (3) 142:6,10
 144:8
improvement (1) 94:23
improvements (3) 94:18
 141:17,23
improving (2) 94:21
 141:19
inaccurate (2) 42:24
 178:18

inadequacies (2) 162:8
 164:11
inadequacy (1) 161:11
inadequate (2) 3:24
 178:18
inappropriate (5) 32:18
 63:14 94:6 125:18
 145:3
incapable (3) 18:1 84:2
 135:19
include (8) 29:22 94:16
 97:12,18 141:23
 165:19 170:11 173:25
included (3) 92:23
 103:10 159:23
includes (3) 18:11
 140:10 147:3
including (35) 3:7,17,20
 4:13 7:3 21:24 27:2
 35:25 36:2 56:17 61:5
 62:2 68:18,20
 73:8,12,15 78:1 83:1
 85:3 86:14 93:5
 99:9,14 100:25 107:1
 110:17 112:18 129:20
 159:8 162:2 166:18
 167:24 170:1 171:1
inconsistent (2) 77:2
 81:3
incorporate (1) 140:12
incorporated (6) 63:4
 75:9 77:6 79:17 104:1
 110:6
incorporating (17) 5:18
 73:4,14 79:12,14 80:3
 83:7 103:4 107:16
 120:2 123:16 128:23
 138:16,19 140:8,14
 142:4
increase (2) 161:21
 171:15
increased (4) 51:8
 158:19 159:1 170:19
increasing (3) 62:21
 161:20 171:25
increasingly (2) 122:24
 170:17
indefensible (1) 43:4
indelibly (1) 179:24
independence (6) 18:11
 167:20 168:14,20,22
 172:17
independent (16) 11:13
 18:14 19:19 20:23
 55:13 56:12 137:14,22
 138:8 144:10 147:4
 154:3 156:9 157:1
 167:23 168:8
independently (1) 147:7
index (1) 181:1
indicated (2) 7:17 87:22
indicates (4) 55:19
 129:9,13 135:23
indicative (1) 35:22
indicator (1) 107:8
indisputable (1) 68:17
individual (10) 8:7
 56:21 67:22 72:19
 85:2 91:16 96:13
 99:18 146:22 147:13
individuals (7) 11:12
 12:14 54:20 58:6,13
 127:8 140:23

induce (1) 68:15
industrial (1) 8:10
industries (1) 178:7
industry (26) 1:8 3:21
 4:6 13:14 17:4 21:17
 25:5 30:16 40:6 66:23
 89:12 90:15 91:11
 97:13 99:8 100:24
 131:2 144:3 161:15
 167:15,23 168:8,15
 169:16 171:4,21
inequalities (1) 174:14
inevitable (2) 159:12
 168:19
inference (2) 13:19
 82:18
inferno (1) 38:13
inferred (1) 73:6
infill (3) 2:21 69:7
 160:10
influence (3) 137:16
 171:3 174:1
influencing (1) 174:16
information (40)
 4:9,13,23 8:10 54:4
 61:9,14 68:10 82:5,7
 83:17 106:12 110:19
 111:12 116:22
 124:6,12 125:4 133:8
 147:12,17 148:14
 150:12,19,21 151:1,14
 152:1,2,13,16,20
 155:11,16,20
 156:1,3,20 168:8
 169:21
informed (5) 10:16
 41:12 110:11 117:22
 146:24
inherent (4) 19:6 27:24
 34:14 77:13
inherently (3) 48:23
 63:13 136:19
initial (3) 147:25 148:9
 151:9
initially (3) 33:19 45:22
 50:5
initiatives (1) 141:15
injured (1) 165:20
injuries (2) 63:8 66:9
innovation (1) 168:10
inorganic (1) 97:10
inquests (1) 164:9
inquiries (1) 10:17
inquiry (121) 1:6
 2:4,6,9 16:7 7:16
 8:1,20,21,24
 9:5,7,11,12
 10:1,5,10,12 11:16,20
 12:2,6,15 13:4,7
 14:13,17 15:7,12 25:8
 37:5 54:16,21
 58:6,21,23 59:3,6
 60:6,11 62:7 67:6,20
 69:18 70:11 75:17
 78:3 84:12,18 85:17
 86:11,20,25 87:4
 88:24 89:5,9,13,15
 93:9,16 107:21 108:1
 112:14 113:15 117:22
 122:5 125:4,8,19,25
 126:5 127:1,3,18
 128:2 129:21,22
 131:13 132:25

138:8,10 142:14,18
 143:25 144:16
 148:19,21,24 149:5
 157:3,9 158:13 159:5
 162:10 163:19 164:20
 166:13 167:2,14
 168:16 169:17,23
 170:6,10 172:9
 174:15,20,25 175:25
 177:9,18
 178:1,5,12,15,20
 179:3 180:2,5 181:2
inquiries (7) 2:25 7:15
 89:20 98:1 119:12
 173:24 174:22
inside (1) 33:1
insists (1) 43:2
insofar (7) 19:25 43:23
 64:20 65:3 78:9 112:1
 116:24
inspection (1) 148:11
inspections (1) 148:1
inspectors (1) 170:12
install (1) 101:16
installation (5) 5:7
 69:22 73:5 135:21
 172:21
installed (10) 2:14 3:16
 100:7 109:2 113:12
 135:22 138:6 160:5
 161:22 177:6
installers (1) 51:1
installing (1) 110:22
instead (11) 17:19 29:5
 43:19 129:18 136:12
 137:6 141:7 161:9
 164:24 166:9 168:11
instigated (1) 55:4
instigation (1) 150:11
institutions (2) 21:14,20
instructed (4) 10:20
 93:10 129:21 138:8
instruction (2) 53:15,17
instructive (1) 33:12
insulants (1) 97:18
insulate (1) 160:9
insulating (2) 93:1
 160:4
insulation (146) 2:18,20
 3:8,18 5:19,25
 19:3,4,11 20:15,18,21
 22:5,10,11,17,21,21
 23:11,14,18,19 25:1,6
 26:18 30:11
 33:15,16,20,21,25
 34:6,10,14,25 40:15
 47:13 49:25 50:2
 68:19 69:10 72:7,9
 73:17,23 74:7
 86:3,7,10
 90:9,11,16,22
 91:4,6,22 94:1 95:15
 96:16,17,25 99:6
 100:7,9 101:10 106:11
 107:6 110:10 111:1
 112:6 116:17 117:19
 120:4,6,14 126:25
 127:5,17,22
 128:3,4,7,9,10
 129:1,5,17
 130:8,14,17,20,21,23,24,25
 131:3,17
 132:10,12,21,24,25

133:10,12,17,19,22
 135:6,12,13,22,24
 136:3,9,17
 137:2,6,9,11,12,18,18,21
 138:2,6,25
 140:11,21,23
 141:6,13,16 142:2,13
 159:25 160:6,7,8
 161:6,8 163:7,12
 172:1 176:6 178:19
insulations (3) 23:4
 32:25 134:23
integral (1) 176:6
integrity (1) 176:7
intend (1) 14:5
intended (4) 1:7 59:14
 71:20 147:15
intending (1) 49:2
intends (1) 159:5
intent (2) 126:4 176:10
intention (4) 47:3,17
 55:11 165:7
interaction (1) 86:20
interactions (1) 165:6
interchangeable (1)
 100:14
interest (9) 67:8 165:23
 166:1,2,13
 169:12,14,22 174:12
interested (1) 89:21
interesting (4) 1:21
 126:9 142:22 173:6
interests (1) 169:15
interim (2) 178:14
 179:3
interlinked (1) 162:10
internal (9) 33:4 38:21
 42:20 43:9 52:7,24
 86:17 105:7 123:8
internally (3) 28:6 40:9
 78:5
international (4) 8:6
 11:21 18:17 53:3
interpolated (1) 6:14
interpretation (2)
 160:25 161:5
interpreted (1) 35:13
interrogating (1) 117:8
interventions (1) 48:7
into (21) 8:21 12:16
 17:3 29:1 32:14 36:5
 52:4 63:4,20 67:16
 70:12 75:10 77:5 85:4
 96:7 110:6 152:14
 159:6 160:13 164:9
 171:8
introduce (1) 23:8
introduced (3) 31:14
 34:3,8
introducing (3)
 32:17,23 170:12
introduction (7) 2:2
 19:9 141:24 169:10
 171:10,14 176:3
invalid (1) 37:5
invalidated (1) 41:21
invariably (1) 117:20
investigate (4) 1:6
 165:8 169:18 170:6
investigated (3) 15:20
 117:1 118:22
investigating (2) 2:24
 4:18

investigation (5) 9:10
 15:13 105:4 144:21
 159:6
investigations (7) 89:25
 92:3 94:6 107:11,13
 174:5,22
investors (1) 50:25
invite (9) 2:2 16:3,12
 56:14,24 57:14,22
 86:24 87:13
invites (3) 126:2 178:15
 179:3
involve (2) 52:25 75:7
involved (29) 6:17
 13:15 33:3 38:15
 49:21 54:21 61:11
 63:10 64:23 69:24
 70:21 74:7 92:5 94:6,9
 95:19 98:11 100:21
 101:3 108:1 111:10
 118:19 133:11 154:13
 158:24 161:24 165:17
 167:15 170:8
involvement (3) 84:16
 86:20 168:23
involves (2) 27:5 91:11
involving (6) 62:23 66:8
 76:23 84:5 138:22
 166:17
ironic (1) 34:12
irregular (2) 43:14 62:1
irregularities (1) 15:4
irregularity (1) 15:11
irrelevant (6) 24:16
 26:21 38:3 39:1 40:14
 112:5
irrespective (4) 43:7
 67:21 79:3 120:3
isnt (2) 25:21 88:15
isolating (1) 1:24
isolation (1) 65:17
issued (15) 4:24 5:24
 21:22 30:17 81:11
 82:23 97:16 99:10
 107:18 121:25 124:5
 148:22 149:23 155:13
 161:2
issues (22) 2:24
 3:1,13,14 15:10 28:12
 69:23 89:17 92:24
 93:23 108:7 125:19
 129:2,20 130:13 136:1
 138:9,10 139:7 144:8
 162:9 174:18
issuing (1) 83:2
istephan (3) 1:17 17:1
 158:8
item (3) 27:3 50:10
 117:22
its (209) 4:1 5:4,6
 8:3,24 9:18 12:21
 13:2,6,9 17:17,20,25
 18:4 19:7 23:13
 24:5,7,9,12 26:14,18
 27:18,20,24 28:7,8
 29:10,12 30:5 31:12
 33:5,12,12 34:12,15
 35:25 36:20 37:8
 38:22 39:10 40:11
 41:3,10 42:2,7,11,16
 43:1,17,20,23 45:18
 46:24,25 47:11,17
 48:10,15 49:4 50:8,12

51:9,14,15,18,22,23,24
 52:4,5,6,12 54:6,6
 55:6,10,20,21 56:3,18
 58:19 59:16,17
 60:3,11,14,25 61:2
 65:21 66:6,25
 68:17,25 69:2
 70:12,23 71:20 73:1
 77:12,25 80:10 84:18
 85:17 86:11 87:24
 89:2,8,16 90:16,25
 91:21 92:24 93:25
 94:1,6 95:2 99:2
 104:22 106:11 107:1,2
 108:19 111:9
 113:20,25
 115:9,11,11,14,18
 116:1 119:12
 120:21,22 121:18,25
 122:7,20 123:5,11,13
 124:10,17,17
 125:2,7,25 126:2,9
 127:11,18,22,23
 128:4,6,9,10,12
 129:4,7 131:2,2
 132:11,12,17 135:17
 136:16 139:9,10,16
 141:17,19 142:2,3,22
 143:20 144:17 146:19
 147:14 148:1,17,18
 149:4 150:3 151:4
 153:21,22 154:8,9,13
 156:10,11,12,24 157:2
 158:13 165:6,17 166:4
 167:25 168:9 169:3,15
 172:6 174:8,23 178:17
 179:8
itself (20) 45:7 55:15
 61:16 65:10 71:2
 80:1,8,14 81:25 82:21
 83:12 84:2 106:7
 114:23 118:16 145:1
 147:20 155:19 163:21
 169:18
ive (14) 16:13 37:3 79:1
 81:2,8 99:25
 100:10,17 104:23
 106:10 108:1 112:7
 124:3 134:2

january (7) 5:15,25
 7:11,25 8:18 14:1
 166:15
job (1) 158:25
john (3) 116:13 145:16
 150:24
joined (2) 92:9 93:19
joins (1) 2:11
jonathan (2) 7:6 49:9
journalist (1) 151:18
judge (1) 54:8
judged (2) 35:4 65:16
judgement (2) 63:21
 154:5
judicial (1) 8:12
judith (4) 172:23 176:3
 178:14,22
july (13) 8:2 21:22
 23:7,7 24:1 32:21
 39:13,16 42:8 50:18
 52:12 110:11 133:18
june (17) 9:23 10:13
 21:22 25:14 30:18

32:6 49:10 51:5 53:20
 110:10 119:15 122:13
 123:9 125:21 127:6
 149:18 175:2
junior (1) 11:13
jurisdiction (4) 64:17,20
 71:4,5
jurisdictions (1) 53:13
justified (1) 83:6
justifying (3) 54:4 83:2
 123:19
justify (4) 30:5 39:21
 41:18 43:11
justifying (2) 22:16
 41:14

K

k15 (94) 2:19 5:25 6:7
 14:16,22,22,24 15:1,3
 20:14 23:14
 24:1,6,18,21,23
 25:10,21 36:16 37:3
 38:4,7,10,15,19,24
 39:6,8,11,14,24
 40:1,9,19 41:3,4,20
 42:18,25,25 45:2,4
 50:1 55:18
 128:7,17,23
 130:8,9,16,20,22,23
 131:8,18
 132:15,17,19,23
 133:3,6,9,13,14
 134:2,6,8,11,16
 138:13,14,16,18,20,23
 139:2,6,15,19,22
 140:2,3,8,12,15,22
 141:7 142:4 148:25
 149:20,21,25 150:10
 160:1
k15s (1) 41:14
keep (2) 56:6 57:8
keeping (1) 161:20
kept (1) 14:9
kevin (1) 163:11
key (4) 6:16 86:5 92:5
 109:22
killed (1) 12:16
killing (1) 174:11
kind (6) 61:24 69:11
 77:13 86:12 120:4
 174:6
king (1) 52:23
kingdom (7) 7:23
 10:19,20 11:17 122:22
 124:24 175:10
kingspan (113) 2:19,20
 5:12,19 6:7 14:15,18
 15:9,13 17:17
 20:10,14 21:5 22:22
 23:5,13,24
 24:4,6,11,15 25:13,15
 26:4,7,12,17 33:3,5
 34:20 36:8,15 37:8
 38:9,22 39:5,9,11,25
 40:4,9,13,15,24
 41:2,5,12,23
 42:2,5,9,15,22,23
 43:2,19 44:21 45:3
 48:12 49:17
 55:3,4,5,9,14,14,19,24
 126:12,21,23,25
 127:5,17,22 128:3
 129:1,5

130:8,17,20,21,21
 132:10,12,24
 133:12,17,22 134:23
 136:17 137:21
 138:2,25 140:11,23
 141:16 142:7,13
 148:25 149:11,20,25
 150:5,8,10,12,12,13
 160:1,6,8 181:8
kingspans (29) 5:25
 14:16,20 23:22,25
 24:16 25:3,8,23 26:15
 37:2,10 38:12,18,21
 39:17,21 40:5
 42:13,14 43:5,6,10,13
 49:19 55:11 56:10
 150:5,8
kitchen (3) 85:18
 160:5,7
knew (8) 5:5 33:16
 40:19 48:21,23 52:25
 124:20 163:12
know (32) 7:15 28:4
 34:10 37:13 38:24
 46:7 52:17 54:22 61:9
 65:24 66:5 67:9 70:16
 76:19 78:15,18 80:6
 81:8,19 82:25 88:8
 116:12 118:3,24,25
 132:16 133:25 162:24
 163:11,13 165:18
 175:21
knowing (1) 118:4
knowledge (14) 12:10
 19:8 53:4,19 66:24
 67:21 70:25 71:2
 72:18 110:3 114:17
 128:3 133:14 154:11
known (29) 20:25
 22:23,25 27:3 28:20
 47:18 48:23 54:4
 62:24 66:21 67:11,13
 90:9,11,13,21 95:17
 96:1 98:3,6 100:20
 106:18 107:4 122:5
 149:12 153:4 166:10
 168:3 178:12
knowsley (1) 166:14
kooltherm (6) 2:19 5:25
 14:15,22 130:22
 148:25
kuszell (1) 162:17

