MTR Corporation Limited
Report on SCL Contract 1112 –
Review of the EWL Slab Construction
1. Executive Summary

On 29 May, we received an enquiry from the media asking a number of questions about the steel fixing works for the East West Line platform slab of the extended Hung Hom Station being constructed as part of the Shatin to Central Link (“SCL”) project.

On 31 May, the Railway Development Office of the Highways Department of Government wrote to us expressing their concern on the alleged non-compliant steel fixing works found at the joints between diaphragm walls and the platform slab at Hung Hom Station under Contract 1112 and requesting us to prepare a Report into this matter, of which this Executive Summary forms part.

SCL is a strategic railway project which connects existing railway lines to form an East West Corridor (“EWL”) (Tai Wai to Hung Hom Section) and a North South Corridor (Hung Hom to Admiralty Section) with six interchange stations. In 2012, Government appointed MTR Corporation Limited (“MTRCL”) to project manage the construction and commissioning of the SCL project under an Entrustment Agreement dated 29 May 2012 (“EA3”). MTRCL therefore has the role and responsibilities of a project manager working on behalf of Government in carrying out the entrustment activities. The responsibilities for the actual construction of the project rest with the contractors appointed to build various parts of the project in accordance with the specifications and terms of their respective construction contracts.

The contractor appointed for the construction contract relevant to the EWL platform slab works (Contract 1112) is Leighton Contractors (Asia) Limited (“Leighton”). Under its construction contract, Leighton has an overarching obligation to construct the works in a manner that complies in all respects with the contract and the specification and approved design drawings. In addition, the contract specifies certain quality control and assurance processes which must be followed. These are described in more detail below and in the body of the Report. From a statutory perspective, Leighton also has obligations under, inter alia, a Site Supervision Plan and a Quality Supervision Plan (“QSP”) in accordance with the requirements of the Buildings
Department (“BD”). These obligations include carrying out full time and continuous supervision of all the reinforcing bar and coupler splicing assemblies on site, thus obliging Leighton to verify the effective assembly and connection of all reinforcing bar with couplers in accordance with the specification, approved design drawings and QSP. The same QSP obliges MTRCL to supervise at least 20% of the splicing assemblies in general, increased to 50% where the structure acts as a transfer plate.

In project managing the construction of the SCL project, MTRCL is obliged (under EA3) to follow our Project Integrated Management System (“PIMS”). This system is certified to be ISO9001 compliant and has been used to manage railway projects for over 20 years. The system, which is embedded within our construction contracts, including Contract 1112, requires a number of “hold points” in any construction activity i.e. points at which a notice of permission, consent or no objection is required before the next activity can be proceeded with. In the construction of the EWL platform slab, there were a number of hold points, including one after completion of the slab bar bending, preparation and fixing works and another before the pouring of concrete. At these hold points, Leighton, once it had inspected and was satisfied that the relevant works had been completed in accordance with the specification, the approved drawings and the QSP, was required to sign and submit a Request for Inspection and Survey Checks (“RISC”) form to MTRCL, and we would then perform our own inspection, which would be signed off by, in the case of the slab bar bending, preparation and fixing works RISC form, both an on-site MTRCL inspector and an on-site MTRCL engineer and, in the case of the pre-pouring of concrete RISC form, an on-site MTRCL inspector. However, work in progress issues discovered during regular on-site inspections before hold points are not required to be documented, as such issues would be rectified before the next hold point. Hence, verbal instructions are usually given on site by MTRCL inspectors to Leighton to rectify such issues.

As Government’s appointed project manager for the SCL project we have, since being notified of this issue and within the limited time available, taken all steps practicable to carry out an investigation into the matter with a view to answering all of the questions raised by RDO and BD and to addressing any subsequent concerns or comments raised in the media. These
steps have included interviewing 19 relevant current and ex members of MTRCL staff, interviewing three individuals made available by Leighton and interviewing representatives from two of Leighton’s sub-contractors, Fang Sheung Construction Company (“Fang Sheung”) and China Technology Corporation Limited (“China Technology”). In relation to the EWL platform slab, Fang Sheung was responsible to Leighton for carrying out the slab bar bending, preparation and fixing works and China Technology was responsible for erecting formwork, carrying out cleaning prior to pouring concrete and for concrete pouring. We have also reviewed relevant documentation and site records within our possession and made available to us by Leighton. Further details of the evidence gathering exercise we have carried out are set out in Section 3 of this Report.

