COMMISSION OF INQUIRY

INTO THE CONSTRUCTION WORKS

AT AND NEAR THE HUNG HOM STATION EXTENSION

UNDER THE SHATIN TO CENTRAL LINK PROJECT

("the SCL Project")

("THE COMMISSION")

(formerly 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 ADDRESS FOR THE EXTENDED INQUIRY

BY COUNSEL FOR THE COMMISSION

(in respect of the Substantive Hearing commencing on 27 May 2019 and concluding on 17 June 2019 and convened to hear the factual evidence concerning the Extended Inquiry)

References below to, for example, **[BB1/1]** are references to the bundle number/page number of the documents prepared for the Substantive Hearing, references to, for example, [**B1/100]** are references to the bundle number/page number of the documents prepared for the Original Inquiry and references to, for example, **[T/Day6/84:9-15]** are references to the Transcript/Day 6/page 84 at lines 9 to 15.

A. THE COMMISSION

1. On 10 July 2018, the Commission was appointed by the Chief Executive in Council of the Hong Kong SAR under section 2 of the Commissions of

Inquiry Ordinance (Cap. 86) ("**the Ordinance**") **[AA1/2-13]**. The appointed Chairman and Commissioner was Mr. Michael Hartmann, with Professor Peter Hansford as Commissioner. Pursuant to its original Terms of Reference, the Commission submitted an Interim Report to the Chief Executive on 25 February 2019 ("**the Commission's Interim Report**").

2. On 19 February 2019, in exercise of the powers conferred by section 3 of the Ordinance, the Chief Executive in Council expanded the original Terms of Reference by adding paragraph (a)(2) thereto. The Expanded Terms of Reference ("**Expanded ToR**") of the Commission will be found at **AA1/1**.

3. The matters set out in the Expanded ToR will be addressed as and are referred to herein as the "**Extended Inquiry**". The part of the Inquiry covered by the original Terms of Reference is referred to as the "**Original Inquiry**".

B. SOME BASIC GEOGRAPHY

4. The Extended Inquiry has extended the geographical areas with which the Commission is concerned. The Original Inquiry was focused on the track and platform slabs at the Hung Hom Station Extension. The Extended Inquiry is concerned with the North Approach Tunnels ("**NAT**") area which includes the Shunt Neck, the South Approach Tunnels ("**SAT**") area and the Hung Hom Sidings ("**HHS**") area. Diagram 3 on page 16 of the Commission's Interim Report gives an overview of the general location of all relevant areas. For present purposes, however, it is necessary to look at the newly introduced areas in a little more detail.

5. So far as the NAT is concerned, amongst the numerous layout plans and drawings available in the hearing bundles, the Commission's legal team makes reference to the Appendices to the witness statement of Fu Yin Chit, Michael, MTRCL's Construction Manager-SCL Civil of the SCL Project ("**Mr. Michael Fu**") [**BB1/85-91**]. Thus, Appendix A [**BB1/85**] shows the NSL Tunnel (in green) coming from the direction of Ho Man Tin Station; the EWL Tunnel (in pink) and the Shunt Neck (in blue). Importantly, on the left hand side of Appendix A, is a black-dotted line which delineates the Contract 1112 works (with which the Commission is concerned) and the Contract 1111 works (with which the Commission is not directly concerned). Work to the right of the black-dotted line was carried out by Gammon-Kaden SCL 1111 Joint Venture ("**GKJV**") and work to the left by Leighton. MTRCL was, of course, the Project Manager under both Contract 1111 and Contract 1112.

6. As the Commission is aware, **Issue 1** (see further below) is concerned with three stitch joints in the NAT (collectively referred to as "**the Stitch Joints**") and **Issue 2** is concerned with a construction joint (originally designed as a stitch joint) in the Shunt Neck. Appendix C to Mr. Michael Fu's witness statement [**BB1/89**] shows two of the stitch joints at the NSL Track Level. The first stitch joint is at the interface of Contract 1112 and Contract 1111 and is called "**the 1111/1112 NSL Stitch Joint**" or "**Joint 1"**. The second stitch joint is 'internal' to Contract 1112 and is called "**the 1112/1112 NSL Stitch Joint**" or "**Joint 2"**. Appendix C [**BB1/90**] shows the third stitch joint at the EWL Track Level at the interface of Contract 1112 and Contract 1111 which is called "**the 1111/1112 EWL Stitch Joint**" or "**Joint 3**". The same

drawing also shows the location of **the 1111/1112 Shunt Neck Joint** at the interface of Bay 3 (constructed by Leighton under Contract 1112) and the Contract 1111 works.

7. In broad terms, and as explained in more detail later, the Stitch Joints were required because either the two concrete structures to be connected were built on different foundations (the 1112/1112 NSL Stitch Joint) or the two structures were constructed at materially different times (the 1111/1112 NSL Stitch Joint and the 1111/1112 EWL Stitch Joint). Further, it is not in dispute that, pursuant to Appendix Z2 (Interfacing Requirements Specification with Civil Contracts) to Contract 1112 between MTRCL and Leighton [**BB1/420-432**], all of the stitch joints and the construction joint referred to above were required to be constructed by Leighton under Contract 1112. It is also common ground that Drawing No. 1112/B/000/ATK/C11/101A at Note 2 [**BB1/463**], which sets out typical tunnel stitch joint details at the NAT Tunnels, provided the following contractual requirement namely:

> "*The stitch joint shall be cast as late as possible in the construction sequence, and preperrably (sic) after groundwater recharge, to minimise the amount of differential movement after casting. Casting of the stitch joint shall not be carried out until after completion of backfilling*."

Whilst the relevant contractual requirements are accurately set out at §19 of MTRCL's Closing Statement, the precise basis used to determine whether the contractual criteria had been met such that the construction of the stitch joints could go ahead remains unclear. It is apparent, however, that the

structures to be stitched were monitored for differential settlement by Leighton, the monitoring data would be submitted to the surveying and/or construction engineering teams at MTRCL and ultimately a joint decision would be reached between MTRCL and Leighton as to when the conditions were appropriate to allow commencement of the construction of the Stitch Joints.[1] It is submitted that, on the basis of the evidence adduced, there is no reason to doubt that the criteria had been met and and no good reason to suggest that the Stitch Joints and the Shunt Neck Joint had been commenced prematurely.

8. With regard to the construction of the Stitch Joints, it appears from the rebar fixing and concrete pour dates information provided [**BB8/5226.3 & CC1/280**] that the sequence of construction is the base slab, followed by the walls and then the roof (although the 1111/1112 EWL Stitch Joint does not have a roof). As explained further at §81 below, it is probably possible to determine (at least approximately) how many 'hold points' are (or are supposed to be) involved in the construction sequence of the Stitch Joints by reference to the number of RISC forms that ought to have been issued in respect thereof.

C. <u>FACTUAL BACKGROUND TO THE EXTENDED INQUIRY</u>

9. Shunt Neck Bay 3 at the interface between Contracts 1111 and 1112 was constructed between 4 January 2017 and 22 March 2017 **[BB1/66/§7(d), BB8/5226.3 and CC1/280]**.

[1] Evidence of Mr. Michael Fu [**T/Day 10/97-100**].

10. The original 1111/1112 EWL Stitch Joint commenced construction on 22 January 2017 and the concrete pour of the base slab took place on 24 January 2017. The commencement, completion and concrete pour of the west wall apparently took place on 25 January 2017, and the commencement and completion of the east walls was 19 January 2017 and 28 January 2017 respectively with the concrete pour taking place on 22 March 2017 **[BB8/5226.3]**.

11. The original 1112/1112 NSL Stitch Joint was constructed between 29 May 2017 and 9 September 2017 **[BB1/65/§7(b), BB8/5226.3 and CC1/280]**.

12. The original 1111/1112 NSL Stitch Joint was constructed between 5 July 2017 and 2 August 2017 **[BB1/65/§7(a), BB8/5226.3 and CC1/280]**.

13. MTRCL observed water seepage at the newly completed 1111/1112 NSL Stitch Joint during a routine inspection in August 2017 **[BB1/168/§2.1]**. (The plan and photos showing the location of this water seepage can be found at Appendix B to MTRCL's '*Report of Defective Works Identified at Tunnel Stitch Joints at Contract 1112, Shatin to Central Link*' dated 26 March 2018 **[BB1/182-184]**.)

14. In October 2017, Leighton was required to carry out grouting work to seal up the water seepage. The process was repeated but the outcome was not effective **[BB1/168/§2.2]**. A photo showing the grouting work can be found at **[BB1/185]**.

15. On 22 December 2017, MTRCL issued to Leighton NCR 066 in respect of the water leakage and cracks identified at the 1111/1112 NSL Stitch Joint [**CC3/1310**].

16. Further, minor separation gaps were observed at the water seepage location **[BB1/168/§2.3, 183 & 184]**. On 9 January 2018, MTRCL instructed Leighton to install settlement markers and tell-tales to monitor the movement of the tunnel structure and the gap width respectively.

17. HyD/RDO was first alerted to the water seepage problem at the 1111/1112 NSL Stitch Joint by MTRCL by way of SCL Project Report for the period 1 to 28 January 2018 submitted on 31 January 2018 (Item 2.9.2) **[DD1/38.80, Item 1 & 38.112]**.

18. On 5 February 2018, by reference to the tell-tale installed, obvious separation of a few millimetres gap was observed at the 1111/1112 NSL Stitch Joint **[BB1/168/§2.3**]. An investigation was carried out between 6 and 8 February 2018 [**BB1/168/§2.4**] or between 7 and 14 February 2018 [**CC1/75/§21**] by chipping off 3 locations of concrete surface at the tunnel wall and roof, exposing the rebar at the stitch joint. It revealed that a significant number of rebar were not properly connected, or were not connected at all, into the couplers **[BB1/168/§2.4 & CC1/75/§21]**.

19. On 9 February 2018, MTRCL issued to Leighton NCR 095 in respect of (again) the 1111/1112 NSL Stitch Joint and the 1111/1112 EWL Stitch Joint. [**CC3/1322**]

20. Between 9 and 14 February 2018 [**CC1/75/§23**], with the consent of MTRCL, Leighton broke holes in the concrete and exposed rebar at the 1112/1112 NSL Stitch Joint and the 1111/1112 EWL Stitch Joint to carry out an investigation into these 2 other stitch joints. It was observed again that a significant number of rebar were not properly connected, or were not connected at all, into the couplers at both stitch joints **[BB1/168 & CC1/75/§23]**.

21. Enabling works for the 1111/1112 NSL Stitch Joint and the 1112/1112 Stitch Joint commenced on 9 February 2018, and demolition works were done between 15 February 2018 and 6 March 2018 **[CC1/77-78/§37&39]**.

22. Enabling works for the 1111/1112 EWL Stitch Joint commenced on 27 February 2018, and demolition works were done between 5 March 2018 and 10 March 2018 **[CC1/77/§33&35]**.

23. Meanwhile, on 15 February 2018, Leighton presented a proposal to MTRCL to demolish and reconstruct the NSL Stitch Joints and, on 5 March 2018, Leighton presented a proposal to MTRCL for demolishing and reconstructing the 1111/1112 EWL Stitch Joint **[CC1/76/§§25 & 29 & CC3/1806-1833 & CC3/1883-1890]**.

24. On 6 March 2018, MTRCL instructed Leighton to chip off the concrete at 3 locations to expose the rebars at the 1111/1112 Shunt Neck Joint for

investigation. This revealed that some of the rebars at the 1111/1112 Shunt Neck Joint were not properly spliced and only slotted into the couplers[2].

25. On 14 March 2018, MTRCL issued to Leighton NCR 096 in respect of the defects at the 1112/1112 NSL Stitch Joint [**CC3/1373**].

26. On 16 March 2018, MTRCL submitted to HyD/RDO and PyPun a draft stitch joint report **[BB1/150-161 & DD1/43-57]**.

27. On 20 March 2018, MTRCL issued a press release on the stitch joints incident **[DD1/60.1-60.4]**.

28. On 22 March 2018, MTRCL submitted to HyD/RDO (i) an updated SSP for the NSL and EWL tunnels at the NAT **[DD1/61-68]** and (ii) the design submission for the revised details of the 1111/1112 EWL Stitch Joint which Leighton had submitted to MTRCL on 21 March 2018 **[DD1/69-74 & CC5/2510-2595]**.

29. On 26 March 2018, MTRCL submitted to HyD/RDO (i) the updated QSP for couplers at NAT (both for BOSA and Lenton couplers) **[DD1/75-108]** and (ii) design amendment submission for the revised details of the 1111/1112 EWL Stitch Joint **[DD1/109-110]**.

30. Thereafter, on 27 March 2018, MTRCL submitted to the Government the formal report dated 26 March 2018, referred to in §13 above **[BB1/162-201 & DD1/38.24 – 38.60]**.

[2] **[DD1/38.64/§§3.4-3.5]**; the witness statement of Michael Fu **[BB1/80/§29]**.

31. MTRCL submitted the "North Approach Tunnel Structure Amendment Submission (NSL Tunnel Stitch Joint Remedial) on 29 March 2018 **[DD1/157-163]**.

32. The actual reconstruction works in respect of the 1111/1112 EWL Stitch Joint took place between about mid-March 2018 and 10 April 2018 **[BB1/102/§27, CC1/77/§36 & CC1/280]**.

33. On 4 April 2018, Leighton submitted to MTRCL its "*Task Method Statement for NSL Stitch Joints Reconstruction*" [**CC3/1914-1972]**. This document had had a couple of predecessors, but appears to be the last version.

34. The actual reconstruction works i.e. rebar fixing and concreting, in respect of the 1111/1112 NSL Stitch Joint, was carried out between 12 April 2018 and 19 May 2018 **[BB1/101/§27 & CC1/280]**.

35. On 17 April 2018, MTRCL issued to Leighton NCRs 097 to 196 in respect of missing RISC forms **[BB12/8389-8446; BB8/5223/§21, Footnotes 3 & 4]**.

36. The actual reconstruction works i.e. rebar fixing and concreting, in respect of the 1112/1112 NSL Stitch Joint was carried out between 8/16 May 2018 and 18 July 2018 **[BB1/102/§27 and CC1/280]**.

37. On 14 May 2018, MTRCL submitted a remedial proposal in respect of the 1111/1112 Shunt Neck Joint **[DD1/191-194].**

38. On 28 June 2018, NCR 095 was closed out **[CC3/1736]**.

39. On 10 July 2018, MTRCL issued to Leighton NCRs 202 to 248 in respect of further missing RISC forms **[BB12/8447-8493; BB8/5224/§24, Footnote 5]**.

40. On 19 July 2018, MTRCL issued a letter to HyD/RDO to withdraw the remedial proposal for the 1111/1112 Shunt Neck Joint as submitted on 14 May 2018 **[DD1/400]**.

41. On 27 July 2018, MTRCL submitted to HyD/RDO a Quality Assurance Scheme in respect of the couplers (both BOSA and Lenton types) [**BB7/4460-4716**].

