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

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SECOND WITNESS STATEMENT OF WILLIAM HOLDEN

I, **WILLIAM HOLDEN** of 39/F, 30 Harbour Road, Hong Kong, say as follows:

1. I refer to my first witness statement dated 2 May 2019. Unless otherwise stated or the context otherwise requires, any abbreviations shall have the same meaning as in my first witness statement.

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.

3. I make this second witness statement in response to the Commission's queries regarding Issue 3 of Lo & Lo's three letters dated 26 March 2019.

The SAT

SAT – General

4. The approved general sequence for the construction works at the SAT (at the EWL level) was as follows:[1]

   (a) installing sheet piles and king posts for temporary excavation lateral support ELS (Hills);

   (b) excavating to maximum depth of approximately - 4mPD (8m below ground level) and installing a maximum three layers of steel struts (Hills)

   (c) open cut excavation for areas requiring shallower excavation (Hills);

   (d) casting 75mm thick blinding layer concrete (China Technology);

[1] The responsible party is noted in brackets for each step.

(e) installing EWL base slab waterproofing layer (Hop Shing);

(f) erecting formwork for the EWL base slab (China Technology);

(g) installing reinforcement for the EWL base slab (Fang Sheung);

(h) inspecting rebar for the EWL base slab (i.e. both routine informal inspections and the formal inspection at a hold point) (Leighton and MTRCL);

(i) formal inspection for pre-pour check, temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check at a hold point, prior to pouring concrete for the EWL base slab (Leighton and MTRCL);

(j) pouring concrete for the EWL base slab and curing concrete (China Technology);

(k) casting 600mm thick concrete propping between base slab and temporary sheet pile wall (China Technology);

(l) backfilling compacted fill to approximately +1.5mPD (Hills);

(m) removing bottom 1 or 2 layers of temporary struts after base slab and concrete propping has gained full strength (Hills);

(n) erecting outer formwork for the EWL trough walls (China Technology);

(o) installing reinforcement for the EWL trough walls (Fang Sheung);

(p) inspecting rebar for the EWL trough walls (i.e. both routine informal inspections and the formal inspection at a hold point) (Leighton and MTRCL);

(q) formal inspection for pre-pour check, temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check at a hold point, prior to pouring concrete for the EWL trough walls (Leighton and MTRCL);

(r) erecting inner formwork and pouring concrete for the EWL trough walls and curing concrete (China Technology); and

(s) backfilling trough walls to existing ground level (Hills).

5. The approved general sequence for the construction works at the SAT (at the NSL level) was as follows:

(a) constructing diaphragm walls by Leighton's specialist foundation sub-contractor (Intrafor);

(b) removing the "over casting" of the top portion of the diaphragm wall and constructing the capping beam on top of the diaphragm wall (Tung Yat Construction Co. Ltd ("Tung Yat"));

(c) conducting a pumping test to verify effective water cut off by the as-constructed walls (Intrafor);

(d) submitting as-built record plans for diaphragm walls and pumping test results by Leighton to MTRCL, and from MTRCL to Buildings Department ("BD") (Leighton / MTRCL);

(e) excavating to NSL formation level approx. -15mPD (20m below ground level) and installing 5 layers of steel strutting at levels (+2.5, 0.0, -4.5, -8.0 and -11.0 mPD) progressively during excavation (Leighton / K&F Construction and Engineering Company Limited ("K&F"))

(f) placing blinding concrete and formwork for the base of the NSL Slab (China Technology);

(g) installing waterproofing layer (Hop Shing);

(h) installing reinforcement for NSL Slab (Fang Sheung);

(i) inspecting the reinforcement fixing for NSL Slab (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL)

(j) formal inspection for pre-pour check, temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form"and survey check prior to pouring concrete for the NSL Slab (Leighton and MTRCL);

(k) pouring concrete for the NSL Slab and concrete curing (China Technology);

(l) removing temporary steel strutting layers 4 and 5 (K&F);

(m) erecting falsework and formwork for internal walls and NSL roof (China Technology);

(n) installing reinforcement for NSL roof slab (Fang Sheung);

(o) inspecting the reinforcement fixing for NSL roof slab (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL)

(p) formal inspection for pre-pour check temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form"and survey check prior to pouring concrete for the NSL walls and roof slab (Leighton and MTRCL);

(q) pouring concrete for the NSL walls and roof slab and concrete curing (China Technology);

(r) installing waterproofing layer on top of NSL walls and roof slab (Hop Shing); and

(s) backfilling and compacting soil with progressive removal of temporary struts to existing ground level (Leighton / K&F).