While, as can be seen from the above, considerable time and effort has been made in the evidence gathering exercise and the subsequent compilation of this Report, it must be recognised that the works in question were carried out some 2 to 3 years ago. As the issue at hand relates to work in progress matters, much of the evidence gathered has, by necessity, been sourced from interviews with those involved in the works and there are, unfortunately, some differences between the recollections of certain individuals.

In addition, oral statements made during the interview of one of Leighton’s sub-contractors contradict assurances given to us by Leighton. Following the interview during which such statements were made (which was observed by two representatives of Leighton) Leighton has strenuously denied such allegations. MTRCL has not seen any documentation which substantiates the allegations and emphasises that it does not form any opinion on the credibility or reliability of the allegations.

Bearing in mind the nature of the statements, the inevitable limitations on the investigation to date and taking into consideration legal advice, information relating to the statements will be passed to Government separately. Noting that a Commission of Inquiry has been established, it is anticipated that all relevant information relating to the allegations will be provided to the Commission in due course. We welcome the work to be carried out by the Commission, which has extensive powers, and will cooperate fully with the Commission.
Based on the recollections of all the current and ex-MTRCL staff members interviewed, none of them actually witnessed the threaded sections of reinforcement steel bars being cut. However, two members of site staff recall either seeing themselves or having reported to them evidence that such cutting had taken place, such as a gap between a threaded steel bar and a coupler connection or the cut ends of threaded steel bars.

One member of site staff recollects that, on five occasions between August 2015 and December 2015, he either saw or had reported to him that the threaded section of reinforcement steel bars had been cut. Following what he believes to be the third of these occasions in December 2015 (which he recollects was originally reported to him by the second member of site staff referred to below and subsequently observed by him in an inspection), the issue was raised to Leighton by email, with a request to “strengthen their quality checks and keep a high level of quality control”. As a result of this email, Leighton issued a formal Non-Conformance Report to Fang Sheung, which was actioned and closed out.

The second member of site staff recollects that, on two occasions over the same time period, he saw evidence that the threaded section of reinforcement steel bars had been cut. His memory is that, on the first of these occasions, he took a photograph of the cut threaded end of a steel bar in his hand. Having seen a copy of the email to Leighton referred to above (which had a number of photos attached to it), he believes that this photograph is one of those which was attached to the email.

It is highly likely that the third occurrence recollected by the first member of site staff was the same as the first occasion recollected by the second member of site staff.

Again, according to the recollections of those interviewed, no further incidences of cut threaded steel bars were discovered by MTRCL staff after December 2015.

On each occasion on which the MTRCL inspectorate staff recall that they found such issues or had the issues reported to them, they further recollect that they raised the issues with Leighton and asked Leighton to rectify the works in accordance with the process described above for work in progress issues. The site
and engineering staff recollect that they subsequently inspected the works and, subject to one occasion, did not observe any further irregularities. There is one occasion in relation to which one of the members of site staff recollects that three threaded steel bars remained unrectified. However, it should be noted that this recollection was not shared by other members of staff during the interviews and all RISC forms relating to these works were signed.

In January 2017, China Technology sent an email to Leighton alleging “malpractice use (sic) of coupler in this project SCL1112” (which email Leighton forwarded to MTRCL). As a result of such allegation, Leighton requested its Head of Engineering to lead an investigation into this matter, which investigation concluded that the construction and checking process had been carried out in accordance with the approved method statement and the inspection and test plan. The report produced to record the findings of this investigation was shared with MTRCL. Based on this investigation report, MTRCL concluded that the issue had been dealt with.

On 15 September 2017, China Technology sent an email to Government’s Transport and Housing Bureau requesting a discussion on “an important issue … on the execution of the works”, a request which was subsequently withdrawn by China Technology (on 18 September 2017) on the basis that they had reached a “satisfactory and full clarification … on the suspecting (sic) technical issue” and they believed “it is a full and final end to the issue and may we invite (sic) to close all relevant files accordingly”.

