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 APPOINTED PURSUANT TO SECTION 2 OF THE COMMISSION OF INQUIRY ORDINANCE (CHAPTER 86) ON 10 JULY 2018

WITNESS STATEMENT OF LOK PUI FAI

I, LOK PUI FAI, Senior Structural Engineer/Railway Development, Kowloon and Rail Section, New Buildings Division 2, Buildings Department, 8/F Cityplaza Three, 14 Taikoo Wan Road, Taikoo Shing, Hong Kong, do say as follows:-

1. I am a Senior Structural Engineer in the Buildings Department ("**BD**") and have been seconded to the Railway Development Office ("**RDO**") of the Highways Department ("**HyD**") for this position since 12 January 2016. My duties include, amongst other things:

(1) examining and endorsing the recommendation of Structural Engineers ("**SEs**") on structural submissions in relation to the Shatin to Central Link Project ("**SCL Project**");

(2) monitoring the progress of structural submissions of the SCL Project, participating in ad-hoc and regular meetings associated with the SCL Project where there are structural related matters; and

(3) providing structural advice on site matters and conducting joint site inspection with SEs if and when necessary, and supervising the work of SEs and the Building Submission Review & Compliance Team (**"BSRC Team"**) of the Monitoring and Verification consultant ("**M&V Consultant**") employed by HyD and advising Building Surveyor of the BO Team which is a team of professionals staff (including myself) seconded from BD to RDO of HyD to handle matters in relation to the SCL Project.

2. I am a member of the Institution of Structural Engineers, U.K., the Institution of Civil Engineers, U.K. and the Hong Kong Institution of Engineers,

and a Registered Structural Engineer under the Buildings Ordinance. I joined BD in 2001 and was promoted to the position of Senior Structural Engineer in 2014.

3. I make this Witness Statement on behalf of the Building Authority ("**BA**") pursuant to the request of the Commission of Inquiry ("**the Commission**") into the Diaphragm Wall and Platform Slab Construction Works at the Hung Hom Station ("**HUH**") Extension under the SCL Project, set out in a letter from Messrs. Lo & Lo to the Development Bureau and Director of Buildings dated 6 August 2018 ("**the 6 August Letter**"). Save where otherwise appears, the facts deposed hereto are within my personal knowledge or are derived from office files and records and sources to which I have access and are true to the best of my knowledge, information and belief. Save as otherwise specified, this Statement adopts the same abbreviations and nomenclature as in the 6 August Letter.

4. This Witness Statement addresses questions 1 to 3, 4, 5, 6, 7(b), 9(c), 9(d), 10(j) to (m), 11, 14 and 15 of the 6 August Letter ("**Questions**"). As Questions 8(a), 9(a) and 9(e) of the 6 August Letter are not related to BD, they will not be covered in this Witness Statement. This Witness Statement is divided into the following parts:

(1) Part A explains the building control mechanism for different stages of the diaphragm wall and platform slab works, in answer to Questions 1 to 3, 6 and 9(c);

(2) Part B sets out the steps and processes involved in the diaphragm wall and platform slab construction works of the HUH Extension on the basis of the professional knowledge of and the information available to BD, in answer to Question 5;

(3) Part C and Part D provide other non-conformities, in answer to Questions 10(j) to (m), 14 and 15;

(4) Part E covers steps taken by the BD to investigate the allegations of Defective Steel Works, in answer to Question 4, 7(b), 9(d), 11, 14 and 15.

A. Building Control Mechanism for Different Stages of the Diaphragm Wall and Platform Slab Works

5. I understand that Mr Ho Hon Kit, Assistant Director of BD, will explain in his Witness Statement to the Commission the building control regime for the HUH Extension under the SCL Project. While BD is not directly involved in the supervision of the construction works, by imposing various conditions through the IoE and specifying requirements via the acceptance letters, there is a building control mechanism in place to ensure that the works are properly executed. The following table summarises in general the control mechanism at different stages of the works performed at the HUH Extension under the SCL Project. Details of the control mechanism will be further elaborated in the ensuing paragraphs, with reference to the IoE (at **Annex HHK-1**) and an acceptance letter dated 25 February 2013 ("**25.2.2013 Letter**") (at **Annex LPF-1**)[1] to illustrate the execution of the said mechanism in practice.

A1. Summary of the building control mechanism for Diaphragm Walls and Platform Slabs works performed at the HUH Extension

I. Design Stage	
Description	*Relevant paragraph(s) in this Witness Statement*
Appointing the Competent Person ("**CP**") to coordinate and supervise the building works, and appoint the Registered Geotechnical Engineer ("**RGE**") for building works with significant geotechnical content to supervise such building works	See paragraphs 11-13 of Witness Statement of Ho Hon Kit
Submitting design submissions for consultation by BO Team	6-8; see also paragraphs 22-25 of Witness Statement of Ho Hon Kit

[1] While BD has issued various acceptance letters and they are included in **Annex LPF-1**, I shall in this Witness Statement primarily refer to the 25.2.2013 Letter (Item 1 of Annex LPF-1) as an illustrative example.

