Commission of Inquiry into the Diaphragm Wall and Platform Slab Construction Works at the Hung Hom Station Extension under the Shatin to Central Link Project

SECOND WITNESS STATEMENT OF STEPHEN LUMB

I, STEPHEN LUMB, of 39/F, Sun Hung Kai Centre, 30 Harbour Road, Hong Kong say as follows:

- I am, and was at all material times, the Head of Engineering for the Hong Kong business of Leighton Contractors (Asia) Limited ("Leighton"), the main contractor for the Hung Hom Station Extension contract (Contract SCL 1112) ("Project") under the Shatin-Central rail link project. The project manager for the Project is MTR Corporation Limited ("MTRCL").
- 2. Unless otherwise stated, the facts stated herein are within my personal knowledge and are true. Where the facts and matters stated herein are not within my own knowledge, they are based on the stated sources and are true to the best of my knowledge, information and belief.

My qualification and experience

- 3. I am a chartered civil engineer (CEng) and a registered structural engineer (RSE). I am a fellow of the Hong Kong Institution of Engineers (HKIE) and the Institution of Civil Engineers (ICE). I have over 25 years of experience in engineering and construction.
- 4. I was employed by Leighton in August 2010 as the Head of Engineering for the Hong Kong business. In this role, I lead an in-house team of around 50 engineers which predominantly provides design services to Leighton's ongoing projects. I report to the Head of Pre-Contracts and the General Manager at Leighton.

Response to Letter of 10th August 2018

Leighton has been asked in Lo & Lo's letter dated 10th August 2018 ("Letter of 10th August 2018") to respond to the following request:

"The Commission requires your client, as the main contractor responsible for the construction of the diaphragm walls, to explain and confirm whether your client has carried out the alleged deviation of the as-built conditions from the BD's approval plans and caused the top of the completed diaphragm walls to be demolished. If so, please explain the reasons for the deviation and why approval of such deviation had not been sought from the BD. Your client should explain how such deviation may affect the structure, integrity and safety of the diaphragm walls and platform slabs. Please also comment on the allegations and matters raised in the Government Press Conference and the MTRCL Press Conference in relation to the diaphragm walls. Authorities relied on by your client should be provided."

- 6. As Head of Engineering for Leighton, I am authorised to respond to the Letter of 10th August 2018. Specifically, I will respond to the request for Leighton to "explain how such deviation may affect the structure, integrity and safety of the diaphragm walls and platform slabs". I am the appropriate person to provide this explanation because I lead the head office engineering design team and have the required expertise and experience to comment on these issues.
- 7. Leighton understands that the Letter of 10th August 2018 refers to the use of continuous rebars (i.e. not connected by couplers) to connect the East West Line platform slab ("EWL Slab") to the eastern diaphragm wall and the slab for the Over Track Exhaust duct ("OTE Slab") (the "Change"). As explained below, this represented a minor change in construction detail (not a change to the design of the works) as the rebars were originally intended to be connected using couplers but were replaced with continuous rebars.
- 8. My understanding of the relevant facts is as follows:
 - (a) the works undertaken to implement the Change were agreed with Atkins, notified to MTRCL and accepted by BD;

- (b) MTRCL knew of and supervised the works undertaken to implement the Change;
- (c) the key differences between the previous accepted drawings and what was built are:
 - (i) continuous rebars were used to connect the EWL Slab, the eastern diaphragm wall and the OTE Slab instead of rebars connected by couplers;¹ and
 - (ii) the EWL Slab, the eastern diaphragm wall and the OTE Slab were cast monolithically.²
- 9. These changes are shown in the diagrams produced and marked Exhibit "SL-3".
- 10. The use of continuous bars instead of bars that would otherwise have been connected by couplers is a minor change in construction detail. It is not a "design" issue. This is clear from the Code of Practice for Structural Use of Concrete 2013 (numbered LCAL.R6.05 in the Index of Documents disclosed to the Commission (the "Index")). This Code allows for the use of either continuous rebars (as connected by lapping) or rebars connected by couplers (i.e. one can be substituted for the other).³ There is no structural difference between continuous rebars and rebars connected by couplers. Generally, continuous rebars are seen as a better solution (where it is possible to use them) than rebars connected by couplers.
- 11. It follows that the Change would have satisfied the applicable structural performance requirements. It also ensured uniform reinforcement spacing from the EWL Slab across the diaphragm wall to the OTE Slab. Both Leighton's position, and my considered opinion, is that it did not affect the overall stability of the structure (as per the accepted drawings).
- 12. This conclusion is relevant to the question of whether MTRCL needed to obtain prior acceptance from BD of the Change. It is important to note that the Instrument of Exemption ("IoE") (numbered LCAL.R1.145 in the Index) applies to the Project. As a

