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<p>1 Thursday, 2 January 2020                  2 (10.04 am)                  3 MR PENNICOTT: Sir, good morning. Prof Hansford, good                  4 morning.                  5 Little did I know, when I stood here on 10 January                  6 2019 wishing you Happy New Year, I would be doing                  7 exactly the same just one year later, but anyway, Happy                  8 New Year.                  9 Before I move on, can I just publicly congratulate                  10 Prof Hansford on his recent honour announced in the New                  11 Year's Honours List in the United Kingdom. He was                  12 awarded a CBE, one of the highest honours obtainable in                  13 the United Kingdom -- the citation says "for services to                  14 innovation in civil engineering" -- and I congratulate                  15 him on behalf of the Commission, the Commission's legal                  16 team, and no doubt all of those in this room.                  17 SEVERAL PEOPLE: Hear, hear.                  18 COMMISSIONER HANSFORD: Thank you very much indeed.                  19 MR PENNICOTT: Sir, I am looking around because I was told                  20 that representatives of Pypun and Atkins might be here                  21 this morning. Right, that's Atkins, behind the monitor.                  22 Nobody appears to be here from Pypun but no doubt we can                  23 just press on, having noted that particular point.                  24 CHAIRMAN: Yes.                  25 MR PENNICOTT: Sir, briefly and by way of recap, and</p>	<p>1 Of further importance, of course, just before we                  2 adjourned in January, MTRC had proposed to government                  3 that a three-stage holistic study should be conducted on                  4 the EWL and NSL slabs and the diaphragm walls, to verify                  5 the as-constructed conditions and provide assurance on                  6 the structural integrity of the works. That holistic                  7 proposal, as it is known, was accepted by the government                  8 in December 2018, during the course of the Original                  9 Inquiry hearings.                  10 Sir, so that's matters outstanding in terms of                  11 investigation. The holistic report had been notified,                  12 proposed and accepted. Then, of course, on 19 February                  13 2019, when the Commission was in the process of                  14 preparing its interim report, the Chief                  15 Executive-in-Council approved and it was duly announced                  16 that the terms of reference of the Inquiry would be                  17 expanded or extended.                  18 CHAIRMAN: Sorry to interrupt a second. Just in case of any                  19 misunderstanding, when the Commission originally                  20 adjourned, it was in fact to write an interim report,                  21 not a final report, because of the very matters which                  22 you have raised and which we took on board as being                  23 possibly and potentially relevant to a final report.                  24 MR PENNICOTT: Indeed, sir, and I will --                  25 CHAIRMAN: Sorry, just in case there was any</p>
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<p>1 primarily for the purposes of public and press                  2 information, could I just I hope relatively briefly                  3 explain where we've been, where we are, and where we are                  4 going in the next couple of weeks.                  5 Sir, you will recall that in January 2019, following                  6 closing addresses by the parties and the Commission's                  7 legal team, on 29 January 2019 to be precise, the                  8 Commission went away with a view to producing a report.                  9 For two primary reasons, that report, which I will come                  10 to in a moment, turned out to be an interim report. The                  11 two primary reasons for that were that when the                  12 Commission adjourned at the end of January 2019, there                  13 were several matters at that point in time still under                  14 investigation and consideration by the government and                  15 MTR. In particular, various opening-up and in-situ                  16 testing of the engagement lengths of coupler assemblies                  17 was taking place; the strength of partially engaged                  18 coupler assemblies was being tested; the structural                  19 adequacy of the top EWL slab to D-wall connections, also                  20 known as the construction joint, was also under                  21 consideration; and also, lastly, miscellaneous defects                  22 and in particular alleged shear link irregularities in                  23 the EWL slab were also being looked at.                  24 So those matters were left, as it were, in the air                  25 at the end of January 2019.</p>	<p>1 misunderstanding and I may have misheard earlier. Thank                  2 you.                  3 MR PENNICOTT: Right. That's entirely right, sir. Then, as                  4 I say, to cap it all, the terms of reference were then                  5 expanded and issues concerning the North Approach                  6 Tunnel, the South Approach Tunnel and the Hung Hom                  7 Stabling Sidings were brought within the remit of the                  8 Commission, and that Extended Inquiry or COI 2 as                  9 sometimes it is called also was then kicked off.                  10 Sir, on 25 February, as you have just indicated, the                  11 Commission did indeed submit an interim report to the                  12 Chief Executive on its findings and recommendations on                  13 matters covered by the original terms of reference,                  14 subject -- expressly subject -- to the various                  15 outstanding matters that I've just mentioned, and                  16 of course because of the extension or expansion of the                  17 terms of reference.                  18 Indeed, sir, if one looks at the interim report, in                  19 the preface, the Commission stated that in the light of                  20 the extended terms and the outstanding matters it was                  21 the Commission's decision that it would be premature to                  22 publish a final report under its original terms at that                  23 time, certainly in respect of matters related to                  24 supervision, management and control systems, and                  25 a determination of the extended terms may require</p>

Page 5	<p>1 significant amendments in the final report. That was</p> <p>2 the position as it stood in February last year.</p> <p>3 Sir, continuing matters chronologically, the next</p> <p>4 thing that happened was that in the light of concerns</p> <p>5 raised in respect of the as-constructed NAT, SAT and HHS</p> <p>6 structures, on 15 May 2019 MTRC proposed that a two-part</p> <p>7 or two-stage verification study of the structures, those</p> <p>8 structures, be carried out. That proposal was also</p> <p>9 accepted by the government. So, come May of last year,</p> <p>10 we had the holistic report in the offing for the</p> <p>11 original part of the Inquiry and we had the verification</p> <p>12 report underway in relation to the NAT, SAT and HHS.</p> <p>13 Sir, as you will recall, on 27 May 2019, the</p> <p>14 Commission resumed for the purpose of taking factual</p> <p>15 evidence in relation to the expanded part of the terms</p> <p>16 of reference. That factual evidence hearing concluded</p> <p>17 on 17 June 2019, and you heard from 33 factual witnesses</p> <p>18 during the course of that period.</p> <p>19 Subsequently, and as directed by the Commission, the</p> <p>20 involved parties present at the extended part of the</p> <p>21 Commission, and indeed the Commission's legal team,</p> <p>22 submitted written closing submissions. That was on</p> <p>23 19 July so far as the involved party were concerned and</p> <p>24 26 July 2019 so far as the Commission's legal team is</p> <p>25 concerned. Can I respectfully remind the Commission</p>	Page 7	<p>1 the government and the Commission itself, or the</p> <p>2 Commission's legal team, and its own independent expert,</p> <p>3 should serve reports responsive to Mr Southward's report</p> <p>4 by 6 December 2019.</p> <p>5 Sir, further, following written and oral submissions</p> <p>6 from the involved parties, that is China Technology but</p> <p>7 in writing only, Leighton, government, MTR and the</p> <p>8 Commission's legal team, the Commission issued</p> <p>9 supplementary directions to the structural engineering</p> <p>10 experts.</p> <p>11 Sir, I wonder if I can just remind you of those</p> <p>12 directions because it is relevant and important to the</p> <p>13 evidence that we will be hearing in the next few days.</p> <p>14 I wonder if we could get up on the screen AA2, tab 125,</p> <p>15 page 472.</p> <p>16 Sir, these are the supplementary directions that</p> <p>17 were issued on 12 October 2019. It's paragraph 2 that</p> <p>18 is of particular importance, and they read as follows,</p> <p>19 so that everybody is a fully aware of the position:</p> <p>20 "It is further directed, however, that in relation</p> <p>21 to the structural engineering expert evidence to be</p> <p>22 adduced pursuant [to] paragraph 1 above:</p> <p>23 (a) the structural engineering experts should focus</p> <p>24 on whether the as-constructed works are safe and fit for</p> <p>25 purpose from a structural engineering perspective; and</p>
Page 6	<p>1 that no oral presentation of those submissions have yet</p> <p>2 been heard to date, and that is relevant to a point that</p> <p>3 I will mention in a moment.</p> <p>4 Sir, on 18 July 2019, just as those submissions were</p> <p>5 being submitted to the Commission, MTR produced,</p> <p>6 published and submitted its holistic report and its</p> <p>7 verification report.</p> <p>8 Sir, following the Commission's and the Commission's</p> <p>9 legal team's consideration of the holistic report and</p> <p>10 verification report, the involved parties were invited</p> <p>11 to indicate whether they wish to adduce any further</p> <p>12 expert structural engineering evidence in relation to</p> <p>13 the COI 1 outstanding matters and also in relation to</p> <p>14 the COI 2 matters, particularly in the light, obviously,</p> <p>15 of the contents of the holistic and the verification</p> <p>16 reports.</p> <p>17 Leighton expressed their wish and desire to adduce</p> <p>18 structural engineering expert evidence, and as</p> <p>19 a consequence of that the Commission, acceding to that</p> <p>20 request, issued directions for, firstly, Leighton, in</p> <p>21 the person of Mr Nick Southward, to submit his reports</p> <p>22 to the Commission on COI 1 and COI 2 separately, by</p> <p>23 30 September 2019. As it happened, that date was</p> <p>24 slightly extended until 11 October 2019.</p> <p>25 At the same time, the Commission directed that MTR,</p>	Page 8	<p>1 only if they are considered not safe or fit for purpose</p> <p>2 that such experts should then provide their opinion on</p> <p>3 whether the suitable measures (as agreed in the holistic</p> <p>4 report or verification report or subsequently) are</p> <p>5 necessary for safety from a structural engineering</p> <p>6 perspective; and</p> <p>7 (b) the structural engineering experts shall not be</p> <p>8 required to look into the question of whether the</p> <p>9 suitable measures (as agreed in the holistic report or</p> <p>10 verification report, or subsequently) are required for</p> <p>11 statutory or code compliance."</p> <p>12 And so, sir, those were, as it were, the</p> <p>13 supplementary directions given to the experts when they</p> <p>14 were preparing their reports.</p> <p>15 As it happened, Mr Southward had already effectively</p> <p>16 prepared his COI 1 and 2 reports as these directions</p> <p>17 effectively were being made, almost simultaneously,</p> <p>18 I think, as I recall. That led to a small number of</p> <p>19 redactions from Mr Southward's reports which I trust</p> <p>20 have not caused any material difficulties to either</p> <p>21 Mr Southward personally or Leightons generally. I don't</p> <p>22 think they have.</p> <p>23 So, sir, I move on. Those were --</p> <p>24 CHAIRMAN: Could you just, again, for the benefit of the</p> <p>25 press and the public at large, perhaps just expand very</p>

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<p>1 slightly on those directions and why they were                  2 considered necessary.                  3 MR PENNICOTT: Yes, sir. They were made, as I have                  4 indicated, against the background of submissions being                  5 made by the parties, and the issue, primary issue, with                  6 which the Commission was concerned was that it did not                  7 want to find itself making the type of determinations                  8 that might more appropriately be made in private                  9 litigation or private arbitration or some other form of                  10 dispute resolution procedure as between the various                  11 involved parties, that is between the government and MTR                  12 or MTR and Leighton or Leighton and other parties. And                  13 the Commission, as I understand it, was very exercised                  14 not to get involved in that sort of private dispute and                  15 wanted to focus very much, as required by its terms of                  16 reference, on the questions of safety and fitness for                  17 purpose and did not want to be drawn into matters of                  18 pure contractual compliance, statutory compliance, which                  19 it saw outside of the primary remit of safety and                  20 fitness for purpose.                  21 CHAIRMAN: Thank you very much.                  22 MR PENNICOTT: Sir, those were the directions so far as the                  23 experts are concerned and we will come back to that in                  24 a moment.                  25 Meanwhile and just to complete the chronology, you</p>	<p>1 Commission submitted their COI 1 and COI 2 reports.                  2 Then, on 10 and 12 December 2019, Dr James Lau, the                  3 government's newly appointed structural engineering                  4 expert, served his reports on COI 1 and COI 2                  5 respectively.                  6 Sir, in recent directions, that is on 16 December                  7 2019, the Commission has directed that, firstly, the                  8 oral evidence of the structural engineering experts                  9 should commence today and, subject to one minor wrinkle                  10 which I will mention in a moment, for all that expert to                  11 be completed by Friday week, 10 January 2020.                  12 Sir, I remain confident that that is readily                  13 achievable and certainly have not had any contrary                  14 indication from any of the other parties. Indeed,                  15 I would hope that we can do better than finish on                  16 10 January. I rather hope we might better that by a day                  17 or two if we can.                  18 Sir, secondly the Commission directed oral closing                  19 submissions to be heard on 22, 23 and 24 January. That                  20 is, however, subject to written closing submissions on                  21 the matters that I've already identified, that is the                  22 statistical evidence, the project management expert                  23 evidence and the evidence that we are about to hear over                  24 the next few days, written closings being submitted by                  25 the parties on 17 January -- that's an incentive to try</p>
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<p>1 will recall that on 25 to 27 September 2019, the                  2 Commission heard independent statistical evidence from                  3 Dr Barrie Wells on behalf of Leighton and Prof Yin                  4 Guosheng on behalf of the government. Sir, at the                  5 moment, no final closing submissions have been made by                  6 any of the parties on that particular topic, but I will                  7 come back to that in a moment.                  8 Sir, on 4 October, the Commission switched its                  9 attention to project management matters, and you heard                  10 on 4 October from a further Leighton factual witness,                  11 Mr Dean Cowley, general manager of Leighton, and also                  12 from Mr Steve Huyghe, the independent project management                  13 expert called on behalf of MTR.                  14 On 8 October 2019, you heard from Mr George Wall,                  15 the Leighton independent project management expert, and                  16 then on 10 October 2019 you heard from the Commission's                  17 independent project management expert, Mr Steve Rowsell,                  18 and again no final submissions or closing submissions                  19 have been adduced by any of the parties or the                  20 Commission's legal team on those matters either.                  21 Sir, as I indicated just a moment ago, on 11 October                  22 2019 Mr Southward served and submitted his structural                  23 engineering expert reports on the COI 1 and COI 2                  24 matters, and on 6 December, as directed, Dr Glover on                  25 behalf of MTR and Prof McQuillan on behalf of the</p>	<p>1 and finish as early as possible next week -- and then by                  2 the Commission on 20 January, as I say, covering those                  3 topics that I've touched on.                  4 Sir, so far as the business of this week and next is                  5 concerned, the order of the witnesses, the experts,                  6 structural engineering experts, will be Mr Southward                  7 will go first, then Dr James Lau, followed by Dr Mike                  8 Glover and then followed by Prof Don McQuillan. Subject                  9 to any observations or protestations from behind me, the                  10 suggested proposed order of cross-examination is that,                  11 so far as Mr Southward, Dr Lau and Dr Glover are                  12 concerned, I will go first on behalf of the Commission.                  13 So far as Mr Southward is concerned, it will be myself,                  14 then the government and then MTR; so far as Dr Lau is                  15 concerned, it will be myself, then Leighton and then                  16 MTR; and then, as far as Dr Glover is concerned, it will                  17 be myself, the government and then Leighton. And so far                  18 as Prof McQuillan is concerned, obviously we will call                  19 Prof McQuillan, and then would suggest, although                  20 obviously they can fight it out amongst themselves if                  21 they wish, the government, Leighton and MTR to go in                  22 that order. I hope everybody has made a note of that.                  23 CHAIRMAN: Sorry, could I again interrupt for the benefit of                  24 the public, and the press representing the public, that                  25 once the oral submissions are completed at or about the</p>

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<p>1 end of January, absent any further new developments,                  2 that will be an end to the proceedings themselves, and                  3 it will then be for the Commission to prepare its final                  4 report, which is anticipated to be delivered to the                  5 Chief Executive within two months.                  6 MR PENNICOTT: Yes, sir. My understanding is that it is at                  7 the end of March, towards the end of March --                  8 CHAIRMAN: That's right.                  9 MR PENNICOTT: -- that the final report is to be delivered.                  10 But so far as I am concerned and no doubt others in this                  11 room are concerned, 24 January, being the last day for                  12 closing submissions, the day before the first day of                  13 Chinese New Year, we will walk away at least with                  14 nothing else to do, at least not on the Commission.                  15 CHAIRMAN: Thank you. I think that gives to everybody                  16 a good catch-up and puts everything into perspective for                  17 purposes of what we will now deal with. Thank you.                  18 MR PENNICOTT: Yes, sir.                  19 Sir, before I mention a couple of procedural matters                  20 which I am bound to do, could I also just draw your                  21 attention to this: that there has been a recent meeting                  22 of the structural engineering experts. On 20 December,                  23 just before Christmas, Prof McQuillan and Dr Glover met                  24 in London and had a videoconference with Mr Southward                  25 and Dr Lau in Hong Kong. The upshot of that meeting is</p>	<p>1 'stretch'.                  2 MG, NS and DM agree that there is an incompatibility                  3 with BOSA's inspection protocols and their intent to                  4 achieve a full butt-to-butt connection. Anything less                  5 than a full butt-to-butt will not pass the permanent                  6 elongation test eg 2 threads exposed will not pass the                  7 test.                  8 MG, NS and DM agree that Highways Department's                  9 acceptance criteria, based on BOSA's criteria, therefore                  10 unwittingly sanction the use of partially engaged                  11 coupler assemblies because anything less than locked,                  12 full butt-to-butt coupler assemblies will fail the                  13 permanent elongation test.                  14 JL [Dr Lau] disagrees with the above points ie                  15 only ful[ly] engaged couplers ie full butt-to-butt and                  16 locked should be used in the structural assessment."                  17 Sir, we will be hearing some more evidence,                  18 I anticipate, about all of that in the not-too-distant                  19 future.                  20 Sir, without reading all of this out, I just thought                  21 it would be appropriate to read that first point out,                  22 for reasons I will explain in a moment.                  23 There is further agreement between Dr Glover,                  24 Mr Southward and Prof McQuillan on various matters                  25 concerning shear link reinforcement and utilisation.</p>
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<p>1 a joint statement, which again perhaps we could just                  2 have a quick look at, at AA2, tab 170, which I think is                  3 the typed-up version.                  4 COMMISSIONER HANSFORD: This was a without-prejudice                  5 meeting?                  6 MR PENNICOTT: It was a without-prejudice meeting, but the                  7 upshot is this agreement that I'm about to show you.                  8 COMMISSIONER HANSFORD: Yes.                  9 MR PENNICOTT: You will see the details that I've just                  10 rattled off. Without going through them again, the                  11 purpose:                  12 "To discuss 'without prejudice' relevant issues ..."                  13 If we could scroll down, please, the issues that                  14 were discussed were firstly the coupler connections and                  15 engagement issues. What it says there is:                  16 "MG [Dr Glover], NS [Mr Southward] and DM                  17 [Prof McQuillan] agree that, on the basis of all the                  18 testing carried out to date, a partially engaged coupler                  19 assembly with a minimum of 7 threads (32 millimetres)                  20 satisfies the strength criteria.                  21 MG, NS and DM agree that the permanent elongation                  22 tests carried out in the laboratories to date are more                  23 indicative of the 'bedding-in' of the threads of                  24 a partially engaged coupler assembly at low tensile                  25 load, rather than a measure of permanent elongation ie</p>	<p>1 If we could scroll down, please.                  2 Unfortunately, again:                  3 "[Dr Lau] does not agree with the other experts                  4 generally. He is concerned that there may not be any                  5 shear links in areas where shear reinforcement is                  6 required."                  7 We will need to explore that, I daresay, with Dr Lau                  8 in due course.                  9 Then, thirdly, the experts discussed the horizontal                  10 construction joint or the CJ.                  11 "All four experts [this time] agree that this is                  12 a solely a workmanship issue.                  13 [Dr Glover, Mr Southward and Prof McQuillan] agree                  14 that nothing needs to be done but it would be prudent,                  15 from a public perspective, to remediate the two                  16 locations where poor workmanship has been identified.                  17 [Dr Lau] disagrees and considers the workmanship                  18 defects must be rectified by retro-installing vertical                  19 steel dowel bars."                  20 Sir, pausing there, if I may, and as a slight aside                  21 to what is stated in the joint statement. You may have                  22 seen in Mr Southward's report and indeed in                  23 Prof McQuillan's report that not only did they say that                  24 nothing needs to be done, other than to remediate the                  25 two specific locations where poor workmanship has been</p>