Vetting structural submissions by BO Team to check compliance with safety requirements under the BO and regulations thereunder (Flow Chart for Processing of Submission for Consultation under IoE is at **Annex LPF-2)**	9-20; see also paragraph 27 of Witness Statement of Ho Hon Kit
Issuing acceptance letters by BD with specified requirements	6-8; see also paragraph 28 of Witness Statement of Ho Hon Kit
Submitting documents to BO Team prior to the commencement of work	9-20
Appointing Registered General Building Contractor ("**RGBC**") and/or Registered Specialist Contractor ("**RSC**")	See paragraphs 14-16 of Witness Statement of Ho Hon Kit
Submitting Notice of Commencement of Works and Undertaking by RGBC and/or RSC	21
II. Construction Stage	
Description	*Relevant paragraph(s) in this Witness Statement*
Sampling and testing of construction materials and Submission of relevant test reports	22-25
Performing site supervision by MTRCL, CP, RGE, RGBC and/or RSC	26
Performing necessary site inspection/audit and site witness by BO Team and/or BSRC Team	27-30
III. Completion Stage	

Description	*Relevant paragraph(s) in this Witness Statement*
Submitting Certification of Completion ("**CoC**") by CP and RGE together with other required documents	31-35
Performing necessary site inspection/audit and site witness by BO Team and/or BSRC Team	36
Acknowledging CoC and issuing no objection letter / acknowledgement letter	37

A2. Design Stage

Consultation submissions and acceptance letters

6. I understand that Mr Ho Hon Kit will explain in his Witness Statement the relevant parties and the processes involved in consultation submissions and the issuance of acceptance letters in which BD specifies requirements for the execution of construction works. To avoid duplication, I will not repeat those matters in this Witness Statement.

7. The structural design submissions of the HUH Extension submitted for consultation under the IoE included mainly the Foundation (Load Bearing Diaphragm Wall), Foundation (Barrette Pile & Socketed Steel H-pile), Superstructure, Substructure, Pile Cap, Excavation and Lateral Support Works (Diaphragm Wall only). The submissions were divided into 3 design packages for the different areas in the HUH Extension, namely:

(1) South Approach Tunnel, Area A (Grid 0 to 7) & HK Coliseum (Grid 7 to 15);
(2) Area B (Grid 15 to 22); and
(3) Area C (Grid 22 to 49).

8. BD had issued several acceptance letters in response to the consultation submissions for the diaphragm walls and the platform slabs

submitted by the CP. Copies of all the relevant acceptance letters are at **Annex LPF-1**. The comments provided by BD on the submissions can be found, for example, at Appendix I to the 25.2.2013 Letter at **Item 1 of Annex LPF-1**.

Documents required prior to commencement of works and the corresponding requirements

9. As explained in the Witness Statement of Mr Ho Hon Kit, BD also specified various requirements in its acceptance letters. Such requirements include the submission of certain documents/information prior to the commencement of works, such as the Quality Supervision Plan ("**QSP**"), Quality Assurance Scheme ("**QAS**") and Site Supervision Plan ("**SSP**").[2]

(a) QSP

10. The QSP is a document prepared by the CP, RGBC and/or RSC setting out the quality control supervisor/co-ordinator appointed and the frequency/extent of supervision/inspection for the coupler works.

11. As explained in the Witness Statement of Mr Ho Hon Kit, the QSP for the mechanical coupler works should include the following details:

(1) Assignments of quality control supervisor of the CP and quality control co-ordinator of the RGBC/RSC to supervise the manufacturing process of the connecting ends of the steel reinforcing bars, and the installation of steel reinforcing bars to the couplers.

(2) Frequency of quality supervision, which should be at least 20% of the splicing assemblies by the quality control supervisor of the CP and full time continuous supervision by the quality control co-ordinator of the RGBC/RSC of the mechanical couplers works.

[2] In the 25.2.2013 Letter at **Item 1 of Annex LPF-1**, for example, paragraph 4 in Appendix V requires that details of site supervision of the diaphragm wall works be included in a SSP to be submitted prior to the commencement of the diaphragm wall works, while paragraphs 2 and 3 of Appendix IX requires respectively that a QAS and a QSP to be submitted prior to the commencement of the mechanical coupler works.

(3) For couplers to be used at the top of pile cap and transfer plate, the frequency of quality supervision should be at least 50% of the splicing assembles by the quality control supervisor of the CP and full time continuous supervision by the quality control co-ordinator of the RGBC/RSC.

12. The CP submitted the QSP for the mechanical coupler works in the diaphragm walls and the platform slabs on 12 August 2013 as required in BD's acceptance letters. A copy of QSP is at Item 2 of **Annex LPF-3**. The QSP included the above details and specified that full time on site supervision for 100% of the splicing assemblies should be carried out by quality control supervisors/co-ordinators of the RGBC/RSC.

(b) QAS

13. The QAS is a set of quality control documentation related to the production of the couplers.

14. In accordance with the requirements specified in BD's acceptance letters, the CP is required to submit the QAS of the couplers' manufacturer prior to the commencement of the splicing assembly works. The QAS should include sample mill certificates; detailed description of the process of strength hardening and threading the connecting ends of the steel reinforcing bars and the relevant specifications from the manufacturer; description of the method of identification for the splicing assemblies from others; description of the method of installing the steel reinforcing bars to the couplers, etc.[3]

15. The CP submitted the QAS for the proposed couplers from BOSA Technology (Hong Kong) Limited on 8 July 2013. A copy of the QAS is at Item 1 of **Annex LPF-3**. The manufacturer's required procedures for installation of the threaded bars to the different types of couplers were specified in the Appendix 8 to the QAS. (See page 117-119 of **Annex LPF-3**)

(c) SSP

16. The CP and the Authorized Signatory ("**AS**") of the RGBC should

[3] See, for example, paragraph 2 of Appendix IX to the 25.2.2013 Letter at item 1 of **LPF-1**.

provide site supervision on the diaphragm walls and platform slabs in accordance with the SSP and Code of Practice for Site Supervision 2009 ("**Supervision Code**") and the Technical Memorandum for Supervision Plans 2009 ("**Technical Memorandum**"). Copies of the Supervision Code and the Technical Memorandum are respectively at Items 1 and 2 of **Annex HHK-6**.