The records for Contract 1112 contain all relevant RISC forms for the EWL platform slab works and do not contain reference to any outstanding issues relating to trimming of the threaded sections of reinforcement steel bars. In addition, Leighton has confirmed to us in writing that “the works on the Hung Hom Station and Stabling Sidings project were undertaken in strict accordance with its quality systems and the specifications of the contract” and that “the Works have been constructed in accordance with the Contract and statutory requirements.” At our request, these statements were reconfirmed by Leighton following the allegations referred to above. Separately, from a statutory perspective and as required under the QSP approved by BD, Leighton has certified completion of the EWL platform
slab works, which includes certification of compliance with the quality site supervision requirements referred to above (i.e. a requirement for full time and continuous supervision of all the reinforcing bar and coupler splicing assemblies). MTRCL also confirms compliance with our requirement to supervise at least 20% of the splicing assemblies in general, increased to 50% where the structure acts as a transfer plate.

Notwithstanding the above and to provide additional assurance to the public over the structural integrity and safety of the EWL platform slab, we have engaged an independent expert to carry out a safety test to confirm the structural safety of the relevant structure. The methodology for this test is being developed and the results of the test (once available, which may take a number of months) will be made public and available to the Commission of Inquiry.
2. Terms of Reference

This Report is intended to examine the circumstances surrounding the EWL platform slab construction including:

- The background to the EWL platform slab construction;
- A sequence of events including the extent and details of any structural defect or irregularities found;
- Information to demonstrate that any irregularities of steel bar fixing works were fully rectified before concreting and the works meet the required quality requirements; and
- Information on any action taken against the relevant contractors and subcontractors.

The following areas will also be addressed in this Report:

- Quality Assurance (QA) / Quality Control (QC) procedures;
- On-site supervision records; and
- Statutory requirements.
3. Evidence Gathered

As Government’s appointed project manager for the SCL project we have, since being notified of this issue and within the limited time available, taken all practicable steps to carry out an investigation into the matter with a view to answering all of the questions raised by RDO and BD. There has also been speculation in the media in relation to certain aspects of this issue and, where possible, we have sought to verify whether such speculation is true.

These steps have included interviewing 19 relevant current and ex members of MTRCL staff. As is common with projects related works of this nature, some staff who were involved in the EWL platform slab works have left MTRCL or Leighton. In such cases efforts have been made to contact such staff and request an interview. It should also be noted that not all staff agreed to be interviewed.

We have also interviewed three individuals made available by Leighton and, with Leighton’s knowledge and participation, representatives from two of Leighton’s sub-contractors, Fang Sheung and China Technology. As described further below, in relation to the EWL platform slab, Fang Sheung was responsible to Leighton for carrying out the slab bar bending, preparation and fixing works and China Technology was responsible for erecting formwork, carrying out cleaning prior to pouring concrete and for concrete pouring. Such interviews were aimed at establishing the facts surrounding this issue, examining the processes and procedures on site for dealing with such issues and exploring whether it was possible to verify recent media speculation. As can be seen from the chronology of events included later in this Report, in many cases, the individuals made available by Leighton and its sub-contractors were not able to provide full information.

MTRCL has and will continue to collate and review relevant project records for Contract 1112 and EWL platform slab works from its own files.

MTRCL has also requested Leighton to provide information to enable a full understanding of the issue, including (but not limited to):
A chronology of events surrounding the issue;
Relevant as-built records and photographs of the works;
Details of actions taken by Leighton against responsible subcontractor(s);
Relevant reports produced or investigations undertaken by Leighton into the issue;
Evidence to demonstrate that any irregularities of steel bar fixing works were fully rectified before concreting in accordance with the relevant Specifications of the Contract, Leighton’s Quality Assurance Plan, associated Buildings Department Site Supervision Plan (SSP) and QSP requirements; and
Assurance as to the safety and integrity of the works.

Leighton has supplied information and stated that all quality control records and as-built documentation, including Leighton’s own QA and QC records, as well as the RISC Forms, have been collated and provided to MTRCL.

While, as can be seen from the above, considerable time and effort has been made in the evidence gathering exercise and the subsequent compilation of this Report, it must be recognised that the works in question were carried out some 2-3 years ago. As the issue at hand relates to work in progress matters, much of the evidence gathered has, by necessity, been sourced from interviews with those involved in the works and there are, unfortunately, some contradictions and inconsistencies between the recollections of certain individuals.

In addition, oral statements made during the interview of one of Leighton’s sub-contractors contradict assurances given to us by Leighton. Following the interview during which such statements were made (which was observed by two representatives of Leighton) Leighton has strenuously denied such allegations and maintains that all relevant works have been constructed in accordance with its contractual and statutory requirements. MTRCL has not seen any documentation which substantiates the allegations and emphasises that it does not form any opinion, at this stage, on the credibility or reliability of the respective and competing positions of Leighton and the sub-contractor.

