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

WITNESS STATEMENT OF HENRY LAI

I, **HENRY LAI** of 39/F Sun Hung Kai Centre, 30 Harbour Road, Hong Kong, will say as follows:

- I am a civil engineer with Bachelor of Engineering in Civil Engineering and Master of Science in Civil Engineering. I joined Leighton Contractors (Asia) Limited ("Leighton") as an Engineer in June 2013. I was promoted to Senior Engineer of Leighton in early 2018 and continue to hold that position.
- 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.

Duties and responsibilities for the Area of the North Approach Tunnel

- 3. I have been working on the Hung Hom Station Extension contract (Contract SCL 1112) ("**Project**") under the Shatin-Central rail link project since February 2016. I had worked on the external area and the tunnel structure of the North Approach Tunnels ("**NAT**"), the Back of House West of the Hung Hom Station and the North Fan Area of the Project. I was then transferred to the Hung Hom Stabling Sidings area of the Project. The project manager for the Project is MTR Corporation Limited ("**MTRCL**").
- 4. The part of the NAT which I covered includes: -
 - (a) the three stitch joints in NAT and at the interface between the Project and the Hung Hom North Approach Tunnels contract (Contract SCL 1111) ("SCL 1111") respectively (the "3 Stitch Joints"); and
 - (b) the shunt neck interface between the Project and SCL 1111 (the "Shunt Neck Joint").

- 5. Wing & Kwong Steel Engineering Company Limited ("Wing & Kwong") was the subcontractor for the fixing of reinforcement bars ("rebar") for the NAT, the 3 Stitch Joints and the Shunt Neck Joint.
- 6. Hills Construction Limited ("**Hills**") was the subcontractor for concreting and necessary formwork after the fixing of rebar for the NAT, the 3 Stitch Joints and the Shunt Neck Joint.
- 7. My usual working hours on the Project were from 8am to 6pm.
- 8. From May to December 2017, I attended weekly works meetings (usually on Wednesdays subject to the attendees' availability) alongside Joe Tam (Construction Manager) of Leighton with the MTRCL's construction engineers for the NAT (Joe Tsang, Chris Chan and Kappa Kang). In those meetings, we would discuss the plans regarding dates, sequence, locations, etc. of the concrete pours and site progress in general.
- 9. On a typical day, I spent most of my time (usually from around 9am to 5pm, especially around the period of the pouring of concrete) on site supervising various construction works, including conducting routine inspections.
- I would usually check once in the morning and once in the afternoon on the progress and manpower for the works. If there were any issues, I would raise them with the foremen of Wing & Kwong and Hills.

The 3 Stitch Joints

11. At the time of construction, my understanding was that the steps and procedures involved in the rebar fixing and concreting works for the construction of the 3 Stitch Joints were no different from other rebar fixing and concreting works in other areas of the Project. The 3 Stitch Joints were to be connected by inserting rebar into couplers that were installed in the concrete on both sides of the joint, and tying the rebar to those in the couplers in order to form a lapped connection. However the 3 Stitch Joints were different to the other works in that the bay width was much smaller (i.e. about 2 metres versus 10 metres), they were cast late and out of sequence, and for the two of the 3

Stitch Joints that have roof structures, those roofs were poured using concrete injection rather than the usual fill from the top.

- 12. The rebar and couplers used in the construction of the 3 Stitch Joints were BOSA brand couplers and BOSA threaded rebar. They are the only couplers that I worked with during construction of the NAT, and I had thought that they were the only couplers and rebar that should be used in the construction of the 3 Stitch Joints and the Shunt Neck Joint. The working drawings did not indicate the type of coupler and rebar that should be used.
- 13. I was not involved in any meetings or discussions between Leighton and the contractor for SCL 1111. I am not aware that there are any documents setting out the details of the reinforcement used on SCL 1111's side of the interface. In fact, Leighton had to raise a Request For Information (RFI) with MTRCL before the details of the Project's side of the interface were provided. Although I was not involved in that RFI, I now understand that it was raised on or around 13th May 2016 and MTRCL replied on or around 23rd May 2016. I was not aware that there has been interface meetings between representatives of Leighton and the contractor for the SCL 1111. Since I was not involved in those meetings, I do not know what was discussed and I did not receive any feedback in relation to the matters discussed in those meetings.

