COMMISSION OF INQUIRY-THE SHATIN TO CENTRAL LINK PROJECT ("THE COMMISSION")

CLOSING SUBMISSIONS OF THE GOVERNMENT[1]

TABLE OF CONTENT

[1] For the purpose of this Inquiry, references to the "Government" are to the (1) Transport and Housing Bureau ("**THB**"), (2) Highways Department ("**HyD**"), (3) Development Bureau ("**DEVB**") and (4) Buildings Department ("**BD**").

A. OVERVIEW

1. The factual evidence, which spanned over a period of 38 hearing days, has revealed numerous problems in respect of, amongst other things, project management, inspection and supervision of the works, and also workmanship in the execution of the works. From the Government's point of view, these problems demonstrate that MTRCL and Leighton failed to perform the obligations (which they accepted and undertook) for the SCL Project under Contract 1112. In particular, as stated in the Government's Opening Submissions, in view of MTRCL's proven track record[2] and the Government's payment of project management fees in the sum of around HK$8 billion to MTRCL for the SCL Project, MTRCL ought to have provided the required skills and care reasonably expected of a professional and competent project

[2] This is acknowledged by both Mr Steve Rowsell (for the Commission) and Mr Steve Huyghe (for MTRCL) in their Joint Statement of Project Management Experts dated 9 January 2019 §§3-4 [**ER1/9/1**].

manager. Disappointingly, MTRCL failed to do so.

2. During the course of the Inquiry, MTRCL's and Leighton's problems and deficiencies were exposed and they include:

   (1) failure to follow the required supervision and inspection requirements;

   (2) absence of contemporaneous records of the required supervision and inspection and compilation of retrospective records;

   (3) lack of proper investigation and implementation of preventive measures despite knowledge of occurrence of bar-cutting incidents and defective works;

   (4) unauthorised alteration works at the top of the east D-wall; and

   (5) failure to maintain proper as-built records.

3. It is most likely that had MTRCL and Leighton fully and properly discharged their duties by complying with the required standards and procedures, the defective works would not have occurred.

4. Notwithstanding the above, MTRCL and Leighton still found it appropriate to raise various arguments primarily on the applicability and interpretation of the supervision/inspection requirements under the Quality Supervision Plan ("**QSP**"), seeking to play down and dilute their responsibilities. Those arguments are contradicted by both factual and expert evidence and do not accord with common sense.

5. One of the Terms of Reference of the Commission is to "*inquire into the facts and circumstances surrounding the steel reinforcement fixing works*". In this regard, the main focus of both MTRCL and Leighton at the hearing was to challenge and discredit the evidence given by Chinat's witnesses. The details

of Chinat's evidence may be subject to debate; however, the allegations that threaded rebars were cut or not properly connected to couplers have been substantiated by the undisputed bar cutting incidents discovered by both MTRCL and Leighton[3], the evidence given by Fang Sheung and the recent results of the opening-up process which are self-explanatory.

6. In fact, the opening-up process was part of the Holistic Proposal for Verification & Assurance of As-constructed Conditions and Workmanship Quality of the HUH Extension ("**Holistic Proposal**") **[G17/12970-12999]** formulated and submitted by MTRCL and accepted by the Government on 5 December 2018. The Holistic Proposal served 2 purposes i.e. (1) to verify the as-constructed conditions of the connections between the platform slabs and D-walls at locations with gaps in the documentation ("**Purpose 1**"); and (2) to verify the work quality of the coupler connections in view of the allegations on the cutting-short of steel bars ("**Purpose 2**").

7. The issues of structural safety will be addressed in Section D below by referring to the relevant expert evidence and the result of the opening-up process. The following points should be highlighted at this stage:

   (1) When various parties entered into agreements and assumed their obligations, whether contractual, statutory or otherwise, including those in relation to steel reinforcement fixing and coupler installation works in this project, they must have accepted that the relevant requirements and procedures were imposed for the purpose of ensuring safety standards and must be strictly followed. In this regard, these requirements and safety standards are and should go hand in hand. Until recently, MTRCL and Leighton never sought to dispute or qualify the

[3] According to Leighton, there were 3 bar cutting incidents in 2015 whereas MTRCL's evidence shows that there were 5 to 6 similar incidents in 2015 (up to early 2016).

requirements which they had clearly and fully accepted, or the underlying rationale of the same. In fact, another objective of the Inquiry under the Terms of Reference is "*to ascertain whether [the steel reinforcement fixing works or any other works which raise concerns about public safety] were executed in accordance with the Contract*".

(2) However, for the purpose of this Inquiry, structural safety has been examined as if it were an issue distinct from compliance of contractual or statutory requirement. MTRCL and Leighton now rely on one single test result done by BOSA to argue that "*we actually don't need to do that much to keep the structure safe*". Insofar as they now contend that the standards could be lowered purely from the perspective of assessing structural safety (i.e. in terms of strength), it is submitted that (a) such arguments cannot exonerate them from or lessen their responsibilities and they can at best be regarded as "mitigating factors"; and (b) more samples need to be tested to ascertain structural safety and this has been agreed by MTRCL. However, if they are now attempting to alter the contractual/statutory requirements which they have undertaken by arguing that the requirement of a fully engaged coupler was not required in the first place, this would be a blatant and unacceptable attempt to move the goalposts and rewrite the contracts.

(3) On the relevant engineering issues, the Government submits that it is perhaps not necessary to determine which expert(s)' professional judgment is more reliable and should therefore be adopted. Matters of opinion on structural safety differ for many reasons including the hypothesis that each expert has adopted and whether the experts form their judgment from the research and development perspective or from a more conservative engineering perspective. The fundamental point in the expert evidence of Professor Au (for the Government) is that the

additional construction joints inside the connection between the EWL slab and the east D-wall introduced by hacking off part of the top of the completed east D-wall and recasting of new concrete would create potential surfaces of weakness and the internal stresses generated within the connections ought to be checked and verified numerically before "more confidence" could be obtained in coming to a conclusive view on the structural integrity of those additional joints. Such calculations have not been done by the other parties and there is no reason why they should not be done. As a matter of principle, it should be incumbent upon the parties who assert that the design for the unauthorised alteration is safe and better than the accepted design to come up with proof supported by calculations.

(4) Insofar as the experts raise the question of whether the opening-up should be stopped, it is important to bear in mind that the sampling scheme set out in the Holistic Proposal was formulated on the basis of the advice provided by experts in both engineering and statistics. So far, no expert opinion or study on statistical analysis has been provided by any party to contradict the original sampling scheme. Further, there is no expert evidence that the opening up process should be stopped for the purpose of verifying the as-constructed condition. Dr Mike Glover (for MTRCL) agrees that Stage 3 of the Holistic Proposal which aims at doing "structural assessment" to determine the structural capacity and stability for the EWL and NSL slabs and the station extension box, will be of value. According to the Holistic Proposal formulated and submitted by MTRCL, Stage 3, however, can only be carried out after all the data are collected upon completion of Stage 2.

8. Last but not least, the Government is fully aware of the importance of reviewing and evaluating its monitoring and control mechanisms in order to

further strengthen and improve the same. In this regard, the Government is grateful for the helpful and constructive recommendations made by Mr Steve Rowsell (the expert instructed by the Commission on project management). Mr Rowsell has also expressed that he is glad to see that the Government has already put in place some of the initiatives for improvement **[T39/113:22-25]**.

9. These submissions will consist of the following sections:

(1) Section B: A summary of the details of the Government's monitoring and control mechanisms. In this section, the arguments raised by MTRCL and Leighton on the applicability and interpretation of the supervision/inspection requirements (as mentioned in §4 above) will be dealt with.

(2) Section C: An analysis of MTRCL's and Leighton's problems and deficiencies during the implementation of the SCL Project.

(3) Section D: Engineering issues.

(4) Section E: Improvement measures on the Government's system.

B. MONITORING AND CONTROL MECHANISMS OF THE GOVERNMENT

B1. Summary

10. As outlined in the Government's Opening Submissions, the SCL Project involves the Government funding the design and construction of the railway and its ancillary infrastructure and ultimately owning the railway, and MTRCL being entrusted with the design, construction, testing and commissioning of the project by virtue of the Entrustment Agreements ("**EAs**") between the Secretary for Transport and Housing (for and on behalf of the Government) and MTRCL **[G7/5466-5714]**. Upon completion of the project, MTRCL

would be granted a service concession for the operation and the Government would receive service concession payment accordingly. As at 1 August 2018, the approved project estimate for the SCL Project (excluding the cost for its design and site investigation) totalled about HK$80.7 billion **[G3/2061 §9]**.

11. The SCL Project adopts a project management approach which embodies three essential elements:

    (1) entrustment of the whole project to MTRCL and utilisation of MTRCL's pre-existing project management and control processes (see Section B2);

    (2) adoption of a "check the checker" approach, with support from a Monitoring and Verification Consultant ("**MVC**") (see Section B3); and

    (3) adoption of a building safety control mechanism (see Section B4).

12. Each of THB, HyD and BD plays a key role in implementing the above approach. In addition, DEVB operates a regime on regulating action for management of the approved lists of public works contractors.[4]

B2. Entrustment to MTRCL

13. Pursuant to the EAs, MTRCL's pre-existing project management and control processes are used to deliver the SCL Project, while the Government retains oversight and representation in key control procedures. In other words, MTRCL is responsible for devising and implementing its own project management procedures as required under the EAs. The Government's role is to monitor and verify that MTRCL fulfils its obligations.

[4] The Commission is referred to §§23-26 of the Government's Opening Address **[OS/6/13-14]** for an outline of DEVB's regime on regulating action. As the regime is not directly relevant to the central issues of this Inquiry, the Government will not further elaborate on the same.

14. The entrustment arrangement is driven by sound policy considerations and MTRCL's successful track record:

(1) MTRCL's project management processes and controls are known to be robust and in line with industry best practice. They are regularly reviewed and audited by outside bodies and have been proven and refined through the delivery of many high-quality railway projects by MTRCL in Hong Kong and abroad: see extract of Report by Lloyd's Register Rail (Asia) Limited ("**Lloyd's**") at **[G3/1776]**.

(2) In the Joint Statement of Project Management Experts, Mr Rowsell and Mr Huyghe agree that *"MTRCL is a very experienced organization with extensive experience and capability in the planning, delivery and operation of railway networks and systems in Hong Kong"* and it has a *"proven track record in delivering many major railway projects"*. In the Joint Statement, the experts also acknowledge that "MTRCL has "*a thorough knowledge and understanding of its responsibilities and duties associated with delivering the Entrustment Activities for a project of this magnitude and complexity"* and its Project Integrated Management System ("**PIMS**"), as defined in its Project Management Plan ("**PMP**"), "is accredited with ISO 9001" and *"undergoes periodic internal review and external audits to ensure it stays up to date to serve its purpose in the management of railway projects"*: **[ER1/9/1-2 §§3, 6-7, 9]**.

(3) In view of MTRCL's expertise and extensive experience, the entrustment arrangement represents the sensible and efficient use of public funds and minimises duplication of resources.

B3. Check the Checker

15. The "check the checker" approach, recommended by Lloyd's for the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link Project ("**XRL**"), is a risk-based sampling approach adopted for the SCL Project to verify delivery of the requirements of the project scope and authorised expenditure. It is also premised on the important rationale that the Government's resources should be utilised effectively to avoid repetition and micro management of the project **[G3/2064 §18]**.

16. In practical terms, the check the checker approach involves continuous monitoring and verification of MTRCL's compliance with its obligations under the EAs through (1) regular and frequent interactions with MTRCL and (2) HyD's engagement of the MVC, Pypun, whose role is to monitor and verify (by way of audits) the activities and processes of MTRCL and verify that they are carried out in accordance with MTRCL's management and control procedures and in compliance with the EAs[5].

17. The Government communicates closely with MTRCL through different levels of meetings **[G3/2066-2068 §§24-33; G3/2078-2079, 2081-2082 §§13-16, 23-26; G3/1856-1857 §9]**:

Meeting	**Description**	**Purposes**
Project Supervision Committee ("**PSC**") meetings	High-level inter-departmental committee chaired by the Director of Highways ("**DHy**") and comprises senior officers of the Railway Development Office ("**RDO**"), THB representatives,	Convened monthly to review project progress and monitor procurement activities, post-tender award cost control and resolution of contractual claims; provides steer at top management

[5] See Clause 6.1.7 of the M&V Agreement as defined below.

	and Project Directors and other senior staff of MTRCL	level on key matters requiring attention
Project Coordination Meetings ("**PCM**")	Co-chaired by Government Engineer/Railway Development (1) of RDO and General Manager of MTRCL, attended by professional officers of RDO and MVC	Convened monthly to discuss and monitor matters including those relating to progress and programme, construction, safety and environment issues of the SCL Project
Project Progress Meetings ("**PPM**")	Chaired by MTRCL's General Manager of SCL and attended by senior staff of MTRCL, Chief Engineers and professional officers of RDO and MVC	Convened monthly for MTRCL to report the progress of works for major civil and electrical and mechanical engineering contracts and other key issues for discussion
Project Control Group ("**PCG**") meetings	Internal establishment of MTRCL, Government representatives entitled to attend	Convened regularly to control cost of railway projects, HyD and MVC would comment on proposals received from MTRCL
Informal liaison meetings	Attended by top management of MTRCL and THB and/or HyD representatives	Convened as and when necessary to discuss issues of mutual concerns relating to railway projects under construction including the SCL Project

18. These channels of communications serve to bring important matters to the Government's attention and for its follow-up actions. In 2015, for example, several non-conformities in respect of construction works at HUH Extension (including one concerning an unauthorised deviation from the accepted design

of the D-wall) and the remedial actions taken by MTRCL and Leighton were reported to DHy and discussed at PSC meetings **[G3/2083-2085 §§32-34; H7/2203-2209 §§55-76]**; see also PSC minutes at **[G9/7138, 7143, 7149]**. Since discovery of the current incident in May 2018, the Government has been working closely with MTRCL to investigate the cause and extent of the problem and to implement remedial and improvement measures (as detailed in Section E below). However, these channels of communications would not be capable of serving their intended purposes if MTRCL and Leighton failed to bring to the Government's attention important issues which arose during the course of the implementation of a project.

19. As regards the MVC[6], its main areas of responsibility, as defined in the Monitoring and Verification Consultancy Agreement **[G9/7638-7753]** ("**MVC Agreement**"), are as follows:

    (1) reviewing key documents relating to the SCL Project including construction programmes, proposals bearing major implications, project finance reports, submissions to PCG and public safety plans (see Clauses 4.1(a) and 6.2);

    (2) carrying out monitoring on MTRCL's works through review of project documents and necessary site inspection, identification of and providing advice on key issues of the SCL Project on cost, programme and public safety[7] (see Clauses 4.1(b) and 6.3). Some of the site visits are conducted along with HyD;

[6] It is Mr Rowsell's view that the Government's use of a MVC is in line with international best practice **[ER1/1/69]**.

[7] Mr Rowsell observes that the delivery of a quality product on a "right first-time basis" is "inextricably linked" to the successful delivery of cost and programme objectives: §123 of Rowsell's Report **[ER1/1/69]**). This echoes the evidence of Mr Chung Kum-Wah (the former DHy) that many of Pypun's responsibilities under the MVC Agreement are related to quality **[T35/113:20-114:16]**.

(3) carrying out verification by conducting audits to the activities/processes undertaken by MTRCL. A risk based approach is adopted to identify high risk areas for forward planning of audits. Audit reports are submitted to HyD after completing each audit session (see Clauses 4.1(c), 6.4 and 6.7.4)[8];

(4) submitting progress reports to and attending meetings with HyD, reviewing the output of meetings and identifying any high risk elements of activities and processes for further examination or verification works (see Clauses 6.3.5 and 9);

(5) taking part in inspection for the completion of works with relevant government departments (see Clause 6.3.4(j)).

20. Apart from monitoring the works of MTRCL, the MVC has a Building Submission Review & Compliance Team ("**BSRC Team**") which assists the Government's BO Team (as defined in §29 below) in respect of compliance with the Buildings Ordinance and relevant standards (see Clause 4.1(d) of MVC Agreement). This will be explained in Section B4 below.

B4. Building Safety Control Mechanism

B4.1 The Buildings Ordinance (Cap 123) ("**BO**") regime

21. BD is responsible for enforcing the BO, which covers the planning, design and construction of buildings and associated works by setting building safety and health standards for private development in Hong Kong **[H7/2108 §4]**.

[8] In relation to the comment at §124 of Rowsell's Report **[ER1/1/70]** that *"the MVC undertakes audits of project procedures at the instruction of Government"*, it should be noted that as per the Verification Plan submitted by the MVC **[K1/180-226]**, the MVC's audits will carry out audits at regular intervals and base their focus on elements that are indicating the higher risk indicators from their Systematic Risk Assessment (§3.4.1). Once the Verification Plan was agreed, the MVC will directly liaise with MTRCL on the audit arrangements (see MVC Agreement clause 6.4.3) and conduct these audits without the need to seek Government's instructions on each of them.

22. The BO regime requires every person for whom buildings works are carried out to appoint registered building professionals and registered contractors to perform their statutory duties. It is the responsibility of these registered personnel to ensure that the works fully comply with the BO and subsidiary legislations, although BD will conduct curtailed and audit checks on plan submissions and audit checks on completed building works. BD acts as a regulator with powers conferred by the BO, and may instigate prosecution against any person committing a statutory offence and disciplinary action against the registered personnel **[H7/2108-2110 §§5-8]**.

B4.2 SCL Project

23. The SCL Project covers building works on both (1) leased land and (2) Government/unleased land. The former is governed by the BO, whereas the latter is exempted therefrom[9]. Hence, insofar as the SCL Project is concerned, there are various parts which concern new works on Government land and the BO does not apply to those parts of the project which are governed by an IoC. There are other parts (including the Hung Hom Station Extension where the D-walls and platform slabs were built) and the works on those parts are built on land vested in Kowloon-Canton Railway Corporation or land leased to MTRCL. In the circumstances, the works are still subject to the BO (see Witness Statement of Cheung Tin Cheung (Director of Buildings), i.e. Building Authority ("**BA**") §13(2) **[H7/2111-2112]**).

24. Under s.54(2) of the Mass Transit Railway Ordinance (Cap 556) ("**MTRO**"):

"The Building Authority may–

[9] The exemption is pursuant to s.41(1) of the BO. For these building works, DHy, in accordance with the EA, issued an Instrument of Compliance ("**IoC**") requiring MTRCL to follow the administrative procedures and requirements as stipulated in the IoC for carrying out building works. The objective is to ensure the quality of these building works is not to be inferior to the standards as required by the BO and its subsidiary legislations **[H7/2111-2112 §13(2)]**.