¹The only exception is that a single row of couplers were used to connect the top row of the rebars in the OTE Slab (at Bay C1-1) to the corresponding bars running from the EWL Slab.

² The only exception is that for Bay C1-1, the EWL Slab was poured first and then a separate concrete pour was completed for the OTE Slab. I understand that this approach was approved by the MTRCL's Registered Structural Engineer (as nominated under the IoE).

³ See Section 8.7 of the Code of Practice for Structural use of Concrete 2013.

result, there is no obligation on MTRCL (as the Competent Person under the IoE) to obtain BD's approval of any change to the design of the permanent works. The only obligation is to consult with the BD. However, even if there was an obligation to obtain BD's approval for any change in the works (which there is not because of the IoE), there is no obligation to seek BD's prior approval to a change in detail that does not affect the overall stability of a structure.⁴ This means that the Change (which, as noted, did not affect the overall stability of the relevant structures) did not need to be subject to BD's prior acceptance before construction.

- 13. In my view, there is no reason why BD would not have accepted the Change. Given that BD was initially satisfied with the use of rebars connected by couplers, and the key parts of the EWL Slab, the diaphragm wall and the OTE Slab being cast separately (as per the original accepted drawings), I cannot see any good reason from a design perspective why BD would object to the Change.
- 14. Despite these facts, my understanding is that BD was consulted in relation to the Change and accepted it.
- 15. My view is further confirmed by the fact that the Change removed most of the construction joints between the EWL Slab, the eastern diaphragm wall and the OTE Slab by allowing for the connection of these structures to be cast monolithically (i.e. as part of single concrete pour). This change is shown in the second set of diagrams in Exhibit "SL-4". Construction joints are potential points of weakness in a concrete structure. It is therefore better to minimise construction joints where possible.
- 16. The works undertaken to implement the Change satisfy or improve upon all relevant requirements of the reinforcement under the original accepted drawings. They are structurally sound and safe. This reflects the fact that:

⁴ See the Practice Note for Authorised Persons PNAP ADM-19 (numbered LCAL.R6.06 in the Index). Appendix G of the Practice Note relevantly provides that minor amendments which affect the overall stability of the building are not permitted to be deferred in their submission to BD (i.e. BD's prior approval is not required for minor amendments which do not affect the overall stability of the building).

- (a) There is no adverse change to the reinforcement details under the accepted design;
- (b) There is no adverse change in the load path through the reinforcement;
- (c) There is no adverse change in the size, number, spacing or anchorage of the rebars;
- (d) The EWL Slab and OTE Slab were cast monolithically;⁵ and
- (e) The as-constructed details do not affect the stability of the structure.⁶
- 17. Leighton's position, and my considered opinion, is that:
 - (a) the works undertaken in relation to the Change are safe and compliant with all design codes;⁷ and
 - (b) the Change represents an improvement to the original design because it provides for continuous, uniformly spaced reinforcement and eliminates the construction joint between the EWL Slab, diaphragm wall and OTE Slab.⁸

Dated the 9rd day of October 2018.

Johnah Signed: Stephen Lumb

⁵ Subject to footnote 2.

⁶ See paragraph 10 above.

⁷ In saying this, I assume that the accepted design was safe and compliant with all design codes. I have no reason to doubt this assumption.

⁸ See paragraphs 8(c), 11 and 15 above.