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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RESPONSE TO STEVE ROWSELL'S REPORT ON PROJECT MANAGEMENT OF THE CONSTRUCTION WORKS AT AND NEAR THE HUNG HOM STATION EXTENSION UNDER THE SHATIN TO CENTRAL LINK PROJECT

BY

GEORGE W. WALL

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INTRODUCTION

Expert's Details

1. I have been engaged by O'Melveny & Myers, on behalf of Leighton Contractors (Asia) Limited, to provide my opinion on project management issues for the purposes of the Extended Commission of Inquiry into the Construction Works at and near Hung Hom Station Extension under the Shatin to Central Link Project ("**Extended Inquiry**").

2. I am the Managing Director of Asgard Project Solutions (PTE.) LTD, which is a specialist project management and dispute advisory firm with its principal office based at 17/F, Yue Hing Building, 103 Hennessy Road, Wanchai, Hong Kong.

3. I am a Chartered Civil Engineer registered with the Engineering Council of the United Kingdom and a Chartered Quantity Surveyor registered with the Chartered Institute of Civil Engineering Surveyors, specialising in the planning and management of construction projects.

Instructions

4. I have been instructed to provide my opinion on project management issues in response to Mr Steve Rowsell's Expert Report dated 23 August 2019 ("**Rowsell's Second Report**").

Structure of this Report

5. This report is split into two parts. The first part responds to the areas of Rowsell's Second Report that I disagree with and the second part looks at areas where I am in general agreement, but have reservations or additional comments to make.

6. Mr Rowsell has stated that his report for the Original Inquiry ("**Rowsell's Original Report**"), which sets out his interpretation of MTRCL's obligations flowing from the Entrustment Agreement ("**EA**") for Construction and Commissioning of the Shatin to Central Link dated 29 May 2012 [**G7/5595+**], is relevant to and applies to the Extended Inquiry.

7. Therefore, where applicable, I have referenced and commented on Mr Rowsell's opinion concerning the EA.

The Commission's Terms of Reference

8. I understand that the Commission's Expanded Terms of Reference are:

"Regarding the MTR Corporation Limited ('MTRCL')'s Contract No. 1112 ('Contract') of the Shatin to Central Link Project:

(a)(1) in respect of the diaphragm wall and platform slab construction works at the Hung Hom Station Extension,

(i) to inquire into the facts and circumstances surrounding the steel reinforcement fixing works, including but not limited to those works at locations that have given rise to extensive public concern about their safety since May 2018;

(ii) to inquire into the facts and circumstances surrounding any other works which raise concerns about public safety; and

(iii) to ascertain whether the works in (1)(i) and (ii) above were executed in accordance with the Contract. If not, the reasons therefor and whether steps for rectification have been taken;

(2) in respect of the construction works at the North Approach Tunnels, the South Approach Tunnels and the Hung Hom Stabling Sidings,

(i) to inquire into the facts and circumstances surrounding any problem relating to the steel reinforcement fixing or concreting works, including but not limited to any lack of proper inspection, supervision or documentation of such works undertaken, any lack of proper testing of the materials used for such works and of proper documentation of such testing, and any deviation of such works undertaken from the designs, plans or drawings accepted by the Highways Department or the Building Authority;

(ii) to inquire into the facts and circumstances surrounding any works or matters which raise concerns about public safety or substantial works quality; and

(iii) to ascertain whether the works and matters involved in (2)(i) and (ii) above were executed in accordance with the Contract. If not, the reasons therefor and whether steps for rectification have been taken;

(b) to review, in the light of (a) above,

(i) the adequacy of the relevant aspects of the MTRCL's project management and supervision system, quality assurance and quality control system, risk management system, site supervision and control system and processes, system on reporting to Government, system and processes for communication internally and with various stakeholders, and any other related systems, processes and practices, and the implementation thereof; and

(ii) the extent and adequacy of the monitoring and control mechanisms of the Government, and the implementation thereof; and

(c) in the light of (b) above, to make recommendations on suitable measures with a view to promoting public safety and assurance on quality of works."

Disclosure of Interests

9. I do not have any current connections with any of the parties, witnesses or advisors involved in the Commission of Inquiry.

EXECUTIVE SUMMARY

10. This report serves as a response to Rowsell's Second Report on the project management issues associated with the Expanded Terms of Reference for the Extended Inquiry.

11. I disagree with Mr Rowsell's view that there is uncertainty regarding the contracting relationship between Government and MTRCL and I do not find references to Cross Rail in the UK to be helpful; this is because Cross Rail had more than one sponsoring Government Department, which is not the case for SCL.

12. I generally disagree with Mr Rowsell's view that MTRCL's Project Management Plan ("**PMP**") for the SCL scheme should contain further details as I think that it was intended as a high-level strategic document and not for the day to day running of the project. I believe that MTRCL's Project Integrated Management System ("**PIMS**") documents that are appended to the PMP are an appropriate platform on which to build detailed project controls for individual projects.

13. I disagree with Mr Rowsell's view that methods statements were not submitted in line with the contract requirements for the stitch joints.

14. I disagree with Mr Rowsell's view that the RISC procedures had not been followed and that certain inspections were ineffective. However, while the inspections themselves were executed, I would accept that there were issues with the associated documentation (namely that a small number of RISC forms were not completed despite the inspections taking place).

15. I disagree with Mr Rowsell's interpretation of full time and continuous supervision and am of the view that the Contractor has complied with its obligations regarding supervision of the coupler works. In any event, I acknowledge that the obligation to provide "full-time and continuous" supervision only applies to couplers that are subject to a ductility requirement. While the structural engineering experts generally agree that none of the couplers in the works should have been subject to a ductility requirement, during construction the determination of whether a coupler was subject to a ductility requirement should have been made by reference to the drawings available at that time. This was the only reference guide that the Contractor had to determine if a particular coupler was subject to "full-time and continuous supervision" or the lower standard of "full-time" supervision under the BD acceptance letters.

16. I generally agree with the majority of Mr Rowsell's comments regarding the PIMS system, though in some instances I would like to see improvements go further.

17. I also agree that the use of digital tools would go a long way to improving the ease of inspections as well as the ease of planning, controlling and auditing inspections.

PART 1: AREAS OF Mr ROWSELL'S REPORT WHERE I GENERALLY DISAGREE WITH HIS OPINION

General Observations on Clarity of Contracting Relationship

18. I disagree with Mr Rowsell's concerns regarding the use of the term "Government" and the possibility that there is a lack of clarity. In my opinion, it is self-evident that the Client / Vendor relationship is between the Secretary for Transport and Housing, as the Client, (or procuring department) and MTRCL as the Vendor.

19. On a plain reading of the documentation, the roles that the various government departments play are no different than they would be with any other developer, i.e. statutory oversight and compliance. The only exception to this being where there is variance under the Instrument of Exemption ("**IoE**").

MTRCL's Obligations Under the Project Management Plan

20. I disagree with Mr Rowsell's overall view that the PMP is too generic and does not provide the appropriate level of detail concerning how the various procedures are to be applied to the project. While I appreciate Mr Rowsell's position, I am of the opinion that it is first necessary to establish whether the PMP is intended to be a fully detailed and codified document to facilitate the management of the project or whether it is intended as a strategic document detailing the general approach that is to be adopted for the management of the overall SCL scheme (which is my preferred view).

21. Given that MTRCL's PIMS documents are appended to the PMP, I am of the view that the PMP was principally intended to be a high-level document that outlined, in general, the roles and responsibilities of those who were assigned to the delivery and management of the overall SCL scheme. In my experience, it would be unusual for a project management plan to contain detail on the scale that Mr Rowsell's would seem to suggest is necessary. The PMP was after all intended to apply to the overall SCL scheme rather than any one of the specific sub-projects.