Page 17	<p>1 identified, they go on further to say, that is</p> <p>2 Mr Southward and Prof McQuillan, that there is</p> <p>3 a potential downside, a potential detrimental effect, of</p> <p>4 carrying out these proposed dowel bar works. I'm not</p> <p>5 sure yet where Dr Glover stands on that particular point</p> <p>6 but no doubt, when I ask him, he will no doubt tell us.</p> <p>7 So there is a concern, as I understand it, from at</p> <p>8 least two of the experts, possibly three, that the</p> <p>9 carrying out of certain of these suitable measures could</p> <p>10 be, as I understand it, a threat to the safety and</p> <p>11 fitness for purpose of the top of the EWL and the</p> <p>12 diaphragm wall. Quite how one quantifies that threat at</p> <p>13 the moment I'm not entirely sure, but I mention that</p> <p>14 point because it does seem to me that it is a point that</p> <p>15 the Commission may have to look at in the context of</p> <p>16 safety and fitness for purpose.</p> <p>17 As an adjunct to those observations, I am aware from</p> <p>18 the weekly reports that the MTRC have been helpfully</p> <p>19 providing to the Commission as to the progress of the</p> <p>20 suitable measures works that the dowel bar works, if</p> <p>21 I can call them that, have commenced. How far they have</p> <p>22 got is somewhat opaque. We are told they have</p> <p>23 progressed to something like 8 to 9 per cent. What that</p> <p>24 actually means in practical terms, I have no idea, and</p> <p>25 it may be that we may need to find out about that, but</p>	Page 19	<p>1 Sir, what would have happened at this stage is that</p> <p>2 I would have sat down and invited Mr Shieh to call</p> <p>3 Mr Southward, his expert -- what would have happened.</p> <p>4 Unfortunately, last evening, at about 7 o'clock, whilst</p> <p>5 I was having dinner, Leightons served upon us, or upon</p> <p>6 those instructing me, two things. First of all,</p> <p>7 Mr Southward's slides for his proposed presentation to</p> <p>8 the Commission this morning, with an indication that it</p> <p>9 would take Mr Southward something of the order of</p> <p>10 50 minutes to an hour to make that presentation. I have</p> <p>11 no problem with that at all and I imagine the Commission</p> <p>12 will not have either. It seems to me that Mr Southward</p> <p>13 was invited to produce his reports first, and to some</p> <p>14 extent he is, I think, in his slides, responding to</p> <p>15 certain matters that have been raised by the other</p> <p>16 experts. Secondly, Mr Southward is the first expert, as</p> <p>17 it were, to go this morning, and it would be quite</p> <p>18 helpful for the Commission and for everybody for</p> <p>19 Mr Southward to, as it were, set the groundwork for the</p> <p>20 principal issues. So I have no problem with extending</p> <p>21 the time to Mr Southward so that he can go through his</p> <p>22 presentation as he wishes.</p> <p>23 CHAIRMAN: Does anybody have any concern about that?</p> <p>24 MR PENNICOTT: It appears not.</p> <p>25 CHAIRMAN: There is no concern shown and, Mr Southward, you</p>
Page 18	<p>1 that's perhaps looking ahead a little further.</p> <p>2 Sir, could I then go back to the joint statement.</p> <p>3 The experts also discussed matters concerning the COI 2</p> <p>4 structures, and you will see there what's been agreed in</p> <p>5 relation to the HHS trough walls, the coupler</p> <p>6 connections and the engagement, and then also, at 5, the</p> <p>7 SAT NSL shear capacity, again agreement largely between</p> <p>8 Dr Glover, Mr Southward and Prof McQuillan, and</p> <p>9 disagreement from Dr Lau.</p> <p>10 Sir, finally on the experts -- and I'm not sure</p> <p>11 whether it's all yet been signed up -- but anyway, if we</p> <p>12 go to ER1, COI 2, tab 15, there is a supplementary joint</p> <p>13 statement that has been signed in the last day or two</p> <p>14 which might just be worth looking at. You will see</p> <p>15 there it's a supplemental memorandum of agreement. The</p> <p>16 experts are identified. The purpose is stated. Then</p> <p>17 the summary statement reads as follows:</p> <p>18 "MG, NS and DM agree that the as-built COI 1 and</p> <p>19 COI 2 structures are safe and fit for purpose.</p> <p>20 [Dr Lau] disagrees with the above and is of the</p> <p>21 opinion that without the implementation of suitable</p> <p>22 measures the as-built COI 1 and COI 2 structures are</p> <p>23 neither safe nor fit for purpose."</p> <p>24 Sir, that is, as it were, an addendum or supplement</p> <p>25 to the main body of the joint agreement.</p>	Page 20	<p>1 can please proceed.</p> <p>2 MR PENNICOTT: Sir, the only slight wrinkle to that</p> <p>3 observation is this. The second thing that Leighton</p> <p>4 served last evening was a witness statement from</p> <p>5 a Mr Chow Kai Fat. He is a site supervisor, he tells</p> <p>6 us, of Leightons, and he is currently managing the</p> <p>7 day-to-day running of all works on site, he tells us in</p> <p>8 his short witness statement.</p> <p>9 It appears from his witness statement that very</p> <p>10 recently, on 30 December, that he was asked by one of</p> <p>11 Leighton's in-house lawyers and Mr Jonathan Kitching,</p> <p>12 Leighton's project director from whom the Commission has</p> <p>13 heard previously, to find some coupler assemblies and</p> <p>14 produce those coupler assemblies to Mr Southward for the</p> <p>15 purposes of Mr Southward expressing various views which</p> <p>16 he has done in his slides. I say expressing certain</p> <p>17 views. What Mr Southward has done is incorporated into</p> <p>18 his slides photographs of the couplers found/obtained by</p> <p>19 Mr Chow, not only found and obtained by Mr Chow but</p> <p>20 couplers that have been cut, Mr Chow explains to us,</p> <p>21 longways, along the long side, as it were, of the</p> <p>22 couplers, and one can see from Mr Southward's</p> <p>23 photographs, or some of them, the rebar being screwed</p> <p>24 into, as it were, the cut couplers.</p> <p>25 It strikes me -- I don't know how my learned friends</p>

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<p>1 for MTR and the government feel about this -- that it                  2 would be inappropriate for Mr Chow's witness statement                  3 simply to be put into evidence and, as it were, taken as                  4 read. My own view is that I would like to ask Mr Chow                  5 some follow-up questions to his witness statement, to                  6 provide information to the Commission as to the precise                  7 circumstances in which he was asked to obtain these                  8 further samples, one or two other questions about the                  9 provenance and where these samples were found, the                  10 cutting process that took place, who did the cutting,                  11 where was it done, and so forth, and also of course to                  12 establish from him, as he says in his witness statement,                  13 that these are in fact BOSA couplers. It seems to me                  14 quite important that one has some evidential basis,                  15 factual evidential basis, for what is in Mr Southward's                  16 slides.                  17 So I would invite the Commission, subject to any                  18 views that my learned friends behind me have, before we                  19 proceed with Mr Southward, that we invite Mr Chow, who                  20 I understand from Mr Shieh is here, to go into the                  21 witness box, and I and anybody else who wants to ask him                  22 some questions may have that opportunity, and of course                  23 the Commission itself.                  24 CHAIRMAN: Again, any concerns at that suggested procedure?                  25 MR BOULDING: Sir, so far as MTR is concerned, we only saw</p>	<p>1 presentation this morning, but I may need some time to                  2 discuss those further points with Dr Lau after the                  3 presentation.                  4 CHAIRMAN: Yes. Good. Nothing else? Thank you.                  5 MR PENNICOTT: Sir, on that basis, I don't know if Mr Shieh                  6 could help us as to where precisely the samples are, but                  7 it does seem to me that probably the most appropriate                  8 procedure would be for myself, Mr Boulding and Mr Khaw                  9 at least, and possibly Prof McQuillan, and Dr Glover if                  10 he's here, and perhaps, I don't know if Dr Lau is here,                  11 for us to actually go and have a look at these                  12 assemblies, and I may want to form a view as to whether                  13 you, sir, and Prof Hansford should also have a look at                  14 them. I understand they are pretty heavy. Certainly                  15 the rebar is about half a metre long or so, and                  16 apparently, Mr Shieh tells me, at least one trolley has                  17 been broken trying to bring them into the building                  18 already. Sir, I don't know if that can be arranged                  19 first. Then, having carried out that inspection,                  20 I suggest we get on with Mr Chow straightaway after that                  21 inspection; once Mr Chow has finished, we proceed with                  22 Mr Southward, he can make his presentation; perhaps                  23 I could then ask any questions I have of Mr Southward.                  24 I would imagine by the time we finish that, a good part                  25 of the day will have gone by anyway. Then we can assess</p>
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<p>1 this witness statement for the first time this morning,                  2 so of necessity we would reserve our position, certainly                  3 until I've had an opportunity to discuss it with my                  4 clients.                  5 But the immediate question I would ask, and I ask                  6 the question to Mr Southward through you, sir, is: are                  7 the samples still available for inspection?                  8 MR PENNICOTT: Sir, my understanding, although Mr Shieh will                  9 probably be in a better position to inform us, is that                  10 the samples are in the building, but precisely where                  11 they are I do not know.                  12 CHAIRMAN: In other words, if you want to have a physical                  13 inspection, then arrangements can be made for you to do                  14 that immediately or at a time that's suitable to you.                  15 MR BOULDING: Thank you very much.                  16 MR KHAW: Mr Chairman, Mr Commissioner, my position in                  17 relation to Mr Chow's evidence is similar to                  18 Mr Boulding's, given the time available to us.                  19 The only point that I wish to mention at this stage                  20 is that Mr Southward's presentation slides have                  21 certainly contained some further particulars in relation                  22 to the points addressed in Dr Lau's report. I also                  23 haven't had a chance to discuss the new points with                  24 Dr Lau, and I do not wish to disrupt the present                  25 arrangement, if Mr Southward wishes to do the</p>	<p>1 Mr Khaw's position at that point.                  2 CHAIRMAN: That sounds sensible to me, provisionally at                  3 least. That is subject to what comments may come from                  4 other counsel.                  5 MR BOULDING: We are content with that proposed course of                  6 action, sir.                  7 CHAIRMAN: Good. I think what we will do then -- obviously                  8 Mr Chow has to give his evidence first. Obviously on                  9 the slides, the physical material that he has brought to                  10 court today is going to be central. So what we will do                  11 is we will adjourn and, Mr Pennicott, you can let us                  12 know when you are ready to proceed.                  13 MR PENNICOTT: Yes.                  14 CHAIRMAN: Because we can't give you a specified time, and                  15 we know you will get about it as soon as possible.                  16 MR PENNICOTT: Of course, sir, yes.                  17 CHAIRMAN: But we will make it, so that everybody at least                  18 is in a position that they are not going to be called                  19 back in two minutes -- it's now 10.50 -- that we will                  20 adjourn until at least 11.30.                  21 MR PENNICOTT: Yes, sir.                  22 CHAIRMAN: Then thereafter we will return when you say that                  23 all the parties are ready.                  24 MR PENNICOTT: Yes, sir. Thank you very much.                  25 CHAIRMAN: Okay? Good. That will on the basis that we are</p>

Page 25	<p>1 going to call Mr Chow first.</p> <p>2 MR PENNICOTT: Yes, sir.</p> <p>3 CHAIRMAN: Thank you.</p> <p>4 (10.50 am)</p> <p>5 (A short adjournment)</p> <p>6 (11.57 am)</p> <p>7 CHAIRMAN: Sorry, just before we commence, myself and</p> <p>8 Prof Hansford were given the opportunity of going</p> <p>9 downstairs and meeting with the experts to have a look</p> <p>10 at the couplers and the rebars and to understand the</p> <p>11 context in which the issue is going to be aired before</p> <p>12 the Inquiry.</p> <p>13 Obviously, things were said during that time.</p> <p>14 Anything said, however, by any of the experts was said</p> <p>15 merely to put matters into context and have been</p> <p>16 accepted only on that basis. So anything said</p> <p>17 downstairs has no evidential value whatsoever and will</p> <p>18 not be taken into account by the Inquiry.</p> <p>19 Thank you.</p> <p>20 MR SHIEH: Mr Chairman and Mr Commissioner, Mr Chow Kai Fat</p> <p>21 is now in the witness box, so I now call Mr Chow as</p> <p>22 Leighton's witness.</p> <p>23 The witness statement, I understand, has not yet</p> <p>24 found itself into the bundles, but I understand that it</p> <p>25 has been served and it should be available as a loose</p>	Page 27	<p>1 Q. Your signature is on the second page; you can see that,</p> <p>2 that's your signature?</p> <p>3 A. Yes, correct.</p> <p>4 Q. Are you happy to put forward the content of this witness</p> <p>5 statement as your evidence in front of this Commission?</p> <p>6 A. Yes.</p> <p>7 Q. Now, this document is written in English and it has no</p> <p>8 translation clause. I take it that you understand the</p> <p>9 content written in English but you prefer to speak in</p> <p>10 Cantonese in these proceedings; correct?</p> <p>11 A. Correct.</p> <p>12 Q. Thank you. I will sit down now and other lawyers for</p> <p>13 other parties may ask you some questions, and the</p> <p>14 Chairman and Mr Commissioner may also ask you questions,</p> <p>15 and after they have done so, if I think it necessary,</p> <p>16 I will have follow-up questions to ask you; right? So</p> <p>17 please continue to be seated and answer their questions.</p> <p>18 WITNESS: Okay.</p> <p>19 Examination-in-chief by MR PENNICOTT</p> <p>20 MR PENNICOTT: Mr Chow, good morning.</p> <p>21 A. (In English) Good morning.</p> <p>22 Q. My name is Ian Pennicott and I am one of the counsel to</p> <p>23 the Commission and I'm going to ask you some questions</p> <p>24 first, before anyone else does.</p> <p>25 A. (In English) Okay.</p>
Page 26	<p>1 copy.</p> <p>2 MR PENNICOTT: It's on the screen.</p> <p>3 MR SHIEH: It's on the screen, yes.</p> <p>4 So, Mr Chow, you are giving evidence in English or</p> <p>5 Cantonese?</p> <p>6 MR CHOW KAI FAT (affirmed in Puntì)</p> <p>7 (All answers given via simultaneous interpreter</p> <p>8 except where otherwise specified)</p> <p>9 Examination-in-chief by MR SHIEH</p> <p>10 Q. Thank you, Mr Chow. Please be seated.</p> <p>11 There is a witness statement in front of you now, in</p> <p>12 hard-copy format, and I think it should also be</p> <p>13 displayed on the computer monitor in front of you, so</p> <p>14 you can choose to look at whatever version there is.</p> <p>15 Is there anything wrong with the headphones? You</p> <p>16 can hear my question?</p> <p>17 A. (In English) Yes.</p> <p>18 Q. This is a document entitled "Witness statement of Chow</p> <p>19 Kai Fat"; that's correct, yes?</p> <p>20 A. (Nodded head).</p> <p>21 Q. When you give an answer, you need to actually say</p> <p>22 something. You can't just nod. This is your witness</p> <p>23 statement; correct?</p> <p>24 A. (In English) Okay, yes, correct.</p> <p>25 A. Yes, correct.</p>	Page 28	<p>1 Q. Mr Chow, you tell us in paragraph 3 of your statement</p> <p>2 that you joined Leighton as a senior foreman in</p> <p>3 September 2015. Is it the case that you have been</p> <p>4 working on the Hung Hom Station Extension project since</p> <p>5 that date?</p> <p>6 A. No.</p> <p>7 Q. Can you tell us when you actually started working on the</p> <p>8 Hung Hom Station Extension project?</p> <p>9 A. 1 January 2018.</p> <p>10 Q. All right. Was that then as a senior foreman?</p> <p>11 A. At the time, I was a supervisor.</p> <p>12 Q. Right. Because you say in paragraph 4 of your statement</p> <p>13 that you assumed the role of site supervisor for the</p> <p>14 whole site from 5 June 2018. Is that right?</p> <p>15 A. Yes, correct.</p> <p>16 Q. Right. So, from the beginning of 2018 up to 5 June</p> <p>17 2018, what was your role?</p> <p>18 A. It was supervisor still.</p> <p>19 Q. Okay. Before the beginning of 2018, did you have any</p> <p>20 involvement at all on the Hung Hom Station Extension</p> <p>21 project?</p> <p>22 A. No.</p> <p>23 Q. You say that your role now, as I understand it --</p> <p>24 paragraph 5 of your witness statement -- is to manage</p> <p>25 the day-to-day running of all works on site. Do you see</p>

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<p>1 that, and is that accurate?</p> <p>2 A. Yes, accurate.</p> <p>3 Q. We know, Mr Chow, that there are certain works being</p> <p>4 carried out on the site which have been labelled</p> <p>5 "suitable measures". Are you aware of that?</p> <p>6 A. Yes, I am aware of that.</p> <p>7 Q. Does your role extend to managing those suitable</p> <p>8 measures?</p> <p>9 A. Yes, part of them.</p> <p>10 Q. Which part?</p> <p>11 A. Manpower, you know, staffing arrangement. Staffing</p> <p>12 arrangement.</p> <p>13 Q. Right. Does it involve supervising or managing the</p> <p>14 different types of suitable measures that are going on,</p> <p>15 that is in the different areas, in area A, in areas B</p> <p>16 and C?</p> <p>17 A. Yes, that's included.</p> <p>18 Q. Right. Does it include the works to the top of the east</p> <p>19 slab and the diaphragm wall, where vertical dowel bars</p> <p>20 are to be inserted?</p> <p>21 A. Yes, included.</p> <p>22 Q. Right. I may come back to that in a moment.</p> <p>23 Now can we just focus on your witness statement.</p> <p>24 You say at paragraph 6:</p> <p>25 "On Monday 30 December 2019, I was asked by Brent</p>	<p>1 Q. And you were aware that it was in that store area; is</p> <p>2 that right?</p> <p>3 A. Yes, I was aware of that.</p> <p>4 Q. Right. So you didn't have to go hunting around the site</p> <p>5 for it; you knew that there was some there?</p> <p>6 A. Yes, correct.</p> <p>7 Q. All right. You used the words "whether there was any</p> <p>8 threaded rebar available on site". Were you also asked</p> <p>9 to locate coupler assemblies?</p> <p>10 A. Well, for the items locked in the store room, they have</p> <p>11 been assembled, so I just retrieved them as is.</p> <p>12 Q. Okay. You say in paragraph 7 of your witness statement</p> <p>13 that you located ten coupler assemblies in a laydown</p> <p>14 yard on site. So the store room that you've just</p> <p>15 referred to was in this laydown area, was it?</p> <p>16 A. Yes, correct.</p> <p>17 Q. That was a general storage area that stored all sorts of</p> <p>18 materials for use on the site; is that right?</p> <p>19 A. Yes, but it will be locked up.</p> <p>20 Q. Okay. And the ten coupler assemblies in the laydown</p> <p>21 yard that you located, was that all of them, that's the</p> <p>22 totality of the rebar and the coupler assemblies in that</p> <p>23 particular store room; is that correct?</p> <p>24 A. No. There are still others.</p> <p>25 Q. Okay. So how many others?</p>
Page 30	Page 32
<p>1 Stowers (in-house legal counsel for Leighton) and</p> <p>2 Jonathan Kitching (project director) to identify whether</p> <p>3 there was any threaded rebar available on site ..."</p> <p>4 Pausing there, when you say you were asked, how were</p> <p>5 you asked? In a telephone conversation, by an email,</p> <p>6 face-to-face; how were you asked?</p> <p>7 A. Face-to-face.</p> <p>8 Q. Can you think of any particular reason why you were</p> <p>9 asked to carry out this task as opposed to anybody else?</p> <p>10 A. I think it's because I'm managing the site, that's why</p> <p>11 they approached me directly; it would be easier.</p> <p>12 Q. All right. Was this the first time you had been asked</p> <p>13 to do such a thing, that is to find and identify some</p> <p>14 threaded rebar?</p> <p>15 A. Yes.</p> <p>16 Q. Right. When you say you were asked to identify whether</p> <p>17 there was any threaded rebar available, when you were</p> <p>18 asked that question, were you aware that there was such</p> <p>19 rebar available on the site?</p> <p>20 A. Yes, there was such rebar.</p> <p>21 Q. Right. So you had seen it about during the course of</p> <p>22 your working days over the last couple of years; is that</p> <p>23 right?</p> <p>24 A. No. For the rebar I provided, it was locked up in</p> <p>25 a store area.</p>	<p>1 A. 30 sets.</p> <p>2 Q. Okay. Why did you pick these particular ten?</p> <p>3 A. I did not just pick them. I just, you know, picked them</p> <p>4 at random.</p> <p>5 Q. Right. So you say there are 30-odd sets and you picked</p> <p>6 these ten at random. Okay. Does that --</p> <p>7 CHAIRMAN: Sorry, could be 30-odd sets left now that he's</p> <p>8 taken them at random.</p> <p>9 MR PENNICOTT: Yes.</p> <p>10 Is that right?</p> <p>11 A. (In English) Yes.</p> <p>12 Q. So 30 sets still left in the store room?</p> <p>13 A. Yes, correct.</p> <p>14 Q. Then what happened, as I understand it, was two -- you</p> <p>15 say in your witness statement -- coupler assemblies, is</p> <p>16 that right, were chosen to give to Mr Southward; is that</p> <p>17 right?</p> <p>18 A. Correct.</p> <p>19 Q. Now, who chose those two coupler assemblies? Was it you</p> <p>20 or somebody else?</p> <p>21 A. It was me.</p> <p>22 Q. Right. Again, what was the basis of your choice? Was</p> <p>23 it entirely random or were there other considerations?</p> <p>24 A. Random.</p> <p>25 Q. Okay. When you say the coupler assemblies consisted of</p>