(a) having regard to the exceptional nature of building or other works connected with the operation or construction of the railway, and

(b) on such conditions as he may specify, either generally or in any particular case,

exempt any of those works from any provision of the [BO]".

25. Pursuant to the said provision, BA had issued an Instrument of Exemption dated 5 December 2012 ("**IoE**") **[H7/2220-2233]** to exempt several requirements under the BO on the buildings and associated building works in relation to the leased land portion of the SCL Project. It is important to note that the IoE is <u>not</u> for general exemption from compliance with BO standards:

(1) The exemption is only in respect of the categories and types of structures specified in the Reference Schedule attached to the IoE ("**Reference Schedule**") and subject to the conditions thereinafter specified **[H7/2222 §1]**. These specified structures include the D-walls and platform slabs under Contract 1112: see Category 2 of the Reference Schedule at **[H7/2226-2227]**.

(2) The exemption is confined to those procedures and requirements relating to the appointment of Authorized Person ("**AP**") and Registered Structural Engineer ("**RSE**") as appropriate, approval of plans, consent to commencement and resumption of works and occupation of buildings provided for in ss.4, 14 to 17A and 19 to 21 of the BO **[H7/2222 §1]**.[10]

(3) BA's duties and sanctioning powers to ensure standards of health and safety are not undermined **[H7/2222 §1]**. The IoE further provides that BA would reserve the right to take any action including suspension and preventive or remedial action in the event of any works materially deviating from the agreed design or working procedure, and the

[10] This point was picked up in Rowsell's Report §9 **[ER1/1/15]** as being "important to note".

exemption may be withdrawn if any of the conditions contained in the IoE are not observed or in other circumstances necessitating such withdrawal **[H7/2224 §§4, 6]**.

26. The conditions imposed by the IoE require MTRCL to, *inter alia*:

(1) appoint a competent person ("**CP**") who shall take up responsibilities and duties of AP/RSE, co-ordinate and supervise the works in accordance with agreed proposals, and submit plans for consultation with BD. The appointment of CP shall be subject to prior agreement of BD in regard to his/her qualifications and experience;

(2) appoint a Registered Geotechnical Engineer ("**RGE**") for building works with significant geotechnical content;

(3) appoint registered general building contractors ("**RC/RGBC**") and registered specialist contractors ("**RSC**"), as appropriate, to supervise and carry out works in accordance with agreed proposals;

(4) instigate an assurance system and control scheme to ensure that management of the construction of the works are at a standard not inferior to that required under the BO and regulations. This assurance system and control scheme comes in the form of MTRCL's PMP **[H7/2234-2642]**. For a summary of MTRCL's responsibilities under its PMP, see **[H7/2170-2171 §§9-10]**.

27. In MTRCL's Opening Submissions, it was contended that Clause 35.1 of the EA dated 29 May 2012 ("**EA3**") acknowledges the SCL Project was constructed under the "*Concession Approach*" "*to which the [BO] is not applicable*", and the BO is "*therefore applied contractually (with modifications) under the terms of EA3*" **[OS/5/6 §39]**. The contention is incorrect:

(1) As explained above, the BO applies directly to the leased land portions of the SCL Project, which (unlike the Government/unleased land portion) are not generally exempted under s.41(1) of the BO. Only limited exemption is made pursuant to s.54(2) of the MTRO and specified in the IoE. If the BO were only applied contractually as MTRCL suggests, there would have been no need for the BA to issue an IoE (in addition to IoC). Paragraph 23 above is referred to and repeated.

(2) There is nothing in the BO to provide that parties may, by contract, alter or dispense with the application of its provisions.

28. In any event, the Government respectfully submits that it would not be necessary for the Commission to decide on MTRCL's argument in this respect because it is academic. This Inquiry is concerned with the substantive duties and responsibilities of MTRCL regarding the D-wall and platform slab construction works at HUH Extension. Even assuming that the BO was not directly applicable (which is denied), the IoE makes it plain that MTRCL's management of the construction of the works has to be *"at a standard not inferior to that required under the BO and regulations"* (see §26(4) above).[11]

B4.3 Role of the BO Team and BSRC Team

29. The building safety control mechanism is implemented by the Government's BO Team (i.e. a team of professional staff seconded by BD to RDO of HyD to handle matters relating to the IoE and IoC for *inter alia* the SCL Project[12]) and the MVC's BSRC Team at every stage of construction of HUH Extension.

[11] It is Mr Rowsell's opinion that *"the full provisions of the BO can be considered to apply to the structural elements which are related to the subject of the Commission of Inquiry"* **[ER1/1/17 §12]**.
[12] See the organisation chart of the BO Team (comprising the SBS/RD, SStrE/RD, BS/RD2 and StrE/RD2) at **[H7/2657]**.

30. At the design stage, drawings, plans, calculations and other details of the proposed works are submitted by the CP for consultation with BD as fulfilment of one of the IoE conditions. Consultation submissions are processed and vetted by the BO Team and BSRC Team. Structural submissions would only be accepted upon satisfactory demonstration of compliance with the BO safety standards. Upon acceptance of the consultation submissions, the BO Team issues acceptance letters specifying requirements pursuant to the IoE ("**Acceptance Letter(s)**")**[H7/2174-2176 §§22-28]**.

31. At the construction stage, the CP and Leighton's Authorized Signatory ("**AS**") are required to manage and supervise the construction works in accordance with the PMP, Site Supervision Plan ("**SSP**") and requirements specified by the BO Team. The BO team would, if necessary, carry out site inspections and site audits with the assistance of the BSRC Team **[H7/2195-2198 §§22-30]**.

32. At the completion stage, the CP, RGE and RC are required to submit certificates of completion ("**CoC**") together with supporting documents (e.g. material test report, quality supervision report and inspection log book) in respect of the construction works for the BO Team's consideration. The BO Team conducts completion inspection to random check whether the works have been completed generally in accordance with the plans accepted during consultation. If there is any issue of non-conformity, the CoC would be rejected until and unless the non-conformity is rectified to the BA's satisfaction. If the works are completed satisfactorily, acknowledgement letters/no objection letters would be issued to MTRCL. The CP had already submitted the CoC for foundation works (i.e. D-wall works) in order to proceed with the subsequent pile cap, capping beams and platform slab works at HUH Extension (which was acknowledged by BD on 5 May 2017) **[H7/2198-2200 §§31-37]**. Upon completion of substructure and superstructure works including the slab construction works, MTRCL has to submit the corresponding CoC to BD

together with supporting documents such as inspection log books and complete set of as-built drawings of the relevant construction works.

B4.4 Specific requirements on steel reinforcement and coupler installation

33. As part of the requirements specified in BD's Acceptance Letters, the CP and AS have to submit documents including the SSP, QSP and Quality Assurance Scheme ("**QAS**") setting out measures in respect of the quality assurance and control of the steel reinforcement and coupler installation works at the D-walls and platform slabs **[H7/2176 §28; H7/2192-2195 §§9-20]**.

34. As an illustration, the two Acceptance Letters dated 25 February 2013 **[H9/3873-3934]** provide that:

(1) The CP should assign a quality control supervisor to supervise mechanical coupler works, determine the necessary frequency of inspection by the quality control supervisor, which should not be less than once a week, and devise inspection check lists. The minimum qualifications and experience of the quality control supervisor is to be the same as the grade T3 Technically Competent Person ("**TCP**"), as stipulated in the Code of Practice for Site Supervision 2009 ("**2009 CoP**").

(2) The RGBC/RSC should assign a quality control co-ordinator to provide full time on site supervision of the works and devise inspection check lists. The minimum qualifications and experience of the quality control co-ordinator is to be the same as the grade T3 TCP, as stipulated in the 2009 CoP.

(3) A QSP is required to be submitted to BD prior to commencement of the mechanical coupler works and should include the following details:

(a) 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.

(b) 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 coupler works.

(c) 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 assemblies by the quality control supervisor of the CP and full time continuous supervision by the quality control co-ordinator of the RGBC/RSC.

(See **[H9/3901, 3903, 3928 & 3930]**. Emphasis added)

35. The above requirements in the Acceptance Letters found their way into the "Quality Supervision Plan on Enhanced Site Supervision & Independent Audit Checking by MTRC & RC for Installation of Couplers (Type II – SEISPLICE Standard Ductility Coupler)"[13] **[H9/4265-4280]**, which MTRCL submitted to BD on 12 August 2013 **[H9/4262]**. This QSP provides that:

(1) For supervision and inspection of installation works by the RC on site:

[13] The QSP makes it clear that the QSP is in addition to: The Site Supervision Plan 2009 submitted by Leighton; and The Quality Control/Assurance scheme prescribed in the Technical Manual implemented by BOSA.)

(a) Quality Control Supervisors (RC) will be responsible to carry out full time and continuous supervision of the splicing assemblies on site.

(b) Supervision and inspection will be recorded in the Record Sheet (appendix C [*sic*][14]) and write into the inspection log book by Quality Control Supervisors (RC).

(c) Checking includes length of thread and correct connection of 2 bars with couplers. Criteria are provided in appendix D.

(2) For supervision and inspection of installation works by MTRCL on site:

(a) Frequency of quality supervision should be ≥ 20% of the splicing assemblies by MTRC T3.

(b) Quality Control Supervisors (MTRC) will record the inspection by countersigning the inspection Record Sheet and put it in an inspection log book.

(c) Checking includes length of thread and correct connection of 2 bars with couplers. Criteria are provided in appendix D.

(3) The inspection log book shall include *inter alia* the SSP, QSP, MTRCL's and RC's Record Sheet. It should be kept at the site office and when required produced to officers of BD for inspection.

(See **[H9/4267, 4269-4270]**. Emphasis added)

36. Appendix B to the QSP is a "*[s]ample record sheet with example…for reference*" **[H9/4277]**. The record sheet provides that each rebar is to be checked for *inter alia* the following:

[14] This is a clear typo. The correct reference should be to appendix B **[H9/4277]**.

(1) whether coupler is fully screwed and fitted;

(2) whether coupler has been cleared of foreign materials (e.g. concrete gels);

(3) whether thread has been cleared of foreign materials (e.g. concrete gels);

(4) whether there is complete splice between coupler/rebar.

B4.5 MTR/Leighton's argument on the supervision/inspection requirements

37. A number of issues emerged during the Inquiry regarding the above requirements. As explained below, in light of the evidence and on a proper interpretation of the relevant documents, these issues should no longer be in any serious dispute.

38. First, it was suggested that the QSP referred to in §35 above does not apply to the EWL slab: see evidence of Kobe Wong **[T29/128:4-133:9]** and Stephen Lumb **[T24/135:9-138:1]**. This was rejected by the project management experts (who agreed that *"MTRCL and Leighton should have followed the QSP requirements regarding the logging, execution and filing of the Record Sheets for coupler inspection"*: Joint Statement **[ER1/9/3 §18]**) and Paulino Lim of BOSA (which provided input in preparing the QSP and training to MTRCL and Leighton on the supervision requirements therein) had no doubt in his mind that the QSP requirements applied to both the D-walls and the platform slabs: **T36/110:12-113:3]** and §39(1) below).

39. Second, there was a question as to how "full time and continuous supervision" is supposed to be carried out. It is submitted that the interpretation of "full time and continuous supervision" is a simple one if common sense is applied. Leighton's own postulation of "one-on-one, man-to-man marking" grossly exaggerates what is required and is irrelevant as the Government has never asked for such deployment of manpower (see evidence of Ho Hon Kit

[T37/87:5-89:1, 93:3-21]). On the other hand, MTRCL/Leighton's suggestion that it would be sufficient to have someone full-time (as opposed to part-time) on site is plainly unacceptable (see evidence of Raymond Brewster **[T23/29:23-30:7, 31:10-23]**, Stephen Lumb **[T25/57:3-58:13]** and Huyghe's Report **[ER1/2/39-40 §§155-156]**) for the following reasons:

(1) First of all, the suggestion has been rightly rejected by Mr Rowsell:

> *"…on this contract there is a requirement that the quality supervision should be full time and continuous supervision by the Contractor of the mechanical coupler works* ***[QSP, para. 5)1.i, B6/4103]****. It is likely that this requirement was included because it was recognised that it would be a technically difficult process with a high risk of problems being encountered. I consider that the interpretation of this requirement is very simple and requires the need for the coupler works to have continuous supervision. That means, in my opinion, that a Contractor's supervisor needs to be present at all times where mechanical coupler works are underway. The objective being to ensure that the work is done properly in accordance with the specifications and any problems are resolved without delay. It does not have to be the same supervisor for the whole of a working day but continuous supervision has to be provided for the full time that work is underway. Mr Paulino Lim of BOSA…, the manufacturer and supplier of rebars and couplers for the SCL Project, provided training sessions to MTRCL and Leighton's quality supervisors and sub-contractor bar fixers. He confirmed that he had gone through the entire QSP with the attendees and emphasised the requirement of full-time continuous supervision on site. There was no doubt in his mind that the QSP requirements applied to both the diaphragm walls and the platform slabs. This is in accordance with the evidence of Mr Aidan Rooney.*[15] *In my opinion, the obligation requires a supervisor to be present at the site of work activity rather than for example, being present elsewhere on site or in the site office carrying out other tasks. The General Specification requires that the Works shall be arranged so that the Works are supervised at a minimum ratio of 1 supervisor to no more than 10 workers* ***[para G3.9.1, C3/2040]****. Therefore, if the number of workers involved in the coupler works is greater than 10 then there*

[15] As well as the evidence of Kit Chan **[T26/104:2-105:6]** and James Ho **[T27/27:21-25]**

should be more than one supervisor in attendance."[16] **[ER1/1/52-53 §78]** (Emphasis added)

(2) Mr Rowsell's interpretation is wholly in line with the explanation of the requirement given by Mr Ho Hon Kit, Assistant Director of BD **[T37/87:5-89:1]**. Mr Ho has also explained the rationale behind the requirement, which is essentially to deter non-compliant / corner-cutting activities:

"I believe that as long as the quality control coordinator, during the process of bar fixing, including screwing in of rebar with couplers, as long as the supervision was done within his line of sight -- well, perhaps it was at a time when some bars, they may be ordinary bars or threaded rebars, that had been lifted onto the site -- during the continuous supervision, the coordinator could conduct visual inspection on the length of the thread, to see if they were shorter. At the site, no one could do anything like cutting the threaded rebar. At the same time, the coordinator could supervise on bar fixing and the installation of coupler with rebar. The coordinator was fully aware of the situation. As I said, as soon as he knew that the screwing in was completed, he would go over to conduct compliance check to ensure that it was fully screwed in. In the entire process, he has met the requirement of full-time and continuous supervision." **[T37/93:3-21]**

(3) The requirement serves a critically important purpose because coupler installation works, as pointed out by Mr Rowsell and reflected in the recent opening up results (see Section C2.4 below), are recognised to be a technically difficult process with a high risk of problems being encountered. Further, defective works (such as a cut thread) may not be detectable or remediable after further layer(s) of rebars are built, and would certainly not be so after concrete is poured. This is the reason why someone was required to be there during the actual installations works for the purpose of supervision. Further, the installation process *"takes a short*

[16] Mr Huyghe agreed in cross-examination with Mr Rowsell's opinion that a contractor's supervisor needs to be always present where mechanical coupler works are underway **[T39/49:1-50:10]**.

time, maybe one or two minutes" only: see evidence of Ho Hon Kit **[T37/88:15-23]**.

40. Third, there was also debate on what is to be supervised as per the QSP requirements. At one point, it was contended on behalf of MTRCL that "splicing assemblies" mean "*the finished product of coupler plus the two rebars which are engaged, not the process"*: see cross-examination of Stephen Lumb of Leighton by MTRCL **[T25/55:11-56:17]**. It was also contended that items in the inspection record sheet (see §§36(1)-(4) above) could be checked after the splicing assemblies and there was no need to supervise the installation process: see re-examination of James Ho **[T27/50:23-52:3]**. It is submitted that these contentions are without merit:

(1) They have been correctly rejected by the project management experts, BD and BOSA (see §§39(1)-(2) above).

(2) They are not supported even by MTRCL's Senior Inspector of Works ("**IoW**"), Kobe Wong, who testified that the items on the inspection record sheets should be checked during the installation process and not merely after **[T30/60:2-8]**.

(3) The QSP expressly provide that the required supervision is of "*the installation of the steel reinforcing bars to the couplers*": see §34(3)(a) above and **[H9/4267 §1(a)]**.

(4) The suggested manner of supervision would defeat the purpose of the requirement (see §39(3) above). It also defies logic and common sense. As queried by the Chairman when this suggestion was put forward at the hearing, how does one carry out full-time and continuous supervision of something that has already been done? **[T25/56:21-59:3]**.

B5. Concluding Remarks

41. It is clear from the above that the Government's mechanisms for monitoring and control of the SCL Project are robust and comprehensive. Although not directly involved in supervision of the steel reinforcing and coupler installation works, it has laid down a set of detailed requirements, which are familiar to MTRCL and the registered building professionals and contractors. The Government was plainly entitled to place trust and reliance on MTRCL for the successful implementation of project, given that its previous track record has been well-recognised. As Mr Rowsell said in his report:

"The organisational structure and governance arrangements they [MTRCL] have established for the project appear to me to be robust and appropriate for the delivery of the Entrustment Activities. They are in line with what I would expect for this type of major project." **[ER1/1/8 §8a]**

42. Mr Huyghe also observed that the project management procedures established by the PIMS, BD's SSP and QSP for coupler installation are *"comprehensive and include the necessary procedures and practices to develop, monitor and construct the Project"* **[ER1/2/19-20 §59]**.

C. PROBLEMS AND DEFICIENCIES IN IMPLEMENTATION BY MTRCL / LEIGHTON

C1. Summary of the issues discovered

43. Since May 2018, reports began to appear in the local media which suggested that the steel fixing works in the D-walls and EWL slab at the HUH Extension were defective. There were allegations that an unknown number of rebars embedded in the concrete of the completed D-walls and EWL slab were either deliberately cut or not properly connected to the couplers **[A1/32-113]**. These led to the establishment of this Commission.

44. The evidence given to the Commission and the recent opening up exercise have confirmed the existence of defective coupler installation works (see Section C2). The evidence also reveals fundamental problems and deficiencies in MTRCL's and Leighton's implementation of the requirements imposed on them by the Government and their own project management systems and plans. These include:

(1) Failure to follow the required supervision and inspection procedures (see Section C3).

(2) Absence of contemporaneous records for supervision and inspection of the coupler installation works (see Section C4) and compilation of retrospective records (see Section C5).

(3) Lack of proper investigation and implementation of preventive measures after discovery of the defective works (see Section C6).