L

l (1) 131:6
labc (10) 6:5,8 21:1,12
 42:24,25 43:2 45:4,6,7
labelling (1) 161:7
laboratory (1) 32:1
lack (8) 40:11 42:14
 47:18 51:19 56:13
 68:9 171:7 178:17
lacking (1) 42:3
lacquer (1) 36:15
lacrosse (1) 52:21
lakanal (3) 68:14
 164:10 170:16
lamatherm (2) 2:22
 160:11
lamb (1) 163:11
lambda (3) 44:12 92:25
 94:18
laminates (1) 45:10

land (1) 179:12
 lane (19) 6:24 25:1
 34:18 36:21 61:15
 109:9 152:1,3,6,20
 153:1 154:1 159:14
 160:16 161:10
 164:4,15 165:14,18
 lanes (3) 82:17 151:23
 153:25
 large (4) 8:20 43:9 63:7
 117:20
 largescale (17) 18:20
 19:7,9 22:23 30:22
 32:12 33:19
 34:2,8,12,22 36:6
 135:11 136:8,12,23
 140:16
 last (5) 50:7 59:15
 117:5 165:14 174:9
 lasts (1) 35:1
 late (2) 53:18 143:9
 later (9) 5:16 14:12
 23:25 25:24 43:11
 59:14 69:16 70:4
 174:20
 latest (2) 52:19 53:18
 launch (3) 92:25
 110:1,14
 launched (1) 93:14
 lawmakers (1) 64:20
 lawrence (4) 115:5
 118:14,21,24
 lawyers (1) 92:19
 lay (1) 65:12
 layer (1) 164:20
 lead (3) 75:3 147:6
 179:10
 leader (1) 25:5
 leading (4) 11:13 19:16
 20:6 169:4
 learn (1) 94:13
 learned (3) 107:14
 132:25 136:18
 learning (2) 169:22,24
 learnt (1) 26:3
 least (12) 36:20 43:22
 47:9 50:6,7 55:1 58:16
 61:17 69:17 70:6
 137:8 143:11
 leave (1) 88:16
 leaves (1) 126:6
 leaving (1) 74:10
 led (4) 23:4 27:16
 144:15 164:24
 left (1) 94:10
 legal (6) 8:17 11:14
 12:22 58:16 59:1
 121:3
 legalities (1) 13:1
 legislation (4) 3:20,23
 4:5 29:15
 legitimate (2) 74:20
 82:18
 legitimately (1) 48:6
 lengthily (1) 81:12
 less (6) 18:6 31:11
 68:19 78:2 122:10
 141:3
 lessons (1) 136:18
 let (8) 59:23 63:8
 74:11,25 78:6,7,10
 81:11
 lets (2) 88:6 158:5

letter (9) 7:15 14:17,20
 15:3,17 37:11 39:10
 53:24 173:22
 level (3) 163:8 167:7,12
 levelled (1) 60:23
 levels (4) 36:12 44:2
 53:5 149:15
 leverage (1) 124:22
 liability (1) 30:4
 liable (1) 114:1
 lie (3) 43:12 53:10
 170:10
 lies (1) 119:6
 lien (2) 32:5 178:11
 life (5) 33:17 34:13 50:2
 66:9 166:19
 lifetime (1) 151:17
 light (6) 9:12,19
 83:4,16 92:21 124:18
 like (16) 1:13,17 2:9
 29:11 48:12 58:2
 59:10 74:9 86:1 88:16
 167:17 109:22 119:8
 141:14 143:8 162:10
 likeforlike (1) 39:18
 likelihood (2) 49:20
 155:16
 likely (2) 5:13 156:18
 likewise (1) 169:17
 limitations (1) 80:7
 limited (38) 7:4 20:21
 22:11 23:12
 30:11,13,16,19 33:17
 34:7 43:1 55:7 72:8
 74:2 96:16
 97:2,4,5,8,18
 100:10,12,17 118:25
 126:25 128:6 131:17
 134:3 135:6 137:24
 147:3 162:20
 163:8,10,14 169:8
 173:24 178:2
 limits (1) 80:1
 line (2) 15:13 116:13
 linear (27) 20:19 21:10
 22:15 30:9,18 31:8
 34:9 71:22 72:3,10
 95:19 96:12,15,18
 97:3,25 98:4 99:22
 100:8 101:17
 131:16,19 134:4,8
 135:2 136:11 163:3
 lines (2) 48:11,16
 linklaters (2) 92:19
 93:10
 list (4) 3:1,14 51:6 55:5
 listed (3) 104:10 105:24
 159:20
 listening (1) 1:12
 lists (1) 106:5
 literature (31) 5:1,3
 91:1 103:9,13 104:10
 106:7,17,21,25 107:19
 108:5,10,17,24
 109:7,16 110:17
 111:9,14,19 112:2,4
 113:14 115:19 116:1
 117:8 134:6 140:4
 142:1 177:13
 little (2) 40:25 74:23
 lives (1) 174:12
 living (1) 175:8
 load (1) 98:15

lobbied (1) 21:14
 local (11) 6:4 20:25
 70:7 93:7 116:20
 119:25 120:9,13 135:9
 171:1 172:2
 locations (1) 146:11
 lockdown (1) 16:7
 london (9) 166:7
 173:10,19
 175:13,19,20
 179:12,12 181:14
 long (7) 61:14 154:18
 161:13 164:8 166:2,10
 167:25
 longer (1) 53:16
 longlasting (1) 175:7
 look (7) 1:19 102:6
 138:9 144:7 165:1
 173:17 177:4
 looked (3) 116:19,22
 128:12
 looking (5) 12:15 55:25
 56:6 68:5 178:20
 loose (2) 160:25 161:5
 loss (4) 66:9
 168:19,21,22
 lost (3) 168:14,17
 176:11
 lot (1) 65:20
 low (1) 12:9
 lower (1) 81:10
 lowered (1) 36:13
 lunch (2) 88:5,15
 luton (1) 50:13

M

madam (1) 143:17
 mag (1) 49:16
 magnesium (1) 43:25
 main (9) 5:21 34:23
 35:1 51:1 68:11
 114:2,6,11 159:15
 majestys (2) 10:2,8
 major (9) 25:19 41:21
 42:11 86:4 110:15
 115:10 125:20 162:5
 166:24
 makes (9) 16:8 29:11
 30:2,4 36:1 44:24
 45:16 96:25 125:8
 making (9) 38:14 47:10
 56:21 72:20 74:20
 146:17 171:20 177:12
 180:16
 managed (2) 69:24,25
 management (11)
 36:10 49:16 92:23
 94:9,17 107:14,24
 108:19 123:4,7 142:10
 manager (7) 51:19
 94:20 110:16 112:12
 115:6 116:13 118:15
 managing (1) 92:8
 manifestation (1) 17:5
 manifestly (1) 85:22
 manipulate (1) 28:1
 manipulation (1) 50:10
 manner (8) 5:5 20:7
 22:24 43:25 49:5 73:2
 124:18 134:12
 mantle (1) 180:14
 manufacture (1) 70:20

manufactured (6) 1:8
 2:17,18,20,22 119:10
 manufacturer (15)
 5:2,5 23:20 29:7 68:3
 71:3 87:6 90:8
 91:15,21,25 111:6
 147:10 148:5 156:6
 manufacturers (35)
 4:14,17,23 6:16
 17:8,12 18:5,10 19:19
 20:7,10,23 21:2,13,18
 22:22 27:23 28:14,17
 29:2,10 34:11 37:1
 54:24 55:14 66:4
 148:13 149:6 166:25
 167:24 168:10,23
 169:5 173:1 178:4
 manufactures (1) 75:7
 many (13) 12:16
 25:21,23 66:1 86:21
 87:7 127:8 140:13
 163:25 165:18 174:24
 175:3 179:25
 maps (1) 145:19
 march (7) 9:16 51:17
 52:7 94:12 125:12
 168:1 169:9
 marginal (1) 135:14
 marichez (1) 53:21
 mark (1) 29:13
 marked (1) 28:23
 market (18) 1:11 5:2
 15:3 28:14 40:16
 42:21 48:13
 50:15,16,22 51:20
 52:14 64:4 65:2 69:9
 83:12 108:13 121:5
 marketable (1) 29:12
 marketed (6) 93:14
 103:2,6 110:1 119:10
 149:3
 marketing (24) 4:25
 17:5 18:4 20:9 21:2
 22:8 42:22 47:9 50:24
 90:2,4 92:6,22 95:1
 110:14 122:21 123:11
 128:16 139:6 140:3
 142:1,5 176:1 177:8
 marketplace (1) 66:15
 markets (3) 13:4,5
 63:20
 marking (1) 29:10
 marley (1) 44:17
 martin (35) 1:3
 16:2,17,19,21
 57:5,14,21 59:23
 87:12,18,20 88:14,21
 102:2,6,9,14,17,21
 126:8,16,19 142:21
 143:4,6 157:10,18,23
 158:1,5 173:5,13,16
 180:9
 masonry (4) 23:15
 24:12 26:20 39:3
 material (22) 15:11
 19:15 32:24 34:16
 47:20 69:1,5 82:6
 85:21 97:10 118:24
 119:16 129:16 137:19
 147:23 148:4 155:14
 156:12,21 161:7 163:9
 164:16
 materials (38) 1:9

2:13,16 3:4,7,12 4:18
 18:4 21:23 22:8 23:2
 28:2 31:19 37:6,15
 67:13,18 70:9,20
 86:15 116:11 117:12
 144:11 145:3,8 146:10
 148:23 159:8 161:6,9
 165:24 166:6,12
 167:17,24 176:17
 179:7,15
 matter (9) 12:23 15:18
 40:6 61:8 64:19
 125:21 126:1 138:7
 174:13
 matters (19) 11:14
 15:17 43:17 62:2 67:7
 77:18 92:20
 93:3,9,20,21 94:5,25
 95:5 101:23 104:13
 115:3 173:25 174:19
 max (1) 110:5
 maximum (3) 8:15
 30:23 35:5
 mayor (13)
 173:10,19,22 174:17
 177:17 178:9,15,20
 179:3,10,18,22 181:14
 meakins (5) 7:24
 10:18,23,25 14:2
 mean (2) 76:7 79:1
 meaning (1) 163:4
 meaningful (1) 115:25
 meaningfully (1) 35:13
 means (15) 21:10 23:8
 30:5 31:13 32:12,19
 34:4,9 68:5 85:2 88:5
 118:4 140:18 160:25
 161:4
 meant (1) 115:11
 meanwhile (1) 42:23
 measure (3) 15:16 36:6
 93:1
 measured (1) 35:6
 measures (4) 96:8
 145:22 150:1 177:19
 mechanical (1) 105:8
 mechanism (2) 9:8
 11:15
 meet (15) 31:16 60:22
 90:17 96:4 97:14,18
 98:25 119:2 120:3,11
 131:22 133:20 136:14
 155:2 161:16
 meeting (6) 31:23
 50:13,18 97:20 103:15
 135:19
 meets (3) 29:13 47:14
 155:3
 melbourne (1) 52:21
 member (2) 1:18 12:15
 members (6) 2:8 15:22
 88:23 94:13 126:24
 163:16
 memory (1) 175:3
 mention (6) 43:13
 59:11 80:6 109:22
 111:21 141:14
 mentioned (7) 52:10
 81:8 87:3 93:22 98:11
 100:19 101:1
 mentions (1) 63:6
 menzies (1) 117:5
 merchants (1) 117:21

mere (2) 21:1 43:20
 merely (2) 54:7 63:13
 merit (1) 117:15
 merits (1) 154:5
 mermoz (1) 52:21
 messrs (1) 50:18
 met (12) 35:16 91:6,8
 95:23 96:14 104:3
 108:12 132:9 138:17
 139:23 140:9 167:10
 method (10) 26:18
 39:20 61:7 71:12
 75:24 76:25 77:18
 79:3 105:25 178:17
 methodologies (1) 7:3
 methodology (1) 36:19
 methods (7) 61:10
 81:22,23 146:12 154:6
 164:15 171:8
 metres (33) 21:8 22:18
 23:18 24:19 25:7
 27:25 32:25 34:7,22
 37:24 40:10 46:5
 47:16 48:22,24 53:9
 91:7,11 95:15 97:2
 103:3 104:5,15 106:12
 107:7 110:2,13 112:7
 117:3 122:11 162:22
 163:8 175:13
 metropolitan (4) 9:8,13
 93:8 144:20
 might (3) 61:25 82:25
 130:1
 millett (9) 2:3,5,7 16:2
 26:3 54:14 58:4,19,23
 mind (4) 56:11 92:2
 104:14 114:4
 mindboggling (1)
 164:14
 minds (1) 179:25
 mineral (11) 19:3 74:7
 120:6 129:16
 135:13,21
 137:2,5,11,18 141:6
 minimise (1) 171:21
 minimising (1) 166:25
 minimum (2) 50:21
 146:5
 minister (1) 1:16
 ministry (2) 9:5 93:6
 minutes (9) 35:1,3
 37:25 57:9 59:16
 85:11,19,25 135:15
 miscalculation (1)
 115:11
 misconceived (1)
 115:14
 misconceptions (1)
 20:11
 misdescription (2)
 108:6,21
 misfired (1) 163:22
 misinterpretation (1)
 150:2
 misled (1) 47:18
 misleading (3) 44:4
 155:17 156:3
 misled (3) 83:12 113:6
 121:4
 misplaced (1) 113:24
 misrepresentation (1)
 51:20
 misstated (1) 58:19

misuse (1) 63:16
 misused (2) 63:15 65:24
 mocked (1) 34:24
 mockedup (5) 27:6
 75:22 76:12,21,24
 modelling (1) 137:13
 modern (1) 90:17
 modifications (1) 28:2
 modified (1) 8:2
 module (57) 1:5 2:9,13
 4:15,16 5:16 6:9,13,20
 7:6,7,13,18 9:25
 13:16,24 14:8,12,14
 15:20,20,23 28:12
 46:9 56:23 62:19
 69:19 70:12 88:25
 89:16,17,19 99:16
 101:2 109:13 111:8
 123:13 127:1,23
 136:5,24 157:6 158:14
 159:5,12,23 160:16
 162:12,16
 172:6,9,24,25 175:25
 176:13 177:4,7
 modules (3) 129:21
 162:10 174:20
 moment (8) 11:24
 58:10 68:15
 88:2,13,17 102:1,15
 monday (5) 6:22 7:11
 180:15,17,21
 monetary (1) 8:16
 money (1) 69:17
 monitor (1) 172:4
 monitoring (2) 6:15
 52:19
 montgomery (1) 158:10
 month (2) 50:23 151:24
 months (2) 8:16 55:18
 moore (2) 150:23
 151:20
 moorebeck (35) 1:3
 16:2,17,19,21
 57:5,14,21 59:23
 87:12,18,20 88:14,21
 102:2,6,9,14,17,21
 126:8,16,19 142:21
 143:4,6 157:10,18,23
 158:1,5 173:5,13,16
 180:9
 more (24) 6:11 8:3
 12:17 19:20 20:17
 26:2 61:24 65:20
 67:23 68:25 69:14
 76:13 110:18 114:17
 115:12 129:7 133:23
 138:19 149:17 163:7
 178:6,12,23,23
 moreover (5) 65:9 67:20
 75:13 80:2 109:12
 morning (14) 1:3,23
 16:15,16,25 26:3
 54:14 57:17,17,19,25
 62:9 159:9 180:15
 most (5) 20:5 28:9 74:1
 170:8 179:25
 move (3) 105:1 106:3
 123:4
 moved (1) 154:7
 movement (1) 174:13
 moving (2) 101:24
 106:7
 moyses (1) 52:12

m
m
ms (31) 1:17
 10:18,23,25 11:11 14:2
 16:1,3,12,14,15,16,18,20,24
 17:1 51:12 52:12 57:6
 61:5 117:5 158:8
 173:9,11,12,15,20,21
 181:4,14
much (21) 13:16
 16:2,25 24:24 26:10
 44:21 57:5,10 78:8
 81:10 87:11,12 99:16
 102:9,22 126:8,10
 142:21 157:10 173:5
 180:9
multicomponent (1)
 103:7
multiple (1) 172:11
must (32) 13:19
 28:23,23 29:20 30:21
 31:22 34:6 53:21
 56:16 60:11,13 62:10
 64:5,9,15 65:17 70:10
 76:17 80:4 103:19
 147:14 154:23
 156:21,24,25 157:1
 161:25 174:15,21
 175:23 176:9 178:5
mustwin (2) 26:23
 45:17
myself (1) 1:17