17. The SSP sets out a management structure for site supervision of building works in compliance with the Supervision Code and the Technical Memorandum.[4] Pursuant to Item (l) in General Notes and Conditions to the Reference Schedule of the IoE, SSPs for the proposed works (i.e. Foundation works, Superstructure/Substructure works and Excavation and Lateral Support Works, etc.) should be submitted to BD before commencement of the relevant construction works.[5]

18. MTRCL has submitted various SSPs for the diaphragm walls and the platform slabs. Examples of the relevant SSPs are at **Annex LPF-4**. A SSP would be checked by BD to see (among other things) whether the proposed Technically Competent Person ("**TCP**") under the CP, RGE (if applicable) and the RSC/RGBC/AS streams comply with the requirements of the Supervision Code. BD will convey its comments on a SSP to CP for any follow-up. An example of a letter with BD's comments on a SSP is at **Annex LPF-5.**

19. Under the SSPs for the diaphragm walls and platform slabs, the CP, RGE (if applicable) and the AS confirm to undertake the management and execution of both site safety and quality supervision of the works covered by the SSP to be carried out in the manner prescribed by the provisions of the BO and regulations.

20. This would be an appropriate juncture for me to address Question 9(c) of the 6 August Letter:

(1) As explained in the Witness Statement of Mr Ho Hon Kit, while the

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[4] See, for example, item (l) of the General Notes and Conditions to the Reference Schedule to the IoE and section 2(1) of the BO.

[5] The types of buildings works are shown in Table 8.1 of the Supervision Code. The supervision requirements including the grades and numbers of TCP and their frequency level of site inspection are subject to the type and scale of the buildings works. A scale assessment should be carried out to determine the manpower input required for a specified frequency level of inspection and the minimum frequency levels of inspection, etc. (see section 8 of the Supervision Code at Item 1 of **Annex HHK-6**).

term generally used under the IoE regime is that BD would consider whether to "accept" the plans submitted for consultation, acceptance letters would only be issued upon satisfactory demonstration of compliance with the safety standards not inferior to those required under the BO as if approval is granted for plans submissions under full application of the BO. BD also specifies requirements in the acceptance letters.

(2) As explained above, the QSP, QAS and SSP are required to be submitted pursuant to the acceptance letters. BO Team and the BSRC Team of the M&V Consultant will check and provide comments on these documents, and request the CP to submit the revised documents if required.

(3) BD has no record of the "Method Statement No. 112601-MDS-LCA-CON-419-00" or an "approved Inspection and Test Plan" ("**ITP**") referred to in Leighton's letter dated 26 June 2018. These documents are not required under the acceptance letters.

(d) Other documents

21. In addition to the documents above, before the commencement of works, RGBC and RSC shall notify of BD their appointments and the commencement of works by submitting the "Notice of appointment of contractor, Notice of commencement of works and undertaking by contractor" according to Appendix 5 of Project Management Plan ("**PMP**") submitted by MTRCL[6].

A3. Construction Stage

Sampling and testing of materials

22. With respect to the materials used for the construction of the steel structures within the diaphragm walls and platform slabs, BD specified the requirements for their sampling and testing to ensure compliance with the required safety standard in the acceptance letters. All the relevant materials test

[6] Mr Ho Hon Kit will provide details of the PMP in his Witness Statement.

reports and mill certificates, etc. as mentioned in specified requirements of the acceptance letters should be submitted for checking and acceptance by BD. The required testing is outlined below, in answer to Question 9(c) of the 6 August Letter.

(a) Steel bars

23. Sampling and testing of steel reinforcing bars should be carried out in accordance with Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers (PNAP) APP-45 for compliance with CS2:1995. Copies of PNAP APP-45 and CS2:1995 are at **Annex LPF-6**. Testing should be carried out by a laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) for the particular test concerned (see, for example, Appendix II to the 25.2.2013 Letter at Item 1 of **Annex LPF-1**).

(b) Mechanical Couplers

24. After delivery of the mechanical splices to site, strength tests on a representative number of the mechanical splices, as directed by the CP, are required to be carried out. The tests should be carried out by a laboratory accredited under the HOKLAS or by other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with the HOKLAS in accordance with the requirements in the acceptance letters (see, for example, paragraph 1(e) of Appendix IX to the 25.2.2013 Letter at Item 1 of Annex **LPF-1**).

25. The CP is required to submit the test results of the aforesaid testing for each material according to the requirement as stipulated in the acceptance letters to the BD (see, for example, paragraph 4 of Appendix IX to the 25.2.2013 Letter at Item 1 of Annex **LPF-1**).

<u>Site supervision by MTRCL, CP, RGE, RGBC and/or RSC</u>

26. As explained earlier, the CP, RGE, RGBC and/or RSC are required to provide site supervision in accordance with the standards and procedures set out in the QSP, SSPs and other documents such as the Supervision Code and Technical Memorandum. MTRCL is required to supervise the works according

to the PMP. I understand that Mr Ho Hon Kit will also elaborate on the required supervision for the steel bar fixing and coupler installation works. I will not repeat those matters here to avoid duplication.