6. The timeline for the construction works at the SAT was as follows:

(a) The permanent concrete works commenced in the SAT at the EWL level with the pouring of the first SAT Bay 4 on 26 November 2015;

(b) The final structural concrete pour at the EWL level (being the walls of Bay 5 L&R, Bay 6, 7 and 8 L&R) was on 27 February 2017;

(c) The first structural concrete pour at the NSL level (being the SAT NSL Track Bay 1) was on 11 April 2016; and

(d) The final structural concrete pour at the NSL level (being the NSL roof) was on 26 October 2016.

The HHS

HHS – General

7. Leighton has disclosed to the Commission general layout plans and sectional drawings of the HHS area (numbered LCAL.HHS.1.01 in the Index).

8. The construction works at the HHS consist of three discrete packages of work, being the HHS track slabs, the HHS accommodation blocks and the North Fan Area ("**NFA**"), (referred to together as the "**HHS**"). The construction works involved in each of the three packages of work are described below.

HHS track slabs

9. Leighton has disclosed to the Commission general layout plans of the HHS track slabs (numbered LCAL.HHS.1.02 in the Index).

10. The HHS track slabs include six reinforced concrete rail troughs with a total of thirteen rail tracks. The rail troughs pass over the two pedestrian underpasses and a three-cell stormwater drainage culvert. The entire HHS track trough was constructed under the existing podium structure. The track troughs consist of an on grade continuous reinforced concrete slab of generally 600mm depth with a formation level of approx. +3mPD and trough walls of 1.8m height and 400mm width. Construction joints were formed between the base slabs and trough walls with concreting works carried out sequentially.

11. The approved general sequence for the construction works at the HHS track slabs was as follows: [2]

    (a) open cut excavation to HHS track slab formation level approx. +3mPD (Leighton);

    (b) pouring blinding concrete and erecting formwork for the base slab of the HHS track slab (Bik Hoi Civil Engineering Company Limited ("**Bik Hoi**"));

    (c) installing waterproofing layer (Hop Shing);

[2] The responsible party is noted in brackets for each step.

(d) installing reinforcement for HHS track slab (Wing and Kwong);

(e) inspecting the reinforcement fixing for HHS track slab (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL);

(f) formal inspection for pre-pour check and survey check prior to pouring concrete for the HHS track slab (Leighton and MTRCL);

(g) pouring concrete for the HHS track slab and concrete curing (Bik Hoi);

(h) erecting outer formwork for trough walls (Bik Hoi);

(i) installing reinforcement for the trough walls (Wing and Kwong);

(j) inspecting rebar for the trough walls (i.e. both routine informal inspections and the formal inspection at a hold point) (Leighton and MTRCL);

(k) formal inspection for pre-pour check and survey check at a hold point, prior to pouring concrete for the trough walls (Leighton and MTRCL);

(l) erecting inner formwork, temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and pouring concrete for the trough walls and curing concrete (Bik Hoi); and

(m) backfilling trough walls to existing ground level (Leighton).

12. The timeline for the construction works at the HHS track slabs was as follows:

(a) the permanent concrete works commenced on the HHS track slabs with the pouring of the south underpass base slab on 13 December 2014; and

(b) the final structural pour (being the south trough wall) was on 11 May 2017.

HHS accommodation blocks

13. Leighton has disclosed to the Commission general layout plans of the HHS accommodation blocks (numbered LCAL.HHS.1.03 in the Index).

14. The HHS accommodation blocks include eight major single storey above ground structures with piled foundations and three minor structures with raft foundations. The

eight major blocks are founded on pre-bored H-piles with a 1000/800mm thick base slab with a formation level of approx. +3.5mPD. The overall structure height of the blocks is generally 4.6m. The roof structures are beam and slabs supported by columns down to the base slab. Construction joints were formed between the base slabs and columns with concreting works for the base slabs and columns and rooves carried out sequentially.