N

namely (13) 5:22 6:1
 7:6,19,22 11:10 19:9
 33:16 36:22 39:4 44:5
 51:10 139:17
national (13) 7:3 21:15
 75:1,4 79:18 80:23
 82:3,11 99:17,25
 146:3 164:17 172:2
natural (1) 8:17
naturally (1) 140:24
nature (16) 3:25 8:11
 66:20 67:3,10,17 76:6
 81:24 90:6,20,23
 114:4 123:1 137:3,20
 142:16
nbs (1) 110:6
nc0 (7) 75:10,18 81:3,9
 83:11,15 84:9
ndpb (1) 168:2
near (1) 170:25
necessarily (4) 70:22
 83:8 140:20 177:22
necessary (9) 34:19
 43:11 57:1 87:9 114:3
 123:23 147:12 164:6
 177:4
need (28) 14:11 15:19
 33:2 37:5 50:13 54:18
 78:8 89:6,10 95:10
 96:19 104:11,13
 105:25 106:21 107:10
 110:20 111:17,21
 113:11 124:5 164:25
 166:11 175:21 177:19
 178:25 180:2,5
needed (8) 40:3 55:13
 96:16 117:11 125:15
 133:20 161:14 163:13
needs (4) 33:17 36:8
 92:2 169:10

neglect (2) 158:16
 170:7
neil (2) 47:22 163:3
neither (11) 12:2 20:14
 22:10 66:3 114:24
 118:10,21 123:23
 161:24 167:10,11
nethercot (1) 158:10
never (9) 58:21 70:5
 85:9 112:15 116:12
 117:1 127:16 151:13
 163:4
nevertheless (7) 27:5,14
 39:10 41:13 47:11
 56:24 128:25
newbuilds (1) 19:12
next (10) 6:23 34:18
 56:6 66:16 70:14 85:4
 86:1 126:11 142:24
 157:18
nhbc (5) 33:6 46:19
 49:10 50:4,5
nhbcs (1) 21:22
night (1) 59:15
ninth (1) 142:10
noble (1) 169:13
nonacm (1) 175:17
noncombustible (18)
 37:11 56:1 68:18
 69:10 73:16 86:10
 97:9 120:5 129:16
 131:18 134:3
 135:6,12,21 137:2
 141:6 167:5,11
noncompliance (2) 30:4
 114:5
noncompliant (5) 17:24
 119:6 159:16,22 160:2
nondepartmental (1)
 168:2
none (6) 68:7 92:5
 101:23 111:11 132:2
 134:18
nonetheless (2) 77:24
 84:14
nonindustry (1) 171:7
nonprofit (1) 145:5
nonuk (3) 11:24 13:25
 14:3
nor (15) 12:2 20:15
 22:10,17 43:16 63:13
 66:3 70:6 101:13
 114:25 118:11,21
 123:24 134:3 167:11
norms (1) 55:25
northboro (1) 35:25
notably (2) 21:21 74:2
note (24) 21:21 30:17
 31:12,14 32:17 33:7
 34:2 52:13 77:12
 97:16 99:10 100:25
 106:2,8 131:12,25
 132:12,21 134:13
 161:2,4,11,23 163:22
noted (9) 43:5 45:3
 50:20 74:12 132:9
 145:11 153:12 166:23
 168:12
notes (2) 37:22 159:12
nothing (2) 133:23
 134:5
notice (4) 11:16,19
 58:7,9

notices (4) 10:17,22
 11:3 93:4
notify (1) 124:11
noting (4) 46:22 54:1
 66:6 69:1
notorious (1) 12:16
november (17) 1:1
 6:2,22,23 7:5,16 26:22
 28:7 44:23 45:15
 49:23 67:15 151:22
 152:18 169:2,8 180:21
number (20) 8:20 14:19
 44:22 45:16 55:7
 62:22 71:23 81:17
 91:11 94:7 98:16
 108:2 110:23 144:21
 148:17 149:21 152:4
 155:6 175:20 177:10
numerous (2) 61:13
 62:1

O

o (1) 151:23
objection (1) 11:3
objective (3) 60:8 61:3
 89:14
objectives (1) 71:25
obligation (2) 155:25
 156:4
obligations (1) 148:2
obliged (2) 114:7
 124:10
obrart (1) 36:9
observation (1) 65:13
observations (2)
 58:4,11
observed (1) 52:10
observer (1) 38:12
observers (1) 38:9
observes (1) 25:13
observing (1) 148:7
obsolete (1) 40:6
obstacle (1) 21:6
obstacles (2) 43:7,8
obtain (5) 9:9 27:9 40:3
 42:16 44:21
obtained (7) 41:3,25
 45:8 51:9,22 54:12
 125:11
obtaining (3) 27:18
 45:6 96:2
obvious (2) 84:25
 161:21
obviously (5) 58:9
 59:4,11 80:17 84:19
occasion (1) 149:24
occur (2) 85:16 142:17
occurred (10) 3:6 25:12
 68:4 85:9 86:12,13
 122:13 127:13 132:18
 142:15
occurring (1) 143:24
occurs (2) 89:7 94:15
oclock (6) 88:3,13,17
 102:4,10 180:17
october (8) 6:2 14:16
 26:5 37:11 39:10 41:4
 49:7 150:3
odd (1) 125:10
offence (1) 28:24
offer (2) 46:24 127:13
offered (1) 68:23
offers (1) 129:1

office (3) 10:7,13 58:25
officer (4) 21:6 115:21
 116:3 117:9
officers (1) 21:11
official (2) 46:14,14
officials (1) 64:14
often (1) 19:20
old (2) 38:6 160:10
omissions (1) 156:22
omitted (1) 155:17
once (6) 52:14 60:1
 93:3 107:23 124:4
 152:12
ones (1) 146:12
ongoing (4) 94:22
 124:10 148:10 156:4
onto (3) 34:17 115:13
 117:15
onwards (6) 6:7 14:23
 40:19 103:8 122:17,19
open (6) 2:8 42:17 47:7
 54:5 158:13 179:2
opening (72) 1:13 2:3,6
 6:21 15:23,24
 16:11,22,24 26:6
 38:22 41:16 43:1,13
 46:10 54:6 55:12
 57:15,24 58:5 62:7
 68:12 88:22,25
 89:16,22 95:7,9 97:21
 99:2 109:18 113:21
 120:25 121:2 123:13
 125:2 126:7,23
 127:24,24 129:4 130:2
 139:9 140:6 141:21
 142:25 143:12,14,19
 148:18 150:4,5,8
 153:21 155:23 156:7
 158:2,6 162:12,16
 173:19 179:24
 180:8,16
 181:2,3,5,6,8,9,11,13
openings (4) 62:4 74:13
 77:8 79:22
operation (1) 172:13
operational (1) 94:16
opinion (7) 24:22 31:15
 138:9 145:9 147:4,6
 159:14
opinions (2) 136:16
 165:3
opportunity (6) 10:16
 15:10 88:24 126:7
 129:24 142:20
opposed (2) 32:10 41:7
opposition (1) 50:5
option (2) 68:2,21
options (2) 68:17,25
oral (21) 6:20 7:17
 9:18,23 10:10 12:2,5
 58:17 59:3,25 60:10
 62:8 67:14 89:22 95:8
 99:12 125:5 127:1
 130:6 143:19 158:15
orally (1) 8:9
order (11) 4:19 10:4
 34:13 36:4 50:14
 69:17 83:1 95:22
 106:22 108:6 171:10
ordered (1) 133:10
ordinary (2) 28:3 37:15
organic (2) 90:18,19
organisation (4) 29:6

143:22 149:14 169:4
organisations (1)
 177:20
original (5) 74:13
 139:12 151:7 155:4
 159:25
originally (6) 9:21
 59:14,20 69:5,15
 152:10
orr (17) 87:13,14,16,19
 88:10,20,22,23
 102:5,8,15,16,17,20,23
 126:8 181:7
orthodox (1) 61:24
osullivan (4) 92:8,18
 93:17,18
osullivans (1) 107:22
others (11) 32:9 54:7
 55:2 58:9 61:8 66:12
 71:12,17 78:2 108:14
 130:2
otherwise (6) 37:19,23
 62:16 75:9 101:5,17
ought (3) 48:24 62:17
 156:19
outcome (6) 64:18 65:8
 75:4,11 84:14 129:15
outcomes (2) 142:5
 156:19
outlet (1) 118:3
outline (3) 6:19,20
 95:10
outlined (1) 61:14
outset (10) 19:8 44:24
 47:4 49:14 58:12
 59:25 78:10 89:1
 125:3 129:6
outside (4) 11:17 33:1
 54:15 73:24
over (34) 16:21 21:8
 22:18 23:18 24:17,19
 25:7 27:25 32:25 34:7
 44:17 46:5 91:7,10
 95:15 96:10 97:2
 103:3 104:5,15 106:12
 107:7 110:2,13 112:7
 117:3 121:4 128:1
 137:25 149:17 160:14
 162:22 175:24 179:14
overall (2) 65:18 73:24
overcladding (4) 19:13
 23:15 39:3 116:8
overcome (1) 10:4
overhaul (1) 56:22
overlap (1) 159:12
overlooked (2) 159:3
 160:15
overly (1) 154:18
overseas (1) 65:4
oversight (1) 64:14
overstretched (1)
 116:14
overtop (1) 35:9
overtopping (1) 37:18
overview (2) 17:3,11
overwhelming (1) 49:19
own (23) 2:10 10:20
 13:5 27:7 33:5 38:21
 40:11 41:10 42:16
 46:14,16 47:9 55:6,21
 58:15 67:8 113:25
 114:4 115:14 148:11
 154:8,20 166:4

oxide (1) 44:1

P

paid (2) 79:19 111:16
pains (2) 42:16 165:4
painstaking (1) 165:21
pandemic (1) 174:11
panel (39) 1:14,15,18
 2:8,11 13:9 15:22
 17:23 20:15,20
 22:6,10,18 23:9 26:25
 27:15 30:19 34:5,10
 37:12 39:4,12,19
 50:11 52:8 56:14,25
 67:3 78:12,14,19
 88:11,23 94:13 120:11
 126:24 158:9 165:25
 174:5
panels (53) 2:17,21
 5:23 13:13 22:12 28:9
 30:15 34:24 51:24
 61:1,18 62:11,13
 66:19 68:20 69:3,7
 75:21,23 76:1,20
 77:10,17,19 78:16
 81:22 86:6,9 90:5
 100:8 112:21
 119:11,13,15
 120:2,4,7,15,17,22,23
 121:6 122:11 123:5
 125:20 140:10 149:1
 150:19 155:13 159:24
 160:4,10 161:6
paper (4) 36:1 66:22
 93:15 107:20
papers (2) 35:25 137:15
paradigm (1) 167:18
paragon (1) 55:15
paragraph (22) 26:9
 36:23 38:18 39:5,17
 40:21 41:6 53:11
 55:11 67:12 72:4,6
 80:8,18 97:20,22
 104:22,23 141:8
 167:3,8 168:12
paragraphs (3) 41:15
 109:17 121:1
parameters (1) 30:22
parents (1) 53:19
pargeter (6) 25:13,20
 36:17 40:18 41:22
 55:21
pargeters (3) 26:9
 42:12 55:18
parliamentary (1)
 144:16
part (28) 2:15 4:16
 42:14 69:17 71:18
 83:23 86:22 91:18
 94:7 101:19 104:21
 105:2 106:4 108:2
 117:4 130:25 131:6,9
 143:25 144:20
 145:7,12 154:16
 160:12 174:6 176:6,8
 180:1
participants (18) 1:12
 6:21 7:15 10:15 12:24
 15:25 16:5 60:12 62:9
 77:8 80:24 129:24
 141:2 174:9 176:14
 177:11 180:4,16
participating (1) 1:25

participation (1) 55:20
particle (1) 44:17
particular (40) 1:9 3:15
 13:4 21:17 56:11
 63:23 64:17 70:22
 71:8 72:19
 75:10,21,22
 76:5,6,11,16,21,24,25
 78:14 79:19 81:5,6
 96:15,21 98:23 123:14
 131:22 136:19 139:10
 145:11,15 146:5 155:1
 171:12
particularly (11) 13:14
 37:16 64:10 68:12
 69:15 71:4 117:6
 128:14 139:4 148:12
 179:25
particulars (1) 121:19
partly (1) 137:20
partner (1) 179:19
parts (5) 17:3 36:16
 66:4 75:3 156:13
pass (15) 23:1,14 25:7
 28:5 35:11,19 36:4,7
 40:22 41:23 49:22
 56:3 123:17 136:7
 137:1
passed (10) 23:20 25:10
 36:16 38:24 39:13
 48:6 136:21,22
 139:15,23
passing (3) 26:18
 141:12 164:17
passport (1) 29:11
past (2) 50:1 55:1
paul (1) 36:9
pays (1) 147:24
pe (75) 2:16 5:23 13:13
 17:23 20:15
 27:10,13,19
 50:8,11,22
 51:10,16,16,22
 52:15,25 53:2,7,16,25
 60:22 61:17,20 62:11
 63:25 65:1 66:8,19,24
 67:13,17,24 69:2,12
 72:25 73:8,14,22 74:6
 76:20 78:23 79:8
 81:16 82:16,18 90:5
 119:11,22 120:2,7,22
 121:6,8,13,14,16,23
 122:1,8,22
 123:2,12,16,18,22
 124:7,12,15,20,24
 149:4 151:19 152:24
 159:24
peccored (20) 129:9,14
 130:11 132:16 133:13
 134:12,15,22,24
 135:3,10,18,23
 136:2,5 137:1,5,10,16
 138:3
peculiar (1) 61:22
peerreviewed (2) 129:8
 137:15
pending (2) 92:15
 150:12
people (3) 16:8 49:25
 127:9
perceived (1) 118:9
perfect (1) 25:14