Site inspection, audit and site witness by BO Team and/or BSRC Team

27. During the course of construction of diaphragm walls and the platform slabs, the BO Team (SE), with the assistance of the BSRC Team of M&V Consultant, will carry out site audit/inspection if necessary.

28. Site inspection by the BO Team and the BSRC Team will be carried out as needed, such as when enquiries/complaints are received from members of the public, public safety issues/concerns identified by the M&V Consultant or raised by MTRCL, the relevant contractors or the media. According to our records, two site inspections were carried out in March 2018 and May 2018 to inspect the mechanical couplers located at the tunnel stitch joint for Contract 1112 in response to concerns raised in media reports. A summary of our site inspection/audit records can be found at **Item 1 of Annex LPF-7**.

29. Site audits will also be carried out as needed. A site audit mainly involves checking that the documentation is prepared and procedures are implemented according to the works as specified in the acceptance letters and Supervision Code. According to our records, two site audits on mechanical couplers were carried out on 22 and 24 January 2014 to inspect the threading process carried out in the fabrication yard in the Contract 1112 site and to witness the sampling, assembling and testing of mechanical coupler works adopted for the HUH Extension structure by using BOSA – Type II mechanical couplers. Copy of the relevant inspection report is at Item 2 of **Annex LPF-7**. Furthermore, a site audit was carried on 19 April 2018 for the Superstructure Works. A summary of our site inspection/audit records can be found at **Item 1 of Annex LPF-7**.

30. Site witness is one of the specific requirements to be conducted by BD staff according to the requirements in the acceptance letters. While site witness is mainly conducted for the foundation works at completion stage, examples of site witness during the construction process include witness of pile test installation and witness of bearing stratum of footings. There is no specific requirement for BD to conduct site witness for diaphragm walls and

platform slabs during construction stage.

A4. Completion stage

Submission of CoC and other required documents for acknowledgement

(a) For diaphragm wall works

31. According to the acceptance letters, a CoC together with other required documents have to be submitted by the CP and RGE (if applicable) to certify the completion of the diaphragm wall works.[7] The CP is also required to submit a quality supervision report signed by him/her to confirm that the quality supervision has been adequately provided with, the inspection log book of the quality control supervisors representing the CP and the RGBC/RSC for the mechanical couplers works.

32. Based on our records, the CoC for diaphragm walls together with the associated records plans and material test reports were submitted by MTRCL in 6 batches within the period from January 2015 to January 2016 (see the demarcation plan at Item 1 of **Annex LPF-8**). Below is a summary of the CoC submissions for diaphragm walls:

Batch	**Date of CoC Submission (Item No. of Annex LPF-8)**	**Date of BD's Reply (Item No. of Annex LPF-9)**
Batch 1	27 January 2015 (Item 2)	*21 May 2015 (Item 2) (Rejected)* 31 July 2015 (Item 5) 6 May 2016 (Item 11)
Batch 2	4 February 2015 (Item 3)	11 May 2015 (Item 1)
Batch 3	27 March 2015 (Item 4)	*21 May 2015 (Item 3) (Rejected)* 11 August 2015 (Item 6) 10 May 2016 (Item 12)
Batch 4	18 May 2015 (Item 5)	*17 June 2015 (Item 4) (Rejected)* 17 March 2016 (Item 9)
Batch 5	13 August 2015	*7 September 2015 (Item 7) (Rejected)*

[7] See, for example, paragraph 3 of Appendix V to the 25.2.2013 Letter at item 1 of **Annex LPF-1**).

	(Item 6)	8 January 2016 (Item 8)
Batch 6	22 January 2016 (Item 7)	6 April 2016 (Item 10)

Remarks:

(1) Copies of CoC submissions including covering letters, CoC and QSPs for coupler works are at **Annex LPF-8**. Other material submissions, such as concrete cube test reports, mill certificates and test reports for steel bars and couplers, are very substantial in volume. They would not be produced here but will be made available upon the Commission's request.

(2) Copies of all as-built record plans for Batch 1 to Batch 6 of diaphragm walls are at **Annex LPF-10**.

33. Site witnesses of proof tests in respect of above diaphragm walls were conducted by BO Team and/or BSRC Team and the results were found satisfactory.

34. The CoC for Batch 1 to Batch 6 was acknowledged on 5 May 2017 (see Item 13 of **Annex LPF-9**) after the required documents were submitted to the satisfaction of the BA and an issue of non-conformity was rectified.

(b) For platform slab works

35. The CP has not yet submitted the CoC for platform slab works up to date. However, BD has received some material submissions for the platform slabs including concrete cube compressive test reports, mill certificates of steel bars and coupler strength test reports[8]. Based on audit checking carried out by

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[8] Upon completion of the mechanical splice works, a report is required to be submitted to the BD, which should include:

(1) All results of the strength tests of the mechanical splices carried out.

(2) A statement signed by the CP to confirm that the acceptance criteria appropriate to the tests have been complied with.

(3) A quality supervision report signed by the CP to confirm that the quality supervision has been adequately provided with, the inspection log book of the quality control supervisors representing the CP and the RC for the mechanical couplers works.

See, for example, paragraph 4 of Appendix IX to the 25.2.2013 Letter at Item 1 of **Annex LPF-1**.

BSRC team on the submitted material test reports for steel bars and mechanical couplers, there have been no findings of unsatisfactory test result so far.