22. I would accept that it may have been beneficial to produce a series of subordinate PMP's for each of the individual projects on the SCL scheme; however I would disagree (for the reasons explained below) with the idea of creating a single highly detailed PMP for the entire SCL scheme.

23. Mr Rowsell's specific observations *(in italics)* in his Original Report on MTRCL's obligations under the PMP, and my response to those observations, are detailed below.

24. Paragraph 14(a) of Rowsell's Second Report states:

    a. *The PMP is too generic in nature and should contain more specific detail on how the generic PIMS procedures will be applied to the project* [**§§20-21, 24 and 29, Rowsell's Original Report**].

25. While I appreciate that the PMP may appear to be too generic, I am of the view that this is because it has been prepared as a general strategic document rather than one that is to be used to deal with the day to day tactical aspects of managing a project.

26. I accept Mr Rowsell's point that the PIMS procedures may need to be developed further so that they can be used appropriately on specific projects. However, I would disagree that the PMP is the best forum for this level of detail.

27. I am of the opinion that granular information would be best placed within project-specific documents that deal with issues such as site supervision, health and safety and the like. This is particularly true given that there would be a number of different disciplines involved in the SCL.

28. Paragraph 14(b) of Rowsell's Second Report states:

    b. *There is a lack of clarity in relation to the role of the Engineer within the MTRCL organisation and the ownership of procedures. The Engineer is responsible for administering the Contract, but many PIMS procedures do not clearly recognise the need for the Engineer to be involved in contractual decisions* [**§22, Rowsell's Original Report**].

29. Based on my review of the PIMS procedures, I note that there are a number of references to the Engineer, regarding the planning and management of resources as well as with regard to quality hold points and quality control points[1].

30. Paragraph 14(c) of Rowsell's Second Report states:

    c. *The PMP is lacking in detail on the requirements for site records and associated responsibilities* [**§22, Rowsell's Original Report, on para 7.6.1 of PMP**].

31. The PIMS documents, which are appended to the PMP, do provide guidance on the need requirement to collect and store relevant records[2]. Crucially, the PIMS document acknowledges the fact that records are likely to vary from project to project, by stating "This

[1] PIMS/PN/11-4/A4 [3.1 & 3.2]
[2] PIMS/PN/11-4/A4 [5.8]

will vary between projects and the SConE/SIOW should continually review the records kept as the works progresses."

32. This is in line with Hong Kong industry practice; records are project-specific, and it would be both unwise and impractical to record the level of detail required on a project within the PMP.

33. Paragraph 14(d) of Rowsell's Second Report states:

> *d. The PMP is lacking in detail in relation to non-conformance procedures and responsibilities and the NCR requirements set out in the PMP are not fully aligned with the PIMS procedural note Monitoring of Site Works [**B3/1581- 1717**]* [**§22 and 87-99, Rowsell's Original Report**].

34. In addition to Rowsell's comment, I would go further and suggest that the current wording of the PIMS[3] document suggests that MTRCL would tolerate a certain level of departure from management practices, especially with regard to non-compliance with documentary procedures, without the need to issue and NCR. The circumstances in which an NCR should be issued is detailed below:

> *"Nonconformance report shall only be issued to the Contractor for a Works NCR as defined in the guidelines provided in **Exhibit 7.9**."*

35. I am of the opinion that this is something that needs to be corrected, which could be done through the use of a staged NCR process where specific issues are considered to be minor non-conformities (such as late submission of test results) and other more significant issues are considered to be significant non-conformities (such as out of tolerance piles). Having said that, I consider that MTRCL had sufficient mechanisms to ensure that RISC forms were submitted prior to formal inspections of the rebar fixing and pre-pour checks and the pouring of concrete. For example, MTRCL could have refused to allow its staff to conduct formal inspections, or stopped the pouring of concrete, until RISC forms were submitted.

36. I believe that such modifications to the system would result in a greater willingness to raise NCR's, effectively proceeding on a without prejudice basis, which would avoid parties having to worry about the potential contractual implications of raising an NCR; in the same way that near-miss incidents are identified within the safety environment.

37. Paragraph 14(e) of Rowsell's Second Report states:

[3] B1585 (Item 5.3.4)

e. *Overall, I [Rowsell] was of the opinion in my Original Report that there are gaps and omissions in the PMP which carry the risk that procedures are not consistently applied and that some requirements may get overlooked* [**§24, Rowsell's Original Report**].

38. I disagree that the PMP should be written in such a manner that it would enable management of all possible eventualities on the project.

39. Paragraph 15(a) of Rowsell's Second Report states:

"I [Rowsell] consider that the events being considered by the Extended Inquiry reinforce my previous conclusions in relation to the PMP and also highlight other key aspects of project delivery which are not addressed in the PMP. Other aspects which, in my opinion are lacking include:

a. *No specific mention of interface risks which are identified as a key process in PIMS procedural documents.*
b. *No reference to resource management or job specific training requirements…"*

40. As to paragraph 15(a), I acknowledge Mr Rowsell's comments regarding the importance of interfaces; however I disagree that these have not been covered. Section 5.2.3 of the PMP clearly states that responsibility for managing interfaces rests with the Competent Persons for the works with Appendix 6 providing further details in terms of delineation of responsibility.

41. As to paragraph 15(b), I disagree that there is no reference to resources management or job specific training. Appendix 10 of the PMP contains a table which sets out the terms of reference for the three-tier meetings, one responsibility for senior management relates to resource planning. However, it is unclear from the table whether this refers to human resources or physical resources or indeed both types of resources. Notwithstanding, I accept that further detail / clarification would be beneficial.

MTRCL's Obligations Under the Contract with Leighton

42. In paragraph 23 of Rowsell's Second Report, Mr Rowsell makes observations on key points made in his Original Report in relation to the PIMS documents, which he considers to be also relevant to the Extended Inquiry.

43. Paragraph 23(b) of Rowsell's Second Report refers to:

b. Clause 2.1(e) states that the Contractor shall take instructions and directions from the Engineer only.

44. I disagree with Mr Rowsell's view that conflicts between the PIMS documents and the contract are fundamentally related to issues of resource management, training and the development of staff. I am of the opinion that the Engineer is primarily a contract administrator and that one would not normally expect issues of resource management training and the development of staff to be within his or her purview.

45. I would expect resource management training and development of staff to be dealt with and managed at a corporate or head office level, whether this be within MTRCL or any other procuring organisation. The purpose is to provide the nominated Engineer with the appropriate tools and human resources to fulfil his responsibilities effectively.

46. Paragraph 23(c) of Rowsell's Second Report refers to:

*c. Clause 16 is headed "Methods of Manufacture, Construction or Installation" **[C3/1847-1849]**. Clause 16.1 requires the Contractor to obtain the Engineer's acceptance to proposed methods of construction. Clause 16.2 states that the Contractor shall not change the methods of manufacture, construction or installation which have received the Engineer's consent without the further consent in writing of the Engineer.*

47. I disagree with Mr Rowsell's statement that the absence of a method statement specific to the stitch joints is a failure to deliver the contract requirements. There is no explicit provision in Appendix Z2 of the particular specification that requires a distinct method statement to be provided for the stitch joints. The specification merely requires that the Contractor take account of the design information that it is provided with. Although the responsibility for preparation of the method statement is ultimately the Contractor's, it remains MTRCL's responsibility to approve method statements and then for Leighton to proceed on that basis, which was the case for the Stitch Joints.