42. On 5 September 2018, NCRs 066 and 096 were closed out [**CC3/1754 and CC3/1795**].

43. On 14 September 2018, HyD/RDO replied to MTRCL's letter dated 19 July 2018 regarding the withdrawal of the submission of "*Remedial Proposal for Shunt Neck Connection at 1111/1112 Interface for North Approach Tunnel structure*" **[DD2/466]**, reminding MTRCL that a design review/justification for the non-conformity should be submitted to HyD/RDO if no remedial works are involved.

44. On 30 October 2018, MTRCL submitted to HyD/RDO the "*Remedial Proposal for Shunt Neck Connection at 1111/1112 Interface for NAT Structure*" **[DD2/717; 737-1089]**. On the same day, MTRCL issued to

Leighton NCR 267 in respect of the 1111/1112 Shunt Neck Joint [**CC3/1805, DD2/1104**]. (There has been subsequent correspondence between HyD/RDO and MTRCL regarding the remedial works proposal and on 28 May 2019 HyD/RDO accepted, subject to certain conditions, MTRCL's Incident Report and Remedial Proposal [**DD9/12254**]. To date, however, the remedial works to the 1111/1112 Shunt Neck Joint have not been carried out and, consequently, NCR 267 has not yet been closed out **[DD12/13963/Item 145]**.)

45. On 20 December 2018, MTRCL wrote to HyD/RDO informing them that, in addition to RISC forms, the missing or insufficient construction records for NAT included specific information about a change of design of some connections during construction from lapping of re-bars to coupler connections; extent of the change; and materials testing records. MTRCL indicated that it would propose a holistic study to RDO/BD for proving the NAT as-constructed conditions and workmanship quality. MTRCL also expected that there were similar, but lesser, issues at the SAT. There was no mention of issues at the HHS at this stage. **[DD3/1115-1117]**

46. Apparently, on 23 January 2019 and 24 January 2019, meetings were held between BD/RDO and MTRCL to discuss, amongst other things, the preparation for the application for the Certificate of Completion of building works at the NAT, but at which MTRCL (a) repeated the various matters mentioned in its letter dated 20 December 2018 and (b) advised, for the first time, that similar issues might also arise at the HHS (see HyD/RDO's letter of 24 January 2019 discussed immediately below [**DD3/1128 @ 1129**] which made reference to the meeting of 23 January 2019 but not to a

meeting of 24 January 2019). Neither the Government nor MTRCL have any minutes of either of these meetings.

47. By letter dated 24 January 2019 to MTRCL, HyD/RDO expressed its disappointment that the problems reported in MTRCL's letter dated 20 December 2018 were allowed to occur **[DD3/1128-1130**]. MTRCL was required to:

(1) Provide a detailed account of the problem of insufficient records in NAT, HHS and SAT with full explanations, and including scale and extent of the problem;

(2) Advise any similar problems in other parts of Contract 1112 apart from platform slabs, NAT, HHS and SAT;

(3) Provide scope and implementation details of the holistic study on NAT;

(4) Confirm whether the holistic study will be extended to HHS and SAT and other parts of Contract 1112; and

(5) Critically assess the programme implications of the matter to the full/partial opening of the Tuen Ma Line.

Apart from the above, MTRCL was requested to urgently resolve the above matters that were affecting the partial and full opening of Tuen Ma Line, as

well as review and improve the reporting mechanism from MTRCL to the Government.

48. On 30 January 2019, the Government held a press conference announcing that there were problems of, *inter alia*, missing RISC Forms, unauthorised design changes and incomplete testing records of materials under Contract 1112 in relation to construction works at the North Approach Tunnels ("**NAT**"), the South Approach Tunnels ("**SAT**") and the Hung Hom Stabling Sidings ("**HHS**") **[DD3/1177.1-1177.18]**.

49. On 31 January 2019, the Government announced that the Chief Executive in Council would consider expanding the scope of the Commission's investigation to cover the various construction issues at the NAT, SAT and HHS**.**

50. By letter dated 15 February 2019 [**BB6/3678-4274**], MTRCL submitted to HyD/RDO a 'Report on 8th Design Amendment for NAT Tunnel Structures (NSL Tunnel, EWL Tunnel Stitch Joint Remedial Details)'. This apparently contains details of the as-built records of the drill-in holes/rebar and the reused couplers.

51. On 19 February 2019, the Chief Executive in Council approved the Expanded ToR as stated above, which was subsequently gazetted in the Gazette Notice No. 1539 dated 22 February 2019 **[AA1/1]**.

52. At the PSC meeting on 4 April 2019, HyD/RDO reiterated its request to MTRCL to provide a full explanation as to why non-conformance of stitch

joints could happen at three locations without being noticed by the site supervisory staff for a long period. MTRCL reported that the draft holistic proposal for investigation and verification of the works at NAT, HHS and SAT including a programme had been submitted to HyD on 4 April 2019 **[DD6/6802-6815/§3.19.2 &§3.19.9]**.

53. By HyD's/RDO's letter dated 4 April 2019, the design amendments referred to in the Report of 15 February 2019 were accepted [**BB6/4275-4277**].

54. On 26 April 2019, MTRCL sent an email to HyD/RDO submitting a draft Verification Proposal of As-Constructed Conditions for NAT, SAT and HHS **[DD6/7116-7135]**.

55. On 27 April 2019, the Commission was jointly informed by MTRCL and the Government, *inter alia*, that (a) the agreed Verification Proposal would be submitted to the Commission by 15 May 2019; (b) completion of Part 1 (Verification of as-constructed condition and workmanship) would be accomplished by 15 June 2019; (c) completion of Part 2 (Structural review and checking) would be accomplished by 30 June 2019 and (d) the Final Report would be completed and submitted to the Commission on the milestone date of **30 June 2019**, all subject to the accompanying notes [**BB1/58-59**].

56. On 29 April 2019, further to MTRCL's email dated 26 April 2019 and in response to HyD/RDO's letters dated 9 and 17 April 2019, MTRCL issued a letter to HyD/RDO submitting a further revised draft Verification Proposal of As-Constructed Conditions for NAT, SAT and HHS **[DD6/7212-7233]**.

57. On 7 May 2019, further to the Task Force meetings held on 2, 3, 6 and 7 May 2019 amongst HyD, BD and EAT, MTRCL issued a letter to HyD/RDO submitting the finalised Verification Proposal of As-Constructed Conditions for NAT, SAT and HHS **[DD7/10200-10220]**.

58. On 15 May 2019, MTRCL submitted to HyD/RDO the revised final Verification Proposal of As-Constructed Conditions of the NAT, SAT and HHS (Rev. E) for agreement [**DD9/11786-11806**]. By HyD/RDO's letter to MTRCL dated 15 May 2019 the Government accepted the Verification Proposal [**DD9/11807-11808**] and, on 16 May 2019, the Commission was informed of the agreement reached accordingly [**BB8/5122**].

59. On 23 May 2019, PyPun submitted to HyD/RDO its 'Document Review Report for the On-Site Record Checking on RISC Form' in relation to the construction of NAT, SAT and HHS [**GG3/1011-1856**].

60. On 27 May 2019, the Substantive Hearing of the Extended Inquiry commenced.

61. On 4 June 2019, HyD/RDO expressed its disappointment to MTRCL regarding the failure to submit the draft final reports on both the Holistic and Verification Proposals on 31 May 2019 as scheduled. MTRCL was requested to advise whether the delay in submission would impact on the ability to submit the final reports to the Commission by 30 June 2019 [**DD10/12445**].

62. On 17 June 2019, being the last day of the Substantive Hearing, the date for the submission of the final reports in respect of the Holistic and Verification Proposals was extended from 30 June 2019 until 15 July 2019 [**T/Day 15/127-136**]. Subsequently, at the joint request of MTRCL and the Government, the date for the submission of the final reports was extended by the Commission until 22 July 2019 but, in any event, the Holistic and Verification Proposals were submitted to the Commission on 18 July 2019.

D. THE INVOLVED PARTIES AND FANG SHEUNG

63. For the purposes of the Extended Inquiry, the Commission issued (a) letters requesting documentation and witness statements and (b) "Salmon letters" dated 23 April 2019 (that is letters giving advance notice to entities who might be the subject of criticism) to the parties identified below ("**the involved parties**"). Each of those parties participated in, and had separate legal representation at, the Substantive Hearing.

64. Firstly, there are four Government bureau or departments involved namely the (1) Transport and Housing Bureau ("**THB**"), (2) Highways Department ("**HyD**") including the Railways Development Office ("**RDO**"), (3) Development Bureau ("**DevB**") and (4) Buildings Department ("**BD**"). THB and HyD/RDO performed a monitoring role in the SCL Project and DevB and BD carried out their statutory duties and functions. As at the Original Inquiry, the four entities are represented by the Department of Justice ("**DoJ**").

65. Secondly, by an agreement dated 20 August 2012 **[G9/7638-7753]**, PYPUN-KD & Associates Limited ("**PyPun**") was engaged by RDO on behalf of the Government as a Monitoring & Verification Consultant to, *inter alia*, monitor the performance of Mass Transit Railway Corporation Limited ("**MTRCL**") under the Entrustment Agreement referred to below. For clarity, this engagement related to the entirety of the SCL Project.

66. Thirdly, MTRCL was appointed by THB on behalf of the Government under an Entrustment Agreement dated 24 November 2008 **[G7/5466-5520]** to design and carry out site investigation works for the SCL Project; by a further Entrustment Agreement dated 17 May 2011 **[G7/5521-5594]** to carry out certain advance works as defined therein and by a further Entrustment Agreement dated 29 May 2012 ("**the Entrustment Agreement**") **[G7/5595-5714]** to project manage the construction and commissioning of the SCL Project. The Government is the majority shareholder of MTRCL.

67. Fourthly, Leighton Contractors (Asia) Limited ("**Leighton**") was the main contractor engaged by MTRCL to construct, amongst many other things, the relevant NAT, SAT and HHS works under Contract 1112 dated 7 March 2013 **[C1/437 to C5/4353]**. Contract 1112 was a target cost contract.

68. Fifthly, pursuant to a sub-contract dated in or around April/May 2015 **[CC11/6554-6745]** [3], Wing & Kwong Steel Engineering Co., Limited

[3] According to the original evidence of Mr. Ben Cheung of Wing & Kwong **[EE1/61-66/§§10-24]**, the sub-contract had two versions. On or about 28 April 2015, Wing & Kwong signed the first version **[EE1/99-178]** and returned it to Leighton for the latter's signature. On or about 13 March 2017, Leighton told Wing & Kwong that the first version was lost and requested Wing & Kwong to re-sign the sub-contract. Wing & Kwong did so assuming the sub-contract it signed **[CC2/870-1062]** was the same as the first version. That the two versions are not the same does

("**Wing & Kwong**") was engaged by Leighton as its sub-contractor responsible for carrying out the reinforcement bar cutting, bending and fixing works for the HHS and the NAT. The 'Sub-Contract Scope of Work' is set out at **CC11/6622-6624**. Wing & Kwong was not an involved in the Original Inquiry.

69. The Commission also issued letters requesting documentation and witness statements but not a "Salmon letter" to Fang Sheung Construction Company ("**Fang Sheung**"), which was, pursuant to a sub-contract dated 28 August 2015 **[E1/31-179]**, Leighton's sub-contractor responsible for carrying out the reinforcement bar cutting, bending and fixing works for the SAT. Fang Sheung indicated its inability, for financial reasons, to engage legal representation **[FF1/8]**. As matters transpired, the Commission procured one witness statement from Fang Sheung and the witness concerned was called by the Commission itself.

E. PRIMARY TOPICS OF EXTENDED INQUIRY AND THE WITNESSES

70. As alluded to above, the following primary matters are of direct relevance to the Expanded ToR:

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not appear to have been discovered until given consideration for the purpose of these proceedings. To potentially complicate matters further, a third version of the sub-contract was disclosed by MTRCL [**BB3/2044-2236**]. Mr. Cheung was evidently giving his evidence from memory, without the benefit of access to all relevant documents. Thankfully, however, the Third Witness Statement of Mr. Jonathan Kitching of Leighton dated 1 June 2019 [**C11/6548-6553**] clarified matters from Leighton's perspective and, in his evidence in chief, Mr. Cheung was able to accept Mr. Kitching's explanation of events [**T/Day6/1-12**] and, in particular, that the relevant Sub-Contract document is at **CC11/6554-6745.**

(i) The three defective stitch joints at the NAT ("**Issue 1**");

(ii) Non-compliance issues at the NAT Shunt Neck ("**Issue 2**"); and

(iii) Lack of inspection and supervisory records, including RISC Forms, unauthorised design changes and incomplete testing records of materials at the NAT, SAT and HHS areas ("**Issue 3**").

71. The factual evidence, both written and oral, has been geared to and focused upon the three Issues identified above.

72. During the course of the Substantive Hearing, 'live' factual evidence was given by 33 witnesses: Fang Sheung (1), Wing & Kwong (3), Leighton (14)[4], MTRCL (10)[5], PyPun (2)[6] and the Government (3). A full list of the witnesses will be found at **Annex 1** hereto.

F. ISSUES 1 AND 2

F1. Stitch Joint v Construction Joint

[4] Leighton also submitted witness statements from two further witnesses together with police statements from three further witnesses, none of whom were required to give oral testimony. Leighton submitted a further witness statement with its Closing Submissions in respect of which the Commission has granted leave.

[5] MTRCL also produced a police statement from one further witness who was not required to be called to give evidence.

[6] Likewise, PyPun produced a police statement from a further witness who was not required to be called to give evidence.

73. As explained by Mr. Michael Fu, the construction manager of MTRCL, where there are two successive placements of concrete, rebar in the form of lapped bars or in conjunction with couplers are typically used to create one continuous structure. This kind of joint is called a construction joint[7].

74. However, if the two placements of concrete to be connected are built on different foundations (e.g. one is founded on piles and the other at grade), or if one of them is constructed well in advance of the other, then the two placements of concrete may have different degrees of settlement or movement. If they are connected by way of a conventional construction joint, there would likely be stress/pressure at the joint if and when differential settlement or movement occurs across the joint, and this might result in cracks at the joint[8].

75. A stitch joint may minimise such potential stress/pressure at the joint because, unlike a construction joint (where the two placements of concrete would be connected as they are constructed), at a stitch joint the two placements of concrete would be "stitched" together only when their respective settlements or movements have been stabilised. This method minimises the stress/pressure at the joint, and hence, reduces the risk of cracking[9].

76. The 3 Stitch Joints were provided for in the permanent design (by or on behalf of MTRCL) for the following reasons[10]:-

[7] See the witness statement of Mr. Michael Fu **[BB1/75/§19(a)]**.
[8] See the witness statement of Mr. Michael Fu **[BB1/75/§19(b)]**.
[9] See the witness statement of Mr. Michael Fu **[BB1/76/§19(c)]**.
[10] See the witness statement of Mr. Michael Fu **[BB1/76/§21]**.