Site inspection, audit and/or site witness by BO Team and/or BSRC Team

36. Certain site audits by rebound hammer tests were carried out in 2016 and 2017 once the structural columns and walls had been constructed. Upon receipt of the CoC from the CP for the works of the SCL Project, the BO Team (SE[9]), with the assistance of the BSRC Team, will conduct witness of site tests for foundation works,[10] which is one of the specific requirements in the acceptance letters. On the other hand, the BO Team (BS[11]) will carry out a general inspection of the building concerned to see if the works have been completed generally in accordance with the building layout plans accepted by the Safety and Security Coordinating Committee ("**SSCC**"), Trackside Safety and Security Committee ("**TSSC**") and Station and Transport Integration Committee ("**STIC**") during the consultation process. The BO Team (BS) will also consult the BO Team (SE) to see if they have any objection to issuing a no objection letter to MTRCL for the CoC of HUH Extension. Moreover, the BO Team (SE) will check the supporting documents and other certificates, including the CoC and the structural related submissions[12], for the structural elements required for the completed works.

Issuing no objection letter/acknowledgement letter

37. For diaphragm wall works, BO Team (SE) will issue acknowledgement letter to the CP if the works were completed to its satisfaction. For HUH Extension, BD will issue a no objection letter to the CP if no irregularities are found. I understand that the Railways Branch of Electrical and Mechanical Services Department will also issue a letter to MTRCL to confirm the completed works are safe and sound after confirmation from all relevant government departments, including BD, that the railway works have been completed up to their satisfaction.

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[9] Structural Engineers

[10] Examples of site tests upon completion of works include core drilling for Load Bearing Diaphragm Wall, Barrette Pile, loading test for socketted steel H-pile and rebound hammer tests to vertical structural elements, etc.

[11] Building Surveyors.

[12] BO Team (SE) will check the related as-built drawings and documents as required in the acceptance letters such as material certificates, testing report, quality supervision report etc.

B. Steel fixing and Couplers works in Diaphragm Walls and Platform Slabs Construction

38. While BD does not carry out the actual construction works, I will outline below my understanding of the steps and processes involved in the diaphragm wall and platform slab construction works of the HUH Extension on the basis of my professional knowledge and the information available. These steps and processes should be carried out in accordance with the requirements of the building control mechanism explained above.

B1. Mechanical couplers/steel fixing bars in the diaphragm walls

39. After delivery steel bars to the site, sampling and testing of steel bars should be carried out in accordance with PNAP APP-45, according to the requirements as specified in the BD's acceptance letters.

40. Steel bars would be prepared by cutting and bending into the required length and profile for fixing of the steel cage of the diaphragm walls according to the accepted drawings.

41. Under Contract 1112, both lapping and mechanical couplers have been adopted in the rebar detailing for the diaphragm walls and the platform slabs according to the accepted drawings.

42. For those steel bars to be connected to couplers, they would be delivered to the fabrication yards set up in Contract 1112 site for threading and installation of couplers. The threading and tightening process would be carried out according to the manufacturer's procedure and method as specified in the QAS of the manufacturer. Sampling and testing of couplers should be carried out in accordance with the requirements as specified in BD's acceptance letters.

43. After completion of the aforesaid preparation works for the steel bars, fixing of the main reinforcements and links would start to form the steel cages of the diaphragm walls. Mechanical couplers with PVC cap protection would also be fixed to the steel cage of the diaphragm walls at levels in the accepted

drawings for future connection with EWL platform slab and NSL platform slab.

44. The prefabricated steel cages of diaphragm walls would be connected to each other by mechanical couplers according to the accepted drawing and lifted down into the excavated trench and concreting would follow.

B2. Mechanical couplers/steel fixing bars in the EWL platform slabs

45. According to the accepted drawings, top-down construction was adopted in the construction of HUH Extension using diaphragm walls and the platform slabs as soil retaining structure and lateral support. After excavation from ground level (Approx. +4.4mPD) to about +0.0mPD (below bottom level of the EWL platform slabs), the pre-installed couplers within the diaphragm walls would be exposed by removing the concrete cover/PVC cap protection for connection with the threaded steel bars of the slabs.

46. After delivery of steel bars for slabs to the site, sampling and testing of steel bars should be carried out in accordance with PNAP APP-45, according to the requirements as specified in BD's acceptance letters.

47. Steel bars would be prepared by cutting and bending into the required length and profile for fixing of the steel works of the slabs according to the accepted drawings.

48. For those steel bars to be connected to the couplers in the slabs, they would be delivered to the fabrication yards set up in Contract 1112 site for threading. The threading process would be carried out according to the manufacturer's procedure and method as specified in the QAS. Sampling and testing of couplers should be carried out according to the requirements as stipulated in the BD's acceptance letters.

49. The threaded steel bars would be then tightened to the exposed couplers cast within the diaphragm walls and the slabs according to the manufacturer's procedure and method as specified in the QAS.

50. Remaining steel fixing works for the EWL platform slab and concreting works would then be carried out accordingly.

B3. Mechanical couplers/steel fixing bars in the NSL platform slabs

51. After excavation to -11mPD (below bottom level of the NSL platform slabs), the pre-install couplers casted within the diaphragm walls would be exposed by removing the concrete cover/PVC cap protection.

52. Steel fixing works for the NSL platform slabs would be carried out following the steps mentioned in respect of the EWL platform slabs above.

C. Non-conformities and Actions taken by BD

53. In respect of any non-conformity found in the steel fixing / coupler installation works, the CP should notify BD immediately if the non-conformity poses imminent danger to the public as required under the Supervision Code. All non-conformities detected during the checking of typical items for specific tasks by the TCP must be properly recorded in the Non-Conformity and Rectification Reports (see Form B at Appendix III to Supervision Code at Item 1 of **Annex HHK-6**). Detailed procedures for dealing with non-conformities are specified in paragraph 7.9 of PMP and clause 10.3 of the Supervision Code.