48. Paragraph 23(d) of the Rowsell's Second Report refers to::

*d. Clause 57.4 Quality Plan **[C3/1881-1882]**: this requires that the Contractor shall by the date stated in the Specification submit to the Engineer for Approval a quality plan, which shall set out details of the quality management system to be implemented by the Contractor in order to control all design, procurement, manufacture, construction and installation activities required by the Contract in such a way as to ensure completion of the Works in accordance with the Contract, with*

*the Approved Design Data and with any drawings or documents submitted by the Contractor pursuant to Clause 8 and Approved **[C3/1835-1836]**.*

49. I note from the witness statements that the behaviour of MTRCL's inspecting staff indicated that the RISC form procedure would not be strictly adhered to, as demonstrated by Mr Kit Chan stating in his witness statement that "MTRCL did not insist on a strict adherence to the RISC form inspection procedure".[4] This was only followed up more seriously at a much later stage when I understand that NCRs (i.e. NCR No's 97 to 196) were issued by MTRCL in relation to the NAT and SAT areas[5].

50. I am of the opinion that this situation has its origins in two areas. The first is that MTRCL obviously did not consider the submission of RISC forms to be a priority in the NAT, SAT and HHS and the second factor is that the PIMS system only provides a single level of non-conformity reporting. The consequence of this is that there is no mechanism within the PIMS system that would allow MTRCL to reprimand the Contractor for not complying with the RISC requirements. Despite that, MTRCL could have refused to carry out the formal inspections or stopped work from proceeding. It is apparent that MTRCL did not take such action, even on one occasion. Indeed, MTRCL did not raise the lack of RISC forms with Leighton's management (other than by sending a single email in 2015[6]) until after the defects in the stitch joints were identified (at which point they issued NCRs in relation to the outstanding RISC forms in the NAT and SAT areas[7]).

51. Paragraph 23(d) refers to:

    e. *Clause 60.1 Examination of Work before Covering Up **[C3/1885]**: this requires that no work shall be covered up or made unavailable for testing or examining without consent of the Engineer.*

52. I disagree with Mr Rowsell that clause 60.1 may result in some level of confusion. Contractual provisions regarding the examination of work prior to covering are common, and they sensibly provide the Engineer with the facility to dictate elements of the work that he wishes to inspect prior to further works taking place. Any uncertainty that may have existed could readily have been remedied by the Engineer through comment and subsequent approval of the ITP. If there was uncertainty over the content of the ITP with regard to hold points or other quality control points, then these could readily have been addressed by finessing the ITP.

[4] BB8/5198 at [42]
[5] BB12/8389-8446
[6] CC10/6208-6209
[7] BB12/8389-8446

Specific Issues Relating to MTRCL's Project Management Procedures

Issue A: Lack of RISC Forms

53. I note the observations that Mr Rowsell has made with regard to the contractual requirements for the submission of RISC forms as detailed in paragraphs 24 to 34 of his Second Report. At paragraph 35 of Rowsell's Second Report, he states:

> *35. "…. Taken as a whole, the procedures described in the documents would in my [Rowsell's] opinion, if they had been fully implemented, have provided a robust inspection regime and a good degree of confidence that the works were provided in accordance with specified requirements. Unfortunately, it is clear that there were a number of failures in the way that the procedures were delivered by both the Contractor and the Engineer/PM. To put it simply, members of the Contractor's team failed to apply the required RISC procedures and members of the Engineer's/PM's team were willing to operate to inappropriate and unapproved arrangements."*

54. I disagree with Mr Rowsell's comment regarding the application of the RISC procedures. In my view, Leighton generally complied with the RISC procedures. I am of the opinion that it is important to distinguish between the application of the inspection procedures and the documentation of those said procedures. From reading the witness statements, I have seen no evidence that would support any assertion that inspections did not take place. The principle non-conformity is the failure to submit some of the RISC forms in the NAT, SAT and HHS areas. Notably, this non-conformity did not affect the EWL and NSL Slabs.[8]

55. I am of the opinion that it is crucial to distinguish between the inspection itself and the documentation relating to the inspection. This is because, as I detailed above, the NCR procedure should be modified so that minor nonconformities can be identified, such as late submission of RISC forms (or equivalent documents), as well as what I would describe to be major non-conformities such as a failure to carry out any form of inspection; the latter of which I have seen no evidence of on the project.

56. I note from Mr Rowsell's report that Mr Kit Chan the former Construction Manager of the MTRCL was well aware of the procedural deficiencies in relation to the RISC forms. It appears that MTRCL elected to continue conducting inspections and proceeding with the Works while fully aware that RISC forms were not being submitted and some continued to

[8] Kit Chan at Day 13, page 119, line 10-15

be outstanding for completed pours. In the circumstances, the Contractor would have been led to believe that these requirements would not be strictly enforced.

57. In paragraph 37 of Rowsell's Second Report, Mr Rowsell has made a number of observations as to the possible reasons for the failure to adhere to the RISC form procedures.

58. Paragraph 37(d) of Rowsell's Second Report states that one possible reason is:

> *d. the introduction of less formal approaches by the Contractor, for reasons of expediency, to avoid the work programme being delayed;*

59. I do not view the introduction of less formal procedures themselves to be a cause of a departure from the specified procedures. As Mr Rowsell has observed, Contractors will always endeavour to use methods and procedures that they perceive will facilitate the progress of their works. It is acceptance of these non-compliant procedures by MTRCL that is the issue.

60. Paragraph 37(h) of Rowsell's Second Report states that another possible reason is:

> *h. younger generation engineers being more comfortable with technology systems rather than administering a paper-based system;*

61. I do not agree that there is a generational issue with younger engineers being more comfortable or happier with technology rather than paper-based systems. In my opinion, all construction professionals (no matter their age) will seek to carry out tasks in the easiest and most efficient manner, whether this be through the use of technology or otherwise. Engineers have been using the latest computing technology for generations and have shown an ability and willingness to adopt new forms of technology (and reduce their reliance on paper-based systems) if they will enhance performance.

62. In paragraph 47 of Rowsell's Second Report, Mr Rowsell provides his overall view on the issue of RISC forms.

63. Paragraph 47(a) of Rowsell's Second Report states:

> *a. MTRCL has developed a robust and comprehensive procedure in relation to the inspection regime.*

64. While I agree that the inspection procedure has some good components, I am of the

opinion that it could be improved further so as to ensure that all parties were aware of the number of RISC forms that would be expected prior to the commencement of particular activities. This could readily be dealt with by the relevant method statements. I understand that Leighton has now implemented such an arrangement within its own enhanced quality assurance procedures.[9]

65. Paragraph 47(b) of Mr Rowsell's Second Report states:

    b. *The various elements of the procedures are set out in a range of documents and there would be benefit in pulling the requirements together into a single location so that it is easier to identify and understand the full requirements.*

66. I am unclear how realistic this would be in practice with some documents contained within the PIMS system and others necessarily contained within the contract documents. I would therefore suggest that a better approach would be to ensure that a gap analysis is carried out to avoid conflicts between the various documents, rather than attempting to locate all of the information in one place.

67. Paragraph 47(c) of Rowsell's Second Report states:

    c. *Contractor's staff failed to apply the required RISC procedure*

68. I disagree that the Contractors staff failed to apply the required RISC procedures, as this suggests that there was a failure to inspect. I am of the opinion that the Contractor did apply the RISC procedures, though these were not comprehensively documented in some cases.