Testing of rebar

- 14. As a member of Leighton's construction engineering team on the Project, the engineers at my level (including myself) were typically responsible for placing orders for batches of rebar and liaising between the rebar fixing subcontractor and the rebar supplier. My practice was to place an order for a batch of rebar with the supplier (who was under contract with Leighton) and provide the supplier with information such as the quantity, size of the rebar and the required delivery date. The rebar fixing subcontractor would provide this information to me when they required rebar to be ordered. After placing the order, I typically let the rebar fixing subcontractor and rebar supplier communicate directly in relation to the details of delivery.
- 15. The rebar delivered to the site would be tested. The rebar fixing subcontractor would cut samples of the rebar to the required size and place them in a secure location on the site. I would collect the certificate issued by the supplier (i.e. from the steel mill),

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procure numbered orange coloured tags from Leighton's quality assurance team and tie them around the sample bars. I would also take photos of the samples that were ready to be tested (e.g. numbered **LCAL.NAT.3.19** in the Second Index of Documents disclosed by Leighton ("**Index**")) and put hard copies of the photos on the responsible MTRCL's Inspector of Works' (Tony or Chung) desk at the site office. I would also access MTRCL's MTS system in order to fill in the information about the rebar samples. I understand that Leighton's quality assurance team would then come around to the secure location and arrange to have the rebar samples delivered to MTRCL's laboratory for testing.

- 16. I am aware that the ends of rebar that were subject to testing were painted but, at that time, I did not realise that this was to indicate their testing status. Rebar was deployed on site before the test results were received in order to achieve the progress required by MTRCL (as determined at the weekly works meetings). I am not aware that MTRCL ever took issue with this approach. I am not aware of any failed test results for the rebar used in the Project.
- 17. I also placed orders for couplers from BOSA, being the coupler supplier for the Project.I was not involved in arranging tests on the couplers. The couplers were delivered to BOSA's area of the site and were distributed from there.
- 18. In or around February 2018, I was informed that an investigation was conducted into water seepages at one or more of the 3 Stitch Joints, and as a result, defects were identified with the reinforcement at those 3 Stitch Joints. I did not take part in the investigation to identify the defects, but I was involved in the subsequent remedial work. I participated in joint inspections with MTRCL (in particular, with Alex (Inspector of Works) and Ben (Construction Engineer)) of the remedial work at the later stages when I was rotated on to the morning shift. I did not participate in the joint inspections with MTRCL at the earlier stages of the remedial work as I was on the night shift at that time. I was mainly involved with other supervision work such as progress, logistics, etc. during the time when I was on the night shift.
- 19. I did submit Request For Inspection / Survey Check ("RISC") forms for the formal joint inspections for which I was responsible when supervising the remedial work on the 3 Stitch Joints. The routine inspections and formal joint inspections for the remedial

work were conducted rigorously. For example, I would usually spend the whole shift at the location where the remedial work was being undertaken to monitor the subcontractors.

The Shunt Neck Joint

- 20. At the time of construction, my understanding was that the steps and procedures involved in the rebar fixing and concreting works for the construction of the Shunt Neck Joint were no different from other rebar fixing and concreting works in other areas of the Project.
- 21. The key difference between the Shunt Neck Joint and the 3 Stitch Joints was that a construction joint (instead of a stitch joint) was used at the Shunt Neck Joint to connect the interface between the Project and SCL 1111 in the Shunt Neck.
- 22. I understand that prior to construction of the Shunt Neck Joint, Leighton also submitted a RFI to MTRCL and received a reply that there was no stitch joint at this Shunt Neck Joint. I was informed at that time that this information had also been confirmed with the contractor for SCL 1111 team (as reflected under the RFI reply).
- 23. The rebar and couplers used in the construction of the Shunt Neck Joint were BOSA brand couplers and BOSA threaded rebar. As with the 3 Stitch Joints, I did not know that any other coupler or rebar should have been used at the Shunt Neck Joint. The working drawings did not indicate the type of coupler and rebar that should be used.
- 24. I was involved in the joint inspection of the rebar fixing works with MTRCL. I can confirm that a construction joint was built at the Shunt Neck Joint.
- 25. The rebar ordering and testing process for rebar used in the Shunt Neck Joint is similar to the process described in paragraphs 14 to 16 above. I am not aware of any significant difference in the testing process for the rebar ordered and used at the Shunt Neck Joint.
- 26. I was not aware of the defects identified at the Shunt Neck Joint during the period of construction. I only learned about them after they were identified in or around February 2018 by other Leighton staff. I was not involved in the identification of the defects or the remedial work for the Shunt Neck Joint.