54. According to our records, there have been three non-conformities relating to the diaphragm wall and platform slab construction works at the HUH.

C1. Non-conformity in 2015 relating to the Diaphragm Wall and Platform Slab Construction Works

55. On 27 January 2015, MTRCL submitted to BD the CoC for diaphragm walls (Batch 1) with material submissions and record plans (see Item 2 of **Annex LPF-8**).

56. On 27 March 2015, MTRCL submitted the CoC for diaphragm walls (Batch 3) with material submissions and record plans (see Item 4 of **Annex LPF-8**).

57. After the BSRC Team checked the as-built submissions for Batch 1 and Batch 3, MTRCL was informed on 11 February 2015 and 9 April 2015 respectively of the outstanding items that require following up (see Items 1 and 2 of **Annex LPF-11**).

58. On 14 April 2015, MTRCL reported in a meeting with the BO Team that non-conformity was found in the construction of the diaphragm wall, in that the reinforcement details of some completed diaphragm walls was not constructed in accordance with the accepted structural plans. A copy of the meeting agenda is at Item 3 of **Annex LPF-11**.

59. On 14 May 2015, the BO Team reported the above non-conformity to RDO so that follow up actions could be taken at the management level (see Item 4 of **Annex LPF-11**).

60. On 21 May 2015, BD rejected the CoC for Batches 1 and 3 as the above non-conformity had not been rectified (see Items 2 and 3 of **Annex LPF-9**).

61. On 27 May 2015, MTRCL gave a presentation to the RDO/BD on the above non-conformity. It submitted incident reports on the non-conformity on 7 and 29 July 2015 respectively (see Items 5 and 6 of **Annex LPF-11**). In the incident reports, MTRCL set out the findings of its investigation and the actions/proposed actions for mitigation, rectification or improvement of the system.

62. On 13 August 2015, MTRCL submitted the CoC for diaphragm walls (Batch 5) with material submissions and record plans (see Item 6 of **Annex LPF-8**). This was again rejected by BD as the above non-conformity had not been rectified (see Item 7 of **Annex LPF-9**).

63. On 14 January 2016, MTRCL submitted design review/design amendment submissions, i.e. its proposal to rectify the above non-conformity, to the BO Team for consultation (see Item 7 of **Annex LPF-11**).

64. On 2 March 2016, BD informed CP by letter that the said proposal

had been vetted and accepted and reminded CP that the previous specified requirements were still applicable (see Item 8 of **Annex LPF-11**).

65. By letter dated 5 May 2017, BD acknowledged the CoC for diaphragm walls (Batches 1 to 6) (see Item 13 of **Annex LPF-9**).

66. As the non-conformity had been rectified and the relevant CoC for diaphragm walls acknowledged, it was considered the issue had been properly resolved.

C2. Non-conformity in July 2018 – Deviation of couplers connection details between MTRCL' report dated 15 June 2018 and MTRCL's letter dated 13 July 2018

67. On 30 May 2018, news report by Apple Daily regarding suspected irregularities in the connection of couplers between the diaphragm walls and the EWL slab of the HUH Extension came to BD's attention. It was stated in the report that a hydraulic cutter was used to shorten or cut steel bars to be installed in the couplers embedded within the diaphragm walls for connection with the EWL platform slab steel bars. To the best of my knowledge, prior to the news report, BD had not received any report about any alleged cutting or shortening of steel bars. BD was not aware of any evidence indicating that it is common practice in the construction industry to use a hydraulic cutter or other equipment to shorten or cut steel bars for the purpose alluded to in the news report.

68. BD and other relevant Government departments have since taken actions to investigate and follow up the issue. The steps taken by BD are outlined in section E below. In the course of the investigation, the following non-conformity was detected:

(1) MTRCL submitted its report on the incident on 15 June 2018 ("**15 June Report**") (see Item 1 of **Annex LPF-12**).

(2) Then, by letter dated 13 July 2018 ("**13 July Information**") (see Item 3 of Annex **LPF-12**), MTRCL provided supplementary information to HyD.

(3) It was then found that as-built connection details between the platform slab and the diaphragm wall disclosed in the 13 July Information were different from those in the 15 June Report. The as-built connection referred to in the 13 July Information involves using continuous steel bars instead of coupler connection. This means the connection details had been altered as compared with the plans already accepted by the BD. Such changes to the accepted plans cannot be regarded as minor alteration because the changes involve partial demolition of the completed diaphragm wall and alteration of the main reinforcement of the platform slab which would affect the structural performance of the platform structure. As such, MTRCL should have consulted BD on the design changes prior to site construction. However, up to date, MTRCL has not submitted the required amendment plans.

(4) BD has requested for explanation and confirmation of the as-built details from the former CP (who resigned on 7 August 2018) and the new CP of MTRCL. The CP replied on 17 August 2018 (see Item 4 at **Annex LPF-12**) to request for more time to verify the information and records.

The above answers Questions 10(j) to (m) of the 6 August Letter.

69. Unlike the non-conformity in 2015 which involved the reinforcement details of some completed diaphragm walls which were not constructed in accordance with the accepted structural plans, the connection located between diaphragm wall and the EWL slab recently reported in the media is a critical location for load transfer and structural integrity. Any change in connection details without prior acceptance by BO could give rise to concerns about substandard works.