Bearing in mind the nature of the statements, the inevitable limitations on the investigation to date and taking into
consideration legal advice, information relating to the statements will be passed to Government separately. Noting that a Commission of Inquiry has been established it is anticipated that all relevant information relating to the competing positions of Leighton and the sub-contractor will be provided to the Commission in due course. We welcome the work to be carried out by the Commission, which has extensive powers, and will cooperate fully with the Commission.

A significant volume of documents have been collated for the purposes of the Report and have been made available to Government.
4. Introduction

4.1 Overview of the SCL Project

The ten-station 17-km SCL connects existing railway lines to form an East West Corridor (Tai Wai to Hung Hom) (EWL) and a North South Corridor (Hung Hom to Admiralty) with six interchange stations (NSL). SCL is a strategic project which, on completion, will significantly improve the connectivity of the existing railway system in Hong Kong. It will also provide a new rail corridor across the Victoria Harbour. SCL consists of two sections.

The Tai Wai to Hung Hom Section will extend the existing Ma On Shan Line from Tai Wai to Hung Hom via Hin Keng Station, Diamond Hill Station, Kai Tak Station, Sung Wong Toi Station, To Kwa Wan Station and Ho Man Tin Station, linking up with West Rail Line and the Hung Hom to Admiralty Section will extend the existing East Rail Line to Exhibition Centre Station in Wan Chai North and Admiralty Station through Hung Hom.

SCL is a highly complicated railway project which has been faced with a number of significant challenges, including:

a. Construction works spanning 14 districts with over 8,000 staff working at more than 70 works site at the peak period;

b. Complicated works in developed areas with high population density and old building structures;

c. A complicated cross-harbour rail tunnel;

d. Tunnel boring works close to tunnels of operating railways;

e. Upgrading and interfacing works with existing operating lines, overnight works during the small window of non-traffic hours; and

f. Coordination with other infrastructure projects.

The progress of the SCL is satisfactory. As at the end of May 2018, overall SCL works were about 85% complete. Over 97% of the works of “Tai Wai to Hung Hom Section” (EWL) has been completed and about 70% of “Hung Hom to Admiralty Section”
have been completed. Test trains have been running along the EWL slab since the commencement of testing and commissioning of the new SCL railway systems in the Hung Hom area in April of 2018.

Government appointed MTRCL to manage the design and construction of the SCL under the terms of several Entrustment Agreements. Under EA3 MTRCL has the role and responsibilities as a project manager working on behalf of Government in carrying out the Entrustment Activities.

Government has a department, Highways Department (“HyD”), constantly monitoring the Project. The Director of Highway chairs the Project Steering Committee at its regular monthly meetings. In addition, the Railway Development Office (“RDO”) performs a monitoring role on-site and in MTRCL’s Project Control Group. Government has also engaged PyPun as the Monitoring & Verification Consultant as checker for the Project.

The responsibilities for the actual construction of the Project rest with the contractors appointed to build various parts of the Project in accordance with the specifications and terms in their respective construction contracts. Such contractors include, for example, engineering and architectural consultants to design the Project. The contractors for the various works all have detailed and defined obligations in their contracts for the ultimate delivery of specified parts of the Project.

Contractors are entitled to sub-let parts of their works and enter into further sub-contracts with sub-contractors. The practice of further sub-letting is a widely accepted norm in the construction industry, especially for large scale projects such as the SCL Project. The contractor’s role vis-a-vis the sub-contractor is then to supervise and manage these sub-contractors. MTRCL does not have any direct contractual relationship with such sub-contractors, but MTRCL would also inspect works carried out by sub-contractors.

4.2 Scope of Contract 1112

Contract 1112 Hung Hom Station and Stabling Sidings is one of the 20 major civil contracts of the SCL Project. Contract 1112 involves the expansion of Hung Hom Station comprising additional platforms at Hung Hom Station for the EWL and NSL,
the construction of Stabling Sidings, and the modification of the concourse at the existing Hung Hom Station. The new EWL platform at the expanded Hung Hom station is connected to the North Approach Tunnel (“NAT”) and South Approach Tunnel (“SAT”). The contract commenced in March 2013, and is anticipated to complete in 2018. Hence it is important to note that this contract has not yet been declared complete nor have all relevant approval documents been submitted to the Buildings Department.

The contract was awarded to Leighton. Leighton is a Registered General Building Contractor (“RGBC”) under the Hong Kong Buildings Ordinance and an approved “Contractor” on the Development Bureau’s Approved List of Contractors for Public Works.