15. The approved general sequence for the construction works at the HHS accommodation blocks was as follows: [3]

(a) installing pre-bored H-pile foundations by specialist foundation contractor (Falcon);

(b) open cut excavation and preparing H-pile heads (Leighton);

(c) casting blinding for base slab (Bik Hoi / Richwell Civil Engineering Limited ("**Richwell**"));

(d) installing waterproofing layer (Hop Shing);

(e) erecting formwork for base slab (Bik Hoi / Richwell);

(f) installing reinforcement for base slab (Wing and Kwong);

(g) inspecting reinforcement fixing for base slab (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL);

(h) formal inspection for pre-pour check temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check prior to pouring concrete for the base slab (Leighton and MTRCL);

(i) pouring concrete for base slab and concrete curing (Bik Hoi / Richwell);

(j) removing formwork for the base slab (Bik Hoi / Richwell);

[3] The responsible party is noted in brackets for each step.

(k) erecting falsework and formwork for column, wall and roof pours including roof beams (Bik Hoi / Richwell);

(l) installing reinforcement for column, wall and roof pours (Wing and Kwong);

(m) inspecting the reinforcement fixing for column, wall and roof pours (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL);

(n) formal inspection for pre-pour check temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check prior to pouring concrete for the column, wall and roof pours (Leighton and MTRCL);

(o) pouring concrete for column, wall and roof pours and concrete curing (Bik Hoi / Richwell); and

(p) removing formwork for the column, wall and roof pours (Bik Hoi / Richwell).

16. The timeline for the construction works at the HHS accommodation blocks was as follows:

(a) the permanent concrete works commenced on the HHS accommodation blocks with the pouring of the base slab at Bay 1 on 23 December 2014;

(b) the final concrete pour for the major structures (being the column and roof for Bay 13) was on 17 March 2016; and

(c) the final concrete pour for the minor structures (being the wall and beam of Bay 3 of the VRV room) was on 12 July 2017.

NFA

17. Leighton has disclosed to the Commission general layout plans of the NFA (numbered LCAL.HHS.1.04 in the Index).

18. The NFA track slab is a reinforced concrete structure that serves the purpose of diverting the 13 rail tracks within the stabling area into two running tracks. The structure is also integrated with the pile caps and ground beams that support the steel

noise enclosure. The NFA is situated to the north of the existing podium. The track troughs consist of at grade continuous reinforced concrete slabs of varying depths 300-600mm with a formation level of approx. +3mPD and trough walls of 1.8m height and 400mm width. Construction joints were formed between the base slabs and trough walls with concreting works carried out sequentially.

19. The approved general sequence for the construction works at the NFA was as follows:[4]

(a) installing pre-bored H-pile noise enclosure foundations by specialist foundation contractor (Falcon);

(b) open cut excavation and preparing H-pile heads (Leighton);

(c) casting blinding for NFA pile caps and ground beams (Tung Yat);

(d) erecting formwork for NFA pile caps and ground beams (Tung Yat);

(e) installing reinforcement for NFA pile caps and ground beams (Wing and Kwong);

(f) inspecting the reinforcement fixing for NFA pile caps and ground beams (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL);

(g) formal inspection for pre-pour check temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check prior to pouring concrete for the NFA track slab (Leighton and MTRCL);

(h) pouring concrete for the NFA pile caps and ground beams and concrete curing (Tung Yat);

(i) removing formwork for the NFA pile caps and ground beams (Tung Yat);

(j) open cut excavation to NFA track slab formation level approx. +3mPD (Leighton);

[4] The responsible party is noted in brackets for each step.