70. The 2015 incident (where the change in connection details of the diaphragm wall did not involve structural safety and integrity of the diaphragm wall) was resolved after MTRCL provided structural justification on the connection details of the diaphragm walls. The non-conformity was subsequently rectified to BD's satisfaction in 2016. The EWL slab was not yet constructed at the time 2015 incident was identified, so that change in

connection details could be verified and accommodated at the next stage of construction works, i.e. construction of the EWL slab.

71. However, the change in 2018 involves the as-constructed diaphragm walls being allegedly altered, with top layers of main steel bars, couplers and concrete removed. The partial demolition of as-built diaphragm wall and the alteration of the connection details is not a minor alteration. The alteration works could affect not only the distribution of load at the connection but also the structural integrity and safety of both the diaphragm walls and EWL slab. It is a major design change, and the deviation from the accepted plans cannot be accommodated in the next stage of the construction works as both the diaphragm walls and EWL slab had been completed. As such, the deviation in 2018 has substantial implications on the structural safety and integrity of both the diaphragm walls and EWL slab and any proposed remedial works will lead to substantial demolition works instead of structural justification.

C3. Non-conformity in August 2018 – Report of honeycomb concrete observed at the soffit of EWL slab

72. In addition to the above incident, MTRCL has reported to the RDO at Project Supervision Committee Meeting on 28 August 2018 that honeycomb concrete was observed at the EWL platform slab of HUH Extension. By an email on the same day (see Item 1 of **Annex LPF-13**), RDO informed BD of the incident. On 29 and 31 August 2018, BD's staff accompanied by the BSRC Team carried out site inspections at the HUH Extension. The site inspections revealed that some loose concrete/concrete spalling and void could be observed at the soffit of the EWL platform slab between grid lines 21-33, 39-43 (i.e. approximately at Areas B, C1 and C2). MTRCL has submitted non-conformance reports to the RDO (which were copied to BD) (see Item 3 of **Annex LPF-13**) and also submitted the method statement for concrete repair works to BD (see Item 5 of **Annex LPF-13**). BD has requested the CP to carry out investigation and submit its investigation report and remedial proposal for comment by BD (see Items 2 and 4 of **Annex LPF-13**). On 10 September 2018, the CP submitted the interim findings of the inspection and investigation to BD and advised that the investigation is in progress. (see Item 6 of **Annex LPF-13**)

D. Non-conformities in 2015 NOT relating to the Diaphragm Wall and Platform Slab Construction Works

73. There were three other non-conformities identified in 2015 in relation to the HUH Extension but not related to the diaphragm walls and platform slabs construction works. These non-conformities were also reported by the BO team to RDO (see BD's email dated 18 May 2015 at Item 4 of **Annex LPF-11**). Given that these non-conformities do not fall within the scope of the Commission's investigation and have in any event been rectified (as explained below), I will only give a brief account of them as follows.

D1. Unauthorised cutting of existing steel beam of the podium structure of HUH

74. In May 2015, the project RSE for the Structural (Alterations & Additions) works of the existing HUH podium deck submitted a non-conformity and rectification report in respect of an unauthorised cutting of existing steel beam identified on site by the TCP T3 under RSE stream to BD. The RSE submitted the incident report including the reinstatement proposal to BD after the joint site inspection carried out by BD and the RSE's representative/TCPs. The non-conformity was considered rectified after completion of the reinstatement works to the existing steel beam.

D2. Construction of capping beams/portal frames prior to the certification of completion in respect of the related diaphragm walls

75. In January 2015, it came to the attention of the BO Team that certain capping beams and portal frames at Area A of the HUH Extension were constructed before the CoC of the relevant diaphragm walls had been submitted. Generally speaking, MTRCL should not proceed to next stage of construction works until the relevant CoC had been submitted and acknowledged by the BD.

76. In March 2015, the CP submitted the CoC of the relevant certification diaphragm walls. In August 2015, the core drilling proof test for diaphragm walls was satisfactorily completed. The CoC was acknowledged by BD on 5 May 2017 (see Item 13 of **Annex LPF-9**) and the non-conformity was

considered rectified.

D3. Building settlements in the existing podium structure of the HUH and reports of cracks in Harbour Plaza Metropolis

77. In 2014, exceedances of settlements in the existing podium structure of the HUH due to the construction/piling works of the SCL Project were observed and they were reported to the BD and RDO in 2015. In early 2015, MTRCL received a report about cracks found in the Harbour Plaza Metropolis Hotel in Hung Hom.

78. Between then and the completion of the works at the HUH Extension in mid-2017, MTRCL had implemented follow up and precautionary measures to address the above problems. The settlements were found stable since 2017 and no further action was required.

E. Actions taken by BD

79. The table below sets out the relevant events and the actions taken by BD up to 29 August 2018. BD's investigation is ongoing and we will provide updates to the Commission as appropriate.

Date	**Action**
30 May 2018	Report of suspected Defective Steel Works in HUH Extension by Apple Daily (see Item 1 of **Annex LPF-14**).
31 May 2018	The BO Team carried out joint inspection with the RDO, M&V Consultant and MTRCL of the EWL/NSL platform slabs (see Item 2 of **Annex LPF-14**).
31 May 2018	BD received a memo from HyD requesting BD to follow up the irregularities in HUH Extension as reported by the media (see Item 3 of **Annex LPF-14**).
1 June 2018	The BO Team issued a letter to the CP requesting for a report and relevant documents by 8 June 2018 (see Item 4 of **Annex LPF-14**).