(1) As regards the 1112/1112 NSL Stitch Joint (Joint 2), while the 1112 NSL Bay 5 tunnel structures were supported by socket H-piles, the neighbouring 1112 NSL interfacing tunnel structures were at grade. In such circumstances, the two tunnel structures were connected by a stitch joint so as to avoid any stress/pressure at the joint as a result of any differential settlements or movements across the joint.

(2) As to the two stitch joints at the 1111/1112 interface, although (a) the 1111 and 1112 NSL interfacing tunnel structures, as well as (b) the 1111 and 1112 EWL interfacing tunnel structures, were all at grade, the tunnel structures under Contract 1111 were programmed to be constructed, and were in fact constructed, well ahead of the tunnel structures under Contract 1112.[11] As such, stitch joints were provided for in the permanent design.

77. Originally, the 1111/1112 Shunt Neck Joint was also designed to be constructed as a stitch joint. However, MTRCL subsequently confirmed that a stitch joint was no longer required at the location and that a construction joint would be adopted instead[12]. The reason for the change of design appears to be that the interfacing structures under Contract 1111 and 1112 were all founded on piles and were therefore not subject to any soil

[11] Mr. Jacky Lee (Senior Construction Engineer of MTRCL on Contract 1111) confirmed that GKJV had completed its NSL structure in July 2015 and EWL structure in September 2015 some 2 years and 16 months respectively before the completion of Leighton's structures to which they were to be stitched [**BB1/95-96/§15**] and [**T/Day 13/88-89, 91:9-20**].

[12] See the witness statement of Mr. Michael Fu **[BB1/75/§18][BB1/435]**; the witness statement of Mr. Chris Chan **[BB1/118-20/§§28-39]**; **[CC6/3341]**.

overburden pressure[13]. Despite a degree of uncertainty in MTRCL's confirmation to Leighton, there is no issue that Leighton knew about such change before the commencement of work[14].

F2. <u>The division of responsibilities between GKJV and Leighton at the 1111/1112 interfaces</u>

78. The 1111/1112 NSL Stitch Joint, the 1111/1112 EWL Stitch Joint and the 1111/1112 Shunt Neck Joint are located at the 1111/1112 interface. The construction works in respect of these joints therefore required collaboration between GKJV and Leighton.

79. In this regard, the "*Interface Requirements Specification Hung Hom North Approach Tunnels (Contract 1111) and Hung Hom Station and Stabling Sidings (Contract 1112)*" ("**Interface Requirements Specification**")[15] provided, *inter alia*, that:

Interface Item	**By 1111 Contractor**	**By 1112 Contractor**	**Purpose of Interface**
1.4	To complete the tunnel structure to enable 1112 Contractor to	To complete the stitching joint, including omega seal, rebar and	To ensure no additional loading induced in the

[13] See the witness statement of Mr. Michael Fu **[BB1/76/§20][BB1/435]**.
[14] See the witness statement of Mr. Chris Chan **[BB1/118-20/§§28-39][CC6/3341]**; the 5th witness statement of Mr. Karl Speed **[CC1/66/§§59-62]**.
[15] See Appendix Z2 to the Particular Specification **[BB1/424-25]**.

	complete the stitching joint.	infill concrete, after tunnel backfilling and stabilization of tunnel settlement.	tunnel structure due to differential settlement of tunnel.
…			
1.7	To carry out joint inspection of the waterproofing system, couplers and protection measures to couplers provided at the interface work. Make good any damage identified during inspection	Provide access and attendance to 1111 Contractor for joint inspection of the waterproofing system, couplers and protection measures to couplers provided at the interface work. Accept and maintain the waterproofing system, couplers and protection measures to couplers provided at the interface work.	To confirm as-built waterproofing system, couplers and protection measures to couplers are properly provided.

F3. <u>Contemplated steps and procedures involved in the construction of the 3 Stitch Joints</u>

80. It is accepted that there was no method statement specifically for the construction of the original 3 Stitch Joints,[16] but rather just a generic "*NAT-Method Statement of Permanent Structure Construction of EWL and NSL at NAT*." [**BB1/202-305]**

81. However, the steps and procedures as originally contemplated for such construction do not appear to be in serious dispute. Using the 1111/1112 NSL Stitch Joint as an example, they can be summarised (in a simplified manner[17]) as follows:-

(1) GKJV would construct the interfacing tunnel structure on the Contract 1111 side with couplers (with protective caps) fixed at the end of the structure.

(2) Leighton would construct the interfacing tunnel structure on the Contract 1112 side with couplers (with protective caps) fixed at the end of the structure.

(3) Upon the construction of the two interfacing structures as mentioned in (1) and (2) above, they would not be "stitched" together immediately. As mentioned above, according to the working drawing, "*[t]he stitch joint shall be cast as late as possible in the construction sequence, and preferably after groundwater recharge, to minimise the amount of differential movement after casting. Casting shall not be*

[16] According to the oral evidence of William Holden **[T/Day 8/84:6-12]** and Michael Fu **[T/Day 10/96:16–97:8]**.
[17] For a more detailed version, see the witness statement of Mr. Michael Fu **[BB1/71-75/§§15-17][BB1/84.1]** and the 5th witness statement of Mr. Karl Speed **[CC1/55-57/§§16-18]**.

carried out until after completion of backfilling." [18] Moreover, according to the Interface Requirements Specification as mentioned above, Leighton should "*complete the stitching joint, including omega seal, rebar and infill concrete, after tunnel backfilling and stabilization of tunnel settlement.*"[19]

(4) After the differential movements of the two structures had stabilized and construction could proceed:

(a) GKJV would expose the couplers fixed at the Contract 1111 side[20] and Leighton would screw rebar into those couplers;

(b) Leighton would expose the couplers fixed at the Contract 1112 side and screw rebar into those couplers;

(c) Leighton would lap the Contract 1111 rebar with the Contract 1112 rebar at their intersections;

(d) Concrete pouring would take place after the "stitching" of the rebar and the installation of, amongst other things, the waterproofing materials.

[18] **[BB1/433/Note 2]**.
[19] **[BB1/424/Item 1.4]**. As mentioned above, there were, however, no quantifiable criteria to determine when the stitch joints could go ahead. See the oral evidence of Mr. William Holden **[T/Day 8/72:5-73:6; 112:16-21]**. The decision to commence was jointly made on site by the frontline staff of MTRCL and Leighton. See the oral evidence of Mr. Michael Fu **[T/Day 10/99:4-100:10]**.
[20] See also the 5th witness statement of Mr. Joe Tam **[CC10/6536-6537/§§5-8]**; **[CC10/6539-44]**.

(5) The process mentioned in (4) above would be repeated for each pour of concrete. In general, base slab, walls and roof slab would each constitute one separate pour[21]. On this basis there ought to be a minimum of four hold point inspections in respect of the rebar, two for the base slab, and at least one each for the walls and roof slab.

82. The contemplated steps and procedures involved in the construction of the 1111/1112 EWL Stitch Joint were similar, save and except the EWL tunnel is an open trough above-ground tunnel structure without a roof or dividing wall (as opposed to a twin-box underground tunnel structure as in the case of the NSL tunnel) and, hence, there was no roof slab and no dividing walls to be connected[22].

83. Similar steps and procedures also applied to the construction of the 1112/1112 NSL Stitch Joint, save that Leighton was responsible for building both sides of the joint, as both of them fell within the scope of Contract 1112[23].

F4. <u>What went wrong?</u>

F4.1 <u>Breakdown of communication</u>

84. As explained above, the 1111/1112 NSL Stitch Joint, the 1111/1112 EWL Stitch Joint and the 1111/1112 Shunt Neck Joint are located at the 1111/1112 interface and would require collaboration between GKJV and

[21] See e.g. the pour summary for the NAT **[BB8/5226.3]**.
[22] See the witness statement of Mr. Michael Fu **[BB1/74/§16]**.
[23] See the witness statement of Mr. Michael Fu **[BB1/75/§17]**.

Leighton. In this connection, a series of interface meetings were set up and were held from about early 2014 to early 2017[24]. Representatives from Leighton (e.g. Mr. Johnny Leung, Ms. Regina Wong and Mr. Jim Wong), GKJV and MTRCL (Mr. Jacky Lee, Mr. Chris Chan and Ms. Kappa Kang) attended those meetings.

85. The working drawings[25] of the interface Stitch Joints did not indicate the type of couplers used on either the Contract 1111 or 1112 side[26]. The matter was therefore raised and discussed at the interface meetings. As recorded in the meeting minutes[27]:

(1) GKJV tabled Lenton couplers for use in Contract 1111[28]. Lenton couplers were taper-threaded[29], in contrast to BOSA couplers which were parallel-threaded. Leighton used BOSA couplers in Contract 1112. Leighton agreed to check with its supplier regarding compatibility; and

(2) It was agreed that T40 coupler would be BOSA and other sizes would be Lenton at the interface[30].

[24] See the meeting minutes produced by Leighton **[CC2/739-865]** and MTRCL **[BB3/1678-1795]**.
[25] **[BB1/433-456]**; **[CC1/124-279]**.
[26] See the 5th witness statement of Karl Speed **[CC1/59/§§26-31]**; the 3rd witness statement of Joe Tam **[CC1/83-84/§§11-13]**;
[27] **[CC2/750-865]**; **[BB3/1791-95]**.
[28] **[BB3/1690]**.
[29] **[BB3/1754]**.
[30] **[BB3/1774/Item 19.3.3]**. In other words, GKJV would use BOSA couplers for T40 rebar and Lenton couplers for other sizes at the interface. See oral evidence of Regina Wong at **[T/Day 7/120:17-121:7]**.

86. According to Mr. Johnny Leung (Site Agent of Leighton) who attended some of the earlier interface meetings on 7 February 2014[31], 8 November 2014[32] and 5 December 2014[33], although he was aware of the potential compatibility issue regarding the couplers used in Contract 1111 and Contract 1112 at the time and he had notified his colleague of the issue, "*no one would give any thought to this*" and the issue "*wasn't on our radar*" because the construction works were at a preliminary stage[34]. In May 2015, he left Leighton long before the interface work was commenced. Evidently, no compatibility check had been carried out by Leighton at this stage.

87. Ms. Regina Wong, Leighton's Sub-Agent and later on Site Agent of Contract 1112 at the time, attended the majority of the interface meetings between early 2015 and early 2017[35]. Her work, however, focused on the North Fan Area ("**NFA**") and drainage issues at the interface, which were not directly related to the interface joints[36]. She was aware of the coupler compatibility issue at the time, but she assumed Mr. Jim Wong (a Leighton Senior Site Agent) would deal with it, and did not pay attention to it[37].

88. Mr. Jim Wong, who was Leighton's Senior Site Agent for NAT from October 2014 until November 2016[38], also attended most of the interface meetings between early 2015 and September 2016[39]. However, even by the

[31] **[CC2/739-749]**.
[32] **[CC2/750-754]**.
[33] **[CC2/756-766]**.
[34] **[T/Day 7/88:11-91:10; 92:23-93:20; 95:2-12]**.
[35] **[CC2/772-865]**; **[BB3/1791-95]**.
[36] **[T/Day 7/108:23-110:7; 111:4-8]**.
[37] **[T/Day 7/121:13-122:2; 132:17-133:17]**.
[38] See the witness statement of Jim Wong **[CC10/6514/§3]**.
[39] **[CC2/772-865]; [BB1/1694-1790]**.

time he attended the last meeting and despite the almost imminent construction of the Shunt Neck Joint, he still considered that there was no need to do the compatibility check[40]. Shortly afterwards, he left the NAT for other areas of Contract 1112[41].

89. Mr. Jim Wong reported to Mr. Joe Tam, Leighton's construction manager for the NAT at the time[42]. Mr. Joe Tam was also aware of the coupler compatibility issue at the time. He, however, made no enquiries about what rebar should be ordered[43]. Neither did he ensure that Henry Lai, Leighton's engineer who was ultimately responsible for ordering the rebar, knew about the compatibility issue[44].

90. Furthermore, on 20 May 2016, Leighton issued a Request For Information ("**RFI**") [45] to MTRCL. Mr. Joe Tam was one of the reviewers before its issuance. At that time, although he (and others at Leighton) was evidently turning his mind to the fact that the Stitch Joints were going to be constructed in the not too distant future, and therefore sensibly requested various information, he still did not pick up the compatibility issue and made no further inquiries about it[46].

91. Although Leighton had an internal system called INCITE, which was meant to contain all the project documents, it did not contain all the interface

[40] **[T/Day 9/117:18-118:25]**.
[41] See the witness statement of Jim Wong **[CC10/6514/§3]**.
[42] See the witness statement of Jim Wong **[CC10/6514/§3]**.
[43] **[T/Day 8/157:18-158:3; 162:2-17]**.
[44] **[T/Day 8/163:6-167:13]**.
[45] **[CC6/3333]**.
[46] **[T/Day 8/154:5-162:17]**.

meeting minutes[47]. Further, engineers such as Mr. Henry Lai were not instructed that they should go back over the relevant minutes in order to draw from the minutes whatever they needed to do their work[48].

92. MTRCL's representatives were present at all these interface meetings. MTRCL viewed its role, however, as limited to monitoring and managing the two interface contractors to ensure that there was a proper and clear flow of information between them and resolve any difficulties that might have arisen[49]. It did not extend to ensuring that Leighton would have an effective communication system within its own organization after and between these meetings.

93. The consequence of the above is that despite the existence of a series of interface meetings from about early 2014 to early 2017, the coupler compatibility issue only stayed at the meeting level, was not followed up and was not brought to the attention of the requisite person at the site level. Eventually, only parallel-threaded rebar was ordered by Leighton[50].

94. As has been acknowledged by Leighton[51], it is submitted that in respect of the compatibility issue there was clearly a breakdown and/or lack of communication within the organisation, which was caused by insufficient attention being paid to the issue by Leighton's various personnel.

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[47] Evidence of Joe Tam at **[T/Day 9/24:21-26:6]**
[48] **[T/Day 9/23:22-27:3]**.
[49] **[T/Day 11/70:4-21]**.
[50] See the 5th witness statement of Karl Speed **[CC1/59/§30]**.
[51] See Leighton's Closing Submissions, at §48.

F4.2 Lack of joint inspection

95. Pursuant to Interface Item 1.7 of the Interface Requirements Specification[52], Leighton and GKJV were required to carry out a joint inspection of, *inter alia*, the couplers installed before the commencement of work at the interface. It appears, however, from the evidence overall that no such formal inspection was carried out[53]. There is a possibility that an "informal" inspection took place when the cofferdam was removed at the NSL interface joint, but there is little or no certainty about that. There is certainly no record of any inspection of whatever nature having been carried out.

96. If there had been such inspection, the coupler compatibility issue ought to have been properly identified and resolved before the commencement of work. At the very least, an opportunity would have arisen to address the compatibility issue.