(k) pouring blinding concrete and erecting formwork for the base slab of the NFA track slab (Tung Yat);

(l) installing waterproofing layer (Hop Shing);

(m) installing reinforcement for NFA track slab (Wing and Kwong);

(n) inspecting the reinforcement fixing for NFA track slab (i.e. both routine informal inspections and the formal inspection for rebar fixing) (Leighton and MTRCL);

(o) formal inspection for pre-pour check temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and survey check prior to pouring concrete for the HHS track slab (Leighton and MTRCL);

(p) pouring concrete for the NFA track slab and concrete curing (Tung Yat);

(q) erecting outer formwork for trough walls (Tung Yat);

(r) installing reinforcement for the trough walls (Wing and Kwong);

(s) inspecting rebar for the trough walls (i.e. both routine informal inspections and the formal inspection at a hold point) (Leighton and MTRCL);

(t) formal inspection for pre-pour check and survey check at a hold point, prior to pouring concrete for the trough walls (Leighton and MTRCL);

(u) erecting inner formwork, temporary works inspection of formwork and falsework including completing "TW4 – Permit to load/strike form" and pouring concrete for the trough walls and curing concrete (Tung Yat); and

(v) backfilling trough walls to existing ground level (Leighton).

20. The timeline for the construction works at the NFA was as follows:

(a) the permanent concrete works commenced on the NFA with the pouring of the pile caps on 17 October 2015; and

(b) the final structural pour (being the trough wall at Bay 5 & 15) was on 25 February 2017.

Rebar fixing and concreting works

21. The following documents set out the standards and requirements for the rebar fixing and concreting works in the construction of the NAT, SAT and HHS:

(a) The relevant drawings for the reinforcement (which have been revised in some cases) (numbered LCAL.NAT.11.02, LCAL.SAT.1.02 and LCAL.HHS.1.05 for the NAT, SAT and HHS respectively in the Index);

(b) Appendices to the Buildings Department's letters of consultation for the works, which set out the supervision obligations for the Reinforced Concrete Works and Mechanical Coupler Works (see C13/8229-8309, and LCAL.NAT.10.03,, LCAL.SAT.2.03, LCAL.HHS.2.03 for the NAT, SAT and HHS respectively in the Index);

(c) Site Supervision Plans (numbered LCAL.NAT.10.05, LCAL.SAT.2.05, LCAL.HHS.2.05 for the NAT, SAT and HHS respectively in the Index);

(d) The Method Statements and ITPs (numbered LCAL.NAT.10.04, LCAL.SAT.2.04, LCAL.HHS.2.04 for the NAT, SAT and HHS respectively in the Index);

(e) Materials and Workmanship Specification for Civil Materials and Workmanship Specification for Civil Engineering Works, Section 10 Steel Reinforcement [C5/3545-3773];

(f) BOSA (coupler manufacturer/supplier) Technical and Quality Assurance Manual [C10/7009-7016];

(g) HK Code of Practice for the Structural Use of Concrete 2013 [C13/8348-8554]; and

(h) Practice Note for Authorised Persons PNAP APP-68 [C13/8555-8580].

22. In summary, the steps and procedures involved in the rebar fixing works and concreting works in the construction of the NAT, SAT and HHS should have been as follows:

(a) providing the latest approved design to the rebar fixing subcontractor (Leighton);

(b) developing pour layouts and planned sequence of works through a series of collaborative meetings (Leighton, MTRCL and the relevant rebar fixing subcontractor);

(c) submitting to MTRCL the proposed position and detail of construction joints, as these were not detailed on the approved drawings (Leighton);

(d) preparing bar bending schedules based on approved design, planned construction joint layout (relevant rebar fixing subcontractor);

(e) notifying the responsible engineer of the quantity and diameter of rebar required for upcoming works (relevant rebar fixing subcontractor);

(f) placing order based on the request from the rebar fixing subcontractor with the reinforcement bar supplier (Leighton);

(g) following arrival of rebar on site, spray painting the rebar a designated colour code to indicate batch (Leighton);

(h) directing the rebar fixing subcontractor to prepare samples from each of the batches of rebar delivered to send to the MTRCL laboratory for testing (Leighton and MTRCL);

(i) Leighton's quality team receive test results from MTRCL and advise the responsible engineer (Leighton);

(j) spray painting the rebar to indicate the test result, either green for a pass or red for a fail (Leighton);

(k) deploying reinforcement from the approved tested batch for use on the site (Leighton and the relevant rebar fixing subcontractor);

