

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

FINAL CLOSING SUBMISSIONS FOR ATKINS CHINA LIMITED

COI 1

17 January 2020

INTRODUCTION

1. Atkins China Limited ("Atkins") was the detailed design consultant for MTR Corporation Limited ("MTRCL")¹ and became an Involved Party² in the original Commission of Inquiry ("the Commission") into the Diaphragm Wall and Platform Slab Construction Works at the Hung Hom Station Extension under the Shatin to Central Link Project.
2. As the Commission will recall, Atkins participated in COI 1 by way of providing documents and other materials, leading evidence before the Commission, assisting the Commission by responding to a number of additional requests for information and making Closing Submissions.
3. On 12 October 2019, the Commission directed *inter alia* that further Structural Engineering evidence to be led "*should focus on whether the as-constructed works are safe and fit for purpose from a structural engineering perspective; and only if they are considered not safe or fit for purpose that such experts should then provide their opinion on whether the suitable measures (as agreed in the Holistic Report or*

¹ Atkins was also as the technical advisor for the contractor Leighton Contractors (Asia) Limited.

² Letters dated 2 October 2018 and 15 October 2018 (the latter of which is referred to as "the Salmon Letter").

Verification Report, or subsequently) are necessary for safety from a structural engineering perspective; and [that]...the SE experts shall not be required to look into the question of whether the suitable measures (as agreed in the Holistic Report or Verification Report, or subsequently) are required for statutory or code compliance".³

4. In the light of this direction, Atkins has considered the further structural engineering expert evidence provided to the Commission and has so far, at least, been represented by way of a 'watching brief' only during the hearing from 2 to 9 January 2020. Atkins is not involved in COI 2.
5. Pursuant to the Commission's directions of 9 January 2020,⁴ Atkins now makes these Final Closing Submissions. However, Atkins does not at this stage consider it necessary to make any oral submissions, unless it would be helpful to the Commission. If the Commission would find it helpful, we estimate the time involved will not exceed 15-30 minutes.
6. These Final Closing Submissions are brief in their extent but we hope of assistance to the Commission in its consideration of matters. They deal with the approach taken by Atkins in the preparation of the Stage 3 Assessment Report (Rev. A) ("the Stage 3 Report");⁵ and record the conclusion of some evidence on which the Commission wrote to the Parties, following the hearing in January 2019.

ATKINS' ROLE

7. Atkins was appointed by MTRCL on or about January 2019 to provide technical support for the Stage 3 Report and the Holistic Report (as one

³ OU10561-OU10562.

⁴ OU11464-OU11465.

⁵ OU4026-OU8578.

of the external consultants).⁶ The Stage 3 Report was issued on 20 August 2019.⁷

THE PURPOSE OF THE STAGE 3 REPORT

8. The Stage 3 Report sets out results from Atkins' Stage 3 Assessment, which "*reanalysed the station structure*" following the receipt of the results of the investigations in Stages 1 and 2,⁸ and proposed certain suitable measures to be carried out for the as built station structures.⁹
9. The Commission in its said direction of 12 October 2019 focused the recent evidence on whether the as-constructed works are safe and fit for purpose from a structural engineering perspective, and not on statutory or code compliance.

SUGGESTIONS THAT THE STAGE 3 REPORT IS CONSERVATIVE

10. It may be helpful in the Commissioners' consideration of the evidence, to understand the context of some views expressed during the evidence submitted to the Commission, as regards Atkins' approach to the Stage 3 Report. The reason for that approach was understandable in the circumstances described below and no criticism ultimately appears to be made of Atkins in that regard – nor should properly be made of them.
11. Mr Southward, Dr Glover and Professor McQuillan have made comments during the course of the evidence received by the Commission that the Stage 3 Report was conservative in nature.¹⁰

⁶ Along with Ove Arup & Partners Hong Kong Limited and AECOM Asia Company Limited. See Holistic Report, para 4.1.1 [OU3273].

