COMMISSION OF INQUIRY INTO THE DIAPHRAGM WALL AND PLATFORM SLAB CONSTRUCTION WORKS AT THE HUNG HOM STATION EXTENSION UNDER THE SHATIN TO CENTRAL LINK PROJECT

CLOSING SUBMISSIONS FOR LEIGHTON

A. INTRODUCTION

1. The remit of this Inquiry is **safety** – specifically, whether the platform slabs and diaphragm walls (**D-walls**) (and in particular the east D-wall) are connected in such fashion as to give rise to a well-founded, evidenced and genuine concern as to their structural integrity.

2. This in turn raises three key questions:-

   (1) Is the change to the East West line slab (**EWL slab**) / D-wall / Over Track Exhaust slab (**OTE slab**) (from use of couplers to continuous rebars) safe? [See Section B below]

   (2) Was there widespread/systemic cutting of threaded ends of rebars? [See Section E below]

   (3) Is the EWL slab effectively and safely connected to the D-wall? [See Sections C and D below]

3. The answers to those questions are:-

   (1) Yes.

   (2) No.

   (3) Yes.

4. Any question of the systems (ie supervision etc) applied to the works then falls to be considered against those answers. An analysis of systems does not, Leighton submits, exist in the abstract as some form of Platonic ideal.

5. Systems can only be analysed in the context of the outcome (a safe structure) and of that which is being constructed (a bulky, robust concrete and steel structure with multiple redundancies requires a different level and nature of supervision than manufacture of a modern microprocessor).

6. Further, when considering systems, it is easy to fall into two traps:-

   (1) Allowing hindsight to infect conclusions as to a system that was in place 3 to 4 years ago; and

   (2) Imposing a model of abstract perfectionism which would not have been workable in 2015 to 2016 or now.

7. There is one final point by way of introduction which is a wider point and has been covered in part by previous Leighton submissions in writing (and Leighton asks for a brief indulgence to adopt and to expand on it).

8. Once a public Inquiry has been created, it is for the Commission and its Counsel to investigate and to report on the extent to which professional men and women are to be criticised against the Terms of Reference with other parties acting as per their Salmon letters. This is right and proper.

9. What is neither right nor proper is for guerrilla warfare to be waged by some parties outside of the Inquiry or outside the scope of their Salmon letter. During this Inquiry this has been done. That is to be deprecated.

B. THE CHANGES

10. The relevant changes with which the Inquiry has been concerned were limited to certain panels in the east D-wall at the intersection of the EWL slab and the OTE slab.[1]

11. The first change was to re-arrange the rebars at the top of the east D-wall panels into three layers to provide space for the use of tremie pipes, the construction of other cast-in ducts and to improve buildability. Certain inverted U-bars were omitted.[2]

12. The second change was to modify the construction detail by removing part of the top of the east D-wall by 450mm to 500mm and the coupled rebars and replacing them with continuous rebars connecting the EWL slab, the D-wall and the OTE slab.[3] This change resulted in the vast majority of the panels in the east D-wall using continuous bars at the intersection of the EWL slab, rather than bars connected by couplers. Only 10 panels of the east D-wall were unaffected by this change and continued to use couplers.[4]

13. It originally appeared to be the case that those that criticised the changes were focussing on the second change (see e.g. Lok's witness statement[5] and Ho's witness statement[6] both from the Government). It was on that basis that the experts met and agreed their Joint Expert Memorandum.[7]

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[1] McQuillan §47 and 121
[2] McQuillan §48; Southward §7.3.2 and Figure 5.
[3] McQuillan §49; Southward §7.4.5 and Figures 8 and 9.
[4] McQuillan §§47 and 121.
[5] [H7/2206:68(3)-2207:71].
[6] [H20/40059:13].
[7] Joint Expert Memorandum §3.

14. In the process of his resiling from the Joint Expert Memorandum, however, Professor Au appeared to be concerned by both changes.[8] The basis on which he was so concerned is unclear. Notwithstanding his remarkable volte face which has not been satisfactorily explained at all (references were made to him being "starving" at the joint expert meeting which is not a good reason – see below), Leighton confines its submissions, other than as to the manifest impact on Professor Au's credibility (discussed below), to what has been termed the second change and is termed here the change (on the basis that there is no evidential basis on which to question the first change and the Inquiry is only concerned with the second).

15. Professor McQuillan opined that the cutting down of the top part of the D-wall is a "normal construction event".[9] All experts agreed.[10] To the extent that this was said to have produced an "A" shape or tapered D-wall – if it did (the evidence on point being inconclusive – the genesis of this point being Poon's evidence – as to which see below)[11] – that would provide an additional shear key which would improve the situation.[12]

16. Mr Southward added that the trimming of the top section of the D-wall concrete is no different from the trimming of the last section of the over-poured concrete above,[13] and the partial demolition and replacement of the top of the D-wall has no effect on its structural performance.[14]

[8] Au [Day 40:71(23)-73(3)].
[9] McQuillan §54.
[10] Joint Expert Memorandum §3.
[11] Exchanges with the Commission: [Day 43:47(5)-48(4)].
[12] Southward [Day 43:32(20)-(24)].
[13] Southward §9.4.
[14] Southward §13.1.

17. The change provided an effective and safe improvement to the original design. All experts originally agreed that the change was "a better detail".[15] The as-built design is superior to the original design in terms of ease of construction and rigidity.[16] More steel reinforcement is provided across the top of the D-wall.[17] As Professor McQuillan opined in his report (and Mr Southward had the same view), the vertical construction joints between the EWL slab, the D-wall and the OTE slab were removed and replaced by a "shelf joint" that "clamps" the D-wall, and the as-built design is superior to the original one in terms of ease of construction and rigidity.[18]

18. Professor Au's position on the change altered when he came to give evidence. He no longer supported the Joint Expert Memorandum he had signed. He claimed that he had signed the Joint Expert Memorandum because he was "starving" at the joint expert meeting [19] - though it must be noted that (i) there was no suggestion that Professor Au had been subject to any pressure to sign the Joint Expert Memorandum; and (ii) food was in fact offered at the meeting.[20] Professor Au claimed that the design change was "not necessarily an improvement" and demanded more tests be done "to check that the stresses at the construction joints are not excessive".[21]

19. Tritely and absent very unusual facts, an expert should not resile from the Joint Expert Memorandum. If the experts cannot agree the Joint Memorandum, it is entirely open to them to produce a schedule of the issues on which they disagree (as the "Purpose" section of the Joint Expert

[15] Joint Expert Memorandum §3.
[16] McQuillan §99; Southward §9.5.2.
[17] McQuillan §98; Southward §9.5.1.
[18] McQuillan §99; Southward [Day 42:117:15; 118:7 – 11]
[19] Au [Day 40:61(20)].
[20] McQuillan [Day 44:89(14)-(16)].
[21] Au §6.4.3.2.

Memorandum made clear). Nothing in the way in which Professor Au gave evidence or answered questions suggested that he was an expert who could be persuaded into agreeing something with which he disagreed – starving or not.

20. Additionally, it is striking that even up to the time of his oral testimony, Professor Au had carried out no calculations of his own. Nor had Professor Au asked for any further information which he considered necessary. Both of these exercises would be expected of an expert seeking to assist the Commission, particularly when Professor Au claimed that the calculations could have been done in "half a day".[22] The obvious conclusion to be drawn is that Professor Au's evidence is, with respect, unhelpful, and should therefore be rejected.

21. Further:-

(1) As Professor McQuillan pointed out, the internal stresses at the top of the wall construction joint are all of a compressive nature and no tension or shear can occur at the interface.[23] Professor Au could not give any convincing reason why Professor McQuillan was wrong. He merely claimed that there is a "potential weakness" and "there is a need to check numerically the forces and the stresses".[24]

(2) In any case, common sense demonstrates that Professor Au's concern is an academic one. Professor Au's case for resiling from the Joint Expert Memorandum was apparently based, apart from

[22] Au [Day 40:36(24)].
[23] McQuillan §100.
[24] Au [Day 40:48(4)-(13)].

hunger, on a horizontal "joint" shown in the representation of the change.[25] As Leighton put to Professor Au,[26] once concrete was poured monolithically, the top of the EWL slab, the D-wall and the OTE slab became "one lump of concrete" (a fact with which Professor Au agreed), so the horizontal "joint" on which he relied in his new case and appearing in the diagram is no more than a notional one and could not possibly contribute to any cracking.

(3) Further, as Atkins put to Professor Au in cross-examination:-[27]

> "The weight of the structure is such that the vertical forces which are being deployed create a bending moment which compresses the slabs. It is reinforced to a very, very large extent, and therefore the risk of anything of the type that you are concerned with arising is simply not realistic."

After some prevarication, Professor Au's response was to accept that any problems he was raising may be "marginal" [28] and dependent on further testing which, of course, he could have done but did not do.

(4) Professor Au also ignored and did not address the undisputed fact that there is up to 50% more through bars (increased from 24 to 36) than coupled connections.[29]

(5) Whilst Professor Au claimed that Atkins had used the wrong equation to calculate the design performance, he offered no

[25] See Figure 12 in Mr Southward's report.
[26] Au [Day 40:190(3)-(20)].
[27] Au [Day 40:143(15)-(20)].
[28] Au [Day 40:144(17)-(18)].
[29] See §9.5.1 and Figure 10 in Mr Southward's report

alternative.[30] Nor did he undertake any calculation. Professor McQuillan accepted Atkins' calculations as confirming his conclusion that the revised design was an improvement to the original one.[31]

(6) Professor Au suggested (in the context of threaded length) that the BOSA tests were in some way undermined because the calculations only concerned strength and no account was taken of elongation or cyclic stress or loading. Again Professor Au could not assist either with the way in which the tests were undermined or with any positive information as to what the position was – taking into account his views. Further, both cyclic stress and elongation are not issues at the station as Mr Southward and Dr Glover pointed out and as BD requires (elongation is no more than 0.1mm).[32] Professor McQuillan was of the view that elongation and cyclic loading are "immaterial" and "irrelevant".[33] For elongation testing, Professor McQuillan was of the view that it relates only to serviceability,[34] and given the level of utilisation, the rebars will never be subjected to a level of stress that strain them to 0.1mm.[35] As to cyclic stress, Professor McQuillan opined that this refers to the situation of a structure undergoing reversal of direction of the forces applied to it (like a wire hanger or a paper clip being twisted in one direction and then in the opposite direction) and, given the huge size of the slab, load reversal

[30] Au [Day 40:157:18-25].
[31] McQuillan §101.
[32] Southward [Day 42:113(11-(13); 133(7)-(14)]; Glover [Day 43:115(18)-(21); 128(10)-(20)].
[33] McQuillan [Day 44:140(4)-(18)].
[34] McQuillan [Day 44:105(14)-(15)].
[35] McQuillan [Day 44:106(23)-107(1)].

involving the slab bending upwards against its own self-weight "simply will never happen".[36]

(7) Much of Professor Au's approach turned on raising questions that he felt should have been answered but had not been (whether by him or others). These unanswered questions were often academic.

(8) Part and parcel of this approach was Professor Au's raising of the possible "notional" construction joint in the connection between the EWL slab and the east D-Wall. This, Professor Au contended, needed a free body diagram to be drawn to analyse the forces and stresses at this location. This exercise he had not done. Three points flow:-

(a) The notional construction joint exists within a monolithic structure. The EWL and OTE slabs at this point had been constructed as one. Therefore, there are issues as to what is the structure one is trying to analyse via the free body diagram. Is it the entire structure or some point within it? If so, which point and why? What methodology has been adopted in selecting that point and why?

(b) If the presence of the construction joint in a system does not affect the monolithic nature of a body of concrete, then the determination of a free body diagram at the location of a construction joint is only notional – that free body could be equally well considered in other locations, ie 500mm lower

[36] McQuillan [Day 44: 109(1)-(4)].

down at the junction with the base of the OTE slab. In fact that is probably a more pertinent place to consider such an approach due to the real discontinuity at this location – the abrupt change in thickness of the wall / slab monolithic arrangement.