(l) if required, notifying Leighton's responsible engineer of the threaded bar and coupler requirements depending on the intended use of the rebar (relevant rebar fixing subcontractor);

(m) ordering threaded bar and couplers from the relevant subcontractor[5] (Leighton);

(n) cutting bar from tested rebar batches and sending to the threaded bar and coupler subcontractor for threading (relevant rebar fixing subcontractor);

(o) receiving and checking the threaded bar and coupler (relevant rebar fixing subcontractor);

(p) cutting and bending onsite the rebar that does not require threading in accordance with the approved design (relevant rebar fixing subcontractor);

(q) installing rebar in layers in accordance with the approved design (relevant rebar fixing subcontractor);

(r) inspecting rebar fixing (i.e. both routine informal inspections and the formal inspection at a hold point) (Leighton and MTRCL);

(s) completing formwork installation and other finishing work in preparation for concrete pour (relevant formwork and concreting subcontractors); and

(t) formal inspection for pre-pour check and survey check prior to pouring concrete (Leighton and MTRCL).

23. A summary of the relevant sampling, testing and approval procedures for rebar and coupler assemblies has been disclosed to the Commission [CC1/869]. This testing criteria applies to rebar and couplers used within the NAT, SAT and HHS.

Use of Couplers Instead of Lapping

24. Leighton has disclosed to the Commission:

[5] The main subcontractor to Leighton was BOSA, who were established on site, but other subcontractors were utilised and available to be used on the Project as required.

(a) drawings identifying the indicative locations within the NAT, SAT and HHS where couplers were adopted instead of lapping to connect rebar (numbered LCAL.NAT.11.01, LCAL.SAT.3.01 and LCAL.HHS.3.01 in the Index);[6] and

(b) Leighton has also disclosed the approved drawings showing the original design at the NAT, SAT and HHS (numbered LCAL.NAT.11.02, LCAL.SAT.1.02 and LCAL.HHS.1.05 in the Index).

25. It is not common for the design of the permanent works to detail construction joints. Typically, this detail is developed by the contractor to suit the particular methodology and sequence required when constructing the works.

26. The original designs for the NAT, SAT and HHS did not provide any details in relation to the construction joints for the slabs or walls that were required to be cast in more than one pour.[7] Laps were indicated on the approved design at the junctions between slab and wall elements. That is, the approved design did not indicate any pour layout or whether couplers or lapped bar should be adopted in the construction joints.

27. Leighton's construction engineering team decided to adopt couplers in lieu of lapped bar at some of the construction joints within the NAT, SAT and HHS (as shown in the drawings numbered LCAL.NAT.11.01, LCAL.SAT.3.01 and LCAL.HHS.3.01 in the Index). These decisions were progressively made in consultation with the reinforcement subcontractors for the relevant areas and with the knowledge and approval of MTRCL[8] because:

(a) it was necessary to create or maintain access routes across the site. These routes were essential for safety and logistical reasons. Such access routes would have been blocked if rebar was fully and continuously installed across the construction areas. Leighton was therefore required to build construction joints (with couplers

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[6] Leighton was not obliged to keep contemporaneous records of its use of couplers and lapped rebar at each construction joint within the NAT, SAT and HHS. However, Leighton collected photographs and other records to verify the locations where couplers were adopted at construction joints within the NAT, SAT and HHS. Leighton's engineers (where available) who worked on the relevant areas have also verified these as-built records by reference to photographs and other records.

[7] With the exception that the original design for the NAT indicated that couplers should be used at the stitch joint locations and at the connections to the diaphragm wall at HUH.

[8] MTRCL supervised the construction of the relevant construction joints and approved the works at both the formal inspections for rebar fixing and for pre-pour checks.

installed to allow rebar to be connected at a later date) on either side or below the access routes;

(b) it would ease construction at and around the base and roof slabs where there were multiple layers of large diameter rebar (i.e. T40 or T50 rebar). If a lapped bar was adopted, it would not be feasible to carry out steel fixing for the adjacent bays and fixing of transverse rebar between those that were already installed; and

(c) in relation to the NAT, it would facilitate the temporary works as couplers were adopted in the NSL tunnel walls under temporary ELS strutting to avoid clashes between rebar and struts.