Supervision, inspection and record of the works

- 27. Whenever I was on site, I saw MTRCL's Inspector of Works (Tony and Chung) carrying out routine checks at the NAT, the 3 Stitch Joints and the Shunt Neck Joint. Sometimes I also saw MTRCL's construction engineers (Chris Chan and Kappa Kang) conducting routine site inspections at the NAT, the 3 Stitch Joints and the Shunt Neck Joint. Members of Leighton staff and I would communicate with them regarding the ongoing construction activities onsite. They would also let us know if they identified any defects that needed to be rectified. MTRCL's construction engineers / Inspectors of Works were always aware of what was happening on site and were quick to inform Leighton if they wanted anything to be done or any issue to be rectified.
- 28. For each concrete pour, there were two "hold points" when Leighton would need to request MTRCL's construction engineer / Inspector of Works to conduct formal joint inspections: after reinforcement bar fixing ("rebar fixing check"), and before the pouring of concrete ("pre-pour check"). Before such joint inspections took place, Leighton's engineers would check to ensure the general works were in order. Following those joint inspections, Leighton's engineers would follow up on any issues raised to the satisfaction of MTRCL.
- 29. For the first few concrete pours in the NAT, I issued the RISC forms to document the request for a rebar fixing check and a pre-pour check. My workload got very heavy later on, including when the 3 Stitch Joints and the Shunt Neck Joint were being constructed. As a result, I did not have time to complete some of these RISC forms before the formal joint inspections with MTRCL. While I intended to complete those RISC forms shortly after the formal joint inspections, my workload never eased up and I forgot to complete them for the rebar fixing checks and pre-pour checks at the 3 Stitch Joints and the Shunt Neck Joint.
- 30. MTRCL's construction engineer / Inspector of Works did not require that the RISC forms were submitted before formal joint inspections for the NAT, the 3 Stitch Joints and the Shunt Neck Joint and allowed work to proceed if they had given their verbal approval after those inspections. It was standard practice that work would proceed if MTRCL's construction engineers / Inspectors of Works gave their verbal approval after a rebar fixing check and pre-pour check. During the construction period, MTRCL's

construction engineer / Inspector of Works did not complain about or mention the fact that RISC forms were not completed for rebar fixing checks and pre-pour checks.

Rebar fixing checks

- 31. In relation to all the concrete pours for which I was the responsible engineer, when Wing & Kwong was about to complete the rebar fixing work for a particular pour area, I would bring along with me the relevant drawings and check on the work. In particular, I would check the size of rebar used, spacing of rebar and number of rebar layers. I would have another brief check on the shape and form of the rebar cage once the rebar fixing work was finished to see if there were any obvious issues.
- 32. At the same time, I would arrange a rebar fixing check with the MTRCL's construction engineer (Chris Chan or Kappa Kang, who were MTRCL's Construction Engineer I and Construction Engineer II respectively) by phone or in person, usually one day in advance. On the day of the scheduled rebar fixing check, I would call the MTRCL's construction engineer again to confirm.
- 33. The MTRCL's construction engineer would attend every rebar fixing check. When I attended the rebar fixing check with the MTRCL's construction engineer, I would bring along the relevant drawings on which both the MTRCL's construction engineer and I would rely for the formal inspection. Workers from Wing & Kwong would also be present so as to attend to any occasional rectification work that was identified by MTRCL's construction engineer or me during the rebar fixing check. This is consistent with MTRCL's site diary records, which recorded the rebar fixing works for the 3 Stitch Joints and the Shunt Neck Joint that was undertaken before, and was inspected by MTRCL during, the rebar fixing check. The rebar fixing check was conducted on the day of the completion of the rebar fixing work or soon after in order to avoid any delay in progress. These site diary records have been disclosed to the Commission under section LCAL.NAT.2 in the Index.
- 34. I would only allow work to proceed after a rebar fixing check if the MTRCL's construction engineer had given verbal approval. I would then inform the MTRCL's Inspector of Works, usually by phone, that the MTRCL's construction engineer had given permission to proceed. I would also inform verbally those who were responsible for the next stage of works.