F4.3 Defective workmanship and inadequate supervision

97. To recap, according to site records[54]:

(1) The 1111/1112 Shunt Neck Joint was completed between 4 January 2017 and 22 March 2017;

[52] **[BB1/424-25]**.
[53] **[T/Day 8/142:4-143:9 (Mr. Joe Tam)]**. **[T/Day 11/21-23 (Mr. Michael Fu)]. [T/Day 11/67-70 (Mr. Chris Chan)]. [T/Day 13/90-95] (Mr. Jacky Lee)].**
[54] **[BB8/5226.3]**.

(2) The 1111/1112 EWL Stitch Joint was completed between 19 January 2017 and 22 March 2017;

(3) The 1112/1112 NSL Stitch Joint was completed between 29 May 2017 and 9 September 2017; and

(4) The 1111/1112 NSL Stitch Joint was completed between 5 July 2017 and 2 August 2017.

98. The next question is, if the coupler compatibility issue was not properly identified and resolved before the commencement of work, why was it not so identified at the commencement and during the course of the work? Moreover, there were also coupler connection problems that were subsequently discovered in respect of 1112/1112 NSL Stitch Joint, which was an internal joint and did not involve the compatibility issue (see Section F4.4 below). What was the cause of them? There is no issue that (a) Leighton only ever ordered parallel threaded rebar from BOSA[55] and (b) such rebar was incompatible with Lenton couplers, supplied by Erico, which had a tapered thread.

99. In this respect, there is a direct contradiction in the evidence adduced by Wing & Kwong and Leighton. According to Wing & Kwong's foreman, Ng Man Chun ("**Ah Chun**"),[56] having spotted the incompatibility and other

[55] Witness Statement of Mr. Karl Speed **[CC1/59/§30 & CC1/68/§73].**

[56] All of Leighton's witnesses who had regular on-site contact with Ah Chun accepted that he was a hard-working, conscientious and competent individual (e.g. Henry Lai **[T/Day 5/30:16-22]**; Jeff Lii - **[T/Day 7/8:18-9:5]**; Ronald Leung – **[Day 10/9:23-10:3]**; and Alan Yeung **[Day 10/39:1-3]**).

problems on site and drawn it to the attention of Leighton (namely Mr. Henry Lai), he was instructed by Mr. Henry Lai (Leighton's Engineer) to disregard the various coupler connection problems discovered on site, including the compatibility problem, and just screw in the rebar as much as could be achieved.

100. Leighton denies having given such instruction. It contends that it was Wing & Kwong's own defective workmanship which caused the coupler connection problems that were subsequently discovered.

101. Wing & Kwong's main arguments appear to be as follows:-

(1) The problems encountered by Wing & Kwong were not its fault. Wing & Kwong was not responsible for choosing the type of threads on the rebar[57]. Nor was it responsible for chipping off the concrete[58]. The sizes of rebar it submitted to Leighton conformed with the working drawings provided by Leighton[59]. Thus, there was no reason for Ah Chun to refrain from raising the problems with Leighton and simply proceed with the work without Leighton's instructions.

(2) Conversely, if the problems were not raised with Leighton, the lack of proper connection (or at all) of the couplers was in any event obvious to the naked eye[60]. In such circumstances, Ah Chun would likely only

[57] **[EE1/371.7/§15(4)]**. See Wing & Kwong's Closing Submissions, at §§19-21.
[58] **[EE1/371.28/§70]**.
[59] **[EE1/371.21/§48; 371.26/§64]**.
[60] **[EE1/371.25/§59; 371.26/§65]**. See also the photos of subsequent opening up **[CC3/1322-32]**; **[CC3/1373-76]**. See Wing & Kwong's Closing Submissions, at §§22-35.

find Wing & Kwong being caught out by the site staff of Leighton and MTRCL, and eventually being held liable for the remedial costs.

(3) The reason that Ah Chun proceeded merely on the words of Mr. Henry Lai and did not keep any record is that he treated him as a friend and trusted him[61].

(4) Mr. Henry Lai is not a credible witness[62]. He conveniently repeated the phrase "I don't remember" to avoid the difficult questions put to him.

102. In contrast, Leighton's main contentions appear to be as follow:-

(1) It would be incredible for Leighton, in particular Mr. Henry Lai as a junior engineer, to give such instructions, when the defective works would be rejected by MTRCL if they were identified at the routine or hold point inspections. Equally, it would be incredible for Ah Chun to simply act on the oral instructions of Mr. Henry Lai[63]. In this connection, the Commission's legal team also notes that according to site records, the construction of 1111/1112 NSL Stitch Joint commenced on 5 July 2017[64]. If Mr. Henry Lai had been told about the mismatch problem when the construction of the 1111/1112 Shunt Neck Joint began in early January 2017, it is unlikely that he would have done nothing about it and repeated the same mistake 6 months

[61] **[T/Day 3/123:24-124:6]**; **[T/Day 4/41:24-45:20]**. See Wing & Kwong's Closing Submissions, at §45.
[62] See Wing & Kwong's Closing Submissions, at §§46-51.
[63] See: Leighton's Closing Submissions, at §§9-20.
[64] **[BB8/5226.3]**.

later. (The Commission's legal team regards this as debatable. If he had been told about the problem in January 2017, the fact that he did not raise the problem at any stage may tend to suggest that (1) he did not do his job properly or at all; or (2) he knew about the defects but simply turned a blind eye.)

(2) The situation encountered by Ah Chun was admittedly "*a big deal*" to him. He however allegedly only spoke to Mr. Henry Lai, a junior engineer. He said that he expected the coupler problems would be noticed when it came to inspection time[65], yet he did not leave any record.[66] He did not inform anybody at Wing & Kwong about it until February 2018, when he was contacted by Wing & Kwong's Quantity Surveyor Manager, Mr. Ben Cheung[67]. He did not protest at the subsequent meeting with Leighton when Mr. Henry Lai was also present[68].

(3) Mr. Ben Cheung accepted in cross-examination that the NAT works would be charged based on the unit weight of the materials under Leighton's Sub-Contract with Wing & Kwong and there was no different formula for such works by reference to labour. It was therefore in the financial interests of Wing & Kwong to complete the works as soon as possible[69]. The Commission's legal team however notes that no transcript or other citation is provided for the aforesaid

[65] **[T/Day 3/119:7-12]**.
[66] **[T/Day 3/113:20-115:15]**.
[67] See Ah Chun's witness statement **[EE1/371.34-371.36/§§91-95]**; **[T/Day 3/96:17-97:2]**; **[T/Day 3/117:2-15]**.
[68] See Ah Chun's witness statement **[EE1/371.36/§§96-97]**; **[T/Day 4/15:24-17:16]**.
[69] See: Leighton's Closing Submissions, at §31.

evidence. Leighton was actually invited by Wing & Kwong to put to Mr. Ben Cheung how the NAT works were charged. The invitation was declined[70].

(4) The working areas of the Stitch Joints and Shunt Neck Joint were confined and narrow. The rebars were connected in layers. It is possible that the coupler connection problems might escape the attention of Leighton and MTRCL. Ah Chun took the chance that they would not be spotted during inspections[71].

103. It must not, of course, be forgotten that MTRCL had an important role in supervising the workmanship of Leighton/Wing & Kwong. There is, however, a fundamental problem here: there is no RISC Form for the original Stitch Joints and the Shunt Neck Joint, and therefore the Commission can only rely upon the oral evidence to determine what, if anything, MTRCL had done in relation to the supervision of these joints.

104. According to Mr. Chris Chan (MTRCL's ConE I), he delegated the rebar hold point inspection to the ConE II (Ms. Kappa Kang) and the IOWs working in his team (Mr. Tony Tang). Mr. Chan was clear and emphatic that he was never asked to and did not conduct such inspection in respect of the Stitch Joints or the Shunt Neck Joint[72]. This evidence was flat contrary to the evidence of Mr. Henry Lai who was adamant that Mr. Chan did carry out the inspections in respect of the Stitch Joints[73].

[70] See: **[T/Day 6/54:11-56:15]**.
[71] **[T/Day 4/25:3-26:9]**.
[72] See Mr. Chris Chan's witness statement **[BB1/116-117/§§24-25]**; **[T/Day 11/96:13-98:12]**.
[73] **[T/Day 4/127:10 - 129:22]**

105. According to Mr. Tony Tang (the IOW working in Mr. Chris Chan's team), however, he was only responsible for the pre-pour hold point inspection but not the rebar hold point inspection, which was the responsibility of the ConE (i.e. Mr. Chris Chan being ConE I and Ms. Kappa Kang being the ConE II for the NAT at the time)[74].

106. Ms. Kappa Kang, on the other hand, could not remember if she had carried out the rebar hold point inspections at the Stitch Joints and the Shunt Neck Joint[75]. However, from the TCP records[76] and from her oral evidence[77], it seems likely that she was not on site on 4 or 5 January 2017 when the Shunt Neck Joint was constructed.

107. Overall, it appears to have remained unclear whether, in fact, MTRCL's representatives carried out the rebar hold point inspection in respect of the Stitch Joints or the Shunt Neck Joint at all, and if so, who did it. What is clear, however, is that even if MTRCL's representatives did carry out such inspection, they did not do it properly.

108. As pointed out by the Government[78] (and apparently agreed by Leighton[79]), however, whether Wing & Kwong or Leighton's witnesses are telling the truth, and whatever may be the answer so far as MTRCL's inspections are concerned, none of this may be particularly important for the purposes of the

[74] See Mr. Tony Tang's witness statement **[BB1/127-128/§29]**.
[75] See Ms. Kappa Kang's witness statement **[BB14/9466/§14]**.
[76] **[BB9/6482]**.
[77] **[T/Day 12/23:1-23]**.
[78] See the Government's Closing Submissions, at §§29-33.
[79] See Leighton's Closing Submissions, at §34.

Inquiry. What is more significant is the non-compliance of the requirements of Contract 1112 and the systematic failure in discovering the defects. But for the subsequent water seepage problem which manifested itself in August 2017, the coupler connection defects would have gone unnoticed and the NAT would have been put to use with such defects existing. All parties involved, including Wing & Kwong, Leighton and MTRCL should be criticised.

F4.4 Discovery of the coupler connection problems and their rectification

109. In August 2017, soon after the completion of the 1111/1112 NSL Stitch Joint, MTRCL observed water seepage during routine inspection at the location of that Stitch Joint[80].

110. Leighton was required to carry out grouting work to seal up the seepage. Cement grouting and PU[81] grouting were carried out from October 2017, but the outcome was not effective[82].

111. Minor separation gaps were observed where water seepage was identified. On 9 January 2018, MTRCL instructed Leighton to install settlement markers and tell-tales to monitor the tunnel movement and the gap width[83].

112. On 5 February 2018, a separation gap of about 3mm gap was observed from the tell-tale installed at the tunnel structure connecting to Contract 1111[84].

[80] **[BB1/168/§2.1]**.
[81] Polyurethane.
[82] **[BB1/168/§2.2]**.
[83] **[BB1/168/§2.3]**.

113. In order to investigate the reason for that separation, MTRCL instructed Leighton to chip off 3 locations of concrete surface at the tunnel wall and roof at the interface of Contract 1111 and Contract 1112, each about 200 mm x 200 mm in size, and expose the rebar condition inside. Leighton did so accordingly, which revealed that some exposed rebar was not connected properly or at all to the couplers[85].

114. Subsequently, MTRCL instructed Leighton to carry out a similar investigation in respect of the other 2 Stitch Joints, namely the 1112/1112 NSL Stitch Joint and the 1111/1112 EWL Stitch Joint. Those investigations again revealed that some exposed rebar was not connected properly or at all to the couplers[86].

115. According to Mr. William Holden, Leighton's senior site agent who was responsible for carrying out the investigation on Leighton's behalf, the non-engagement of the rebar caused cracks in the concrete, which ultimately caused the water seepage at the 1111/1112 NSL Stitch Joint[87].

116. As for the 1112/1112 NSL Stitch Joint, Mr. William Holden did not see any crack. Although he also discovered the non-engagement of rebar, he concluded that it was the failure of the installed permanent waterproofing measures which led to the water seepage[88].

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[84] **[BB1/168/§2.3]**.
[85] **[BB1/168/§2.4]**; the 1st witness statement of Mr. William Holden **[CC1/75/§§20-21]**.
[86] **[BB1/168/§2.5]**; the 1st witness statement of Mr. William Holden **[CC1/75/§§22-23]**.
[87] **[T/Day 8/79:1-80:19]**; the 1st witness statement of Mr. William Holden **[CC1/75/§24]**.
[88] **[T/Day 8/80:20-83:12]**; the 1st witness statement of Mr. William Holden **[CC1/75/§24]**.

117. On 22 December 2017, 9 February 2018 and 14 March 2018, MTRCL issued NCR 66[89], 95[90] and 96[91] to Leighton respectively. The NCRs concerned the defects discovered at the Stitch Joints.

118. Rectification works were carried out soon after the discovery of the coupler connection problems at each Stitch Joint. In particular:

(1) The overall works for the rectification of the 1111/1112 NSL Stitch Joint and the 1112/1112 NSL Stitch Joint, including enabling works, commenced on 9 February 2018 and were completed on 18 July 2018. Leighton engaged T&M Specialists ("**T&M**") as the sub-contractor for the demolition works, Fang Sheung as the sub-contractor for the rebar fixing, and Hills Construction Co Ltd ("**Hills**") as the sub-contractor for the formwork and concreting for those rectification works[92].

(2) The overall works for the rectification of the 1111/1112 EWL Stitch Joint, including enabling works, commenced on 27 February 2018 and were completed on 10 April 2018. Leighton engaged Kingland (Sino) Company Limited ("**Kingland**") as the sub-contractor for the demolition works, Fang Sheung as the sub-contractor for the rebar fixing, and Hills as the sub-contractor for the formwork and concreting for those rectification works[93].

[89] **[CC3/1310-21]**.
[90] **[CC3/1322-34]**.
[91] **[CC3/1373-76]**.
[92] See the 1st witness statement of William Holden **[CC1/77/§37]**.
[93] See the witness statement of William Holden **[CC1/77/§33]**.

119. NCR 66, 95 and 96 were closed out following the completion of the relevant rectification works[94]. Subject to certain material submissions (see Section G8.4 below), the Government has accepted the aforesaid rectification works by RDO's letter dated 4 April 2019[95]. MTRCL has also recently confirmed that no water seepage was found at the NSL Stitch Joints[96].

120. As for the 1111/1112 Shunt Neck Joint:-

(1) In around the end of 2017, a minor crack but no water seepage was observed at the structure[97].

(2) On 6 March 2018, MTRCL instructed Leighton to chip off the concrete at 3 locations to expose the rebars at the Joint for investigation. This revealed that some of the rebars at the Joint were not properly spliced and only slotted into the couplers[98].

121. On 30 October 2018, MTRCL issued NCR 267[99] to Leighton. On the same day, a remedial proposal was also formally submitted by MTRCL to RDO[100].