(9) In any event, Professor McQuillan, Dr Glover and Mr Southward all agreed that Professor Au's degree of academic abstract analysis was not necessary. Further, Mr Southward demonstrated by use of the strut and tie method and also dowel action of the vertical D-wall reinforcement that Professor Au's hypothetical concern could not arise.[37]

(10) This debate over the free body diagram demonstrates three more widely applicable flaws in Professor Au's approach:-

(a) Professor Au's approach does not help the Commission. The Commission is concerned with real world safety and real world public concerns about safety. This structure has been in place for three years under 90% dead load. The Commission's task (and the public debate) must be: **is this structure safe?** An academic, abstract and hypothetical debate over putative concerns measured against idealistic objectives does not assist.

(b) When trying to ascertain the weight to be given to Professor Au's evidence, the exercise has to be carried out as to whether

[37] [Day 42:122(1)-124(6)]

each and all of his questions are academic – in other words, in the real world are the questions relevant and pertinent.

(c) Simply raising questions without context or answers serves no purpose but may in fact generate doubt. This is abstract; dangerous (it may aggravate public anxiety for no reason); and fails to address the central question of whether the structure is safe – which it is.

(11) Professor Au's approach was akin to a Government department waiting to be provided with materials to satisfy him/it rather than acting as an independent expert seeking to proactively assist the Commission.

C. MINIMUM EMBEDMENT LENGTH OF THREADS

22. The evidence that in order to attain structural safety, full embedment of all threads into the couplers is **not** necessary is overwhelming.

23. Professor McQuillan concluded that based on BOSA's calculations, an embedment of 22mm (5.5 threads) is sufficient (as an absolute minimum) to achieve a full rebar tension, and 24mm (6 threads) achieves a safety factor of 1.14.[38] Mr Southward gave a more conservative figure of 26.4mm (60% thread engagement, or 6.5 threads) based on the CASTCO test results.[39] Dr Glover was of the same view.[40] Even Professor Yeung *de facto*

[38] McQuillan §119.
[39] Southward §15.5.
[40] Glover §7.2.

accepted that according to BOSA's calculations, at most 7 threads (28mm) would be sufficient.[41]

24. The contrary voice is Professor Au. Professor Au asserted that BOSA's calculations were "yet to be substantiated by testing",[42] but he was unable to say how BOSA's results were wrong. In any event, he claimed that there would only be "a bit deviation" on testing.[43] Professor Au also accepted that a minimum of three samples was deemed to be acceptable.[44]

25. Professor Au claimed that any embedment of less than 37mm constituted non-compliance,[45] but neither in his report nor his evidence [46] was there analysis as to why that was the case. He accepted that 37mm was a "quality standard" adopted by the Government.[47] However, an embedment length of 36mm would be the maximum possible if the coupler is fully screwed on to the parent bar.[48]

26. These points alone cast doubt on Professor Au's evidence.

27. In addition, Counsel for the Government put to Professor McQuillan that the manufacturer of the coupler informed the Government that for a proper installation of a coupler, there had to be an engagement of ten threads. This meant that coupled with a plus/minus 3mm deviation, the Government adopted the 37mm embedment requirement.[49]

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[41] Yeung [Day 41:161(2)-(5)].
[42] Au [Day 41:7(18)-(19)].
[43] Au [Day 41:8(11)-(12)].
[44] Au [Day 41:28(9)-(15)].
[45] Au [Day 40:89(15)-(17)].
[46] Au [Day 40:89(15)-90(3)].
[47] Au [Day 41:2(7)-(13)].
[48] Southward §15.4.
[49] [Day 44:141(18)-143(15)].

28. This must have been, presumably, to buttress the Government's case. The difficulties with that approach:-

(1) The questions were not reflected in evidence from the Government's witnesses; and (not or)

(2) Counsel was giving evidence;

(3) Counsel must have been giving evidence as to the Government's assessment of what the manufacturer's quality manual suggests one might do, rather than an assessment of safety;

(4) This is again an abstract exercise - the acceptance criteria set by the Government is "really an ideal world";[50]

(5) Professor McQuillan took the view that the Government's benchmark was "too stringent";[51]

(6) There is no evidence that the 40 or 37mm were expressly or impliedly set as the standard with which Leighton or anyone else were to comply;

(7) No one has suggested a means by which 37mm or 40mm could be empirically verifiable on site during construction – no one has contended for X-rays or ultrasound or the other means of actually measuring whether the rebar was 37mm or 40mm engaged; and

[50] McQuillan [Day 44:145(22)-146(5)].
[51] McQuillan [Day 44:134(9)].

(8) Common sense dictates that an entity (be it the Government or manufacturer) may suggest or recommend or impose a test or criteria which is more than required for the purpose of safety (whether for reasons of a margin/buffer or ease of administration or many other reasons). Leighton submits that Professor Au's bare assertions must be rejected.

29. Finally, China Technology Corporation Limited ("**CT**") suggested in cross-examination of Professor Au that there was nothing in the CASTCO test sheets to show that the grade of the bars that were tested was the same grade as those used for the project.[52] There is absolutely nothing to the point. CASTCO is a reputable testing centre and the tests were witnessed by BD.[53] As pointed out by Professor Hansford, if CASTCO and BD who witnessed the tests had considered the results to be unusual, they would have called for further tests, but they did not. They must therefore be taken to have had no material queries as to what is shown by the results – including the grade of steel used.[54]

30. Thus, based on Professor McQuillan's criteria of 24mm (or Mr Southward's more conservative figure of 26.4mm, which is endorsed by Dr Glover), the opening-up results (as of 26 January 2019)[55] showed that **113 out of 116 rebars** tested (**97.4%**) had the adequate embedment length for structural safety purpose. Even based on Professor Yeung's most stringent criteria of 7 threads (28mm) plus a chamfer of a maximum length of 2mm[56] (although the rebars used on site and produced by BOSA for

[52] Au [Day 40:110(1)-(3)].
[53] Au [Day 41:20(10)-(19)].
[54] [Day 41:25(15)-(23)].
[55] [OU542].
[56] Yeung [Day 41:117(11)].

testing showed no such chamfer [57]), **109 out of 116 rebars** tested (**94%**) had passed.

D. REDUNDANCY

31. There is no dispute that the utilisation of the couplers between the slabs and the D-walls is low (and it has not been suggested otherwise by any evidence before the Commission):-

    (1) Arup Assessment Report: the utilisation of the top steel in the D-wall to EWL slab connection is generally below 50% (with local peaks above 60%), which provides a robust design with a comfortable margin of redundancy.[58] As discussed in evidence, it is the top steel that is under tension in the EWL slab connections.

    (2) COWI Report: the ultimate bending strength utilisation at the EWL slab to D-wall connection is typically less than 50%.

32. Mr Southward was of the view that there is at least 40% spare capacity in the coupled reinforcement connection between the EWL slab and the D-wall on the top mat (which is the critical mat) so that at least 40% of the couplers at the top surface could be ineffective without affecting structural integrity of the slab.[59]

[57] [H25/44856].
[58] [B19/25128].
[59] Southward §17.

33. All experts agreed that only 50% of the rebar provided for in the design at the mid-span of the EWL slab is required to be connected to the D-walls, and this is only for the purpose of code compliance.[60]

34. Professor McQuillan further opined that the bottom of the EWL slab is always in compression, such that the threaded rebar will never try to pull out of the couplers. One could therefore sever the reinforcement and the slab would still carry the load as intended.[61] All experts also agreed that the EWL slab does not rely on steel at the interface at the bottom for flexure and shear capacity.[62] That being so, all bottom couplers could be defective and the EWL slab would still function structurally and safely.[63]

E. NO WIDESPREAD/SYSTEMIC CUTTING OF THREADED ENDS

35. The Terms of Reference and the letters from the Commission's solicitors to the parties allude to media reporting of widespread cutting of threaded ends of rebars in May 2018 causing public safety concerns.

36. It is important to bear in mind the crucial differences between:-

    (1) what has always been accepted (indeed internally documented) by Leighton; and

    (2) what CT has sensationally alleged and maintained in this Inquiry and widely reported by the media.

[60] Joint Expert Memorandum §1.
[61] McQuillan [Day 44:112(16)-(23); 113(13)-(18)].
[62] Joint Expert Memorandum §2.
[63] McQuillan §§89-90.

37. Leighton accepts (and Leighton itself also detected) that there had been isolated instances of threaded ends of rebar being cut:-

(1) NCR 157.[64]

(2) Mok's incidents.[65]

(3) MTRC's incidents (in addition to Mok's).[66]

38. The preponderance of evidence before this Commission is that the isolated (and not widespread or systemic) cutting of the threaded ends of rebars was undertaken by Fang Sheung Construction Company ("**FS**") or ("**Fang Sheung**") workers:-

Leighton witnesses

(1) Khyle Rodgers: "… they were Fang Sheung workers … Because generally they wore yellow hats, probably the gloves they're wearing, probably their attire." [67]

(2) Edward Mok: "… Leighton workers would not appear at that location under that circumstance, and if you look at the attire, well, there should be dirt, say for example rust. If you ask me, I would think that these two were Fang Sheung workers." [68]

[64] [C12/8134-81359]. Closed out version [C27/20358-20364].
[65] [C12/8113(28)-8117(48)].
[66] [B1/438(68)-442(88)].
[67] [Day 15:54(16)-(20)].
[68] [Day 21:75(1)-(5)].

MTRCL witnesses

(3) Aidan Rooney: "My impression, at the time when I first saw [the photo at C12/7931], was that they were Fang Sheung workers. That was just my impression. They were handling the rebar quite well, they had the right clothing that seemed to indicate they were steel fixers. My view was steel fixers." [69]

(4) Andy Wong: looking at the photos provided by CT, "they both work for Fang Sheung".[70]

Fang Sheung witnesses

(5) Pun Wai Shan: agreed "only Fang Sheung workers would be responsible for the work as shown in the pictures".[71]

(6) Joe Cheung: "It was not until then that I knew that workers without our instructions cut short five rebars. I was very angry. So I feel most regretful about this incident. At once, I called all my workers for a briefing. I gave them a very serious briefing because it was a serious thing, because Mr Mok told me that for sure an NCR, i.e. a warning, would be issued to me. I was very angry about that matter." [72]

39. Leighton's evidence was that it never allowed (let alone ordered) any cutting of threaded ends under any circumstances, and when it found out

[69] [Day 28:140(16)-(20)].
[70] [Day 30:136(6)].
[71] [Day 13:74(16)-(20)].
[72] [Day 14:134(25)-135(7)].

about the cutting it immediately took steps to stop and rectify them.[73] Safety is always the top priority of Leighton.[74]

40. Pun of FS also confirmed that no one (including Leighton) instructed FS workers to saw off the threaded ends of rebars.[75]

41. This has to be contrasted with Poon (CT) who was the **only** party to this Inquiry (and Poon was the "sole fountainhead") [76] who alleged that there was widespread and systematic cutting of threaded ends of rebar on site as directed by Leighton:-

(1) Poon: "… Leighton's people cutting bars … They didn't cut it one by one. Now, the bars came in bundles, and when they cut them, they cut bundle by bundle …" [77]

(2) Poon: "[the casual labourers] are just receiving orders, instructions, from the Leighton supervisors".[78]

(3) Poon's email to Zervaas dated 15 September 2017: "… cheating practice [by] Leighton direct staffs cutting away most of the threads, estimating over 30,000 pcs involved".[79]

[73] See the evidence of Edward Mok [C12/8117(47)], Andy Ip [C12/8161(23)], Man Sze Ho [C27/20665(25)], Joe Leung [C27/20683(22)], Chan Chi Ip [C27/20672(16)], Khyle Rodgers [C27/20689(26)], Ian Rawsthorne [C27/20696(28)], Malcolm Plummer [C27/20677(21)], Joe Tam [C27/20613(13)] and Gabriel So [C27/20659(11)], who were all unchallenged.
[74] Rodgers [Day 15:59(18)-(20)]; Speed [Day 16:129(3)]; Rawsthorne [Day 18:42(24)-(25)].
[75] [Day 12:104(5)-(12)].
[76] Chairman's observations [Day 9:142(10)].
[77] [Day 7:55(16)-(21)].
[78] [Day 7:82(10)-(11)].
[79] [C12/7987].