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<p>1 two pieces of threaded rebar, each about 50 centimetres</p> <p>2 long, do you mean that a 50 centimetre, approximately,</p> <p>3 long rebar was fitted into each end of the assembly, the</p> <p>4 coupler assembly, or just one end?</p> <p>5 A. They were fitted on both ends.</p> <p>6 Q. Right. Had you any idea where those assemblies had come</p> <p>7 from?</p> <p>8 A. It was crimped at BOSA and then it was sent back to us</p> <p>9 and then we kept it in a store room for testing purpose.</p> <p>10 Q. Okay. You say in your witness statement at paragraph 8</p> <p>11 that the coupler assemblies were excess to requirements</p> <p>12 for the project and had not been tested by the HOKLAS</p> <p>13 lab.</p> <p>14 How did you know they had not been tested?</p> <p>15 A. Because for the batch that was tested, it was already</p> <p>16 taken away. This batch was kept here, because at the</p> <p>17 time there were excess, so they were kept here, and if</p> <p>18 there was a need for further test then this could be</p> <p>19 used.</p> <p>20 Q. Okay. How did you know they were manufactured by BOSA,</p> <p>21 Mr Chow?</p> <p>22 A. Because at the time we sent the rebars to BOSA and then,</p> <p>23 when BOSA completed the process, we took it back from</p> <p>24 them and we kept it at the store room.</p> <p>25 Q. You, as I understand it from your answers a moment ago</p>	<p>1 samples were delivered in 2019, if I've understood that</p> <p>2 correctly. what I'm trying to find out from you is why</p> <p>3 were Leighton ordering BOSA coupler assemblies and</p> <p>4 threaded rebar in 2019? What were they going to use</p> <p>5 them for?</p> <p>6 A. As far as I understand, it's ordered for testing</p> <p>7 purpose.</p> <p>8 Q. Any particular type of testing that you can think of?</p> <p>9 A. Well, I was not involved in the testing.</p> <p>10 Q. All right.</p> <p>11 Mr Chow, if one looks at the coupler assemblies, is</p> <p>12 there anything on them that indicates that they are</p> <p>13 indeed BOSA coupler assemblies as opposed to any other</p> <p>14 manufacturer?</p> <p>15 A. Well, if it's BOSA's couplers, the threads are parallel.</p> <p>16 Q. So your evidence is because the threads are parallel,</p> <p>17 they must be BOSA; is that right?</p> <p>18 A. Well, as far as I understand, yes, the answer is yes,</p> <p>19 but at the time it was BOSA who sent it back to us.</p> <p>20 Q. Right. Mr Chow, sorry to press you on this, but are you</p> <p>21 sure that those coupler assemblies and the samples of</p> <p>22 rebar that we've now all seen weren't there for some</p> <p>23 time, perhaps a number of years, stretching back to</p> <p>24 perhaps 2014, 2015 and 2016?</p> <p>25 A. No, no, it can't be the case, because I took delivery,</p>
Page 34	Page 36
<p>1 to my questions, indicated that you joined this site at</p> <p>2 the beginning of 2018; is that right?</p> <p>3 A. Correct.</p> <p>4 Q. Are you suggesting that from that date or after that</p> <p>5 date, orders were placed for this rebar and the couplers</p> <p>6 to BOSA by Leighton, in 2018 and 2019?</p> <p>7 A. For that batch of rebars, it was sent to the site in</p> <p>8 2019 and then it was transported to BOSA.</p> <p>9 Q. So your evidence is that the batches that you</p> <p>10 identified, the ten samples that you chose and then the</p> <p>11 two coupler assemblies that you chose had been delivered</p> <p>12 by BOSA to Leighton in 2019; is that right?</p> <p>13 A. Correct.</p> <p>14 Q. And how do you know that, Mr Chow? Were you involved in</p> <p>15 the ordering and taking delivery of those samples?</p> <p>16 A. I was not involved in the ordering, and when the batch</p> <p>17 was delivered to us there was an invoice to us and then</p> <p>18 we passed it on to the relevant engineer. That's why</p> <p>19 I knew it was sent from there back to us.</p> <p>20 Q. Okay. Can you help me with this. In 2018 and in 2019,</p> <p>21 what type of work was Leighton carrying out that would</p> <p>22 require or might require these coupler assemblies and</p> <p>23 the threaded rebar?</p> <p>24 A. 2018? Actually, I am not sure.</p> <p>25 Q. Right. Let's focus on 2019. You told us that these</p>	<p>1 I supervised, you know, the transportation of the bars</p> <p>2 to the site.</p> <p>3 Q. And your evidence is that they were delivered, so far as</p> <p>4 you can recall, for the purpose of testing only, not for</p> <p>5 actual physical use in the works; is that right?</p> <p>6 A. Correct.</p> <p>7 Q. Okay. You say in paragraph 9 of your statement you met</p> <p>8 with Brent Stowers, who's the in-house legal counsel to</p> <p>9 Leighton, and he asked you to disassemble the coupler</p> <p>10 assemblies, and I assume what you mean by that is the</p> <p>11 two that you had randomly chosen; is that right?</p> <p>12 A. Correct.</p> <p>13 Q. And that meeting also took place on 30 December; is that</p> <p>14 correct, Mr Chow?</p> <p>15 A. Correct.</p> <p>16 Q. You go on to say that he, that is Mr Stowers, "asked me</p> <p>17 to arrange for two of the couplers to be cut in such</p> <p>18 a way that the threaded rebar inside the couplers would</p> <p>19 be visible, which I did", and indeed we've all now seen</p> <p>20 the two coupler assemblies that were apparently cut.</p> <p>21 Who cut them, Mr Chow?</p> <p>22 A. I did it myself.</p> <p>23 Q. Using what tool?</p> <p>24 A. Cutting machine.</p> <p>25 Q. Right. And that was a machine that, what, Leighton had</p>

Page 37	<p>1 available to them on site?</p> <p>2 A. Correct.</p> <p>3 Q. Was anybody else involved in the cutting or just</p> <p>4 yourself?</p> <p>5 A. The workers helped me to hold the coupler assembly, you</p> <p>6 know, the threaded part.</p> <p>7 Q. Right. And we've seen this morning the cut couplers.</p> <p>8 How did you decide how much to cut out? It looks as</p> <p>9 though about perhaps 15 or 20 per cent of the</p> <p>10 circumference has been cut out. How did you decide how</p> <p>11 much to cut out?</p> <p>12 A. Brent told me the approximate size he wanted.</p> <p>13 Q. When you say he told you the approximate size, you mean</p> <p>14 he told you roughly how much to cut out; is that right?</p> <p>15 A. That's correct.</p> <p>16 Q. When he originally -- he or Mr Kitching -- asked you to</p> <p>17 identify the rebar and the couplers, did they ask you to</p> <p>18 identify them by any particular size?</p> <p>19 A. 40mm.</p> <p>20 Q. Right. And indeed the ones you found were indeed</p> <p>21 40 millimetres?</p> <p>22 A. Yes.</p> <p>23 Q. In the samples that are downstairs, the ten, they are</p> <p>24 all 40 millimetres, I think, are they?</p> <p>25 A. Yes, correct.</p>	Page 39	<p>1 A. Yes, correct.</p> <p>2 Q. All right. So once you'd located the rebar and the</p> <p>3 couplers, you, what, then made a call to Mr Stowers or</p> <p>4 to Mr Kitching saying, "Look, I've got these materials,</p> <p>5 now what do you want me to do with them?" Is that</p> <p>6 really how it came about?</p> <p>7 A. Yes, correct.</p> <p>8 Q. Okay. That's when you got the instruction to cut them,</p> <p>9 the coupler assemblies?</p> <p>10 A. They just asked me to prepare ten sets or ten rebars,</p> <p>11 and then I arranged for transportation, to send them to</p> <p>12 the office. Then he told me, "Okay, you cut two for me</p> <p>13 according to this size and that will be fine."</p> <p>14 Q. Okay. Could I then just ask you a few more questions</p> <p>15 about a point I touched on earlier, which is suitable</p> <p>16 measures. Can I ask you to be shown bundle OU9,</p> <p>17 tab 352, page 11332. You can either look at it in hard</p> <p>18 copy, Mr Chow, or on the screen, whichever you find</p> <p>19 easier.</p> <p>20 This is, at 11332 -- I don't know if it's a document</p> <p>21 you've seen before -- a contractor's submission form.</p> <p>22 Are you generally familiar with Leighton's contractor</p> <p>23 submission forms, Mr Chow?</p> <p>24 A. I know it but not that familiar.</p> <p>25 Q. Right. This, as is happens, is sending a method</p>
Page 38	<p>1 Q. In the perhaps 30-odd that are not here but are still in</p> <p>2 the store room, are they all 40 millimetres or are they</p> <p>3 of different dimensions?</p> <p>4 A. All 40mm.</p> <p>5 Q. Once you had done the cutting, you gave -- or you made</p> <p>6 arrangements, you say, for the rebar and the cut</p> <p>7 couplers to be transported off site to Mr Southward; is</p> <p>8 that right?</p> <p>9 A. Correct, yes.</p> <p>10 Q. The original request that you say was made by Mr Stowers</p> <p>11 and Mr Kitching was made on 30 December; is that right?</p> <p>12 A. Correct.</p> <p>13 Q. This witness statement that you've signed is dated</p> <p>14 30 December. We can see that from the second page. Do</p> <p>15 you see that?</p> <p>16 A. Correct.</p> <p>17 Q. So did all of this happen on Monday?</p> <p>18 A. Correct.</p> <p>19 Q. When you went to the store room and located and then</p> <p>20 chose the rebar and the couplers, did Mr Stowers or</p> <p>21 Mr Kitching accompany you, or did you go on your own?</p> <p>22 A. Just me.</p> <p>23 Q. Okay. None of your colleagues at all?</p> <p>24 A. Yes, there were other colleagues helping out.</p> <p>25 Q. Okay. Those were just labourers, were they, assisting?</p>	Page 40	<p>1 statement. If you look on the left-hand side, you will</p> <p>2 see it says, "Document title" -- you see Mr Kitching's</p> <p>3 name and then underneath "Document title", "HUH --</p> <p>4 method statement for suitable measure works"; do you see</p> <p>5 that?</p> <p>6 A. Yes, I see it.</p> <p>7 Q. It's going to Mr Fu at MTR.</p> <p>8 A. Yes.</p> <p>9 Q. Then if we go to the next page, please, 11333, we see</p> <p>10 a list of names there, some of which are familiar to us</p> <p>11 or at least one of which is. You see at the top there,</p> <p>12 Mr Chow, it says "Construction method statement", and</p> <p>13 then "Preparation sign-off" and a list of names there,</p> <p>14 with dates and signatures. Then "Review sign off", we</p> <p>15 see three other positions mentioned -- safety manager,</p> <p>16 construction manager and superintendent -- and I imagine</p> <p>17 Oscar Chow is not you, it's just another Mr Chow; is</p> <p>18 that right?</p> <p>19 A. That's me.</p> <p>20 Q. Oh, it's you? Right. Even better.</p> <p>21 So what role did you play in the preparation of this</p> <p>22 construction method statement, Mr Chow?</p> <p>23 A. Together with the safety division and the manager, I had</p> <p>24 to see whether the method would work.</p> <p>25 Q. Right. So you, amongst others, that is Mr Bobby Chan</p>

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<p>1 and Mr Holden, who we have heard from previously, you</p> <p>2 were reviewing what had been prepared by others,</p> <p>3 checking it, and making sure that you were happy with</p> <p>4 the content; is that right?</p> <p>5 A. Correct.</p> <p>6 Q. If we could go over the page to 11337 -- that's it -- we</p> <p>7 see a little organisation chart there, Mr Chow; do you</p> <p>8 see that?</p> <p>9 A. Yes, I see it.</p> <p>10 Q. So you were identified here as the superintendent?</p> <p>11 A. Correct.</p> <p>12 Q. If we could go back a page to 11336, we have a basic</p> <p>13 programme for the carrying out of certain of the</p> <p>14 suitable measures works; do you see that, Mr Chow?</p> <p>15 A. Yes, I see it.</p> <p>16 Q. This is something that you would have reviewed at the</p> <p>17 time that you were looking at and considering and</p> <p>18 reviewing this document; is that correct?</p> <p>19 A. Yes, correct.</p> <p>20 Q. We can see that the sequence is "Setting out", then</p> <p>21 "Preparation works", then "Trim the mass concrete",</p> <p>22 "Scan and check the alignment of reinforcement bar",</p> <p>23 "Expose the top layer of reinforcement bar", "Coring</p> <p>24 holes for dowel bar installation", "Inspection of depth</p> <p>25 and spacing of drilled holes", and then "Dowel bar</p>	<p>1 shown page -- in the same bundle -- 11375, but it's</p> <p>2 a new document.</p> <p>3 Mr Chow, just to explain -- I'm not suggesting</p> <p>4 you've seen this document before -- the Commission has</p> <p>5 received on a weekly basis from the MTR an update as to</p> <p>6 how the suitable measures works is progressing. Do you</p> <p>7 understand?</p> <p>8 A. Yes, I understand.</p> <p>9 Q. Okay. So this is the status as of 25 December,</p> <p>10 Christmas Day, 2019.</p> <p>11 If you would be good enough, please, to be shown</p> <p>12 page 11380, we see highlighted in green 20 of the</p> <p>13 23 panels into which the dowel bars are to be inserted,</p> <p>14 and then in yellow three not yet commenced, making up</p> <p>15 the 23 panels; do you see that?</p> <p>16 A. Yes, I see it.</p> <p>17 Q. You will see that the green is described in the box at</p> <p>18 the bottom as "In progress"; do you see that?</p> <p>19 A. I do.</p> <p>20 Q. If you would be good enough, please, to go back to</p> <p>21 page 11378, a couple of pages earlier -- that's it --</p> <p>22 you will see there, under "HUH &amp; SAT", and then item 2,</p> <p>23 do you see that, "EWL -- suitable measures (area A, B</p> <p>24 and C)"; do you see that, Mr Chow?</p> <p>25 A. Yes, I see it.</p>
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<p>1 installation".</p> <p>2 Then pausing there. This is, I understand it,</p> <p>3 Mr Chow -- I would be grateful if you could confirm</p> <p>4 it -- a description and a programme in relation to the</p> <p>5 vertical dowel bars that are to be installed at the EWL</p> <p>6 slab and the top of the diaphragm walls; is that</p> <p>7 correct?</p> <p>8 A. Correct.</p> <p>9 Q. If we go, please, to page 11340, we see a heading, 6.2,</p> <p>10 "Typical procedure for the 200 thick RC slab of suitable</p> <p>11 measures (detail 1)", and then underneath the diagram we</p> <p>12 see a seven-stage process up to that point, and then</p> <p>13 a list of the panels into which the vertical dowel bars</p> <p>14 are to be inserted. Do you see that, Mr Chow?</p> <p>15 A. Yes, I see it.</p> <p>16 Q. There are 22 panels listed there, take it from me, and</p> <p>17 there's one that's missing, which is EH49, making</p> <p>18 23 panels in all.</p> <p>19 Are you with me, Mr Chow?</p> <p>20 A. Yes, correct.</p> <p>21 Q. Right. Then if we go over the page to 11341, one sees</p> <p>22 the rest of the stages set out so far as those works are</p> <p>23 concerned; do you see that?</p> <p>24 A. Yes, I see it.</p> <p>25 Q. Mr Chow, if then you would be good enough to go to or be</p>	<p>1 Q. Then the status/completion percentage on the right-hand</p> <p>2 side is stated to be 8.7 per cent; do you see that?</p> <p>3 A. Yes, I see it.</p> <p>4 Q. Mr Chow, going back to 11380, if you're able, could you</p> <p>5 please explain to the Commission, first of all, with</p> <p>6 regard to the panels that are identified there in green,</p> <p>7 what progress has actually been made with these works</p> <p>8 that are to lead to the insertion of the dowel bars?</p> <p>9 I mean how much work has actually been done on any of</p> <p>10 these panels?</p> <p>11 A. The concrete has been exposed, and we can see the bar on</p> <p>12 the surface, that's for the green shaded ones. As for</p> <p>13 drilling holes to install dowel bars, we are still doing</p> <p>14 the drilling, as far as I know. And you know, for the</p> <p>15 green ones, it doesn't mean that the dowel bars have</p> <p>16 been installed. No, they haven't.</p> <p>17 Q. Right. Let's take this in stages. In relation to the</p> <p>18 green ones, preparatory works have been done, chipping</p> <p>19 away the concrete has been done -- for all green ones;</p> <p>20 is that right?</p> <p>21 A. No, not all the green ones. For some, the concrete</p> <p>22 hasn't been fully chipped away but the work is in</p> <p>23 progress.</p> <p>24 Q. Understood. So it's either been done or it's in</p> <p>25 progress on the green ones, I see. And in relation to</p>