28. The adoption of couplers rather than lapping amounts only to a modification of construction detail and is not a change to the approved design of the relevant works.[9] For this reason, the adoption of couplers did not require the Buildings Department's ("**BD**") prior consultation or acceptance. The Code of Practice for Structural Use of Concrete 2013 [C13/8348-8554] allows for the use of either continuous rebar (as connected by lapping) or rebar connected by couplers. That is, the choice between either continuous rebar (as connected by lapping) or rebar connected by couplers is left up to the construction contractor as a matter of "detail". It is not a change in design and does not represent a "deviation" from the approved design or approved drawings.

29. The summary tables prepared and disclosed by Leighton for the concrete pours in the NAT, SAT and HHS (numbered LCAL.NAT.10.01, LCAL.SAT.2.01 and LCAL.HHS.2.01 respectively in the Index) identify the concrete pours where couplers were adopted instead of lapping. These tables show the status of RISC forms in relation to these concrete pours. Leighton has disclosed copies of the RISC forms available for the relevant concrete pours (disclosed in LCAL.NAT.10.02, LCAL.NAT.2.02 and LCAL.HHS.2.02 for NAT, SAT and HHS respectively in the Index).

[9] Please refer to the Expert Report prepared by Nick Southward of Tony Gee & Partners dated 7 January 2019 [ER1] for confirmation that couplers and lapping are interchangeable and the choice between them is a minor question of detail that is left up to the contractor.

Use of Drill-in Bars in SAT

30. Standard drill-in bars were used to replace damaged/misaligned couplers at the diaphragm wall to NSL base slab connections at panels SAT1, SAT8 and SAT9.[10]

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

32. This is confirmed by a report prepared by Atkins (in its capacity as Leighton's design consultant) entitled "Design Report for HUH Station Primary Structure and Excavation & Lateral Support Part 1 of 4: SAT, Area A and HKC Coliseum Review Drill in bars for SAT [Deliverable No. PWD-234]" ("**Atkins Report**") (numbered LCAL.SAT.3.02 in the Index).

33. The conclusion of the report supported by calculations and structural modelling is "....for the permanent stage, due to the beneficial effect of the uplift water pressure, these drill in bars can be eliminated."

34. MTRCL was aware of, and approved, the use of the drill-in bars. A report was prepared by Atkins and included in the MTRCs DDC submission OR3386 dated 18 December 2015 ("Coupler Report"). The Coupler Report identified that drill-in bars were needed for diaphragm wall panels SAT1, SAT8 and SAT9. The Coupler Report is included as Appendix C in the Atkins Report. Leighton left it to MTRCL to determine whether it was necessary to consult with BD in relation to the use of drill in bars.

HHS Rooms

35. Leighton has disclosed to the Commission drawings identifying the locations of the "standalone SER, TER & CER rooms and associated E&M rooms" (the "**HHS Rooms**")

[10] Please refer to Figure 3.1 in the Atkins Report (numbered LCAL.SAT.3.02 in the Index) for the location of panels SAT1, SAT8 and SAT9.

referred to in the Letters dated 26 March 2019 (numbered LCAL.HHS.3.02 in the Index).

36. As explained above, the original design for the HHS did not provide any details in relation to the construction joints for the slabs or walls that were required to be cast in more than one pour. That is, the approved design did not indicate any pour layout or whether couplers or lapped bars should be adopted.

37. The construction engineering team used lapped bars at the relevant construction joints for the HHS Rooms because it was the most suitable method of connecting the reinforcement in that area.

38. The relevant concrete pours for the HHS Rooms are included in the HHS Summary Table (numbered LCAL.HHS.2.01 in the Index). They are as follows:

    (a) Block 1 & 2 base slab (bay 5) (box number 5 in the HHS Accommodation Blocks);

    (b) Block 1 & 2 column and roof (bay 7) (box number 27 in the HHS Accommodation Blocks);

    (c) Block 3 base slab (bay 2) (box number 35 in the HHS Accommodation Blocks);

    (d) Block 3 base slab (bay 3) (box number 36 in the HHS Accommodation Blocks);

    (e) Block 3 column and roof (bay 1) (box number 37 in the HHS Accommodation Blocks); and

    (f) Block 3 column and roof (bay 2) (box number 38 in the HHS Accommodation Blocks).