(4) Poon's statement to the media: the threaded ends of "thousands of rebars" were cut (Apple Daily, 28 June 2018).[80]

(5) Poon claimed the purported cutting was "a planned endeavour" [81] and he suggested that it was a form of "articulated, organized sabotage" in answer to the Chairman's question.[82]

(6) When pressed for a possible motivation or reason, Poon alleged without any evidence or intelligible explanation that it was because of corruption.[83] This allegation was never put to **any** of Leighton's witnesses and is discussed further below.

42. From Leighton's perspective, there are, in theory, two possible allegations that could be made against it:-

(1) First, an allegation that instances of rebar cutting (or inadequate screwing or engagement) were not picked up or spotted by Leighton during supervision.

(2) Second, an allegation that Leighton actually ordered or acquiesced in known instances of rebar cutting.

43. There is a massive difference in the severity (and media impact) between the above two allegations. The severity of the first allegation can be demonstrated by its instrumentality in setting up this Commission of Inquiry.

[80] [C32/24183].
[81] [Day 7:77(21)].
[82] [Day 7:85(7)-(11)].
[83] [Day 7:79(2)-(9)].

44. After the expenditure of considerable time and expense, the only evidence for the second allegation is from Poon and CT.

45. Thus, this second allegation (Leighton ordering or acquiescing in known incidences of rebar cutting) turns solely on the credibility of Poon and the 4 other CT witnesses. Whatever other issues there may be, if (as Leighton submits) Poon and the CT witnesses lack credibility, the allegation that Leighton ordered or acquiesced in rebar cutting must be rejected.

46. For reasons set out below, Leighton submits that save where corroborated by undisputed or indisputable evidence, the evidence of Poon and the other CT witnesses is not credible and should be rejected – and the Commission should explicitly so find.

47. Specifically, Poon is manifestly a witness with an agenda (whether that is commercial spite against Leighton [which is obvious] or other reasons – say political – is not something that needs to be fully resolved by this Commission) and almost every answer he gave to this Commission was not designed to assist but was either a speech given to further that agenda or to provide sound bites for the media.

48. What Poon has done is to seize upon two items of evidence (e.g. the NCR, and one single photo [D1/228]) showing "possible" action of cutting of an unidentified part of a rebar and attempt to construct a case of systematic and widespread rebar cutting (and not any other form of defective or faulty works). Even if legitimate (which it is not), the attempt does not withstand analysis. To take but one example - the photo at [D1/228] on which Poon heavily relied has been "debunked" by Professor McQuillan. Professor McQuillan points out that the rebar that was allegedly cut short showed 13

threads and was therefore a Type B rebar (which has a threaded length double to that of a Type A rebar) and could not have been a Type A rebar which only starts with 10 to 11 threads.[84] He was also of the view that the shortening of Type B is not a practice that compromises safety.[85]

49. Poon and CT's evidence can be rejected on this basis alone.

50. There are, however, multiple additional reasons why their evidence is not credible:-

(1) Poon's evidence was that he was fully aware of mistakes in his witness statements but made a conscious decision not to submit a corrective statement (despite the Commission's direction) or, at the very least, notify the Commission and the parties before the Inquiry. These mistakes were not trivial – for example, the correction of typos or misremembered dates. They were critical and systemic. This state of affairs gives rise to three problems:-

(a) As the Chairman pointed out, Poon left all (including the Commission) with "known errors floating in the various statements".[86]

(b) Poon was content to adopt a "catch me if you can" approach and was never serious about putting in accurate evidence to the Commission.

[84] McQuillan [Day 44:125(24)-126(1)].
[85] McQuillan §108.
[86] [Day 7:16(20)-17(4)].

(c) Poon affirmed his self-confessedly wrong evidence. The obvious but unpleasant conclusion to be drawn is that Poon therefore knowingly gave false evidence to the Commission.

(2) All the CT witnesses had the same "standard paragraph" in their witness statements – which they verified on oath – that they agreed with all the facts set out in Poon's witness statements, when they are clearly not in a position to do so (for example, on what Poon alleged to have said to Leighton or MTRCL). This showed that their witness statements are no more than "lawyer's / Poon's drafting" put to the respective witnesses for their signature.

(3) Witnesses insisted that they had seen something when that was simply impossible:-

(a) Li allegedly witnessed an event of cutting of threaded ends of rebar at around lunch time on 12 January 2016 [87] when:-

(i) he was clearly not on site (he only started work on 13 January 2016 according to CT's organization chart;[88]

(ii) could not have been on site given he was doing the safety induction course that day;[89] and

(iii) the area concerned (Area B) had already been fully concreted. [90]

[87] [Day 5:11:10-11].
[88] [D1/224] [Day 4:122(15)-(18)].
[89] [C8/5670] [Day 4:121(1)-(3)].
[90] [Day 4:123(7)-(15)].

(b) Chu allegedly witnessed an event of cutting of threaded ends of rebar in mid-June 2016 in NSL, Area A,[91] when that area had already been fully concreted by 21 May 2016.[92]

(c) All the CT witnesses had remarkable eyesight – being able to see 2 to 6cm of threaded ends being cut at distances of 2 to 10m, at night on a building site.[93]

(d) But "identified" Law Chi Keung and "Ah Tung" (Mr Ho Hiu Tung) from the photos at [D1/601, 603, 604] said to be taken on 4 September 2015, when:-

(i) "Ah Tung" did not become a banksman (and assigned a red helmet) until 30 September 2015;[94] and

(ii) Law was a rigger and did not work on rebar fixing.[95]

(2) There were glaring inconsistencies between the evidence of Poon and the CT witnesses which could not possibly be explained away by any claim of memory lapse. For example:-

[91] [D12/975(18)].
[92] [Day 6:80(1)-(19)] [B5/2903].
[93] But Ho Yin (6cm cut, 8m away) [Day 4:34(1)-(22)]; Thomas Ngai (3-4cm cut, 6-7m away) [Day 4:77(5)-(11)]; Li Run Chao (6cm cut, 10m away) [Day 5:10(1)-(12)]; Chu Ka Kam (2-3m away, 2cm cut) [Day 6:54(6)-(21)].
[94] [C34/25786(3)].
[95] [C34/25782(3)].

(a) Chu said he did not tell anyone (which must include Poon) of the two incidents of cutting spotted by him [96] but Poon said that Chu had reported to him [97] and also to MTRCL.[98]

(b) But arrived on site in mid-September 2015 and could not have told Poon about any incident of cutting in early September 2015,[99] when Poon said that he had been told by But about cutting in early September.[100]

(c) Ngai said that he had never seen rebars which were not fully screwed in or anyone screwing a rebar with shortened thread into a coupler,[101] but Poon claimed that Ngai had told him he saw workers pretending that they had properly installed the threads into the couplers.[102]

(3) An attempt was made to rescue the credibility of Li. During Li's evidence, CT's Counsel (who must have been acting on instructions) asserted that there were photographs purporting to show that pouring was still going on in Area B (where Li claimed that he had witnessed the cutting) on 14 January 2016.[103] The actual photograph eventually produced showed pouring in a completely different area.[104] Further, according to Li's own description as to where he was, he was nowhere near the location where concrete was being poured on that

[96] [D2/907.4(6)]
[97] [D1/19(30)]
[98] [D1/19(32)].
[99] [Day 4:5:16-18].
[100] [D1/20(35)].
[101] [D2/942.3(6)].
[102] [D1/22(42)].
[103] [Day 5:49(19)-(21)].
[104] [Day 6:4(5)-(15)] [D2/1084(9)] [D2/1109(21), (23)].

day.[105] These were all facts which CT must have known. Yet CT instructed its counsel to intervene in the way he did.

(4) Poon's evidence that he had spoken to Khyle Rodgers and Gabriel So [106] and Anthony Zervaas [107] of Leighton, and Aidan Rooney of MTRCL [108] about rebar cutting was not put by CT's counsel to the witnesses, and was in any event rejected point-blank by Rodgers and So when that evidence was put by Counsel for the Commission.

(5) If Poon had indeed spoken to any of those persons as he alleged, then (based on what Leighton in fact did in January 2017 upon receiving Poon's email of 6 January 2017), [109] what would plainly have happened is that there would have been an investigation then by both Leighton and MTRCL.

(6) Complaints were raised by Poon a year and then 18 months later after all relevant works had been completed and at a time when CT wanted money from Leighton. Two points flow:-

    (a) If the complaints were as serious as Poon alleges, they could, would and should have been made contemporaneously. Poon would naturally also not have allowed CT to complete the concrete pouring to preserve material evidence.

    (b) The complaints were only raised as and when Poon wanted (but did not manage to get) money from Leighton. The timing

[105] [D1/831.1(2)-(3)].
[106] [D1/20(36)].
[107] [D1/23(46)].
[108] [D1/22(44)].
[109] [C12/7923].

of and motivation for the complaints are obviously relevant to credibility of his allegations of widespread cutting ordered by Leighton. It is of course possible to engage in commercial blackmail and to threaten to tell the truth as a bargaining chip at the same time. But that would involve finding that Poon knowingly concealed his knowledge of cutting of the threaded ends of rebars (which according to him was a serious thing) and only chose to utilize his knowledge when it suited him.

(c) Poon suggested during questioning by the Chairman that initially he did not think that the problem was serious and that was why he was content to pour concrete and not speak out. This cannot be reconciled with his evidence that he did speak out nor does it explain why he chose to speak when and how he did.[110] As Professor Hansford rightly pointed out, presumably CT "would not have poured concrete until the joint was correctly prepared".[111]

(7) Poon made unsubstantiated and serious allegations very late in the day, or only when he was in the witness box:-

(a) When pressed on other topics, Poon alleged there had been some of corruption (albeit the precise form of that corruption remains completely unclear).[112]

[110] See Poon's exchanges with the Chairman [Day 7:62(15)-65(16)].
[111] See his exchanges with Counsel for the Government: [Day 43:24(17)-(19)].
[112] [Day 7:81(3)-(10)].

(b) Poon also alleged that Leighton imposed the condition that Poon must "stay silent" on the alleged defective steel works in order to get the $6m payment in January 2017.[113]

(8) Both of those allegations are baseless.

(9) The allegation of corruption did not, on its face, make sense. In addition, no detail was provided. Instead, Poon alleged that the Prevention of Bribery Ordinance (**POBO**) prevented him from so doing.[114] That, in turn, was clearly wrong, as a cursory investigation of the POBO shows. There is nothing in the POBO that prevents presentation of the facts behind an allegation of corruption.[115] The POBO only prevents disclosure of the investigation and the identity of an informant neither of which can apply here when the alleged informant (Poon) had said in an open hearing that he was assisting in an investigation. Manifestly Poon did not remain silent. Further, the Commission has seen Poon's ICAC statement and decided that it does not assist.

(10) The fact that Leighton told MTRCL and both Leighton and MTRCL had carried out an investigation into Poon's allegations is contrary to there being any supposed cover up.

(11) Two conclusions flow:-

[113] [D2/1060].
[114] [Day 7:91(23)-(25)].
[115] [A1/424-434].

(a) Poon having alleged corruption (to the extent that it was capable of being understood) and found to lack any merit, fairness dictates that there be an explicit finding to that effect;

(b) That Poon was capable of making impromptu, warrantless and serious allegations must seriously impact his overall credibility.