69. Paragraph 47(f) of Rowsell's Second Report states:

    f. *The Contractor failed to rectify the defective procedures.*

70. Although it is not in doubt that the Contractor did not fully document the RISC procedure as it is laid down in the Contract (i.e. did not submit RISC forms for certain inspections in the NAT, SAT and HHS), I would not agree that the Contractor failed to rectify the defective procedures. This is because the behaviour of MTRCL's inspection and management team would have given the Contractor the reasonable impression that the inspection regime and notification requirements had been amended

[9] CC11/7290 at [9] to [10]

Issue B: Ineffective Site Inspections

71. I would seek to clarify Mr Rowsell's statement at paragraph 48 of his Second Report, which refers to "significant defects". I am concerned that this suggests that the defects in question were pervasive, which they were not. In practice, defects in the reinforcement were confined to isolated locations at the stitch joints in the NAT[10] and minor works in the HHS (i.e. the VRV room)[11]. In my opinion, they are not a cause for concern and are consistent with the level of defects that one would expect to emerge during the course of a large construction project.

72. At paragraph 50 of Rowsell's Second Report, Mr Rowsell would seem to suggest that it is possible to have an element of dynamic and resource planning during the course of the project based on the contents of the construction programme and the ITP. From a practical perspective, I would disagree with this assertion, as it assumes that there is some readily available pool of inspection staff who are adequately trained and who may be called upon at relatively short notice. This is simply not the case.

73. I note Mr Rowsell's reference to the supervision ratio specified under clause G3.9.1 of the General Specification. However, I would highlight that this supervision ratio relates to health and safety and not quality assurance matters. In particular, it does not relate to the supervision or inspections of reinforcement or coupler works. In any event, the Summary of Rebar Fixing Workers and Leighton Rebar Supervision[12] prepared by the Contractor demonstrates that the number of TCP grade engineers supervising the coupler works exceeded this 1:10 ratio.

74. I appreciate Mr Rowsell's view with regard to supervision of the coupler works and his interpretation of what is meant by the words "full time and continuous supervision" under the standards that apply to the supervision of couplers with a ductility requirement (i.e. to the extent that any of the couplers were actually subject to such a requirement)[13]. However, I disagree with Mr Rowsell's interpretation of "full time and continuous" as meaning that there must be an engineer present on the site looking at the coupler works all of the time that the works are being carried out. I would not consider this practical nor

[10] CC1/75 at [19]-[24] and CC1/80 [54]-[57]
[11] Ronald Leung at Day 10, page 24, line 9-20
[12] CC12/7481
[13] I note that: (a) the structural engineering experts agree that none of the couplers used in the project should have been subject to a ductility requirement (see paragraph 1 of the Agreed Expert Memorandum in Appendix XI of McQuillan's Expert Report for the Original Inquiry); and (b) Leighton's closing submissions to the Original and Extended Inquiry indicate that based on the drawings available during construction almost all of the couplers supervised by its engineers (with the possible exception of the couplers embedded into the d-wall and connected to rebar in Area A of the EWL Slab) were not subject to a ductility requirement.

would I consider it to be normal industry practice.

75. For the purposes of determining whether a coupler was subject to a ductility requirement for the purposes of the Buildings Department acceptance letters for the works (i.e. which determines whether they are subject to the higher standard of "full-time and continuous" supervision or merely "full-time" supervision), the only suitable reference guide that was available the Contractor during construction would have been the working drawings provided by MTRCL (as prepared by Atkins in its capacity as DDC). In my opinion, it is appropriate to expect that the Contractor applied the higher standard of "full-time and continuous" supervision to couplers that were shown to be located within the marked ductility zones on the drawings and otherwise provided the lower standard of "full-time" supervision.

76. The witness statements from the Contractor suggest that the engineers supervising the coupler works tended to spend approximately 70% of their day on-site supervising the works, i.e. 3 to 4 hours in the morning followed by a further 3 to 4 hours in the afternoon, with the remainder of their time spent on administrative duties. I view this as broadly in line with standard industry practice on construction sites in Hong Kong and I would consider this to be full-time and continuous supervision. I am of the opinion that any suggestion that there should be an engineer present on site 100% of the time while coupler works are in progress is both impractical and uneconomical.

77. If the specification had intended that an engineer was to stand observing the works 100% of the time, that would, in my opinion obviate the need for a detailed ITP and for formal inspections.

78. In paragraph 52 of Rowsell's Second Report, Mr Rowsell has made specific observations regarding the potential contributory factors in the non-identification of defects during the inspections. My comments on the factors identified by Mr Rowsell are as follows:

    (a) *"lack of knowledge in the inspection teams of the different types of couplers":* paragraph 52(a) of Rowsell's Second Report;

        I doubt that the lack of knowledge in the inspection teams of the different types of couplers that would be used at the stitch joints in the NAT would have contributed negatively to the reinforcement inspections at the stitch joints.

        I am of the opinion that such lack of knowledge in the inspection teams for the stitch joints primarily stems from a lack of interface coordination, in particular with respect to the lack of adequate detail contained on the construction drawings.

(b) *"lack of training in the mechanical fitting of couplers and the need for different types of reinforcement bars":* paragraph 52(b) of Rowsell's Second Report;

I find it difficult to accept that a lack of training in the mechanical fitting of couplers contributed to inadequate inspections, as the idea and functioning of a coupler is a simple matter and not sufficiently complex that is should require technical training. Notwithstanding, the issue of how couplers that have been damaged or clogged with concrete should be dealt with may well require training.

(c) *"access difficulties in the work area to examine couplers connections closely and being able to see that they were inappropriately slotted in rather than screwed in":* paragraph 52(c) of Rowsell's Second Report;

This is something that should have been identified by both the Contractor and MTRCL during the preparation of the ITPs. The fact that this was not considered suggests that there were deficiencies in the review and acceptance process for the ITPs.

(d) *"a desire in the inspection teams not to cause delays to the work programme":* paragraph 52(e) of Rowsell's Second Report;

I find it unlikely that inspectors would rush through inspections because of a perception that they were likely to delay the progress of the works. Moreover, as far as I am aware, the inspections process is broadly similar to other projects and with the possible exception of the stitch joints in the NAT, there is no evidence that inspections were done poorly or were rushed.

(e) *"reduced periods of notice given by the Contractor that inspections were required to be carried out by the informal social media platforms and the failure to follow the formal RISC procedures":* paragraph 52(f) of Rowsell's Second Report;

I disagree with the premise that inspectors need a long notification period to review the construction drawings, as it suggests that the majority, if not all, of the notice period is to be used by the inspection staff to familiarise themselves with the construction details at the inspection location. Industry practice shows that this is not the case. In reality, the three day period is principally taken up with administration time. This view is reinforced by the fact that MTRCL was fully engaged with the project and were monitoring and supervising the progress on an ongoing basis, enabling them to respond effectively to the Contractor's requests to conduct inspections.

(f) *''a willingness by MTRCL staff to undertake inspections despite inadequate notice being given and appropriate procedures being followed":* paragraph 52(g) of Rowsell's Second Report;

I disagree with Mr Rowsell's view that a willingness on the part of MTRCL's staff to carry out inspections even without the requisite notice period contributed to ineffective inspections. I have seen no evidence to support this view. Furthermore, I assume that his analysis is based on the premise that those carrying out the inspection would need a reasonable amount of time to familiarise themselves with the construction details in readiness for the inspection. Mr Rowsell's would also seem to be inferring that there was a widespread problem with the quality of the inspections; this is not supported by the witness statements or other evidence..