5 June 2018	CP replied on 5 June 2018 stating that the report would not be available before 15 June 2018. (see Item 5 of **Annex LPF-14**).
6 June 2018	The BO Team, RDO and M&V Consultant carried out joint visit to the site office for viewing the site inspection records. Inspection form related to concreting works (formwork, reinforcement bar fixing and general cleanness) and inspection checklists for couplers under RGBC stream were available for inspection (see copies of documents collected from the site visit at Item 6 of **Annex LPF-14**).
15 June 2018	MTRCL submitted the 15 June Report and "Additional Technical Documents" and reported that there were 5 occurrences of deficiencies in steel works from August 2015 to December 2015 which have been rectified (see Item 1 and Item 2 of **Annex LPF-12**). [Note: Copies of the accepted drawings and calculations in relation to the construction of the diaphragm walls and platform slabs which are kept by BD, as mentioned in paragraph 5.3.3 of the MTRCL's 15 June Report, are at **Annex LPF-15**. The drawings provided by BD to the Commission's solicitors by letter dated 20 August 2018 are the latest drawings without calculations.]
25 and 29 June 2018	The BO Team, RDO and M&V Consultant carried out joint visits to the site office for viewing the inspection records of the concreting / couplers works for EWL slab. Inspection records of coupler works under RC stream were available for inspection in both visits and the inspection records of coupler works under the CP stream were available in the 2nd visit. Copies of the inspection reports are at Item 7 and Item 8 of **Annex LPF-14**.
30 June 2018	In response to MTRCL's 15 June Report and submissions, BO Team issued a letter to the CP requesting for outstanding documents in relation to the HUH Extension by 13 July 2018

	(see Item 9 of **Annex LPF-14**).
16 July 2018	BD issued a reminder email to the CP demanding a reply to BD's letter of 30 June 2018 (see Item 10 of **Annex LPF-14**)
19 July 2018	BD issued a further reminder email to the CP demanding a reply to BD's letter of 30 June 2018 (see Item 12 of **Annex LPF-14**).
13 July 2018 (received by BD on 25 July 2018)	MTRCL issued a letter to the RDO (i.e. the 13 July Information) disclosing that the as-built connection details were different from the MTRCL's 15 June Report. BD received a copy of 13 July Information from HyD via email on 25 July 2018 (see Item 3 of **Annex LPF-12**).
17 July 2018 (received by BD on 26 July 2018)	CP replied to BD's letter of 30 June 2018 stating that the requested documents would be provided to BD shortly (see Item 11 of **Annex LPF-14**).
31 July 2018	BD issued a letter to the CP demanding the outstanding items in BD's letter of 30 June 2018 and explanation on MTRCL's 13 July Information (see Item 13 of **Annex LPF-14**).
8 August 2018	MTRCL changed the CP from Mr. Wong Chi Chung, Jason to Mr. Ng Wai Hang, Neil ("**the New CP**") (see Item 14 of **Annex LPF-14**).
10 August 2018	BD issued a letter to the New CP demanding the outstanding items in BD's letter of 30 June 2018 and explanation on MTRCL's 13 July Information and confirmation of the as-built construction detail in relation to the diaphragm walls and platform slabs (see Item 15 of **Annex LPF-14**).
10 August 2018	BD issued a letter to Leighton to request for relevant documents in relation to the HUH Extension including construction drawings and records, inspection log book, non-conformity and rectification report (see Item 16 of **Annex**

	LPF-14).
17 August 2018 (Received by BD on 20 August 2018)	The New CP replied BD's letter dated 10 August 2018 to request more time to review, verify and provide the requested information (see Item 4 of **Annex LPF-12**).
17 August 2018	Leighton replied to BD's letter dated 10 August 2018 and provided some documents and informed BD that the further submission would be made by 29 August 2018 (see **Annex LPF-16**).
21 August 2018	BD issued a reminder email to the New CP demanding reply to BD's letter of 30 June 2018 and 10 August 2018 (see Item 17 of **Annex LPF-14**).
29 August 2018	Leighton replied to BD's letter dated 10 August 2018 and provided further submissions (see Item 18 of **Annex LPF-14**).

80. With reference to Question 9(d) of the 6 August Letter, since BD is still gathering and reviewing the information from MTRCL and Leighton, it has not interviewed any relevant site engineers of Leighton or any personnel of the relevant parties.

81. The Hong Kong Police Force has carried out investigation on the HUH Extension and collected statements from BD's staff, including myself, as set out in the following table:

Date	**BD Staff involved**
9 July 2018	Statement from Mr. LOK Pui Fai (SSE/RD) (Item 1 of **Annex LPF-17**)
17 July 2018	Statement from Mr. LOK Pui Fai (SSE/RD) (Item 2 of **Annex LPF-17**)
25 July 2018	Statement from Mr. LOK Pui Fai (SSE/RD) (Item 3 of **Annex LPF-17**)
7 August 2018	Statement from Mr. WONG Wing Wah (SE/RD1) (Item 4 of **Annex LPF-17**)

	Statement from Mr. FAN Tak Pun (SE/RD2) (Item 5 of **Annex LPF-17**)
23 August 2018	Statement from Mr. LOK Pui Fai (SSE/RD) (Item 6 of **Annex LPF-17**)

82. I confirm that the contents of this Witness Statement are true to the best of my knowledge, information and belief.

Dated this 13th day of September 2018

LOK PUI FAI
Senior Structural Engineer
Buildings Department