perform (1) 56:5	98:3,4 119:19 120:14	162:24 166:16 174:15	principally (5) 11:19	107:19 108:5,10,17,24	projects (9) 49:10 51:6	providing (8) 5:8 32:8
performance (55) 5:4	128:9 129:18 132:23	potentially (2) 29:17	12:19 30:22 39:1	109:7,16 110:12,17	53:16,21 68:5 73:7	51:15 59:1 60:6 89:8
28:23,25 31:8,24 35:3	134:1,11 135:12,21	166:19	48:10	111:5,9,19 112:2,3	110:15 115:7 116:9	112:17 155:25
38:9 42:6 50:9 65:16	136:2 137:6,12,18,24	powerless (1) 13:9	principle (2) 135:2	113:14 115:19 116:1	prolonged (1) 24:17	provision (3) 96:24
75:8 78:13 79:11,13	place (7) 22:16 26:13	pr (2) 47:13 53:25	163:6	117:8,24 121:24	promote (3) 120:19	125:4 179:14
82:6,7 83:6,17,18,20	70:6 71:24 150:1	practical (1) 29:24	prior (6) 37:4 42:8	122:9,19 123:2	156:18 179:2	provisions (1) 100:22
87:3 95:23,25 96:4,15	153:3 156:24	practically (2) 36:24	66:24 92:24 103:2	124:8,17,25 128:7	promoted (1) 177:3	provoking (1) 57:7
98:8 99:1,17 101:15	placed (1) 109:14	42:3	151:14	132:17 133:2	promotes (1) 33:7	public (23) 12:15,25
103:16 104:3,6	plainly (1) 125:18	practice (9) 3:21 4:6	priorities (3) 176:15,18	134:1,6,16 139:1	promoting (2) 49:9	13:12 14:6 15:19
105:4,8 107:1 108:12	plan (1) 179:13	35:24 36:1 40:6 41:9	177:21	140:4 141:24 145:18	65:21	50:15 54:10 57:1
112:4 116:10 119:3	plastering (3)	98:19 106:9 144:3	priority (2) 175:22,24	146:3,25 147:2,4	promotion (5) 18:10	89:10 125:18 165:23
121:5,12,23 122:5	118:2,7,11	practitioners (2) 164:21	private (2) 170:12 178:7	148:15 149:3,6	130:15 138:13 139:2	166:1,2 168:2,17
124:6,8 128:19 133:20	plastic (1) 67:5	171:17	privatisation (1) 171:3	151:5,16,19 152:25	177:8	169:13,21 171:1
142:1 144:11 147:4	played (7) 6:14 27:15	precautionary (1) 15:16	probably (1) 174:19	153:5,17,20 154:16,25	prompted (3) 15:4,6	174:24 175:2 177:12
156:10 159:20 168:9	86:5 92:13 125:20	precautions (3) 63:3	problem (6) 17:6 35:17	155:1,3,6,8	164:9	178:7 179:1
177:13,15	160:12 174:6	84:22,25	38:14 140:20 175:18	156:5,6,9,15,17	promptly (1) 93:3	publication (3) 29:19
performancebased (3)	please (9) 16:22 82:13	precedent (2) 23:13	176:9	164:16 168:9,23 169:5	proof (1) 167:16	142:3 151:24
19:22,24 31:5	84:12 87:15 102:10	25:6	problematic (3) 31:2	173:1 177:8 179:17	propagation (1) 123:21	publicised (1) 100:24
performances (2)	126:20 157:14,20	precipitating (1) 86:6	72:25 124:16	production (3) 48:10,15	proper (3) 54:13 101:7	publicly (1) 171:7
146:25 153:16	180:18	precise (5) 42:4 62:24	problems (1) 133:1	139:11	166:11	published (5) 5:1 29:6
perhaps (7) 20:5 66:3	plus (1) 137:11	67:21 73:25 117:12	procedures (8) 42:3	products (88) 1:7 4:19	properly (4) 65:11 87:8	77:25 137:14 163:22
70:11 74:18 126:12	pm (5) 102:11,13	precisely (4) 25:17 37:6	94:21 128:13	5:9,19 6:1,11 13:5	165:12 166:22	punish (1) 12:13
168:11 174:25	157:15,17 180:19	59:20 117:2	141:17,19 142:10,11	17:9,12,13 18:10,23	properties (5) 146:3	purchased (3) 99:7
period (6) 7:9 24:17	pointed (2) 61:19 63:5	precluded (1) 8:19	150:14	19:17 20:13 21:7,8	147:11 151:2 156:9,12	118:1,4
81:12 121:4 122:24	pointing (1) 49:25	predated (1) 5:24	proceed (3) 64:7,16	22:3,17 27:24	proposals (3) 153:22,25	purported (1) 45:9
166:18	points (10) 85:1 89:23	predecessor (1) 34:3	65:6	28:3,4,14,16,18,20	155:19	purpose (12) 3:12 27:17
perkins (1) 118:3	103:13 104:12 109:22	predominantly (1) 31:5	proceedings (5) 1:25	29:11 31:11,19 32:5	propose (3) 5:11 89:22	36:14 62:16 80:22
permissible (5) 19:12	113:16 123:14 130:1,7	prefer (1) 88:11	8:13 11:20,21 94:11	35:19,22 36:12 37:2	157:9	81:21 82:3 136:11
30:23 35:5 65:19	153:25	preference (1) 88:9	process (18) 77:13,22	53:19 54:2 55:10	proposed (10) 5:7 14:1	143:25 144:9 159:11
146:8	police (4) 9:8,13 93:8	preliminary (1) 58:3	94:22 115:1 128:13	62:14 63:22 68:24	23:7 31:16 33:13	169:14
permit (1) 10:9	144:20	premise (3) 42:1 51:10	129:22 139:3,11	71:20 73:13 74:12	34:13 45:23 46:11	purposes (1) 107:9
permitted (8) 9:11	policy (3) 85:15 86:18	56:18	148:6,9,16 149:5,18	79:7 81:9,16 90:2,9,19	113:12 133:22	pursuant (3) 4:20 11:3
33:22 91:3 95:14 99:3	106:8	prepared (3) 58:2 59:15	150:11,15 152:3,22	92:7,10,22 93:2,25	proposing (2) 15:22	148:1
131:8 135:2 175:23	polyethylene (6)	67:2	155:19	94:2 95:2,3,6 98:3	101:15	pursued (2) 45:14 54:9
permitting (1) 19:22	78:16,19 119:17,17	presaged (1) 172:23	processes (8) 94:18	99:7,18,21 101:25	propositions (1) 62:19	pursuing (1) 15:12
perreiah (1) 53:6	159:24 161:5	prescribed (1) 35:6	114:23 128:12 141:17	102:25 103:3 107:8	proprietary (1) 169:21	purveyor (1) 54:7
persist (1) 48:20	polyethylenecored (1)	prescribes (1) 18:22	147:6 148:12 153:23	117:7 118:8 120:21	prosecution (8) 10:11	pushing (1) 51:1
person (5) 1:23 16:6	19:2	prescriptive (6)	156:23	128:10 142:2 145:9,25	11:1,25 12:4,8,11	putting (1) 178:4
112:23 142:24 157:18	polyisocyanurate (1)	19:23,23 20:2 31:8,9	procure (1) 44:4	146:8 147:10,10	13:22 59:4	
personnel (1) 92:5	90:8	55:5	procured (2) 43:24	148:20 149:10 150:25	prosecutor (2) 12:9,13	Q
persons (2) 8:17 64:12	polymeric (1) 160:8	presence (2) 86:7	51:14	154:8 159:21,23 160:3	protect (2) 34:13 67:8	
perspective (1) 49:3	polyol (1) 48:10	129:14	procurement (1) 176:1	163:13 166:3,4 168:25	protection (2) 63:9	qc (2) 16:1 173:9
persuaded (1) 21:20	polyurethane (1) 23:14	present (4) 10:14 13:25	produce (2) 21:20 33:7	176:2 178:25	156:6	qualification (1) 46:6
pertinent (1) 12:18	poor (3) 38:9 49:19	14:4 174:14	produced (5) 32:5 42:24	profess (1) 67:7	protocol (2) 141:25	qualified (2) 31:15 96:3
perversely (1) 17:20	50:8	presentation (4) 6:24	95:24 103:9 169:12	professional (3) 106:17	142:9	quality (2) 94:19,20
peter (1) 7:22	poorly (1) 54:19	7:1 34:18 156:2	product (195) 5:2,6	107:4 109:6	protocols (1) 142:5	quantities (1) 117:20
phase (27) 1:5 2:9	pose (2) 167:6,12	presented (5) 1:10 5:3	12:18 14:23,25 15:1,3	professionals (6) 63:21	prove (1) 48:5	queries (1) 106:11
17:24 25:1 36:23	posed (2) 166:16 171:8	151:10 155:17 157:6	17:4,20 20:6 25:21,25	64:13 90:21 91:12	proved (1) 24:18	question (13) 19:21
56:16 61:15 63:5	poses (1) 33:16	president (1) 53:7	28:4,8,22 29:1,2,5,13	100:20 101:3	proven (2) 167:6,11	32:14 36:5 52:4 59:11
67:1,12 70:12 84:19	position (18) 8:25 10:15	press (1) 50:4	31:22 32:9 36:14	professor (6) 63:5	provide (21) 8:23 29:20	62:12 87:23 88:9
85:17,20 86:23 109:9	27:7 39:23 44:12	pressed (1) 52:11	38:8,15 39:7 41:5,7,21	67:9,12 158:10	31:12 55:5 123:24	134:14 136:4,10,25
119:13 132:5,11 157:5	55:21 58:20 71:24	pressing (2) 50:14 88:4	42:5,8,11 45:25 46:24	165:3,4	132:13,13 138:8	137:7
160:20 165:3 166:1	72:23 89:17 91:17	pressure (1) 143:10	47:6,11 48:9,21,25	professors (1) 165:13	143:18 144:9,24	questioned (1) 48:25
172:9,10 176:13,21	123:13 124:13 127:22	prevailing (1) 156:10	49:2,11 50:8	proffering (1) 31:7	145:22 152:16 153:2	questioning (1) 112:14
phenolic (5) 128:7	154:7 155:10 156:7	prevalent (2) 48:19	51:2,16,25 54:7 61:7	profile (1) 174:12	154:5 157:2 160:21,23	questions (7) 14:5,7
130:24 132:24 136:2	177:2	170:18	62:25	profit (2) 177:17 178:4	161:15 168:7 171:16	15:8,14 48:18 127:20
137:6	possession (3) 150:21	prevent (9) 50:3 118:9	63:12,14,17,18,22	profound (2) 60:2	provided (49) 4:23 6:5	180:6
phenomenal (1) 37:17	151:4 155:12	125:7 143:23 144:6,14	64:6,8,11,12,15	127:12	9:21 12:3 13:24 21:19	quickly (1) 137:12
phil (1) 49:20	possibility (2) 10:7 88:4	154:17 157:3 177:20	65:5,16,21,24 66:6	programme (9) 6:19,20	33:22,25 61:9 82:5	quite (6) 37:8 48:17
photo (3) 27:21 44:5,8	possible (18) 14:11 16:9	prevented (3) 65:10	70:22 71:7,10,13,14	18:22,25 33:11 49:15	83:9 89:15 91:7 93:15	52:18 66:18 69:20
phrase (1) 162:20	24:8 30:5 42:17 44:22	85:6,23	72:7 73:1 74:14,17,22	55:21 56:19 142:8	95:17 103:14 104:16	80:6
physical (1) 66:20	47:5,12 73:11,13,19	preventing (2) 37:17	75:5,6,8,12,15	progressive (1) 33:25	107:21 121:20 122:4	quote (1) 123:8
picked (1) 26:16	81:22 93:13 108:9	79:20	76:4,11,14,16,20,22,23	prohibit (1) 19:14	127:25 128:1 131:9,14	quoted (1) 141:1
pictures (1) 165:1	138:4 139:15 147:16	prevention (1) 96:8	77:3,5 78:23	prohibited (2) 8:8 34:15	135:5 139:8 141:22	
piecemeal (2) 161:12,14	155:22	previous (1) 116:7	79:12,14,25	prohibiting (1) 31:10	142:7 144:19,22	R
pieces (2) 21:25 33:4	possibly (4) 15:20 39:25	previously (3) 64:3	80:1,3,16,20 81:1,5,25	prohibitions (1) 8:23	145:14 147:23 149:7	race (1) 174:1
pipeline (1) 51:6	48:17 61:22	69:11 92:22	82:2,8,11,15,24	project (19) 24:16	150:20 151:1,13,22	racial (1) 174:13
piper (7) 7:25 8:18	postfire (1) 175:4	price (1) 69:2	83:7,11,21,22 84:2,7	26:24 47:4 54:10	152:1,2,8 153:14	radical (1) 18:12
9:2,7,16,23 10:1	postgrenfell (1) 163:23	primary (1) 112:23	87:5,6	61:12,24 72:20 109:25	154:16 155:7,11,21	raging (1) 38:12
pir (30) 26:18 45:12	postponed (1) 172:6	prime (1) 1:16	90:11,12,18,23,25	110:5 113:4 114:2	156:3,21 161:4 177:10	rainscreen (40) 2:17
56:4 90:9,15,18,20	potential (10) 11:16	principal (6) 2:13 4:18	91:16,25 92:17 96:25	115:5,10 158:24	provides (9) 8:5 29:18	18:2 90:12 91:20
91:8 96:17	45:2 63:16 76:16	17:8 37:1 86:25	97:8 103:9,10 104:10	162:24 163:1,25	30:7 89:17 104:24	92:14 95:18 103:7,10
97:4,12,14,18,25	83:14 101:8 106:14	119:13	106:17,21,22,25	164:22 174:17	147:3,11 157:1 159:22	104:2,7,15 106:9