(4) Unauthorised alteration works at the top of the east D-wall (see Section C7).

(5) Failure to maintain proper as-built records in respect of the D-walls and the EWL slab (see Section C8).

45. It is clear that had MTRCL and Leighton complied with their obligations (particularly, the obligations in relation to supervision and inspection), the defective coupler installation works would not have been allowed.

C2. Incidents of Cutting of Rebars and Defective Installation into Couplers

C2.1 Evidence of MTRCL and Leighton

46. On Leighton's case, there were three occasions where Leighton and MTRCL discovered rebars being cut and one of the incidents resulted in a non-

conformance report no. 157 ("**NCR**") issued by Leighton to Fang Sheung **[C12/8113-8117 §§28-46, B6/4121-4132]**. On MTRCL's case, there were five (or possibly six) incidents of rebar cutting **[B1/438-442 §§68-88]**.

47. The evidence on the incidents can be summarised as follows:

(1) The first incident occurred in about September 2015 at an area where rebar fixing works were in progress. Staff of MTRCL and Leighton discovered during their inspection that the threaded end of one or two rebars had been cut **[B1/438-439 §§69-70; C12/8114 §29]**.

(2) The second incident occurred in October or November 2015. Again, this incident was discovered by MTRCL and Leighton during inspection **[B1/439-440 §§74-76; C12/8114-8115 §§32-36]**. Photos taken by Edward Mok show at least two rebars were cut and not screwed into the couplers **[C12/8123 & 8125]**.

(3) The third incident occurred on 15 December 2015 at Area C3-2/C3-3 and resulted in the NCR **[B1/440-441 §§77-84; C12/8115-8116 §§37-43]**. As recorded in the NCR, the threaded ends of five rebars located at the bottom mat of the EWL slab were cut by a wire cutter and had not been screwed into couplers **[B6/4121-4132]**.

(4) Kobe Wong of MTRCL gave evidence of two other incidents which occurred in late December 2015 to early January 2016, shortly after the NCR was issued, at Areas C1-5 and B4/B5 respectively. As with the first two incidents, one or two cut rebars were involved **[B1/441 §§85-86; T29/151:8-157:2]**.

(5) Between 16 to 31 December 2015, Andy Wong of MTRCL discovered 5 or 6 threaded rebars not screwed into couplers at Area C1-5 or C3-3. At the time, concreting in the relevant bay had already commenced and 3

rebars could not be rectified as they were located in the lower part of the top mat **[B1/454-456 §§30-37]**. It appears from the number of non-compliant rebars involved that this is a separate incident from the fourth and fifth incidents discovered by Kobe Wong.

C2.2 Evidence of Chinat

48. Five witnesses from Chinat testified that they had witnessed the practice of cutting the threaded ends of rebars on site: But Ho-yin **[D2/912 & 915 §§9-11, 24]**; Chu Ka-kam **[D2/973 §11]**; Thomas Ngai **[D2/962 §9]**; Li Run-chao **[D2/924-926 §§9-17]** and Jason Poon **[D1/19-22 §§33, 38 & 41]**. The timeframe and certain features of the incidents described by Chinat witnesses bear resemblance with the incidents discovered by MTRCL and Leighton:

(1) But and Poon claimed to have witnessed the cutting of rebars in September 2015 **[D2/912 §§9-11; D1/21-22 §§38 & 41]**, at about the same time when the first incident occurred. But said that the cutting happened at a location near Area C1, which is consistent with Kobe Wong's evidence that the first incident was most likely to have occurred in Areas C1-1 to C1-2 **[B1/438 §69.4]**.

(2) Chu allegedly witnessed a cutting incident in late October 2015 **[D2/973 §11]**. As stated above, the second incident occurred in October or November 2015.

(3) Ngai purportedly witnessed an incident in December 2015 **[D2/962 §9]**. Several other cutting incidents were also discovered in December 2015, including the NCR incident, the fourth incident discovered by Kobe Wong and the incident discovered by Andy Wong.

(4) Li gave evidence that he saw workers cut threaded rebars with a handheld grinder/cutter **[D2/926 §16]**, whereas But testified that a red machine was

used **[D2/912 §9]**. As shown in a photo attached to the NCR **[B6/4124]** (see coloured copy at **[B10/7463]**), a red portable wire cutter was discovered near the scene of the NCR incident **[T30/123:18-25]**.

(5) Ngai testified that he saw on one occasion in December 2015 workers cut about half of the length of the threaded rebars away **[D2/962 §9]**. This coincides with the evidence of Kobe Wong and Andy Wong, who discovered that rebar threads were shortened by half. The incident referred to by Andy Wong happened in December 2015 **[B1/438-439 §70; B1/453 §22]**.

49. The Government notes that there are various inconsistencies in the evidence given by Chinat witnesses. These will no doubt be addressed at length in Leighton/MTRCL's submissions, which may also comment on whether there was an ulterior motive on Jason Poon's part to exaggerate or even fabricate his allegations in order to exert commercial pressure on Leighton. However, considering all the circumstances, the Government submits that it may not be justified to dismiss the evidence of Chinat witnesses entirely:

(1) Leighton and MTRCL accept that rebar cutting incidents had occurred. While they would like the Commission to believe that these were a small number of isolated incidents, the inherent probabilities are that not each and every one of such incidents would have been discovered through supervision/inspection. This is especially so given the deficiencies in MTRCL and Leighton's supervision/inspection system as identified below.

(2) Even if one ignores the testimonies of the Chinat witnesses, the photo produced by Jason Poon at **[D1/228]** shows *prima facie* a worker cutting the threaded end of a rebar on site with a portable cutter for no obvious (legitimate) reason.

(3) Both MTRCL and Leighton sought to pray in aid the evidence of Fang Sheung in the hope that it may help them prove that the bar cutting incidents were only isolated and minor incidents: see MTRCL's Opening §26 **[OS/5/4]** and Leighton's Opening Submissions §§9-14 **[OS/4/2-3]**. However, the evidence of Fang Sheung's witnesses has shown to be unreliable (see analysis at Section C2.3 below) and it raises more concerns than comfort.

(4) The opening up results to-date show defective coupler installations and unconnected rebars which raise serious suspicion of rebar cutting (see Section C2.4 below).

C2.3 Evidence of Fang Sheung

50. Mr Pun Wai Shan and Mr Cheung Chiu-fung Joe (respectively Fang Sheung's owner and foreman) gave evidence on the incidents of cutting of rebars on three occasions:

(1) On 13 June 2018, they attended an interview (which was recorded) with MTRCL as a result of media reports on rebar cutting allegations in May 2018 **[B5/3082.2-3082.35]**;

(2) On 27 August 2018, they filed Witness Statements with the Commission **[E1/26-29.4; E5/875-879.5]**; and

(3) On 3 September 2018, both Pun and Cheung gave Police statements on rebar cutting allegations **[E6/1585-1595.10; E6/1575-1584.10]**.

51. There are glaring inconsistencies in the evidence given by Pun and Cheung on these three occasions and at the hearing.

52. First, both Pun and Cheung said in their Police statements that "in reality" when there were not enough Type A rebars, Fang Sheung workers may cut the

threaded ends of a Type B rebar to convert it into a Type A rebar **[E6/1595.9 §A11; E6/1584.8 §A4]**. At the hearing, Pun retracted from his earlier evidence and maintained that the reason he gave the Police was actually his own "imagination" without any factual basis **[T13/15:6-16:19]**. Cheung also said he only heard workers mention the "possibility" of converting Type B rebar into Type A rebar but did not see that take place **[T14/101:7-103:5]**. This version appeared more than once. In the MTRCL interview, Pun and Cheung also put forward the conversion of Type B into Type A rebar as a reason for cutting. Cheung even specified that about 10-odd rebars for each bay would be cut for that purpose **[B5/3082.15 & 3082.35]**.

53. Second, when asked about the cause of the NCR incident at the MTR interview, Pun said that because the bars were too congested, the workers "took a risk" and cut away the threads of the rebar so that it would appear that they have been screwed into couplers **[B5/3082.6; T13/20:11-24:13]**. At the hearing, however, he denied that he knew about such bar cutting incidents and failed to explain why he accounted for the NCR incident in the way he did at the MTRCL interview **[T13/39:13-40:6]**.

54. Third, when being asked when he first found out about the cutting incidents, Pun said he thought it was a workmanship issue at the time and he did not know that cutting was involved until his interview with MTRCL on 13 June 2018 **[T13/33:10-34:12]**. Later on, however, Pun admitted that Cheung told him about the cutting on the day of the incident i.e. 15 December 2015 **[T13/34:18-35:13]**. Subsequently, Pun switched back to his original story that he only found out about the cutting at the MTRCL interview **[T13/39:13-40:8]**. He was simply going around the circle and trying to conceal the truth. Pun's story is further contradicted by Cheung's evidence that he had informed Pun about the second and third incidents after they happened and Pun was "very angry" and felt "ashamed" about the incidents **[T14/134:5-136:1]**.

55. Fourth, Pun and Cheung were clearly aware of the cutting incidents when they filed Witness Statements with the Commission. Pun admitted that he became aware of the NCR incident latest at the MTRCL interview **[T13/39:13-40:8]**. Cheung agreed that Edward Mok of Leighton had informed him of all three occasions where cut rebars were discovered. On the second and third occasions, Edward Mok explicitly told him there were workers who cut the threaded rebar and Cheung informed Pun of the same **[T14/124:16-134:4]**. Nonetheless, both Pun and Cheung in their Witness Statements denied that there were any incidents of cutting. Pun stated in his Witness Statement that he had allegedly "investigated" Fang Sheung workers but did not hear about any cutting **[E1/29.3 §7]**. Similarly, Cheung said in his statement that he *"made inquiries to [sic] the staff of Fang Sheung and had never heard of anyone cutting off the screw heads of the steel bars for fraud"* **[E5/879.2 §7]**. Not only were Pun and Cheung unforthcoming with the Commission, they also lied to the Police. Despite their clear knowledge of the NCR incident, Pun told the Police that he only became aware of the cutting incidents from the news reports **[E6/1595.8 §A11]** while Cheung said that he had not witnessed or heard of cutting of rebars **[E6/1584.8 §A4]**.

56. Fifth, Cheung mentioned another reason for cutting at the MTRCL interview. He said that Fang Sheung workers would follow Leighton's instructions to cut the threaded heads of rebars slightly and to insert the cut rebar into damaged couplers **[B5/3082.30]**. He said such practice was acceptable as Leighton would carry out remedial procedures by coring a hole and inserting a dowel bar **[T14/108:6-112:23]**. This was again never mentioned in his Witness Statement to the Commission. When asked why Leighton would instruct Fang Sheung to cut rebars for insertion into damaged couplers, Cheung first answered it was to make things look "sightly" or "pretty". Subsequently, he changed his evidence to say that it was to prevent misunderstanding that the rebar was not installed

[T14/106:11-112:23]. Both explanations are entirely incredible. As Professor Hansford has noted, there is no reason to make things look pretty as the works would all be covered in concrete **[T14/107:5-9]**. Further, the evidence that Leighton instructed Fang Sheng to cut rebars is not consistent with Cheung's evidence that Fang Sheung workers decided to cut the rebars by acting on their own frolic.

57. Sixth, Cheung's evidence is also contradicted by photographic records. Cheung said that if he saw his workers cut rebars, he would stop them immediately **[T14/137:5-10]**. However, the Chairman of the Commission noted that **D1/D228** which shows a worker cutting a threaded rebar was taken only one minute before **D230** which shows that Cheung was in the vicinity. This suggests that Cheung was around when the cutting openly took place **[T14/140:22-142:11]**.

58. What is most troubling is that despite their clear knowledge of the bar cutting incidents (and also Cheung's admission that he felt alarmed, angry, ashamed in relation to the rebar cutting incidents **[T14/134:11-136:1]**), no steps were taken by either Pun or Cheung to ascertain why workers had decided to cut the threaded rebars without seeking prior approval. This is incredible given that Cheung accepted that some workers were replaced as a result. This indicates that Fang Sheung witnesses either made no serious attempt to find out the reason(s) behind the rebar cutting incidents, or they actually knew about the reason(s) but chose to conceal the truth. Either way, this is unacceptable. As will be further discussed in Section C6 below, it is important to understand the reason(s) for the defective works in order to ascertain the extent of the problem and devise suitable measures to prevent recurrence.

C2.4 Opening-up results

59. Pursuant to the Holistic Proposal **[G17/12970-12999]** formulated and submitted by MTRCL and agreed to by the Government, the opening up of the concrete of the platform slabs and D-walls commenced on 10 December 2018. The results up to 21 January 2019 show that (1) a total of seven couplers were found not connected to any rebar at one end; (2) out of the said seven couplers, four of them were found adjacent to unconnected threaded rebars; (3) out of the said four pairs of coupler and rebar, the threaded ends of two unconnected rebars showed only 2-3 or 3-4 threads, which raises serious suspicion of rebar cutting[17]. In addition, a total of 38 connected couplers (i.e. 37% of the total number of connected couplers tested so far) were not installed in accordance with the coupler manufacturer's specification.

60. Insofar as MTRCL and Leighton now seek to challenge the test results by saying that the Government's 37mm benchmark is not reliable, it should be noted that before that one single test result of BOSA came out, neither MTRCL nor Leighton had ever put forward any views on the standard required. In the QSP accepted by MTRCL and Leighton, BOSA's manual was specifically referred to.

61. Leighton obviously prepared its questions for Professor McQuillan in a desperate attempt to shift the focus from the unsatisfactory test results (which have the effect of reinforcing Leighton's failure to inspect and supervise) to unfair criticisms of the Government's analysis and presentation of such results. While Professor McQuillan, during his cross-examination by Leighton **[T44/131:18-136:16]**, saw fit to provide his comment that the benchmark was arbitrary and misleading, he, when cross-examined by the Government, was

[17] For further details, see the results in HyD's webpage: https://www.hyd.gov.hk/en/road_and_railway/railway_projects/scl/result/index.html.

unable to tell whether he knew about the reason for the Government's adoption 37mm as the acceptance criteria **[T44/141:1-17]**. He then tried to explain that he did not mean to say that the test results were "misleading" to the public and that he simply tried to express his view that the Government's acceptance criteria was too stringent **[T44/145:3-146:5]** according to his engineering judgment. Professor McQuillan also referred to 3 sample tests in support of his view but (as we will explain in Section D), such tests simply cannot support the lowering of the standard to 24mm, i.e. 60% engagement. The benchmark adopted by the Government was based on the information provided by BOSA (i.e. the coupler manufacturer) and it decided to take 37mm instead of 40mm in order to give MTRCL and Leighton the benefit of the doubt (arising from the level of tolerance gathered from experts). This issue will be fully discussed in Section D of these submissions.

C3. Failure to Comply with Supervision and Inspection Requirements

62. Had the supervision and inspection requirements set out in Sections B4.4 and B4.5 above (in particular the requirement of full time and continuous supervision) been implemented, the coupler installation process would have been properly supervised and it would at least minimise the risk of workers improperly cutting the threaded rebars. Also, defective installations, such as rebars not being fully screwed into couplers, would likely have been discovered and rectified immediately on site.

C3.1 Leighton's supervision and inspection

63. The evidence overwhelmingly demonstrates that Leighton did not provide the requisite level of supervision.

64. First, most of Leighton's witnesses (whether of higher or lower rank) were unaware of the QSP for coupler installation, the requirements on supervision and inspection stipulated therein, or related documents:

(1) As provided in the QSP, the TCPs proposed in the SSP would be responsible for the quality control of coupler installation works **[H9/4268]**. Andy Ip was nominated as one of the grade T3 TCPs under the SSP **[H10/4548]**. However, he only saw the QSP for the first time at the hearing **[T20/29:18-30:15]**.

(2) Gabriel So, then General Superintendent and a grade T1 TCP under the SSP **[H10/4548]**, had not heard of the QSP or the Inspection and Test Plan ("**ITP**")[18] and was not familiar with the inspection procedure **[T18/130:13-24, 132:15-20]**.

(3) Chan Chi-ip, another grade T1 TCP under the SSP **[H10/4548]** and a Site Supervisor, had no knowledge about the QSP or SSP **[T19/25:24-26:18]**.

(4) Khyle Rodgers, the Superintendent, was not aware of any particular requirements for supervising coupler installation works at all **[T15/38:20-22]**.

(5) Joe Tam (Site Supervisor) had no recollection of the QSP **[T19/103:9-10]**.

(6) Joe Leung (Site agent) had not seen the QSP before **[T20/6:8-7:15]**.

(7) Man Sze-ho (Assistant Engineer), who conducted part of the inspection for rebar fixing works, was not made aware of the QSP back in 2015 **[T22/24:23-25:4]**.

[18] ITPs are submitted by Leighton and should contain appropriate quality control and hold points for critical activities **[B1/327 §22]**.

(8) Anthony Zervaas, the Project Director, was not aware of the QSP **[T17/150:13-17]**.

(9) Kevin Harman was, worryingly (given his position as Leighton's Quality and Environmental Manager at the time), also not aware of the QSP on coupler installation **[T37/39:14-41:9]**.

65. Second (and not surprisingly in light of the first point above), some of the major requirements were not implemented on site:

(1) There was no full time continuous supervision in the manner contemplated by Mr Rowsell and BD (see §§39(1)-(2) above). Supervisors would not be witnessing the installation process of all rebars into couplers. They would not "stand there and watch" workers perform the coupler installation works **[T18/113:4-14, 135:12-139:6]**. Nobody was specifically assigned to look after such works on a full-time basis. Instead, supervisors would stay at an area for a while, walk around the site and keep circulating **[T19/40:11-42:21; T21/30:7-13]**. It also appears that supervisors would not necessarily ensure that they were present whilst coupler installation works were underway. For example, when Chan Chi-ip (Leighton's Site Supervisor) was asked whether he actually watched workers installing rebars closely, he said:

> *"When I get to that spot, if workers are working on rebars, like screwing bars into couplers, as you mentioned, then I see them doing that, but I wouldn't be standing there for a long period of time. I see that there are workers doing the work and then I would continue to move on to another area or check another sub-contractor. So I would continue with my round of inspections."* **[T19/22:24-23:6]** (Emphasis added)

(2) The existing records, such as the documents entitled "Record of Specific Tasks Performed by TCP under RC Stream", cannot be relied upon as evidence that Leighton's staff had carried out supervision or inspection

full time. This is because it would be stated on such records that the "Frequency of Inspection" was "Level 5 (full time on site)" (see e.g. **[C27/20594]**) as long as the supervisor spent some time on site **[T20/62:2-63:1]**.