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<p>1 certain of them, some coring has been done, is that                  2 right, some core drilling has been done?                  3 A. Yes, some of them.                  4 Q. And that coring or drilling process is currently                  5 proceeding?                  6 A. Correct.                  7 Q. So if I were to go there today and look at some of these                  8 panels, I would see that drilling going on; is that                  9 right?                  10 A. Correct.                  11 Q. And Leightons have a sub-contractor doing that drilling                  12 work; is that right, or are you doing it yourselves?                  13 A. A sub-contractor.                  14 Q. And presumably the works of the sub-contractor are being                  15 carefully monitored and supervised by yourselves, by                  16 Leighton?                  17 A. Yes, correct.                  18 Q. And are MTRC also involved with the monitoring and                  19 supervision of these works that are going on?                  20 A. Correct.                  21 Q. Are both Leighton supervisors and MTR supervisors in                  22 constant attendance when these works are proceeding?                  23 A. They are there all day, constantly.                  24 Q. Okay.                  25 We saw reference earlier, in that method statement</p>	<p>1 whether in fact the dowel bars are required if the                  2 construction joint itself, when inspected, looks to be                  3 in a satisfactory condition?                  4 A. Yes, correct, because it's for the engineer to come back                  5 to us.                  6 Q. Right. When you say "the engineer" you mean MTRC?                  7 A. Yes, correct.                  8 Q. All right. Are you aware, Mr Chow, from your own                  9 involvement in the process, of a photographic record                  10 being taken of the exposure of the rebar?                  11 A. Yes, there are such records.                  12 Q. Right. They are taken by Leighton and MTR; is that                  13 right?                  14 A. Correct.                  15 Q. All right. Just to make sure I've understood this, as                  16 at the moment, Mr Chow, no dowel bars have actually been                  17 inserted in any of those panels that we looked at; is                  18 that correct?                  19 A. Correct.                  20 MR PENNICOTT: Okay. Thank you.                  21 COMMISSIONER HANSFORD: Can I ask one question here,                  22 Mr Chow. This programme on the screen here shows                  23 13 days' activity in total. When do you expect this                  24 work to be completed on all of these 23 panels?                  25 A. Well, we expect to finish it by the end of April.</p>
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<p>1 I showed you, Mr Chow, to scanning the alignment of the                  2 reinforcement bar; do you recall that? We can go back                  3 to it, if you like, at 11336. You see the fourth item                  4 down, "Scan and check the alignment of reinforcement                  5 bar"; do you see that?                  6 A. Yes, I see it.                  7 Q. Who is doing that scanning work, Mr Chow?                  8 A. MTR.                  9 Q. When this work is being done, Mr Chow, are you able to                  10 answer this: is the general condition of each of the                  11 construction joints that are being exposed being checked                  12 or being observed and checked and photographed?                  13 A. I don't get your question, sorry.                  14 Q. There's exposure, as I understand it, of the rebar, the                  15 top level of the rebar, by chipping away of the                  16 concrete?                  17 A. Yes.                  18 Q. And that should enable one, at least those that are                  19 qualified, to look at and check the general condition of                  20 the construction joint; is that right?                  21 A. Correct.                  22 Q. And so do you know whether that process of checking is                  23 being carried out, and if so by whom?                  24 A. That I'm not sure about.                  25 Q. So you don't know whether the question is being asked</p>	<p>1 COMMISSIONER HANSFORD: The end of April?                  2 A. (In English) Yes.                  3 COMMISSIONER HANSFORD: Which is much longer 13 days.                  4 A. It's because for the hole drilling, there could be some                  5 problems, and if we could insert the dowel bars then we                  6 will have to wait for MTRCL to tell us what method to                  7 adopt.                  8 COMMISSIONER HANSFORD: Okay. And when do you expect the                  9 first dowel bar to be inserted?                  10 A. It should be this month, end of this month.                  11 COMMISSIONER HANSFORD: Thank you.                  12 MR PENNICOTT: Sir, I have no further questions at this                  13 stage. Thank you very much.                  14 CHAIRMAN: Is it agreed who should follow?                  15 MR PENNICOTT: I'm not sure it is, sir.                  16 CHAIRMAN: Mr Khaw?                  17 Cross-examination by MR KHAW                  18 MR KHAW: Mr Chow, I represent the government. Just a few                  19 questions for you.                  20 You told us, when you answered Mr Pennicott's                  21 questions, that you started to work for the Hung Hom                  22 Extension project in January 2018; is that right?                  23 A. Yes, correct.                  24 Q. So am I correct to say that you never actually took part                  25 in or witnessed any of the actual coupling connection</p>

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<p>1 works which were carried out on the site; is that</p> <p>2 correct?</p> <p>3 A. Correct.</p> <p>4 Q. Again, in answer to Mr Pennicott's question, you told us</p> <p>5 that when you were asked to locate the coupler</p> <p>6 assemblies -- that is what you told us in your witness</p> <p>7 statement -- when you were asked to locate the coupler</p> <p>8 assemblies, there was no need for you to hang around</p> <p>9 because you knew where they had been placed. Do you</p> <p>10 remember that?</p> <p>11 A. Yes, correct.</p> <p>12 Q. That is because you took care of the deliveries of such</p> <p>13 coupler assemblies which were made in 2019; is that</p> <p>14 correct?</p> <p>15 A. Correct.</p> <p>16 Q. So you had records as to how many coupler assemblies</p> <p>17 were actually delivered at that time; am I correct?</p> <p>18 A. Correct.</p> <p>19 Q. If we take into account all you have managed to locate,</p> <p>20 ie those which were delivered to the court today and</p> <p>21 also those that are still left in storage, they</p> <p>22 constituted the total amount of the coupler assemblies</p> <p>23 which were delivered at that time, in 2019; is that</p> <p>24 right?</p> <p>25 A. Are you referring to the total number in the store?</p>	<p>1 Q. Then back to the last topic that Mr Pennicott discussed</p> <p>2 with you -- now, you told us about the stages in</p> <p>3 relation to the work for the suitable measures, ie the</p> <p>4 installation of dowel bar.</p> <p>5 A. I remember.</p> <p>6 Q. And you told us that you were responsible for</p> <p>7 supervising such works on site.</p> <p>8 A. I wasn't there all day, but for most of the day I would</p> <p>9 be there.</p> <p>10 Q. You have also told us that some drilling process had</p> <p>11 already taken place.</p> <p>12 A. Correct.</p> <p>13 Q. Now, presumably the dowel bars would be placed on top of</p> <p>14 the D-walls; is that correct?</p> <p>15 A. Correct.</p> <p>16 Q. If a rebar is encountered during the drilling process,</p> <p>17 would the workers stop the work immediately and wait for</p> <p>18 the engineer's instruction?</p> <p>19 A. They would.</p> <p>20 MR KHAW: I have no further questions.</p> <p>21 CHAIRMAN: Thank you.</p> <p>22 MR BOULDING: No questions from us. Thank you very much,</p> <p>23 sir.</p> <p>24 CHAIRMAN: Thank you very much.</p> <p>25 Re-examination by MR SHIEH</p>
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<p>1 Q. Yes.</p> <p>2 A. No, that does not equal the total number.</p> <p>3 Q. So some coupler assemblies which were delivered in 2019</p> <p>4 were placed elsewhere?</p> <p>5 A. No. They were taken to the lab.</p> <p>6 Q. Yes. That actually relates to the next question that</p> <p>7 I wanted to ask you.</p> <p>8 Now, you told us that the reason why coupler</p> <p>9 assemblies were delivered to the site in 2019 was</p> <p>10 because it was necessary to carry out some testing, even</p> <p>11 though you are not able to tell us the details of such</p> <p>12 testing.</p> <p>13 A. Correct.</p> <p>14 Q. Now, who told you about the need to carry out any</p> <p>15 testing?</p> <p>16 A. Ian, that is a colleague from the company.</p> <p>17 Q. Did he mention anything about the reason why such</p> <p>18 testing was required?</p> <p>19 A. I did not ask him.</p> <p>20 Q. You know about how many coupler assemblies were sent to</p> <p>21 the lab for testing?</p> <p>22 A. I can't remember.</p> <p>23 Q. When you located those coupler assemblies in the storage</p> <p>24 on site, they were all assembled; right?</p> <p>25 A. Correct.</p>	<p>1 MR SHIEH: A few questions in re-examination.</p> <p>2 Mr Chow, you remember being shown an organisation</p> <p>3 chart in the opening-up bundle, at 11337.</p> <p>4 A. Yes.</p> <p>5 Q. You can see, under William Holden, there is "Site agent:</p> <p>6 Jeffrey Chan", and it then branched out into</p> <p>7 "Superintendent", that is you.</p> <p>8 A. Correct.</p> <p>9 Q. And senior engineer Man Sze Ho, and then each have</p> <p>10 people reporting to them; right? So you have people</p> <p>11 under you and Man Sze Ho has "Engineer" under him; do</p> <p>12 you see that?</p> <p>13 A. I see them.</p> <p>14 Q. Also you remember being asked earlier this morning about</p> <p>15 your role in the suitable measures and you were asked</p> <p>16 whether you were involved in managing the suitable</p> <p>17 measures; you remember that?</p> <p>18 A. I remember.</p> <p>19 Q. My question to you is this: looking at this chart, and</p> <p>20 also remembering the question that you were asked about</p> <p>21 your role, would you say you are on the engineering side</p> <p>22 of the matter or you are really on the foreman, you</p> <p>23 know, workers' management side of the matter on the</p> <p>24 site?</p> <p>25 A. Managing the manpower.</p>

Page 53	<p>1 Q. Your position is a T1; you are a T1, correct?</p> <p>2 A. Correct.</p> <p>3 Q. So you wouldn't call yourself an engineer?</p> <p>4 A. Correct.</p> <p>5 Q. It's correct that you wouldn't call yourself</p> <p>6 an engineer?</p> <p>7 A. Correct.</p> <p>8 Q. Thank you.</p> <p>9 At [draft] page 38 of the transcript, you were asked</p> <p>10 about the rebars that you looked up in the store room.</p> <p>11 That was when Mr Pennicott, in front of me, asked you</p> <p>12 questions, and he asked you whether or not, when you</p> <p>13 were asked to identify rebars or couplers, whether you</p> <p>14 were asked to identify them by any particular size, and</p> <p>15 your answer was 40 millimetres. Do you remember that?</p> <p>16 A. I remember.</p> <p>17 Q. I just want to clarify with you that when you refer to</p> <p>18 40 millimetres, is that simply a generic, colloquial way</p> <p>19 of describing those couplers, or was it a matter of</p> <p>20 measurement, that you measured them and they were</p> <p>21 40 millimetres?</p> <p>22 A. At that time, I didn't measure them, but generically we</p> <p>23 call them 40mm ones.</p> <p>24 MR SHIEH: Thank you very much. I have no further</p> <p>25 questions.</p>	Page 55	<p>1 CHAIRMAN: Is there any reason why we should start earlier</p> <p>2 today, perhaps? I don't know.</p> <p>3 MR PENNICOTT: No, sir. I mentioned this morning, during</p> <p>4 the course of some opening observations, the issue</p> <p>5 regarding the installation of the dowel bars and the</p> <p>6 view that Prof McQuillan and Mr Southward take about the</p> <p>7 wisdom of carrying out those works.</p> <p>8 CHAIRMAN: Yes.</p> <p>9 MR PENNICOTT: The reason I wanted to take the opportunity</p> <p>10 of Mr Chow being here was to ask him some questions</p> <p>11 about how far that work had got.</p> <p>12 CHAIRMAN: Yes.</p> <p>13 MR PENNICOTT: I'm bound to say I got a bit further than</p> <p>14 I thought I was going to get, when he told me that he</p> <p>15 was indeed Oscar Chow on the organisation chart and that</p> <p>16 he was indeed involved. It's a matter, perhaps -- if</p> <p>17 I could raise it now, those instructing my learned</p> <p>18 friends and indeed the experts themselves may want to</p> <p>19 reflect upon the point over lunch, and I've discussed</p> <p>20 this very briefly with Prof McQuillan and I appreciate</p> <p>21 that this might be very short notice for the MTRC, but</p> <p>22 I do wonder whether if these works are going on at the</p> <p>23 moment, as Mr Chow has described, whether there might be</p> <p>24 some benefit in the experts visiting the site, perhaps</p> <p>25 on Saturday, without interrupting our hearing, if they</p>
Page 54	<p>1 COMMISSIONER HANSFORD: Can I just ask a question, Mr Chow.</p> <p>2 Are you referring to the diameter of the bars? When you</p> <p>3 talk about 40 millimetres, do you mean 40 millimetres</p> <p>4 diameter; is that what you mean?</p> <p>5 A. Yes, correct.</p> <p>6 COMMISSIONER HANSFORD: Thank you.</p> <p>7 MR PENNICOTT: Sir, unless anybody else has any questions,</p> <p>8 or you or Prof Hansford have any more questions --</p> <p>9 CHAIRMAN: No. I have no questions. Thank you.</p> <p>10 Thank you very much indeed. Your evidence is</p> <p>11 completed and you can go now.</p> <p>12 There is always the possibility that you may be</p> <p>13 recalled, if something should arise, but if so you will</p> <p>14 be contacted. Okay? Thank you for coming today and</p> <p>15 thank you for your assistance.</p> <p>16 WITNESS: (In English) Thank you.</p> <p>17 (The witness was released)</p> <p>18 CHAIRMAN: Good. So we are now sitting at 1 o'clock, almost</p> <p>19 to the minute. Mr Southward, I'm not going to ask you</p> <p>20 to fill in that minute. I think if we were to start</p> <p>21 with you immediately after lunch.</p> <p>22 MR PENNICOTT: Yes, sir.</p> <p>23 CHAIRMAN: And are we returning to our normal routine of</p> <p>24 2.30?</p> <p>25 MR PENNICOTT: Yes.</p>	Page 56	<p>1 thought it might be of some use and benefit.</p> <p>2 As I say, I've discussed that with Prof McQuillan.</p> <p>3 I think in principle he thinks it might be helpful, just</p> <p>4 to see what's going on, how all this is being done in</p> <p>5 practice, rather than just reading the words on the</p> <p>6 method statement. But, sir, I just raise it. I'm not</p> <p>7 positively putting it forward at the moment. Perhaps</p> <p>8 others might want to have a think about that, and</p> <p>9 perhaps we'll see where we get to.</p> <p>10 CHAIRMAN: All right. So it's a matter that perhaps the</p> <p>11 relevant parties, the experts, could consider over the</p> <p>12 lunchtime and maybe discuss with those who instruct them</p> <p>13 and see where we go.</p> <p>14 MR PENNICOTT: Yes, and I will further reflect upon it as</p> <p>15 well, with Prof McQuillan.</p> <p>16 CHAIRMAN: Good. Certainly on behalf of the Commission,</p> <p>17 it's a matter which would obviously be better if it</p> <p>18 could be sorted by perhaps an actual site visit so that</p> <p>19 then the parties can see: is there any possibility of</p> <p>20 damage or is there not? Or rather -- to put it</p> <p>21 better -- has any damage been exhibited already or not?</p> <p>22 MR PENNICOTT: Yes. I think my concern is -- and that's why</p> <p>23 I'm saying this with a heavily hesitating voice -- that</p> <p>24 yes, we have the method statement. I assume that that's</p> <p>25 all been approved by the government, and indeed it was</p>

Page 57	<p>1 a condition of approval that a method statement be</p> <p>2 produced, which it has been, it would appear. But we</p> <p>3 don't actually have any factual evidence about what has</p> <p>4 in fact happened to implement that method statement.</p> <p>5 I think that's my concern, that Prof McQuillan and</p> <p>6 Mr Southward have expressed doubts about the wisdom of</p> <p>7 carrying out this work, and they may -- and obviously</p> <p>8 I can ask Mr Southward about this in due course and no</p> <p>9 doubt Prof McQuillan will express his views and perhaps</p> <p>10 Dr Glover as well -- but we don't know whether any</p> <p>11 problems have in fact been encountered or whether in</p> <p>12 fact it's all plain sailing and there's nothing to worry</p> <p>13 about. We simply don't know.</p> <p>14 I just wonder whether we could perhaps -- it's not</p> <p>15 terribly satisfactory, but through the agency of the</p> <p>16 experts just find out a bit more about what has actually</p> <p>17 happened and what is happening.</p> <p>18 CHAIRMAN: Yes. Good.</p> <p>19 COMMISSIONER HANSFORD: I think that's right, Mr Pennicott,</p> <p>20 and I think we can probably go a bit further than that.</p> <p>21 Two of the experts have expressed concerns based on the</p> <p>22 method statement, but what we'd like to know is: do they</p> <p>23 have concerns based on the actual work?</p> <p>24 MR PENNICOTT: Yes. Anyway, some food for thought and</p> <p>25 perhaps we can have an exchange of views later.</p>	Page 59	<p>1 Original hearing</p> <p>2 Structural engineering expert report".</p> <p>3 And can you confirm that this is the report that you</p> <p>4 compiled?</p> <p>5 A. That is the report.</p> <p>6 Q. Can we then turn to item 14.8, please. This is</p> <p>7 a document entitled "Executive summary of expert reports</p> <p>8 for the Original Inquiry and the Extended Inquiry". So,</p> <p>9 jumping ahead, we haven't gone to the expert report for</p> <p>10 the Extended Inquiry yet, but since we are in the same</p> <p>11 bundle it's a convenient place to pick this document up.</p> <p>12 This is your executive summary for both reports;</p> <p>13 correct?</p> <p>14 A. Yes.</p> <p>15 Q. Then, for your expert report for COI 2, the Extended</p> <p>16 Inquiry, can you look at the bundle for the Extended</p> <p>17 Inquiry, the expert report bundle for COI 2. It's</p> <p>18 item 10.1. This is:</p> <p>19 "Commission of Inquiry</p> <p>20 Extended Inquiry.</p> <p>21 Structural engineering expert report".</p> <p>22 So that is your COI 2?</p> <p>23 A. Yes.</p> <p>24 Q. For the purpose of this part of the Inquiry, you have</p> <p>25 prepared some sides for the purpose of explaining and</p>
Page 58	<p>1 CHAIRMAN: Yes. Thank you very much indeed. Would 2.30 --</p> <p>2 MR PENNICOTT: Yes. 2.30.</p> <p>3 CHAIRMAN: Thank you. 2.30.</p> <p>4 (1.03 pm)</p> <p>5 (The luncheon adjournment)</p> <p>6 (2.36 pm)</p> <p>7 MR SHIEH: Mr Chairman and Mr Commissioner, we now have</p> <p>8 Mr Nick Southward in the witness box as Leighton's</p> <p>9 expert witness.</p> <p>10 Mr Southward, welcome back.</p> <p>11 MR NICHOLAS JOHAN SOUTHWARD (sworn)</p> <p>12 Examination-in-chief by MR SHIEH</p> <p>13 Q. Mr Southward, for the purpose of this part of the</p> <p>14 Inquiry, you have made two expert reports, one for the</p> <p>15 purpose of COI 1 and another for the purpose of COI 2;</p> <p>16 do you remember that?</p> <p>17 A. Yes.</p> <p>18 Q. You also have an executive summary of both your reports;</p> <p>19 correct?</p> <p>20 A. Correct.</p> <p>21 Q. Let me just take you to the bundles, just to identify</p> <p>22 them. For your report for COI 1, it's in the part 1</p> <p>23 bundle, expert report bundle, item 14.1. That is</p> <p>24 a document entitled:</p> <p>25 "Commission of Inquiry</p>	Page 60	<p>1 illustrating your views; correct?</p> <p>2 A. Correct.</p> <p>3 Q. I am now going to invite you, hand the floor over to</p> <p>4 you, so that you could present those slides.</p> <p>5 A. Okay. Thank you.</p> <p>6 Presentation by MR SOUTHWARD</p> <p>7 So, Mr Chairman, Prof Hansford, thank you for</p> <p>8 allowing me to be here again and giving me the</p> <p>9 opportunity to present my views on the topics and issues</p> <p>10 raised in the extended hearings of this Commission of</p> <p>11 Inquiry.</p> <p>12 Next slide, please. This presentation summarises</p> <p>13 some of the key points in my two expert reports</p> <p>14 submitted to the Commission last October. In those</p> <p>15 reports, there are five key areas that I'm going to</p> <p>16 highlight, as follows: the couplers and the whole or</p> <p>17 partial embedment of their threaded ends and their</p> <p>18 resulting suitability; the presence or not of shear</p> <p>19 links in the station slabs and the resulting impact on</p> <p>20 the structure; the diaphragm wall construction joint and</p> <p>21 the effect of any workmanship defects on its</p> <p>22 performance; the stability of the trough wall upstands</p> <p>23 in the HHS area; and, finally, the shear strength of the</p> <p>24 NSL slab in the SAT area of the project.</p> <p>25 Next slide, please. In November 2016, some testing</p>