122. Further communication followed between MTRCL and RDO. The latest position is that the Government has on or about 28 May 2019 approved,

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[94] See the witness statement of Michael Fu **[BB1/83/§36]**.
[95] **[BB6/4275-77]**. See also the 2nd witness statement of Lok Pui Fai **[DD7/10275-76/§17]** and **[T/Day 15/97:19-99:3]**.
[96] **[BB16/10041-80]**.
[97] **[DD1/38.64/§3.2]**.
[98] **[DD1/38.64/§§3.4-3.5]**; the witness statement of Michael Fu **[BB1/80/§29]**.
[99] **[DD2/1103-05]**.
[100] **[DD2/717;737-1089]**.

subject to conditions, the remedial proposal in relation to the 1111/1112 Shunt Neck Joint[101].

123. NCR 267 remains open pending the completion of the rectification work[102].

124. A similar problem, however, pervades the investigation process of all the Joints, namely that MTRCL's reports on the defects discovered and the cause thereof were, at best, sketchy. There is limited detail and very little analysis. In its Stitch Joints Report[103] and Shunt Neck Report[104], there were only limited photographic records showing the condition and extent of the defects discovered. The analysis of the actual cause was even less. It is regrettable but obvious that when MTRCL and Leighton discovered the defects, the focus was upon speedy rectification and little or no sufficient attention was applied to investigating the cause of the defects and those responsible for them.

G. ISSUE 3

G1. Nature of RISC Forms

125. According to Clause 4.6(c) of the Entrustment Agreement dated 29 May 2012, in performing its obligations under the Entrustment Agreement,

[101] See the RDO's letter dated 28 May 2019 **[DD9/12254]** and **[T/Day 15/99:4-101:2]**.
[102] See the witness statement of Michael Fu **[BB1/83-84/§37]**.
[103] **[BB1/162-201]**.
[104] **[DD1/38.61-38.79]**.

MTRCL shall act in accordance with its management systems and procedures[105].

126. Pursuant to the Instrument of Exemption letter dated 5 December 2012, MTRCL was required to follow various imposed conditions, including the instigation of an assurance system and control scheme to ensure that the management of the construction of the works was at a standard not inferior to that required under the Buildings Ordinance and Regulations[106].

127. In order to explain what its management systems and procedures were under the Entrustment Agreement and assure the Government that the imposed conditions under the IOE would be followed, MTRCL submitted to the Government a Project Management Plan ("**PMP**")[107]. Indeed, the covering letter to the IOE required the submission of a formal PMP. The first formal PMP was submitted on 8 February 2013[108]. It was subsequently updated 6 times, with the latest one submitted on 1 November 2018[109]. Each PMP was applicable to the whole SCL Project and, therefore, Contract 1112 in particular.

128. The PMPs referred to MTRCL's Project Integrated Management System ("**PIMS**")[110]. PIMS is a series of internal project management documents. In

[105] **[G7/5612-13]**.
[106] **[H7/2220-2233]**.
[107] See e.g. the "Introduction" to the PMP Version D dated 20 February 2014 **[B4/2223]** and the PMP Version F dated June 2016 **[B4/2356]**; witness statement of Aiden Rooney **[B1/183-184/§11]**.
[108] Version A **[B4/1825]**. Before that there was a draft PMP dated 22 November 2012 referred to in the IOE **[H7/2401]**.
[109] Version B **[B4/1950]**; Version C **[B4/2082]**; Version D **[B4/2217]**; Version E **[B4/2350]**; Version F **[B4/2488]**; Version G **[BB12/8058-8195]**.
[110] See e.g. the PMP Version D dated 20 February 2014 **[B4/2229/§5.1]** and the PMP Version F dated June 2016 **[B4/2362/§5.1]**.

particular, in PIMS/PN/11-4/A4 "Monitoring of Site Works"[111], the Request for Inspection and Survey Checks ("RISC") process is prescribed[112] and the RISC standard form provided[113].

129. The PMPs themselves also independently referred to Engineering Hold Points and the need for the Contractor (i.e. Leighton) to submit and MTRCL to maintain RISC forms[114].

130. Consistent with the PMPs and PIMS, and pursuant to and in accordance with the Contract between MTRCL and Leighton, Leighton submitted various Inspection and Test Plans ("**ITPs**") for NAT, SAT and HHS to MTRCL[115]. In these ITPs, Leighton set out the necessary hold point inspections, including the rebar inspection and pre-pour inspection, and the need of RISC form submission[116].

131. In summary, whether between the Government and MTRCL or MTRCL and Leighton, it was agreed, as a matter of contract, that the rebar hold point inspection and the pre-pour hold point inspection would be carried out and the corresponding RISC forms generated.

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[111] See e.g. the PMP Version D dated 20 February 2014 **[B4/2285]** and the PMP Version F dated June 2016 **[B4/2418]**.
[112] **[B3/1583/§5.1.2]**.
[113] **[B3/1609]**.
[114] See e.g. the PMP Version D dated 20 February 2014 **[B4/2236/§§7.5.1 and 7.6.1]**, the PMP Version E dated March 2015 **[B4/2495/§§7.5.1 and 7.6.1]** and the PMP Version F dated June 2016 **[B4/2369/§§7.5.1 and 7.6.1]**.
[115] See the supplementary witness statements of Michael Fu **[BB8/5218/§12]** and Kit Chan **[BB8/5190-5191/§16]**.
[116] See e.g. **[BB1/293]** for NAT.

132. Nevertheless, it appears to be common ground (between Government, MTRCL and Leighton) that RISC forms are not statutory or regulatory documents in the sense that they are required under the BO or BD's acceptance letters[117]. They were not documents that would be audited by Pypun carrying its BSRC role on behalf of BD or its M & V role[118].

133. It is noted from MTRCL's PIM Practice Note "Archiving of Project Records" (PIMS/PN/02-4/A1), Inspection Certificates (Item 11.18) are required to be retained for 12 years[119], Requests for Inspection (Item 11.26) are to be destroyed after the completion of the project[120] and Concrete Structures Specific (11.47) – Holdpoints Witness Points Inspection Records (11.47.1) can also be destroyed after completion.

134. It is submitted that RISC forms are self-evidently a "request" (for an inspection) but they also contain a record (or should contain a record) of the inspection itself and may, therefore, be taken to be a form of certification. If, however, MTRC's submission at §34.3 of its Closing Statement is correct and "*Holdpoint/Witness Points Inspection Records*" relating specifically to concrete structures can be destroyed after completion, it is submitted that there is a an inconsistency and/or weakness in the system and the RISC forms relevant to the structures under consideration ought to be maintained for a reasonable period as they are important project records under PIMs. In any event, it is observed that in the specific context of the Inquiry, since

[117] See the 2nd witness statement of Lok Pui Fai, §22(ft 1) **[DD7/10277]**; the 3rd witness statement of Lok Pui Fai, §11 **[DD7/10288-10289]**; the 4th witness statement of Lok Pui Fai, at §9 **[DD7/10294]**; MTRCL's opening, §49 **[OA1]**.
[118] See the 2nd witness statement of Yueng Wai Hung, §103 **[GG1/46]**.
[119] BB16/9858
[120] BB16/9853 and the note at the top of [BB16/9850] regarding items earmarked with *

completion of Contract 1112 has not yet been achieved, had the requisite RISC Forms been issued for the NAT, SAT and HHS then the same would have been available for scrutiny by the Commission.

G2. Procedures in respect of RISC Forms

135. MTRCL's ConEI Mr. Chris Chan [121] and SIOWII Mr. Victor Tung [122] explained the procedures of RISC form as follows:-

(1) Whenever Leighton reached a hold point, Leighton should submit a RISC form;

(2) This RISC form was printed out from Leighton's system (in quadruplicate);

(3) Leighton's engineers would then sign on the RISC form;

(4) The RISC form would then be submitted to Leighton's QA department for registering;

(5) Leighton would then pass the RISC form to MTRCL's administrative assistants for in-putting information into the MTRCL RISC register;

(6) The RISC form would then be passed to MTRCL's SIOW to sign and confirm the date of receipt;

[121] 1st witness statement of Chris Chan **[BB1/115/§18].**
[122] Victor Tung's oral evidence at T13/13:15 - 15:5

(7) The SIOW would then distribute the RISC form to the relevant construction engineers or inspectors to conduct hold point inspections. Ordinarily, RISC forms requiring a rebar inspection would be given to the construction engineers and RISC forms in respect of pre-pour inspections would be given to IOWs.

136. Mr. Victor Tung estimated that this process could take more than 1 day[123].

137. Mr. Victor Tung agreed that Leighton's engineers could have anticipated one day before a hold point inspection, and submitted a RISC form one day beforehand[124].

138. Mr. Tony Tang also said that MTRCL could not create its RISC number without Leighton having submitted a RISC form[125].

G3. Reasons for Missing RISC Forms

G3.1 Evidence of Leighton on RISC Forms

139. Mr. Henry Lai, who was Leighton's engineer responsible for the external area and tunnel structure of NAT, Back of House West of the Hung Hom Station and NFA since February 2016[126], said that the reason for not completing the RISC forms was due to his heavy workload such that he did

[123] Victor Tung's oral evidence at **[T/Day 13/13:15-21]**
[124] T13/15:12-15
[125] T12/126:17-127:7
[126] 1st witness statement of Henry Lai **[CC1/88/§3]**.

not have the time to complete the RISC forms[127]. Mr. Henry Lai's performance in issuing RISC Forms was very poor and, by a significant margin, he was the worst of Leighton's engineers in this regard.

140. Mr. Jeff Lii was Leighton's engineer working on HHS from February 2015 to May 2018[128]. He gave several reasons for not submitting the RISC forms[129]:-

(1) Both MTRCL and Leighton expected the inspections to proceed without delay, so that inspections would be carried out without RISC forms;

(2) The RISC form was not user friendly. He said he would have to use a tri-colour photocopier to print the document using the INCITE system, there might be errors and it was difficult to correct them. Sometimes, for the same item, he would have to input the information again and it was rather time consuming[130]; and

(3) He was busy attending to other tasks. Though he was aware that he had to submit the forms, as work piled up, he began to forget about it[131].

[127] 2nd witness statement of Henry Lai **[CC6/3787/§6]**.
[128] Witness statement of Jeff Lii **[CC6/3809/§5].**
[129] Witness statement of Jeff Lii **[CC6/3814/§§20&21].**
[130] T/Day 7/15:7-21
[131] T/ Day 7/34:19-35:10

141. He added that it was a common and normal practice for Leighton to continue working once it obtained MTRCL's verbal approval after a formal inspection. MTRCL's staff was fully aware, and approved, of this normal practice[132]. He mentioned such a practice involved communication via WhatsApp[133].

142. Mr. Sean Wong, who was Leighton's graduate engineer/engineer responsible for SAT at EWL Level[134] from November 2014 to December 2016, said that the reason for not submitting the RISC forms was that he was constantly busy carrying out other tasks; he did not have time to review missing RISC forms; he forgot to issue the ones that were outstanding, and MTRCL's construction engineers and inspector of works also did not demand RISC forms to be submitted prior to formal joint inspections[135].

143. Mr. Alan Yeung, who was Leighton's engineer responsible for HHS from September 2014 to January 2016 and SAT at NSL level from January 2016 to January 2017[136], said that he was very busy and must have forgotten to submit the RISC forms that were outstanding[137].

144. Mr. Raymond Tsoi, who was Leighton's engineer responsible for SAT at EWL level from November 2016 to March 2017[138], said the reason for not submitting RISC forms was because he was busy carrying out other tasks, and he did not have time to prepare all the RISC forms[139].

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[132] Witness statement of Jeff Lii **[CC6/3814/§19].**
[133] Witness statement of Jeff Lii **[CC6/3813/§17(d)].**
[134] Witness statement of Sean Wong **[CC6/3799/§3]**.
[135] Witness statement of Sean Wong **[CC6/3804/§19]**.
[136] 1st Witness statement of Alan Yeung **[CC6/3818/§5]**.
[137] 1st Witness statement of Alan Yeung **[CC6/3824/§22]**.
[138] Witness statement of Raymond Tsoi **[CC6/3790/§§3-4]**.
[139] Witness statement of Raymond Tsoi **[CC6/3795/§20]**.

145. In summary, it can be concluded from the evidence of Leighton's engineers who were responsible for submitting RISC forms, that the essential reason for not submitting RISC forms was that they gave this task a low priority, no doubt because they believed MTRCL would still carry out formal hold point inspections in the absence of RISC forms.

G3.2 Evidence of MTRCL on RISC Forms

146. Mr. Victor Tung, the SIOWII of MTRCL responsible for SAT and HHS, said that if MTRCL had strictly insisted on the proper submission of RISC forms by Leighton before each and every hold-point inspection was allowed to take place, site progress would have been seriously affected. However, he rightly accepted that carrying out inspections without a proper RISC form being submitted was not the best practice[140]. He mentioned that he relied on a WhatsApp group between MTRCL's and Leighton's personnel to check which locations were ready for hold-point inspections[141].

147. Mr. Tony Tang, the IOW of MTRCL responsible for pre-pour checks at NAT, including the Stitch Joints and Shunt Neck Joint, also confirmed that he acceded to Leighton's oral requests for inspections and gave permission for works to proceed without RISC forms in order not to hold up the progress on site[142].

[140] Witness statement of Victor Tung **[BB8/5257/§37]**.
[141] Witness statement of Victor Tung **[BB8/5251/§§11 & 12]**.
[142] 1st witness statement of Tony Tang **[BB1/132-133/§47]**.

148. Ms. Kappa Kang, the ConEII for NAT responsible for rebar fixing hold point inspections, said MTRCL's construction team was aware of and discussed the problem of Leighton's failure to submit RISC forms in advance of inspection and she had received oral requests, telephone calls and WhatsApp messages from Leighton's engineers requesting for inspection[143]. She also identified several WhatsApp messages in a WhatsApp group as an illustration of the practice adopted[144].

149. Similarly, Mr. Sebastian Kong, the graduate engineer/ConEII of MTRCL who was responsible for HHS rebar hold point inspection, said that he would carry out rebar hold point inspections with Leighton's Jeff Lii or Matthew Tse upon their oral requests and without RISC forms[145] having been submitted.

150. The former Construction Manager of MTRCL, Mr. Kit Chan, was well aware of the outstanding RISC form problem as early as May 2015. He requested Leighton to compile and submit a register of various problems and issues, and this register included items which kept track on the RISC form situation[146]. Leighton's quality assurance department duly complied with this request.

151. However, Mr. Kit Chan considered that the lack of RISC forms was not very serious during his time of tenure[147]. He did not insist on having RISC forms

[143] Witness statement of Kappa Kang **[BB14/9465/§10]**
[144] BB14/9469-9473
[145] Witness statement of Sebastian Kong **[BB8/5246/§14]**.
[146] Witness statement of Kit Chan **[BB8/5197-5198/§§37-38]**. See also the registers at **BB8/5692-5786 and BB16/9799-9835**
[147] T13/136:6-9

submitted by Leighton before carrying out inspections[148]. He also did not raise the matter with more senior management[149].