(3) It appears that the rebar fixing works were at best inspected on a "layer-by-layer" basis. Various Leighton witnesses have referred to such "layer-by-layer inspection", but accepted that it was not documented in any contemporaneous records: see e.g. evidence of Karl Speed **[T16/99:4-16]**, Ian Rawsthorne **[T18/50:14-17]**, Gabriel So **[T18/141:20-21]** and Edward Mok **[T21/22:2-7]**. Chan Chi-ip explained that inspectors might go off during inspection for other works and come back to see the completed product **[T19/42:3-43:1, 63:20-66:15]**. Gabriel So said only a small number of completed coupler works would be checked **[T18/135:14-139:23]**.

(4) In light of the above evidence, and the fact that Leighton did not maintain any contemporaneous record sheets of coupler supervision/inspection, whether in the form of or similar to appendix B to the QSP **[H9/4277]** (see Section C4 below), there is nothing to suggest that the supervision/inspection were undertaken at the level of detail and thoroughness required by appendix B (see the items set out at §§36(1)-(4) above).

(5) None of the Leighton engineers involved in the inspection was a grade T3 TCP **[T20/13:13-14:5, 32:3-12]** as required by the QSP.

66. The level of supervision and inspection provided by Leighton failed to prevent or minimise the risk of the occurrence of incidents of rebar cutting and the defective installations of couplers. Indeed, it was admitted by Gabriel So, Chan Chi-ip and Edward Mok that, under the existing system, it would be possible

for workers to cut the threaded ends of rebars or for certain rebars to be not screwed into couplers to the required extent without being detected **[T18/139:4-23; T19/65:2-66:15; T21/43:25-45:9]**. Further, in spite of the recurrence of rebar cutting incidents on site, there was apparently no checking by Leighton of the installed rebars by asking workers to unscrew them at least on a random basis, except on 15 December 2015 when the NCR incident took place **[T21/89:24-90:18]**. Edward Mok agreed that, without asking the workers to unscrew the installed rebars, it would be impossible to tell whether they had been cut **[T21/93:25-94:6]**.

C3.2 MTRCL's supervision and inspection

67. The evidence reveals not only Leighton's deficiencies, but also MTRCL's. As a project manager who had been paid HK$8 billion project management fee, MTRCL was given sufficient resources and was required and expected to take steps to ensure that Leighton as the RC fulfilled the relevant supervision and inspection requirements by deploying sufficient manpower. MTRCL itself was under an obligation to carry out ≥ 20% / 50% supervision of coupler installation works. It is clear that MTRCL failed to identify that Leighton was working in ignorance or defiance of the key requirements. As Mr Rowsell observed:

"In relation to the requirements for approved resources for site supervision and their technical competence as set out in the SSP, evidence has been provided by witnesses from the Contractor that they were unaware of the SSP and/or the QSP. This included the Contractor's Construction Manager. Without the knowledge of the requirements it was clearly impossible to ensure that the requirements for supervision set out in these documents were being delivered. I would have expected that the MTRCL supervisory and inspection teams to have identified that the Contractor was working in ignorance of those key supervision documents. I would have expected MTRCL teams to have checked that the levels of the Contractor's supervisory resource met the requirements in terms of numbers set out in the General Specification and also

met the approved named resources and requirements for technical competence set out in the SSP and QSP" **[ER1/1/51 & 53 §§74 & 79]**.

68. Turning to MTRCL's own obligation to supervise and inspect coupler installation, at least the following problems and deficiencies can be identified.

69. First, there was a lack of clarity in the designated responsibility of the construction engineering team and the inspection team. Evidence of the communications breakdown between the two teams and the serious confusion in their roles regarding the supervision and inspection of coupler installation works was aptly summarised by Mr Rowsell:

> *"The procedure for undertaking inspections described by Mr Louis Kwan (a construction engineer of MTRCL) in his evidence does not appear to me to be well-controlled. He explained that as far as he was concerned, he was only responsible for the inspection of reinforcement bars in the slabs and not the coupler connections although he might look at them. He was not aware, however, of who was responsible for coupler inspections. He considered that it was the inspection team which should conduct inspection of the coupler connections in the EWL slab. Mr Kobe Wong, a Senior Inspector of Works ("**IoW**") of MTRCL, however, considered that the responsibility for inspecting the couplers connections should lie with the construction engineer team and not the IoWs. There would appear to have been a breakdown in the management communications if it was not clear where responsibilities lay."* **[ER1/1/54-55 §82]** (Emphasis added)

70. Mr Huyghe for MTRCL accepted that the state of affairs described above caused him to agree that*"there was a lack of clarity for the designated responsibility of formal inspections and for maintaining records"*: see the project management experts' Joint Statement **[ER1/9/4 §27]**[19] and **[T39/56:8-57:10]**.

71. The confusion of responsibility was further aggravated by the fact that Kobe Wong, who (according to the CP, Mr Jason Wong) was appointed as the quality control supervisor under the QSP **[B1/174 §30]**, was unaware of his

[19] The issue about record maintenance will be addressed in Section C4 below.

responsibilities and he was never instructed by his superiors to keep or countersign any record sheets for the coupler installation works in the EWL slab **[B16/13659 §9; T30/5:11-18]**. He was not identified in the SSP either.[20]

72. Second, while it is MTRCL's case that Kobe Wong and his team had conducted routine site surveillance in respect of more than 50% of the couplers in the EWL slab **[B1/434 §54]**, the evidence raises considerable doubts as to whether MTRCL has provided the required level of supervision or inspection:

(1) As pointed out above, Kobe Wong was not even aware of his responsibility as a quality control supervisor for the coupler installation works at the EWL slab, and was told by his superior that the responsibility fell on the construction engineering team instead and he should refrain from inspecting the couplers. However, he was assigned to inspect the couplers when the D-walls were built **[T30/4:17-12:25]**.

(2) Indeed, Kobe Wong considered at the time that the QSP did not apply to the construction of the EWL slab at all without any proper basis **[T29/128:15-132:25]**.

(3) As will be further discussed in Sections C4 and C5 below, no contemporaneous records were kept by MTRCL in respect of the supervision or inspection of coupler installation works at the EWL slab. Various forms of summaries and records have been put together long after the event based on Kobe Wong's recollection and site photos. Such retrospective records cannot constitute reliable evidence that the requisite level of supervision or inspection had been provided.

C3.3 Concluding remarks

[20] As stated in §64(1) above, the QSP provides that the TCPs proposed in the SSP would be responsible for the quality control of coupler installation works **[H9/4268]**. However, the two grade T3 TCPs nominated under the SSP are Derek Ma and Louis Kwan, not Kobe Wong **[H10/4545]**.

73. The aforesaid problems and deficiencies in the supervision and inspection of coupler installation works are totally unacceptable, especially in light of the unchallenged evidence given by Mr Paulino Lim that BOSA's training to MTRCL and Leighton's quality supervisors would include going through the entire QSP with emphasis on the requirement of full time continuous supervision **[T36/75:6-76:7, 111:21-115:10]**.

74. It is also disappointing to note that, in the course of the Inquiry, Leighton and MTRCL (instead of candidly admitting the extent of their obligations required) have seen fit to advance various arguments regarding the supervision/inspection requirements in the hope of diluting their responsibilities (see Section B4.5 above). For reasons already explained, none of these arguments is tenable.

C4. Absence of Contemporaneous Records

75. It is undisputed that:

(1) Leighton failed to prepare and maintain such record sheets contemporaneously for the coupler installation works at the EWL slab, contrary to what was done for the same kind of work at the east D-wall. Edward Mok, who was responsible for inspection of the EWL slab, confirmed that Leighton did not keep such record sheets for the EWL slab **[T21/30:21-32:20]**.

(2) MTRCL never received such contemporaneous record sheets from Leighton in respect of the EWL slab for countersigning: James Ho **[B1/335 §47]**; Kobe Wong **[B1/432-433 §§46-48]**; Derek Ma **[B1/363-364 §24]**. As stated above, Kobe Wong's evidence is that he was never instructed by his superiors to keep or countersign any record sheets for the coupler installation works for the EWL slab.

76. Such collective failure on Leighton and MTRCL's part to maintain contemporaneous record sheets for the EWL slab is inexplicable, especially when such record sheets had been maintained for the D-wall **[e.g. F30/18837-18842]** and there is no legitimate reason to adopt a different approach to the EWL slab. This shows either insufficient knowledge of the essential requirements for record-keeping or execution of their duties in a piece-meal and cavalier fashion. As stated by MTRCL's own project management expert, Mr Huyghe:

> *"The Record Sheets that were to be prepared and executed by both Leighton and MTRCL under the QSP requirements for recording the inspections of the rebar-coupler installations at the EWL slab were not provided, which omission should have been recognised by both parties and properly implemented.*
>
> *Other documents such as the RISC forms and Hold Point Inspection for rebar fixing and pre-pour check were put into place, but the Record Sheets such as those that were kept for the construction of the Diaphragm Wall which should have been prepared and jointly executed by both Leighton and MTRCL for the EWL slab were not"* **[ER1/2/15-16 §§54a, b]**.
>
> *"…the Record Sheets required under the QSP regime for the inspection of the couplers should have been prepared, executed, and signed off by Leighton and MTRCL. Leighton should have followed the contractual requirements for record keeping, and MTRCL should also have been aware of the same, and made sure that Leighton followed through with its implementation; regrettably this did not occur"* **[ER1/2/20-21 §62]**.

77. It has been suggested on behalf of both Leighton and MTRCL that the RISC forms and pre-pour checklists **[e.g. H1/38-42; 43-45]** are sufficient evidence that the coupler installation works had been properly supervised and inspected: see e.g. evidence of Aidan Rooney **[T28/143:15-144:23]** and Edward Mok **[T21/31:8-20, 32:14-20]**. For the following reasons, the proposition is unsustainable:

    (1) The hold-point/formal inspections, as recorded in the RISC forms, would only be conducted after the coupler installation works at the particular bay

were completed **[B1/429-432 §33-40]**. It was therefore the completed product, as opposed to the installation process, that was subject to checking at a hold-point inspection. Further, the hold-point inspections were visual inspections only **[T21/17:20-18:17]**. As Kobe Wong accepted, if the threaded end of a rebar was cut and screwed into a coupler, it could not be detected from visual inspection **[T30/98:10-16]**. In other words, such non-conformity could only be discovered if there was supervision of the coupler installation process. It would not be detected in the hold-point inspections.

(2) Hold-point inspections were not properly documented. Only the inspections of the top mats were recorded in a RISC form. For the bottom mats, there are no specific records indicating when or by whom the inspections were carried out **[T28/166:15-19; T29/2:8-4:2]**.

(3) Louis Kwan, who was responsible for the hold-point inspections, admitted that he did not specifically inspect the couplers at such inspections. As such, the RISC forms cannot be relied upon as confirmations that couplers had been properly inspected **[T29/16:7-19:20]**. As mentioned above, Andy Wong once discovered 5 to 6 rebars that were not properly screwed into couplers at an area where concrete pouring had already started **[B1/454-455 §§30-36]**. According to MTRCL's inspection system, two hold-point inspections (namely, the hold-points for respective rebar fixing check and pre-pour check) would be required before concrete could be poured **[T30/139:6-16]**. The fact that there were still non-compliant rebars after concrete pouring had started is a clear indication that the hold-point inspections failed to detect defective installations.

(4) Finally, the fact that both Leighton and MTRCL had engaged in the compilation of retrospective record sheets for the coupler installation works at the EWL slab after May 2018 (see Section C5 below) is a tell-tale sign that they were or ought to have been aware of the need to have such record sheets in place, and that the RISC forms should not be retrospectively taken as substitute.

78. Professor Frederick Ma, Chairman of MTRCL, in this evidence expressed his disappointment at the inaccuracy of documentary records (which caused the wrong statement on the number of couplers used in MTRCL's report submitted to the Government dated 15 June 2018 **[T33/26:11-27:5]**). He also confirmed that in the circumstances, he and the board clearly understood why the Government lost confidence in MTRCL's project management team **[T33/23:19-30:5]**.

C5. Compilation of Retrospective Records

C5.1 Chronology of events

79. The following table sets out a brief chronology of events that can be gathered from the evidence with regard to Leighton's and MTRCL's compilation of retrospective checklists:

	Date	Event
(1)	May 2018	Media reports on rebar cutting allegations
(2)	4 Jun 2018	Site visit by representatives of RDO and Pypun **[G13/10873-10874 §§5-6, G18/13418 §3(i)]** After the site visit, Kobe Wong prepared a summary table entitled "1112 Contract installation checklist" and signed on it as "IOW" ("**MTRCL Summary**") **[H14/35070]**: **[B1/365**

		§§31-32]
(3)	6 Jun 2018	Site visit by representatives of BD, RDO and Pypun [**H20/40113 §§5-6, 40108-40109 §§5-6]**, who were shown *inter alia*: • Record sheets prepared by Leighton entitled "Checklist for On Site Assembly of EWL Slab to D-Wall/Slab Couplers" ("**Leighton Checklists**"): see e.g. **[H14/35067]**. These Leighton Checklists were shown to the above representatives with Leighton's permission **[T27/79:9-20]** • MTRCL Summary. Upon being shown the MTRCL Summary, BD/RDO/Pypun representatives requested more detailed records demonstrating nature and extent of supervision and inspection carried out by MTRCL, as the format of MTRCL Summary did not correspond to format in Appendix B to QSP **[B1/365 §32, H20/40110 §10]** Based on the records obtained, Pypun concluded that there were about 20,300 couplers in the D-wall panel to slab connection **[G18/13418 §3(ii)]**
(4)	6-7 Jun 2018	Derek Ma (on James Ho's instruction) prepared a set of coupler checklists for areas covered by Kobe Wong and his team based on the format of checklists provided to MTRCL by Leighton in soft copies **[B1/365-366 §§33-34, T27/86:25-87:9]**. Such checklists ("**MTRCL Checklists**") • were signed by Kobe Wong as "IOW" • were dated 10 February 2017 • contained the following remark at the footnote: "*This form serves a retrospective record of coupler installation*" (see e.g. **[B7/4589]**)

(5)	7-8 Jun 2018	Site visit by representatives of Pypun **[G13/10874 §7]**, who were shown the MTRCL Checklists **[G18/13428 §3.6.4]**
(6)	9 Jun 2018	Pypun's email to the Government **[G13/10880+]** reporting its initial findings including: • *"The inspection was recorded on inspection sheet individually for each inspected bay. Although the inspection dates (as recorded in separate undated and unsigned summary) were recorded from 03/08/2015 to 07/10/2015, the supervisor signed off each inspection sheet at same day of 10/02/2017 (about 18 months after the inspections")* **[G13/10881 §6.1.3]**
(7)	15 Jun 2018	MTRCL submitted "Report on SCL Contract 1112 – Review of the EWL Slab Construction" ("**June Report**") to the Government **[B1/1+]**. It was concluded *inter alia* that the total number of couplers connecting the EWL slab to the D-walls was approximately 23,500 **[B1/24]** and that *"Full records are in place. All inspection records indicated that the works were acceptable, with no anomaly"* **[B1/29]**. The following documents (among others) were submitted to the Government together with the June Report: • Another summary table entitled "MTR Mechanical Coupler Checklist for HUH EWL Slab" and signed by Kobe Wong as "IOW" **[B7/4537]** ("**MTRCL Revised Summary**") • The MTRCL Checklists (see e.g. **[B7/4589]**)
(8)	13 Jul 2018	MTRCL submitted letter to the Government with supplementary information **[B1/69+]**. Attachments to letter shows connection arrangement between east D-wall and EWL

		slab was different from June Report and suggested number of couplers to be less than 23,500 **[G3/2102 §20]**
(9)	10 Aug 2018	Letter from the Government to Leighton requesting *inter alia* "*inspection log book of the quality control supervisors representing the Registered General Building Contractor (i.e. [Leighton]) in respect of the mechanical couplers works*" **[H14/7810]**
(10)	29 Aug 2018	Leighton's reply to the Government attaching *inter alia* summary document entitled "As-built for on-site assembly of couplers" and stating that "*[t]he original of these documents was produced in June 2018 and for some bays in the EWL Slab, the documents were updated recently to generally reflect the replacement of couplers with straight through bars for the East Dwall connection in Areas B and C*" **[H14/7813, 7814 §c]**

C5.2 Leighton's retrospective records

80. The Leighton Checklists, referred to in §79(3) above and shown by MTRCL to the Government at the 6 June 2018 site visit with Leighton's permission, were highly misleading. These checklists (see e.g. **[H14/35067]**) were undated and purported to show the condition ("Satisfactory" or "Unsatisfactory") of each coupler installation at a particular area against the items required to be inspected in Appendix B to the QSP (see §§36(1)-(4) above) by circling the relevant boxes by hand. There was nothing to suggest they were not prepared contemporaneously when supervision/inspections of the couplers were carried out.

81. It was only in its 29 August 2018 letter (see §79(10) above) that Leighton informed the Government that the checklists were produced in June 2018. The evidence now reveals that Leighton's engineers, including Edward Mok and Andy Ip, were asked by their superiors in June 2018 to work out the number of couplers at each area and insert information on the connection details to the relevant checklists **[T20/50:16-52:2; T21/77:11-78:3]**. However, no one from Leighton was able to confirm who had filled in the checklists by hand, in particular circling the relevant boxes that purported to show the conditions of couplers **[T20/51:6-16; T21/104:1-105:3; T25/50:16-22]**. Upon the request of the Counsel for the Government, Mr Lumb agreed to check and inform the Commission who had put the circles on the checklists. As of today, Mr Lumb has not reported back to the Commission at all.

82. What has further complicated matters is that, upon realising that the original Leighton Checklists did not take into account the unauthorised alteration works, Leighton compiled further versions of such checklists. As it turned out, there could be at least three versions of a checklist for a particular area. Using area C3-3 (East) as an example, one can locate:

    (1) A Leighton Checklist at **[H14/35067]**. As explained above, this checklist was entitled "Checklist for On Site Assembly of EWL Slab to D-Wall/Slab Couplers".

    (2) A further checklist at **[G12/9883]** entitled "As-Built for On Site Assembly of EWL Slab to D-Wall/Slab Couplers".

    (3) Yet another checklist at **[C15/10250]** also entitled "As-Built for On Site Assembly of EWL Slab to D-Wall/Slab Couplers" but marked as "Revised on 31 Jul 2018".

None of these versions was marked "retrospective" or something to the like effect to make it clear that they were not contemporaneous records of the relevant coupler installation works.

C5.3 MTRCL's retrospective records

83. As identified in §§79(2), (4), (7) above, MTRCL's records are in the form of the MTRCL Summary, MTRCL Checklists and MTRCL Revised Summary.