(g) *"failure to ensure full-time supervision of the coupler works by the Contractor and for MTRCL to provide 20% attendance":* paragraph 52(h) of Rowsell's Second Report;

I disagree that there has been a failure to provide full-time supervision of the coupler works by either the Contractor or MTRCL. Based on the witness statements that I have reviewed I am of the opinion that the Contractor provided "full-time and continuous" supervision. In my view, the standards required for "full-time" supervision must be lower and has therefore been satisfied. Short of providing man marking of the rebar fixing workers, (which the experts have agreed would not be practical), I am of the opinion that it would not have been possible to enhance the supervision of the coupler works any further.

(h) *"lack of availability of the latest working drawings to all staff":* paragraph 52(k) of Rowsell's Second Report;

I disagree with Mr Rowsell's view that the availability of drawings is related to inspection quality. As noted, I do not consider there is a notable problem with the inspections performed by the Contractor or MTRCL. The obvious exception would be for the stitch joints at the NAT. In relation to the stitch joints, I agree that updated drawings showing the different type of couplers used by the Gammon Kaden JV would have been likely to assist the inspection teams to conduct the relevant inspections.

(i) *"doubt has been expressed as to whether some inspections actually took place":* paragraph 52(l) of Rowsell's Second Report;

I disagree with Mr Rowsell's comment. I have seen no evidence that would support a view that there is doubt as to whether inspections took place or not. As far as I am aware, the only doubt is whether one of MTRCL's Construction Engineer conducted inspections of the rebar fixing at the stitch joints in the NAT. Otherwise, the evidence indicates that the Contractor's engineer and MTRCL's Inspector of Works did conduct the relevant inspections at the stitch joints

Issue E: Interface Management & Planning

79. I disagree that adding further content to the PMP is the best way to address deficiencies in interface management. I agree that interface risk management should be covered in greater detail in the PMP along with possible communication strategies and resourcing, including taking the necessary step to revise the drawings accordingly. Having said that, I am of the opinion that training and development as well as leadership issues should be kept with the PIMS documentation.

Issue F: Testing Reinforcement

80. I disagree with Mr Rowsell's suggestion that MTRCL should develop procedures for ensuring that the Engineer's team is notified by the Contractor that a delivery of materials that require testing have arrived on site. I am unclear how this would work in practice or what benefit MTRCL would gain from such notification. I am of the opinion that this is likely to result in an increase in paperwork, but with no tangible benefits. If MTRCL feels that it needs this level of control over Contractor's material deliveries, then it is already at liberty to station a member of staff at the site entrance to record deliveries as they arrive. However, as I have said, I do not believe that this would result in any tangible benefits.

81. I note Mr Rowsell's suggestion that MTRCL should ensure that requirements are included in contracts to achieve effective segregation on site of tested and untested steel to avoid the risk of untested steel being used in the works. However, I am of the opinion that this facility already exists through the use of the Project Quality Plan[14] that must be submitted by the Contractor within 4 weeks of the date of the Letter of Acceptance.

[14] G9.1.1 [C3/2106]

PART 2: AREAS OF MR ROWSELL'S REPORT WHERE I AM IN GENERAL AGREEMENT, BUT HAVE RESERVATIONS OR ADDITIONAL COMMENTS TO MAKE

MTRCL's Obligations Under the 2012 Entrustment Agreement ("EA")

Comments made by Mr Rowsell with Respect to the Original Report

EA Clause 4.1 [G7/5612]:

The Corporation shall, to the satisfaction of Government, carry out or procure the carrying out of the Entrustment Activities for the RRIW, the EPIW, the Property Development Enabling Works and the Miscellaneous Works (if any), in accordance with specifications and/or standards to be agreed or, in the absence of such agreement, reasonably stipulated by Government or other relevant public bodies.

82. I am of the view that Mr Rowsell's comments misinterpret the intent of the EA Clause 4.1, which ensures that all of the EA works comply with the relevant statutory requirements. While I acknowledge that the full scope of works includes the Railway Works, the RRIW (Re-provisioning, Remedial and Improvement Works), the EPIW (Essential Public Infrastructure Works), the Property Development Enabling Works and the Interface Works, those works listed under EA Clause 4.3 would seem to be items where the Government would subsequently be responsible for operation and maintenance. I am therefore of the opinion that EA Clause 4.3 provides the appropriate level of coverage.

EA Clause 4.6(A) [G7/5612]:

*The corporation shall: Let all contracts with Third Parties under the Corporation's conditions of contract (each a **"Third Party Contract"**), provided that the maximum pain share for the Employer under any Third Party Contract which is a target cost contract shall be 10% of the initial target cost.*

83. I would generally agree with Mr Rowsell's comments concerning the risk-sharing arrangements between the parties, and the fact that the maximum pain share for the contract works has been limited to 10% of the initial target cost. However, I would disagree with Mr Rowsell's suggestion that there is a fundamental link between a Contractor's pricing errors and likely behaviour on site. While Contractors who are under adverse cost pressures may seek to make savings, this is not specifically connected with the type of contract that has been used and will tend to arise regardless.

EA Clause 35 [G7/5643-5644]:

Without prejudice to the rights and obligations of the parties under the Instrument of Compliance and notwithstanding the difference in respect of applicability of the Buildings Ordinance to the works in relation to a railway project carried out by the Corporation under the Ownership Approach (subject, in any event, to section 54(2) of the Ordinance) and the works in relation to a railway project carried out by the corporation under the concession approach (as in the case of the Shatin to Central Link, to which the Buildings Ordinance is not applicable), the Corporation agrees that it shall carry out consultation in relation to the Railway Works and the Interface works in substantially the same manner and substantially to the same extent (adjusted as in necessary to reflect the specific requirements of the Railway Works and the Interface Works, and by agreement between Government and the Corporation) as if the Shatin to Central Link were being carried out by the Corporation under the Ownership Approach.

84. I would agree with Mr Rowsell's general observation with regard to EA Clause 35.1, in that the requirements are placed in a number of locations, resulting in a risk that there may be some confusion regarding MTRCL's responsibilities. Although I would also agree that there would be some benefit to listing out or at the least summarising the requirements in one location, I doubt that it is practical for the requirements themselves to be placed in one location. This is especially true, given the fact that some of the obligations are statutory, while others are contractual. The difference in the origin of the various obligations would clearly preclude them being co-located, however a central reference point would have been useful.

MTRCL's Obligations Under the Instrument of Exemption and the Instrument of Compliance

85. Mr Rowsell has correctly observed that the IoE as issued by the Buildings Department [H2220] on 5 December 2012 gives the MTRCL exemption from the Buildings Ordinance in respect of the buildings and associated building works for the Shatin to Central Link (SCL) – North-South Line and East-West Line.

86. However, as conditions of the exemption, MTRCL is required to:

    (a) submit such drawings, plans and calculations and other details as may be necessary to implement the consultation process detailed in the Reference Schedule and to comply with any reasonable request made during such

consultation; including any requirement for modification or variation of designs and working procedures as may be reasonably necessary to maintain standards of health and safety;

(b) appoint a competent person, who shall take up the responsibilities and duties of Authorized Person/Registered Structural Engineer, to co-ordinate and supervise each area of the works in accordance with the agreed proposals, to certify the preparation of plans or documents and to certify to the relevant authorities upon completion of works. The appointment of the competent person shall be subject to prior agreement of the Buildings Department in regard to his/her qualifications and experience.