107:6,15 108:23	162:21,23 179:17	115:22 116:6 118:19	68:7,16 70:15 71:25	remained (6) 82:4	requesting (1) 8:8	68:1,7 70:19 72:14
109:2,8 110:17,21	recalls (1) 46:4	120:19 128:5,8,22	72:16,22 73:15 74:10	84:9,23 94:10 114:10	requests (1) 15:6	87:2 91:13 113:21
111:2 112:24 114:12	receipt (1) 26:5	130:10 131:4,8	85:23 87:9 114:19	120:21	require (4) 18:12 19:24	114:10 115:21 118:16
116:17 133:9	receive (1) 60:11	132:4,14,20,22	124:14 140:13 145:24	remaining (1) 14:8	28:12 72:3	130:22 132:3,14,22
158:18,20 159:2	received (3) 78:24	133:2,10,12,17,24	reinforce (1) 155:24	remains (6) 39:23 57:22	required (27)	133:24 134:10,19
160:3,19 161:19 162:1	116:9 141:3	134:4,7,10,20,25	reinforced (1) 44:9	58:24 59:6 158:11	20:18,20,21 23:12	164:22 166:24 167:13
165:5,14 167:9	recent (1) 178:2	136:3 138:18 144:2	reissued (2) 150:11	175:2	30:10,13,18 31:6,24	168:11 175:22
170:3,18,25 171:18	recently (4) 1:15,24	148:23 153:11,18	152:23	remarkable (1) 66:25	34:6 50:21 56:23,25	rest (1) 133:6
172:1,21	14:16 51:7	159:19 161:24	reissues (1) 149:22	remarks (7) 17:10 54:23	71:7 79:18 85:22 98:8	restates (1) 80:9
raise (1) 8:1	recladding (1) 161:18	165:10,18 167:16	reiterate (2) 60:1 89:2	58:2,8 59:8,13,15	99:23 100:10 111:2	restored (1) 89:13
raised (2) 18:9 130:1	recognise (4) 56:20	170:9 174:17 175:23	rejected (3) 46:18	remember (1) 82:13	121:18 124:2	restricted (1) 122:10
raises (2) 15:8 174:18	60:5 63:11 129:22	176:14,18	117:16 123:6	remembered (1) 19:25	131:21,23 147:17	result (23) 20:3 21:2
range (4) 47:5 78:4,13	recognised (11) 33:24	refusal (1) 13:2	rek (1) 163:6	remind (4) 16:4 84:11	159:19 167:5	23:20 61:12 77:4 78:2
164:15	40:9,15 77:23	refuse (1) 12:22	relate (1) 81:15	86:11,19	requirement (6) 29:22	83:20,24 84:1,4 86:13
ranges (1) 94:1	139:10,16 164:1	refuses (1) 123:10	related (5) 46:15 79:24	reminded (1) 174:13	72:7 133:21 160:22	104:4 109:5 110:18
rapid (2) 12:19 24:23	165:9,17 166:2 167:25	regard (5) 74:25 101:10	83:13 104:7 177:23	remit (1) 60:11	176:24 179:13	114:24 118:23
rather (6) 31:6 50:2	recognises (4) 43:22	110:7 118:10 177:1	relates (1) 76:10	remorse (1) 55:20	requirements (25) 3:21	121:22,25 122:18
81:16 113:23 116:1	89:10 94:5,22	regarded (10) 20:23	relating (15) 7:3 15:5	remotely (2) 1:25 16:11	4:21 29:21,25 32:22	123:25 146:16 150:13
136:20	recognising (2) 34:13	25:5 40:24 78:20 79:8	17:22 30:1 45:21	removal (2) 175:14,16	72:22 90:18 91:5,8	159:1
rating (5) 52:6 80:13	40:3	80:16 82:24 122:1	68:14 72:5,6 81:4	remove (3) 44:6,8	95:20 97:15,19 101:6	resulted (3) 66:9 127:7
107:2 151:6 171:15	recollection (1) 113:9	123:7 177:16	83:20 142:2 144:1,3	160:24	103:20 131:4 132:6	176:18
ray (7) 45:22 111:22,24	recommend (1) 177:19	regarding (2) 124:6	160:19 173:25	rendered (1) 38:3	136:14 145:24 159:17	results (30) 4:21 6:15
112:8 113:16,20	recommendation (2)	161:1	relation (22) 8:13 51:12	renders (1) 18:7	160:18 161:1,8,17	32:10,20 40:13,14
115:15	56:17 179:8	regardless (8) 13:1	58:11 60:3 61:24	renew (1) 60:4	170:17 171:12	41:2 43:6 51:17 68:6
rb (7) 51:10,16 52:3	recommendations (10)	24:19 135:20,24 136:8	69:23 71:25	repeat (1) 82:9	requires (5) 28:21	77:25 82:14,17
82:15,16,18,19	56:16,21 57:1 71:9	138:4 141:12 179:9	75:5,12,13 76:14 78:9	repeatable (1) 40:25	31:19,22 132:7 175:14	83:9,24 93:14 98:23
rbkc (2) 101:22 115:21	157:8 177:23,24	regards (2) 125:4,5	79:9 80:17 93:24	repeating (1) 162:15	requiring (3) 19:22	108:13 121:8 122:8
reached (5) 10:8 30:24	178:5,21 179:4	regime (42) 3:12 6:10	114:18 128:14 139:4	repeats (1) 105:23	request (8) 19:22	148:13 152:9
37:24 53:4 176:21	recommended (2) 55:7	17:7 18:20,21	156:10,11 174:20,23	replacing (1) 137:17	requisite (2) 80:21,23	154:21,24 155:7
reaching (1) 10:3	164:5	28:11,13,15,17 29:16	relationship (2) 145:16	replica (1) 25:14	research (15) 36:1	169:22 175:5 176:19
reacquaint (1) 162:17	reconciled (1) 113:8	33:9 53:13 56:23	147:21	replicate (1) 36:25	39:7,14 41:19 44:23	177:13 178:25
react (2) 52:25 166:3	record (1) 36:24	60:18 64:9,17,22	relatively (3) 24:21	replicated (2) 25:9	95:24 103:5 129:8,12	resume (3) 7:10 57:9
reaction (9) 83:14	recorded (6) 4:22 35:12	65:3,4,7,10 68:16	84:10 105:18	139:14	137:20,23 139:19	102:3
107:8 146:2,9,16,18	37:21 38:20 40:16	70:15,16 71:2	relatives (2) 180:1,2	replicating (1) 108:8	166:4,5 171:7	retain (1) 172:17
151:2 153:6 156:11	42:12	72:1,16,24 73:15,20	relevance (5) 20:17	report (50) 35:12,14	reserved (2) 8:24 11:4	retardance (1) 36:13
reactions (1) 54:2	recruiting (1) 94:16	74:10 85:23 124:14	23:23 24:1 44:18	36:23 37:7 38:21	reside (1) 175:21	retardant (15) 19:2
read (20) 46:9 47:25	recurrence (1) 157:4	158:23 159:10 162:9	155:1	40:4,12 43:15 44:4,21	resident (3) 7:19,21,23	36:11,15 40:22,25
55:8 69:24,25 105:19	recurring (1) 144:7	164:12,14 165:11	relevant (57) 3:19,25	45:1,4,11 46:15	residential (12) 19:1	41:23 68:20,25
106:17	reduce (1) 155:16	172:12,20 178:24	4:14 7:1 8:20 9:14	49:8,21 55:18 61:15	63:2 89:11 91:4 116:8	69:5,8,14 79:6 120:23
111:11,12,14,15 112:1	reducing (3) 35:21 69:2	regimes (5) 7:2 18:14	14:4 28:11,13 29:20	63:5 67:12 84:19	119:23 120:15 144:4	123:5 149:2
113:14 116:13 147:14	170:23	28:13 64:19 140:13	37:4 41:2,17 64:9,19	85:17,20 93:9 95:24	161:18 163:25 167:18	retardants (6) 35:19,24
154:23 162:6,14	refer (3) 107:10 147:19	registered (2) 6:6	65:12 70:18 74:4,16	98:21 99:12 103:23	171:13	36:2,7,9 43:16
165:1,20	148:19	175:15	77:25 81:15 89:18	105:11,12 109:10,17	residents (4) 127:14	retested (1) 108:11
reader (2) 68:21 78:21	reference (15) 35:4	registration (1) 179:16	92:16 93:5,11,18,20	119:13 121:21 123:20	131:2 175:8 176:16	retesting (1) 39:11
readers (1) 90:25	47:10 70:2 71:21	regret (1) 60:2	95:10 96:24 99:20	132:5,9 151:4,23	resigned (1) 94:12	rethink (1) 18:13
readily (3) 169:25	79:24 80:9,18 86:1	regular (1) 10:12	100:22 107:5,8,25	157:5 159:15 160:20	resist (4) 29:23 96:10	return (1) 179:22
178:12 179:1	96:22 112:3 133:21	regulate (2) 172:21	109:4 111:1 123:24	166:1 167:3 168:1,13	132:8 176:25	returning (1) 175:19
reading (4) 78:17 89:21	146:1 154:19 173:24	173:2	131:4,13 136:14	174:8 176:4,22 178:15	resistance (3) 4:12	reveal (1) 175:12
162:23 163:15	174:23	regulated (1) 65:4	145:17,23 147:2,17	reported (6) 25:1 93:4	79:11 80:2	revealed (1) 121:11
ready (5) 102:19 143:13	references (3) 89:18	regulating (1) 166:6	148:14 152:4,8	107:25 148:4 159:14	resolution (1) 126:1	reveals (2) 128:11 160:9
144:23 158:5 173:17	154:1 162:15	regulation (5) 20:8	155:5,8 156:14,16	166:15	resolved (2) 40:7 169:12	review (13) 14:10 17:6
real (5) 12:4 13:21	referred (9) 8:3 38:12	28:18,20,21 31:18	158:21 162:3 168:6,16	reports (22) 14:19,20	respect (25) 3:6,25 4:2	56:18 86:2 93:11,14
35:22 94:8 137:7	77:9 97:21 99:11	3:19,19,23 4:5 8:7	169:17 180:4	15:9,14 23:3 39:15	5:17,23 42:7 43:16	138:25 139:2 141:25
realised (1) 50:8	106:25 152:4 153:1	19:14,21 21:9 22:1,14	reliable (1) 113:18	51:15 55:8 76:13	68:25 71:15 72:21	161:14 164:5,7 172:15
realistically (2) 28:8	162:11	29:19,19,22	reliance (7) 39:21 86:17	107:18 108:4,9,17,25	73:9 82:14 84:4 91:17	reviewed (4) 147:7
91:15	refers (3) 41:22 78:20	31:3,10,19 32:23	109:14 115:17,25	109:6 142:3 144:18	121:10 128:19 131:5	152:11 155:18 172:24
reality (1) 141:9	97:7	50:20 62:15 63:20	125:17 126:3	150:7 152:25	133:1,17 138:5 140:3	reviewing (2) 94:21
reallife (1) 36:21	reflect (5) 42:14 54:19	66:2 71:18 74:12,15	reliant (1) 168:18	154:16,19 165:21	145:8 148:22 153:14	113:9
really (2) 57:22 88:10	150:16 152:23 162:11	79:18 90:1 91:2,14	relied (10) 15:15 26:13	represent (8) 58:15,19	165:21	reviews (1) 149:8
reason (6) 12:1 28:1	reflected (1) 153:9	95:11,14 100:22	40:13 109:6 111:24	60:13 68:13 71:6 75:6	respectfully (3) 69:19	revising (1) 161:12
29:2 108:20 119:14	reflective (2) 36:20 39:6	101:13 111:4	112:3 128:16,24	84:15 143:17	86:11 92:1	revision (1) 161:14
162:1	refurbishment (80) 2:15	114:9,13,22 118:13,17	139:6,20	representations (2)	respects (1) 22:1	revisions (1) 164:6
reasonable (3) 63:18	13:15 61:12 64:23	119:20 131:6,7 132:7	relief (1) 52:24	60:12,14	respond (5) 58:10	revisit (2) 9:17 11:4
64:24 71:3	65:5 66:1 68:8	136:15	relies (3) 38:22 39:11	representative (5) 14:22	127:20 130:1,3 170:24	rewrite (1) 21:19
reasonably (6) 53:12	70:17,25 71:16 72:21	145:11,18,20,21	115:20	15:2 18:2 61:2 121:23	responding (1) 106:11	rewriting (1) 32:16
64:6,15 71:1 83:5 98:2	73:4 86:16 87:2 89:24	158:21 159:17 160:18	rely (8) 41:13 63:19	representatives (2) 9:5	responsibilities (1) 60:8	reynobond (45) 2:16
reasons (8) 12:7 13:20	90:1,3,10	161:17 162:18 164:23	65:20 73:1 113:19	127:11	responsibility (13) 68:9	5:23 17:23 27:10,19
16:6 71:23 81:2 83:10	91:3,10,19,23	166:8 170:14 176:25	118:20 124:16 164:24	represented (2) 16:1	71:17 84:19 91:14	51:15 66:8 73:22 90:5
115:16 131:1	92:10,17 94:4	regulatory (25) 17:7	relying (3) 11:24 114:21	121:22	101:23 111:7 112:23	119:11,22 120:17,22
reassure (1) 59:23	95:12,13 97:14 98:18	18:13 28:11 56:22	168:11	representing (1) 16:5	113:25 114:5 115:13	121:6,8,10,13,14,16,20,23
rebranded (1) 49:1	99:8,15,19 100:21	60:18 62:2	remain (3) 17:14 92:7	represents (2) 51:19	117:14 119:5 177:11	122:1,8,21
rebuilt (1) 166:8	101:4,25 103:1 108:23	64:9,14,17,19 65:7	180:4	169:4	responsible (27) 4:8	123:2,12,16,18,22
recall (4) 14:12	111:11 114:8,16		remainder (1) 84:23	request (2) 133:18,21	64:7,11 65:8 67:16	124:7,12,15,20,24