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<p>1 was carried out on partially engaged couplers, testing                  2 that was subject of much discussion the last time I was                  3 here. Although those tests clearly proved that                  4 a coupler with a six-thread engagement satisfied the                  5 static tension test requirement of withstanding                  6 a tension stress of 329MPa, with failure in the parent                  7 bar, further tests were carried out in February and                  8 April 2019 by the MTR. These subsequent tests showed                  9 that seven threads were able to withstand the static                  10 tension test requirement of 529MPa, with failure in the                  11 parent bar.                  12 But the February 2019 tests also included six-thread                  13 embedment tests. These proved that six threads were                  14 sufficient to withstand the static tension test                  15 requirement of 529MPa, showing a minimum failure stress                  16 of 565MPa, but the failure occurred in the coupler and                  17 not the parent bar.                  18 The test also showed that the failure stress for the                  19 cyclic tension and compression tests with six threads                  20 was a minimum of 556MPa, with failure again in the                  21 coupler. So again that test was more than the 529                  22 limit.                  23 On the basis of those six-thread tests, I can say                  24 with confidence that partially connected couplers that                  25 have six threads are suitable for use in the works.</p>	<p>1 these couplers can be used in the works and their use                  2 does not make the station unsafe.                  3 Next slide, please. My report states that the                  4 Atkins design for the station required that some                  5 couplers in the diaphragm walls were subject to                  6 a ductility requirement. These couplers were located in                  7 marked "ductility zones" in a detail shown on the design                  8 drawings.                  9 So Leighton have analysed all of the drawings                  10 available at the time of construction of the D-walls and                  11 slabs. They have found that none of these drawings                  12 showed "ductility zones" across the slabs, with the                  13 exception of drawings for the NSL area A. These                  14 drawings also did not specify the use of ductile                  15 couplers in any other way.                  16 Dr Lau -- and I must apologise for using "Mr" in my                  17 slides -- appears to disagree and has stated that                  18 couplers are specified on certain drawings that were                  19 submitted to BD. However, I must point out that the                  20 drawings that he relies upon were prepared after                  21 construction of the diaphragm walls. They also only                  22 show the use of vertical ductile couplers in the                  23 diaphragm walls.                  24 It follows, therefore, that my report is accurate in                  25 saying that ductile couplers were not structural</p>
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<p>1 Next slide, please. So why can I say this, and does                  2 it matter that failure did not occur in the parent bar                  3 for a six-thread embedment? I can say this because the                  4 smallest failure stress of 556MPa in the coupler is                  5 typically 2.7 times the typical stress in the                  6 reinforcement at the design scenario of the ultimate                  7 limit state, and I explain this as follows.                  8 The typical ULS design stress in reinforcement bars                  9 is 400MPa. This is for grade 460 reinforcement. This                  10 means that when you design reinforcement, you limit the                  11 stress in that reinforcement to 400MPa. But we know,                  12 from all the work the consultants have done, that the                  13 design has typically at least 50 per cent spare                  14 capacity. So this means the actual stress in the                  15 reinforcement bars is typically 200MPa at the design                  16 ultimate limit state. Thus, 556 divided by 200 equals                  17 2.7. This is therefore the additional safety factor on                  18 top of the safety factors already included in the                  19 ultimate limit state design.                  20 So, given the huge additional factor of safety, that                  21 is additional to all the load and material factors                  22 already included in the design process. It really does                  23 not matter that the failure mechanism of the six-thread                  24 coupler was that of coupler failure. It is proven to                  25 safely take the actual load applied to it, so therefore</p>	<p>1 required in the slabs. I do understand, however, that                  2 ductile couplers were used throughout the project for                  3 convenience.                  4 Next slide, please. So the Buildings Department do                  5 not require non-ductile couplers to be cyclic tested.                  6 Therefore, as the couplers in the slabs are not                  7 structurally required to be ductile, there is no                  8 requirement for any cyclic testing to be carried out on                  9 them. Furthermore, because at the location the couplers                  10 are used there is no stress reversal, all the couplers                  11 are either permanently in tension or permanently in                  12 compression. And the permanent loads in these couplers                  13 are typically 85 to 90 per cent of the total load                  14 applied in the couplers in the design condition.                  15 So these couplers do not experience any stress                  16 reversal and certainly not the level of stress reversal                  17 used in the cyclic testing method. That's why the                  18 cyclic testing is irrelevant.                  19 Next slide, please. Dr Lau has criticised me in his                  20 report for not including a serviceability limit state                  21 check on the partially engaged couplers. But I must                  22 advise that acceptance of the coupler connections that                  23 are not butt-to-butt will not compromise the                  24 serviceability and the long-term durability of the                  25 station or the slabs within which they are in. The</p>



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<p>1 reason I can say this is that the exposure condition of                  2 the Hung Hom Station is one of a mild and dry                  3 environment. The internal environment of the station is                  4 classified by the Hong Kong Code of Practice in                  5 table 4.1 which I have extracted on this slide, and it                  6 classifies all internal environments as exposure                  7 condition 1.                  8 Next slide, please. So what are the implications of                  9 this exposure condition? The Hong Kong Code of Practice                  10 requires structures to be designed to the ultimate limit                  11 state loading conditions, and that, I explain: you take                  12 the actual loading, times a load safety factor, and                  13 compare that against the structural elastic capacity and                  14 a material safety factor. If you do this, the Hong Kong                  15 Code of Practice does not require a check at the service                  16 limit state. Instead, it adopts a "deemed to satisfy"                  17 approach, provided that rules on minimum reinforcement                  18 areas and maximum reinforcement spacing are met.                  19 So the Hong Kong Code of Practice does not require                  20 you to calculate crack widths explicitly. They are                  21 deemed to be acceptable by virtue of the fact that the                  22 structure will perform adequately at the ultimate limit                  23 state.                  24 Next slide, please. So the Hong Kong Code of                  25 Practice recognises the proven concept that crack width</p>	<p>1 that occur would not be visible. For area A, also some                  2 part of area A between gridline 0 to 2, there is also                  3 trackwork concrete covering the coupler locations.                  4 Next slide, please. In terms of deformation, the                  5 partially engaged couplers cannot compromise the                  6 deflection behaviour of the slabs. The slabs will                  7 deflect as originally intended. This is because not all                  8 of the couplers are partially engaged. It is accepted                  9 that 63 per cent of the couplers are fully engaged, as                  10 no strength reduction factor is applied to them; ie                  11 the 63 per cent comes from the 100 per cent of couplers                  12 minus the 37 per cent of couplers that are discarded by                  13 the MTR. So these 63 per cent of bars will perform                  14 normally and so limit the deflections of the slab to the                  15 anticipated levels. This is certainly evidenced by the                  16 performance of the slabs to date under load. They have                  17 not deflected by any excessive amount.                  18 Next slide, please. Because crack widths and                  19 long-term durability are not an issue, the permanent                  20 deformation tests of partially embedded couplers are not                  21 relevant, in this instance.                  22 The performance of the couplers and their ability to                  23 withstand the ultimate limit state loadings is not                  24 compromised by any permanent deformation of the coupler                  25 assembly.</p>
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<p>1 does not affect long-term durability in mild and                  2 moderate exposure conditions. This is recognised in                  3 other international design codes, such as the American                  4 AASHTO LRFD code which is used for the design of                  5 structures in America. The Hong Kong Code of Practice                  6 states that in a mild exposure condition, ie exposure                  7 condition 1, the limit on crack width of 0.3 that the                  8 structure is deemed to comply with is only relevant in                  9 terms of acceptable appearance, and it states clearly                  10 that the crack width has no influence on durability. So                  11 that phrase is underlined in red on the slide.                  12 Acceptable appearance means that that visible                  13 cracking will not be ugly or would not cause undue alarm                  14 of the condition of the structure to the viewer.                  15 Next slide, please. Therefore, cracking at working                  16 loads is allowed by the Hong Kong Code of Practice to                  17 occur. There is no evidence that some couplers not                  18 being butt-to-butt has impacted on the structure.                  19 However, even if cracks are exacerbated by some                  20 percentage of the couplers not being butt-to-butt, there                  21 is no durability limit on the crack widths in the                  22 EWL/NSL slabs at the coupler locations.                  23 In terms of acceptable appearance, for all of the                  24 area B and area C coupler locations, the slabs are                  25 covered with trackwork concrete and therefore any cracks</p>	<p>1 Prof McQuillan, Dr Glover and I all agree that the                  2 permanent deformation exhibited in the test results of                  3 the partially engaged couplers is a sign of the                  4 "bedding-in" of the threads rather than a deformation of                  5 the coupler assembly itself.                  6 Next slide, please. On the issue of the BOSA                  7 couplers and their installation methods, BOSA has                  8 a clear instruction that two visible threads was the                  9 acceptable installation tolerance. This slide shows                  10 an extract of their instruction manual, and the image on                  11 the right shows a coupler with the limit of two visible                  12 threads exposed outside the coupler.                  13 So what does this mean inside the coupler? Next                  14 slide, please. With two visible threads, the bars                  15 cannot physically be butt-to-butt. The photo on the                  16 right is of a 40 millimetre diameter coupler assembly.                  17 The bottom bar is the parent bar, ie that bar in the                  18 diaphragm wall, and this bar has been fully wound into                  19 the coupler, so all the threads are engaged and the                  20 coupler is locked against it. The top bar is the                  21 continuation bar, ie that bar that goes into the slab,                  22 and this has been screwed into the coupler until two                  23 visible threads are showing outside the coupler, exactly                  24 like the picture in the BOSA instruction manual on the                  25 left.</p>

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<p>1 You can see from the photo that there is a clear gap 2 in the middle and the couplers are not butt-to-butt. 3 I must also add here that these bars and their 4 threads are 44 millimetre long threads, threaded bars. 5 There were no threaded bars longer than that in the 6 samples that we have that you saw downstairs, and these 7 bars, the threaded lengths are the same lengths as the 8 typical threaded length bar that was used on site. And 9 the 44 millimetre length is a typical length that is 10 used with the 88 millimetre long couplers. Yes, that's 11 right. 12 Next slide, please. This slide shows the same 13 coupler assembly but with a tape measure showing the 14 dimensions of the embedment, which is 44 millimetres on 15 the left and 37 millimetres on the right. So this means 16 that the government pass criteria of 37 millimetres from 17 the phased array ultrasonic testing results in a gap in 18 the coupler when the bars are not butt-to-butt. 19 Next slide, please. In fact, even with the 20 embedment criteria of 40 millimetres, shown here to be 21 40 millimetres on both sides of the coupler, there is 22 still a gap in the coupler and the bars are not 23 butt-to-butt. 24 Next slide, please. On the issue of the shear 25 links, this hinges on two key items: were the shear</p>	<p>1 Second, even at 200 millimetres wide, a slot may not 2 pick up shear links due to the construction tolerances 3 in bar placement. As you can see here in the photograph 4 on the right of the slide, which has been drawn with 5 an approximately 200 millimetre wide slot superimposed 6 on the same photograph, there are no shear links visible 7 within the red boundary lines of this slot. That is 8 because the bars are not spaced at exactly 9 150 millimetres; there is always some tolerance in the 10 placement of those bars. 11 Next slide, please. The investigation states that 12 no shear links were found in locations HZ1, 5, 8, 10, 14 13 and 16. The image on the slide is a plan of the station 14 structure showing all the locations where the 15 investigation was carried out. 16 A further criticism in the MTR's holistic report was 17 that the shear bars found did not match the dimensions 18 and spacings required in the design drawings. In the 19 eyes of this Commission, and for the purposes of 20 structural safety, this should not be a relevant 21 criticism, because the standard should have been to 22 check against the shear link requirements of the updated 23 stage 3 assessment design calculations. These showed 24 a maximum of T12 at 300 centres, which is often much 25 less than required on the original design drawings.</p>
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<p>1 links installed and, if they were not, then what is the 2 impact on the structural design of the structure? 3 Next slide, please. On the topic of their 4 installation, the limited opening-up investigations 5 carried out by MTR found shear links of a size equal to 6 or greater than 12 millimetres diameter in 12 of the 7 18 locations. The fact that shear links were not 8 exposed in every location by the MTR is to be expected, 9 in my view, given the limited nature of this exercise. 10 It does not prove that there were no shear links in 11 those locations. 12 Next slide. Dr Lau has criticised figure 6 in my 13 report, where I showed that it was possible to 14 completely miss the shear links using the slot approach 15 of the MTR. In my sketch, I showed two orthogonal shots 16 that were approximately 150 millimetres wide, within 17 which no shear links were visible, in a sample that 18 clearly has shear links outside of the slots. 19 Next slide, please. Dr Lau comments that the slots 20 should have been wider, at 200 millimetres. So there 21 are two issues here. First, the photographic records of 22 the shear investigation do not provide any dimensions, 23 so I am not clear where he has obtained the measurements 24 shown in the photographs which are repeated in his 25 report.</p>	<p>1 But we can be confident that these shear links were 2 installed by Leighton. The following slides are of 3 Leighton's pre-concreting progress photographs of the 4 project at each of these HZ locations, each photo 5 clearly showing the presence of shear links in the slab 6 reinforcement. 7 So this first slide is of the HZ01 area. I hope you 8 can see, but there are shear links -- you can see the 9 top of the shear links bending over the longitudinal 10 rebar, and they occur in all of that photograph. So the 11 HZ location is in this bay. 12 Next slide, please. This is of HZ05, and again you 13 can see those shear links in this photograph quite 14 clearly. 15 Next slide. This is HZ8 and 10, both of which were 16 actually in the same bay, and here again you can see the 17 tops of all of the shear links. 18 Next slide. These photographs were taken inside the 19 reinforcement cage, so it's a 3 metre-deep slab, someone 20 has gone inside the slab, they have taken the 21 photographs; all those vertical bars are the shear link 22 bars. 23 Next slide. Then this -- not to sort of bore 24 everyone but this shows more photographs of some of the 25 other locations, and again in every single one of those</p>

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<p>1 photographs the shear links are present.</p> <p>2 Next slide, please. So Atkins' stage 3 assessment</p> <p>3 calculations used to determine the requirements for</p> <p>4 suitable measures for missing shear links, by their own</p> <p>5 admission, are conservative. Atkins did not include for</p> <p>6 the correct tensile steel areas, for shear capacity</p> <p>7 enhancement from the compression loads in the slab, and</p> <p>8 the actual as-constructed concrete strengths. EIC</p> <p>9 included these omitted factors in their calculations</p> <p>10 and, even if all the shear links are ignored, they found</p> <p>11 they only needed strengthening in 2.5 square metres of</p> <p>12 all the station slabs.</p> <p>13 Next slide, please. Arup's more considered</p> <p>14 calculations did not find any requirement for suitable</p> <p>15 measures due to missing shear links, ie Arup found</p> <p>16 that the design strength of the slabs in shear is large</p> <p>17 enough to resist the shear forces without considering</p> <p>18 any shear reinforcement in the slabs.</p> <p>19 Next slide, please. EIC have considered the actual</p> <p>20 strength of the concrete in the station structure rather</p> <p>21 than the originally intended "design" strength of 40MPa.</p> <p>22 The actual strength has been determined by reference to</p> <p>23 the 28-day cube test results taken on site for every</p> <p>24 batch of concrete. There are over 6,000 individual</p> <p>25 concrete cube test results, and those are just the ones</p>	<p>1 Next slide, please. Dr Lau says that as Leighton</p> <p>2 had ordered grade 40 concrete from their supplier, they</p> <p>3 are only allowed to use grade 40 in the design</p> <p>4 calculations. So I've gone back to look at the original</p> <p>5 cube test results that verify the strength of the grade</p> <p>6 40 concrete mixes. These are the tests that were done</p> <p>7 at the time when the concrete mixes were originally</p> <p>8 designed, well before construction. There are many</p> <p>9 mixes, so shown here is just a sample of four of them,</p> <p>10 but all exhibit a strength well in excess of the 60MPa</p> <p>11 used by EIC in their calculations. The trial mix cube</p> <p>12 test results are similar to the site cube test results,</p> <p>13 so the use of 60MPa as design strength for the in-situ</p> <p>14 concrete is confirmed.</p> <p>15 So, in essence, we could simply strike off the words</p> <p>16 "grade 40" on the original test result sheets and</p> <p>17 replace those words with "grade 60", and the report</p> <p>18 sheet would still be valid. If this was the case, then</p> <p>19 I'm sure Dr Lau's objections would not be valid.</p> <p>20 Next slide, please. In the experts' meeting of</p> <p>21 20 December, Prof McQuillan, Dr Glover and I agreed that</p> <p>22 it is possible to consider the effect of the age of</p> <p>23 concrete, now typically three or four years old, and its</p> <p>24 effect on the concrete strength. Concrete goes stronger</p> <p>25 as it ages. When it is first created, it's a liquid and</p>
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<p>1 that I was sent.</p> <p>2 These tests gave a statistical strength of over</p> <p>3 60MPa which was then used in the calculations.</p> <p>4 Next slide, please. Dr Lau does not accept the use</p> <p>5 of enhanced concrete strength for the following reasons.</p> <p>6 He says the concrete in the structure will actually be</p> <p>7 weaker than that in the test cubes. He says that it is</p> <p>8 only acceptable to use the originally designed concrete</p> <p>9 strength.</p> <p>10 Next slide, please. The design of the concrete in</p> <p>11 the structure is done using a weaker concrete than that</p> <p>12 of the test cubes. This is an established precedent of</p> <p>13 reinforced concrete design and is recognised in the</p> <p>14 Hong Kong Code of Practice. This diagram shows a plot</p> <p>15 of the relationship of stress and strain in the</p> <p>16 constituent concrete material. It's not relevant except</p> <p>17 that it shows that in the design calculations, the</p> <p>18 28-day cube strength is factored by 0.67 to reflect the</p> <p>19 difference in relationship between cube strength and the</p> <p>20 strength of in-situ concrete. This concrete strength</p> <p>21 which is factored by 0.67 is then further reduced by</p> <p>22 a material safety factor of 1.5. So the actual concrete</p> <p>23 in the structure is considered in design to be</p> <p>24 substantially weaker than the cube tests, and this is</p> <p>25 catered for in all the design calculations.</p>	<p>1 thus has no strength. When it's one day old, it's set</p> <p>2 but is very weak. When it is seven days old, it is</p> <p>3 a bit stronger, and we design based on a 28-day</p> <p>4 strength, which is even stronger, but it can get a lot</p> <p>5 stronger than this.</p> <p>6 Next slide, please. There are many references in</p> <p>7 other international design codes on this increase in</p> <p>8 strength, but concrete in Hong Kong is different to that</p> <p>9 in Europe or the USA due to its constituent components,</p> <p>10 so the Hong Kong Structures Design Manual provides the</p> <p>11 best reference for the effect of age on Hong Kong</p> <p>12 concrete strength; the Hong Kong Structures Design</p> <p>13 Manual being the equivalent of the Hong Kong Code of</p> <p>14 Practice, and it is used for the design of highway</p> <p>15 structures, bridges and roads.</p> <p>16 So, on this slide, it is an extract of the rate of</p> <p>17 growth of strength of the concrete, and it shows that</p> <p>18 when concrete is 360 days old, it is typically 20 per</p> <p>19 cent stronger than its 28-day strength. This is shown</p> <p>20 on this logarithmic scale plot which is extracted from</p> <p>21 the Hong Kong Structures Design Manual. This means that</p> <p>22 it will be possible to use 72MPa in the EIC calculations</p> <p>23 instead of 60.</p> <p>24 Next slide, please. There was also much debate in</p> <p>25 the holistic report about the shape of the shear links</p>