(c) appoint a Registered Geotechnical Engineer for building works with significant geotechnical content as described in Section 7 of the Code of Practice for Site Supervision 2009, to supervise each area of the works in accordance with the agreed proposals, to certify the preparation of plans or documents, and to certify to the relevant authorities upon completion of works.

(d) appoint registered general building contractors and registered specialist contractors, as appropriate, to supervise and carry out each area of the works in accordance with the agreed proposals, and to certify to the relevant authorities upon completion of geotechnical works; and

(e) instigate an assurance system and control scheme to ensure that management of the construction of the works are at a standard not inferior to that required under the Buildings Ordinance and Regulations. All permanent construction and temporary works carried out by the person appointed in accordance with (d) and supervised by the persons identified in (b) and (c), or others acting on their behalf, shall not adversely affect the margin of safety or impair the stability of, or cause any danger to, any adjoining building, structure, land, street or services. Adequate and timely arrangements shall be made to facilitate relevant authorities in the inspection and testing of the works as may be required.

87. In addition to the requirements that are set out within the IoE, I am of the opinion that it is also pertinent to consider the contents of MTRCL's contract with Leighton. Clause P2.1 of the Particular Specification makes the following reference with regard to the SCL project and the Building Ordinance:

The SCL Project will generally be exempted from the application of the Buildings Ordinance (CAP 123) in accordance with the provisions of the Mass Transit Railway Ordinance (CAP 556) Section 54(2). For Works exempted the Employer is obliged to satisfy the Railway Development Office (RDO) in respect of the Works under Instrument of Compliance (IoC) and/or Buildings Department (BD) in respect of the Works under the Instrument of Exemption (IoE) in connection with IoC/IoE consultation procedure on the effects of the Works on existing or proposed nearby non-MTR buildings, structures and slopes. The Contractor is required to demonstrate to the Engineer and thereby satisfy RDO/BD that the carrying out of the Works will not cause any unacceptable effect on the non-MTR buildings, structures or slopes.

88. Although I would agree that IoE should not materially affect the conditions under which MTRCL operates, as the requirements have been replaced by a series of other conditions, I would also add that these conditions are principally imposed on MTRCL. MTRCL has elected to transfer some of the risk associated with the conditions but only in respect of negative impacts to non-MTR buildings structures or slopes. The remainder of the obligations rest with MTRCL.

MTRCL's Project Integrated Management System (PIMS)

89. In paragraph 20 of Rowsell's Second Report, Mr Rowsell has made a number of comments with regard to the PIMS system. I have not reviewed all of the PIMS documents. However, I have reviewed the PMP, which would enable me to respond to Mr Rowsell's comments as detailed below.

90. Paragraph 20(b) of Rowsell's Second Report states:

> *b. it would be desirable to review and update the older documents and consider rationalising and combining some of the related documents* [**§28**]*;*

91. I would agree with Mr Rowsell that it would be desirable to review and update the older documents and consider rationalising and combining some of the related documents. However, I would go further and note that the PIMS system has a provision for lessons learned, which I have not seen in detail. This is an ideal framework to guide future improvements.

92. Paragraph 20(c) of Rowsell's Second Report states:

c. *ensure that procedures are fully aligned with conditions of contract and contractual roles and responsibilities* [**§31**]*;*

93. I would agree with Mr Rowsell that it is imperative that the conditions of contract and contractual roles and responsibilities are fully aligned. However, I would go further and say that this is the minimum standard that I would expect from an organisation such as MTRCL as well as the consulting organisations that it has employed to provide it with tendering and contract management advice.

Issue D: General Site Supervision and Record-Keeping

94. Mr Rowsell correctly highlights the importance of general site supervision and record-keeping. It is also interesting to observe that the PIMS system requires site staff to maintain diaries. However, it is unclear whether these requirements are ever audited to assess compliance.

95. I would also agree with Mr Rowsell's comments regarding site photographs. As access to digital technology has become more prevalent, the industry has exhibited an increasing sloppiness with regard to the recording and filing of site photographs. This is an instance where perhaps the PIMS system and general site procedures need to be reviewed and updated.

96. I also agree wholeheartedly with Mr Rowsell's view that the current site supervision arrangements need to be digitised so that they reflect current best practice. There are a variety of available digital platforms that would significantly improve the tracking of inspections and the tracking of any defects. In my opinion, the adoption and use of these types of systems should be a contractual requirement.

97. In addition, I would suggest that it should be a requirement to continuously update the working drawings and ensure that there is proper controlled document distribution of those updated drawings.

Issue F: Testing of Reinforcement Steel

98. I note that Mr Rowsell has commented that there was some reinforcement included in the project that had not been tested. I would generally agree with Mr Rowsell's observations regarding the testing of reinforcement, including the fact that one would have expected further progress in terms of ensuring that the industry had certified suppliers of reinforcement negating their need for additional testing to be carried out by contractors.

99. Notwithstanding the slightly outdated testing regime, I am of the opinion that MTRC already has procedure in place to enable it to monitor the delivery of reinforcement through the Contractors QA procedures. Compliance with these procedures could be ensured through MTRCL's existing QA procedures.

100. However, I note that Leighton had a QA procedure in place which was used to control the delivery and use of reinforcement on the site. This resulted in 100% of the reinforcement being tested off site and supported by mill certificates and 93% of reinforcement batches being tested after delivery to site.

REPORT PART 3: OPINION ON HOW SYSTEMS FOR SUPERVISION, MONITORING, CONTROL AND MANAGEMENT MAY BE STRENGTHENED COMMENDATIONS

RISC Form & Inspection Procedures

101. I would agree with Mr Rowsell that MTRCL should investigate and introduce new digital, i.e. technology-based, RISC form procedures which can be implemented by site staff using portable devices such as tablets. This type of approach is common in the oil and gas industry. I would agree that MTRCL should ensure that roles and responsibilities in relation to the RISC procedures and the recording of results are clear and communicated to all those involved in the procedures on a project-specific basis, however I am of the view that this is already clear; enforcement would appear to have been the principal issue.

102. I would agree with Mr Rowsell that requirements relating to RISC form procedures and inspections should, if possible, be pulled together into a single source covering requirements on individual projects; though I do query if that is practical, given the varying disciplines on different projects.

103. I would agree with Mr Rowsell, that any form of inspection that is identified in an approved ITP should be captured in any new digital system.

104. I would agree with Mr Rowsell that MTRCL should review its drawing control arrangements so as to ensure that all site staff have access to the latest working drawings to support more reliable surveillance and inspections of the works; this would preferably take place through the aforementioned digital platform.

105. As I stated previously, I disagree that the use of forward programmes could realistically be used as a way to dynamically manage resources on a project. However, I would agree that there should be a plan which details where inspections are expected and that they have been completed.

106. I would agree with Mr Rowsell that MTRCL should review responsibilities and procedures for ensuring that non-compliances with procedures by the Contractor are addressed promptly and that action is taken to remedy non-compliances. However, I am of the view that such an arrangement should not be confined to the Contractor but should also cover MTRCL. As detailed above, I am also of the view that the NCR procedure should be

modified such that there is a range of NCR grades, from minor through to major non-conformances, without prejudice to existing audit arrangements.

MTRCL Organisational Roles

107. I would agree that MTRCL should consider and clarify roles and responsibilities in relation to their obligations as Project Manager in delivering Entrustment Activities and also as Engineer to the Contract. In particular, clarification and guidance should be given to project team members in relation to reporting and communication requirements both internally within the MTRCL organisation and externally with the Contractor and stakeholders.