(12) Even though strict rules of evidence do not apply to this Inquiry, contentious factual issues (if there is any truth in any of them) could and should have been put to witnesses by the party alleging them so that (i) the witnesses can have the fair chance to address them and explain them, and (ii) the Commission is assisted in gathering the evidence. Indeed, the more serious the allegations, the greater the need to have them put (assuming always that it is proper so to do). Here, numerous allegations made by Poon were not put by CT to the witnesses – most obviously corruption, but in addition and by way of example: Poon's alleged conversations with Mr Rodgers and Mr Zervaas (on cutting of threaded ends) and Malcolm Plummer (his purported "heart-to-heart conversation" about corruption on site).[116]

(13) This failure to put allegations is particularly striking given Poon had never articulated the allegations in his witness statements or to the media or in the press statements. The only possible opportunity for Leighton witnesses to rebut and address any specific allegation, on the assumption that the allegation had any credibility, is if those were fairly and squarely put by CT counsel to them. No one else could

[116] [Day 7:88(17)-(22)].

have done this for CT, because no one knew what the allegations were. Again, the Commission can draw the necessary inferences.

(14) Poon's evidence lacked credibility even at the most basic level. Poon's allegations as to the number of allegedly defective couplers have varied wildly from over 1,000 to 30,000.[117] No rationale has been given for this variance. This would be reason enough to reject his evidence but again when challenged Poon raised a wholly new case about torque, tensile strength and visible threads.[118] That case in turn lacked merit when analysed by reference to the BOSA Manual [119] and Mr Lim's evidence.[120]

(15) CT made much of photographic evidence:-

(a) There was the twice repeated and unhelpful attempt to put in the 21,000 photographs said to be in CT's possession when CT did not in fact rely on the photographs.[121]

(b) There was the attempt to buttress Li's evidence by producing photographs that alleged that concrete was being poured when he was on site. They did not (see above).

(c) CT asserted that its photographs had somehow been lost via reformatting and/or been deleted from its server but partially restored – a case which became more obscure the more it was

[117] [C12/7987] [D1/25(51)] [D1/237] [D1/22(87)].
[118] [Day 8:33(13)-34(7); 39(14)-40(2)].
[119] [C10/7013].
[120] [Day 36:99(16)-(18)].
[121] [Day 7:147(21)-(24)].

explored.[122] Further, as the Chairman pointed out, Poon was apparently content to dispose of the photographs once he had reached a commercial settlement with Leighton, even though the photographs were said to contain evidence of important wrongdoing affecting structural integrity of the area which CT had been working at.[123]

(d) The Commission's open offers for CT to present further photos has not been taken up.[124]

(e) Given the admission in Poon's police interview [125] that he had identified all relevant photos for the police, it could not have been time consuming task for Poon to identify the photos and mark them and explain them. Despite the time that has elapsed in Inquiry during the hearings alone, this has not been done.

(f) It is submitted that these manoeuvres with photographs were but an attempt by Poon to conceal his inability to produce any probative photographic evidence of cutting.

(16) Ultimately, the high point of CT's case is one photograph [D1/228] taken on 22 September 2015. Poon was not on site on that day or any of the days of that week (or if he was, he had entered the site

[122] [Day 8:85(25)-87(14), 107(5)-(7)] [Day 9:72(14)-73(3)].
[123] [Day 8:15(1)-16(24)].
[124] [Day 6:136(1)-(6), 143(12)-(14)].
[125] [D1/831.1(2)-(3)].

improperly).[126] Poon told the police [127] and, initially, the Inquiry that it was taken with his Huawei phone and secretly.[128] The photograph was in fact taken on a Sony phone.[129] Poon's explanation that he had previously used a Sony phone is not credible as CT confirmed that Poon had simply replaced one Huawei phone with another and did not list this photograph as one said to be taken by Poon. [130] Even if CT can overcome all of the above, the photograph, as per Professor McQuillan's evidence, shows the cutting of Type B rebar – not the Type A that forms the core of CT's case. Accordingly, CT's "best point" rests upon a false premise.

51. Three final points on Poon's evidence require discussion.

52. First Poon's claim that he was gagged by the Confidentiality Agreement is without any merit. This can be demonstrated in two ways:-

(1) Poon treated himself as being released from any obligation of confidentiality in May 2018 by contending that he will "feedback freely" to the media after Leighton had confirmed that there was no malpractice on site;[131] and

(2) Poon's own conduct shows that Poon did not and does not regard himself as limited in what he can or should say.

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[126] See Leighton's site attendance record for Poon [C8/5720]. Poon's challenge to the site record (despite CT using the same to calculate its payroll: [Day 7:45(8)-(11)]) showing 9.5 work days for him that month [Day 8:128(15)-(25)] was addressed by Ms Emily Cho who explained how the record system worked [C35/26647-26648].
[127] [D1/765.4(10)].
[128] [D1/21(41)].
[129] [D1/232.2].
[130] [D2/1053-1055].
[131] [C12/8080].

53. Second, Poon's use or exploitation of the media.

54. In January 2017, Poon used the media to threaten Mr Zervaas.[132] Poon sought to justify that statement by saying that he was seeking to ensure the media had access to the site to interview him on something unrelated to his complaint to Mr Zervaas.[133] If Poon genuinely wanted to speak to the press about something that was unrelated to CT's disputes with Leighton, there was simply no reason why he could not have done so in CT's own office premises rather than at Leighton's site. Poon's explanation is not credible and should be rejected.

55. In May 2018, Poon adopted the same strategy – informing Leighton that the media were investigating.[134] Again this was a threat. That the threat emanated from a leak to Apple Daily [135] is clear given (i) the timing and (ii) that there could be no other source for that leak, and (iii) that it is entirely in Poon's character to engage the media.

56. At the Inquiry, Poon made it clear that he was addressing the media: the "Freudian slip" as to whom (i.e. the media) was the intended ultimate judge (and audience) of his words in his mind (the Commission will no doubt recall Poon's act of immediately (yet falsely) denying that he had "ever" said the word "media" within seconds after he had uttered the word in light of comments from the Chairman);[136] the attempt to discredit Counsel to the Commission (by suggesting that he was present at a meeting with MTRCL

[132] [C12/7926].
[133] [Day 8:6(11)-(18)] [Day 9:93(24)-(25)].
[134] [C12/8083-8084].
[135] [C12/8084].
[136] [Day 8:99(15)-100(5)] [Day 9:6(24)-7(4)].

and Leighton prior to the Inquiry)[137] and the Commission of Inquiry[138] and his outburst to the Chairman and his threats to walk out of the hearing;[139] his wholly unfounded allegation that he was being targeted by Counsel for the Commission;[140] his contemptuous remarks to both Counsel to the Commission[141] and to Mr Boulding;[142] the offensive emails by CT's solicitors to the Commission recently, unfairly and unjustifiably criticizing the Commission for refusing to "accommodate" the diary of Professor Yeung on the timing for him to give oral evidence;[143] and the use of soundbites and long speeches in his evidence.[144] This is the conduct of an unreliable witness.

57. Third, on Poon's own estimate there were at least around 1,000 defective couplers which had been cut. The evidence before the Inquiry shows that even if there were 1,000 defective coupler connections that has no impact on the integrity or safety of the structure as:-

(1) The expert evidence (set out above) on the utilisation of the couplers establishes that there is sufficient margin of safety on the slabs, and 1,000 defective coupler connections does not materially impact on that margin of safety; and

[137] [D1/34-35(80.6].
[138] [Day 9:76(12)-(25)]: claiming that the Commission of Inquiry had spent days on irrelevant matters which did not go to the Terms of Reference.
[139] [Day 9:79(1)-(7); 81(10)-(11)].
[140] [Day 7:8(20)-(23)].
[141] [Day 7:28(13]: "I suggest you update your photo on the website".
[142] [Day 10:75(10)-(16); 110(14)-(16)]: "Our QC"; "I'm not as smart as you".
[143] [D2/1596]. Commission's reply at [D2/1597-1598].
[144] [Day 9:76(12)-(18); 79(11)-(12)].

(2) Even Poon accepted (correctly) that 1,000 defective connections in a structure the size of the EWL slab would be insignificant.[145]

58. Leighton submits that the Commission should reject CT's evidence unless that evidence is supported by or consistent with uncontroverted evidence.

59. As submitted above, it is accepted that rejection of CT's evidence does not mean that there are no further issues for the Commission to consider but, without CT's evidence, the landscape in which that is done is very different. The issues are addressed in turn.

60. **Was there cutting?** Yes, but on the evidence, not widespread.

61. **Who did the cutting?** The preponderance of evidence is that the threaded ends of the rebars were cut by workers of FS. This is also consistent with inherent probabilities because FS was the contractor engaged for fixing the rebars. No plausible reason has been suggested as to why any other party should cut the rebars. Given Leighton acted when incidents of rebar cutting were discovered (Mok's actions, the NCR), it is implausible that Leighton was the party which ordered or directed rebar cutting in the first place. No one could suggest a plausible reason why Leighton should instruct or direct large-scale cutting of threaded ends of rebars. There could be no motivation for Leighton to do so.

62. **Why cut?** The evidence suggests that two possible reasons for cutting.

[145] [Day 8:54(2)-(8)].

63. First, some of the couplers were misaligned or damaged or the threads were contaminated with concrete [146] such that the threaded ends could not be inserted either completely or at all into the couplers. The evidence is that if FS workers encountered such problems, they should have approached Leighton who would have remedied the situation by replacing the damaged couplers.[147] There was therefore no need and no motivation to cut the threaded ends of rebars, certainly not on a large scale basis. Any incidents of cutting of threaded ends of rebars can therefore only have been because of a desire by the rebar fixing workers to cut corners or to speed things up due to their own sense of urgency or time pressure.[148]

64. Second, turning a Type B rebar into a Type A by cutting half of the threaded ends, possibly due to inadequate stock and, again, self-induced sense of urgency or time pressure. This finds support in the photograph at [D1/228] which is the only photograph before the Commission showing possible cutting of threaded ends. Professor McQuillan confirmed that the photograph showed a Type B rebar. Professor McQuillan's view was that cutting a Type B into Type A created no safety concerns.

65. **Frequency and extent of rebar cutting?** Prior to the opening-up, there were only a few documented incidents of cutting – as set out in Leighton's Opening Submissions. Although opening up has shown that some bars were not screwed in to the extent which CT and the Government say was required by BOSA, there is still no evidence of widespread cutting of rebar.

[146] Joe Cheung of FS [Day 16:21(3)-(8)].
[147] Pun Wai Shan of FS [Day 12:33(1)-34(8)]; Joe Cheung of FS [Day 14:62(6)-(10); 65(13)-(20); 135(8)-(18)].
[148] See for example the evidence of Gabriel So [Day 18:139(14)-(18)], Andy Ip [Day 20:20(6)-(8)], and Edward Mok [Day 21:72(12)-(23)].

Further and crucially there is no evidence of any impact on the structural safety.

66. **How was the rebar cut?** The most likely method was using a handheld cutter (as seen in the demonstration at HKCIC). This is battery-powered and the efficiency and speed of cutting would decrease over time.[149] There is therefore little scope for wide-spread cutting with this machine.

G. RESULTS OF OPENING UP

67. Opening up of the structure as devised by MTRCL and BD is on-going, despite all the experts agreeing that based on the redundancy of the couplers in the bottom of the EWL slab, further opening-up was unnecessary.[150] Dr Glover was critical (and skeptical) of the "tape measurement" of the length of the exposed threads.[151]

68. Opening up has not shown widespread cutting of the threaded ends of rebar as alleged by Poon.

69. What the results of the opening up process, and the debate over the opening-up process in the Inquiry, have shown is that the real question (so far as safety is concerned) is what is the baseline against which the embedding of rebar within the coupler is to be judged.