39. The HHS Summary Table shows the status of RISC forms in relation to these concrete pours. Leighton has disclosed copies of the RISC forms available for the relevant concrete pours (numbered LCAL.HHS.2.02 in the Index).

Materials (Couplers and Rebar)

40. The Commission has requested "*a summary showing (1) the number of rebar and couplers which would have been required in the original design and (2) the number of rebar and couplers actually required and used by adopting the deviated designs.*"

41. As explained above, the original design (as reflected in the approved drawings) did not provide details in relation to the construction joints (i.e. it did not indicate the location of construction joints and whether couplers or lapping should be adopted at particular construction joints). It is therefore not meaningful to compare the quantity of rebar and couplers indicated on the original design to the quantity of rebar and couplers used in the NAT, SAT and HHS.

42. The original design for major structural works in the NAT, SAT and HHS required rebar, couplers and concrete. All of these items were ordered from approved suppliers. As explained above, couplers were ordered and adopted at some construction joints. This reflects the fact that the drawings did not need to specify whether couplers or lapping should be adopted because this was a question of detail that was left up to Leighton. It follows that the materials ordered and adopted at the construction joints in the NAT, SAT and HHS were in accordance with the approved drawings.

43. In summary, the usual procedure for ordering and testing rebar for the Project (with the party responsible for each step listed in brackets) was as follows:

(a) proposing supplier of rebar (Leighton);

(b) approving supplier of rebar (MTRCL);

(c) bulk ordering of rebar (Leighton);

(d) requesting materials of suitable specification and quantity in accordance with approved drawings (rebar fixing subcontractor[11]);

(e) ordering reinforcement in accordance with the rebar fixing subcontractor's request (Leighton);

(f) visually inspecting materials upon delivery to site for quantity and quality compliance (rebar fixing subcontractor and Leighton);

(g) selecting rebar samples for testing (Leighton / MTRCL);

[11] The rebar fixing subcontractor for the NAT and HHS was Wing & Kwong. The rebar fixing contractor for the SAT was Fang Sheung.

(h) cutting rebar samples as directed (rebar fixing subcontractor);

(i) tagging rebar samples using MTS identification tag (Leighton);

(j) sending photographic record of rebar samples to MTRCL inspector (Leighton);

(k) approving rebar test batch in MTS system prior to test (MTRCL); and

(l) witnessing the testing of rebar samples in accordance with the relevant ITP (MTRCL)

44. The member of Leighton's construction engineering team who ordered each batch of rebar for the Project was also responsible for arranging the sampling and testing of the rebar. The engineer would need to liaise with MTRCL's staff and Leighton's quality team in relation to the sampling and testing.

45. In summary, the usual procedure for ordering and testing coupler assemblies for the Project (with the party responsible for each step listed in brackets) was as follows.

(a) order batch of couplers specifying the type, diameter and quantity on the coupler order form or purchase requisition (Leighton);

(b) deliver couplers to site (the delivered pallets are labelled to indicate they are not yet tested and not able to be used) (BOSA);

(c) submit RISC form to MTRCL for selection of coupler sample from delivered batch, MTRCL to sign/initial on selected coupler (Leighton/MTRCL);

(d) order threaded bar for the test sample coupler assembly (Leighton);

(e) prepare threaded bar and coupler assembly (BOSA);

(f) submit RISC form to MTRCL for verification of coupler assembly samples (Leighton/MTRCL);

(g) deliver coupler samples to HOKLAS certified testing laboratories (Leighton);

(h) receive test results and:

(i) if couplers passed the testing, change label on coupler pallets to approved status and allow use on site (Leighton); and

(ii) if couplers failed the testing, arrange and conduct re-testing (Leighton).

46. The testing of couplers assemblies was handled by one member of Leighton's construction engineering team. This task could be handled by one person because there was a manageable number of batches of couplers that were ordered for the Project when compared to the rebar.

Dated the 17th day of May 2019.

Signed: _____

William Holden