108. However, I am of the opinion that to a great extent these procedures are already in place. It appears that these procedures were not followed. I would agree that MTRCL should review its systems and procedures for escalating problems and disputes up through the organisation to senior management. Senior management should encourage the reporting of issues where there may be doubt about whether to elevate them[15], so that they can consider the significance of any issues and decide whether to get involved.

109. The first step in this process would be a modification of the NCR process so that it is a tiered process rather than an all or nothing system, which is what currently exists.

Interface Risk Management

110. I agree that MTRCL should ensure that interface risks are generally treated as potential key risks in its procedural documents, risk management and reporting procedures. Interface management meetings, as with all meetings, should ensure that actions, with specified timelines, are clearly allocated and communicated to the responsible individuals. Meeting notes containing relevant information about interface issues should be communicated to all members of site teams (who may be involved in the execution and supervision of the interface works) as well as the Designer (who should update the working drawings to show the revisions arising from the interface meetings).

111. I agree with Mr Rowsell's suggestion that consideration should be given, where appropriate, to holding interface workshops attended by relevant site team members (Designers, Contractors and Employers representatives), to ensure that the works are adequately planned, and risks are identified and mitigated.

[15] I make this observation without drawing a conclusion as to whether this did or did not occur.

112. I agree that MTRCL should ensure that method statements are required from contractors for the execution of works at interfaces. However, I note that this is an existing requirement which MTRCL did not enforce during its administration of the Works. I note Mr Rowsell's suggestion that MTRCL should consider the appointment of a project interface manager in the Engineer's team who has responsibility for ensuring that interface planning and communications are delivered as required.

113. I have some concerns over such an approach. MTRCL's design and site teams should already have the personnel in place capable of managing design or construction interfaces. I am of the opinion that if someone is provided with specific responsibility for interfaces then there is a risk that the design and construction teams will view coordination as someone else's responsibility rather than their own, which is certainly not the case.

Investigating Failures

114. I agree with Mr Rowsell's statement that MTRCL should review its procedures for reviewing problems that have occurred and learning lessons to avoid them being repeated. In the case of the need for major remedial works there should be an automatic requirement for an investigation to the causes of the problems. However, I note that the PIMS system now has a section that deals with "lessons learned"[16], which was issued on 5 January 2018, though I have not seen any documentation or evidence that would indicate how this procedure has been implemented in practice

[16] PIMS/PN/02-6/A3

EXPERT DECLARATION

I understand that my duty in providing written reports and giving evidence is to help the Commission, and that this duty overrides any obligation to the party by whom I am engaged or the person who has paid or is liable to pay me. I confirm that I have complied and will continue to comply with my duty.

I confirm that I have not entered into any arrangement where the amount or payment of my fees is in any way dependent on the outcome of the case.

I know of no conflict of interest of any kind, other than any which I have disclosed in my report.

I do not consider that any interest which I have disclosed affects my suitability as an expert witness on any issues on which I have given evidence.

I will advise the party by whom I am instructed if, between the date of my report and the trial, there is any change in circumstances which affect my answers I have shown the sources of all information I have used.

I have exercised reasonable care and skill in order to be accurate and complete in preparing this report.

I have endeavoured to include in my report those matters, of which I have knowledge or of which I have been made aware, that might adversely affect the validity of my opinion. I have clearly stated any qualifications to my opinion.

I have not, without forming an independent view, included or excluded anything which has been suggested to me by others, including my instructing lawyers.

I will notify those instructing me immediately and confirm in writing if, for any reason, my existing report requires any correction or qualification.

I understand that; my report will form the evidence to be given under oath or affirmation; questions may be put to me in writing for the purposes of clarifying my report and that my answers shall be treated as part of my report and covered by my statement of truth.

GEORGE WALL

20 September 2019

LIST OF APPENDICES

- Appendix A - George Wall – Asgard CV

Asgard
PROJECT SOLUTIONS

George Wall
Managing Director

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Professional History

- Asgard, Hong Kong & Singapore
- Systech International
- Leighton Asia
- Leader Civil Engineering
- Mouchel
- Taylor Woodrow

Professional Associations

- **SIMC,** Experts Panel
- **FCIArb,** Fellow of the Chartered Institute of Arbitrators
- **MAE,** Member of the Academy of Experts
- **MICE,** Member of the Institution of Civil Engineers
- **CEng,** Chartered Civil Engineer; Engineering Council, UK
- **MCICES,** Member of the Chartered Institute of Civil Eng' Surveyors

Expertise

- Expert Witness: Delay
- Arbitration, Mediation
- Claim identification and drafting
- Forensic Delay Analysis
- Quantity Surveying
- Programme Development

Education

- BEng (Hons) - Civil Engineering
- Post Graduate Diploma in Arbitration
- Master of Business Administration

George Wall

Practising Expert Witness and experienced dispute resolution practitioner in Building, Heavy Infrastructure and Energy sector construction. Advises a broad range of clients internationally on dispute resolution and mitigation, construction project delivery, project turnaround, contractual and commercial risks and due diligence, as well as contract administration.

He has over 20 years of hands-on experience in Heavy Infrastructure, Oil & Gas, Mining and Commercial Buildings throughout Asia, the Middle East, Europe and Africa. He frequently speaks at industry events to share his experience and is an RICS trainer on time and quantum matters.

George has a strong technical background complemented by significant ongoing practical experience of major projects – knowing the technical implications whilst understanding the practical constraints on site. This combination enables him to analyse both the causes of delay and their subsequent effects, and to accurately and convincingly identify and allocate costs from prolongation and disruption.

His experience on major international assignments includes working with both Employers and Contractors on the efficient planning and management of multi-billion dollar multi-disciplinary projects from inception through to final completion. George has extensive experience of the development and review of delay and contractual claims, assessment of project progress and the identification of key evidence to substantiate cost entitlements.

George has been responsible for a number of international and domestic appointments on major construction projects as an Expert Advisor and Expert Witness, which included the provision or oral evidence and cross examination:

- Hong Kong – Party appointed Expert providing support to the extension of time claims developed by the Contractor as part of the mediation process.

- Singapore – Party appointed Expert for an SIA Arbitration, related to technical issues, delays and costs on a building project.

- Singapore – Party appointed Expert for an SIAC Arbitration, related to an iconic building in the Orchard Road area.

- Hong Kong – Party appointed delay analysis Expert for an HKIAC Arbitration, related to infrastructure works for a project in Hong Kong.

- West Africa – Expert forensic delay analysis on a gold mine for a London based Technology & Construction Court directed mediation.

Asgard
PROJECT SOLUTIONS

SELECTED EXPERIENCE

Heavy Infrastructure

Reclamation Works, Bangladesh; appointed by the contractor to provide contract administration support and advice regarding the costing and structure of a prolongation claim.

Cable Tunnels, Singapore; appointed by the Japanese contractor to establish the time impact of various changes to the project, including deletions, additions and suspension of works. The analysis formed part of a detailed claim submission including distribution and allocation of prolongation costs.

Central to Wan Chai By-pass Tunnels, Hong Kong; provision of construction planning and contract risk analysis for the development of extension of time claims associated with the reclamation and diaphragm walling component of this part of the Central to Wan Chai By-Pass Tunnels.

3 No. XRL Railway Tunnelling Contracts, Hong Kong; appointed by three separate contractors to three different sections of Hong Kong's High Speed Rail Link (XRL) to mainland China. Completed reviews of contractors planned sequence of works and baseline programmes as well as detailed forensic delay analysis in support of the extension of time claims being developed by the contractors as part of the mediation process.

Stonecutters Bridge, Hong Kong; one of the Experts appointed by the international joint-venture to carry out forensic delay analysis associated with the various heads of claim on the project, ranging from design changes to material availability.