84. The MTRCL Checklists (see e.g. **[B7/4589]**), which were shown to Pypun at site visit and eventually submitted to the Government along with the June Report (see §§79(5), (7) above), were also problematic and misleading:

(1) Even though they contained a footnote that "*This form serves a retrospective record of coupler installation*", they were all dated 10 February 2017, as opposed to June 2018 when they were compiled. This had led Pypun to believe they were signed off on 10 February 2017 **[G13/10881 §6.1.3; G18/13428 §3.6.4; T35/52:17-53:5]**. Kobe Wong accepted that the backdating of the checklists was an attempt to make it look like they had been compiled in February 2017, at about the time when MTRCL's internal review (referred to in Section C6.2 below) was carried out **[T30/30:12-31:7]**.

(2) The suggestion that the MTRCL Checklists were somehow prepared in response to the follow-up action recommended in the internal review back in February 2017 **[B1/336 §53]** is simply incredible. It is plain from the chronology in §§79(1)-(4) above that these checklists were prepared in response to the Government's request for more detailed records in the form of Appendix B to the QSP. There is simply no rhyme or reason for the dates of such checklists to have any correlation with the date of MTRCL's internal review.

(3) The same goes with the contention that these MTRCL Checklists were meant to be internal records only **[B1/336 §53; B1/434 §55]**. As seen from the chronology, it is clear that these checklists were intended to be shown to the Government when they were compiled.

(4) While Derek Ma had alleged in his witness statement that it was emphasised to BD/RDO/Pypun representatives the MTRCL Checklists were *"retrospective records prepared internally by MTRCL"* **[B1/367 §40]**, he accepted in cross-examination that he merely showed the checklists to those representatives without saying they were retrospective records **[T27/111:6-112:24]**. MTRCL also decided not to cross-examine those Government representatives who have confirmed unequivocally in their witness statements that they were never told the records were retrospective **[G13/10874 §5; H20/40110 §10; H20/40116 §15]**. The Government's evidence was corroborated by the evidence of Mr Ron Yueng from Pypun **[T35/92:7-93:6]**.

(5) The MTRCL Checklists stated Kobe Wong's title as "IOW", despite the fact that he had since been promoted to be the SIOW in November 2015 and the Site Representative in April 2018 **[B1/417 §§2-3]**. It would further give the readers of the checklists the impression that they were prepared some time ago.

85. The same observation in point (5) above can be made about the MTRCL Summary and MTRCL Revised Summary, which were signed by Kobe Wong as IOW. These summaries were undated. There were also considerable inconsistencies between them **[T30/72:15-75:12]**. The MTRCL Summary only set out the inspection dates for 20 bays, but the Revised Summary covered 29 bays. Further, the inspection dates recorded in the summaries are also different (e.g. in the MTRCL Summary, inspection dates of C1-2 were stated to be 3 and

14 August 2015. But in the Revised Summary it was stated to be 7 and 13 August 2015).

C5.4 Concluding remarks

86. What MTRCL and Leighton ought to have done was to come clean at first opportunity about the lack of contemporaneous records, rather than engage in the creation of misleading and confusing retrospective checklists. Such practice is wholly unacceptable and represents extremely poor project management. As MTRCL's former Projects Director, Dr Philco Wong, observed, these retrospective records *"should not have been created. No one should ever do anything like that"* **[T32/111:11-112:17]**.

87. The lack of proper contemporaneous inspection records and the unreliability of MTRCL's/Leighton's documents have put the Government in an impossible position when it comes to verifying the as-constructed conditions and quality of the works. This, coupled with the lack of proper as-built records, has made the opening up of the structure as recommended in the Holistic Proposal formulated and submitted by MTRCL inevitable.

C6. Failure to Carry Out Proper Investigation and Implement Preventive Measures

88. The response of Leighton and MTRCL to the rebar cutting incidents and allegations and their handling of these matters call for critical evaluation.

C6.1 Leighton

89. First, while many Leighton witnesses acknowledged the seriousness of cutting the threaded ends of rebars (see e.g. Malcolm Plummer **[T14/33:14-15]**, Khyle Rodgers **[T15/7:11-13]**, Ian Rawsthorne **[T18/86:13-18]**, Gary Chow **[T19/123:17-18],** Andy Ip **[T20/20:4-15, 67:2-6]** and Kevin Harman

[T37/28:2-6]), none had apparently investigated into the cause(s) of such incidents. The NCR simply provided the causes of the incident on 15 December 2015 to be "Workmanship" and "Personnel" **[B6/4122]** and, despite the stated instruction in the NCR to Fang Sheung to *"review the evidence and investigate the root cause of the problem then propose your corrective actions with a timetable implementation"* **[B6/4121]**, no one in Leighton or Fang Sheung have followed up on the matter **[T20/65:19-66:11; T37/28:15-30:15]**. The apparent lack of interest in finding out the cause(s) of the incidents is concerning because, as the Chairman had pointed out, understanding the cause of the problem may explain whether it was symptomatic of a broader problem **[T16/139:3-12]**.

90. Second, there was hardly any effort on Leighton's part to tighten or strengthen the supervision/inspection of coupler installation works after the incidents, or to prevent their recurrence **[T20/67:7-16; T21/94:7-13]**.

(1) Despite the seriousness of the repeated rebar cutting incidents, there was little attempt to share knowledge of them and alert the relevant Leighton personnel to the problem. With the exception of Joe Leung (who recalled being informed that a rebar could not be properly screwed into a coupler **[C27/20683 §21]**), Andy Ip (who was informed by Edward Mok and Kobe Wong of the two rebar cutting incidents in December 2015 **[C12/8160-8161 §§16-21]**), Edward Mok and Kevin Harman, most of the Leighton witnesses claimed to have no recollection of the incidents. For instance, Rawsthorne, who signed on the NCR as Project Manager, does not recall the document or anyone discussing it or raising concerns about the incident with him **[C27/20695 §23]**. Gary Chow, who was the Construction Manager of the relevant areas at the material time, had not seen the NCR at the time and was not aware of the other incidents. He

was surprised that such incident was not reported to him **[T19/122:17-123:22]**.

(2) Kevin Harman has confirmed that he did not propose any corrective action for the NCR, even though he agreed it was important to prevent recurrence of such non-conformity at the time before rebar fixing works were completed and concrete was poured **[T37/29:10-30:15]**.

91. Third, the NCR was formally closed out by Kevin Harman on 13 January 2017, over a year after it was issued, and only because he was "prompted" by the investigation by Stephen Lumb referred to in §92 below **[C35/26716 §18, B6/4127]**. This was done apparently to enable the conclusion to be made in the investigation report that the NCR had been closed out: see **[C27/20254 §7]**. The long lapse of time was said to be a "normal occurrence" and attributable to the "poor communication" between Leighton's construction team and quality team **[T37/31:15-32:2]**.

92. Fourth, the root cause of the rebar cutting incidents was not addressed even in the investigation report prepared by Stephen Lumb (Head of Engineering) and Guntung (Design Manager) **[C27/20242+]** in response to the allegations in Jason Poon's email to Leighton in early 2017 regarding the cutting of threaded ends of rebars **[C35/26683-26686]**. In fact, the evidence and the report itself cast serious doubts on the agenda behind and thoroughness of the investigation:

(1) While Guntung had discussed Poon's allegation with certain site team members **[C35/C26681 §7]**, most of them were not involved in the day to day supervision or inspection work. Man Sze-ho was the only engineer on the list responsible for inspection of coupler installation work **[T25/41:24-42:3]**. Edward Mok, the person primarily responsible for inspecting rebar fixing works **[T21/16:14-20]**, was not interviewed **[C35/26681 §7]**.

(2) Although the investigation was triggered by Jason Poon's complaint, he was conspicuously absent from Guntung's list of interviewees. Neither was any Chinat or Fang Sheung workers approached for the investigation. While this may have been an internal review, it does not follow that investigators should not be speaking to people outside the organisation for ascertaining the truth **[T25/40:23-41:22]**. In fact, it is inconceivable as to why Leighton chose not to approach the complainant Jason Poon to ascertain the authenticity and/or the extent of his complaint first.

(3) The investigation report covers only the NCR incident **[C27/20254 §7]** but makes no reference to the two other rebar cutting incidents (see §§47(1)-(2) above). In fact, Stephen Lumb was not even aware of those prior incidents **[T24/174:16-21]**.

(4) No steps were taken to ascertain the location shown in the photos attached to Jason Poon's email **[C35/26685-26686]** or the workers involved **[T25/10:15-14:21]**.

(5) As stated above and to borrow Stephen Lumb's words, the investigation never "got to the bottom" of why the NCR incident occurred **[T25/45:5-8]**.

(6) It was concluded in the investigation report (among other things) that:

"Information collected during the investigation indicates suitable QA/QC documentation was prepared, submitted and approved by MTR, and that the construction and checking process was carried out in accordance with the approved method statement and inspection and test plan.

It would appear that the works were carried out with an appropriate level of on-site supervision by both Leighton's own Engineering and Supervisor staff, and MTR's own Inspector of Works.

Compliance with Building Department approval letter conditions in relation to coupler supply, manufacture and installation was reviewed, and the records were found to be in order and compliant…"

The investigation plainly failed to uncover the deficiencies in Leighton's level of supervision/inspection as identified above, and the absence of contemporaneous record sheets for the coupler installation works at the EWL slab.

93. Fifth, it is clear that Leighton's senior management was generally dismissive of Jason Poon's allegations or any query as to the integrity of the as-built structure. It is, for example, telling that Anthony Zervaas was content to rely on a 5-10 minute briefing by Stephen Lumb and did not read his report in any detail **[T17/145:18-24]**. Ian Rawsthorne referred to a "consensus opinion" at both Leighton and MTRCL in 2017 that Poon had raised the allegations in order to negotiate a better deal for his company **[C27/20695 §26]**. Karl Speed, when questioned at the Inquiry, said he firmly believed in the integrity and safety of the structures, and brushed aside the need to even consider expert evidence in favour of opening up the structures **[T16/138:1-141:25]**. All of these demonstrate not only corporate arrogance but also unacceptably poor management and quality control.

94. Sixth, Leighton witnesses have confirmed that Chinat was the only sub-contractor in the Project that was asked to enter into a Confidentiality Agreement **[C10/7017-7028]**: Karl Speed **[T16/112:13-16]**; Khyle Rodgers **[T14/47:21-24]** and Anthony Zervaas **[T17/108:1-2]**. The irony is that if Leighton was of a firm view, by reason of the internal investigation or otherwise, that Jason Poon's allegation had no substance at all (and that Poon simply used the allegation to exert pressure on Leighton), why did Leighton find it necessary to insist on signing the Confidentiality Agreement when the commercial disputes with Poon had already been resolved?

95. The aforesaid problems are highly unsatisfactory given that Leighton, as an experienced RC, was supposed to have a well-functioning system for dealing with non-conformance issues. It also has a designated Quality and Environmental Manager whose responsibilities, as stated in the QAP, include providing advice following the detection of non-conformities related to subcontractor's activities, determining non-conformities and their causes, evaluating the need for actions to prevent occurrence and determining and implementing preventive actions **[B6/3983-3984]**. Unfortunately, these responsibilities – at least insofar as the subject incidents were concerned – remained on paper only and were not properly discharged in practice.

C6.2 MTRCL

96. There were similar issues with the implementation of MTRCL's system for dealing with non-conformances. As Mr Rowsell has observed:

"In relation to the identification of the observation of non-compliant rebars/couplers by the MTRCL inspectors, I am surprised that formal non-conformance actions was not taken by MTRCL. I recognise that the incidents need to be considered in the context of the scale of the overall project, but the evidence provided by the MTRCL representatives shows that they knew that the cutting of the bars was not normal practice and they did not know who had undertaken the inappropriate work. This type of incident should have raised a warning flag and I would have thought that even on the first incident this should have justified further investigation to find out why it had occurred and who had done it rather than just saying "put it right". The fact that the defective bar was replaced very quickly should not in my opinion, have determined whether or not to issue a NCR. Due to the nature of the incident it was more important to try and find out why the bars had been cut and by whom and should have resulted in a NCR being issued. I would also have

expected details of the incident to be shared with colleagues and senior managers so that they could look out for any further occurrences. The Contractor acknowledged that the cutting of the bars was inappropriate by issuing the third incident report, and so all parties appear to have been agreed that the re-bar cutting was inappropriate." **[ER1/1/60 §98]**

97. Further, the project management experts have jointly opined that:

"We agree that an NCR need not be issued if the defective work is identified, corrected and immediately signed off on the same day. However, all site supervision and construction engineering teams should be made aware of the defective work and put on notice. If such defective work occurs again, an NCR should be issued". **[ER1/9/4 §22]**

98. The manner in which the rebar cutting incidents were handled by MTRCL fell far short of the standard expected by the experts:

(1) When Kobe Wong came across the first incident of cutting, he was already aware that the workers intended to install the cut rebars into couplers. He admitted in cross-examination that the situation suggested "someone intended to cheat"[21]. Nonetheless, he did not consider it necessary to report the case to his supervisor. Nor did he take steps to find out the reason behind the incident **[T30/84:14-85:14]**.

(2) MTRCL did not urge Leighton to issue an NCR until the third incident happened. It is clear from Kobe Wong's email to Leighton on the day of the incident (where he stated that the works in question was *"unacceptable and very poor [sic] performed"* **[B10/7456]**) that the seriousness of the problem was recognised. Yet still, MTRCL did not,

[21] He subsequently sought to retract from his answer in re-examination by saying he could not comment on the motive of the worker who cut the rebar **[T30/90:23-91:10]**.

whether by itself or through Leighton, ascertain the cause of the problem.

(3) After the NCR was issued, Kobe Wong discovered two further incidents of rebar cutting at different locations from the previous incidents **[B1/441 §§85-86]**, but he found it "acceptable" and thought they were possibly caused by different workers **[T29/152:13-153:8]**. MTRCL did not require Leighton to issue another NCR or do so itself, despite the repeated occurrence of the same type of incidents within such a short period of time.

(4) Even assuming that MTRCL did provide 20%/50% supervision of the coupler installation works, chances are that there would be incidents that were not picked up by MTRCL inspectors. Yet, Kobe Wong never saw fit at the time to check with Leighton whether the latter had independently discovered similar incidents **[T30/92:5-12]**.

99. Leighton's investigation report was submitted to MTRCL, which apparently accepted the same without taking issue with any of the inadequacies identified above **[T31/13:21-17:4]**. MTRCL had conducted its own document review of the inspection records for the coupler installation in Contract 1112 in early 2017. Yet again, the review appeared to be merely an exercise for going through the motion:

(1) The stated purpose of the review was to examine the construction records to confirm that the relevant quality assurance and quality control regimes had been complied with **[B7/4516 §1]**. There was a specific reference in the report to the QSP requirement on Leighton to *"carry out full time supervision of splicing assemblies and maintain inspection records (Record Sheet of Appendix C [sic] of QSP"* **[B7/4519]**. In spite of that, the review did not manage to identify that neither Leighton and MTRCL

had maintained contemporaneous record sheets of the coupler installation works at the EWL slab as required **[T31/63:10-65:24]**.

(2) In fact, the review was carried out by reference to the QSP for "the installation of couplers for diaphragm wall and barrettes" **[B7/4518 §5]**, which is a separate QSP from the one applicable to the construction of slabs (see §35 above). Carl Wu, MTRCL's Co-ordination Manager who led the review, was either not aware that the document referred to was not the applicable QSP, or simply assumed the requirements were the same without checking **[T31/77:1-78:17]**.

(3) Although a series of recommended follow-up actions had been put forward in the report, including the recommendation to "*Confirm the frequency of [Leighton] and MTRCL supervision were in compliance with the requirement of the QSP, and were recorded on the Record Sheet (Appendix C [sic] of QSP)*" **[B7/4519 §5.1]**, the authors of the report felt able to conclude that "*the steel reinforcement and coupler for the East West Line (EWL) track slab of Contract 1112 had been installed in accordance with the requirements of relevant quality assurance (QA) and quality control (QC) regimes*" **[B7/4520]**. The conclusion was plainly unjustified before the follow-up actions were even implemented **[T31/86:1-88:5]**.

C7. Unauthorised Alteration Works

100. A further problem that has transpired is the unauthorised alteration works at the top of the east D-wall. The Government's position, as developed below, is that the alteration ought not to have proceeded without BD's prior acceptance. This is consistent with the joint view of the project management experts: **[ER1/9/2 §13]**.

C7.1 Prior BD acceptance required for the alteration works

101. As stated earlier, the IoE, which was granted on the basis of the PMP dated 22 November 2012, imposes certain conditions on MTRCL. Pursuant to §2(a) of the IoE, MTRCL is required to *"submit such drawings, plans and calculations and other details as may be necessary to implement the consultation process detailed in the Reference Schedule and to comply with any reasonable request made during such consultation; including any requirement for modification or variation of designs and working procedures as may be reasonably necessary to maintain standards of health and safety"* **[H7/2222-2223]**. §4 further provides that the BA reserves the right to take any action including requiring the suspension of any works and preventive or remedial action in the event of any works materially deviating from the agreed design or working procedure **[H7/2224]**.

102. Under Category 2 of the Reference Schedule, structural design (including modification and/or variation to such design) has to be submitted to BD for acceptance prior to the execution of the works **[H7/2226-2227; 2229 §(e)]**. Consultation means the submission of drawings, plans, calculations and other details together with any necessary supporting documentation for the proposed works, for vetting and agreement by the BO Team or the various consultation committees in a timely manner and ahead of site construction, and shall include subsequent certification of satisfactory implementation of the agreed proposals prior to the operation of the railway **[H7/2229 §(a)]**.

103. The consultation process is set out in Section 9.1 of the PMP **[H7/2391]** and Appendix 9 thereto **[H7/2498]**[22]. Appendix 9 makes it clear that amendment

[22] See Version E which was in force during the construction of EWL slab and the implementation of the revised design at the east D-wall between July 2015 and Jan 2016 **[H7/2371-2504]**.

submissions are required to be submitted to BD for acceptance before commencement of work.

104. As will be elaborated in §137(1) below, the Government discovered from MTRCL's 13 July 2018 letter that the design adopted for the connection between the east D-wall and the EWL slab is different from the design accepted by the BD under the IoE. Such change had not been accepted by BD before it was implemented. This is a clear breach of the IoE and PMP. Further, MTRCL failed to honour its promise made in its PowerPoint presentation (prepared as a result of the non-conformities discovered in 2015) that all proposed changes to working drawings for D-wall would be submitted to BD for approval **[G11/8601, T36/58:7-60:9]**.

105. Leighton has put forward the following arguments in respect of the issue:

    (1) Minor change in design is exempted under Practice Note for Authorized Persons Registered Structural Engineers and Registered Geotechnical Engineers ADM-19 ("**PNAP ADM-19**") **[C27/20803-20804 §§14-17; C35/26549 §7]**.