149:1,4 150:17,18	50:4 90:11 92:15,24	satisfy (3) 114:23	12:21 55:2	106:14 178:9	signing (1) 112:16	14:15 54:16 58:21
151:2,19 152:9	93:13 103:1,4,7,10	145:23 146:5	seeking (5) 8:8 66:14	sheeting (2) 45:11,13	siloed (1) 176:8	62:5 67:14 74:22
153:10,17 155:13	104:1,4,14 105:21	satisfying (2) 21:11	125:23 152:14 170:18	sheets (3) 133:3,6	silverpore (1) 153:12	111:5
159:23	106:19 107:1,16,19	44:3	seeks (2) 17:17 179:10	138:14	similar (4) 48:4 56:5	soon (1) 161:3
rh25 (1) 160:11	108:10,22 109:3,20	save (1) 69:17	seem (1) 37:23	sheidecker (1) 52:9	139:21 141:4	sorrow (1) 127:12
rig (12) 27:6,8 28:2	110:1,14,17,19	saw (2) 116:24 175:6	seemingly (1) 37:21	shift (2) 115:13 117:14	similarly (1) 154:4	sotech (2) 140:22 141:4
34:22 35:7,9 37:18,25	112:4,9,17,21	sawtell (7) 142:24	seems (7) 40:20 50:17	shifted (1) 31:9	simulating (1) 98:15	sought (12) 10:5 20:8
38:12 44:2,10 98:14	113:1,6,22 117:2	143:2,3,5,15,16	69:23 118:6 133:16	shirley (2) 164:10	simultaneously (1)	24:11 34:11 41:3
righthand (1) 105:2	120:10 128:9 132:23	181:10	158:23 161:21	170:16	55:16	44:6,8 47:11 49:9
rights (1) 12:22	133:5 160:1	saying (5) 14:18 36:24	seen (7) 74:15 112:15	shocked (1) 127:5	since (28) 10:13 12:12	94:13 124:22 125:11
rigid (1) 130:23	rules (1) 32:3	46:5 142:12 160:24	150:4 152:5,7 172:23	shocking (1) 70:11	18:21 19:13 20:18	sound (1) 12:7
rigorousness (1) 148:10	run (5) 7:8,11 13:18	scale (2) 27:4 175:18	178:3	short (13) 57:8,12	21:20 23:11 24:7	soundes (2) 162:19,20
rigour (1) 168:21	59:15 176:4	scenario (1) 44:25	select (3) 166:15,23	102:12 105:18 117:14	25:15 38:4 40:6 48:7	source (4) 34:25 35:2
rise (2) 93:23 108:7	running (6) 6:1 35:7	scenes (1) 179:24	168:12	119:5 130:6 133:5	51:5 67:24 80:20 82:1	38:16 144:10
risk (15) 10:10 11:1,25	59:24 87:22 143:9	scenestting (1) 22:3	selected (1) 69:12	134:9 147:18 152:8	83:13 108:23 128:18	spate (1) 164:6
12:4,8 13:18,21 33:25	168:19	schedule (6) 25:19	selecting (2) 28:16	157:12,16	129:9 130:17 132:24	speak (1) 127:10
34:14 59:3 159:1	runs (1) 14:1	29:21 42:12 86:21	67:17	shortcomings (8) 43:21	138:22 141:15	speaker (1) 173:8
161:21 167:7,12	rydon (25) 5:9 68:11	132:6 176:24	selection (4) 20:6 45:19	128:14,22,25 139:3	149:14,18 174:9	specialist (2) 31:15 96:3
170:20	109:13 113:19,24	schmidt (2) 7:20 11:11	47:8 48:1	140:3 141:18 178:1	179:10	specialists (1) 162:3
risks (7) 56:20	114:1,6,9,14,16,17,20,22	scientific (1) 77:11	selfevident (1) 72:2	shorter (1) 166:18	sincere (1) 129:2	specific (11) 2:24 5:6
166:10,16,25 171:8,25	115:2,3,9,10,20	scope (4) 8:25 9:20	selfevidently (1) 147:16	shortly (3) 23:6 117:18	single (5) 27:3 50:10	18:2 31:1 47:10 80:1
172:4	118:7,10,15,20,20,22	45:2 98:19	selffunding (1) 145:5	141:5	66:4 87:5 133:18	100:15 113:9 141:18
ritter (1) 50:19	119:6	scored (1) 52:3	selfserving (1) 113:17	should (58) 1:13,17	159:7 177:22	159:7 177:22
rivet (15) 27:9 52:5,17	rydons (9) 114:3,4,20	screen (7) 87:15 96:21	sell (1) 87:6	10:2 14:11,15	sinister (2) 20:5 32:16	specifically (5) 24:15
71:10 73:22 75:9,24	115:6,13,24 117:14	102:15,16,18 104:19	selling (4) 5:8 13:13	19:21,25 22:12,13,25	16:2,17,19,21,25	36:16 45:14 97:21
81:22 82:9 83:8	118:2,14	126:13	124:24,25	25:8 26:11 30:16	57:5,14,19,21,25	125:10
121:13,21 122:3,7,18		scrutiny (3) 55:13 62:22	seminally (1) 25:4	41:12 44:19 46:1 47:4	59:16,23	specification (14) 44:14
riveted (10) 27:15,20	S	179:2	send (2) 46:2 106:9	48:23 56:17 64:25	87:12,18,19,20	69:16 95:2,6 99:20
50:11 51:25 52:3,15		sd (3) 118:2,7,11	sense (2) 25:3 60:2	65:1 70:5 72:8	88:14,20,21 94:13	103:11 108:22 109:19
151:6,12 152:24 153:7		sealed (1) 50:17	sent (3) 47:20 87:23	79:17,19 85:9 90:21	101:24	110:6,16 113:22
riyadh (1) 52:23		seaward (9)	110:16	97:19,23 98:6 100:20	102:1,2,6,9,14,17,21	123:18 151:16 178:24
rob (1) 46:8		157:19,20,22,25	separate (1) 58:16	101:21 107:3,4	126:6,8,16,18,19	specified (10) 44:19
robust (2) 147:15		158:4,7,8 173:6	separately (2) 79:5	108:3,16 117:10,15	142:21 143:3,4,6,17	69:6,15 96:14 109:24
156:24		181:12	100:14	124:20 125:22 127:16	157:10,18,23 158:1,5	110:2 128:9 132:21
robustly (2) 141:10		second (27) 2:18 17:6	september (9) 7:16	128:25 129:10 131:3	173:5,13,16 180:9	133:20 160:6
178:16		22:10 26:9 28:15	47:22 93:16 133:7	133:13 139:12,20	sit (1) 180:14	specifier (4) 67:16
rockwork (1) 73:23		29:16 30:20 40:18	138:19,22 139:17	142:15 151:8 156:15	site (2) 36:25 179:20	147:9,18 154:20
role (18) 1:16,21 5:8		59:10 65:13 84:21	140:1 179:11	163:8 164:7 165:16,18	sitting (1) 180:13	specifiers (4) 28:15
6:13 13:13 19:18		89:24 90:12 95:21	series (3) 84:12 137:15	167:4,23 169:24	situation (2) 94:15	47:18 147:1 156:8
27:15 54:6,18 71:6		98:10 103:17 105:20	152:14	177:22	159:3	specifying (2) 103:23
86:5 89:23 90:7 91:21		110:9 123:23 129:12	serious (5) 15:8 18:9	shouldnt (3) 28:9 52:10	six (8) 7:18 8:16 51:3	105:14
92:13 109:19 116:7		130:9 131:21 132:19	48:17 60:23 117:3	143:10	94:11 103:13 130:7	speed (1) 137:3
125:20		136:10 138:18 141:24	seriously (1) 47:24	show (4) 33:5 124:21	138:20 139:16	spin (1) 41:11
roomie (7) 7:6 46:1,4		163:18	seriousness (1) 18:6	137:10 151:11	sixday (1) 13:24	spirit (1) 144:13
47:20 49:9,24 110:15		secondary (1) 177:16	reserved (3) 10:18	120:1,9	141:14 142:6	sponsored (1) 168:3
root (1) 72:11		secondguess (1) 46:17	169:1,8	showed (3) 108:11	size (2) 76:1 102:18	sponsors (4) 168:18
roper (1) 45:3		secondly (5) 63:16 72:2	service (5) 9:8 10:22	120:1,9	11:15,22 85:12	169:15,20 172:17
roppers (1) 44:23		148:25 156:5,20	11:15,22 85:12	showing (7) 13:11 51:23	set (29) 4:20 23:13 25:5	spread (29) 4:1 12:19
roughly (1) 59:13		secret (1) 28:1	29:5 30:21 37:21	55:19 73:18 78:1,4	44:20 47:14 64:18	24:23 29:23 33:25
round (1) 88:17		section (10) 10:17,22	44:20 47:14 64:18	124:19	81:2 92:16 93:15	35:21 62:11 72:12
route (44) 19:10		11:3,15 30:9 61:15	81:2 92:16 93:15	shown (8) 31:23 51:11	95:16 105:25 110:16	73:23 79:20 80:10
20:2,9 21:10		66:10 70:14	127:22 129:2 131:5	69:4 75:16 81:6 119:2	132:6 135:20 139:7	83:14 96:9,10 105:6,7
22:13,15 30:9,18,20		78:21,22,22	132:6 135:20 139:7	131:10 153:8	140:5 141:8,20 144:16	119:14 125:21 129:13
31:8 33:10,14 34:9		79:5,7,10,16 80:15	140:5 141:8,20 144:16	shows (13) 25:20 39:17	146:2,12 148:17	132:8 137:3,25
49:17 55:17 71:22		83:4 96:24 97:7,15	146:2,12 148:17	44:8 68:4 76:4,22	162:15	160:13,14 166:17
72:3,10 95:19		99:23 100:3 129:7	162:15	101:2 111:8 121:4	setbacks (1) 43:7	167:1,7,13 177:1
96:12,15,18 97:3,25		147:18 153:13 159:15	setbacks (1) 43:7	137:15,23 149:13	sets (4) 35:6 89:16	smoke (1) 153:11
98:4 99:4,22 100:9		161:8,9 162:23	105:21 146:4	158:15	105:21 146:4	socialled (5) 19:1 20:23
101:8,17 103:14		sections (3) 95:20 162:4	160:2 164:19	side (1) 34:23	105:21 146:4	22:15 38:13 131:15
104:17,25		163:4	shall (7) 1:12 29:23	sidewise (4) 2:23 5:13	105:21 146:4	social (2) 174:1,2
131:16,19,21,23		sector (5) 21:18 50:15	34:19 65:9,19 88:15	17:25 160:11	105:21 146:4	society (1) 174:14
134:5,8 135:2 136:11		54:10 171:1 178:2	173:17	sif (1) 133:4	105:21 146:4	socioeconomic (1)
163:1,3,11		sectors (2) 177:25 178:8	shant (1) 180:13	sig (2) 5:14 46:10	105:21 146:4	174:14
routes (16) 20:1 30:8		sectre (2) 26:23 57:1	share (4) 27:17 52:6	sigh (1) 52:24	105:21 146:4	sole (10) 1:8
76:18 95:17 96:19		see (22) 9:8 16:17,17	64:4 68:8	sight (1) 15:11	105:21 146:4	2:17,19,20,23
98:6,7,10 99:5,13		46:24 57:17,19,20	seek (4) 8:21 10:2	signed (1) 112:9	105:21 146:4	14:23,25 63:20,22
100:19 131:14,20		78:22 82:16		significance (1) 74:18	105:21 146:4	66:6
132:2 134:19 162:25		87:14,16,18,19		significant (12) 9:14	105:21 146:4	sole (2) 91:21 111:22
rs5000 (60) 2:18 20:14		126:16,19 143:4,4		15:19 24:24 25:11	105:21 146:4	solely (1) 36:3
45:19,21,25		157:23,25 173:13,16		63:8 66:9 121:12	105:21 146:4	solicitors (3) 7:25 10:21
46:5,12,18 47:1,4,9,13		175:17		151:12,16 154:10	105:21 146:4	14:16
48:2,5,13,21,23 49:10		seeing (1) 102:6		175:7,19	105:21 146:4	someone (1) 158:25
		seek (4) 8:21 10:2		shared (4) 9:11 78:4	105:21 146:4	something (8) 7:14

142:4 148:16 149:2	stock (1) 117:22	138:17,20 140:9	75:14 78:12,20	135:15 137:1	24:2,8,10,12,14,18	167:6,12,22 170:2
155:2,3 156:25 164:18	stone (1) 166:9	successor (1) 171:24	79:8,25 80:10,17	138:15,19,23 139:5,21	25:7,9,11,13,15,16,18,23,25	171:4 172:3,12,16,19
standards (27) 3:20,23	stop (3) 49:9 102:3	sudbury (3) 74:5 84:6	81:5,15 82:2,11,24	140:2,8,12,14 141:11	26:6,8,10,11,16,18,19,21	175:4 177:7,14,15
4:6,13 18:17,18 29:14	124:25	86:9	83:14,15,19 99:21	142:4 146:2 156:23	27:2,4,5,11,14,16	178:24 179:1
32:1,4 64:18 93:7	stopped (2) 27:12 44:10	suffered (1) 56:13	100:6 122:2,20,22	161:19 166:11,17	28:1,8 30:22 31:23,25	tests (63) 4:20,20,21
96:14 97:12 100:2	storey (1) 163:7	suffering (1) 127:8	124:6,8 153:12	167:4 170:3,18,25	32:4,7,11,12,20 33:14	6:14 15:2 18:3
121:11 124:23 125:1	story (3) 13:13 27:15	suffice (1) 68:15	surfaces (3) 72:5 99:24	171:9,19 172:1,22	34:2,12,21,22	22:16,18,24 32:6,9
135:20 145:18 147:2,5	121:7	sufficient (2) 59:1	161:10	175:9 178:19	35:1,9,12,13,14,17,21	35:10,18 36:4,7 38:6
156:11,14 164:17,18	strategy (4) 47:24	110:19	surrounding (1) 85:21	systemspecific (1)	36:17,22,25	39:16,18 40:7,23
167:10 170:23	50:12,25 51:4	sufficiently (1) 85:7	surrounds (6) 90:14	24:10	37:3,4,5,7,20,23,25	41:6,14,17,18,20,24
standing (2) 13:5 82:6	strategiesupport (1)	suggest (10) 25:23	117:23 118:9,12,17,23		38:1,3,5,10,19,21,23,24,25,25	54:13 79:15
stark (1) 36:5	56:8	39:12 45:18 49:1	surveillance (3) 148:10	T	39:3,6,9,13,15,21,22,23	98:17 100:16 119:24
start (12) 37:2 59:9	strength (1) 122:23	64:25 92:1 99:2 102:3	149:8 154:8	table (1) 82:17	40:1,4,5,7,13,22 42:19	120:1,5,8 121:10
84:17,20	stress (1) 78:10	125:18 154:24	surveyors (1) 46:23	tables (1) 164:19	43:14,16,24	122:17 128:15,20,24
88:1,13,16,23 89:5	stressed (1) 80:25	suggested (14) 8:21	survivors (6) 54:17 89:3	taken (13) 11:12 13:20	44:7,16,25 45:9 47:14	135:11 136:8,13
103:1 104:20 158:5	strict (1) 12:22	10:1 22:8 26:7,10	127:14 143:21 180:1,2	58:15 67:16 94:14	48:4,6 49:6,8,19,21,22	137:1,10 138:21
starting (7) 5:11 15:25	strident (1) 122:25	33:19 45:7 47:24	susceptibility (1) 18:19	115:17 118:6 134:9	50:6,10 51:15,17	139:4,17,21,25
17:11 22:21 42:21	strong (1) 50:5	50:13 52:16 62:9	suspect (1) 58:8	138:5 141:15 163:12	52:17 55:8,23 56:4,5,8	140:1,7,10 141:9
59:13 88:6	strongly (1) 135:22	64:21 66:14 111:24	suspended (3) 92:15	166:24 175:5	68:6 75:7,11,21,23	142:5 146:13,17,21
stated (7) 53:25 94:3	struck (1) 69:18	suggesting (3) 23:17	150:14 152:17	taking (1) 96:7	76:10,12,16	155:8 160:19 169:24
97:17 134:7,25 151:4	structure (4) 31:3	51:22 58:20	suspension (1) 150:16	tall (5) 129:11 131:9	77:14,14,21,25 78:24	175:5 178:11
177:3	146:24 149:17 171:11	suggestion (3) 71:19,22	swept (1) 43:9	135:3 140:15 175:20	83:9,20 98:14,20,23	text (2) 105:3,23
statement (63) 2:3,6	struggle (2) 46:20 54:17	74:13	switched (1) 53:22	taller (1) 33:18	103:6,17,17,19	thank (40) 2:7
16:22,24 25:20 26:9	struggled (1) 25:16	suggestions (1) 180:11	switches (2) 60:4	107:18,19	107:18,19	16:2,23,25
36:18 40:19,21	studd (7)	suggests (4) 33:15	127:13	tamweel (1) 52:21	108:7,8,10,13 116:12	57:5,10,21,25
57:15,24	173:9,11,12,15,20,21	49:12 120:20 172:25	sympathy (2) 89:2	taplog (3) 73:20 74:9	117:11	87:11,12,20 88:21
88:3,11,18,22,25	181:14	suit (1) 45:5	143:20	86:9	121:8,14,19,21,22	102:5,8,9,17,20,21,22,23
89:22 93:17,17 95:9	studies (7) 32:15,18	suitability (7) 54:8	synthetic (5) 135:13	target (1) 24:15	122:8 123:17,24 124:2	106:6 126:6,8,10,22
107:22 113:8	56:9 98:21 99:3,14	70:22 113:1 116:17	137:5,11,18 141:6	targeted (2) 31:1 32:8	135:15 136:19,22	142:19,19,21,23
126:7,11,20,23	178:11	132:15 144:12 178:19	system (148) 2:14 3:15	targeting (1) 50:25	139:12,12,14,18,20	143:16 157:10,14
127:1,24,24 129:4,7	studio (8) 5:9 109:13	suitable (9) 46:18 64:18	5:7,10 6:5 19:11 31:16	tb4000 (14) 20:15	140:17,17,18,22	158:8 173:4,5,7,21
130:6 139:9 140:5,6	110:6 111:13,23	65:7 80:10 104:4	32:10,11,20 34:16	90:13 117:17,19,23	141:7,12 142:3	180:9,11,18
141:8,21 142:25	114:9,25 115:18	106:23 110:12 117:2	35:3,11 38:14,19	118:1,4,6,11,16,22,24	146:11,15 148:13	thinking (1) 88:24
143:9,12,14 145:14,15	study (15) 31:13 32:4,7	118:22	46:16 47:10 56:22	119:6 160:8	150:7 152:9 153:13	thats (16) 36:22 41:15
148:18	40:7 96:2,7 98:21	suitably (3) 31:15 96:2	62:15 63:3 66:5 69:22	team (14) 2:11 15:25	154:15,19,24 155:4,4	57:6 59:24 66:23
150:4,5,9,22,24	101:16	140:14	73:5,21,25 74:1	16:24 91:18 99:2	169:20,20,22 178:19	74:24 80:13 97:20
151:20 153:21 155:24	112:10,11,13,15,17	summarised (5) 120:25	75:1,20,22,22	123:1 162:6,14	tested (41) 1:8 14:24	102:2,4 141:7 143:7
158:2,6 173:19	132:1 134:17	121:2 139:9 141:21	76:5,12,17,21 77:5,14	163:16,24 164:4,22	15:5 18:1 24:20 27:10	167:3,8 180:7,17
181:2,3,5,6,8,9,11,13	styrofoam (1) 160:4	148:18	78:1,14 79:4,21 80:3	172:18 181:4	35:11 45:25 46:13,16	themselves (5) 35:10
statements (17) 1:13	subcontractors (4)	summarises (1) 164:19	81:5,17 83:21,23	teams (1) 121:3	47:2,11 55:6 77:14,16	42:19 145:21 147:7
6:21 9:13 13:10,12	114:10,21,24 118:2	summarising (1) 66:22	84:5,8 85:1,5 86:4	tech (2) 38:19,24	93:13 96:5 98:25	173:3
15:24 16:11 42:25	subject (9) 4:19 6:25	summary (4) 93:15	90:12 91:20 92:14	technical (22) 5:1 8:11	103:5,19,22 104:3,8	theoretically (1) 123:19
62:7 122:4 127:25	8:6 29:18 58:12 59:9	107:20 146:23 147:11	95:18,21,23	21:21 29:6,8 33:7 46:8	105:11,13,22 106:19	thereby (4) 25:10 38:1
129:3 130:2 139:7	64:13 80:4 94:11	supervise (1) 162:18	96:4,10,14	74:23 94:16 97:16	107:16 108:3,16,21,25	159:22 161:7
144:22 148:17 180:16	subjected (3) 78:23	supervision (1) 149:16	98:9,12,13,24,24	99:9 100:25 123:1,7	109:15 111:18 113:13	therefore (36) 11:17
states (6) 47:13 78:19	98:14 114:25	supplied (6) 27:22 64:1	100:7,9	131:12,25 134:13	131:22 138:16,20	15:14 19:17 31:4
79:7,10,16 145:9	subjective (1) 67:22	91:22 92:11 119:10	101:7,11,13,15	142:7,8 152:13	140:14 141:5 155:6	38:17 39:22 45:17
stating (3) 42:25 45:4	submit (13) 22:12 30:12	133:6	103:4,17,18,22,24	154:10,11	testified (1) 165:14	47:15 65:18 67:6
53:21	62:12,20 69:19 70:10	supplier (5) 63:18	104:2,8,10,14	technically (1) 147:15	testify (1) 59:5	72:13 73:13 75:10,16
statute (20)	72:11 95:4 99:4 113:7	64:6,15 147:23 148:2	105:4,10,13,14,22	technology (5)	testing (114)	77:3 78:25 83:24 84:9
8:4,14,19,24 9:1,18	115:24 119:5 172:7	suppliers (5) 55:7 63:24	106:19,20,23	38:5,6,7,7,10	3:2,5,9,11,20 5:17,17	86:5 97:23 98:4
10:1,5,11 11:1,5	submits (7) 113:17	133:4 169:6 173:2	107:6,15,17	telling (2) 31:5,7	6:10,25 7:2 15:5	106:13 117:11 118:20
12:1,5,11,12 13:22	115:14 117:16 123:12	supplies (1) 75:7	108:3,7,9,12,15,21,24,25	temperature (1) 30:23	17:4,7,9	122:12 125:14 128:21
125:6,17,23 126:3	161:25 162:5 164:6	supply (23) 23:24 28:13	109:2,15 110:21	temperatures (2) 35:5,8	18:10,12,13,20	130:6 136:10 138:1
statutory (4) 20:8 43:8	submitted (2) 86:21	37:4 39:24 41:25	111:2,4,18 112:6,24	tempting (1) 129:25	19:7,10 22:23,23 27:1	140:18 146:25 147:8
73:3 95:16	150:3	44:14 60:17,20,22	113:12,13	ten (2) 40:5 57:9	33:9,19 34:8,19 36:6	148:7 149:13 153:17
stayput (2) 85:14 86:18	subsequent (7) 38:6	61:1 63:25 64:10 65:4	114:12,13,15 116:18	tendering (1) 115:11	37:1 41:9 43:9,10,17	theres (1) 105:20
steadfastly (1) 123:10	41:21 48:3 76:23	70:20 71:7 90:2 92:17	117:7,11,13 119:20,23	terminal (1) 31:3	44:24 49:15 55:17,21	thereto (1) 8:13
stearne (2) 5:14 46:8	148:1 149:8 151:21	101:24 102:25 109:20	120:6,10,15 123:16	terms (23) 4:15 14:21	56:12,23 60:18 68:6	thermal (6) 133:20
steel (5) 24:2 26:20	subsequently (5) 41:10	123:12 133:1 138:18	128:23 131:10,15,22	30:23 54:12 70:13	74:22,25 75:1,3,4	159:24 161:20 170:18
37:13 39:2 44:17	133:25 150:9	support (9) 56:8 115:23	135:18 136:13,20	75:24,25 77:17 82:23	76:7,11,23 77:1,21,24	172:1 176:5
steelframed (1) 24:13	152:11,18	123:1 142:7,8,17	137:10,12 139:18	83:3 84:13 97:8	79:6 80:5,25 90:4	thermocouples (1) 35:7
step (1) 142:18	substantial (1) 98:12	155:19 164:2 178:21	140:18,19,22 141:5,10	100:14 112:18 137:8	92:6,21,24 93:5,24	thermosetting (1) 97:17
stepbystep (2)	substantially (1) 109:1	supported (2) 128:18	146:4 158:18,20	145:25 146:19 148:8	94:1,2,18 95:1,21	theyre (1) 168:3
104:17,24	substrate (3) 75:25	145:21	159:2,16 160:4,20	165:5 167:7,13 173:24	98:11,16 103:16	thicker (2) 82:16,19
stephanie (1) 16:1	77:10,19	supports (2) 127:17	162:2 165:5,15 167:9	174:23	122:14 123:11 128:17	thickness (2) 111:1
steps (5) 71:17	succeeded (1) 51:5	179:6	171:15	terracotta (7)	129:8,12 130:15	133:19
94:14,15 108:18 134:9	successful (9) 12:10	supposedly (1) 18:14	systems (50) 5:18,20	39:4,12,13,16 45:10	134:17 135:4,8 136:23	thicknesses (1) 117:21
still (7) 18:6 20:3 26:2	23:25 26:1 38:23	sure (3) 16:13 42:4	15:5,5 45:2,5 55:6	139:18,21	138:12 139:1,10	thing (3) 13:7 59:10
58:14 70:13 85:13	54:10 138:21 139:17	80:10	62:21,23,24 63:9	terrible (4) 60:3 84:14	141:25 148:3 154:6,25	127:4
175:14	140:1 169:24	surely (1) 82:18	73:8,11 76:24	85:13 127:8	155:2 158:22 159:6,9	thinking (2) 12:8 176:8
stimulating (2) 1:21	successfully (7) 25:9	surface (27) 20:19	77:16,16 86:17 94:19	test (197) 6:14 14:19,21	162:8 164:11,14,15,18	thinks (1) 64:5
168:10	47:14 103:5 104:2	30:14 61:17 71:14	96:1 103:8,15 120:2	17:22 18:14 19:19	165:11,23 166:4,12	thinner (2) 82:15,20
				23:2,6,8,15,16,17,20,20,22,22,25		

