

**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**

WITNESS STATEMENT OF LEE WAN CHEUNG

FOR

ATKINS CHINA LIMITED

I, Lee Wan Cheung, of 10/F Genesis, 33-35 Wong Chuk Hang Road, Hong Kong, do say as follows:

1. I am Technical Director of Meinhardt Infrastructure & Environment Ltd ("**Meinhardt**") and am responsible for the structural design within Meinhardt's infrastructure section. I used to work for Atkins China Limited ("**Atkins**") from October 2013 to the end of September 2015. I was an Associate Director, primarily involved in the management of the structural design aspects for the Mass Transit Railway Corporation Limited ("**MTRCL**") projects, which included the structural works for the Shatin to Central Link Hung Hom Station Extension Contract 1112 (the "**Project**") and alteration and addition works above ground.
2. I have a degree in Civil Engineering from Kingston Polytechnic, and specialise in structural engineering. I am a MStructE, MHKIE (Struct), RPE (Struct), a registered structural engineer ("**RSE**") and a registered inspector. After graduation in 1986, I worked in the UK until the end of 1992. I returned to Hong Kong in early 1994, where I have worked for both contractors and design consulting companies. I enclose my CV in attachment **WCL-1**.
3. When I joined Atkins, the structural design had already been approved in principle and construction had commenced. I started working on the structural aspects of the Project, which included responding to queries mainly from MTRCL initially and later from Leighton Contractors (Asia) Limited ("**Leighton**"). I reported to Mr. CK Chan of Atkins who was the head of the structural department. I was part of the detailed design consultant team ("**DDC**"), which is also known as Team A.

4. I have prepared this witness statement to address each of the Commission's requests as set out in Lo & Lo's letters dated 2 October 2018 [J1-J9], 15 October 2018 [J10-J12] and 17 November 2018. I have only responded to requests 2, 3 and 4 as set out in Lo & Lo's letter of 2 October 2018 [J1-J9].
5. 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.

Request 2 – Alleged Cutting of Rebars

6. Request 2(a) from the Commission: "*Explain and confirm whether Your Company has any knowledge of the alleged cutting of threaded steel bars and existence of a gap at threaded steel bar/coupler connections for diaphragm walls to slab and slab to slab during construction period on site.*"
7. I have no knowledge of the alleged cutting of threaded steel bars and existence of a gap at threaded steel bar / coupler connection for D-walls to slab and slab to slab during construction period on site. Furthermore, as part of the DDC, it was not my responsibility to visit the site or supervise the construction works.

Rectification and Remedial measures

8. Request 2(b) from the Commission: "*Comment on what rectification and remedial measures should have been taken by Leighton and/or other sub-contractors if threaded steel bars within EWL/NSL Slabs had been cut as alleged and there was a gap at threaded steel bar/coupler connections for diaphragm walls to slab and slab to slab, and explain and confirm whether rectification and remedial measures have been actually carried out on site.*"
9. I have read the witness statement of Mr. Blackwood at paragraphs 42 to 44 and I agree with the comments stated there.

Knowledge of Cutting of Threaded Steel Bars and Existence of Gap without Rectification

10. Request 2(c) from the Commission: "*Explain and confirm whether Your Company has any knowledge of any cutting of threaded steel bars and existence of a gap at threaded steel bar/coupler connections for diaphragm walls to slab and slab to slab in the as-built structures without any rectification.*"

11. I have no knowledge of any cutting of threaded steel bars and existence of a gap at threaded steel bar / coupler connections for D-walls to slab and slab to slab in the as-built structures without any rectification.

Effects of Cutting of Threaded Steel Bars and Existence of Gap – Quality, Safety and Integrity of the D-walls and EWL / NSL Slabs

12. Request 2(d)(i) from the Commission: "*On the basis of the evidence given by the witness as extracted above: comment on whether such shortening and cutting of the steel bars of EWL/NSL Slabs and the existence of a gap at threaded steel bar/coupler connections for diaphragm walls to slab and slab to slab would compromise the quality, safety and integrity of the diaphragm walls and EWL/NSL Slabs.*"
13. I have read the witness statement of Mr. Blackwood at paragraphs 49 to 54 and I agree with the comments stated there although in paragraph 49 I would use the words "full tension" rather than "full shear".
14. If there is the shortening and cutting of the steel bars of EWL / NSL Slabs and the existence of a gap at threaded steel bar / coupler connections for D-walls to slab and slab to slab then, in theory, it would compromise the quality, safety and integrity of the D-walls and EWL / NSL Slabs.
15. However, the structural quality, safety and integrity of the D-walls and EWL / NSL Slabs would be affected by the number of bars cut, scope, layer, area and whether the cutting was in tension zone or compression zone.