    (2) The alteration works were submitted to and accepted by BD.

    (3) The Government was aware that the alteration works were implemented through site visits.

106. For reasons set out below, none of these arguments stands up to scrutiny. At this juncture, it should be pointed out that the Government fully understands the Commission's observation that any legal submission arising from PNAP ADM-19 should not fall within the Terms of Reference. However, since PNAP ADM-19 has been raised by Leighton for the purpose of defending its position on the unauthorised alteration works, the following details are set out for the sake of completeness.

C7.2 PNAP ADM-19 is inapplicable

107. Insofar as the unauthorised alteration works are concerned, the version of PNAP ADM-19 at the time (if relevant) is the one issued in February 2014 **[H20/40065-40094]**. This was accepted by Brett Buckland of Leighton **[T24/8:15-9:8]**.

108. As stated in §20 of the said PNAP ADM-19, it is concerned with the approval process in respect of minor changes to certain type or parts of building works under the BO **[H20/40065]**. Hence, the practice note only applies to approval procedures in relation to works governed by the BO. Such approval procedures are exempted under the IoE. In this regard, §1 of the IoE clearly provides that the subject of exemption is "*those procedures and requirements relating to the appointment of Authorized Person and Registered Structural Engineer as appropriate, approval of plans, consent to commencement and resumption of works and occupation of buildings provided for in section 4, sections 14 to 17A and sections 19 to 21 of the Buildings Ordinance*" **[H7/2222]**. It follows that PNAP ADM-19 has no application in the SCL Project. Leighton's argument on "minor change" should be dismissed on this ground alone. In fact, Leighton's engineering expert, Mr Southward, also agrees that PNAP ADM-19 has no application here **[ER1/5/§11.1; T43/22:4-15]**

109. In any event, the streamlined procedure for minor changes under PNAP ADM-19 does not cover changes made to building substructure (including foundation).

110. §20 of PNAP ADM-19 provides that prior approval and consent are exempted for minor amendments of building, superstructure (including curtain wall, cladding, space frame and similar superstructural elements) and drainage work for which approval has already been given, subject to the exceptions set out in the following subparagraphs. Subparagraphs (a) to (c) sets out the exceptions

for general building plan, superstructural plan and drainage plan respectively **[H20/40067]**. It is clear that §20 applies to general building works, superstructural works and drainage works, but does not apply to substructure (including foundation).

111. The change in the connection at the top of east D-wall is clearly a change to the substructure. Despite the view of Mr Southward that the underground station box structure can be termed the superstructure **[ER1/5/§14.2]**, Professor Au **[ER1/7/10 §6.4.1.1; T40/53:10-25]**, Dr. Yeung **[T42/76:3-78:19]** and Dr Glover also appears to be in agreement that the work in question is part of the substructure/foundation **[T44/17:14-18:8]**. In fact, the D-walls under Contract 1112 are described as foundation works in §3.2.2.1 of Atkin's design report TWD-004B3 **[B12/9012]**.[23] It is plain that the exemption for minor change under PNAP ADM-19 does not apply to substructure or foundation **[H20/40066 §12]**. Wilson Sung of Atkins also confirmed in cross-examination that the works in question were foundation works and therefore PNAP ADM-19 would not apply **[T33/144:6-145:15]**. Hence, even if PNAP ADM-19 were applicable to the works under Contract 1112, the alteration works could not take advantage of the minor amendment exception under §20.

112. A further issue that arose in the course of the evidence is whether the alteration works is actually minor in nature. In light of the matters set out above, this issue is irrelevant. For completeness, however, the Government submits that the change is not a minor one:

[23] The D-walls are described as "substructure" and "Foundation (Load Bearing Diaphragm Wall)" in BD's acceptance letters (e.g. H9/3873). It is also telling that the D-walls were required and had been constructed by a Registered Specialist Contractor (Foundation Category) (i.e. Intrafor Hong Kong Limited). The D-wall panels are demarcated by cut-off and founding levels (i.e. depth into the ground). The record plans for D-walls enclosed in the certification of completion of works for "Foundation (Load Bearing Diaphragm Wall/Barrette) show that the cut off levels of the completed eastern diaphragm walls at Areas B and C are generally +2.82mPD which is the same level as the top of the EWL slab and OTE slab.

(1) Pursuant to §20(b) of PNAP ADM-19, an amendment is not minor and cannot be exempted if it is *"affecting the overall structural stability of the building"*.

(2) The change in question is not confined to replacing sections of reinforcing bars connected by couplers with through reinforcing bars before the execution of the works. It also concerns trimming down part of the completed D-wall and rebuilding the hacked off part of the D-wall with a revised reinforcing details at the connection between the D-wall and the EWL and OTE slabs, which was a critical element of the substructure or foundation system: see the explanation of Mr Ho Hon Kit on behalf BD **[H20/40573 §25]**. This is clearly not a minor change for the purpose of PNAP ADM-19.

113. Leighton argues that it would be impractical to require all changes to construction details to go through the consultation process **[C35/26549 §6]**. Such argument is, however, misconceived:

(1) Not every change in detail has to be submitted for consultation. For example, changes to minor construction details such as locations of construction joints (which are usually not shown on accepted plans) need not go through the consultation process **[H20/40579 §13(a)]**. Some construction details such as the depths of D-wall panels shown on the accepted plans are specified by reference to tentative founding levels **[e.g. H4/896]**. Therefore, minor changes to tentative founding levels without changing the founding criteria need not be submitted for approval.

(2) Further, to facilitate submissions in design and construction stages, §3 of Appendix 11 of the PMP provides that the normal turnaround time for processing consultation submissions would be 28 days, while that for urgent submissions accorded with "high priority" would be 14 days

[H7/2503-2504]. As such, changes could be dealt with promptly without affecting the progress of works.

C7.3 The alteration works was not submitted to BD for consultation and in any event not accepted by BD

114. In support of the assertion that changes have been submitted by MTRCL to BD for consultation, Leighton relies on two submissions:

(1) Amendment Submission for HUH Station Excavation & Lateral Support for Area Cl and C2 (with Design Report TWD-004B3 attached) dated 29 July 2015 **[B12/8888-B13/10607]**; and

(2) Amendment Submission for HUH Station Excavation & Lateral Support for Area C3 dated 23 March 2016 **[C26/19996-20001]**.

115. In response to the said submissions, BD issued two reply letters respectively dated 8 December 2015 **[H14/35344-35351]** and 28 April 2016 **[H14/35372-35374]**. Leighton alleges that BD had provided "in principle acceptance" to the alteration works by these two letters **[C27/20807-20810 §§27-39]**.

116. For the reasons set out below, the above submissions cannot be regarded as design amendments for the change in connection details.

117. First, according to Leighton's witnesses, the alteration works comprises the following steps **[C27/20807 §27]**:

(1) The top of the D-wall would be trimmed to the lowest level of the top reinforcement bars in the relevant part of the EWL slab (i.e. a minimum of 420mm below the top level of EWL slab).

(2) The top reinforcement bars in the relevant part of the EWL slab would be connected to the corresponding reinforcement bars in the OTE slab – that is, through bars would be used to replace coupler connections.

(3) The EWL slab and OTE wall are to be cast monolithically.

118. As the above changes were made to the permanent structure, the proper procedure would be for MTRCL to make a permanent works amendment submission to BD for acceptance before implementing the change **[H20/40574 §27]**. Andy Leung, the design manager of MTRCL, agreed with this **[B1/246 & 252 §§26 & 47]**.

119. The two submissions relied on by Leighton are amendment submissions for temporary works rather than permanent works. It was stated in the design report that *"the scope of report is limited to the temporary load cases only"* **[B12/8993]**. As such, the two submissions cannot properly be regarded as consultation submissions for the alteration works.

120. Second, the two submissions are concerned with works in Area C only. They do not cover the works in Area B. Thus, even putting MTRCL/Leighton's case to its highest, no consultation with BD in respect of the changes in Area B has ever been submitted. This was, again, accepted by Brett Buckland **[T24/13:23-14:5]**.

121. Third, the submissions did not set out sufficient details of the alteration works for the purpose of consultation. The relevant section relied on by Leighton witnesses was section 6.2 of Design Report TWD-004B3, which contains the following paragraphs:

"The top of diaphragm wall panel will be trimmed to the lowest level of top rebar for the EWL slab (min 420mm below the top level of EWL slab).

The top rebar of EWL slab at the D-wall panel will then fix to the top rebar of OTE slab to achieve full tension laps.

The EWL slab and OTE slab will be casted concurrently with temporary openings around the existing columns and pile caps." **[B12/9034]**

122. These paragraphs were only mentioned as part of the "Construction Sequence" instead of providing details of the intended alteration and change in reinforcing details. Importantly, the use of through bars to replace couplers was not mentioned at all. The typical anchorage details shown in drawing 1112/B/HUH/LCA/C12/755 Rev C **[B13/10557]** attached to the Design Report still shows the use of couplers at the interface between the EWL slab and the D-wall and between the D-wall and the OTE slab. WC Lee of Atkins confirmed that what was shown in the drawing was consistent with the second paragraph of section 6.2 of the Design Report **[T34/51:5-11]**. That being the case, there is simply no indication in the Design Report that the couplers would be replaced by through bars.

123. Further, as a matter of trade practice, it was the design drawings instead of the design report that would be vetted by BD **[T35/36:19-40:9; 82:1-84:7]**. Such practice is well known to Atkins **[T34/59:2-22]**. Details of the trimming down operation, as well as the changes in disposition of rebars and the changes from couplers to through bar, would have to be shown on drawings for prior acceptance by BD **[T34/59:10-60:18; T35/98:10-99:8]**. In the absence of such drawings, it cannot be said that BD has accepted the proposed change.

124. In fact, Atkins confirmed that there was no intention to make the changes in question in July 2015 when Design Report PWD-059A3 for permanent works was prepared and submitted to BD **[T34/43:13-44:8, 46:8-23, 47:6-48:11; B10/7357]**. It is WC Lee's evidence that at the time, BD was specifically informed that the EWL slab and OTE slab were to be cast on both sides of the D-wall at the same time **[T34/47:6-48:11]**.

125. In line with the above, the cross sectional details in Design Report TWD-004B2 (the preceding version of 4B3) Figure 1.4 **[J1/107]** shows the trimming down of the D-wall and use of through bars over the top of the east D-wall was intentionally removed. Further, section 1.3.5 was revised such that the paragraph with the following contents was taken out: "*the OTE is to be concreted with EWL slab concurrently to achieve the full tension lap for slab rebars*" **[J1/106-7; *c.f.* J3/1690-1691]**. It is plain that there was no intention to alert BD to the change in question. Robert McCrae from Atkins further confirmed that the three paragraphs in section 6.2 of Design Report TWD-004B3 should have been omitted **[T36/156:13-157:15]**.

126. Fourth, the alteration works that was actually implemented was different from what was described in section 6.2 of Design Report TWD-4B3. According to the latest connection details shown in Annex B to the Joint Statement of MTRCL and Leighton **[B19/25487-25493]**, there were various types of connection details adopted on site that were not foreshadowed in section 6.2. In particular, Types 2 and 4 details show that the extent of trimming of the top of the D-wall were 200 mm and 1500 mm respectively, not down to the lowest level of the top rebar for the EWL slab as described in section 6.2 **[H20/40575 §31]**.

127. In any event, in the two reply letters dated 8 December 2015 and 28 April 2016, BD made it blatantly clear that the reinforcement details of the slab was "*for information only*" and MTRCL was "*required to submit all change in the permanent station structure in the appropriate design package for consultation agreement*" **[H14/35348 §15; 35374 §6]**.

128. Despite the specific request by BD, no submission for consultation in respect of the changes to the connection between the EWL slab and the D-wall was made by MTRCL. The proposed changes were not included in any Permanent

Works Submissions (e.g. submissions dated 30 July 2015 **[C17/12144]**, 4 November 2015 **[B16/13758]** and 14 January 2016 **[B11/8536]**). This could only mean that MTRCL did not intend to proceed with the proposed alteration to the top of the east diaphragm wall.

C7.4 The Government cannot be regarded as having knowledge of the alteration works as a result of site visits

129. In the cross-examination of Mak Yu-Man and Ron Yueng of Pypun, MTRCL's counsel referred to certain site photos and suggested that staff of RDO, BO Team and the MVC ought to have notice of the trimming down of the east D-wall. This matter is entirely irrelevant to whether the alteration works was accepted by BD. It is MTRCL's obligation to comply with the consultation submission procedures under the IoE and PMP.

130. In any event, the allegation that staff of RDO, BO Team and the MVC should somehow be aware of the trimming down operation is wholly unfounded. As explained by Mr Mak and Mr Yueng of Pypun and Mr Jonathan Leung of HyD, the site visits would normally last for only 1 to 1.5 hours. The purpose of such visits is to allow Government officials to get a general impression of the progress of works, as opposed to checking construction details **[T35/6:19-7:14; T36/36:18-25, 53:7-13]**. Mr Leung further explained that the construction site for Contract 1112 is a large one and it was impossible to reach all locations or to see every detail. Therefore, those taking part in the site visits would focus on certain areas of concern on each visit and this would be determined by discussion with Pypun and information provided by MTRCL at the briefing sessions **[T36/38:4-10, 49:14-21]**.

131. In the premises, it is unreasonable to expect staff of RDO, BO Team or the MVC to be able to tell what exactly was going on at a particular location, bearing in mind that the captions inserted by MTRCL into the photos for the

purpose of this Inquiry and shown by MTRCL's counsel to the witnesses did not exist on site during site visits. As a matter of common sense, the persons attending site visits at the time would not be able to tell precisely which panel they were looking at, let alone noticing any abnormity in the works performed. In fact, neither Mr Yueng nor Mr Leung could recall having seen the scenes depicted in the photos **[T35/20:19-23; T36/54:10-25]**.

132. Furthermore, there is nothing unusual about the trimming down of the D-wall *per se*:

(1) Mr Mak of Pypun explained that the hacking down of the top of the D-wall could have been part of the normal process of removing over-cast concrete at the top part of the D-wall **[T34/142:14-23]**.

(2) Mr Yueng of Pypun pointed out that some of the site photos referred to by MTRCL show normal working progress:

(a) **[B19/25647]** depicts panels EH85-88. As shown in the design drawing **[H4/888]**, a capping beam was located at the said panels. Mr Yueng explained that the top of the capping beam should be aligned with the top of the EWL slab. In order to achieve that, workers would need to break the concrete of the top of the D-wall **[T35/2:25-4:20]**. Thus, the breaking down of the top of D-wall here was part of the original scope of work.

(b) **[B19/25685]** shows panels EH112-114. There was an airduct on the top of the D-wall at these panels **[H4/887]**. This means the D-wall would have to be broken down **[T35/4:22-5:24]**.

(c) Thus, even if Mr Yueng had seen the trimming down operation depicted in the photos, he would have concluded that the breaking out was a normal construction process **[T35/20:1-18]**.

(3) Mr Leung of HyD further pointed out that the scope of works under Contract 1112 includes modification to existing structures at various locations and stages. Therefore, even if he saw demolition works being carried out during any of his site visits, it would not occur to him as anything other than demolition works under the original scope of contract work **[T36/52:21-54:8]**.

133. In conclusion, there is no substance in MTRCL's allegation that HyD, BD or Pypun were or should have been aware that the alteration works was implemented on site.

C8. Failure to Maintain As-Built Records

134. Since discovery of the unauthorised alteration works in July 2018, the Government has repeatedly requested MTRCL to provide information on the as-built conditions of the EWL slab **[e.g. G8/6892-6893, 6945-6946, 6967-6968]**.

135. The obligations of MTRCL and Leighton regarding the maintenance and production of as-built records have been helpfully set out in Mr Rowsell's report **[ER1/1/37-39 §§40-47]**.

136. It is clear that both MTRCL and Leighton have failed their obligations. In the course of evidence, Louis Kwan and Derek Ma of MTRCL confirmed that no as-built records drawings were prepared for the EWL slab at the time when it was being constructed **[T27/113:22-115:6; T29/69:20-72:8]**. Edward Mok of Leighton also testified that no revised working drawings were produced for the change in connection detail **[T21/39:19-40:4]**.

137. The failure to maintain proper as-built records and the ensuing confusion as to what exactly had been constructed resulted in MTRCL/Leighton submitting

several different versions of connection details between EWL slab and east D-wall to the Government between July and November 2018:

(1) According to MTRCL's letter dated 13 July 2018 **[G8/6870-6874]**, "East – C1-1 & 1875" were the only bays that retained coupler connections **[G8/6873]**. Through bars were used at the remaining bays on the east side **[G8/6874]**.

(2) On 30 August 2018, a loading test proposal was submitted by MTRCL to the Government **[H8/3390]**. A layout plan was attached to the proposal, which shows eleven types of different connection details **[H9/3818]**. According to the layout plan, through bars were used at the top row at EH74 of Area C1-1, and there were some other bays which retained coupler connections. There were marked inconsistencies between the layout plan and the information provided in the 13 July 2018 letter.

(3) By letter dated 19 September 2018, Leighton submitted to MTRCL *"design proposal drawings detailing the as built details for the EWL and NSL slabs for Areas B and C"* for MTRCL *"to prepare the final design amendment for…onward submission to [BD]"* **[C34/26491-26493]**. The layout plan enclosed with the letter shows the connection details between the east D-wall and EWL slab **[C34/26494-26495]**. For example, couplers are shown on the layout plan to be used at EH45 and EH48. This is, however, inconsistent with Fang Sheung's record, which shows that through bars were adopted at those panels **[E3/542]**. Another example of inconsistency is EH44. While Leighton's record shows coupler connections at this panel **[C34/26494]**, Fang Sheung's record shows through bars **[E3/534; T12/74:1-76:23]**.

(4) On 16 November 2018, MTRCL and Leighton produced a Joint Statement **[B19/25480-25483]** and yet another layout plan as well as

drawings by Leighton **[B19/25486-25493]**. It was stated that *"MTRCL and Leighton have endeavoured to agree, to the best of our current knowledge and information respectively, the as-constructed works at the intersection of the EWL slab, eastern diaphragm wall and the OTE slab"* **[B19/25480 §1.2]**. It was further stated by MTRCL that, *"In agreeing the Joint Statement at paragraph 1.2 above, MTRCL has relied on the site photographs attached as Annex [F] to this statement"* **[B19/25481 §3.3]**. At footnote 2, MTRCL added that: *"There is one panel (EM76) in respect of which MTRCL does not have sufficient photographic evidence. The as-constructed position for this panel (EM 76) will be verified by Opening Up at the locations to be agreed between MTRCL and Government in due course"* **[B14/25481]**. The opening-up results show that the connection details at some locations are inconsistent with the layout plan attached to the Joint Statement **[OU1/420 Items 13 & 20]**

(5) MTRCL accepted in its Holistic Proposal that *"despite the best endeavours by the Contractor's project staff and checking by MTRCL, based on all available information, there still exists a degree of uncertainty on the correlation between the design amendment drawings and the as-constructed conditions"* **[G17/12985 §6.3.4]**.