⁷ OU4028.

⁸ Para 2.1.6 [OU4046].

⁹ Para 1.13.1 [OU4045]. See also para 2.3.4 [OU4048].

¹⁰ See Professor McQuillan's report, para 183 [ER2, item 15.1, page 58]; Professor McQuillan's oral evidence [Transcript 11/135]; Dr Glover's oral evidence [Transcript 10/77-79]; Mr Southward's oral evidence [Transcript 7/73, 81-82, 87]

12. Atkins' position is as follows:
 - 12.1 The Stage 3 Report was prepared in accordance with the updated design assumptions set out in the Holistic Report prepared by MTRCL.¹¹
 - 12.2 However, the extent to which the Stage 3 Report was conservative arose from the need to address the requirements for code compliance and consequently the obtaining of statutory approval.¹² Atkins acknowledged in section 16 of the Stage 3 Report that there is considered to be some additional conservatism remaining in the approach taken and the assumptions made.¹³
13. Atkins now addresses three respects in which the Stage 3 Report was said to be conservative:

Partially engaged couplers were not considered

- 13.1 Professor McQuillan commented in his report that the Stage 3 Report did not consider the capacity of partially engaged or connected couplers.¹⁴ Atkins' position is as follows:
 - 13.1.1 The Stage 3 Assessment was prepared in accordance with the Holistic Report, i.e. "*[t]he strength of those coupler assemblies with engagement less than 37mm by PAUT has not been included in the Assessment*".¹⁵ MTRCL provided the reduction factors derived from the statistical analysis to Atkins for the

¹¹ The Stage 3 Report, Table 5.1 [OU4056-4057]. See also Holistic Report, Table 5 [OU3280-3282].

¹² Stage 3 Report, para 1.13.1 [OU4045].

¹³ The Stage 3 Report, Section 16 [OU4128-4139].

¹⁴ Professor McQuillan's report dated 6 December 2019, para 72 [ER2, item 15.1, page 31]. See also Professor McQuillan's oral evidence [Transcript 11/151].

¹⁵ Holistic Report, para 4.2.4 [OU3276].

Stage 3 Assessment.¹⁶ Professor McQuillan accepted this in his oral testimony.¹⁷

13.1.2 At section 16.8.16 of the Stage 3 Report, Atkins considered that *"it would therefore be possible to include the coupled bars with minimum 28mm engagement for the SLS condition, and with minimum 32mm engagement at ULS, in the capacity checks for the structures"*.¹⁸

13.1.3 Further, Professor McQuillan acknowledged that the partially engaged couplers were not considered as Atkins was *"simply acting on the recommendations of the holistic report in their stage 3 assessment"*.¹⁹

Shear links at platform slabs were not considered

13.2 A number of experts considered that in determining safety and fitness for purpose from a structural engineering perspective, the shear links at the platform slabs should have been considered.²⁰ Atkins' position is as follows:

13.2.1 The Holistic Report (in accordance with which the Stage 3 Report was prepared) stated that *"in order to avoid damaging the structure by extensive opening up, a conservative approach has*

¹⁶ Report on Statistical Analysis in relation to the Final Report on Holistic Assessment Strategy for the Hung Hom Station Extension dated 13 September 2019, para 4 [ER1, item 11.1, page 2]. See also the Stage 3 Report, para 1.3.3 [OU4039].

¹⁷ Professor McQuillan's oral evidence [Transcript 12/5], *"instructed to override that observation by imposing the strength reduction factors dictated by the holistic report"*.

¹⁸ OU4138.

¹⁹ Professor McQuillan's oral evidence [Transcript 11/151-152].