Circle Line Construction, Singapore; re-writing the construction programme for the contractor to provide a more accurate forecast of the completion dates as well carrying out detailed delay analysis to support the various heads of claim that were being pursued on the project; resulting in an acceptable settlement.

Taiwan High Speed Rail, Taiwan; appointed by the Japanese led joint-venture to establish the impact of various changes to the project, especially with regard to a number of the depots. The analysis formed part of the detailed submissions and evidence presented during the international arbitration.

Eagles Nest Tunnel, Hong Kong; part of the turnaround team, re-wrote the baseline programme for the project and then carried out a series of detailed delay analyses to justify extensions of time to multiple key dates. The delay analysis and associated documentation was used as part of the mediation process.

Project Management of Highway Improvement & Noise Barriers, Hong Kong; project and commercial management of the construction of a series of noise barriers along one of Hong Kong's primary expressways. This was followed up with the development of a number of heads of claim associated with changes to the project scope and potential design defects.

Lok Ma Chau Spur Line, Hong Kong; development of detailed construction sequencing and resource planning for the eastern approaches to this critical extension to Hong Kong's primary connection to mainland China.

Short Piling Scandal, Hong Kong; one of the team of Experts working on this major arbitration looking at the implications of remedial works as a consequence of fraudulently short piles on a high rise project in Hong Kong.

Pipe-jacking, Airport Railway, Hong Kong; involved in a series of pipe-jacks, for water mains, beneath Hong Kong's live airport railway. This entailed all of the design works associated with the jacking and reception pits as well as the survey control and commercial aspects of the operation. The presence of unforeseen ground conditions and an existing sea-wall resulted in a significant delay and cost overrun to the project for which time and cost claims were prepared.

West Rail Station Construction, Nam Cheong Hong Kong; detailed construction planning for one of the largest stations on Hong Kong's West Rail System. This involved significant underground excavation, major temporary works and a substantial number of interfaces with various railway operating system contractors.

Reclamation and Marine Port, Pearl River Delta, Hong Kong; detailed construction planning and sequencing for both the earthworks and reclamation followed by all of the services installations on this new port development on the periphery of Hong Kong.

Mobile Telephone Network Construction, United Kingdom; site management for the construction of a mobile telephone network throughout the northwest of England as part of the initial roll-out of mobile technology in the United Kingdom.

Highway realignment, United Kingdom; site management for the realignment and reconstruction of components of a major ring road in the northeast of England.

Asgard
PROJECT SOLUTIONS

Building

Commercial Building, Singapore; party appointed Expert dealing with project management and insurances losses arising from fire damage to a commercial building.

Residential Development, Singapore; party appointed Expert dealing with programme delay and prolongation costs associated with delayed completion of a residential property development.

High-rise Commercial Building, Singapore; party appointed Expert dealing with programme delay, disruption and costs associated with prolongation; in contemplation of arbitration.

Regional Public Hospital, Singapore; programme oversight and claim preparation for a contractor working on one of Singapore's regional hospitals.

High-rise Public Housing, Singapore; party appointed Expert in a Singapore High-Court Litigation dealing with technical issues associated with surveying and setting-out errors.

Condominium, Singapore; party appointed Expert in an SIAC arbitration dealing with delay and disruption related issues associated with an iconic development in the Orchard Road area of Singapore.

Public Hospital, Singapore; programme reconstruction and forensic delay analysis to demonstrate the impact of late access and substantial design changes to project completion for a major public hospital in Singapore; also looked at the impact of prolongation and disruption on the project.

Low-rise Residential Building, Singapore; party appointed Expert in a Singapore High-Court Litigation dealing with construction issues associated with the piling works.

Low-rise Residential Building, Singapore; party appointed Expert in an arbitration dealing with technical, quantum and project delay related issues for a high-end residential building in the exclusive Sentosa Cove area.

Theme Park, Hong Kong; party appointed Expert in an arbitration dealing with issues of project delay and prolongation on this high profile development at one of Hong Kong's theme parks.

Residential Piling, Connaught Road, Hong Kong; forensic delay analysis of the impact of unforeseen ground conditions and design changes on the piling and foundation works associated with a residential development in Hong Kong as part of a claim for additional costs and an extension of time.

Disney Land, Hong Kong; re-construction of an as-built programme, based on site records, and forensic delay analysis of the impact of design changes to the project in support of claims for additional time and additional payments being pursued through a Hong Kong based mediation.

Ocean Park, Hong Kong; development of a resource loaded baseline programme and monitoring arrangements associated with the redevelopment of a number of new attractions at Ocean Park.

Chep Lap Kok Airport, Terminal 2, Hong Kong; detailed forensic delay analysis associated with all of the works at the Terminal 2 construction project, including the use of measured mile techniques, for a Hong Kong based mediation.

International Commerce Centre, Hong Kong; contracted to a major Hong Kong based sub-contractor responsible for all of the HVAC installation within this landmark development. Responsible for carrying out a detailed review of existing programmes to establish the status of the project followed by a forensic delay analysis of work complete to date to identify the impact of changes to the project. In addition, carried out a review of letting and sub-contracting processes on the site to establish if there had been any fraudulent activity.

Shopping Centre Construction, United Kingdom; site management for the reinforced concrete frame and structural steel elements of this city centre shopping development.

Oil & Gas

Gas Compression Facility and Accommodation Camp, Algeria; contracted to a consortium of national and transnational oil companies to carry out a detailed forensic delay analysis to establish delays associated with unforeseen events.

Turnaround Project Management, Singapore; contracted to turnaround a drilling rig refurbishment project. The project was in serious difficulties, both in terms of time and budget. A new execution strategy was developed along with a revised budget and schedule. This ensured that the project was delivered on time, ready to commence drilling operations in Myanmar as scheduled.

Drilling Rig Upgrade for the Itchys Project, Singapore/Australia; contracted to provide construction oversight, project planning and risk mismanagement to ensure a high degree of confidence in the completion of the project.

FPSO Conversion, Singapore / India; forensic delay analysis to support the award of an extension of time as well as analysis to justify the additional costs associated with delays to the project due to significant design and scope changes.

Fleet of 4 Jack-up Drilling Rigs, Singapore; contracted to a world leading offshore drilling contractor for the project oversight and programme management for the construction of a fleet of 4 jack-up drilling rigs.

Fleet of 7 Semi-submersible Drilling Rigs, Singapore; contracted to a world leading offshore drilling contractor for the project oversight and programme management for construction of a fleet of 7 deep sea semi-submersible drilling rigs. This included a complete revision of the reporting structure and fundamental changes to the interaction with the shipyard.

Drilling Rig Upgrade for Saudi Aramco, Dubai; detailed construction planning, which included resource loading, for a major drilling rig upgrade project to ensure compliance with client specific requirements.

Sub-Sea Pipeline Laying, Thailand; contracted to a multi-national offshore pipe laying contractor. The assignment required detailed forensic delay analysis and associated claim preparation relating to an insurance dispute and restricted access to a working platform in the bay of Thailand.

Mining

Gold Mine, Burkina Faso, West Africa; contracted to an EPC contractor for a London based Technology and Construction Court directed mediation to carry out a detailed forensic delay analysis associated with the construction of a gold processing plant in West Africa to establish and justify reasons for the time and cost overruns at the facility.

Coal Mine, Queensland, Australia; detailed construction planning, for design and execution phases, for the infrastructure associated with a new coal mine development. Including major earthworks, rail spur, camp facilities and all of the coal handling equipment.