138. It is a highly unsatisfactory state of affairs that MTRCL has had to ascertain the as-built condition of such a large-scale railway project from photos and the memories of staff. This was admitted to be a shortfall by TM Lee, former General Manager of SCL **[T32/42:10-17]**. Mr Lee also accepted that, but for this shortfall, it would not have been necessary to open up the structure for the purpose of ascertaining the as-built condition (namely Purpose 1 of the Holistic Proposal: see e.g. **[G17/12975 & 12986 §§1.1 & 6.3.8]**) **[T32/42:18-22]**.

139. The following propositions have been put forward on behalf of MTRCL/Leighton but neither of them stands on solid ground:

(1) First, it was suggested that photos would be sufficient contemporaneous records of the as-built condition: see evidence of Brett Buckland **[T23/181:9-183:23]**. This has been firmly rejected by Mr Rowsell, who considered that *"the use of photographs of their own, as described in witness statements, would not deliver these requirements [under the contract between Leighton and MTRCL]"* **[ER1/1/40 §49]**. As explained further by Mr Rowsell:

"The Commission has received evidence that the detail of the re-bar connection between the EWL slab and the diaphragm wall were not recorded contemporaneously as required by the contract apart from photos. This indicates to me a failure by the Contractor to either carry out the required survey of the as-built works and/or a failure to record the survey detail on as-built drawings. It also indicates to me a weakness in MTRCL's systems which should have monitored the execution of the works and the production and receipt of as-built drawings showing the differences from the approved plans. I consider that use of photos to support site records is helpful but on their own they are insufficient for the purposes of providing a complete record. A photo reflects a specific moment in time and can be difficult to interpret". **[ER1/1/42 §52]**.

The project management experts also agreed that "*as-built records comprise a wide spectrum of records including material submissions, test certificates, construction records (such as TQs, RFIs, photographs) and as-built drawings."* **[ER1/9/4 §23]**.

(2) Second, it was suggested that it would take time for MTRCL to prepare as-built drawings and it would have to wait for the final construction stage to occur to consolidate all previous documentation. It was said that it would typically take three to four months before project completion to complete the as-built drawings: see Huyghe's report **[ER1/2/34 §130]**. This argument fails to take heed of the following:

(a) The obligation on Leighton is that it shall *"during the progress of works prepare drawings showing those parts of the Works which have been designed by the Contractor as built"*. It shall also *"keep records of levels and dimensions during the course of the Execution of the Works in an Approved form and shall submit records as and when required by the Engineer"*: see Clauses 9.10 and 58.1 of the Contract between MTRCL and Leighton **[C3/1836-1839, 1885]**.

(b) MTRCL itself is subject to the following obligations under the PIMS:

(i) *"CM/SConE/ConE/SIOW/IOW/AIOW shall keep regular constructional records, or review the preparation of such records, a typical schedule of the records required to be kept is provided in Exhibit 7.15. This will vary between projects and the SConE/SIOW should continually review the records kept as the works progresses. Wherever possible the site specific ePMS system should be used for this."* **[B6/3630 §5.8.2]**

(ii) Exhibit 7.15 referred to above requires the ConE and SIOW to ensure that "as-built" records are prepared "*as a continuous operation as construction proceeds, and that brand-names of actual materials used, instructed and proposed changes, actual details of works determined on site are recorded.*" **[B6/3665]**

(c) It is not open to Leighton or MTRCL to argue that they could take as long as they need to produce the as-built drawings. The General Specifications for the Contract sets out a timeframe for conducting as-built survey and submitting the relevant records. G1.10.1 requires Leighton to ensure that the as-built surveys are undertaken within 2 days of the completion of the Permanent Works and the survey

record submitted for review within 7 days. Leighton shall prepare and maintain a set of drawings of the Permanent Works to show the as-built survey records and identify all deviations with respect to the design, and ensure that the data from the as-built surveys is incorporated into the as-built survey record drawings and submitted for review within 14 days of the date of the as-built survey **[C3/2019]**.

(d) Mr Rowsell has referred to above obligations of Leighton and MTRCL and observed that:

"Based on my experience, it is normal practice to require the drawings to be updated during the course of construction to reflect the as-built details and any revisions made to the original design. No maintaining and updating the drawings would carry a high risk that changes may not be incorporated into the final as-built drawings. The question here is whether the Contractor has been carrying out the as-built surveys and recording the details on the drawings, and if not, what steps has the Engineer taken to rectify the position? The evidence appears to indicate that, whilst the final as-built documents are yet required, the Contractor has not been able to make available the preliminary as-built drawings in accordance with the General Specification during the course of the contract." **[ER1/1/40 §49]**.

140. The problems exposed by the lack of proper as-built records are manifold. It shows, first of all, that MTRCL has failed to hold Leighton to its contractual obligations. Within MTRCL itself, there was also a breakdown of communication in this regard. MTRCL's construction management ("**CM**") team was fully aware of the change from the use of couplers to through bars in the east D-wall **[B1/368 §44]**. Kit Chan, the Construction Manager, said he expected the design management ("**DM**") team to proceed to update the working drawings of the EWL slab reinforcement and thereafter obtain approval from BD **[B1/280 §51; T26/137:20-138:6]**. However, Andy Leung, the Design Manager, said that the DM team did not pick up the proposed

alteration works **[T25/114:14-116:4]**. In any event, given that the CM team did not keep proper as-built records of the connection details adopted at various locations along top of the east D-wall, it would be difficult for the DM team to know the details for the purpose of updating the working drawings.

141. The absence of proper as-built records also reveals MTRCL and Leighton's failure to learn from a previous incident in 2015 and implement the improvement measures they promised at the time. This incident has been picked up by Mr Rowsell, who observed that:

"…an Incident Report was issued two years ago, on 27 July 2015, by the MTRCL investigating the cause of non-conformity to the original design accepted by BD which was not identified by the MTRCL until the preparation of the Certificate of completion of works (BA14) to BD in January 2015. The 2015 Incident Report provided an account of the events leading to the occurrence of the non-conformity and the actions which would be implemented to prevent its recurrence in the future ***[H11/5542]****. Steps purportedly taken by MTRCL and Leighton at the time (ie. 2015) to avoid future recurrence were stated in the conclusion of the Incident Report (paragraphs 4.4, 4.5 and 4.7)* ***[H11/5546]****):*

> *"4.4 In addition to the procedures (PIMS/PN/11-4/ A4, refer to Appendix B) stipulated for reviewing contractor's submissions in MTRCL's Project Integrated Management System (PIMS) which is included in the PMP of SCL,* ***TCPs shall not allow changes to be made to the permanent works in contractor's shop drawing submissions. TCPs in the CP stream shall supervise the works to ensure they are executed in accordance with the Working Drawings/Accepted Plans. They should bring CP's attention to any deviations in a timely manner****;*
>
> *4.5 1112 Contractor shall deploy adequate resource to compile the BA14 submission* ***in a timely manner****…*
>
> *4.7 In addition to the original procedures for design and drawing management in the 1112 Quality Management System, the Contractor has implemented a robust control system to track the progress of all proposed changes to the permanent works until they are approved and incorporated into the Working Drawings."* **[ER1/1/39 §46]** (emphasis added)

142. In addition, the Incident Report in 2015 also stated that the CP had taken *inter alia* the following actions:

(1) *"This non-conformity was largely a result of communicating and formalising the changes made by the contractor. In this connection, CP has instructed his TCPs and the Construction Manager to strictly follow the Working Drawings which are prepared in accordance with plans accepted by the Authority such as BD/GEO (Accepted Plans) in the execution of the Works. TCPs should bring CP's attention to any deviations in a timely manner"* **[H11/5544 §3.3.1]**.

(2) *"In order to improve the robustness of the controls to track progress of all proposed design changes until they are approved and incorporated into the Working Drawings, the contractor has developed and is implementing an additional control procedure defined as the Technical Query process (TQ). TQ's will be used to provide robust monitoring of design progress, clarification of design, instruction of design change, modification and/or carrying out new design works"* **[H11/5545 §3.3.6]**.

(3) *"This non-conformity was identified when the Certificate of Completion of Works (BA14) was prepared in January 2015, almost 16 months after the first diaphragm wall panel concreted in August 2013. It should have been uncovered earlier and the number of diaphragm wall panels affected would be much smaller if the BA14 submission was compiled in a timely manner. CP has requested Leighton to deploy adequate resource for compiling the BA14 submission at the earliest"* **[H11/5545 §3.3.7]**.

143. Had the above measures been implemented, the current incident would likely have been avoided. Unfortunately, there remained communication problems within MTRCL (as described in §140 above). The CP, Jason Wong, was not even informed of the unauthorised alteration works **[B1/179 §50]**. Also, while a TQ had been raised on this occasion, there was no one to ensure that the changes were incorporated into the working drawings **[C27/20829-20830]**. It is also to be noted that, even though the last concrete pour for the EWL slab was in August 2016 **[B17/24198-24199]**, the preparation of the BA14 submission did not commence until 2017 **[T29/71:20-72:1]**. It could hardly be said that the BA14 submission was compiled in a "timely manner".

D. ENGINEERING ISSUES

144. Subject to certain exemptions on procedural requirements in relation to submission and approval of design, appointment of AP and RSE etc. under the IoE, the design and construction of the station box structure at HUH Station Extension, comprising the EWL slab, NSL slab and the D-walls on the east and west side of the slabs ("**Station Box Structure**"), are governed by the BO. Under the requirements of the BO and the relevant Code of Practice, in particular, the Code of Practice for Structural Use of Concrete 2004 ("**2004 Concrete Code**"), a structure built in compliance with the same would provide safety margin in its performance to cater for future unforeseen and/or exceptional circumstances that it may experience during the lifetime of the structure. It is therefore the Government's positon as the statutory regulator that such level of safety margin ought to be maintained at all times without exception. Hence, compliance with the BO and the standard of 2004 Concrete Code is the starting point and cannot be compromised. In fact, on top of this absolute minimum, the safety margin covered by the contractual specifications have already been paid and committed to the Government, and the MTRCL and Leighton are obliged to complete a structure with such level of safety margin.

145. As the structural safety of the as-built Station Box Structure is called in question, apart from Professor McQuillan, the structural engineering expert appointed by the Commission, the following experts were also called by some of the Involved Parties to assist the Commission: Professor Francis Au (for the Government), Dr Albert Yeung (for Chinat), Mr Nick Southward (for Leighton) and Dr Mike Glover (for MTRCL).

146. The main issues between the engineering experts are: (1) whether it is necessary to carry out design check numerically to ensure that the stresses generated inside the connection between the east D-wall and the EWL slab ("**the Connection**") under

different loading conditions are not excessive, (2) whether the as-built Station Box Structure is structurally safe, and (3) whether it is necessary to continue with the present opening-up exercise set out in MTRCL's Holistic Proposal.

147. As stated in Section A (i.e. The Overview) above, the opening-up exercise that is being carried out by MTRCL serves two purposes: (1) to verify the as-constructed conditions of the connections between the platform slabs and D-walls at locations with gaps in the documentation (Purpose 1); and (2) to verify the work quality of the coupler connections (Purpose 2). There is no suggestion from MTRCL, Leighton or the experts that the opening-up work should not continue for Purpose 1.

148. It is the Government's position that the present opening-up works proposed by MTRCL for Purpose 2 ought to continue as per the Holistic Proposal in order to provide the necessary statistical data for the purpose of ascertaining the quality of the embedded splicing assemblies at the junctions between the slabs and the D-walls. In view of the limited amount of information available on the as-built work, it is premature to form any conclusive view on the structural integrity of the Station Box Structure. Also, to have the level of assurance that both the Government (as ultimate owner of the SCL) and the public at large are entitled to, the structural adequacy of the as-built Connection ought to be checked and proved by MTRCL/Leighton scientifically and numerically. Details are elaborated in the following sub-sections.

D1. Adequacy of the Connection ought to be checked numerically

149. Professor Au pointed out, amongst other things, that the additional construction joint inside the Connection introduced by hacking off part of the top of the completed east D-wall and recasting of new concrete would create potential surfaces of weakness and the internal stresses generated within the Connection ought to be checked and verified numerically **[ER1/7/10 §6.4.2]**. He further

testified that the results of the preliminary checking performed by Mannings on the basis of incomplete base data indicate that the internal stresses at some locations may be 'problematic' **[T40/177:2-7]**. Dr Glover also agrees that Professor Au has raised a "legitimate issue" and accepted that it would be beneficial to conduct calculations to verify safety of the joint **[T43/165:5-13]**.

150. At the moment, the stresses generated inside the Connection under the most critical loadings have not been properly checked and proved numerically to be within the allowable limits. Neither Dr Glover nor Professor McQuillan has carried out such exercise, and their views were founded on engineering judgment rather than scientific calculations. This (in our respectful submission) is not sufficient. COWI confirmed that they did not undertake any structural calculations in this aspect **[ER1/4.5/Answer to Q7]**. The calculations performed by Atkins **[J6/4557-4562]**, according to Professor Au, are unfortunately both incomplete and problematic **[ER1/7/11-13 §§6.4.3.3-6.4.3.7]**. As to Mr. Southward, he has only carried out simple calculations for one specific panel (EH113) **[T42/161:6-9]** and the bending moment adopted in his calculation is clearly not the most critical moment, it is almost 27% lower than the value adopted by Atkins in its calculation **[T42/160:12-161:14; compare Slide 25 of Mr Southward's Presentation with J6/4562]**. Insofar as shear resistance at the construction joint may be provided by dowel action, Mr Southward confirmed that he had not checked the bearing stresses generated on the surrounding concrete to make sure that the concrete can withstand the stresses **[T43/12:3-8]**.

151. The above only reinforces Professor Au's concern. When it comes to public safety, it is submitted that nothing short of a proper assessment made on scientific basis and adequately supported by structural calculations would be sufficient. Further, it is believed that both MTRCL and Leighton would not find it appropriate to dispute the need for further checking and calculations because the same would not

have been necessary but for the lack of proper as-built records for and changes made to the Connection without prior consultation with the BA.

152. Regarding the calculations performed by Mannings **[H27/45885-46124]**, they are preliminary calculations prepared on the basis of incomplete base data available at the time. They only served as reference materials for Professor Au and thus do not form part of his expert opinion, nor could these calculations lead to any conclusion.

153. In response to the specific request from the Commission, Professor Au has provided details of the base data required for the proper checking of the internal stresses in the Connection and the further tests to be carried out to the splicing assemblies with partially engaged threads, see **[H27/45876-45884]**.

D2. The opening-up exercise ought to continue

154. It is common ground that the opening-up works for Purpose 1 ought to continue for the purpose of ascertaining the as-built condition of the Connection. Dr Glover also opined that opening up for Purpose 1 is important and should continue **[T44/52:19-24]**. In relation to the other opening-up works designed for Purpose 2 under the Holistic Proposal, the sampling scheme was proposed by MTRCL and accepted by experts in both engineering and statistics for the purpose of obtaining sufficiently representative samples of couplers in the two platform slabs. So far, no expert evidence has been adduced to dispute the statistical analysis on which the sampling scheme set out in the Holistic Proposal was based.

155. In the course of evidence, both Dr Glover and Professor McQuillan suggested that no further opening up at the bottom of the EWL slab is necessary because the splicing assemblies for the bottom reinforcement of the EWL slab are in compression **[T43/138:24-141:8;T44/111:24-114:1];** as such the effectiveness of those splicing assemblies would not be a concern. However in view of the

wider purpose of the opening-up exercise as explained above, the opening up works ought to continue as per the Holistic Proposal. In any event, the NSL slab is subject to high uplift water pressure from below. As agreed by both Dr Glover and Professor McQuillan, unlike the EWL slab, the splicing assemblies at the bottom of the NSL slab are subject to tension at all time and therefore it is important to ensure proper connection at the bottom of the NSL slab to resist the tension **[T43/157:16-25; T44/154:16-19]**. Further, in the event of dewatering, the splicing assemblies of the top reinforcements may also be subject to tension **[ER1/7/6 §3.2.2]**.

156. Due to the lack of access to the underside of the NSL slab, opening up for inspection of any of these splicing assemblies has not been included in the Holistic Proposal **[ER1/7/6 §3.2.1]**. Therefore, as Professor McQuillan has agreed, there is a need to open up other areas (e.g. the top of the NSL slab) to get a better idea about the quality of the connections **[T44/156:20-157:2]**.

157. Dr Glover takes the view that the figures available so far should be able to show the trend and the potential fluctuations **[T43/158:6-19]**. On this basis, he has suggested that the current opening-up results should be sufficient. However, Dr Glover has fairly admitted that he is not an expert in statistics and he would welcome a statistician's verification of his views **[T43/158:10-159:4]**.

158. Lastly, Dr Glover has agreed that Stage 3 of Holistic Proposal will be of value **[T43/135:20-136:13]**. For the purpose of the Stage 3 assessment, it is essential to obtain sufficient data on the extent and scale of the deficiencies of the as-built structure, such as defective/missing coupler connections, defective shear links and honeycombing concrete through the Stage 2 opening-up works. Putting a stop to the opening-up works would hinder the Stage 3 assessment and may affect the accuracy of the safety margin which will be determined based on the Stage 2 results.

D3. It is premature to form a view on the question of whether the as-built Station Box Structure is structurally safe

159. As submitted above, the structural integrity and adequacy of the Connection has yet to be checked and proved numerically. If the Connection is found to be structurally inadequate in some or all locations after numerical checking, such adverse structural effect should be taken into account in assessing the overall structural safety of the Station Box Structure. Thus, unless and until the same is checked satisfactorily, no conclusive view on this issue can be formed.

160. Besides, apart from the uncertainty in relation to the Connection mentioned above, the quality and effectiveness of the splicing assemblies embedded in the slabs (which are yet to be ascertained by the opening-up exercise pursuant to the Holistic Proposal) would have an impact on the result of the Stage 3 - Structural Assessment work. It is to be noted that the primary purpose of the said Stage 3 work is to determine the very question as to whether the as-built Station Box Structure is safe and acceptable. As mentioned in section D2 above, the results of the present opening-up exercise would be highly relevant and also have a determining effect for the purpose of Stage 3.