152. However, when Mr. Kit Chan left in May/June 2016, his successor, Mr. Michael Fu, was not apparently aware of the problem of the lack of RISC forms until February/March 2018[150], even though Mr. Michael Fu was sent the "*Michael Fu Special Request Process Control Register*" by email on 10 June 2016[151] and he therefore had the means at his disposal to have found out about the RISC forms problems.

153. It is submitted that the problem with the lack of RISC forms started when Mr. Kit Chan was the Construction Manager. He did not take the compliance of RISC forms as seriously as he should have done. A general habit or mind-set among the front-line site staff of MTRCL and Leighton was formed which viewed the submission of RISC forms as non-essential and, therefore, the problem of lack of RISC forms continued after Mr. Kit Chan's departure with Mr. Michael Fu either not knowing about, or certainly not appreciating, the seriousness of the lack of RISC forms.

154. The upshot of all of this was that Leighton was permitted to complete the construction works on site without submitting a large number of RISC forms with the knock-on consequence that there is uncertainty as to when and by whom the inspections took place, or indeed whether they took place at all.

[148] T13/135:17-136:5
[149] T13/138:1-21
[150] T10/104:21-105:25
[151] BB16/9797, Count 4 (Active Tasks) of BB16/9831 and Count 38 (Completed Tasks) of BB16/9833

155. It can be seen from the bar charts[152] below that there was a trend of deterioration starting mid-2016. There was an obvious increase in the numbers and percentage of missing RISC forms at NAT and SAT after Mr. Kit Chan left the project and Mr. Michael Fu took over as Construction Manager:-

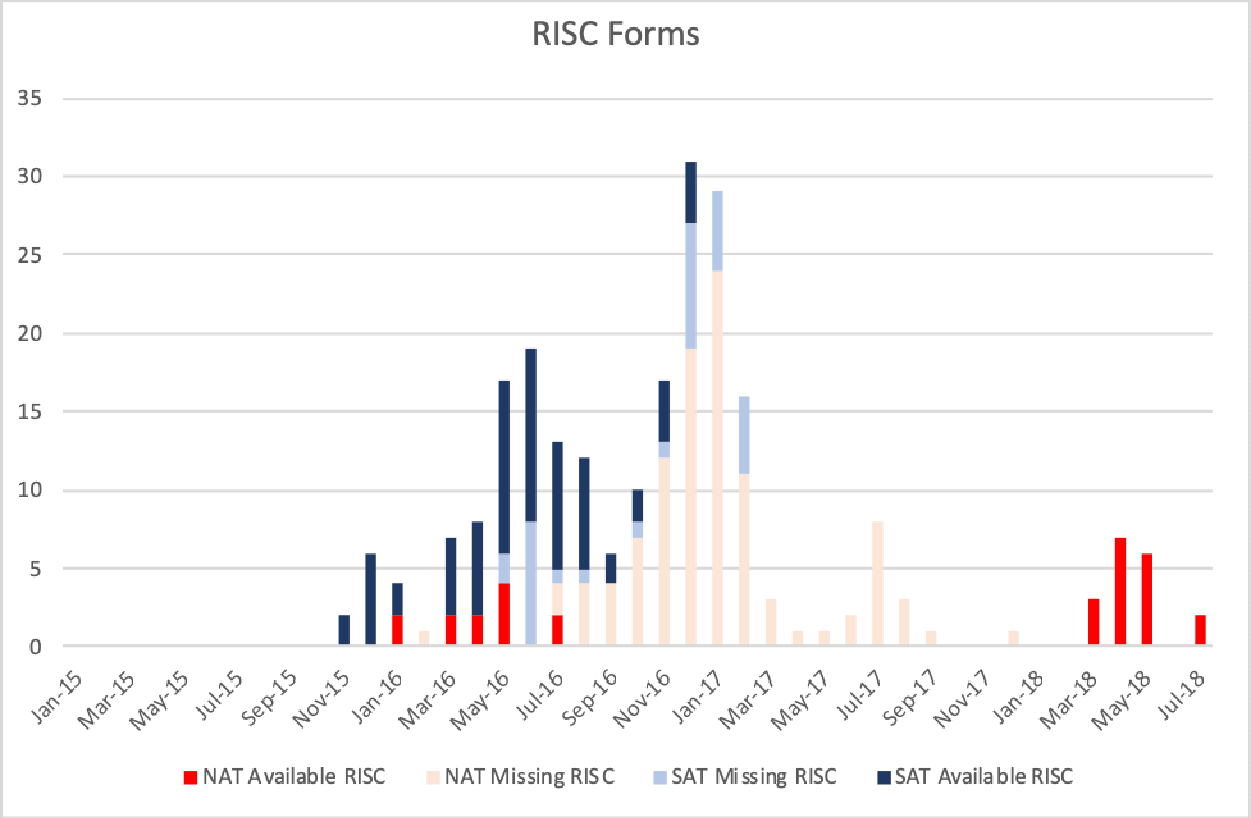

Chart 1 – NAT and SAT

[152] The bar charts are created by Counsel for the Commission based on the summary tables provided by Leighton.

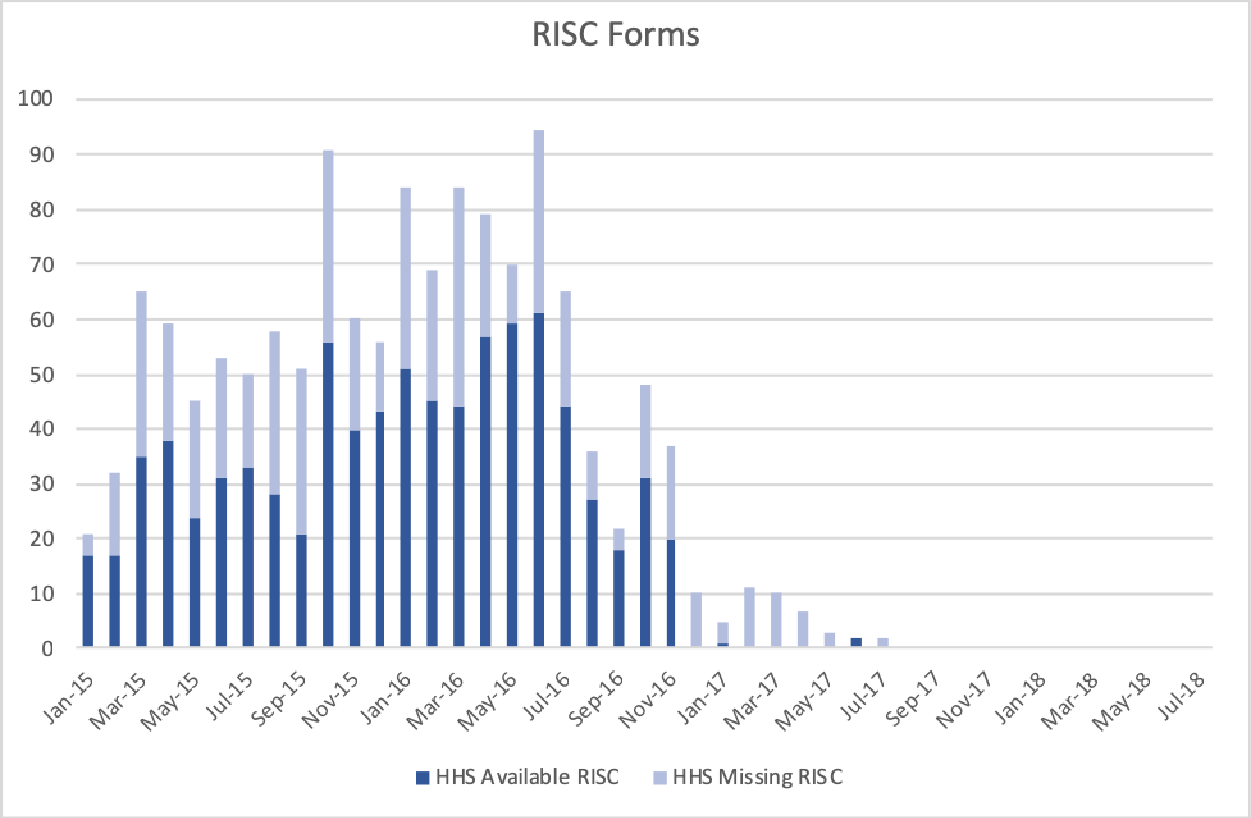

Chart 2 – HHS

156. It is submitted that, with the benefit of hindsight, Mr. Kit Chan or Mr. Michael Fu could have stopped and/or improved the situation if MTRCL had taken a firmer attitude with Leighton. For example, by refusing to carry out inspections without RISC forms being submitted[153].

157. In summary, Mr. Kit Chan put forward 5 reasons to explain the missing RISC Forms[154]:-

(1) Individual performance;

[153] T13/135:24-136:5
[154] T14/1:13-2:23

(2) The relative importance of the pours;

(3) Non-user-friendly nature of the RISC form in today's construction environment;

(4) Delay that may be caused to the works if the RISC form procedure was strictly adhered to;

(5) RISC form procedure was a contractual requirement and not a statutory requirement.

G3.3 Individual Performance

158. It is submitted that the performance (and competence) of the individuals concerned must be one of the key factors.

159. It can be seen from Leighton's HHS summary table [155] that certain individuals nearly submitted almost all of the RISC forms required, whereas, some other individuals had a rather poor record in submitting RISC forms.

160. However, it seems that there was no responsible management within either Leighton's or MTRCL's organisations to monitor and control individuals' performance in relation to the submission of RISC forms.

G4.4 Importance of Pours

[155] CC9/5656.1-5656.15

161. Mr. Kit Chan explained this point by using the examples of the construction of a draw pit or a 1 or 2 metre high wall, and describing them as minor pours[156]. These were presumably to be contrasted with the pour(s) in respect of a slab to a whole bay area.

162. Mr. Kit Chan considered that it was the personal judgment of the front-line staff on site to determine which pour was important or not[157].

163. It is noted that Mr. Kit Chan considered the construction of stitch joints at NAT as important pours[158]. Yet, the problem of missing RISC forms applied to these very important areas so far as the original Stitch Joints are concerned.

164. It is submitted that the inherent problem with this point is the absence of any definition as to what were major pours and what were minor pours.

165. It is submitted that if MTRCL or Leighton considered minor pours did not need to follow the RISC form procedure, it should be expressly stated in the PIMS or other contractual documents in order to avoid uncertainty and/or confusion.

G4.5 <u>Non-user-friendly nature of the RISC form</u>

[156] T14/17:1-2
[157] T14/17:9-12
[158] T14/18:20-22

166. Mr. Kit Chan explained that engineers nowadays have many different and various responsibilities from those in the past. Engineers these days are, so he said, burdened with many different tasks[159].

167. It is submitted that this reason may be a factor discouraging an individual to strictly adhere to the RISC form procedure. However, this should not be viewed as a self-sustaining excuse. This is especially the case when it can be shown that some individuals were able to follow the RISC form procedure properly.

G4.6 Delay Caused

168. Apart from Mr. Kit Chan, Mr. Victor Tung and Mr. Tony Tang also considered keeping or catching up with the progress of works was more important than following the RISC form procedure.

169. However, as accepted by Mr. Victor Tung, with proper attendance at site and appropriate planning, Leighton's engineers could have anticipated one day (at least) before a hold point inspection and submitted a RISC form one day beforehand[160].

170. As such, it is submitted that potential delay caused to the progress of works is not a sustainable excuse for not following the RISC form procedure.

[159] T13/135:2-10
[160] T13/15:7-15

171. Delay could be avoided if Leighton and/or MTRCL planned ahead and anticipated forthcoming hold point inspections.

172. This point, it is submitted, is more a reflection of poor planning, organization and management within MTRCL and Leighton rather than a legitimate excuse for not issuing RISC forms.

G4.7 RISC form procedure was a contractual requirement and not a statutory requirement

173. It appears that there is no dispute between the involved parties that RISC form procedure is a contractual requirement and not a statutory requirement.

174. Mr. Kit Chan explained that since the RISC form procedure was only a contractual requirement, the contractors did not pay high attention to it[161].

175. However, as stated above, the RISC form procedure is part of the quality assurance and control system. As Dr. Peter Ewen accepted, RISC forms are part of the quality records[162].

176. It is submitted that this RISC form procedure should not be circumvented in the manner achieved under Contract 1112 and, whilst modernization through the use of technology may be desirable, this really affords no excuse for what has occurred.

[161] T13/131:1-9
[162] T14/81:11-17

G4.8 Conclusion on Reasons for Missing RISC Forms

177. It is submitted that the 5 reasons given by Mr. Kit Chan are no doubt a good summary of the reasons for missing RISC forms.

178. However, it is submitted that the ultimate reason behind the missing RISC forms was the poor management within both MTRCL and Leighton in the planning, supervision and monitoring of hold point inspections, which led to the widespread non-implementation of the RISC form system as part of the quality assurance procedure.

G5. Extent of Missing RISC Forms

G5.1 MTRCL

179. Initially, on 30 January 2019, MTRCL provided the Government with a PowerPoint presentation which purportedly provided the figures of RISC forms available.

180. According to MTRCL's presentation, there were only 16 rebar fixing RISC Forms (27%) and 13 pre-pour RISC Forms (22%) available out of 59 pours for NAT[163]. In the Final Verification Study Report, the required RISC Forms at NAT are said to be 64 and 59 for rebar fixing and pre-pour respectively and the available RISC Forms are 21 (33%) and 13 (22%) respectively[164].

[163] DD3/1187
[164] Table 1 at BB16/9963

181. Further, according to MTRCL's presentation, there were only 25 rebar fixing RISC Forms (64%) and 25 pre-pour RISC Forms (64%) available out of 39 pours for SAT[165]. In the Final Verification Study Report, the required RISC Forms at SAT are said to be 42 and 44 for rebar fixing and pre-pour respectively and the available RISC Forms are 23 (55%) and 27 (61%) respectively[166].

182. Further, according to MTRCL's presentation, there were only 174 rebar fixing RISC Forms (37%) and 209 pre-pour RISC Forms (44%) available out of 474 pours for HHS[167]. In the Final Verification Study Report, the required RISC Forms at HHS are said to be 659 and 661 for rebar fixing and pre-pour respectively and the available RISC Forms are 287 (44%) and 344 (56%) respectively[168].