Effects of Cutting of Threaded Steel Bars and Existence of Gap – Original Design Intent of the D-walls and EWL / NSL Slabs

16. Request 2(d)(ii) from the Commission: "*On the basis of the evidence given by the witness as extracted above: Comment on whether cutting of threaded steel bars and the existence of a gap at threaded steel bar/coupler connections for diaphragm walls to slab and slab to slab would affect the original design intent of the diaphragm walls and EWL/NSL Slabs.*"
17. I have read the witness statement of Mr. Blackwood at paragraphs 56 to 58 and I agree with the comments stated there.
18. The design intent may be affected depending on the extent of the cutting and the existence of a gap at threaded steel bar / coupler connections for D-walls to slab and slab to slab. In some areas, such as where there are openings in the slab (such as

opening for the vertical access), the sensitivity of the design of the cutting and existence of gaps would be more critical.

Request 3 – Alleged Change of Connection Details between EWL Slab and East D-walls

Atkins' Role and Participation in the Process

19. Request 3(a) from the Commission: *"Explain and describe Your Company's role and participation in this deviation in connection details."*
20. I was involved in the development of the connection detail with original couplers as shown in Enclosure 1, page 1 [J8] of Lo & Lo's letter dated 2 October 2018 and presented to MTRCL and Buildings Department ("BD"), which I understand was subsequently approved.
21. On or around May / June 2015, I attended a presentation to BD with Mr. David Wilson on the alternative design assumption for the moment connection details between the EWL slab and the tension anchorage into the OTE wall. Following this meeting, Team B prepared the first version of the report which became *"Discussion on Design Amendment Works D-wall [Deliverable No. PWD-059A3]"* ("PWD-059A3") [C21765-C21799]. Although I signed off the PWD-059A3 report as the reviewer [C21767], I cannot now remember doing so. I presume that it must have been because I was familiar with the design principles and it was necessary for the work progress. I understand that on 30 July 2015, PWD-059A3 was submitted to BD by MTRCL [B7322-B7358] and that it was accepted by BD on 17 September 2015 [B261].
22. On 24 July 2015 (timed at 16:20), I replied to a technical query from Mr. Johnson Luk who was then working for Leighton regarding the connection details between the OTE slab / wall and EWL 3m slab connection relating to panels EH47 and EH48-EH108. This subsequently became Technical Query 33 ("TQ 33") [B7513]. In my email, I replied that:

"[t]he maximum number of layer of rebar in the top section of 3m slab is 3, so adding the bending radius for T40 and the gap (at 160mm) between layer as shown on the as-built drawings provided by your team, so the top rebar would require a distance from the face of the d-wall is 600+160+100 (layer 1) +100 (layer 2) a total approx. 1000mm for comply with the design requirement.

For any OTE with horizontal distance small than 1100mm (from the face of d-wall) to the outer face of the OTE wall, the top layer of rebar in the 3m EWL slab will have to be end upward to ensure full tension anchorage as shown in page 1/2 sketches.

Please be reminded that in order to comply with the design assumption, the OTE wall must be concrete / pour together at the same time (monolithically) with the 3m EWL slab and the wall to extend to 300mm above the chamfer section of the wall to provide the kicker for the OTE wall above" [B7512-B7513].