70. In this debate, CT and Government (Professor Yeung and Professor Au) adopt one tack. Leighton and MTRCL (Mr Southward and Dr Glover)

[149] Joe Cheung [Day 16:81(20)-82(11)]. Poon alleged that the cutter at [D1/228] is a hydraulic cutter [Day 10:32(18)-(23)]. Professor Hansford inspected the cutter produced at the Inquiry and opined that it was not a hydraulic cutter but an electrical one [Day 10:50(19)-(23)].
[150] Joint Expert Memorandum§6
[151] Glover [Day 43:137(16)-138(10)].

adopt another. In this Mr Southward and Dr Glover agree with the expert to the Commission, Professor McQuillan.

71. The CT and Government cases flow from an alleged BOSA requirement that 40mm was to be embedded (see Professor Au's Report §2). On analysis, Leighton submits, that this is a retrospective, lawyers' construct.

72. The test to be adopted is how any requirements were set out in the BOSA Manual, [152] BOSA's instructions, and how those would be read and understood by those engaged in building the Hung Hom Station. On that test, the Manual and instructions were correctly applied.

73. Once again, due to the history of how the parties' evidence and cases before the Inquiry have been presented and to be absolutely clear, Leighton makes no criticism of BOSA or those applying BOSA's instructions as part of the construction of the works. Leighton does not, however, accept that any abstract retrospective interpretation of the documents is valid.

74. The text of the BOSA Manual[153] contains no explicit **requirement** for 40mm to be embedded. Professor Yeung admitted that such a purported requirement is to be "deduced" from the Manual[154].

75. If the need for 40mm was so critical as to form *the* requirement against which success or failure of the installation of the rebar would be judged, it would be reasonable and indeed necessary for the Manual to say so explicitly, in clear and unequivocal terms.

[152] [C10/7011-7016].
[153] [C10/7011-7016].
[154] Yeung §96: "It can be deduced from [C10/7016] that the minimum embedment length is 40mm and the minimum number of full threads engaged should be ten (10)."

76. Further, that 40mm embedment was "a" or "the" requirement did not feature in BOSA's evidence.

77. Thus, there is nothing in the evidence to support 40mm embedment as a BOSA requirement.

78. There is, in particular and pertinently, no evidence that this requirement was communicated to Leighton or anyone else at the time.

79. In fact, it now emerges that the only way one can construct a 40mm requirement is to select 10 threads at 4mm per thread. To that one adds the concepts (only advanced recently) of chamfer [155] and "butt-to-butt" connection. [156] To that then one must add a question as to on site verification during construction.

80. A number of points arise:-

(1) This is a process of back-calculation or "deduction".

(2) This is not a process of specification nor is it a process of defining a categorical safety factor.

(3) This point arose late in the day during the process of an incredibly expensive, lawyer-heavy Inquiry. If it were immediately apparent to those constructing the works, it would have arisen obviously and early in the Inquiry if not during the construction of the works.

[155] Yeung [Day 41:161(9)-172(1)].
[156] See the very recent letter from BOSA to BD dated 18 January 2019 [H27/46159] claiming, inter alia, that BOSA's purported "objective" is to ensure that bars are screwed butt-to-butt and that was purportedly mentioned in BOSA's training sessions.

(4) The suggestion that a point that has only arisen in the way it has should be apparent to those engaged in the construction of the works is misconceived.

(5) BOSA's latest letter to the BD (after completion of the evidence in the Inquiry) claiming a "butt-to-butt" connection "objective":-

(a) is not expressly mentioned in BOSA's Manual or any other written materials; and

(b) is inconsistent with other unchallenged evidence given by Leighton's frontline engineers that they were informed at BOSA's training only of the requirement that no more than two threads should be exposed outside the couplers for a Type A rebar (which is consistent with what was stated in the BOSA Manual that there could be a maximum tolerance of "two full threads" being exposed after full connection).[157]

81. Thus, the starting point of 40mm is in and of itself and in all senses of the phrase an artificial construct as:-

(1) It is not reflected in the documents;

(2) It was not instructed or raised contemporaneously; and

[157] Edward Mok [Day 21:18(1)-(6)]: "… BOSA, the supplier of couplers, provided training. I attended the training. So that's why I know what the criteria were for acceptance. Now, it was mostly visual inspection, that we were told there could be an allowance of one to two threads that may be exposed. So that's about it."

(3) It can only be derived by manipulating elements of the BOSA Manual.

82. The 40mm embedment requirement falls to be rejected on that basis alone.

83. The position then gets worse. As can be seen from Professor Yeung's evidence, a process of reasoning is then applied to construct several baselines, from 37mm to 43 mm.[158]

84. Leighton therefore submits that the baselines advanced by CT and Government are hypothetical, arbitrary and ultimately do not assist the Inquiry in its task.

85. What is relevant to the Inquiry is the extent to which the rebar has to be embedded for the as built structure to be safe.

86. This is capable of being empirically ascertained and that exercise has been done. The empirical evidence before the Inquiry (as opposed to speculation or hypothesis) is that 24mm (or 60%) embedment is all that is necessary for structural safety purposes (per Dr Glover and Professor McQuillan), and even adopting a conservative approach, at most 26.4mm being embedded would suffice (see Section C above).

87. All bar 3 of the 116 couplers examined to date (26 January 2019) are embedded by more than 26.4mm.

88. A pure numerical analysis, therefore, gives a pass rate of 97.4% in a structure which has at least 40% additional capacity.

[158] See summary at [Day 41:175(16)-(21)].

89. It would, however, not be correct simply to carry out a counting exercise across all areas (which is what has been occurring on the part of the Government and the media). As Professor Au accepted, the connection between the EWL slab and the west D-wall can be ignored;[159] in the EWL slab to the east D-wall the critical mat is the top mat (which is consistent with the design); the vast majority of the connections at the east D-wall do not involve couplers but continuous bars;[160] therefore there are very few relevant couplers and none in the bottom mat (because the mat is always in compression).[161]

90. One must look at where the couplers are located – an exercise which neither CT nor the Government (their experts being the ones that disagree with Professor McQuillan, Dr Glover and Mr Southward) have done.

91. Thus, CT and Government are caught on Morton's fork:-

(1) If one adopts a purely numerical analysis, one gets to a rate of 2%, which is well within the capacity of the structure.

(2) There is no evidence to adopt any other basis on which one could analyse, never mind critique, the structure as it is currently built.

92. Therefore, the results of the opening-up process show that the structure is safe.

[159] Au [Day 40:87 (7) – (11)]
[160] McQuillan §47 and 121.
[161] Au [Day 40:86(17)-89(6)]; McQuillan §§90-91.

H. THE KEY QUESTIONS

93. As set out above, the change in detail at the interface of the EWL slab and the east D-wall provided a safe and (the expert consensus is) better design.

94. The only allegation of widespread cutting of the threaded ends of rebar comes from CT and turns on CT's evidence. That evidence is not credible for the reasons set out above. There is no proper basis on which the Inquiry can find there was widespread cutting of the threaded ends of rebar and any such allegation must fail.

95. The vast majority of the rebar is sufficiently embedded: Mr Southward opined that 97% of the connections are sufficiently engaged.[162] This figure would now increase to 97.4% in light of the more recent results of the opening-up process.

96. The structure is therefore safe and there is no persuasive evidence to the contrary before the Inquiry.

97. All the independent design reviews show that the coupled reinforcement connection between the EWL slab and D-wall has 40% spare capacity at the top mat and 50% at the lower mat.[163] There is no evidence to show that either capacity has been exceeded or is close to being exceeded.

98. The above all matches the common sense reality. This Inquiry concerns a structure which has been in place for 3 years, taking 90% of the final load

[162] Southward [Day 42:124(15)-125(3)].
[163] Southward [Day 42:126(5)-(12)].

(the final 10% making no difference)[164] and has had trains operating on the slabs without any signs of deformation or distress.[165]

99. As Mr Southward put it:-[166]

> "Well, I'm saying you've got to look at it from the perspective of where are we now. We are in a situation that the structure is in the ground, it's been built, it's standing up, it's holding its load. The load has been taken up by all of the couplers. The structure is there. It's working. There's no sign of distress. What is the future loading going to be on the coupler? The future loading -- sorry, the future change in loading, that change in loading is actually going to be very small because it's only the live load of the trains on the platform slab, which is almost on top of the diaphragm wall, so the incremental stress change is very small."

100. Leighton respectfully agrees with Professor McQuillan's conclusion set out in §126 of his report:-

> "In conclusion, on the basis of all the evidence available, I am satisfied and in **no doubt** that the structural integrity of the EWL slab has **not been compromised** as a result of changes of detail and sub-standard workmanship incidents, and that there are **no safety issues or concerns**." [emphasis added]

[164] McQuillan [Day 44:120(15) – (18); 157:(7) – (14)]
[165] [Day 42:132(20)-134(16)].
[166] [Day 42:153(7)-(19)].

101. As Professor McQuillan also pointed out in evidence:- [167]

> "And in fact, as Dr Glover has emphasised, the situation is now actually better, because originally the big 3 metre slab was free-spanning. Now, because internal walls and piers have been introduced which are taken down to the NSL slab and hence into foundations, the situation is actually vastly improved and I think we mustn't lose sight of that fact; it's even safer."

I. SYSTEM AND PROCESS

102. There are three issues:-

(1) Supervision;

(2) Record keeping; and

(3) Mr Lumb's investigation and the handling of Poon's complaint.

103. Issues (1) and (2) will be addressed at the same time. Leighton submits that it has substantially complied with its supervision and record keeping obligations. As noted below, there is clear evidence in support of this conclusion.

104. While attempts were made to discredit Leighton in relation to (3), the relevant matters (and Leighton's actions) must be viewed pragmatically and in the actual context in which the decisions were made (rather than

[167] [Day 44:120(19)-(25)].

with the benefit of hindsight and the evidence that is now available to the Commission). In that light, Leighton should not be criticised for its response to Poon's initial allegations.

I.1 General site supervision

105. There were various Site Supervision Plans (**SSPs**) for the platform/track slab works for the Project. See [H10/4487-4625].

106. The SSPs set out the grades of TCPs and their minimum frequency level of site visits.

107. Leighton has prepared charts (**Annex 1** to these submissions, which has been provided separately) which show that Leighton's nominated TCPs under the different SSPs conducted site visits at or above the required frequency level. Indeed, many of these staff were present at the site far more frequently or were working there on a full-time basis. The charts at Annex 1 are based upon the site attendance records in the hearing bundle at [C8/5540-5578]. The charts show that Leighton had 50 site supervision and engineering staff involved in the supervision of the works during 2015 to 2016 (ie the relevant period of construction).

108. There is no doubt that Leighton nominated appropriately qualified people to act as TCPs under the SSPs. This is demonstrated by **Annex 2** to these submissions (provided separately) which sets out the qualifications and experience of all relevant TCPs.

109. The charts at Annex 1, and the summary at Annex 2, demonstrate that Leighton has complied with the general supervision requirements under the SSPs and the BD consultation letters.[168]

110. The relevant requirements that applied to Leighton under the SSPs and BD consultation letters are summarised in the table at **Annex 3** to these submissions (provided separately).

I.2 Supervision/inspection of coupler connections and record keeping

111. The BD consultation letters [169] impose additional obligations in relation to the installation of mechanical couplers:-

(1) For couplers with a ductility requirement:-

(a) the RGBC (Leighton) / RSC (Intrafor) should assign a quality control coordinator to provide full time on site supervision of the works and devise inspection checklists. The minimum qualifications and experience of the quality control coordinator is grade TCP T3;

(b) the names and qualifications of the supervisory personnel representing the Competent Person (MTRCL) and RGBC (Leighton) / RSC (Intrafor) respectively should be recorded in an inspection log book. The date, time, items inspected and inspection results should be clearly recorded in the log book.