G5.2 Pypun

183. Pypun has produced a Document Review Report dated 23 May 2019[169].

184. Table 1 of this report in relation to rebar fixing RISC forms is reproduced below[170]:-

	NAT	**SAT**	**HHS (AB)**	**HHS (NFA)**	**HHS (U&TT)**
Total No. of Concrete Pour	59	49	67	82	519
Nos. of RISC Form	64	42	96	72	436

[165] DD3/1195
[166] Table 1 at BB16/9963
[167] DD3/1192
[168] Table 1 at BB16/9963
[169] GG3/1011-1856
[170] GG3/1021

Required					
Nos. of RISC Form Available for checking	21	23	28	66	149
% of RISC Form Available for checking	33%	55%	29%	92%	34%

185. Table 2 of this report in relation to pre-pour RISC forms is reproduced below[171]:-

	NAT	**SAT**	**HHS (AB)**	**HHS (NFA)**	**HHS (U&TT)**
Total No. of Concrete Pour	59	49	67	82	519
Nos. of RISC Form Required	59	46	67	82	400
Nos. of RISC Form Available for checking	13	27	22	73	207
% of RISC Form Available for checking	22%	59%	33%	89%	52%

G5.3 WSP

186. MTRCL has engaged WSP as an independent audit consultant to carry out an audit of the structures at NAT, SAT and HHS to check if the construction works were properly inspected[172].

187. WSP has produced an audit report for NAT dated 15 May 2019[173] and an audit report for SAT dated 15 May 2019[174].

[171] GG3/1021
[172] Witness statement of Peter Ewen **[BB8/5155/§11]**
[173] B11/7625-7646
[174] B13/9199-9218

188. The audit report for HHS was under preparation at the time of hearing[175]. It was submitted to the Commission on 19 July 2019[176].

189. As stated in table 7 of WSP's audit report for NAT dated 15 May 2019[177], 79 RISC forms were required for rebar fixing and 76 RISC forms were required for pre-pour checks. However, there were only 22 and 15 RISC forms found respectively.

190. These figures represent that only 27.8% and 19.7% of RISC Forms for rebar fixing and pre-pour checks had been submitted at NAT.

191. As stated in table 5 of WSP's audit report for SAT dated 15 May 2019[178], 51 RISC forms were required for rebar fixing and 51 RISC forms were required for pre-pour checks. However, there were 32 and 32 RISC forms found respectively.

192. These figures represent that 62.7% of RISC Forms for both rebar fixing and pre-pour checks had been submitted at SAT.

193. As stated in table 3.1 of WSP's audit report for HHS dated July 2019[179], 698 RISC forms were required for rebar fixing and 669 RISC Forms were required for pre-pour checks. However, there were 314 and 397 RISC forms found respectively. These figures represent that only 44.99% and 59.3% of

[175] Witness statement of Peter Ewen **[BB8/5155/§13]**
[176] BB16/10004-10028
[177] BB11/7640
[178] BB13/9214
[179] BB16/10022

RISC Forms for rebar fixing and pre-pour checks had been submitted at HHS.

194. It is noted that in calculating the number of RISC forms required, WSP adopted a different methodology in counting the number of RISC Forms required. It is assumed that elements concreted on the same date, such as slabs and walls in each box, required individual RISC forms.

195. The underlying checklists adopted by WSP in counting the number of RISC Forms required and available for NAT and SAT are located at **BB16/9869-9871** and **BB16/9872-9873** respectively.

196. The calculation in percentage terms is different to that calculated by MTRCL itself and Pypun.

197. There are two problems apparent in WSP's methodology for NAT:

(1) WSP did not take into account the missing RISC Forms for the original stitch joints constructed at NAT. It has only audited the RISC Forms for remedial works at the stitch joints, which necessarily results in a higher percentage.

(2) WSP stated in its NAT audit report that it assumed the stitch joints required individual rebar fixing RISC Forms for top and bottom rebar. However, it appears from the checklist for NAT that this is not the case. Examples are boxes 62 and 63 in the checklist.

G5.4 Conclusion on the extent of missing RISC Forms

198. Despite the various statistics compiled by different parties, two things are clear: firstly, there is a substantial amount of RISC Forms unavailable and (ii) the contractual requirements in Contract 1112 in respect of the preparation and maintenance of the RISC Forms have not beeen complied with. Both MTRCL and Leighton should bear responsibility for such non-compliance.

G6. Pypun's role in auditing of RISC Forms

199. Pypun considers it has no duty to audit RISC forms[180]. This is essentially because they do not fall within Pypun's repeated mantra of "*cost, programme and public safety*."

200. Mr. Jonathan Leung on behalf of the Government disagrees. This is because he considers RISC forms involved quality issues[181]. He considers quality was part and parcel of all the work of Pypun and that cost, programme and public safety all have quality elements in them[182]. It appears that he expected Pypun would have carried out a simple auditing on RISC forms[183].

201. The Government reiterates in its Closing Submissions that it does not accept that the RISC forms were documents that Pypun would not have been required to look at and its position is that the checking exercise falls within

[180] 2nd witness statement of Yueng Wai Hung, §103 **[GG1/46]**; §3.9 of Closing Submissions of PyPun.
[181] T15/90:11-22
[182] T15/89:19-25
[183] T15/91:9-19

the scope of the M&V Agreement and no supplementary engagement is required[184].

202. The legal team of the Commission agrees with the Government's position and submits that, as a general proposition, part of Pypun's responsibilities should have been to carry out auditing of RISC forms. Whether that general responsibility would have resulted in an audit of the RISC Forms in respect of NAT, SAT and HHS under Contract 1112 is, of course, a matter of conjecture. However, if an auditing task on RISC forms had been carried out, it is submitted that the situation might not be as serious as it is now. As an observation, if it is thought that there is any ambiguity in the M & V Agreement regarding Pypun's role in respect of RISC Forms, no doubt a simple amendment to its terms could be made.

G7. <u>Recommendations in relation to RISC Form Procedure</u>

203. Dr. Peter Ewen said that MTRCL planned to introduce a tool called "iSuper" (Intelligent Supervision for Projects). This tool has been used for digitalisation of the RISC form process and also includes an element of process control[185].

204. He considers digitalisation of the inspection process would significantly simplify the works that site team members are required to carry out, enabling them to conduct the actual inspections and to complete all the necessary recording and filing works more efficiently.

[184] §137 of Closing Submissions of the Government
[185] Witness statement of Peter Ewen **[BB8/5167/§53]**

205. The system can also help to track the RISC forms to overcome the problems of being unable to locate them[186].

206. He says that one of the most significant improvements brought about by iSuper in the inspection process is that the process can now be carried out by the frontline staff themselves and instantaneously archived, as opposed to relying on office based colleagues to complete the documentation. In doing so, iSuper substantially reduces the risk of inspection records being missed[187].

207. It appears that the digitalisation of RISC forms can only specifically address the non-user friendly nature of the RISC form, which is one of the 5 reasons given by Mr. Kit Chan for missing RISC forms. However, it may indirectly assist to improve the performance of individuals and, hopefully, eliminate or at least reduce the perception that progress may be adversely affected by sticking rigidly to the RISC Form procedure.

G8. Material Testing

G8.1 The Issues in relation to Material Testing

208. Apart from the primary matters mentioned above, the attention of the Commission was brought to a material testing problem by Mr. Karl Speed of

[186] Witness statement of Peter Ewen **[BB8/5167/§54]**
[187] Witness statement of Peter Ewen **[BB8/5168/§56]**

Leighton. He stated that approximately 7%[188] of the rebar delivered to site for the entire Project (i.e. 4,061.123 tonnes out of 57,795.426[189]) was not tested by a HOKLAS certified laboratory.

209. At the request of the Commission, Leighton provided a summary table for rebar testing results which sets out the details of tested and untested rebar batches[190]. It can be seen from this summary table that most of the untested rebars are in relation to Wing & Kwong's works. It can be inferred that the areas with most untested rebar are at HHS and NAT areas.

210. On the other hand, it seems that there is no concern on concrete testing (since the Government has only followed up on the rebar testing but not concrete testing). This is also confirmed in the Final Verification Study Report. In particular: (1) no anomalies were found from the available concrete cube test records; (2) the results of Schmidt Hammer tests and testing of concrete core samples carried out in the verification exercise were found to be satisfactory; and (3) consequently, the concrete of the as-constructed structures can be assumed to have the required strength as specified in the accepted drawings[191]. Therefore, rebar testing will be the focus of the discussion below.

211. As can be seen from RDO's letter to MTRCL dated 18 June 2019[192] and BD's letter to MTRCL dated 24 June 2019[193], the Government was unaware

[188] 6th Witness statement of Karl Speed **[CC6/3761/§60]**; T/Day 8/41:23-42:1
[189] 7th Witness statement of Karl Speed **[CC11/7287-7288/§5(a) & (d)]**
[190] C11/7252-7282
[191] Item (c) of Table 5 at BB16/9972
[192] D11/13191
[193] DD12/13345-13346

of such a problem up until the commencement of the Extended Inquiry and, in particular, the receipt of Mr. Karl Speed's 6th Witness Statement, together with other witness statements submitted by or on behalf of Leighton.

212. From MTRCL's reply letter to BD dated 24 June 2019[194], it appears that MTRCL also could not verify the extent of this problem.

213. In fact, MTRCL's lack of awareness can also be seen from its CP confirmation that *"sampling and testing of steel reinforcing bars used have been carried out in accordance with the CS2:2012/PNAP APP-45 for compliance with CS2:1995"* [195], which was attached to the *"As-built Submission Documents for NAT-NSL/EWL Tunnels, Shunt Neck Trough Structure (Package 4)"* dated 7 September 2017[196].

214. Pypun's BSRC team also was unaware of the untested rebar problem[197] and considered the material testing records for rebars to be in order[198]. Mr. Yueng said it was because they relied on the report submitted by MTRCL and CP's confirmation, and they could not detect the problem if there was no report.

[194] DD12/13348
[195] BB2/1065
[196] BB2/1060-1159
[197] T/Day 15/24:2-26:20
[198] 2nd Witness Statement of Yueng Wai Hung **[GG1/48/§111]**, 3rd Witness Statement of Yueng Wai Hung **[GG1/287/§10]**, 4th Witness Statement of Yueng Wai Hung **[GG1/328/§11]** for NAT, SAT and HHS respectively

G8.2 Requirements and Usual Procedures for Material Testing

215. Mr. Lok Pui Fai of BD summarized the statutory requirements on sampling and testing of rebars[199].

216. Buildings Ordinance section 17(1)6 empowers the Building Authority to impose requirements for testing reinforcement when approving structural plans or consenting to the commencement of building works.

217. Acceptance letters from BD, e.g. Appendix II to the acceptance letter of 26 September 2013 for HHS[200] specify that sampling and testing of rebar should be carried out in accordance with PNAP APP-45 for compliance with CS2:1995[201].

218. PNAP APP-45[202] § 4 requires the verification tests imposed under the Buildings Ordinance section 17(1)6 to be the purchaser's tests referred to in CS2:1995 and shall be performed by a HOKLAS accredited laboratory.

219. Section 5.1.1 of CS2:1995 provides that all rebar arriving on site shall be tested by the purchaser[203] i.e. every batch of rebar shall be tested[204]. Table 9 of CS2:1995 sets out the required sampling rate per batch[205].

[199] DD9/12281-12282/§§16-19
[200] DD8/11571
[201] H10/4751-4786
[202]H10/4787-4789
[203] H10/4777
[204] See also 5th Witness Statement of Lok Pui Fai **[DD9/12281-12282/§§18]**
[205] H10/4778

220. It is stipulated in Clause 6.1.2 of PMP[206] that MTRCL will consult the relevant Government departments on all deviations from the Government Standards during the consultation submissions. There is no such application so far. Therefore, it is obvious that Leighton has not complied with such rebar testing requirement.

221. Leighton's Alan Yeung[207] and Raymond Tsoi[208] explained the practical procedures on site in relation to rebar testing:-

(a) they would order a batch of rebar and inform MTRCL's IoW when the batch was delivered to site;

(b) MTRCL's IoW would select samples from the batch to be cut and labelled for testing;

(c) thereafter, MTRCL's IoW would inspect the samples again to ensure that they were accurately labelled and everything was in order;

(d) the samples were then sent to MTRCL's lab for testing. Leighton's Quality Assurance team handled this part of the process; and

(e) Leighton's Quality Assurance team would inform them of the test results in due course.

[206] H7/2385
[207] 1st witness statement of Alan Yeung **[CC6/3825/§27]**
[208] Witness statement of Raymond Tsoi **[CC6/3797/§24]**

222. The procedures described by MTRCL's IoW Mr. Tony Tang was also in line with the above[209]. Additionally, he mentioned that there should be a RISC form for the sampling of each batch.

223. Mr. Tang also said that Leighton should have informed him if a batch of rebar had arrived on site. It would be hard for him to find out whether rebar had arrived if Leighton did not inform him[210].

224. It is evident that Leighton relied on a colour coding system to differentiate tested and untested rebars on site:-

(1) Leighton's Mr. William Holden explained the process of rebar testing procedures. He said that following the arrival of rebar on site, spray painting the rebar a designated colour code to indicate batch and spray painting the rebar to indicate the test result, either green for a pass or red for a fail, would be carried out[211].

(2) Leighton's Mr. Joe Tam said that rebar arriving on site would be spray painted with different colours and the colour code would dictate their status. Spraying white meant the sample should be tested. When the sample has passed its test, then it would be sprayed with another colour. He explained that tested and untested rebar used to be placed near each other but now the system has improved in that the untested

[209] 1st Witness statement of Tony Tang **[BB1/135-137/§§54-63]**
[210] T/Day 12/142:21-144:7
[211] 2nd Witness statement of William Holden **[CC6/3775-3776/§22]**

rebar would be put on one side and would be cordoned off to avoid any confusion[212].

(3) Leighton's Mr. Raymond Tsoi also explained about the colour coding system and said they would also put tags onto rebar which had not been tested[213]. However, the distance between the storage areas of tested and untested rebars were not far away[214].

G8.3 Reasons for 7% of Rebars Untested

225. Leighton's Mr. Alan Yeung, who was responsible for SAT and HHS said he forgot to test 2 batches of rebar for SAT NSL area because he was busy.[215]

226. Leighton's Mr. Henry Lai who was responsible for the rebar ordering and testing in the NAT said he arranged for the sampling and testing of 103 out of the 159 batches of rebar and he did not arrange for the sampling and testing of the remaining 56 batches. The reason was because his workload was very heavy and he did not have time to arrange for the testing of the remaining batches[216].

227. He also confirmed that the rebar was available for the workers to use before testing was completed and said this was a very normal phenomenon[217].

[212] T/Day 9/27:24-29:18
[213] T/Day 10/72:2-76:24
[214] T/Day 10/75:8-13
[215] 1st witness statement of Alan Yeung **[CC6/3826/§28]**; T/Day 10/53:10-55:10
[216] 2nd Witness statement of Henry Lai **[CC6/3789/§16]**
[217] T/Day 5/127:14-128:14

G8.4 Material Testing for Remedial Works

228. On 27 May 2019, MTRCL submitted to RDO the As-built Submisison Documents for NAT-NSAL/EWL Tunnels, Shunt Neck Trough Structure, including concrete cube compressive test reports and rebar test reports for the remedial works at the Stitch Joints[218].

229. At the same time, Leighton and MTRCL provided actual material testing records to the Commission in the Extended Inquiry[219].