Page 77	<p>1 and the shorter length of the end of the link compared</p> <p>2 to that specified in the Hong Kong Code of Practice.</p> <p>3 Concern was raised by the MTR on the shape of the</p> <p>4 as-constructed shear links that were discovered in the</p> <p>5 opening-up locations. The tab length here is less than</p> <p>6 specified in the Code. Prof McQuillan, Dr Glover and</p> <p>7 I agree that this does not affect the structural shear</p> <p>8 strength of the structure, given the over-provision of</p> <p>9 the shear links compared to the design requirements.</p> <p>10 Next slide, please. Both Atkins and Arup have</p> <p>11 performed extensive non-linear, cracked section finite</p> <p>12 element analysis on the diaphragm wall and the EWL slab</p> <p>13 construction joint region. This analysis, plus the</p> <p>14 Atkins/AECOM hand calculations and the strut-and-tie</p> <p>15 analysis confirm my own findings in January 2019 that</p> <p>16 the joint is safe and can withstand the loadings. All</p> <p>17 the analyses demonstrate that the level of stress at the</p> <p>18 Hong Kong joint is low. This low stress means that any</p> <p>19 construction defects at the joint will not adversely</p> <p>20 affect the performance of the joint.</p> <p>21 Next slide, please. This slide shows an extract of</p> <p>22 the Arup and Atkins FE analysis. This is a plot of the</p> <p>23 resulting stress distributions in their model, Arup on</p> <p>24 the left and Atkins on the right. Both of these plots</p> <p>25 show low stresses in the region of the horizontal</p>	Page 79	<p>1 Next slide, please. Dr Lau is also concerned that</p> <p>2 any gap between the top of the diaphragm wall and the</p> <p>3 EWL slab would lead to a path for corrosion and</p> <p>4 adversely affect the long-term durability. There is no</p> <p>5 path for corrosion. The construction joint region is</p> <p>6 fully encapsulated by concrete. As shown in the sketch</p> <p>7 on this slide that I have extracted from</p> <p>8 Prof McQuillan's report of January last year, no water</p> <p>9 can possibly get into the construction joint area</p> <p>10 because it is surrounded by concrete under compression,</p> <p>11 causing a tight seal, and the top surface of the EWL</p> <p>12 slab is itself covered with track slab concrete. It is</p> <p>13 a very mild, non-corrosive environment.</p> <p>14 Next slide, please. The HHS trough walls have also</p> <p>15 been a key issue. These walls were constructed using</p> <p>16 coupled vertical reinforcement at the base of the walls.</p> <p>17 The vertical reinforcement is what provides the strength</p> <p>18 resistance of these walls to the case of a train</p> <p>19 derailment and the subsequent collision of that train</p> <p>20 with these walls. The MTR have applied a strength</p> <p>21 reduction factor of 35 per cent to the reinforcement,</p> <p>22 because of the presence of the couplers, and as a result</p> <p>23 the calculation method used by their consultant AECOM</p> <p>24 demonstrated that the trough upstand walls were not</p> <p>25 strong enough to resist the collision loads.</p>
Page 78	<p>1 construction joint at the top of the D-wall. But these</p> <p>2 analyses did not consider the presence of a defect at</p> <p>3 the top of the diaphragm wall at the construction joint.</p> <p>4 Next slide, please. So to demonstrate that a gap at</p> <p>5 the construction joint has no impact on the performance,</p> <p>6 I carried out a much simpler linear elastic FE analysis.</p> <p>7 This analysis has a physical gap right at the top of the</p> <p>8 construction joint, which is pointed out on the slide.</p> <p>9 Next slide, please. Dr Lau objects to this</p> <p>10 analysis, saying that as a linear elastic analysis it is</p> <p>11 not representative of the behaviour of the joint. But</p> <p>12 it's not meant to be representative of the behaviour of</p> <p>13 the joint. It is only meant to demonstrate that there</p> <p>14 is no change in stress distribution and that the</p> <p>15 critical stresses are at the base of the slab in the</p> <p>16 diaphragm wall. As you can see here, in these two plots</p> <p>17 of stress distribution, on the left is the model with</p> <p>18 the gap at the top of the diaphragm wall, and on the</p> <p>19 right is the same model but with no gap. You can see</p> <p>20 that there is little difference in terms of stress</p> <p>21 distribution in these two models, and the main stress</p> <p>22 concentrations are at the base of the EWL slab, away</p> <p>23 from the construction joint. And these stress</p> <p>24 distributions are similar to the stress distributions of</p> <p>25 the Atkins and Arup analysis.</p>	Page 80	<p>1 I have checked the strength of the as-built upstand</p> <p>2 walls using the yield line theory. This is</p> <p>3 a well-established and proven method that is referred to</p> <p>4 in the Hong Kong Code of Practice, but it is not your</p> <p>5 typical design engineer's approach to the design of</p> <p>6 slabs.</p> <p>7 Next slide. The traditional approach is to design</p> <p>8 the wall as a vertical cantilever, with the load</p> <p>9 spreading down at 45 degrees to the base of the wall,</p> <p>10 mobilising more of the base of the wall than where the</p> <p>11 load is applied. This was AECOM's approach.</p> <p>12 Next slide, please. My approach was to use yield</p> <p>13 line theory, in which the way the wall would actually</p> <p>14 fail is modelled. Looking at this 3D sketch, you can</p> <p>15 visualise the top corner of the wall breaking off along</p> <p>16 the diagonal line. This is how the wall would actually</p> <p>17 fail and it would not fail at the base, as is assumed</p> <p>18 with the traditional approach. This yield line analysis</p> <p>19 shows the wall is safe, even if the MTR's proposed</p> <p>20 strength reduction factor as set out in the holistic</p> <p>21 report is considered, and that strength reduction factor</p> <p>22 could even be increased and the wall would still be</p> <p>23 okay.</p> <p>24 Next slide, please. Dr Lau states in his report</p> <p>25 that for this yield line approach to be valid, shear</p>

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<p>1 reinforcement should be provided. His opinion appears</p> <p>2 to be based on his interpretation of the wording in the</p> <p>3 commentary to the AASHTO LRFD code, which is repeated</p> <p>4 here on the slide. But his interpretation is not</p> <p>5 correct.</p> <p>6 Next slide, please. What this wording means is that</p> <p>7 the trough walls must also be checked for its shear</p> <p>8 capacity. In other words, the yield line analysis is</p> <p>9 only to be used for the bending or flexural effects of</p> <p>10 the applied loading. It does not mean that stirrups and</p> <p>11 ties must be provided for the yield line analysis to be</p> <p>12 valid.</p> <p>13 Now, stirrups and ties are the American word for</p> <p>14 shear links. There's a shear force in the wall. If the</p> <p>15 concrete is not strong enough to take that shear force</p> <p>16 by itself, you put in shear links, or in America you put</p> <p>17 in stirrups and ties; same thing.</p> <p>18 The shear force in the wall has of course been</p> <p>19 checked and it is less than the shear capacity, and no</p> <p>20 shear stirrups or diagonal ties are needed, which is</p> <p>21 a similar finding to that of AECOM. So the HHS trough</p> <p>22 walls are adequate and do not need strengthening.</p> <p>23 Next slide, please. This brings us to our last</p> <p>24 topic, that of shear in the SAT/NSL slab. I'm afraid</p> <p>25 that Atkins are not correct to suggest that suitable</p>	<p>1 But Atkins have done their assessment using only</p> <p>2 a 2D strip or frame analysis of the five individual</p> <p>3 different sections along the length of the SAT.</p> <p>4 2D analysis, by definition, will not take account of the</p> <p>5 3D effect of load distribution, ie a concentrated</p> <p>6 train load from a wheel will actually spread</p> <p>7 longitudinally throughout the slab and therefore reduce</p> <p>8 its effect on any one particular point.</p> <p>9 These two sketches on the slide show a very crude</p> <p>10 example of the beneficial effect of 3D analysis. On the</p> <p>11 left, the load from the train wheel is seen to be</p> <p>12 spreading down into the slab at 45 degrees in both</p> <p>13 directions, thereby engaging a large amount of slab to</p> <p>14 resist its effect. On the right, the same wheel load is</p> <p>15 taken only by the 1 metre strip that is assumed in the</p> <p>16 Atkins analysis. The 1 metre strip is shown by the</p> <p>17 dashed lines, and the slab outside of this area is</p> <p>18 ignored.</p> <p>19 Next slide, please. So this is a plot of the</p> <p>20 computer model used by Atkins to design one of their</p> <p>21 five 2D strip models, and this model was used for the</p> <p>22 design of the slabs and the wall in this area. One of</p> <p>23 the main elements with this 2D approach is that they did</p> <p>24 not model the correct way in which the NSL slab was</p> <p>25 built. The NSL slab was cast on the ground, so it is</p>
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<p>1 measures are necessary to strengthen the NSL slab in the</p> <p>2 SAT area. This is because Atkins have been conservative</p> <p>3 in their calculations, and they have also ignored the</p> <p>4 beneficial effects of shear links in the design</p> <p>5 calculations.</p> <p>6 Next slide. Shear links were of course installed in</p> <p>7 the NSL slab of the SAT area. These photographs are of</p> <p>8 the SAT area and the NSL slab, and the shear links are</p> <p>9 clearly visible in the photographs in this slide.</p> <p>10 Again, you can see the tops of the shear links as they</p> <p>11 come over the reinforcement.</p> <p>12 Next slide, please. These are some more photographs</p> <p>13 showing the shear links in the slabs, and you can see</p> <p>14 them quite clearly in the two photographs at the bottom</p> <p>15 of the slide.</p> <p>16 Next slide, please. So, in my view, Atkins have</p> <p>17 been too conservative in their design analysis of the</p> <p>18 SAT area. The SAT area varies in dimensions. The</p> <p>19 width, the spacing of the internal walls and the</p> <p>20 external walls vary and the thickness of the NSL slab</p> <p>21 varies along its length. This image has been extracted</p> <p>22 from the Atkins design drawings and it shows a plan of</p> <p>23 the SAT area, and you can just about see the varying</p> <p>24 width. I'm sorry for not finding a clearer image of the</p> <p>25 plan of the area.</p>	<p>1 supported by the ground, but there is no support given</p> <p>2 to the slab in their computer model. Therefore, the</p> <p>3 effect of loading on the slab will be grossly</p> <p>4 overestimated in the structural analysis, as the</p> <p>5 analysis assumes the slab to be free-spanning between</p> <p>6 each side wall and not in fact constantly supported by</p> <p>7 the ground.</p> <p>8 Next slide, please. Notwithstanding this</p> <p>9 conservatism, EIC have worked within the confines of the</p> <p>10 Atkins analysis, but have considered the 3D effect by</p> <p>11 accounting for a load redistribution from the NSL slab</p> <p>12 upwards to the roof slab. This is a valid design</p> <p>13 approach and simply reflects the concept of moment</p> <p>14 redistribution that is allowed by the design codes. But</p> <p>15 the main reality is that Atkins' analysis is</p> <p>16 over-conservative as the soil below the slab has not</p> <p>17 been considered, especially considering that the soil is</p> <p>18 of limited thickness above the rock, and if such soil</p> <p>19 was considered then no shear failure would be observed.</p> <p>20 So when I say "limited thickness", if you look on</p> <p>21 the slide showing a cross-section of the SAT area, below</p> <p>22 the bottom of the slab you can see some rough lines, and</p> <p>23 that's highlighted as the inferred rockhead. So you've</p> <p>24 got this layer of soil that's probably 2 metres thick</p> <p>25 that is completely constrained with concrete above,</p>

Page 85	<p>1 concrete on each side, and rock below. So this soil</p> <p>2 can't go anywhere; it's completely contained, so it</p> <p>3 can't settle and it will always therefore provide</p> <p>4 support to the NSL slab.</p> <p>5 COMMISSIONER HANSFORD: Just to be clear -- sorry to</p> <p>6 interrupt you -- are you referring to the dotted line at</p> <p>7 the bottom there? Is that presumed to be the top of the</p> <p>8 rock?</p> <p>9 A. Unfortunately, I don't have a thingy, but yes, it's that</p> <p>10 dotted line.</p> <p>11 COMMISSIONER HANSFORD: It's got some question marks marked</p> <p>12 on it, or are they number 2s? Perhaps they are</p> <p>13 number 2s, are they?</p> <p>14 A. No, I think that's just the line type that they have</p> <p>15 used.</p> <p>16 COMMISSIONER HANSFORD: I see.</p> <p>17 A. I mean, it says "inferred rockhead".</p> <p>18 COMMISSIONER HANSFORD: Yes. Thank you.</p> <p>19 A. So that soil is trapped completely.</p> <p>20 Next slide, please. So, to conclude my</p> <p>21 presentation, let me sum up as follows. Partially</p> <p>22 engaged couplers of six or more threads can safely take</p> <p>23 the applied loading. Partially engaged couplers do not</p> <p>24 compromise the long-term durability of the structure due</p> <p>25 to the mild environment within which they are in.</p>	Page 87	<p>1 walls are proven to withstand the train collision loads,</p> <p>2 even if a 35 per cent strength reduction factor is</p> <p>3 applied to the coupler connections, via the use of yield</p> <p>4 line theory. The walls are therefore safe and fit for</p> <p>5 purpose for use in the works.</p> <p>6 Next slide, please. No reliable conclusion can be</p> <p>7 drawn from the Atkins analysis of the SAT area due to</p> <p>8 the conservatism in the analysis method and the lack of</p> <p>9 slab support. It is absurd to consider that the shear</p> <p>10 links were not installed in the works on the basis of</p> <p>11 the limited investigation, when shear links were found</p> <p>12 in 66 per cent of the locations, and the photographic</p> <p>13 evidence clearly shows links to be installed. With the</p> <p>14 presence of shear links, there is no overstress issue,</p> <p>15 even considering the conservative Atkins analysis. The</p> <p>16 SAT area is therefore safe and fit for purpose for use</p> <p>17 in the works.</p> <p>18 Finally, the structures that were considered by this</p> <p>19 Commission of Inquiry in both the hearings last year and</p> <p>20 now are safe and fit for purpose in their as-constructed</p> <p>21 condition.</p> <p>22 CHAIRMAN: Thank you.</p> <p>23 MR SHIEH: Thank you, Mr Southward. You have been through</p> <p>24 this process before and I take it that you will be</p> <p>25 familiar with what comes next. Counsel for the</p>
Page 86	<p>1 Partially engaged couplers do not compromise the</p> <p>2 serviceability of the structure in terms of performance</p> <p>3 and deflection. Partially engaged couplers are</p> <p>4 therefore safe and fit for purpose for use in the works.</p> <p>5 Next slide. The updated calculations show that the</p> <p>6 structure does not require shear links to withstand the</p> <p>7 applied loadings. In my view, it is absurd to consider</p> <p>8 that shear links were not installed in the works on the</p> <p>9 basis of a limited investigation, when shear links were</p> <p>10 found in 66 per cent of the locations, and the</p> <p>11 photographic evidence clearly shows links to be</p> <p>12 installed in all locations. The slabs are therefore</p> <p>13 strong enough to resist all applied shear loadings and</p> <p>14 are safe and fit for purpose for use in the works.</p> <p>15 Next slide. All the consultants -- Prof McQuillan,</p> <p>16 Dr Glover and I -- agree that the design of the</p> <p>17 as-constructed diaphragm wall joint is safe. I have</p> <p>18 demonstrated that a gap in the construction joint makes</p> <p>19 no difference to its performance and is therefore safe.</p> <p>20 The gap, if present, cannot compromise the durability of</p> <p>21 the structure. The as-constructed joint is therefore</p> <p>22 safe and fit for purpose for use in the works.</p> <p>23 Next slide, please. The HHS trough walls can</p> <p>24 withstand the applied ULS train collision loads, even if</p> <p>25 the couplers in the wall are partially engaged. The</p>	Page 88	<p>1 Commission, followed by other parties, and also</p> <p>2 Mr Chairman and Mr Commissioner, may have some questions</p> <p>3 for you, and after that I may have some follow-up</p> <p>4 questions for you in re-examination. So could you</p> <p>5 please kindly remain seated while others ask questions</p> <p>6 of you.</p> <p>7 WITNESS: Sure.</p> <p>8 Examination by MR PENNICOTT</p> <p>9 MR PENNICOTT: Mr Southward, good afternoon.</p> <p>10 A. Good afternoon.</p> <p>11 Q. I had or rather we had between us prepared a number of</p> <p>12 questions for you, and as you have been going through</p> <p>13 your slides I've been ticking off the answers to most of</p> <p>14 them, or at least I think I have.</p> <p>15 The first point I was going to discuss with you was</p> <p>16 Dr Lau's views about ductility crack width, durability</p> <p>17 and deformation, and it seems to me that you have</p> <p>18 covered those in some of your earlier slides.</p> <p>19 So, unless there is anything more you want to say</p> <p>20 about those particular topics, I will move on from that.</p> <p>21 The second point, however, I think I do just need to</p> <p>22 clarify with you. In your reports, both for the COI 1</p> <p>23 and COI 2, you adopt a threshold of 28 millimetres for</p> <p>24 the embedded length of threaded rebar into the couplers,</p> <p>25 and I think you do that on the basis of what you</p>

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<p>1 describe as your engineering judgment. Is that right?</p> <p>2 A. Yes. I mean, the 28 millimetres comes from the six</p> <p>3 threads. Six threads is the key thing.</p> <p>4 Q. Yes. Now we know, in the joint statement that you</p> <p>5 signed up to with the other experts, that yourself,</p> <p>6 Prof McQuillan and Dr Glover take the view that</p> <p>7 a 32 millimetre engagement would ensure that all the</p> <p>8 relevant strength tests are met and passed; is that</p> <p>9 right?</p> <p>10 A. Yes. By default, if I consider that six threads is</p> <p>11 acceptable, then certainly seven are.</p> <p>12 Q. Right. So you haven't changed your mind about the</p> <p>13 28 millimetres?</p> <p>14 A. No.</p> <p>15 Q. It's just, by default, 32 will certainly do it?</p> <p>16 A. Yes. I agreed with that statement because it is</p> <p>17 correct. Seven threads are adequate.</p> <p>18 Q. Understood. That's helpful.</p> <p>19 In COI 2, you point out, and I think we all know,</p> <p>20 that no physical investigation work has actually been</p> <p>21 carried out in the HHS area, but a 35 per cent reduction</p> <p>22 factor has been adopted based upon the coupler testing</p> <p>23 results in respect to the NSL slabs.</p> <p>24 A. (Nodded head).</p> <p>25 Q. As I've understood it, your view is that there is</p>	<p>1 coupler, there will be friction between the threads of</p> <p>2 the bar and threads of the coupler, and the more you</p> <p>3 screw it in, any misalignment of the bar, say a guy is</p> <p>4 holding the bar and it's heavy, he gets a bit tired, he</p> <p>5 may droop a bit, that droop will then bind up the short</p> <p>6 bit of thread that is screwed into the coupler, so it's</p> <p>7 going to get more difficult to thread the bars in.</p> <p>8 So although I've not personally done this task,</p> <p>9 I can imagine it's a bit tricky.</p> <p>10 In the HHS area, the bar diameters were</p> <p>11 25 millimetres, so that is more than half the full</p> <p>12 length -- the 25 millimetre bar weighs less than half of</p> <p>13 a 40 millimetre diameter bar. The couplers were just</p> <p>14 above the base slab, the couplers were standing proud of</p> <p>15 the base slab in plain air, so the starter bar was</p> <p>16 there, the guys would come along, screw the</p> <p>17 250 millimetre coupler onto the bar, and then get their</p> <p>18 25 millimetre bar, which was 1 metre or 2 metres tall,</p> <p>19 so the guy could probably lift that bar up by hand and</p> <p>20 then just place it down on to the top of the coupler and</p> <p>21 thread it in. He can see the whole coupler, he can see</p> <p>22 the orientation of that coupler, he can see the bar</p> <p>23 below, so I imagine it must be much easier for him to</p> <p>24 screw that bar in. I have to say I've not done that</p> <p>25 particular task but in my opinion it must be easier.</p>
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<p>1 insufficient similarity between the two areas, that is</p> <p>2 the HHS area and the NSL slabs, to, as it were, apply</p> <p>3 the reduction factor from one to the other; is that</p> <p>4 correct?</p> <p>5 A. That is correct, yes. They are completely different.</p> <p>6 Q. Right. That remains your view?</p> <p>7 A. Yes.</p> <p>8 Q. In what sense would you describe them as wholly</p> <p>9 dissimilar? Why are they not similar?</p> <p>10 A. Because, in the EWL slab, the bar diameter is</p> <p>11 40 millimetres. The bars are typically 6 metres long</p> <p>12 when they are installed into the couplers. A 6 metre</p> <p>13 long 40 millimetre diameter bar is very heavy.</p> <p>14 Q. As we found out this morning.</p> <p>15 A. As you found out, and this morning we were only lifting</p> <p>16 half a metre long bars.</p> <p>17 Q. Yes.</p> <p>18 A. So you have a much longer bar which takes several men to</p> <p>19 hold, and then a line and thread into the coupler. The</p> <p>20 coupler itself is blind. When I say that, you can only</p> <p>21 see the front face of the coupler, you can only see</p> <p>22 a hole. You can't really see its alignment. You can't</p> <p>23 see the outside surface of the coupler to know at what</p> <p>24 orientation to align the bar as you screw it in. And</p> <p>25 then, because it's so heavy, as you screw it into the</p>	<p>1 Therefore, in my opinion, the two physical acts are</p> <p>2 completely different.</p> <p>3 COMMISSIONER HANSFORD: Just to add to that, would the</p> <p>4 effect of gravity make a difference as well. If you are</p> <p>5 inserting the bar vertically, does that make it easier</p> <p>6 to install?</p> <p>7 A. I don't know. I don't know. I guess it might help, but</p> <p>8 I guess on the other hand, if it was a really heavy bar,</p> <p>9 it might push against -- if you had a vertical T40 bar</p> <p>10 that was 6 metres long, its pure weight might bind</p> <p>11 against the threads and make it harder. But with</p> <p>12 a 25 millimetre bar that you can physically hold and</p> <p>13 move up and move down, it would have to be easy to do.</p> <p>14 COMMISSIONER HANSFORD: Thank you.</p> <p>15 MR PENNICOTT: So, in essence, Mr Southward, then, it's</p> <p>16 really very different working conditions and the</p> <p>17 inherent different tasks involved in the two operations?</p> <p>18 A. I believe so, yes.</p> <p>19 Q. Okay. The next topic I was going to look at with you</p> <p>20 was the yield line analysis which again Dr Lau has made</p> <p>21 some observations or criticisms about which I think</p> <p>22 you've now sought to address in various of your slides</p> <p>23 that we've just gone through. Again, I'm not going to</p> <p>24 spend time on that.</p> <p>25 Just one specific point, to make sure I've</p>