[168] [C13/8229 ff].
[169] [C13/8229 ff].

The log book should be kept at the site office and, when required, produced to the BD for inspection; and

(c) a quality supervision plan (QSP) of the Competent Person and the RGBC (Leighton) / RSC (Intrafor) is required to be submitted to BD prior to the commencement of the mechanical coupler works.

(2) For couplers without a ductility requirement:-

(a) the RGBC (Leighton) / RSC (Intrafor) should assign a quality control coordinator to provide full time on site supervision of the works and devise inspection checklists. The minimum qualifications and experience of the quality control coordinator is grade TCP T1; and

(b) the names and qualifications of the supervisory personnel representing the Competent Person (MTRCL) and the RGBC (Leighton) / RSC (Intrafor) respectively should be recorded in an inspection log book. The date, time, items inspected and inspection results should be clearly recorded in the log book. The log book should be kept at the site office and, when required, produced to the BD for inspection.

112. Leighton submitted a version of the QSP to MTRCL that was expressly stated to apply to the "diaphragm wall and barrettes".[170] It was substantially similar to the version that MTRCL sent to BD and BD subsequently

[170] Lumb [Day 24:135(23)-136(25)] and [Day 24:162(11)-(21)]; Brewster [C27/20107(fn 1)].

approved. The primary exception was that the title of the MTRCL's version had been changed to state that it applied to the "diaphragm walls and platform slabs". MTRCL's version of the QSP was not provided to Leighton. As such, Leighton retained and consulted the version of the QSP that it had submitted to the MTRCL.[171]

113. In any event, both versions of the QSP required the following of the RGBC (Leighton) / RSC (Intrafor):-

(1) Quality Control Supervisors are required to carry out full time and continuous supervision of the splicing assemblies on site. The minimum qualification and experience of the quality control supervisors are grade TCP T3 as stipulated in the Code of Practice for Site Supervision;

(2) Supervision and inspection should be recorded in the Record Sheet (Appendix C to the QSP) and written in the inspection log book by Quality Control Supervisors; and

(3) Checking includes length of thread and correct connection of the rebar with the couplers. Criteria are provided in Appendix D to the QSP.[172]

114. The evidence before the Commission indicates that Intrafor as RSC supervised the installation of the couplers used in the D-walls [173] and Leighton supervised the installation of the couplers used in the slabs

[171] Lumb [Day 24:140(12)-(18)].
[172] See Item 9 of Annex 3.
[173] Gillard [F1/38:33. 153-159]; Lumb [Day 24:161:10-17].

(including the connection of bars in the slabs to the horizontal couplers in the D-walls). Having said that, Leighton also conducted formal inspections of the reinforcement installed in the D-walls with MTRCL. In this way, multiple checks were performed by Intrafor, Leighton and MTRCL on the reinforcement in the D-walls.[174]

115. Under the BD consultation letters, the QSP [175] only applies to couplers with a ductility requirement despite all experts agreeing that there was no requirement for ductility couplers.[176] It is thus important to distinguish between the couplers which were subject to a ductility requirement and those that were not. Leighton was only obliged to satisfy the higher supervision standards applicable couplers with a ductility requirement under the BD consultation letters and the QSP.

116. In this context, it is necessary to consider whether the couplers under Leighton's supervision (those in the slabs and the horizontal couplers in the D-walls) were subject to a ductility requirement.

117. The Commission has received conflicting evidence and submissions as to whether the horizontal couplers in the D-Walls were subject to a ductility requirement.

118. As explained below, Leighton submits that the better view is that almost all of the horizontal couplers in the D-walls that were connected to bars in the EWL and NSL slabs were not subject to a ductility requirement.

[174] Speed [C12/7607(48f)].
[175] [C13/8310 ff].
[176] Joint Expert Memorandum §1.

119. In any event, there is no doubt that the couplers installed in the EWL and NSL slabs (between the construction joints in the slabs) were not subject to a ductility requirement. This was confirmed by the witness evidence and was not challenged by any of the parties.[177]

120. In relation to the horizontal couplers installed at the intersection of the D-walls and the slabs, the best evidence as to whether such couplers were subject to a "ductility requirement" comes from Atkins' working drawings at the time of the construction of the slabs. These drawings represent the only contemporaneous records on the subject. They were the only documents issued by the designers to Leighton at the time of construction of the slabs that indicated the location of couplers that were subject to a ductility requirement (i.e. those couplers within the "ductility zones" shown on the drawings).

121. Various lay witnesses expressed differing views on this topic. This was hindsight opinion evidence and to be discounted.

122. The extent of Leighton's supervision obligations can only be properly determined by looking at the working drawings that Leighton was expected to follow at the time of construction.

123. Importantly, Atkins' working drawings show the location of "ductility zones" in the D-wall panels.[178]

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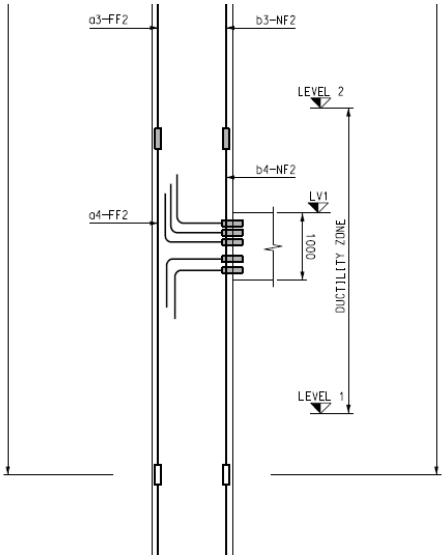
[177] Lumb [Day 24:135(23)-136(25); 162(11)-(21)]; Brewster [C27/20107 (fn 1)].

[178] See the typical drawings of the cross-section of the D-walls (showing the intersection of the both NSL and EWL slabs) for each area of the slabs in the drawings folder [C13/8228]: (1) Area A: 1112_W_HUH_ATK_C12_688A; (2) Area B: 1112_W_HUH_ATK_C12_820A; (3) HKC: 1112_W_HUH_ATK_C12_645A; (4) Area C1/2: 1112_W_HUH_ATK_C12_622A (5) Area C3: 1112_W_HUH_ATK_C12_620A.

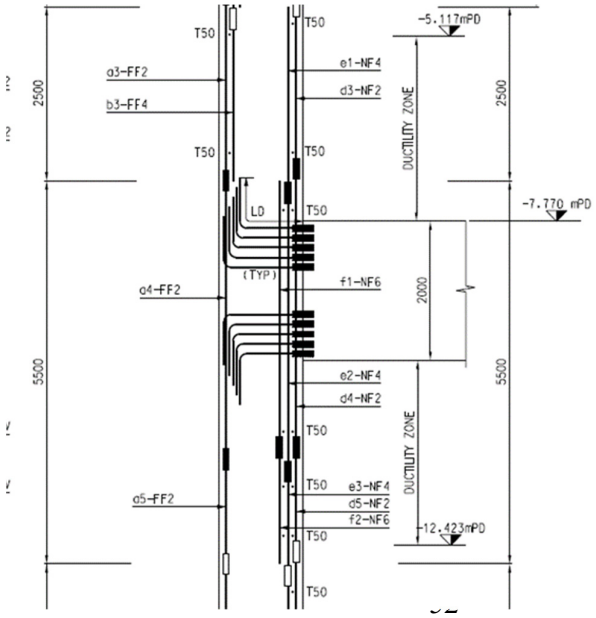
124. This is reflected in the following extracts (at Figures 1 and 2) from Atkins' working drawings which show the intersection of the slab and the D-walls in Areas A and B of the NSL slab respectively.

Figure 1 – NSL Area A – Drawing 1112/W/HUH/ATK/C12/721 Rev.A, Panels WH8 & WH9. Ductility zone <u>includes</u> the intersection of the slab with the D-wall:-



DUCTILITY ZONE INCLUDES THE SLAB PORTION OF D-WALL

Figure 2 – NSL Area B – Drawing 1112/W/HUH/ATK/C12/629 Rev.A, Panel WH48, Ductility zone <u>does not include</u> the intersection of the slab with the D-wall:-

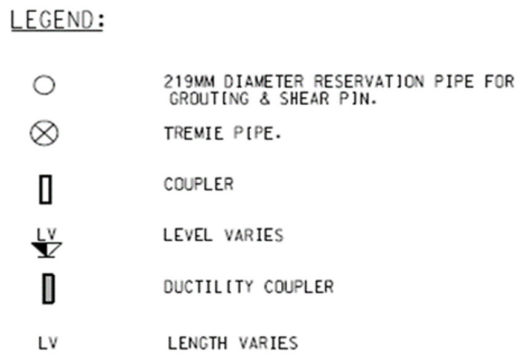


DUCTILITY ZONE ONLY ABOVE AND BELOW THE SLAB PORTION OF D-WALL

125. Notably, the legend for the couplers that are shown in these drawings (to the extent that the legend was shown at all in the working drawings) indicate that "ductile couplers" were intended to be used at all points in the D-wall above the lowest level of the first "ductility zone". This is clear from a comparison of Figures 1 and 2, which indicate that "ductile couplers" were used both inside and outside of the "ductility zones" but always above the lowest level of the first "ductility zone". It follows that the reference to "ductile couplers" in the legend must refer to (or at least could be reasonably interpreted as referring to) the nature of the coupler to be used, not whether the coupler was subject to a ductility requirement.

126. The legend used in the relevant Atkins' working drawings for both the EWL and the NSL slabs is as follows:-

Figure 3 - Legend for Couplers shown in the Atkins' Working Drawings



127. Counsel for the Government attempted in cross-examination to suggest that Atkins' working drawings showed that the horizontal couplers in the D-wall that were connected to bars in the EWL and NSL slabs were subject to a ductility requirement.[179] They did this by pointing to the legend for the couplers in the drawings (as shown in Figure 3) but they failed to consider

[179] Lumb [Day 25:6(23)-8(7)].

the relevance of the ductility zones. This suggestion was incorrect. It misinterpreted the legend and did not take into account the "ductility zones" marked in the drawings (see above). It should be dismissed along with any submission made to the same effect.

128. In fact, ductile couplers were used at all locations in EWL and NSL slabs and at the intersection of D-wall and the slabs.[180] They were also used in the D-wall above the lowest level of the "ductility zones" marked in Atkins' working drawings. This is consistent with the interpretation of the legend (at Figure 3) in Atkins' working drawings set out above).

129. The following tables at **Figure 4** summarise the key details from Atkins' working drawings for each area of the EWL and NSL slabs. In particular, they show whether: (a) "ductility zones" appear in the drawings of the D-wall panels for each area of the EWL and NSL slabs during the period of construction (from the first pour date to the last pour date for that area of the slabs); (b) any such "ductility zones" in the drawings include the intersection of the D-walls and the slabs; and (c) the coupler legend at Figure 3 above (indicating whether a "ductile coupler" should be used at a location) appear in the drawings.

[180] Lumb [Day 25:8(17)-(25)].

Figure 4 - Summary of "ductility zones" and coupler legends shown in Atkins' working drawings during construction of EWL and NSL slabs

Figure 4.1 - EWL Slab

EWL Slab Pour	Area A	HKC	Area B	Area C1/C2	Area C3
Date of first pour in area (**First Pour**)	16-May-15*	11-Jul-16*	25-Nov-15	30-May-15	24-Oct-15
Date of last pour in area (**Last Pour**)	24-Jul-15*	16-Aug-16*	12-Jan-16	23-Dec-15	28-Dec-15
% of drawings showing ductility zones in d-wall at First Pour	0%	70% (18/26)	62% (23/37)	0%	0%
% of drawings showing ductility zones in d-wall at Last Pour	0%	70% (18/26)	62% (23/37)	0%	0%
% of drawings showing ductility zones in d-wall that include intersection of slab and d-wall at First Pour (e.g. Fig. 1)	**n/a***	**n/a***	**0%**	**0%**	**0%**
% of drawings showing ductility zones in d-wall that include intersection of slab and d-wall at Last Pour (e.g. Fig. 1)	**n/a***	**n/a***	**0%**	**0%**	**0%**
% of drawings showing coupler legend at First Pour (e.g. Fig. 3)	0%	100% (26/26)	86% (32/37)	0%	63% (28/45)
% of drawings showing coupler legend at Last Pour (e.g. Fig 3)	37% (15/41)	100% (26/26)	86% (32/37)	67% (56/85)	63% (28/45)

*The EWL slab in Area A and HKC is connected to the D-wall via a capping beam. Ductility zones (where indicated) stop at the soffit of the capping beam. There is no reference to ductility on the drawings for the capping beam.