third (21) 2:19 17:7
22:16 25:20 30:25
36:17 40:21 65:14
89:25 96:2 103:21
105:3 110:14 124:4
130:11 131:23 134:21
136:25 137:7 141:25
164:11
thirdly (1) 156:23
thirdparty (3) 91:22
133:3 134:6
though (6) 17:21 20:13
24:9 62:23 67:4 95:10
thought (4) 55:9 57:6
69:21 158:24
thread (2) 46:7 52:8
threat (1) 33:16
threatening (1) 54:15
three (14) 7:19 30:8
55:18 58:13 96:18
105:5 128:15,20,24
131:14 140:10 150:6
156:13 162:5
through (14) 16:9 42:22
51:2 79:21 91:22
103:15 121:1 149:21
166:13 167:6,11 168:9
174:10 179:12
throughout (7) 20:22
89:8 112:5 122:24
167:2 174:22 175:10
thursday (2) 1:1 7:9
thus (1) 166:19
time (73) 4:3 13:18
16:9 25:4 26:19 27:11
30:10,24 31:4
32:14,19 33:21
34:2,5,14 35:20 38:20
39:24 40:5 41:3 42:5
46:21 49:8 52:24 53:2
59:20,24 61:14
66:5,6,23 68:23 69:1
74:6 76:15,15 82:14
87:22 90:1 91:2 94:4
95:11,13 97:13 98:18
99:6,9,14,19 100:25
120:18 126:25 127:2
128:21 131:7,13 134:7
138:17 143:11 145:4
149:17 151:3,7,9
152:6 154:10 155:12
160:22 161:13 162:25
165:17 174:9 175:6
timeframe (1) 149:14
times (2) 35:6 155:6
timetable (2) 13:25
87:23
timetabling (1) 14:9
timetemperature (1)
35:12
timing (3) 15:16 59:11
70:13
timings (1) 37:21
title (1) 3:2
today (8) 1:5,16 2:12
6:22 17:3 130:1,6
180:17
today's (2) 1:4 140:7
together (4) 50:25
93:16 109:18 175:5
told (5) 10:21,24 11:6
38:20 116:13
tomas (1) 163:6

tomorrow (1) 180:13
tone (1) 42:23
too (2) 17:11 53:17
took (4) 59:15 70:5
108:18 166:12
tools (1) 21:2
topic (4) 74:10 78:7
101:24 102:24
topics (1) 4:15
torch (1) 52:22
torero (3) 63:5 165:4,13
total (3) 133:3 138:20
140:7
totally (1) 97:10
towards (4) 49:18,24
166:25 179:23
tower (134) 1:10 2:14
3:7,16 5:8 13:15 23:23
52:21,22 54:9 60:3,18
61:12,16,21,22
64:11,24 65:25
66:7,17,25 69:6,12
71:14 72:15 74:5
84:23 87:2 89:4,24
90:10,14
91:3,17,19,21
92:7,12,14 94:4,25
95:3,6,12 98:5,18
99:7,15,19 100:21
101:4,7 107:12 108:23
109:2,5,8,20,25
110:3,10,22 111:11
112:9,22
113:2,4,13,22 114:6
115:5,22 116:5 117:24
118:1,5 119:12,15
120:1,18 121:17
122:12 123:19
128:6,21 129:10
130:12 131:8
132:4,15,18,23
133:4,13 134:22
135:8,19 137:4,17
138:15,24 143:21
144:2 148:24 151:14
153:11,18,24
158:12,19 159:8
160:14,22 161:3,13,25
162:2 163:12,21,24
164:8,22 165:16,19
167:10 169:2 170:9
172:13 174:17 175:1
176:2,15 177:6
towers (2) 164:10
170:16
tp10 (3) 128:11 160:6,9
traceability (1) 141:24
track (1) 70:13
tracking (1) 53:2
tracks (1) 44:10
trade (2) 21:13 47:18
trading (1) 93:7
tragedies (1) 142:16
tragedy (21) 65:10 85:8
86:12 87:1 89:7
122:13 127:6,7,15,15
128:4 129:9 130:18
136:18 138:24 141:15
142:15 143:23
144:7,14 157:4
tragic (1) 89:3
tragically (2) 66:1
176:20

training (7) 94:21 116:9
149:16 153:23 154:12
156:24 163:16
trains (1) 154:9
transcript (1) 162:15
transparency (3) 178:17
179:2 180:3
transparent (2) 5:5
178:23
transpires (1) 26:10
travis (1) 118:3
treated (4) 62:17 76:8
80:21 82:2
treaties (1) 8:6
tried (2) 79:1 81:2
tries (1) 113:19
triumphal (1) 42:23
trivialise (1) 17:17
troubling (1) 55:3
true (3) 60:15 71:9
121:5
truly (2) 56:10 126:4
trumpeting (1) 55:15
trusted (1) 173:2
truth (1) 142:14
try (2) 46:17 60:22
tuesday (2) 6:23 73:10
turn (11) 6:12 15:6,24
54:12 70:14 78:6 92:3
109:21 148:20 150:17
165:23
turning (11) 4:15 6:19
28:11 33:9 37:1 43:22
90:6 102:24 130:19
149:20 160:16
turns (1) 74:19
twofold (1) 155:24
twothirds (1) 61:16
type (7) 130:23 133:21
135:24 136:9 138:5
141:12 176:9
types (2) 137:9 146:5

U

uk (31) 5:1 13:14 18:17
20:12 32:3 40:16
50:12,17 51:8,18
54:15 58:25 60:18
61:2 64:4,22 65:2,3,7
66:14 70:14 71:21,25
72:19,24 83:12 98:16
120:22 124:14,23
172:5
ukas (3) 31:25 147:7
154:13
ukbased (1) 11:23
ultimately (3) 65:17
69:12 138:7
unable (2) 1:22 152:15
unacceptable (5) 43:23
94:7 108:2 167:7,12
unambiguous (1)
156:18
unavoidable (1) 74:24
unaware (3) 67:25
101:4 113:2
unchanged (1) 82:4
unclear (1) 43:4
uncovering (1) 178:1
undergone (1) 25:21
underlay (1) 33:9
underlies (2) 18:21
33:11

underlying (4) 56:23
170:7,10 172:7
undermined (1) 17:22
undermines (1) 26:1
underseid (1) 117:25
understand (15) 14:6
54:18 58:13,24 59:21
60:10 69:7 89:19
110:19 136:23
162:3,7,14 172:19
177:5
understanding (6)
47:19 49:22 134:23
137:8 160:21 166:3
understands (4) 90:13
149:3 153:10 159:5
understated (1) 115:12
understatement (1)
44:11
understood (7) 20:7,10
21:5 48:12 66:21
117:10 165:9
undertake (4) 93:10
101:14 159:6 172:14
undertaken (10) 41:8
119:4 128:15,17
137:13 138:22
139:5,17,22 164:4
undertaking (5) 9:21
98:13 125:12,15
177:12
undoubtedly (1) 22:12
undue (1) 86:17
unequivocally (1) 23:12
unfabricated (4)
75:5,12,14 78:12
unfit (1) 63:13
unfortunate (1) 177:25
unfortunately (3) 1:22
58:19 61:11
uniformly (1) 22:6
uninterrupted (1) 88:6
union (5) 157:13,20
158:6,11 181:12
unique (2) 65:25 86:14
united (7) 7:23
10:19,20 11:17 122:22
124:24 175:10
unknown (1) 92:23
unless (8) 28:5 57:3
83:18 84:1 119:2
124:7 134:16 161:22
unlike (2) 11:23 119:19
unmodified (1) 119:17
unofficial (1) 38:13
unorthodox (1) 61:19
unravel (1) 165:22
unrealistic (2) 36:4
123:21
unreliable (1) 115:16
unrepentant (1) 56:10
unrepresentative (2)
28:3 37:15
unsafe (4) 63:15 124:20
129:10 175:9
unsatisfactory (1)
113:17
unsuitability (3) 27:25
53:20 123:2
unsuitable (1) 22:6
unsure (1) 116:21
untenable (5) 71:23
123:14 124:1,9,18

until (13) 7:8,11 23:19
24:6 40:5 49:11 128:3
130:2 132:18 133:15
169:2,9 180:20
untroubled (1) 17:13
untrue (1) 54:1
update (1) 55:18
updated (4) 2:25 3:14
150:15 153:2
updates (1) 149:8
upon (14) 15:15 26:13
53:10 127:25
128:16,24 129:24
139:6,20 167:1,14
168:18 170:25 171:4
upper (1) 104:21
upvc (1) 117:25
urge (2) 13:6 179:7
urged (1) 123:4
urgency (1) 179:5
urgent (2) 56:15 89:10
urgently (2) 53:21
56:18
urges (1) 125:25
urging (1) 87:4
used (133) 1:9 2:13
15:1 17:12 18:11,23
20:15 22:3 23:4,18
24:19 25:7,17,22
27:9,14 28:9 30:14
31:21 36:9,11,15
37:6,12 39:4,19
41:1,23 42:18 43:2
44:1 45:4,12 46:1,5
47:4,6 53:9 61:20
62:14 63:1,23 66:19
69:11 70:9,23 72:9
73:2,25 75:25 77:19
80:11 86:15 87:8
90:3,10,11,13,15 91:4
92:7,10 96:17 97:1,25
98:5 101:25 102:25
107:6 112:21 114:24
116:17 117:7,12
118:1,4
119:1,11,19,22
120:6,14 121:16
122:12 124:17,21
128:5,7,11
129:10,11,17
130:9,11,14
131:9,16,19 132:17,20
133:13,15
134:4,8,11,15,22,25
135:5,18 136:3,9
137:2,5,24 139:18
140:9 141:13
146:10,12,13 148:23
153:10,17,20 159:8,18
160:3,9 167:17
176:2,5 178:18
useful (1) 161:16
using (27) 23:1
26:17,19 28:2 32:1
34:14 35:19 38:5,7
40:22 43:25 45:6
55:20 91:6 104:14
137:10,12 138:23
139:15,18,22
140:2,10,22 141:5
146:3 178:10
utilised (4) 31:4 39:7
61:25 86:10

utmost (1) 18:20
utterly (1) 18:8
uvalue (1) 133:18
uvalues (1) 110:25

V

valid (3) 11:15 22:16
39:23
validated (1) 128:18
value (4) 90:16 115:17
136:23 154:5
values (2) 44:12 93:1
variable (1) 77:4
variant (9) 121:21
122:3,6,7,9,10,16,18
139:19
variations (2) 77:9,13
varied (1) 76:25
variety (2) 45:5 91:12
various (5) 22:5 75:19
83:1 100:19 165:6
variously (1) 41:11
vary (5) 75:23 76:12
77:14,17,20
vast (1) 175:18
vehicle (1) 34:15
ventilated (1) 36:20
vents (2) 36:22 160:6
verification (1) 156:9
verified (1) 134:16
version (15) 27:9,10,13
39:8,14 49:7 52:2,3
71:11 151:5,6,8
153:5,7 155:5
versions (6) 27:21 41:20
81:1 151:13 153:9
154:25
versus (1) 31:8
via (5) 9:9 58:25 65:15
132:1 134:4
viability (1) 36:5
victims (2) 143:21
165:19
viewed (2) 13:3 116:21
vigour (1) 172:8
vince (1) 7:24
virtue (2) 30:11 55:16
visitors (1) 176:16
visual (1) 174:25
vital (4) 85:24 130:25
134:14 179:4
vitality (1) 127:18
volume (2) 9:14 95:16