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<p>1 understood it. You've made reference to and Dr Lau has</p> <p>2 also referred to the American Association of State</p> <p>3 Highway and Transportation Officials document, and</p> <p>4 I think you say that in your analysis, your yield line</p> <p>5 analysis, you've adopted the design rules from that</p> <p>6 particular code or document; is that right?</p> <p>7 A. That's correct, yes.</p> <p>8 Q. And you've adopted that approach, as I understand it,</p> <p>9 because you believe that gives a more robust analysis?</p> <p>10 A. Yes, and that is the approach that the Americans would</p> <p>11 use for the design of bridge parapets. So parapets on</p> <p>12 the side of bridges that are designed to contain the</p> <p>13 traffic, those parapets must be designed correctly, and</p> <p>14 the yield line approach is therefore specified in the</p> <p>15 American code as a way to design those parapets. And</p> <p>16 those parapets are very similar in job description to</p> <p>17 the HHS trough walls --</p> <p>18 Q. To the trough walls, yes.</p> <p>19 A. -- which are containing collision loads.</p> <p>20 Q. I see. And the point that I think you've addressed --</p> <p>21 well, the point that Dr Lau sought to make was that it</p> <p>22 only applies to walls with the provision of stirrups and</p> <p>23 ties/shear links; is that right? Is that the criticism</p> <p>24 as you understood it?</p> <p>25 A. Yes. I think that is a misunderstanding of the wording.</p>	<p>1 "Stirrups and ties should be provided to resist the</p> <p>2 shear and/or diagonal tension forces ..."</p> <p>3 So it says you should provide ties to resist the</p> <p>4 shear force. In this case, the concrete by itself is</p> <p>5 strong enough to resist the shear force, so shear ties</p> <p>6 are not required.</p> <p>7 Q. Are not necessary.</p> <p>8 A. This is what the other consultants found. I've done</p> <p>9 that check as well but there's no issue.</p> <p>10 Q. Okay. So, as you said at the outset, it comes really to</p> <p>11 an interpretation of those words?</p> <p>12 A. Yes.</p> <p>13 Q. Also, in connection with shear links more generally,</p> <p>14 you, Dr Glover and Prof McQuillan have agreed in the</p> <p>15 joint statement that when retro-analysing a structure,</p> <p>16 the Concrete Code allows the safety factors to be</p> <p>17 reviewed, that is the safety factors that are built into</p> <p>18 the Code to be reviewed, to use actual loads and actual</p> <p>19 material properties, as I understand it. Is there, in</p> <p>20 your view, an opposite conclusion that can be reached</p> <p>21 from the codes, or is it as clear as it can be that that</p> <p>22 is perfectly acceptable?</p> <p>23 A. Well, the design codes are written so you design -- when</p> <p>24 you design a structure, and you typically design</p> <p>25 a structure before it's built, so at the time of design</p>
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<p>1 The wordings -- if you want to go to the slide, we will</p> <p>2 look at --</p> <p>3 Q. Yes.</p> <p>4 A. I don't know how to --</p> <p>5 Q. I tried to number them as we were going through. We are</p> <p>6 on about 45, I think. Yes, at 44, "Yield line</p> <p>7 approach", that's it. Is it that one?</p> <p>8 A. Yes. This wording is in the commentary to the AASHTO</p> <p>9 code. So the AASHTO code is written in a format that on</p> <p>10 each page, on the left side is the rules, and on the</p> <p>11 right side of the page is a commentary which explains</p> <p>12 what the rules are and how they work. So CA13.3.1, that</p> <p>13 is from the commentary side, because it has a C, and it</p> <p>14 says:</p> <p>15 "The yield line analysis shown in figures C1 and C2</p> <p>16 includes only the ultimate flexural capacity of the</p> <p>17 concrete component."</p> <p>18 So that's saying that you only use that method to</p> <p>19 cater for flexural bending effects. You've still got</p> <p>20 shear force to be dealt with. There is still a shear</p> <p>21 force. In any type of design, you have bending and</p> <p>22 shear, and you've got to cater for both aspects. So the</p> <p>23 yield line caters for the bending, the flexure, and then</p> <p>24 you've got to look at shear.</p> <p>25 So this is just a statement that says:</p>	<p>1 there's not even a contractor on board, you have no idea</p> <p>2 what type of concrete the contractor will use, where he</p> <p>3 sources it from, where he's going to get his</p> <p>4 reinforcement from; you don't know any of that. So you</p> <p>5 just, as a practising engineer, use the rules in the</p> <p>6 design code which are unified to consider every possible</p> <p>7 scenario. And, as you saw, there are lot of</p> <p>8 conservatisms included in the design code to account for</p> <p>9 what the contractor might do when he comes to build it.</p> <p>10 Q. Yes.</p> <p>11 A. So the design code is really for pre-construction work.</p> <p>12 Q. Can I, just so that I make sure I've understood the</p> <p>13 criticism that Dr Lau is making of this particular point</p> <p>14 and your answer to it, can we look at a passage in</p> <p>15 Dr Lau's report, please. That's in ER2, that's the</p> <p>16 Original Inquiry, tab 17, paragraph 79.</p> <p>17 Could you, as it were, read that to yourself.</p> <p>18 You've obviously read this report --</p> <p>19 A. Yes, I have.</p> <p>20 Q. -- probably more than once.</p> <p>21 If we could scroll down, please. Four lines from</p> <p>22 the top there, Mr Southward, what Dr Lau says is:</p> <p>23 "The higher concrete strengths obtained from</p> <p>24 laboratory tests on concrete cubes should not be relied</p> <p>25 on for the determination of the actual concrete strength</p>



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<p>1 in the structure. Strengths obtained from concrete cube                  2 tests are always (in fact inevitably) higher than the                  3 actual concrete strengths of the structure. It is                  4 because the concrete cube samples were separately                  5 compacted and cured in on site curing tank under ideal                  6 conditions before they were tested. Thus, the results                  7 can only be used as a means of quality control. They do                  8 not represent the actual concrete strength in the                  9 structure."                  10 What would your observations be in relation to that                  11 particular point that he makes?                  12 A. "Strengths obtained from concrete cube tests are always                  13 (in fact inevitably) higher than the actual concrete                  14 strengths of the structure."                  15 That is not inevitable at all. There are many, many                  16 occasions when I've had a contractor ring me up and say,                  17 "I want to strip the formwork for this particular piece                  18 of concrete, and the cube tests that we've got give us                  19 an average of 39MPa when we're supposed to have 40, and                  20 therefore, what do we do?" So, certainly, it's not                  21 inevitable at all.                  22 The concrete cube samples are separately compacted                  23 and cured on site in a curing tank -- that is what                  24 happens. That is how it's done. That is the method of                  25 quality control, the BS standard or the specification</p>	<p>1 paragraph.                  2 Again, Mr Southward, just so I've understood it, the                  3 last couple of sentences here in the same paragraph,                  4 Dr Lau says:                  5 "As a structural engineer, I do not agree to the use                  6 of the cube strength results in design check. The cube                  7 strength is higher than the strength of the concrete in                  8 the structure."                  9 Do you agree or disagree with that last proposition?                  10 A. What I say is that the testing of the cube is going to                  11 give you a different result than testing of the concrete                  12 in the structure, because of the shape of the cube.                  13 I don't agree with the second-last sentence -- "I do not                  14 agree to the use of the cube strength results in design                  15 check" -- I think it's completely valid to do that                  16 because I know that the design calculations take account                  17 of that relationship.                  18 Q. All right. Thank you.                  19 Could I ask, please, for the joint statement to be                  20 put up on the screen. Thank you. Could we go to                  21 point 5, please. We are still on the topic of shear                  22 capacity, but we are dealing with the SAT area here, and                  23 it's recorded that Dr Glover, yourself and                  24 Prof McQuillan agree:                  25 "... as per '2' above, there is adequate shear</p>
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<p>1 which tells you how to take cubes, tells you to do it                  2 this way, and that's how -- you're not -- when you're                  3 doing these tests, you're not -- you know, you can't                  4 replicate the conditions of the in-situ concrete,                  5 because the two items are completely different. You've                  6 got a large room full of concrete over there. You're                  7 just taking a little sample, making a square and testing                  8 that.                  9 Now, some people use squares. Other people use                  10 strengths -- make cylinders, and a square and                  11 a cylinder, when you test those two -- if you use                  12 exactly the same mix for a square and a cylinder, and                  13 you test them for strength, the strength of one will be                  14 different to the other. I think there's a correlation                  15 of about 20 per cent, I think, and in fact off the top                  16 of my head I can't remember which is stronger than the                  17 other. I think the cylinder is weaker than the cube.                  18 So there is the same concrete that's showing                  19 completely different strengths, because of its size. So                  20 the two things are separate, which is why, when we do                  21 design calculations, these cube strengths or cylinder                  22 strengths are factored downwards by that relationship                  23 factor, to take account of the fact that the concrete in                  24 the structure will be weaker.                  25 Q. Right. Could we scroll down a bit, please, on the</p>	<p>1 capacity", in the SAT area. "In the one potential                  2 'hotspot' identified by EIC, failure cannot occur                  3 because of the load redistribution in the                  4 three-dimensional structure. The 'hotspot' is in                  5 an area where only nominal/minimum shear reinforcement                  6 is needed."                  7 Then:                  8 "[Dr Lau] generally disagrees because of his concern                  9 that there may be no shear links present."                  10 Forget about that point for the moment.                  11 "As for the 'hotspot' the shear failure would be                  12 'brittle' and load redistribution cannot occur."                  13 What is your understanding, if you have one, of                  14 Dr Lau's description that the failure would be brittle?                  15 Do you know what he means by that?                  16 A. I can imagine he means that -- I mean, a brittle failure                  17 is one that will happen without warning. That is what                  18 a brittle failure is.                  19 Q. Okay. And is he right that -- is that the type of                  20 failure that you would expect in this hotspot?                  21 A. I can't imagine that the structure would actually fail                  22 in that area, because -- the opinion on whether or not                  23 the failure occurs is based on extremely conservative                  24 analysis, so, you know, it's a question of goalposts                  25 that -- a very conservative analysis has been done and</p>

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<p>1 we're talking about whether a failure will happen</p> <p>2 because of that conservative analysis. The reality is</p> <p>3 that shear failure cannot occur because there is all</p> <p>4 that soil below the slab that is -- confined soil that</p> <p>5 is stopping the slab from occurring. If you take those</p> <p>6 goalposts where they are, the shear failure where they</p> <p>7 occur, if you move the goalposts by saying, "Actually,</p> <p>8 let's look at this properly, let's take account of the</p> <p>9 three-dimensional analysis", then the shear failure</p> <p>10 wouldn't occur. If you kept the goalposts there and</p> <p>11 said, "But there is actually shear reinforcement in</p> <p>12 there", then again the failure wouldn't occur.</p> <p>13 So it's a bit of a non-issue, in my opinion.</p> <p>14 Q. Okay. All right.</p> <p>15 Sir, I've reached the point now where I wanted to</p> <p>16 ask Mr Southward some questions about the construction</p> <p>17 joint and the dowel bar issue. It was brought to my</p> <p>18 attention over lunch that the method statement that</p> <p>19 I asked Mr Chow some questions about this morning is</p> <p>20 not, apparently, the up-to-date, current method</p> <p>21 statement. I have been told that the MTR have given us</p> <p>22 the up-to-date one, which is dated 13 December 2019, and</p> <p>23 I think the previous one was about 19 November. I am</p> <p>24 told that there are some differences, and indeed one</p> <p>25 particularly potentially important difference between</p>	<p>1 Q. And you are referring to the holistic report, and then</p> <p>2 you say, in the last paragraph on this page:</p> <p>3 "The report does not define these 'suitable</p> <p>4 measures' in detail, but I understand from discussions</p> <p>5 with the MTR at the site visit on 21 September 2019 that</p> <p>6 the work involves installing 25 millimetre diameter</p> <p>7 bars, vertically at 600 millimetre centres, to provide</p> <p>8 reinforcement continuity between the D-wall and the EWL</p> <p>9 slab through the construction joint."</p> <p>10 Now, pausing there, has any of that detail changed,</p> <p>11 to your knowledge?</p> <p>12 A. I am not aware -- I have not seen the method statement,</p> <p>13 so I'm not aware of any -- that is, as far as I know,</p> <p>14 what they are doing.</p> <p>15 Q. Right. So you thought at the time 25 millimetre</p> <p>16 diameter bars or dowel bars at 600 millimetre centres</p> <p>17 and that remains your state of knowledge?</p> <p>18 A. Yes.</p> <p>19 Q. And you've not seen even -- you were presumably looking</p> <p>20 at the method statement as we were looking at it with</p> <p>21 Mr Chow this morning; is that right?</p> <p>22 A. That's the first time I've seen any of that document.</p> <p>23 Q. Okay. Could we press on in this report. You have</p> <p>24 a heading "What is the effect of carrying out the</p> <p>25 suitable measures?" You say:</p>
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<p>1 the two method statements. The second current method</p> <p>2 statement, I'm told, runs to 58 pages. It's been</p> <p>3 emailed to the Commission while we've been sat here</p> <p>4 listening to Mr Southward this afternoon, and I've not</p> <p>5 yet had an opportunity of looking at it and I imagine</p> <p>6 perhaps not many others have either. I am happy to</p> <p>7 press on and ask my few questions of Mr Southward, and</p> <p>8 then if necessary come back to it later, if I need to,</p> <p>9 or we can just pause now and I can go away and have</p> <p>10 a look at the method statement, the new method</p> <p>11 statement. Unfortunately, I just couldn't tell you how</p> <p>12 long that's going to take. I just don't know, without</p> <p>13 seeing it.</p> <p>14 CHAIRMAN: We are of the view that you should press on.</p> <p>15 MR PENNICOTT: Yes, thank you, sir. I'd be happy to.</p> <p>16 Could we go to your report for the COI 1, and could</p> <p>17 we look, please, at paragraph 8.5.</p> <p>18 I appreciate you were writing this back on</p> <p>19 11 October or signing this off on 11 October.</p> <p>20 A. Yes.</p> <p>21 Q. And really what I need to find out from you is whether</p> <p>22 anything has moved on or changed since that date.</p> <p>23 You're discussing here, as I understand it, the proposed</p> <p>24 suitable measures at the top of the D-wall.</p> <p>25 A. Yes.</p>	<p>1 "The provision of these dowel bars is clearly meant</p> <p>2 to provide additional horizontal shear strength across</p> <p>3 the construction joint."</p> <p>4 Then, without reading all the rest of it out,</p> <p>5 essentially what you conclude is that given that that's</p> <p>6 only going to provide additional reinforcement across</p> <p>7 2.2 per cent of the joint, then it's really not --</p> <p>8 A. No, the extra reinforcement that they are providing is</p> <p>9 2.2 per cent of the total amount of reinforcement</p> <p>10 crossing that joint.</p> <p>11 Q. Right, and therefore, you say, that's negligible and</p> <p>12 what's the point?</p> <p>13 A. Yes.</p> <p>14 Q. Okay. Again, your state of knowledge on that detail has</p> <p>15 not changed?</p> <p>16 A. No.</p> <p>17 Q. If we could then move down, please, "Is there any</p> <p>18 justification for carrying out the suitable measures"?</p> <p>19 In short, no. If we could just scroll down. Stop</p> <p>20 there, please. In the third bullet point you say:</p> <p>21 "The detailed work of Atkins, Arup and AECOM showed</p> <p>22 that the shear links in the D-wall played an important</p> <p>23 part in the strength capacity of the D-wall/EWL slab</p> <p>24 connection. If vertical bars are to be drilled into the</p> <p>25 top surface of the EWL slab and then downwards into the</p>

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<p>1 D-wall, there is a significant danger that the</p> <p>2 horizontal shear link bars might be cut by the action of</p> <p>3 the drilling."</p> <p>4 Then if we could skip to the penultimate sentence of</p> <p>5 the next paragraph:</p> <p>6 "There is no possible way", you say, "to ensure that</p> <p>7 the shear link bars will not be cut during the drilling</p> <p>8 and it will be purely down to luck if none are damaged.</p> <p>9 Therefore, this is a significant risk and one which I do</p> <p>10 not recommend is taken."</p> <p>11 Do you remain of that view, Mr Southward?</p> <p>12 A. I've not seen the method statement so I don't know how</p> <p>13 they are doing it, but if you are drilling into a slab,</p> <p>14 and you've got reinforcement that's several hundred</p> <p>15 millimetres down, you've got no way of telling where</p> <p>16 that reinforcement is before you drill. So, once you</p> <p>17 start to drill it, as soon as you hit it, you hit it.</p> <p>18 You may not necessarily cut it but you've hit it. So,</p> <p>19 I mean, it cannot be good to hit reinforcement.</p> <p>20 Whether that reinforcement is necessary or not is</p> <p>21 another question, and that's what I don't know, but</p> <p>22 reinforcement was used in the design calculations.</p> <p>23 Q. Right. Is there, to your knowledge, any way of avoiding</p> <p>24 this problem of hitting the reinforcement as you are</p> <p>25 drilling? Is there a way around it? Can a method be</p>	<p>1 the blue line going down.</p> <p>2 COMMISSIONER HANSFORD: Yes.</p> <p>3 A. So I don't know how deep it goes. But I don't believe</p> <p>4 it's possible to scan and locate a reinforcement bar</p> <p>5 that's 400 millimetres down inside a body of concrete.</p> <p>6 COMMISSIONER HANSFORD: So the reference to "scanning" is</p> <p>7 likely to be a reference to the top bar?</p> <p>8 A. I imagine so, but again I can't say that with</p> <p>9 confidence.</p> <p>10 MR PENNICOTT: Sir, therein lies one of the problems. I am</p> <p>11 instructed that the "scanning" has been deleted from the</p> <p>12 latest method statement, and that's one of the reasons</p> <p>13 I need to go and have a look at it.</p> <p>14 COMMISSIONER HANSFORD: Yes.</p> <p>15 MR PENNICOTT: But apparently the "scanning" has gone, as it</p> <p>16 were.</p> <p>17 COMMISSIONER HANSFORD: But we are hearing that scanning may</p> <p>18 not --</p> <p>19 MR PENNICOTT: That may be the reason it's gone. We just</p> <p>20 don't know.</p> <p>21 COMMISSIONER HANSFORD: Okay. Thank you.</p> <p>22 MR PENNICOTT: Anyway, that's all I wanted to ask</p> <p>23 Mr Southward. Thank you very much.</p> <p>24 Perhaps we could have a coffee break.</p> <p>25 CHAIRMAN: Yes.</p>
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<p>1 developed to avoid that occurring?</p> <p>2 A. I don't know.</p> <p>3 COMMISSIONER HANSFORD: There was reference this morning in</p> <p>4 the cross-examination of Mr Chow to scanning. What was</p> <p>5 that about? Is it possible to scan that, to locate that</p> <p>6 reinforcement in some way?</p> <p>7 A. As far as I know, not to that depth, no. You have the</p> <p>8 EWL slab going over the top.</p> <p>9 COMMISSIONER HANSFORD: Yes.</p> <p>10 A. You have two layers of T40 reinforcement bar with</p> <p>11 a cover of 40 millimetres.</p> <p>12 COMMISSIONER HANSFORD: Yes.</p> <p>13 A. So you can scan the top surface of the slab to locate</p> <p>14 where that reinforcement is.</p> <p>15 COMMISSIONER HANSFORD: Yes.</p> <p>16 A. Then I imagine they would chip off the cover to expose</p> <p>17 the bars.</p> <p>18 COMMISSIONER HANSFORD: Yes.</p> <p>19 A. Then they will have got the gap between the bars where</p> <p>20 they can drill down. Then they've got to drill down at</p> <p>21 least 200 millimetres to get to the top of the</p> <p>22 construction joint, and then they've got to drill down</p> <p>23 into the diaphragm wall by the amount that the anchorage</p> <p>24 of these dowel bars is, and I don't know what the</p> <p>25 dimension is, but you saw the sketch this morning with</p>	<p>1 MR PENNICOTT: Ten minutes?</p> <p>2 CHAIRMAN: Ten minutes. Thank you.</p> <p>3 (4.08 pm)</p> <p>4 (A short adjournment)</p> <p>5 (4.26 pm)</p> <p>6 Cross-examination by MR KHAW</p> <p>7 MR KHAW: Good afternoon, Mr Southward. I represent the</p> <p>8 government.</p> <p>9 If I may first discuss with you some preliminary or</p> <p>10 what we call conceptual issues of the analysis that you</p> <p>11 have conducted.</p> <p>12 Obviously we all know that one of the questions</p> <p>13 posed by the Commission for the experts on structural</p> <p>14 engineering is to consider whether the as-constructed</p> <p>15 structure is safe and fit for purpose from a structural</p> <p>16 engineering perspective.</p> <p>17 Am I correct in saying there is no such textbook</p> <p>18 definition on what is safe and what is fit for purpose</p> <p>19 from a structural engineering point of view; is that</p> <p>20 correct?</p> <p>21 A. I'm not aware of a textbook definition of that, no.</p> <p>22 Q. Right. And according to your analysis, it seems to me</p> <p>23 that if we look at your paragraph 6.7, the last bit of</p> <p>24 your 6.7, while you were talking about coupler</p> <p>25 connections, you say, if I may quote:</p>