23. By monolithically, I meant the OTE wall and the EWL slab on each side of the D-wall cast at the same time to ensure full tension anchorage for the 3m EWL slab.
24. On 27 July 2015, Team B received from Leighton Technical Query 33 ("TQ 33") [B2986-B2996] regarding OTE wall and EWL 3m slab connection requirement concerning a problem regarding the fixing of the L-shaped tension anchorage bars to the OTE slab and the connection to the D-wall. The problem concerned a number of panels, where Leighton did not have enough working space to fit the tension bars.
25. On 27 July 2015, Team B received from Leighton Technical Query 34 ("TQ 34") [B12527-B12528] regarding the level of the couplers at panel EH74 of the Eastern wall, which was approximately 70mm lower than the EWL slab rebar, and proposing that the top layer of the D-wall was trimmed down to the top layer of the rebar with a full length bar provided without any coupler.
26. On or around 29 July 2015, I responded to TQ 33 again in view of the urgency, clarifying how to calculate the length of the L-shaped tension anchorage and to bend them upwards [B2997-B2999]. I also stated that the OTE slab / wall must be poured together with the EWL slab. This was very similar to the comments in my email on 24 July 2015 (timed at 16:20). This was then submitted by Leighton to MTRCL for their review.
27. On 29 July 2015, I responded to TQ 34 that the proposal by Leighton for TQ 34 was acceptable for panel EH74 [B12527-12528] and returned to Leighton. This was then submitted by Leighton to MTRCL for their review.
28. I replied to TQ 33 and TQ 34 as I understood the EWL slab / D-wall connection details and because they were required urgently by Leighton. I had also previously commented on the same issue as raised in TQ 33 by email dated 24 July 2015 (timed at 16:20).

Explain and confirm whether such Deviation in Connection Details requires the Expressed Approval of the BD

29. Request 3(b) from the Commission: *"Explain and confirm whether such deviation in connection details requires the expressed approval of the BD. If it is required, state the procedures and identify the party or parties who should take steps to seek approval from the BD. If approval is not required, explain why not. Explain the role*

Your Company as the design consultant under Contract No.1112 would play in the procedures for seeking approval from the BD."

30. I have read the witness statement of Mr. Blackwood at paragraphs 98 to 100 and I agree with the comments stated there.
31. I was involved in the BD issues from a technical aspect and I attended consultation meetings regarding the BD issues and provided comments on the submitted reports / drawings in the submission process.
32. I was not aware of the change in connection details. If there was a change in construction detail, then MTRCL would have instructed Team A to prepare the submission for BD approval. As far as I was aware, this did not happen during the time I was working on the Project.
33. This issue, of whether such deviation in connection details requires the expressed approval of BD, was the responsibility for the competent person ("CP") provided by MTRCL, therefore I am not able to comment further.

Effect of the Alleged Deviation in Connection Details

34. Request 3(c) from the Commission: *"Explain whether and how the deviation may affect the design intent of the east diaphragm wall. Comment on the effect of the alleged deviation in connection details on the EWL Slab and East Diaphragm Walls structures themselves and on the overall design scheme."*
35. As the joint remains a fixed joint and the change is a substitution of couplers for straight through bars. In my view, I consider the change does not affect the design intent of the East D-wall.

As-built Connection Details

36. Request 3(d) from the Commission: *"Explain and confirm with the aid of drawings the as-built connection details between EWL Slab and east diaphragm walls. Provide a set of the relevant as-built drawings. If such as-built drawings are not available, explain why they are not available. Confirm whether it is Your Company's responsibility to provide as-built drawings."*
37. I was not involved in the as-built construction details for the EWL slab and the D-walls.
38. I was aware of the missing U-bar issue and anchorage issues, which was addressed in PWD-059A3. However, I was not directly involved in the production of the as-built drawings, which was handled by Team B.

39. I refer to PWD-059A3 at paragraph 21 above, which was based on couplers at the top of the D-wall. I was not aware of any trimming of the D-wall.

Request 4 – Presentation to Professor David A Nethercot

40. Request from the Commission:

"(a) Explain and describe the contents of the presentation given to Professor David A Nethercot.

(b) Confirm who gave the presentation on behalf of Your Company.

(c) Explain, with the aid of any presentation materials given to Professor David A Nethercot, what is the overall design scheme of the diaphragm walls and EWL/NSL Slabs and the details of the slab/wall connections.

(d) Please produce the relevant paper, notes, power point, slides and/or video of the presentation."

41. I had already left Atkins at the time of this presentation and therefore I am not in a position to comment on this request.

Close

42. I trust that the information provided in this witness statement and its exhibits are of assistance to the Commission. I will be pleased to supplement with any additional information which the Commission may find helpful.

Dated 3 December 2018



Lee Wan Cheung