Figure 4.2 - NSL Slab

NSL Slab Pour	Area A	HKC	Area B	Area C1/C2	Area C3
Date of first pour in area (**First Pour**)	3-Mar-16	25-Jan-16	16-Apr-16	31-Dec-15	4-Mar-16
Date of last pour in area (**Last Pour**)	21-May-16	21-Mar-16	18-May-16	26-Apr-16	21-Apr-16
% of drawings showing ductility zones in d-wall at First Pour	0%	0%	62% (23/37)	0%	0%
% of drawings showing ductility zones in d-wall at Last Pour	76% (31/41)	0%	100% (37/37)	0%	0%
% of drawings showing ductility zones in d-wall that include intersection of slab and d-wall at First Pour (e.g. Fig. 1)	**0%**	**0%**	**0%**	**0%**	**0%**
% of drawings showing ductility zones in d-wall that include intersection of slab and d-wall at Last Pour (e.g. Fig. 1)	**76% (31/41)**	**0%**	**0%**	**0%**	**0%**
% of drawings showing coupler legend at First Pour (e.g. Fig. 3)	37% (15/41)	92% (24/26)	86% (32/37)	66% (56/85)	58%% (26/45)
% of drawings showing coupler legend at Last Pour (e.g. Fig 3)	93% (38/41)	92% (24/26)	100% (37/37)	66% (56/85)	58%% (26/45)

130. The tables set out in Figure 4.1 and 4.2 indicate that none of the couplers located the intersection of the D-wall and slabs were subject to a "ductility zone", with the exception of those at the intersection at Area A of NSL slab.

This reflects the rows titled "*% of drawings showing ductility zones in d-wall that include intersection of slab and d-wall at First Pour / Last Pour (e.g. Fig. 1)"* (which have been marked in bold text). These show that 76% (31/41) of Atkins' working drawings for Area A of the NSL slab include "ductility zones" at the intersection of the D-wall and slabs. Thus, Atkins' working drawings indicate that the couplers at the intersection of the D-wall and slabs (other than in Area A of the NSL slab) were not subject to a "ductility requirement" for the purposes of the BD consultation letters and, as a result, were not subject to the QSP.

131. There is no requirement under the BD consultation letters to have a QSP for couplers without a ductility requirement. It follows that the QSP does not apply to the couplers used in the slabs or the horizontal couplers in the D-walls (i.e. that were connected to bars in the slabs). As explained above, the only potential exception would be for those horizontal couplers at the intersection of the D-wall and the NSL slab at Area A. Subject to that exception, the QSP was only relevant to the vertical couplers installed in the D-walls.

132. The above conclusion is consistent with the fact that the Record Sheet (Appendix C to the QSP) for inspections under the QSP references panel numbers, the arrival date of threaded rebar (which is stated to be "Based on Purchase order for each panel from Intrafor") and includes a column titled "Verticality checking for coupled re bars (10% per column)". This indicates that this form was intended to be used for the vertical couplers in the D-walls rather than the horizontal couplers in the slabs or the horizontal couplers in the D-walls which were connected to bars in the slabs.

133. Therefore, Leighton submits that it has complied with its supervision obligations under the BD consultation letters and QSP (to the extent it applied) because:-

(1) Leighton supplied a QSP for the couplers with a ductility requirement alone as it was required to do. There was no need for a QSP for the non-ductility couplers.

(2) Leighton generated check lists for its supervision of the installation of the reinforcement in slabs and the connection of such rebar to the horizontal couplers in the D-walls. This was permitted under the BD consultation letters (see paragraph 111 above) for couplers without a ductility requirement (i.e. almost all couplers installed under Leighton's supervision) and was appropriate given that the checklist in the QSP only applied to vertical couplers.

(3) Under the BD consultation letters and the QSP, a TCP T3 grade engineer is required to provide full time and continuous supervision of the installation of couplers with a ductility requirement. As noted, Leighton was not responsible for supervising couplers with a ductility requirement with the potential exception of the horizontal couplers at the intersection of the D-wall and the NSL slab at Area A. As a consequence, the vast majority of all couplers under Leighton's supervision were not subject to a ductility requirement and could be supervised by a TCP T1 grade engineer. All of Leighton's construction engineering team who supervised the EWL and NSL Slabs were TCP T1 grade. In fact, with the exception of

Sasa Leung (TCP T2) and Man Sze Ho (TCP T1),[181] all members of Leighton's construction engineering team were TCP T3 grade or above: see Annex 2 to these closing submissions for details of the qualifications and experience of Leighton's relevant engineers.

(4) To the extent that Leighton was obliged to use TCP T3 grade engineers to supervise the installation of couplers with a ductility requirement (e.g. at the intersection of the D-wall and NSL slab at Area A), it satisfied this obligation because all of its engineers in the relevant areas were TCP T3 or above. In particular, Patrick Kwong (TCP T4) and Nigel Ho (TCP T4) (who worked full-time on site)[182] supervised the installation of the reinforcement in Area A of the NSL Slab. They signed off on the relevant RISC forms and Quality Control Checklists to record the inspection and approval of the installation of the reinforcement in that area.

(5) Leighton's construction engineering team provided "full time supervision" (as per the BD consultation letters) / "full-time and continuous supervision" (as per the QSP, to the extent that it applied) by making multiple and overlapping sites visits every day (which included routine and formal inspections) and communicating frequently with the sub-contractors.[183] For example, the reinforcement works in Area C of the EWL Slab (which is the only location where Leighton's staff identified and rectified a small

[181] While not strictly relevant as they did not supervise couplers with a ductility requirement, both Sasa Leung and Man Sze Ho worked with and were supervised by Edward Mok (TCP T3) and Andy Ip (TCP T4).
[182] This is confirmed by Leighton's site attendance records. See Annex 1 for details of the site attendance of Patrick Kwong and Nigel Ho for the purposes of the SSPs.
[183] See the evidence of Edward Mok [C12/8109(16)-(27)], Man Sze Ho [C27/20661(6)-(7), (15)-(20)], and Andy Ip [C12/8159(9)].

number of defective rebars) were supervised by four full-time engineers (Andy Ip (T4), Edward Mok (T3), Sasa Leung (T2) and Man Sze Ho (T1). Andy Ip worked at least 10 hours per day on site or in the site office and conducted routine inspection once per day for 1 to 2 hours. Edward Mok, Man Sze Ho and Sasa Leung worked at least 10 hours on site or in the site office and conducted routine and formal inspections for 2 to 4 hours per day.[184] This amounts to a collective total of up to 14 hours spent conducting inspections each day. There were also other Leighton staff who were supervising, including foreman, site agents, sub agents, such that there could be at least six Leighton staff in the area.[185]

(6) Leighton's construction engineering team also ensured that RISC forms and Quality Control Checklists were completed and signed to record all formal inspections of the reinforcement (i.e. rebar fixing checks and pre-pour checks) for the EWL and NSL Slabs.

(7) Leighton's sub-contractor, BOSA, inspected and verified the threaded length for each rebar and kept records of this exercise.[186] Leighton retained these records on site In addition, Leighton's engineers visually inspected the rebars when they were delivered to the slabs for installation.[187]

134. Setting aside the technical requirements of the BD consultation letters (which Leighton has complied with in any event), Leighton had many

[184] Edward Mok [C12/8110(18)-(27)] [Day 21:24(23)-25(16)]; Man Sze Ho [C27/20660(5)-(7)] [Day 22:7(9)-(20); 37(11)-(25)].
[185] Khyle Rodgers [Day 15:41(5)-(11)].
[186] [C13/8315]; [C13/8324]; Paulino Lim [Day 36:111(5)-(6)].
[187] Edward Mok [Day 21:90(1)-(5); 121(9)-(18)].

experienced construction professionals and engineers working full-time on site performing both general supervision of the works and dedicated supervision of the installation of the reinforcement. Annex 1 shows that 50 such professionals were engaged in the supervision of the works during 2015 to 2016 (i.e. the relevant period of construction). The evidence before the Commission confirms that Leighton's engineers checked every coupler connection in accordance with BOSA's requirements (i.e. a visual inspection to confirm that no more than 2 threads were exposed out a coupler).[188] Leighton also kept multiple records to confirm that such inspections were completed and that the coupler connections were assessed to be satisfactory by Leighton's engineers and MTRCL's engineers / Inspectors of Works.[189]

135. The Commission received conflicting opinion evidence as to the meaning of the terms "full-time supervision" (as per the BD consultations) or "full-time and continuous supervision" (as per the QSP). The Joint Statement of Project Management (**PM**) Experts (at §26) pointed out that full time and continuous supervision does not mean man-marking. This was the only expert evidence on the issue.

136. Neither the consultation letters nor the QSP are statutes; they are also not drafted with the precision one would see in a contract prepared by a lawyer. Further, both must be applied in the context of day-to-day operations on a construction site. A pragmatic rather than literal approach to their meaning must be adopted.

[188] Edward Mok [Day 21:17(20)-18(6)]; Man Sze Ho [Day 22:10(24)-11(3)].
[189] Speed [C11/7609(48)]; Edward Mok [C12/8111-8112/(24)]; Man Sze Ho [C27/20662-20663(16)].

137. Further, if an exceptionally literal meaning were to be adopted that would amount to "man marking" which, as per the Joint PM Expert Statement (at §26), is not what construction professionals would take the terms to mean. Man-marking would also be entirely impractical and require a substantial increase in the number of qualified engineers assigned to the supervision of the reinforcement.[190] As the Chairman rightly pointed out during the cross-examination of Mr Brewster, "common sense dictates it doesn't mean standing there all day long, watching each and every coupler";[191] see also the Chairman's exchange with Mr Gabriel So, remarking that one supervisor for one worker is "counter-productive".[192] Even the witnesses for the Government (whose representatives adopted a literal interpretation of the term in cross examination) accepted that "man marking" was not feasible and could not have been required.[193] At the very least, the term "full-time and continuous supervision" is "confusing", is "vague and open to debate", and is not a specific term in the industry.[194]

138. Leighton instead submits that a robust, common sense meaning must be given to the words but one that also accepts that there would be an element of judgment in deciding what supervision was required at that time and in relation to what work. If that is done, the words should be interpreted to require that sufficient full-time staff were deployed to supervise the works.

139. On any reasonable interpretation of these terms, Leighton must be found to have substantially satisfied its supervision obligations. This reflects the

[190] Lumb [Day 25: 58(8)-13]; Plummer [Day 14: 45(13)-(15)]; Zervaas [Day 17:150(6)-(7)]; Brewster [Day 22:98(4)-(12), 102(20)-(25)] [Day 23:29(23)-31(23)].
[191] Brewster [Day 23:31(10)-(13)].
[192] [Day 18:135(14)-(19)].
[193] Humphrey Ho [Day 37:88(24)-89(1)]: "We are not saying that the entire process of each coupler connection should be watched over by one man. That is not the actual requirement."
[194] Brewster [Day 23:29(23)-31(9)].

fact that Leighton deployed teams of full-time engineers in each area of the EWL and NSL slabs to conduct such supervision on a daily basis. They spent many hours in the working area of the site each day and worked long hours generally (see paragraph 133 above).