161. Another issue between the engineering experts, which again would have an impact on the Stage 3 assessment and probably have a pivotal effect on the question of whether the Station Box Structure is structurally safe, relates to the question of what the appropriate benchmark for the acceptance of the splicing assemblies should be the 37mm embedded thread length presently adopted, the 60% thread engagement suggested by Professor McQuillan, Dr Glover and Mr Southward or something else?

162. The present deemed compliance benchmark of 37mm measured engagement/embedded length (by PAUT) was set on the basis of the requirement of a full engagement of 10 threads (40mm) for proper installation

of the couplers supplied by BOSA **[H26/45640]**[24]; which was adopted and accepted by MTRCL and Leighton in its QSP dated 12 August 2013 **[H9/4280]**. Because of the measurement tolerance of +/-3mm by PAUT, for the purpose of the present investigation, the acceptance criterion was set at 37 mm (with a view to fairly giving MTRCL and Leighton the benefit of the doubt). Thus, contrary to the suggestion of Professor McQuillan, it is not an arbitrary benchmark imposed by the Government. The daily update of the results of the opening-up work on HyD's website is to make the progress of such work transparent to the public.

163. In reliance on the result of a single test performed by BOSA on a coupler with 60% thread engagement **[H25/44520]**, Mr. Southward and Professor McQuillan assert that the acceptance benchmark ought to be lowered to 60% thread engagement **[ER1/5/49 §15.5; ER1/3/47 §119]**. Professor McQuillan asserts that there are in fact 3 test results instead of one in support of that proposition **[T44/146:17-151:8]**. During cross-examination, Professor McQuillan remained adamant about this point although it is clear that the other two tests he referred to were for couplers with 70% engagement and full engagement respectively **[H25/44520]** and it is obvious, as a matter of simple logic and common sense, that these results do not go to support the lowering of the benchmark down to 60%.

164. Professor Au pointed out that in accordance with established practice, more samples should have been tested because there are bound to be natural variations between samples; elongation test should also be performed **[T41/24:22-27:4]**. Dr Glover also agrees that more samples are required **[T44/14:5-7]**.

[24] The requirement is further confirmed by BOSA in its letter dated 18 January 2019 **[H27/46159-46160]**. Although this letter was recently issued, the standards explained therein do not deviate from the details set out in BOSA's manual which, as stated above, was adopted and accepted by MTRCL and Leighton in the QSP.

165. It is plainly inappropriate to lower the pass criteria down to 24mm engagement length at this stage by reference to a single test result. Besides, other strength and elongation tests required under the Acceptance Letter of BD **[H9/3931 §5]**, clause 3.2.8.2 of 2004 Concrete Code **[H8/2852-3**] and Section 4.1.2 of AC 133 including cyclic tension and compression tests **[ER1/8/App II]** have not been performed on couplers with 24 mm engagement length so far. Compliance in relation to those properties provides for the required serviceability and ductility of the structure which are of equal importance. On Day 44 of the hearing, MTRCL informed the Commission that further tests, including elongation tests, would be carried out on 60% engagement of the rebar into the coupler in early February **[T44/128:18-129:16; T43/128:7-12**]. The present benchmark should not be reviewed until sufficient tests are performed.

166. It is important to bear in mind that before the above-mentioned single test by BOSA came out, neither MTRCL nor Leighton had ever disputed or qualified the requirement of a full engagement of 10 threads (40mm) for proper installation of the couplers supplied by BOSA. Obviously, they (being the parties which failed to provide proper inspection/supervision for the coupler installation works) are now seeking to argue opportunistically that the requirements regarding the engagement length should be lowered by relying on the test result and some of the expert evidence. By reason of the matters discussed above, insofar as they now contend that the standards could be lowered for the assessment of structural safety, this remains to be further tested and verified. But, insofar as they attempt to alter the contractual/statutory requirements which they have accepted, it is submitted that they are obviously trying to move the goalposts and rewrite the contracts. This is egregious and irresponsible.

167. Some of the experts refer to the assessment of strength utilisation done by Atkins and COWI. While the level of strength utilisation would have to be considered in the future structural assessment upon completion of the opening-up exercise, the various preliminary assessments on utilisation done by the consultants engaged by MTRCL and Leighton should not be overly emphasized at this stage. It is to be noted that OAP has only carried out spot check at a few locations **[ER1/6/8 §6.5; B19/25132]**, and no details were provided by Atkins other than a graphical presentation of the purported results **[B17/24479-24503]**. As to COWI's assessment, it has admittedly not taken into account the effects of the existing defects in the structure in its analysis **[ER1/4.5/Answers to Q4 & 5]**. More importantly, while Professor McQuillan, Dr Glover and Mr Southward refer to the assessment of Atkins and COWI, none of them has checked the details of the assessments.

168. As to the other quality issues, namely spalling of concrete and voids at the soffit of the EWL slab, as well as gaps between the load-bearing walls/columns and the underside of the EWL slab, the experts (save and except Mr Southward) agree that such defects are repairable **[ER1/3/App XI §4]**. However, these have to be followed up by MTRCL and their effects or impact on the future performance of the Station Box Structure have to be taken into account at Stage 3 of the Holistic Proposal.

169. With a view to allaying public safety concerns and also providing a way to assess the future performance of the Station Box Structure, Professor Au recommends the installation of a long-term structural health monitoring system to continuously check the movement at key locations of the structure. Professor Au believes that some displacement sensors and accelerometers would probably be sufficient. Further, using fibreoptic sensors for measurement of strength may also be considered as part of a sensible and cost-effective mechanism for long-term monitoring **[ER1/7/17 §8.1; T40/98:19-99:25]**.

Professor McQuillan also agrees that the future performance of the structure should be monitored by way of instrumentation **[ER1/3/45 §113]**.

E. RECOMMENDED IMPROVEMENT MEASURES

170. The Commission's project management expert, Mr Rowsell, has helpfully provided in his report insights and recommendations on possible enhancement measures aimed at strengthening the Government's monitoring and control mechanisms **[ER1/1/80 §§156-166]**. In reality, while perhaps not every non-compliance during the execution of the project management and the construction process could be identified by even a well-established monitoring and control system, the Government acknowledges that the enhanced measures would help increase the levels of understanding (in relation to the standards and procedures required) and also alertness (in relation to new potential risks or increased risks), thereby facilitating a more effective and interactive implementation and management of a railway project **[ER1/1/80-81 §§156-166]**.

171. These recommended enhancement measures for the Government include:-

(1) **Streamlining lines of reporting** to provide greater clarity in communication and more efficient project control in its role as the project sponsor. Insofar as is possible, the Government should consider establishing a single point of contact with MTRCL (§§120 and 156) ("**Recommendation 1**");

(2) **Fostering collaboration** as follows:

(a) The Government, as the project sponsor, should see itself as part of the overall project partnership and consider options for more integrated and co-located working with MTRCL and all other parties involved so as to achieve greater transparency, better forward planning and

more comprehensive joint risk management (§§136, 159 and 195) ("**Recommendation 2(a)**");

(b) For the purpose of reinforcing collaborative working on projects, the Government may consider establishing a cross-party Senior Leadership Forum for more effective management of working relationships and cultural aspects of service delivery (§152) ("**Recommendation 2(b)**");

(3) **Clarifying rules and requirements** by simplifying the structure of the various documents in which the relevant procedures as well as obligations and responsibilities of the project contractor and/or sub-contractors are set out, including the BO, the EAs, IoEs, IoCs and the 2009 CoP, and by minimizing the need for cross-referencing (§§137-138, 157 and 161) ("**Recommendation 3**");

(4) **Reviewing the efficacy of the PSC** to ensure that it is (a) operating as a high-level committee focusing on strategic and performance issues as intended and (b) provided with reliable performance data upon which substantive qualitative and quantitative issues may be identified and rectified in a timely manner (§§130-131 and 160) ("**Recommendation 4**");

(5) **Devising and developing a conflicts of interest policy** appropriate and applicable to projects of this nature, the administration of which may be assigned to the PCM or other committees as appropriate (§162) ("**Recommendation 5**");

(6) **Restructuring the role and engagement arrangements of the MVC** as follows:

(a) The Government may consider extending the role of the MVC to one that is akin to a central project representative of the Government so that the MVC can play a wider "eyes and ears" role to help protect the Government's interests in the delivery of the project by providing high-level monitoring of cost, programme and performance issues (§158) ("**Recommendation 6(a)**");

(b) The form of remuneration of the MVC may be reviewed to incentivise it to be more proactive in the execution of its duties. In this connection, the option of recovering extra audit costs from the MVC in the event of poor performance may also be considered (§§163 and 166) ("**Recommendation 6(b)**");

(c) Requirements in relation to site audits and surprise checks should be clarified in MVC briefs (§164). Should it be desired that the level of monitoring by the MVC be increased due to concerns over poor performance, the Government should ensure that the MVC is given access to the corresponding increase in the level of resources required in the discharge of its duties (§165) ("**Recommendation 6(c)**").

172. The Government welcomes the recommendations put forward by Mr Rowsell and will endeavour insofar as is practicable to take on board the suggested measures, whether in the SCL Project going forward or in similar railway projects to be undertaken in future.

173. Indeed, as acknowledged by Mr Rowsell in the course of his evidence **[T39/113:22-25]**, the Government has, since it started to investigate the allegations of defective works as raised by the media in late May 2018, been proactively implementing a series of improvement measures which seek to strengthen and enhance its monitoring and control over MTRCL's

performance and delivery of the SCL project (some of these improvement measures have been mentioned in the Witness Statement of Chung Kum-wah at §44 **[G3/2072-2073]**). Many of these improvement measures are in line with Mr Rowsell's recommendations. They include:-

(1) Reviewing MTRCL's systemic issues relating to site supervision and communication at each PSC meeting so that relevant matters will be promptly brought to the attention of the management at the highest level;

(2) Requesting MTRCL to report on the non-conformance statistics in PSC meetings to enhance transparency and to allow for input from the BO Team where appropriate and necessary;

(3) Requiring the regular attendance of the project team of RDO, MVC and BO Team at PSC meetings (in addition to their attendance at the PCMs) to report on the quality of workmanship and progress of works for appropriate follow-up actions;

(4) Increasing the frequency of site visits and regular audits by the MVC. The MVC had carried out 45 site walks between 8 August 2018 and 30 November 2018; and

(5) Having independent surprise checks conducted by HyD's in-house staff to ensure that MTRCL's site supervision of the SCL Project is carried out in accordance with the site supervision plan. A total of 36 site surprise checks have thus far been conducted up to the end of December 2018.

174. Notwithstanding the above, in considering how the Government should put Mr Rowsell's recommendations properly and effectively in place, it is important to bear in mind the following:

(1) The successful implementation of Mr Rowsell's recommendations is substantially dependent upon MTRCL taking the lead as the project manager to ensure that it will provide all necessary skills, manpower and support as required. For instance, whether and to what extent the PIMS can be revised inevitably depends on what MTRCL is prepared to do, after seeking professional advice from all its teams, although the Government is as always prepared to provide insights and assistance on setting out the principles for the reformulation of the PIMS.

(2) It is important to focus on the substance rather than the form of the suggested measures. Hence, understanding the underlying rationale of the recommendations is of great significance. For example, in considering what should be done to enhance and improve communications between all parties, the questions as to how effective channels could be provided may be more crucial than the factors concerning physical arrangements such as the venue of meetings or the number of meetings required.

(3) Whilst, as mentioned above, some of the improvement initiatives have already been put in place by the Government, the implementation of some of the suggested measures warrants detailed consultations (through which all stakeholders will be given an opportunity to express their views on the proposals) and this exercise takes time, particularly when it concerns the construction industry which involves a great deal of local culture and dimensions. For example, while the idea of achieving an overall project partnership that brings together all parties involved may help generate greater transparency, better forward planning and risk management, the practical and logistical difficulties are foreseeable, given, for example, the significant number of contractors and sub-contractors (as one would expect in a project of this nature) and the delicate relationship between main contractors and sub-contractors (which may not be conducive to

fostering helpful discussions during the process and may even cause unnecessary costs and expenses to be incurred). Therefore, striking a fine balance is always a delicate task.

(4) It must be recognized that not all recommendations can be implemented in the existing SCL Project insofar since such implementation may alter the existing contractual regime and obligations assumed by the relevant parties. Otherwise, complicated issues on the scope of each party's obligation may arise when the determination of liability becomes necessary. Nevertheless, the Government will take serious heed of these recommendations and will review and assess how best they can be taken forward insofar as they are applicable to future railway projects.

(5) Whilst Mr Rowsell had met with representatives of the MTRCL and their consultants to discuss relevant project management issues for the purpose of preparing his report, Mr Rowsell did not have a chance to meet with the Government prior to the compilation of his report. This is by no means a criticism, but with further information on the actual operations of the existing system, Mr Rowsell might be in a better position to comment on whether some of the recommendations require only fine-tuning the existing mechanisms instead of having new measures introduced.

175. With the above considerations in mind, the Government wishes to address Mr Rowsell's recommendations as follows:-

(1) With respect to Recommendation 1, MTRCL is no doubt familiar with the mechanism of reporting to the government departments involved given its past experience in the construction of railway projects since the 1970s under similar arrangements. Further, Mr Huyghe (for MTRCL) during cross-examination agreed that he was not aware of any difficulty that MTRCL encountered in its communications with the Government

[T39/59:1-6]. Having said that, the Government has endeavoured to streamline the lines of reporting. There are in fact several coordination committees set up to facilitate the consultation and communication processes between MTRCL and the various Government departments involved. The RDO has also served as the single point of contact for overall administrative coordination (see EA3 Clause 30.1 **[G7/5639-5640]**). If considered necessary, however, the Government is prepared to instill further clarity into its lines of communication and/or reporting.

(2) Insofar as Recommendation 2(a) is concerned, whilst MTCRL (entrusted by the Government as the project manager of the SCL Project and was paid project management fees in the sum of approximately HK$8 billion) ought to have provided the requisite degree of skill and care reasonably expected of a professional and competent project manager even without the Government's close involvement, the Government is open to the idea of adopting a more collaborative approach akin to a partnership for future railway projects, although it is contemplated that the difficulties outlined in §174(3) above would need to be addressed at the same time. The practical difficulty is that the scope for a higher level of partnering under the existing SCL Project is rather limited given that contractual agreements have already been reached and concluded between all relevant parties and thus, there is very little room for re-delineating and redefining the roles and obligations of various parties. Nevertheless, the Government fully appreciates the utility and desirability of adopting a partnership approach and will endeavour to incorporate such an approach in future projects.

(3) As for Recommendation 2(b), the main purpose of the proposed Senior Leadership Forum to promote collaborative working has been served by meetings at different levels. For instance, informal meetings have been

held among the top management of THB, HyD and MTRCL from time to time **[G3/1856 & 1858]**, which serve largely as a forum through which a wide range of issues are discussed. In addition, there have been a 3-tier meeting protocol set up under the PMP. As per Mr Rowsell's suggestion, matters on working relationships and the cultural aspects of service delivery could be added to the agenda of these informal meetings. Logistical arrangements could also be made to seek to expand the scope of participants in these informal meetings, although there may be limitation in engaging each and every contractor and subcontractor in the whole SCL Project (which comprises 98 contracts and over 3,000 subcontracts) or project of similar scale and complexity.

(4) On Recommendation 3, given the scale of the SCL Project, a certain degree of complexity and multiple cross-referencing across documents setting out the obligations and responsibilities of the parties involved are inevitable. Mr Rowsell has fairly accepted that it would be extremely difficult to bring everything together into one single form **[T39/129:8-12]**. Under the provisions of the IoE, MTRCL must appoint a CP and various other qualified professionals, who should be equipped with in-depth knowledge and understanding of the requisite regulatory requirements (not least those as set out in the BO and the IoEs), to assist it in the discharge of its duties. Also, working level meetings have in fact been held weekly to enhance collaboration and communication between the Government and MTRCL. MTRCL is invited to clear all potential doubts related to the governance procedures / requirements / technical issues during the weekly working sessions with the BO team to ensure clarity and mutual understanding of the relevant procedures and standards expected of MTRCL. The Government will discuss with MTRCL (and other parties, if necessary) to ascertain how to ensure that every party

involved in the process would have a clear understanding of their respective obligations. Further, BD will consider how to further enhance the clarity of the 2009 CoP and strengthen the requirements on communication among the site supervisory personnel and the requirements relating to their respective obligations.

(5) In respect of Recommendation 4, the Government has always strived to maximize the efficacy of the PSC meetings and to ensure that it achieves its intended purpose by inviting the attendance of all parties which may be in a position to offer valuable inputs. Following the recommendation of the Independent Expert Panel of the XRL, representatives from the MVC are invited to join the PSC meetings. Further, as stated above, several non-conformities in respect of construction works at HUH Extension were reported to DHy and discussed at PSC meetings. Shortly after the allegations of defective steel reinforcement fixing works surfaced in mid-2018, prompt actions were taken by the Government which included inviting representatives from the BO Team to take part in the PSC meetings primarily to discuss the non-conformance reports. Following Mr Rowsell's recommendations, the Government will further consider how to make the work at the PSC level more efficacious.

(6) The Government agrees that Recommendation 5 should be implemented as far as practicable. Going forward, the Government will request MTRCL to review its PIMS in general to make it more user-friendly and also to impose a more stringent policy to guard against potential conflicts of interest by undertaking, for example, regular audits to ensure that the firewall has been adequately and properly set up and maintained throughout the remaining project period. Insofar as future projects are concerned, the Government will include appropriate provisions guarding against conflicts of interests in the relevant entrustment agreements.

(7) The Government welcomes the suggestion of extending the role of the MVC in accordance with Recommendation 6(a). Indeed, as set out above, the Government has since mid-2018 already implemented measures which sought to encourage more proactive involvement of the MVC, for example, by including the MVC in all 3-tiered meetings and by increasing the frequency of site visits and regular audits by the MVC. The Government will also consider how to further utilise e-platforms (which have already been set up) to facilitate the sharing of all relevant site and project records by MTRCL with the MVC so as to ensure that the MVC has ready access to relevant and timely information. Further review will be undertaken to consider how best to further define and potentially enlarge the role of the MVC for future railway projects.

(8) As for Recommendation 6(b), the Government will consider reviewing the remuneration mechanism and the possibility of recovering audit costs from the MVC in the event of poor performance in future railway projects.

(9) Lastly, insofar as Recommendation 6(c) is concerned, the Government agrees that actions are necessary notwithstanding that there have already been surprise checks by HyD's in-house supervisory staff on MTRCL's site supervision. The minimum audit frequency is specified in the MVC briefs. The Government will work together with the MVC in order to identify the areas in which more frequent audits or audits of a wider scope should be carried out. The Government will also take steps to ensure that the MVC will be capable of providing the necessary resources and manpower when they are required to do so.

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