230. BD instructed Pypun's BSRC Team to check these material records for the remedial works. Pypun's BSRC Team provided findings and obvervations on 31 May 2019[220]. On 13 and 14 June 2019, Leighton[221] and MTRCL[222] submitted their respective comments on the findings and observations of Pypun's BSRC Team. Pypun then consolidated all these comments and responses together with its further remarks under a table on 21 June 2019[223].

231. As can be seen from DOJ's email dated 2 July 2019, updating the status of material testing for remedial works[224], there are still some minor outstanding comments on the material testing of remedial works[225], and the major concern of the BD is still the 7% of untested rebars (the 2 letters mentioned therein to Leighton and MTRCL are in relation to 7% of untested rebars)[226].

[218] DD10/12573-12588; see also paragraph 2 of DOJ's email **[DD12/13405]**
[219] [CC4/2175-2203], [CC6/3866-3866.3428] and [BB14/9489-9493]
[220] DD10/12410-12442
[221] CC11/7088-7248
[222] BB16/9774-9779
[223] DD12/13337-13341
[224] DD12/13405
[225] Paragraphs 4 and 5 of DD12/13405
[226] Paragraph 6 of DD12/13405

It is noted, however, that the Verification Proposal does not require "suitable measures" to be taken.

G8.5 Conclusion on Material Testings

232. As can be seen from the above, Leighton's colour coding system and MTRCL's monitoring system were not effective in ensuring all rebar was tested in accordance with the statutory requirements.

233. MTRCL only relied on Leighton in initiating the rebar testing process and it was difficult to detect any failure in testing.

234. On an individual level, the reason for failing to test all the rebar was due to inadequate attention being paid to the testing of rebar by the staff of Leighton.

235. Consequently, MTRCL and Leighton clearly did not execute their works according to the requirements of Contract 1112.

236. As mentioned above, though most of the untested rebar are relevant to NAT and HHS, no one can tell precisely on which structure(s) the untested rebar were installed. On the other hand, it can be seen from the summary table for rebar testing submitted by Leighton that all rebars that had been tested passed the tests[227].

[227] C11/7252-7282

237. Leighton has indicated its intention to adduce expert evidence from a statistician to show that the number of tests performed on the rebar was adequate in light of international quality standards and the statistical likelihood of untested material on site not passing testing[228].

238. However, it is noted that the Final Verification Study Report concludes that owing to spare structural capacity, suitable measures are not required for untested rebars [229]. In which event, expert evidence may not be required.

G9. Deviations

G9.1 Change from lapped bar to coupler

239. The primary issue of deviations raised in the Extended Inquiry concerns the change from lapped bar to coupler in the construction joints at the NAT, SAT and HHS.

240. According to MTRCL[230] and Leighton[231], the reasons for such change was construction need and/or convenience. For example, MTRCL's Mr. Kit Chan explained that one main reason behind the change to the use of coupler instead of lapped bar at some of the construction joints at the slab and the wall at the NAT, the SAT and the HHS was to form an opening at a permanent structure for the provision of a temporary site access for a short period of time (e.g. a few months). This is a very common practice in the

[228] See Leighton's Closing Submissions, at §74.
[229] §§4.5.3, 4.5.4, 4.5.6, 5.3 at **BB16/9978-9980**. The suitable measures at SAT NSL tunnel box appear to arise from the shear link issue, not the rebar testing issue. See §§4.5.4 and 5.2.
[230] See the Witness Statement of Kit Chan **[BB8/5200-02/§§46-48]**.
[231] See the 2nd Witness Statement of William Holden **[CC6/3777-78/§27]**.

construction and engineering industry involving a large civil project like the SCL Project[232].

241. While what is stated in the last paragraph is largely undisputed, the main thrust of Government's complaint appears to be as follows:-

(1) MTRCL/Leighton failed to make a prior consultation submission to the BD regarding the change[233];

(2) If they had done so, the BD would have imposed certain requirements in respect of the couplers not originally shown in the accepted drawings, just as they did in respect of the original couplers[234]. For example:-

(a) According to Appendix IX to the acceptance letter dated 25 February 2013[235], a quality supervision plan ("**QSP**") was required to be submitted and complied with by MTRCL and Leighton in relation to the couplers for rebars with ductility requirement at the SAT.

(b) According to Appendix V to the acceptance letter dated 5 November 2014[236], although the submission or compliance with a

[232] Witness Statement of Kit Chan **[BB8/5200/§46]**
[233] See the 2nd Witness statement of Lok Pui Fai **[DD7/10284/§§39-41]**; the 3rd Witness statement of Lok Pui Fai **[DD7/10289-10290/§§15-16]**; the 4th Witness statement of Lok Pui Fai **[DD7/10295/§§13-14]**; also §127 of the Closing Submissions of the Government.
[234] See the Government's Closing Submissions, at §127(2).
[235] **[DD8/10936-10939, particularly DD8/10938/Item 3]**
[236] **[DD7/10339-10341]**

QSP was not required, the creation of an inspection check list, the preparation of an inspection log book and so on were set out as the minimum requirements in relation to the couplers for rebars without ductility requirements at the NAT.

(3) In the present case, MTRCL and Leighton at least failed to comply with various supervision and inspection requirements, including the minimum requirements as set out in Appendix V to the acceptance letter dated 5 November 2014, whether in respect of the original or non-original couplers[237].

242. In contrast, MTRCL contends that the change from lapped bar to coupler was a minor change. According to Appendix 7 to the PMP, no prior consultation was necessary[238]. Leighton's contention is likewise[239].

243. It is respectfully submitted that the contentions of MTRCL and Leighton do not materially assist them. Whether a prior consultation was required or not, MTRCL and Leighton ought to have at least complied with the minimum requirements contemplated by the Government, MTRCL and Leighton for coupler installation at the time, including those set out in Appendix V to the acceptance letter dated 5 November 2014[240]. It would make no sense that while MTRCL and Leighton would need to comply with those requirements

[237] See: the Government's Closing Submissions, at §§128-129.
[238] See the Witness Statement of Kit Chan **[BB8/5204/§54]; [T/Day 14/38:22-40:18];** Appendix 7 to the PMP at **[BB12/8182-8185]**; also §84 of the Closing Submission of MTRCL.
[239] §78 of the Closing Submission of Leighton
[240] It appears that Leighton does not dispute that it had to at least comply with the lower standards. See: Leighton's opening submissions, at §§51-52 **[OA1]**; Mr William Holden's oral evidence **[T/Day 8/130:14-23]**. See also Leighton's Closing Submissions, at §104.

in respect of the original coupler installation identified in the accepted drawings, they, by not notifying the BD, would not need to do so in respect of the additional couplers that they used in lieu of lapped bars. MTRCL's Closing Statement at §§74 to 90 fails to address this simple but crucial point.

244. However, as shown by, for example, the evidence of Mr Henry Lai[241], Mr Jonathan Kitching[242], Mr William Holden[243], no log book recording the date, time, items inspected and inspection results regarding couplers were prepared by Leighton. MTRCL does not suggest that it did either. The other documents relied on by Leighton, such as organisational charts, Site Supervision Plans, RISC forms and witness testimony, are different from a log book[244].

245. Another problem regarding the couplers, whether original or non-original, is that no proper as-built record has been prepared[245]. The records produced by Leighton identify the "indicative locations" only[246].

246. Therefore, it is respectfully submitted that the coupler installation work of MTRCL and Leighton failed to comply with the requirements of Contract 1112.

247. It is noted that the Final Verification Study Report concludes, based on a strength reduction factor of 35%[247], that no suitable measures in respect of

[241] **[T/Day 5/5:8-6:18]**.
[242] **[T/Day 6/77:19-78:3]**.
[243] **[T/Day 8/131:6-11]**.
[244] See Leighton's Closing Submissions, at §105.
[245] See the Witness Statement of Kit Chan **[BB8/5202/§49]**. See: the Government's Closing Submissions, at §§130-136.
[246] See the 2nd Witness Statement of William Holden **[CC6/3776-77/§24]**.

coupler connections are required at NAT and SAT[248]. However, suitable measures are required at HHS[249].

G9.2 Use of Drill-in Bars at the SAT

248. This issue was originally rasied in MTRCL's briefing to the Government on 30 January 2019[250]. Mr William Holden in his witness statement explained that standard drill-in bars were used to replace damaged/misaligned couplers at the diaphragm wall to NSL base slab connections at panels SAT1, SAT8 and SAT9[251].

249. The drill-in bars for SAT1, SAT8 and SAT9 were constructed on site and used for a temporary purpose. Specifically, they enhanced the strength of the connection between the diaphragm wall and NSL base slab during the construction phase. After completion of construction, and with uplift water pressure acting on the base slab, the bars were no longer required to perform a structural function and were effectively redundant. While these were an enhancement during the construction phase, they became redundant after construction was completed[252].

250. This is confirmed by a report prepared by Atkins[253]. MTRCL was aware of and approved the use of the drill-in bars[254]. No structural issue has been

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[247] §4.2.6 at BB16/9976
[248] §4.5.1 at BB16/9978
[249] §4.5.2 at BB16/9978
[250] **[DD3/1178-1197]**.
[251] See the 2nd Witness Statement of William Holden **[CC6/3779/§30]**.
[252] See the 2nd Witness Statement of William Holden **[CC6/3779/§31]**.
[253] See the 2nd Witness Statement of William Holden **[CC6/3779/§32]**.

raised by any Involved Party in respect of this change at the hearing[255]. It is no longer referred to in the closing submissions of any Involved Party. Subject to any future engineering issues raised by any expert, it is submitted that this matter requires no determination from the Commission[256].

H. STRUCTURAL SAFETY

251. In respect of the rectification works for Issues 1 and 2, they have been or will be carried out under strict supervision by MTRCL. It is clear that a "belt and braces" exercise was adopted for the remedial works to the Stitch Joints (§§46 to 48 of MTRCL's Closing statement refers). There is no suggestion that the Stitch Joints and the Shunt Neck Joint pose or will pose any structural safety problem after the completion of the rectification works.

252. So far as Issue 3 is concerned, MTRCL has recently submitted the Final Verification Study Report. In summary, the Report concludes that with the implementation of the proposed suitable measures at HHS[257] and NSL tunnel box at SAT[258], the concern about the structural integrity of NAT, SAT and HHS arising from the missing RISC Forms and other relevant reported issues will be adequately addressed[259].

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[254] See the 2nd Witness Statement of William Holden **[CC6/3779/§34]**.
[255] It is also noted that the Final Verification Study Report disregards the strength of drill-in bars in the structural review. See §4.2.7 at BB16/9976.
[256] As to whether the change requires prior consultation, it is submitted that this is more of an internal matter between the Government and MTRCL and does not require the Commission's determination.
[257] §5.1 at BB16/9980.
[258] §5.2 at BB16/9980.
[259] §4.1.1 at BB16/9974.

253. As to whether any further engineering expert evidence will be required (and if so, on what issues), the Commission's legal team will liaise with all the Involved Parties in due course.

I. PROJECT MANAGEMENT

254. Similar to the engineering expert evidence, the Commission's legal team will liaise with all the Involved Parties in due course as to whether any project management expert evidence will be required (and if so, on what issues).

Dated 26 July 2019

Ian Pennicott SC
Calvin Cheuk
Solomon Lam
Counsel for the Commission

Annex 1

Commission of Inquiry into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project

List of Witnesses (Extended Inquiry)

	Date	Factual Witness	Position held in Organisation at the Material Time
1.	28 May 2019	Mr PUN Wai-shan	Sole Proprietor of Fang Sheung
2.	29-30 May 2019	Mr NG Man-chun	Site Supervisor of Loyal Ease Engineering Limited (on behalf of Wing & Kwong)
3.	30 May 2019	Mr LEUNG Chi-wah	Steel reinforcement worker of Loyal Ease Engineering Limited (on behalf of Wing & Kwong)
4.	30-31 May 2019	Mr Henry LAI	Engineer / Senior Engineer of Leighton
5.	3 June 2019	Mr Ben CHEUNG Yick-ming	Quantity Surveyor Manager of Wing & Kwong
6.	3 June 2019	Mr Jonathan KITCHING	Project Director of Leighton
7.	4 June 2019	Mr Jeff LII	Engineer / Senior Engineer of Leighton
8.	4 June 2019	Mr Johnny LEUNG	Site Agent of Leighton
9.	4 June 2019	Ms Regina WONG	Sub-Agent / Site Agent of Leighton
10.	5 June 2019	Mr Karl SPEED	General Manager of Leighton
11.	5 June 2019	Mr William HOLDEN	Engineering Manager of Leighton
12.	5-6 June 2019	Mr Joe TAM	Construction Manager of Leighton
13.	6 June 2019	Mr Sean WONG	Engineer / Senior Engineer of Leighton
14.	6 June 2019	Mr Saky CHAN	Assistant Engineer / Engineer of Leighton
15.	6 June 2019	Mr Sebastian KONG Sai-kit	Graduate Engineer of MTRCL
16.	6 June 2019	Mr Jim WONG	Senior Site Agent / Construction Manager of Leighton
17.	10 June 2019	Mr Ronald LEUNG	Site Agent of Leighton
18.	10 June 2019	Mr Alan YEUNG	Senior Engineer of Leighton
19.	10 June 2019	Mr Raymond TSOI	Graduate Engineer of Leighton
20.	10-11 June 2019	Mr Michael FU Yin-chit	Construction Manager – SCL Civil of MTRCL
21.	11 June 2019	Mr Chris CHAN Chun-wai	Construction Engineer II / Construction Engineer I of MTRCL
22.	12 June 2019	Ms Kappa KANG Pu	Construction Engineer II – Civil of MTRCL
23.	12 June 2019	Mr Tony TANG Siu-hang	Inspector of Works – Civil of MTRCL
24.	13 June 2019	Mr Victor TUNG Hiu-yeung	Inspector of Works / Senior Inspector of Works II of MTRCL
25.	13 June 2019	Mr Jacky LEE Chiu-yee	Senior Construction Engineer – Civil of MTRCL
26.	13 June 2019	Mr Cano NGAI Kwok-hung	Senior Construction Engineer of MTRCL
27.	13-14 June 2019	Mr Kit CHAN Kit-lam	Construction Manager – SCL Civil of MTRCL
28.	14 June 2019	Dr Peter EWEN	Engineering Director of MTRCL
29.	17 June 2019	Mr YUENG Wai-Hung	Director of PYPUN, Leader of the Building Submission Review & Compliance (BSRC) Team
30.	17 June 2019	Mr CHIU Chung-Lai	Director of PYPUN, Deputy Project Manager - Programme Monitoring (Civil) of M&V Team
31.	17 June 2019	Mr Ralph LI Tsz-Wai	Chief Engineer / RDO, HyD
32.	17 June 2019	Mr Jonathan LEUNG Man-Ho	Government Engineer / Chief Engineer of RDO, HyD
33.	17 June 2019	Mr Andrew LOK Pui Fai	Senior Structural Engineer of BD