140. The results of the opening-up also support the conclusion that Leighton's engineers substantially satisfied their supervision obligation. For example, the BOSA Manual shows that the test to be adopted when inspecting couplers connections is to visually confirm that no more that two threads on the rebar are exposed out of the coupler. If one then looks at the results of opening up, the vast majority of the coupler connections would pass this test. Unless it is suggested for the first time now that there should be some form of ultrasound or X-ray testing during the supervision and inspection on site during construction (which makes no sense), the only inference that can be drawn is that Leighton's supervision and inspection system worked and the reinforcement installed in the works is safe.

141. Further, to the extent that there is or was confusion arising from whether a QSP did or should relate to those couplers with and/or to those couplers without a ductility requirement, that confusion flows from BD having two different regimes which would apply to the same structure and to couplers that could be in close proximity. Allied to this is the fact that Leighton cannot be criticised if the regulatory regime is unclear, ambiguous or complex to apply.

142. While it is submitted that the matter is made clear by reference to Atkins' working drawings, Leighton should not be subject to criticism as a result of any confusion or disagreement as to whether the couplers under its

supervision were subject to a ductility requirement, and therefore, whether the QSP was applicable.

143. Leighton makes this submission because much of the cross-examination from the Government seemed to be based on the false premise that all of the horizontal couplers located at the intersection of the D-wall and the slabs were subject to a ductility requirement. Frontline engineers were asked whether they had read the QSP, rather than first determining whether the QSP was applicable to the areas for which they were responsible.[195] The Government also asked questions as to whether Leighton's engineers who supervised the installation of the reinforcement were TCP T3 grade (which is only required for the supervision of couplers with a ductility requirement) before ascertaining whether the individuals were allocated to areas which included couplers with a ductility requirement.[196] In turn, the Government proceeded on the incorrect basis that the higher supervision standards under the BD consultation letters and the QSP applied to all such couplers. No attempt was made by the Government, for example, to consider the lower supervision standards that apply to couplers without a ductility requirement (e.g. which would not include the QSP).

144. There was also no critical examination or appreciation by the Government of the fact that the QSP provided by Leighton only applied to couplers with a ductility requirement. Nor was there any concerted attempt to identify the location of such couplers. As a result, many of Leighton's witnesses were asked if they had read the QSP without any effort being made to establish whether the QSP was relevant to the areas of the slabs for which those witnesses were responsible. In fact, the QSP was not applicable to the

[195] See, for example, Andy Ip [Day 20:29(18)-30(9)] and Edward Mok [Day 21:13(14)-(18)].
[196] Joe Leung [Day 20:14(1)-(5)].

responsible areas of witnesses from Leighton's construction engineering team. The QSP was also not relevant to Leighton's site supervision team because that team was not directly responsible for the supervision of the coupler connections under the BD consultation letters (as noted, this supervision was performed by members of Leighton's construction engineering team). Therefore, it is to be expected, and is not a problem, that these witnesses answered that were not familiar with or had not read the QSP. No negative inference should be drawn from such responses.

145. As explained, Area A of the NSL is the only location on the slabs where couplers with a ductility requirement were located on Atkins' working drawings. None of Leighton's engineers from that area were cross-examined. It follows that Leighton cannot be criticised for the fact that its witnesses were not familiar with supervision requirements that did not apply to their work on the slabs. Two points follow.

146. First, care must be taken to ascertain whether one is talking about obligations relating to couplers with a ductility requirement or without a ductility requirement and not to confuse the two. This care must be redoubled when examining the Government's cross examination, so that evidence which relates to one type of couplers (couplers with a ductility requirement) is not applied to the other (couplers without a ductility requirement). Where that distinction cannot be drawn, conclusions must either not be drawn on the cross examination or be drawn with considerable circumspection.

147. Second, the Government has no answer to this difficulty. The Government devised the requirements and imposed them. The Government's bind is solely of the Government's making.

148. As an associated issue, as Leighton has previously submitted, there are further issues as to the approach the Government has adopted in this Inquiry. This is not, again as previously pointed out, anything to do with the Government's role in responding to its Salmon letter.

149. The Government has, outwith this Inquiry, imposed regulatory sanction against Leighton, a sanction that the Government has not reconsidered or withdrawn even as events have unfolded in this Inquiry. The legitimacy of this sanction forms no part of the Inquiry's remit. The Government's actions in relation to this sanction are however relevant to the Inquiry's function and its approach to the evidence as follows:-

(1) The Government cannot be presumed, at least, in relation to Leighton, to be a wholly neutral, unimpassioned party.

(2) Distinctions must be drawn between legitimate concerns raised by Government (defending Government from criticism and the public interest under its own Salmon letter) and other concerns or purposes outside the remit of this Inquiry.

150. Leighton complied with the requirements to keep a log book to record the names and qualifications of supervisory personnel for couplers by (in addition to the "log book" maintained by Intrafor):-

(1) producing and updating organisational charts, which recorded the details of Leighton's construction engineering teams who supervised

the installation of the reinforcement (including the engineers who conducted routine and formal inspections of the reinforcement);[197]

(2) producing the SSPs, which recorded the names and qualifications of Leighton's nominated TCPs; [198]

(3) completing both MTRCL's prescribed RISC forms and Leighton's Quality Control Checklists which recorded the names and positions of Leighton's engineers who conducted the inspections; and

(4) retaining copies of the organisational charts, SSPs, RISC forms and Quality Control Checklists at the site office and on Leighton's electronic record management system (which was accessible from the site office).

151. Leighton complied with the requirements to record the supervision and inspection of couplers by way of the following (in addition to the log book maintained by Intrafor):-

(1) BOSA's thread preparation records (i.e. in the form at Annex C to the QSP);

(2) Leighton's Quality Control Checklists;

(3) MTRCL's prescribed RISC forms, which set out (inter alia) the date, time and result of the formal inspections for rebar fixing and pre-pour checks;

[197] [C7/5530-5539].
[198] [C13/8336-8341].

(4) Leighton's site attendance records, which show when its construction engineering team were on site; and

(5) retaining copies of BOSA's thread preparation records, Leighton's Quality Control Checklists, MTRCL's RISC forms and site attendance records at the site office and on Leighton's electronic record management system (which was accessible from the site office).

152. While these records were not kept in a physical "log book", this term cannot reasonably be interpreted to require Leighton to somehow condense all of the relevant information into a book format. It would be entirely impractical, not to mention an unnecessary duplication of work, for Leighton to do so when it had established other systems to retain the records and ensure that they were accessible for BD.

153. Finally, there is plainly nothing sinister (however undesirable) in the retrospective creation of as-built records. Leighton's letter to the BD in August 2018 made clear that they were not contemporaneous.[199] There is no suggestion that the inspections did not take place. In addition, Leighton produced recent as-built records for the reinforcement at the specific request of MTRCL.[200] It would be unfair for Leighton to be criticised for the production of these records in the circumstances.

I.3 Mr Lumb's investigation

154. Mr Lumb's investigation into Poon's complaint must be put into context.

[199] [C35/26699-26701].
[200] Lumb [Day 24:152(23)-153(7)].

155. In particular:-

(1) Mr Lumb was dealing with an allegation made out of the blue.

(2) The investigation was intended to be independent of any person involved at site and undertaken within a limited timeframe.

(3) Poon was perceived as a troublemaker. The Commission has observed him for days. It is readily understandable – on a human level – why it might have been regarded as futile and unhelpful to interview him.

(4) If Poon's evidence is incredible (as we have demonstrated above), then interviewing Poon at that time would have changed nothing and anything that can be said about what would have happened if he had been interviewed is an hypothetical abstract.

(5) The most that can be said is that had Leighton investigated the matter by interviewing Poon as well, Poon would have, presumably, advanced then the same evidence he advances now. To the extent that evidence would have been credible, Leighton repeats its submissions above. To the extent that Poon would have been content to let the allegations rest there, the Commission has had the benefit of observing Poon and can draw the appropriate inferences.

I.4 Conclusions regarding systems and process

156. Leighton's position is therefore fivefold.

157. First, the systems in place worked – in the sense that a safe structure has been built.

158. Second, if valid criticisms are made under any of these three heads, they pale into insignificance when compared with the serious but baseless allegations made by Poon and CT which were the genesis of this Inquiry.

159. Third, criticisms by the Government of Leighton must be treated with considerable scepticism (for the reasons set out above).

160. Fourth, it would be a very rare large-scale construction project where problems in record keeping did not emerge particularly where the project is placed under the microscope of a public inquiry.[201] Mr Huyghe pointed out that Leighton's quality plan is "very detailed" and he had not seen others that are basically any better.[202]

161. Fifth, the criticisms under this head amount to this: had there been full and detailed log book entries of the inspection of each and every coupler, one may have been better able to summarily refute Poon's allegations. Having said that, Leighton did have multiple records showing that the reinforcement (including the coupler connections) had been formally inspected and approved by both Leighton's engineers and MTRCL's engineers / Inspectors of Works but that did not prevent the effort and expense of this Inquiry or false allegations being made against Leighton. It follows that such records are unlikely to have made any difference to the current situation. As noted, Leighton submits that it satisfied its supervision and record keeping requirements. Any suggestion that Leighton's systems

[201] Aidan Rooney [Day 28:87(23)-89(12)].
[202] [Day 39:40(19)-(22)].

and process should have been rigourous is not justified in the current circumstances. Leighton should not be criticised in this regard.

J. BD SUBMISSION FOR DESIGN CHANGE

162. Despite voluminous questioning from the Government, what is clearly not in issue for the purpose of this Inquiry within its Terms of Reference is what paperwork or documentary process should have been gone through under the IoE/BO regime. As discussed on [Day 42:64(5)-(22)], that is a matter for a different arena/forum.

163. But likewise what is not (or should not be) in issue is that:-

(1) MTRCL approved the change in detail;[203]

(2) the use of couplers or continuous rebars is interchangeable under the applicable Code of Practice in Hong Kong and internationally, and is a change in "detail" rather than "design";[204]

(3) there were limited changes on the design, giving spacing and size remained unchanged and the only difference was replacement of couplers with continuous rebars;[205]

(4) TQ 34 was raised (on Panel EH74)[206] and approved by MTRCL and Atkins, and followed in execution by concreting the hacked-off

[203] Kit Chan [B1/272-282(29)-(58)].
[204] Southward §§8.1-8.6.
[205] Edward Mok [Day 21:110(3)-(12)].
[206] [C27/20829-20830].

portion of the D-wall, the EWL slab and the OTE slab "in one go" (i.e. monolithically), and subsequently applied to other panels;[207]

(5) Leighton provided sufficient information for MTRCL to make a submission to BD on the design changes;

(6) it was not for Leighton to consult BD and it has always been done by MTRCL with which the responsibility on consultation rests; [208] and

(7) as accepted by Counsel for the Government,[209] the substance of the intended change had been made known to the BD in the design report by design report TWD-004B3.[210]

164. Further, it is not or should not be in dispute that there would always be a submission to BD once the structure was completed.[211] Leighton submits that the changes in detail under consideration here can and should be resolved by that route.

[207] Kit Chan [B1/277(41)].
[208] Buckland [C27/20804(18)-(19)].
[209] [Day 2:111(21)-112(3), 114(1)-(5)].
[210] [C18/12718].
[211] Lee Tze Man (MTRCL) Day 32:38(20)-41(5) Humphrey Ho (Government) [Day 37:80(2)-81(15)]; Lok (Government) [Day 38:19(4)-(16)].

165. There have been attempts to suggest that the change in detail was not included in the submission to the BD because of a desire not to alert the BD to the change.[212] The evidence does not support that case and the fact remains that the revised detail is at least as safe as the one it replaced if not superior to it.

Dated 27 January 2019.

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[212] See, for example, Buckland [Day 23:127(13)-(18)].