- 35. I was the Leighton engineer responsible for conducting the rebar fixing check with the MTRCL's construction engineer for the 3 Stitch Joints and the Shunt Neck Joint. I confirm that I conducted those checks with MTRCL's construction engineer (Chris Chan) and no issues regarding the rebar and couplers and their connections were discovered at the time.
- 36. I was not aware during construction that the couplers used by the contractor for SCL 1111 were different from those used on the Project (see paragraphs 12 and 13 above). As a result, I did not closely inspect the thread inside the couplers installed by the contractor for SCL 1111 at the interface between SCL 1111 and the Project, and did not notice that they were any different from the other couplers used on the Project.
- 37. All layers of rebar at the 3 Stitch Joints and the Shunt Neck Joint were fixed in a continuous process. I supervised the installation of the rebar but did not pay special attention to the couplers. I cannot recall anyone raising any issue regarding the connections between the couplers and the threaded rebar at the time. In particular, the MTRCL's construction engineer did not raise any defects or issues at the time. I received verbal approval to proceed from MTRCL's construction engineer after those rebar fixing checks were completed.
- 38. While conducting the remedial works at the 3 Stitch Joints, the rebar fixing check with MTRCL's construction engineer involved rigorous inspection of the reinforcement. I can confirm that during the remedial works stage LENTON brand couplers and LENTON threaded rebar were used at the 3 Stitch Joints.
- 39. For the remedial works at the 3 Stitch Joints, I was instructed to conduct a torque test to confirm that the rebar was connected to the LENTON brand couplers during the rebar fixing check. I did not conduct such tests at the rebar fixing checks during the construction of the 3 Stitch Joints because I was not aware at the time that a different type of coupler was used by the contractor for the SCL 1111 (see paragraphs 12 and 13 above). Generally, the torque test was not required to check the connections between rebar and couplers on the Project.

Pre-pour checks

- 40. After the rebar fixing check was completed, the next step would be preparing the area for the pouring of concrete. If formwork was required, I would check to ensure it was done according to the approved design drawing. For example, I would check the spacing and layers. When the preparation work for the pouring of concrete was about to be completed, I would generate a request for a "permit to load" to the extent that they were required. This permit was known as a TW4 form ("TW4"). Copies of the TW4 have been disclosed to the Commission under section LCAL.NAT.2 in the Index. The TW4 would then be handed to Leighton's Temporary Works Coordinator ("TWC") along with documents related to the concrete pour (such as the design plan). An additional checklist was later introduced and would also be attached to the TW4 to be submitted to the TWC. The TWC would carry out his inspection of the formwork on the requested inspection date. The TW4 would be signed and issued upon the TWC's satisfaction.
- 41. I would then provide a photocopy of the issued TW4 to the MTRCL's Inspector of Works to indicate that the formwork had been approved. I confirm that I issued TW4s (and provided a copy to the MTRCL's Inspectors of Works) for the 3 Stitch Joints (to the extent required).
- 42. One day before the concrete pour (the date of which had been previously discussed in the weekly works meetings and agreed between Leighton and MTRCL), I would confirm with the MTRCL's Inspector of Works, either by phone or in person, the time of the pre-pour check, which usually happened on the day of the concrete pour. I would also conduct an inspection myself on the day before the pre-pour check.
- 43. The MTRCL's Inspector of Works would be present at every pre-pour check. Workers from Hills would also attend in order to follow up on any matters such as the general cleanliness of the area of the concrete pour. This is consistent with MTRCL's site diary records, which recorded the concrete pours for the 3 Stitch Joints and the Shunt Neck Joint and the work that was undertaken before, and was inspected by MTRCL during, the pre-pour check. The pre-pour check was conducted on or shortly before the day of concrete pour. These site diary records have been disclosed to the Commission under

section **LCAL.NAT.2** in the Index. I would only allow work to proceed after a prepour check if the MTRCL's Inspector of Works had given verbal approval.

- 44. The MTRCL's Inspector of Works gave verbal approval for all concrete pours at the 3 Stitch Joints and the Shunt Neck Joint. The MTRCL's Inspector of Works would not allow the concrete to be poured, unless he and the MTRCL's construction engineer had approved the works and given permission to proceed after the rebar fixing check and the pre-pour check.
- 45. After Leighton received the on-site approval from the MTRCL's Inspector of Works for the pouring of concrete, I would later report to the MTRCL's Inspector of Works on real-time progress when the pouring of concrete was under way. In particular, I would report the volume of the concrete poured (which is recorded in the site diaries as prepared by MTRCL (disclosed to the Commission under section **LCAL.NAT.2** in the Index)), as well as the starting and finishing time of the pour. The MTRCL's Inspector of Works would occasionally drop by during concrete pours and would follow up on the progress.

Dated the 2nd day of May 2019.

Signed: ...

Henry Lai