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<p>1 "Safe in this context means that the use of the 2 partially engaged coupler assemblies will not endanger 3 the structure, or cause it to suffer distress. It means 4 that the structure will be able to operate as intended 5 by the designer, to withstand the design loads within 6 the designed elastic range of the structure and will 7 allow the structure to achieve its required design 8 life." 9 So presumably the two major elements in your 10 analysis of the question of safety would be whether it 11 is of sufficient strength and whether it is durable; is 12 that correct? 13 A. Whether it's safe, whether it's durable, whether it will 14 perform satisfactorily. 15 Q. Yes. 16 A. So it's more than more than two aspects. 17 Q. Obviously different engineers may have different ideas 18 on what parameters should be adopted for the purpose of 19 assessing the issue of safety; would you agree? 20 A. Safety is a matter of common sense; right? 21 Q. Yes, absolutely. 22 A. That whole -- those four lines, that's just basic common 23 sense. 24 Q. Yes. Now, you have had a chance to look at Dr Lau's 25 analysis regarding his parameters for the purpose of</p>	<p>1 CHAIRMAN: Just up a little tiny bit. That's it, 2 "Stability -- whether there is overturning of structure 3 or buckling of individual members", individual parts of 4 the structure, a layman might put it, "under the worst 5 combination of different types of design ultimate 6 loads." Okay. In other words, "stability" means it 7 must be able to remain stable and as an integral 8 structure under a combination of different types of 9 design loads that place an ultimate stress on them? 10 A. Yes, I mean in this scenario, stability is not an issue, 11 because the stability of the structure is provided by 12 the ground that it's buried within. It's not going to 13 fall over. It can't. But generically, for a building, 14 stability is an issue; you wouldn't want it to blow over 15 because of the wind. 16 CHAIRMAN: Yes. I think Dr Lau says stability is not 17 a problem in this case. 18 A. Yes. 19 CHAIRMAN: So then we move on to rupture. Okay. I think we 20 all understand that, perhaps in a biological sense as 21 much as anything else, but part of the body being torn, 22 or something like that. 23 A. That would be like the EWL slab, the whole platform slab 24 sort of breaking, which isn't a problem. 25 CHAIRMAN: Okay.</p>
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<p>1 assessing safety. If I can just very briefly take you 2 to his paragraph 26, internal page 9 of his COI 1 3 report, where he sets out four aspects that he would 4 look at for the purpose of discussing the concept of 5 safety, namely stability, rupture of section, robustness 6 and also ductility. 7 Pausing here, I would like to know whether you find 8 any of these factors irrelevant for the purpose of 9 assessing the question of safety, from your point of 10 view? 11 A. I mean, "irrelevant" is a strong word. If you look at 12 the term "robustness", a structure can be safe, durable, 13 it will stand up, yet it may not necessarily be robust, 14 because "robust" is to do with how much more safe it is 15 compared to the design criteria. I wouldn't say that's 16 irrelevant. 17 Q. I don't think you would have any problem with the 18 factors of stability and rupture of section; would you 19 agree? 20 A. Can you just scroll up to them? 21 Q. Of course. 22 A. Yes, I don't have a problem with that. 23 Q. And what about ductility, which is item (d) here? 24 CHAIRMAN: Sorry, could we just go back to -- 25 MR KHAW: Yes, of course.</p>	<p>1 And robustness? So, if it's robust, then the 2 collapse or rupture or breaking or breaking away of any 3 minor part, if I'm with you, or any small part, is not 4 going to cause disruption of the whole. Is that -- 5 A. Yes, I guess if you had a four-legged stool and you took 6 away one of those legs, a four-legged stool is robust 7 because you took away one of those legs and the 8 three-legged stool will still be stable. 9 CHAIRMAN: Yes. 10 A. But if you took away one of the three legs of the stool 11 remaining, then the stool would fall over. 12 CHAIRMAN: It would be less robust. 13 A. So robustness is not an absolute requirement for the 14 stability and strength and ductility of a structure. 15 Robustness is an added extra. 16 CHAIRMAN: Okay. 17 A. So, I mean, Dr Glover spoke about robustness last time, 18 and in fact I believe he was involved in Ronan Point. 19 He mentioned this last time. So he might be the best 20 person. 21 CHAIRMAN: So would it be correct then to say that to ensure 22 safety, you identify a number of necessary instances of 23 the integrity of a structure, just to make sure that 24 those various aspects render the structure safe? 25 A. Yes. I mean, when the design engineer does his job, he</p>

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<p>1 designs every element of the structure so that each</p> <p>2 element can withstand the design loadings and therefore</p> <p>3 as a whole the structure is therefore safe.</p> <p>4 CHAIRMAN: Yes. And safety of course needn't go to the</p> <p>5 mortality of the structure. It needn't be just</p> <p>6 a collapse. It could be, for example, a very high roof</p> <p>7 in a major international airport with bits falling off</p> <p>8 it, landing on the heads of passengers doing some</p> <p>9 duty-free shopping. That would be -- we cannot open it</p> <p>10 up because the roof is not safe, bits are falling off</p> <p>11 it.</p> <p>12 A. Yes. That is because bits on the roof have ruptured,</p> <p>13 have broken, and then they've fallen off, so --</p> <p>14 CHAIRMAN: That's a safety issue too --</p> <p>15 A. Yes.</p> <p>16 CHAIRMAN: -- so it covers a great wealth of matters then.</p> <p>17 Is there in fact a difference between safety and fit for</p> <p>18 purpose? Because if you are busy selling Scotch whisky</p> <p>19 at a duty-free price, so you tell everybody, and bits of</p> <p>20 plaster are falling down and killing shoppers, then it's</p> <p>21 clearly not fit for purpose.</p> <p>22 A. If we look at it from the station perspective, if the</p> <p>23 platform slab -- I'm not saying -- this won't happen,</p> <p>24 of course, but just hypothetically speaking, if the</p> <p>25 platform slab was designed to be only 200 millimetres</p>	<p>1 purpose that you've just discussed with Mr Chairman.</p> <p>2 But also would you agree that the concept of safety,</p> <p>3 to a certain extent, overlaps with the concept of</p> <p>4 fitness for purpose?</p> <p>5 A. Yes, sure. I think one is a subset of the other.</p> <p>6 Q. Yes. An obvious example: if a structure is not</p> <p>7 considered safe for ordinary use, then it can hardly be</p> <p>8 regarded as fit for purpose, since one of the obvious</p> <p>9 purposes of having that structure is that it has to be</p> <p>10 safe for occupation, for continuous use; you would</p> <p>11 agree?</p> <p>12 A. (Nodded head).</p> <p>13 Q. Yes.</p> <p>14 As an engineer, would you agree that in assessing</p> <p>15 whether a structure is fit for purpose, it's necessary</p> <p>16 to consider the purposes that it intended to serve as</p> <p>17 per the client's requirements?</p> <p>18 A. Yes, insofar as the remit of an engineer goes; that the</p> <p>19 client will want a structure or a building or whatever</p> <p>20 to cover many things. The engineer is only tasked with</p> <p>21 making sure that that building can be built and is safe</p> <p>22 when it's built.</p> <p>23 Q. Right. If we can look at Dr Lau's discussion on the</p> <p>24 concept of fitness for purpose. It's again in his COI 1</p> <p>25 report, internal page 13, where he has listed a number</p>
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<p>1 thick, say, but using super-super-strong steel and</p> <p>2 super-strong concrete such that it was able to span</p> <p>3 between the diaphragm walls, that very thin slab would</p> <p>4 be very flexible. So, once the weight of all the trains</p> <p>5 came on to that slab, the slab would deflect. If the</p> <p>6 slab deflects downwards, the train sitting on the</p> <p>7 tracks, because the slab deflects downwards, the train</p> <p>8 would then fall off.</p> <p>9 CHAIRMAN: So not fit for purpose in those circumstances.</p> <p>10 COMMISSIONER HANSFORD: But still safe.</p> <p>11 A. Safe because the structure is not falling over but the</p> <p>12 outcome is not fit for purpose because the product is</p> <p>13 not good enough for use.</p> <p>14 CHAIRMAN: Thank you, because I think the layperson may</p> <p>15 throw in: are we debating in fact two things that are</p> <p>16 the same and differentiating them? But I can see the</p> <p>17 differentiation now. Thank you very much. It helps me.</p> <p>18 A. Just to clarify, the platform slab is 3 metres thick, so</p> <p>19 it is very stiff and very strong and will not deflect.</p> <p>20 CHAIRMAN: Yes. I recall that being said very early on.</p> <p>21 Thank you.</p> <p>22 Sorry, Mr Khaw.</p> <p>23 MR KHAW: Thank you.</p> <p>24 Now, obviously there are differences between the</p> <p>25 concept of safety and also the concept of fitness for</p>	<p>1 of factors relevant to the concept of fitness for</p> <p>2 purpose.</p> <p>3 If we can have a look at paragraph 39, where he has</p> <p>4 referred to durability, which is obvious:</p> <p>5 "A durable structure must meet the requirements of</p> <p>6 strength and stability throughout its intended design</p> <p>7 working life ..."</p> <p>8 Which is consistent with what you have also said</p> <p>9 under paragraph 6.2 that we have just seen.</p> <p>10 And other factors that Dr Lau has outlined,</p> <p>11 including deformation, fire resistance, cracking,</p> <p>12 vibration and fatigue -- would you consider those</p> <p>13 factors relevant to the question of fitness for purpose</p> <p>14 in general?</p> <p>15 A. All of those elements are factors to be considered, yes.</p> <p>16 Q. Thank you.</p> <p>17 Apart from the parameters that we have to look at in</p> <p>18 considering the questions of safety and fitness for</p> <p>19 purpose, the next question is obviously the safety</p> <p>20 factor or what we call the level of safety required for</p> <p>21 the relevant parameters.</p> <p>22 In your report, apart from the Hong Kong Code, the</p> <p>23 HKCoP, the Hong Kong Code of Practice for Structural Use</p> <p>24 of Concrete, the 2004 version, you have also referred us</p> <p>25 to the codes of different countries, including the</p>

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<p>1 American design code which is used for design of                  2 infrastructure in the States, and also the British                  3 Standards, some of which have been superseded by the                  4 Eurocodes.                  5 Am I correct in saying that the codes that you have                  6 referred to, to a certain extent, reflect different                  7 safety standards or requirements in different countries;                  8 would you agree?                  9 A. No, I don't think so. I think all structures -- all                  10 codes are written with the intent of making sure that                  11 the end product is safe.                  12 Q. Yes.                  13 A. You know, a structure can either be unsafe or it can be                  14 safe. So the codes -- the difference between the codes                  15 is that they use different ways to get there.                  16 Q. Yes.                  17 A. But the resulting thing, the resulting product, is                  18 something that either is safe or unsafe.                  19 Q. Yes.                  20 A. I mean, the resulting product is something that is safe,                  21 of course.                  22 Q. Yes. You have just told us that all codes are written                  23 with the intent of making sure that the end product is                  24 safe, so obviously you agree that the requirements under                  25 the code are intrinsically linked with the question of</p>	<p>1 look at a requirement in legislation, of whatever nature                  2 the legislation is, as constituting objective evidence                  3 of what is safe.                  4 Obviously, you can assume it will be, but is it the                  5 minimum of safety level? Is it because they are very                  6 conservative, they have a history of warfare and loss,                  7 et cetera, et cetera, that they are now making safe                  8 something extra-safe?                  9 A. No, I don't think the codes deliberately go out to make                  10 things extra-safe. Wherever they are, by and large, the                  11 assessment of how strong reinforced concrete is is the                  12 same. The load factors by and large are similar. What                  13 does change between jurisdictions is loading, so, for                  14 example, in Australia, there is very, very heavy vehicle                  15 loads that are much heavier than vehicle loads in                  16 Hong Kong, because in Australia they have those massive                  17 articulated three-truck things which they don't have                  18 here. So the codes reflect -- the codes are adapted for                  19 the local conditions. But the product of those codes is                  20 the same wherever -- it's the same structure, it's the                  21 same -- you know, designed with the same materials. The                  22 inherent safety factors on that finished design will be                  23 the same.                  24 CHAIRMAN: Okay. Let me put it this way, because it's just                  25 been worrying me slightly. You wouldn't therefore</p>
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<p>1 safety; that you would not dispute, right?                  2 A. I don't think so, no. I wouldn't dispute that.                  3 Q. If I can then move on --                  4 CHAIRMAN: Sorry, could I ask this, because this in some                  5 respects is quite an important point. The issue becomes                  6 one of legislatures, statutory bodies and/or commissions                  7 in various countries, may be more or less conservative                  8 than each other, may have different histories, may have                  9 histories, for example, of warfare, may have histories                  10 of seismic problems, and may therefore determine within                  11 the parameters of their culture, their history, their                  12 conservative attitudes and the like what in fact amounts                  13 to a matter being safe and fit for purpose within their                  14 jurisdiction. Would you agree with that rather                  15 long-winded statement?                  16 A. I'm just trying to decipher it.                  17 CHAIRMAN: You see, what I'm saying, effectively, perhaps                  18 speaking as a lawyer here, but you have issues of what                  19 is objectively safe and what is objectively fit for                  20 purpose; okay? But when we start to move into an area                  21 of law or regulations in different parts of the world,                  22 in different jurisdictions, some of the bodies that                  23 determine those issues may be more conservative than                  24 others; right? Some may be more conservative because of                  25 their history. I just wonder to what extent you can</p>	<p>1 accept that a commission in country A would, for its own                  2 purposes and in its own culture, define what is safe and                  3 fit for purpose in a way that the same commission in                  4 country B would do? You think they would both reach the                  5 same conclusion?                  6 A. Yes.                  7 CHAIRMAN: Okay.                  8 A. As I said, probably the only thing that really changes                  9 is the loading, that each jurisdiction might require to                  10 use. But from that point, yes, like earthquakes and                  11 stuff, some countries have earthquakes, some countries                  12 don't, and so --                  13 CHAIRMAN: Okay, but leaving aside seismic activity and odd                  14 things like that, and perhaps the fact that you are                  15 likely to be involved in warfare or something, leaving                  16 that aside, if therefore, on your statement, it appears                  17 in our building code that you should do X, then that                  18 itself is sufficient to say that's what defines safety?                  19 A. Yes. As an example, I've designed structures all over                  20 the world, and basically they are all the same. There                  21 might be a few minor differences, but essentially                  22 a structure designed in country A could be transported                  23 and built in country B, and you would follow the codes                  24 for country B for that country A structure, and you                  25 would end up with the same thing.</p>

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<p>1 COMMISSIONER HANSFORD: Your point about the loads being                  2 different is quite important. For instance, if you                  3 designed a station for country A that had heavy snow,                  4 and then built it in country B where it never snows, the                  5 roof would be rather over-designed, but that's an issue                  6 of loading.                  7 A. Yes.                  8 COMMISSIONER HANSFORD: I believe that's happened, actually.                  9 in places, where the snow loading on structures in the                  10 tropics because the design was bought from Europe. Just                  11 a little anecdote.                  12 CHAIRMAN: So on your basis, then, if the necessary                  13 regulatory requirements here state X, Y and Z, that's                  14 what defines safety, and if you don't follow that, then                  15 it's not safe?                  16 A. No, I mean, because you can design structures that don't                  17 precisely follow the code. I mean, reinforced concrete                  18 beam can withstand a certain amount of load, and no                  19 matter where that beam is in the world, it's still going                  20 to withstand that same amount of load. A beam safe in                  21 country A is going to be safe in country B.                  22 CHAIRMAN: Yes. I understood what you were saying earlier                  23 really was that different commissions in different                  24 countries, they will, at the end of the day, pretty much                  25 come up with exactly the same results as to what is safe</p>	<p>1 It may be able to do whatever you need, fit for slightly                  2 different, but there are all sorts of impositions for                  3 different reasons.                  4 But if we go down to the question of safety and fit                  5 for purpose then, again you would say you would have to                  6 look at what the provisions are and weigh that against                  7 the objective reality, engineering reality?                  8 A. Yes.                  9 CHAIRMAN: I'm sure this has been debated hundreds of times                  10 elsewhere, and as a layperson in this area, it's                  11 a little difficult to try and find a clean and clear                  12 pathway that leads to the answer.                  13 All right. Thank you.                  14 Sorry, Mr Khaw.                  15 MR KHAW: Perhaps if I may just ask one more question on                  16 this issue.                  17 Would you agree or would you not agree that the                  18 partial factors of safety adopted in different countries                  19 are different, obviously?                  20 A. Within approximate tolerance, I would say they are more                  21 or less the same. There's just different ways of                  22 approaching -- different ways of using these factors,                  23 but by and large the safety factors are very similar.                  24 MR KHAW: I'm moving to another topic, which actually arises                  25 from Mr Southward's PowerPoint presentation today, which</p>
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<p>1 and what is fit for purpose.                  2 A. Yes.                  3 CHAIRMAN: And if you are looking to determine what is safe                  4 and what is fit for purpose, in those circumstances, the                  5 easiest way to do so is to look and see whether there's                  6 compliance with the relevant codes?                  7 A. I think compliance with the codes covers a broader topic                  8 than whether a structure is just safe or not. A code                  9 may say, "We want to have this particular detail in this                  10 way", but another code elsewhere won't have that same                  11 peculiar requirement, but yet the one without that                  12 peculiar requirement is still safe. So you could take                  13 the one without the peculiar requirement, take it here,                  14 where there is that peculiar requirement, so okay, there                  15 is a conflict, but it doesn't mean that what is built is                  16 not safe.                  17 COMMISSIONER HANSFORD: That's a very good example, is it                  18 not, of something being safe but not being compliant,                  19 because of that peculiar requirement?                  20 A. Yes.                  21 CHAIRMAN: I think that's what I'm trying to -- in my own                  22 head, to see -- because to me it would seem if you say                  23 a window in a particular jurisdiction must be of                  24 a minimum size to allow for air, that's got very little                  25 to do with safety or even necessarily fit for purpose.</p>	<p>1 I probably would need to further discuss with Dr Lau.                  2 I wonder whether I can continue tomorrow on that point?                  3 CHAIRMAN: Yes, of course. We're almost at 5 o'clock. Yes.                  4 9.30 tomorrow?                  5 MR KHAW: Okay.                  6 CHAIRMAN: Thank you very much indeed.                  7 MR PENNICOTT: 10 o'clock.                  8 CHAIRMAN: 9.30 or 10.00?                  9 COMMISSIONER HANSFORD: 10.00. We've been away for so long,                  10 you've forgotten.                  11 CHAIRMAN: I've been sitting on other things in the interim                  12 period where we start a little earlier. All right.                  13 10 o'clock tomorrow morning. And just a gentle                  14 reminder: obviously, as you are aware, you are not able                  15 to discuss the substance of your evidence with anyone                  16 until your evidence is complete.                  17 WITNESS: Of course.                  18 CHAIRMAN: Thank you very much.                  19 (4.58 pm)                  20 (The hearing adjourned until 10.00 am the following day)                  21                  22                  23                  24                  25</p>

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