²⁰ See Professor McQuillan's report, para 115 [ER2, item 15.1, page 40]; Professor McQuillan's oral evidence [Transcript 11/156]; Dr Glover's oral evidence [Transcript 10/111-112]; Mr Southward's report, para 5.6.2 [ER2, item 14.1, page 8]; Mr Southward's oral evidence [Transcript 7/73, 81].

been adopted to ignore any shear links at platform slabs that may have been installed in the Assessment".²¹

13.2.2 At section 16.7.3 of the Stage 3 Report, Atkins recognised that residual strength of the partially installed links can still be assessed and the contribution can be included in the capacity of the slab.²²

13.2.3 Professor McQuillan, when referring to shear links at the platform slabs, also clarified his earlier comment in his report during the hearing that he was "*not criticising Atkins for what they did...just saying they were acting on instructions*" and "*implementing the recommendations of the holistic report*".²³

Design concrete strength instead of actual concrete strength was adopted

13.3 A number of experts considered that in determining safety and fitness for purpose from a structural engineering perspective, the actual concrete strength instead of the design concrete strength should be adopted.²⁴ Atkins' position is as follows:

13.3.1 It was necessary to adopt the design concrete strength instead of the actual concrete strength (which could be derived from the cube strength) for code and statutory compliance.²⁵

13.3.2 At section 16.6 of the Stage 3 Report, Atkins recognised that the cube strengths and concrete cores taken from the diaphragm walls and slabs provide an indication that in-situ concrete

²¹ Holistic Report, para 4.2.17 [OU3278].

²² [OU4136].

²³ Transcript 11/157.

²⁴ See Professor McQuillan's report, para 116 [ER2, item 15.1, page 40]; Professor McQuillan's oral evidence [Transcript 11/176]; Dr Glover's oral evidence [Transcript 10/112]; Mr Southward's report, paras 5.4 and 5.6.2 [ER2, item 14.1, pages 6 and 8]; Mr Southward's oral evidence [Transcript 7/73].

²⁵ The Stage 3 Report, para 7.2.1 [OU4061].

strengths are likely to exceed those adopted from the original design. Atkins noted also that "*[t]hese increased strengths can be statistically analysed and adopted for an assessment and could significant enhance the shear strength for the reinforced concrete*".²⁶

HORIZONTAL CONSTRUCTION JOINTS

14. This point is addressed to assist the conclusion of the Commission's consideration of evidence which was heard, but not completed, at the end of evidence in January 2019.
15. The structural engineering expert appointed previously on behalf of the Government, Professor Au, is understood to have had reservations regarding the internal stresses at the top-of-wall construction joint relating to the changed construction detail,²⁷ which required a review of the internal stresses to be carried out.
16. Pursuant to the Commission's request on 4 February 2019,²⁸ Atkins provided further data for the checking of the EWL-wall joints on 20 February 2019²⁹ and carried out the checking of the horizontal construction joint as set out at section 13 of the Stage 3 Report.³⁰
17. All structural engineering experts agree that the issue of horizontal constructions joints is "*solely a workmanship issue*"³¹ and accordingly, this issue appears to have been resolved to the satisfaction of all the experts.

²⁶ The Stage 3 Report, para 16.6.1 [OU4136]. See also para 16.7.2 [OU4136].

²⁷ Interim Report, para 332a [A815].

²⁸ OU915-OU916.

²⁹ OU917.2-OU917.15.

³⁰ OU4103-OU4118.

³¹ Joint Memorandum of Agreement dated 20 December 2019, item 3, para 1 [ER2, item 18.3].

CLOSE

18. Atkins' approach to the Stage 3 Assessment was determined by a number of factors including the criteria set out in the Holistic Report and overall, the need in the Stage 3 Report to consider the requirements for code and statutory compliance. In the circumstances, the Commissioners are entitled to hold that the approach taken by Atkins in the Stage 3 Report was appropriate.

19. Atkins trusts that these Final Closing Submissions assist the Commission in its consideration of the evidence in COI 1 and in reaching its Final Report on the matters raised in the Terms of Reference. Upon the evidence heard, Atkins respectfully commends to the Commission that its Interim Report (and in particular the Findings at paragraphs 370-377, 383-390 and 481(2)) should be confirmed in its Final Report.

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