W

wait (1) 130:2
wall (26) 3:3,7,12 21:24
33:1 34:23,23 35:1
65:18 75:10 79:11,13
83:6 97:1 99:21 100:6
109:4 116:10 119:1
149:1 150:19 155:13
159:8 160:1 161:1,10
walls (9) 29:23 34:17
72:5 96:11 99:24
132:8 163:7 176:23
179:7
wandsworth (1) 74:5
warm (1) 2:10
warning (6) 30:12
53:1,23 54:3 83:4
105:23

warnings (2) 111:17
122:25
warped (1) 177:20
warrant (1) 11:6
warren (3) 46:8,13
47:25
wasnt (1) 43:3
watching (1) 60:9
way (36) 1:6,9 6:19
9:10 14:6 15:23 19:7
20:12 22:3 24:7,25
44:6 52:5 53:1 54:23
58:3 61:21 64:8,22
76:6,11 81:6 82:8
98:20 101:16 118:5
128:14 129:16 130:4
139:4 142:18 154:2,8
155:18 179:17 180:7
ways (2) 66:1 78:17
weatherproofing (1)
176:6
webb (8)
126:12,14,15,18,23,24
142:21 181:8
website (11) 3:1 77:25
89:20 90:25 93:4
107:25 116:21,23
142:3 150:15 169:3
websites (2) 68:6
116:20
wednesday (1) 7:5
week (8) 16:7 34:18
73:10 98:2 99:13
109:11 117:5 165:14
wehrle (9) 7:20 11:10
50:18 52:7,11 53:1,6
122:25 123:4
wehrles (1) 53:20
weigh (1) 13:23
welcome (6) 1:3,14,18
2:10 136:24 174:12
welcomed (1) 165:20
welcomes (2) 127:17
129:19
went (8) 20:12 32:21
44:4 52:5 78:11
127:19 149:21 174:3
werent (1) 88:8
weve (1) 42:15
whatever (4) 122:20
123:3 142:4 175:9
whats (1) 77:23
whatsoever (1) 20:17
whereas (3) 20:20 38:6
100:16
whereby (1) 77:14
whilst (9) 35:11 40:14
44:16 47:10 55:16
56:20 59:4 77:10
85:13
whistleblower (1) 156:5
white (3) 69:6 153:12
179:16
whole (9) 41:7 73:12
80:1 89:12 98:9
131:24 136:13,20
140:19
wholebuilding (1)
134:18
wholesale (4) 161:14
164:4,7 172:15
wholly (6) 37:5 40:14
43:25 45:24 46:25

69:9
whom (7) 7:19,21 58:14
 63:21 65:12 68:13
 118:19
whose (4) 17:12 64:13
 68:11 72:11
widely (7) 66:19,20
 67:11 90:15 106:13
 131:2 178:6
widen (1) 98:19
wider (4) 60:19 63:9
 74:18 86:2
wideranging (2) 81:12
 141:16
widespread (4) 49:12
 87:7 158:16 163:23
widest (1) 47:5
width (2) 77:9,15
willing (2) 59:6 81:9
willingness (1) 25:23
wilmerhale (1) 10:21
win (1) 56:4
window (11) 2:21 62:3
 90:14 98:15 117:23
 118:9,12,17,23 128:11
 160:9
windows (7) 3:18 36:22
 79:21 85:21 117:25
 160:5,11
wing (1) 34:23
winning (1) 51:7
wish (5) 12:13 60:1
 89:1 127:4,12
wishes (2) 129:5 179:22
withdraw (2) 15:9 26:6
withdrawal (1) 26:15
withdrawing (2) 14:19
 150:6
withdrawn (10) 15:15
 23:21 26:8,11,12
 38:25 39:22 49:11
 65:1 152:18
withdrew (1) 39:9
withheld (1) 152:13
witness (22) 9:13
 11:16,16 13:10 40:19
 93:16,17 107:22 113:8
 122:4 127:25 129:3
 139:7 140:5 141:20
 144:22 145:14,15
 148:17 150:22,24
 151:20
witnesses (36) 4:17
 5:12,16 7:6 9:19,24
 10:9,23 11:9,23,24
 12:3,17,21
 13:2,6,11,11,17,25
 14:3,7,9,13 43:18
 54:15 59:5 67:1,22
 89:19 109:13 111:13
 112:18 114:20
 125:7,13
wonder (1) 40:25
wonders (1) 42:9
wont (2) 55:23 59:19
wood (1) 166:9
wool (3) 19:3 74:7
 120:6
worded (3) 6:17 79:24
 154:2
wording (6) 43:2 45:6,7
 149:23 150:2 153:23
work (14) 9:7 29:17,20

64:13 65:5
 70:19,21,25 89:13
 92:18,20 127:18
 142:17 175:20
worked (2) 9:12 127:20
working (9) 1:19 33:6
 55:6 59:7 72:19
 114:16 141:10 170:4
 179:18
workload (1) 116:6
works (8) 63:4 65:9
 73:4 87:9 91:13 114:8
 115:23 144:4
world (4) 13:3 52:20
 62:23 140:13
worse (2) 21:13 151:6
worst (1) 44:25
worth (3) 66:6 69:1
 154:5
wouldbe (1) 43:5
writing (2) 8:9 45:21
written (32) 17:2,15
 24:5 26:4,6 38:22 54:6
 62:7 66:21 68:12
 74:13 77:7 86:22
 89:15 95:7 97:21
 109:18 113:20 120:25
 121:2 125:2 127:24
 129:4,7 139:9
 141:1,8,21 150:4
 153:2 155:23 162:16
wrong (7) 17:19 43:4
 44:12,13 45:17 99:4
 127:19
wrongdoing (3) 17:17
 55:1 74:19
wrongful (1) 45:18
wrote (4) 8:1 14:17
 150:5 173:23

xrathern (1) 23:20

Y

yardstick (1) 156:16
year (4) 9:16 10:14 38:3
 168:1
years (10) 2:15 12:12
 15:13 23:19 25:16,23
 40:5,8 87:7 178:3
yesterday (1) 26:3
yet (12) 18:3 19:20 20:3
 21:13 32:21 49:10
 51:24 52:25 55:14
 56:24 110:12 171:21
you'd (1) 88:15

Z

zinc (1) 69:4
zoom (2) 104:21 105:2

0
0 (48) 7:4
 20:11,13,16,17,20
 30:14 36:17
 40:14,20,21
 41:2,14,17 43:17
 48:13,15 51:11,17,19
 54:1 65:21 75:4 78:20
 79:8,24 80:16

82:3,12,14,19,24
 99:17,19,24
 100:4,12,15 107:2,5
 112:4 122:2,20,22
 146:10,13 154:1
 163:13
01120 (1) 36:23

1

1 (48) 7:8,12 8:1 13:16
 15:25 16:24 17:24
 25:1 29:21 36:23 46:9
 61:15 63:5 67:12
 69:19 84:19 85:17,20
 86:23 88:3,13,17
 89:19 92:9 99:2,16
 101:2 109:9,13 111:8
 119:13 132:5,6,11
 157:5 158:14 160:20
 162:5,12 165:3 166:1
 172:9,9,24
 176:13,21,24 181:4
10 (4) 6:23 53:9
 180:17,20
1000 (1) 1:2
11 (4) 7:5,11 138:21
 159:15
112 (1) 121:1
1130 (1) 57:11
1140 (2) 57:9,13
1145 (1) 59:17
1230 (2) 59:18 87:24
1235 (1) 59:18
125 (2) 30:9,12
1257 (1) 102:11
126 (8) 72:4 80:18
 95:20 99:23 100:3
 161:9 163:4 181:8
127 (6) 72:6 96:24
 97:7,15,20 161:8
129 (3) 30:9 95:20
 163:4
13 (1) 36:11
130 (1) 88:7
135 (29) 14:20 30:21
 31:17 33:20,23
 35:4,15 44:3 47:15
 96:1,5 99:1
 103:16,18,21 104:4
 106:5,18 108:12
 116:13 119:3 120:3,11
 131:23 135:20 138:17
 139:24 140:9 164:24
13501 (2) 146:13,15
135011 (2) 27:2 35:18
13823 (3) 27:3 75:21
 76:10
14 (7) 5:25 14:1 119:15
 122:13 125:21 127:6
 175:2
143 (1) 181:9
145 (1) 133:3
15 (3) 127:25 140:7
 169:8
158 (1) 181:11
16 (9) 80:8 84:18,22
 85:3,18,24 152:18
 160:13 181:3
1666 (1) 166:7
17 (1) 7:10
173 (1) 181:13
179 (1) 175:12

18 (43) 21:8,21 22:18
 23:18 24:19 25:7
 27:25 30:17 31:14
 32:17,25 33:7 34:7
 40:10 44:5 46:5
 47:16,22 48:22,24
 91:7,11 95:15 97:2,16
 103:3 104:5,15 106:12
 107:7 110:2,13 112:7
 117:3 122:11
 131:12,25 134:13
 162:22 163:8 167:3
 168:12 175:13
1966 (1) 145:1
1968 (1) 8:2
1980 (1) 8:3
1982 (1) 145:4
1984 (2) 29:18 170:12
1985 (2) 33:22 170:15
1988 (1) 33:19
1991 (1) 166:14
1992 (2) 23:11 34:6
1997 (2) 170:13 171:5
1999 (6) 166:13,15
 167:14 168:1 169:2
 171:6

2

2 (44) 1:5 2:9,13
 4:15,16 5:16 6:13,20
 7:6,7,13,18 9:25 13:24
 14:8,14 15:23 28:12
 46:9 56:16 62:19 67:1
 70:12,12 88:25
 89:16,17 95:16
 102:4,10 104:20
 108:14 123:13 127:23
 159:5,23 160:16
 161:17 162:7,16
 172:10,25 176:13
 181:2
20 (1) 167:8
200 (1) 102:13
2000 (3) 32:6 166:15,23
20000 (1) 115:12
2003 (1) 149:11
2004 (2) 171:15,24
2005 (39) 10:17
 14:22,24 19:8 23:5,13
 24:7,8,18
 25:9,11,15,18,22,25
 26:6,11,16 27:1 33:13
 37:2,7 38:3,5,24 39:3
 40:1,4 43:14 49:21
 50:8 76:19 77:2
 121:11 123:24 128:15
 139:5,12,14
2006 (10) 14:23,25
 26:12 34:8 38:5,8 41:5
 50:12 100:23 149:12
2007 (6) 38:11,19 41:8
 51:17 140:22 169:9
2008 (9) 5:25 6:2 38:21
 41:4,19 122:1
 149:10,22 169:10
2009 (4) 6:7 41:20
 52:19,20
2010 (4) 52:7,12 74:4
 176:25
2011 (4) 28:20 50:18
 76:20 77:2
2012 (11) 2:15 23:19
 36:11 40:21,23 41:24

48:11,14 52:21 109:25
 133:18
2013 (8) 28:7,19 41:24
 42:8 44:23 50:24
 149:22 159:20
2014 (40) 15:2 21:22
 24:1 26:16,22 30:18
 38:23 39:6,9,13,16,22
 43:25 45:15 46:3
 47:21,22 48:5,6
 49:6,7,20,23 50:6
 51:5,13 52:22 92:25
 103:2,4,8 107:17
 108:16 109:1 110:11
 122:17,19 128:16
 139:5,18
2015 (27) 6:2 23:25
 37:4 39:12,16,21 45:9
 46:9 49:10 52:22,23
 53:5,19,20,25 110:23
 123:9 128:17 133:7
 138:14,19,22
 139:17,22 140:1
 149:23 151:20
2016 (10) 2:15 21:22
 32:21 40:19 41:14
 53:16 92:9 128:18
 139:23 169:9
2017 (8) 94:12 117:22
 119:15 122:13 125:21
 127:6 149:18 175:2
2018 (14) 7:25 8:18 9:2
 19:14 31:9 48:4 55:4
 67:15 93:16 94:12
 108:11,14 151:22
 152:18
2019 (6) 7:16 25:9,14
 26:8 152:19 179:11
2020 (13) 1:1 5:15 7:16
 9:16,22,23 26:5 37:11
 39:10 125:12 150:3
 173:23 180:21
2021 (5) 5:15 7:8,11,12
 14:1
21 (5) 10:17,22 11:3,15
 67:15
21000 (1) 128:1
2162 (1) 165:2
23 (3) 26:5 37:11 39:10
24 (1) 26:9
24storey (1) 74:5
25 (2) 7:16 169:2
26 (2) 8:2 45:9
27 (2) 46:3 47:21
2784 (1) 175:15
28 (1) 152:19
29 (3) 7:16 14:16 123:9

3

3 (4) 8:14 105:1 162:8
 173:23
30 (2) 35:3 150:3
31 (2) 168:1 169:9
325 (1) 157:15
33 (2) 82:15,19
335 (3) 157:12,14,17
34b (1) 40:21
354 (1) 97:22
3a (1) 50:19

4

4 (6) 37:24 105:25
 161:4,11,23 163:22
40 (7) 41:6,15 80:19
 82:3 146:7,18 164:25
4000 (1) 94:1
410 (1) 180:19
42 (1) 41:15
431 (1) 67:12
45 (1) 59:16
46 (2) 38:18 141:8
476 (6) 36:16 51:15
 75:3,11 146:12,15
4766 (1) 100:16
48b (1) 39:17
4a (1) 2:25
4d (1) 3:13
4mm (1) 56:2

5

5 (2) 1:1 166:15
50 (3) 50:15 61:17,25
5000 (2) 94:1 153:15
51 (2) 12:12 39:5
52 (2) 109:17 133:9
53 (1) 39:17
55 (14) 2:16 5:23 17:23
 20:15 27:10,13,19
 51:10,16 52:3,25
 82:16,18 149:4
57 (1) 181:5

6

6 (12) 6:9 14:12 15:20
 34:22 36:16 56:23
 75:3 78:21,22 136:24
 159:12 172:6
60 (1) 35:1
60minute (1) 37:25
61 (2) 78:22 153:13
62 (1) 79:5
63 (2) 79:7 80:15
65 (2) 79:10 83:4
66 (1) 79:16
68678 (1) 8:2
6metre (1) 37:25

7

7 (4) 31:18 36:16 75:3
 100:16
72 (2) 109:18 127:7

8

8 (2) 53:9 61:15
800 (1) 179:19
8414 (62) 5:18 14:19
 15:2 22:23
 23:6,8,15,17 24:9 25:7
 27:4 28:7 30:22 32:20
 33:8,9,14 34:3,20
 35:10,17 36:19 42:19
 55:6,17 56:8 95:22
 96:5 98:12,20,23
 103:5,16,17,20
 104:3,8 106:5 108:8
 116:12 117:10 119:24
 123:17 128:15,24
 131:23 135:11 136:8
 137:1 138:16,21,21
 139:12,21,25

140:7,17,18,21 141:10
 142:3 150:7
84141 (4) 24:8,12 37:3
 39:23
841412005 (1) 23:22
84142 (8) 24:2,14 26:19
 39:2 43:24 44:16
 47:14 48:4
85 (1) 121:1
88 (2) 63:6 181:6

9

9 (4) 6:22 34:2 162:23
 180:21
93 (1) 55:11
9414 (1) 32:13