Leighton is a construction company with over 46 years’ experience of projects in Hong Kong and the Asia Pacific Region. As a leading international contractor, Leighton has an established robust structure of quality management systems and standards, which have met the requirements of ISO9001 and Leighton is certified under that standard. Leighton has maintained certification (under ISO9001 or earlier standards) for over 20 years.

4.3 Construction Works Packaging and Sub-letting

During the peak of the construction works under Contract 1112 there were more than 1,000 workers being employed by Leighton or its sub-contractors to carry out different trades of works.

The permanent reinforced concrete works for Contract 1112 in relation to the EWL slab were divided into the following components and carried out by different sub-contractors as below:

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<tr>
<th>Item</th>
<th>Activity for the EWL slab construction</th>
<th>Sub-contractor</th>
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<tbody>
<tr>
<td>1</td>
<td>Diaphragm wall construction including re-bar preparation, bending and couplers installation</td>
<td>Intrafor</td>
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<tr>
<td>2</td>
<td>Diaphragm wall and slab re-bar coupler supply and threading</td>
<td>BOSA</td>
</tr>
<tr>
<td>3</td>
<td>Excavation to formation level for top slab</td>
<td>Leighton</td>
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There were two steel fixing sub-contractors working for Leighton on Contract 1112, i.e., Fang Sheung and Wing Kwong. Fang Sheung was responsible for all steel fixing work for the EWL and NSL slabs and the SAT, whereas Wing Kwong was responsible for all other areas.

### 4.4 EWL Slab Works under Contract 1112

Contract 1112 is one of the major contracts for the SCL Project. As an indication of the size of this contract, the total volume of reinforced concrete required for the construction is approximately 213,000m³ and the total tonnage of steel reinforcement within the concrete is approximately 50,000 tonnes. Of this total volume, approximately 71,100m³ of reinforced concrete construction and approximately 19,200 tonnes of steel reinforcement is required for the expanded Hung Hom Station structure and, within this volume, approximately 21,200m³ of reinforced concrete and approximately 4,000 tonnes of steel reinforcement was used for the EWL slab construction works. Hence in terms of construction volume, the EWL slab accounted for approximately 10% of the concrete and 8% of the steel reinforcement used in the whole of Contract 1112.

Before the EWL slab was constructed, Leighton was required to construct the diaphragm walls at the western and eastern sides of the station which served as the cofferdam to facilitate the excavation and construction of the EWL and NSL track slabs and platforms. The use of diaphragm wall foundations is a standard civil engineering construction methodology used in various places around the world. The diaphragm wall construction works were completed around June 2015 and the
related Certifications of Completion of Works were issued to BD. BD acknowledged receipt and set out remaining proof-tests required which were subsequently completed.

A general layout plan showing the location of the EWL slab is included in Appendix 1.

The EWL slab was constructed by the top down method at Area A, Area B and Areas C1-C3, while the EWL slab at the Hong Kong Coliseum (HKC) area was constructed by the bottom up method. For the top down excavation method, the existing ground was excavated down to approximately 4 metres below ground level. The ground formation was treated and paved with a layer of blinding concrete before the EWL slab structural works commenced.

4.5 EWL Slab - General Details

The total length of the EWL platform is approximately 406 metres. The EWL slab is divided into 6 construction zones, and constructed under a total of 32 construction bays. A layout plan showing the location of the 32 construction bays is set out in Appendix 2. The slab is typically 3 metres thick at Area B & Areas C1-C3, and is typically 1 metre thick at Area A & HKC area. The length of each construction bay generally ranged from about 8 to 34 metres long, with width varying across different sections of the area. The EWL slab was cast during the period from May 2015 to August 2016.

4.6 EWL Slab - Structural Details

The EWL slab at the eastern side is typically connected to the diaphragm wall panels at each side with a shear key and couplers at the top and bottom layers of the reinforcement. At Area B, C1, C2 & C3 on the western face, the EWL slab sits directly on top of the diaphragm wall, and couplers are provided for the bottom reinforcement bars only.

The following diagrams show the typical location of couplers connecting the EWL slab and diaphragm wall, and reinforcement bars arrangements.
Typical location of couplers connecting the EWL slab and diaphragm wall

Typical coupler connection
Steel works done layer by layer
5. Management and Control over Works

5.1 MTRCL’s Projects Organisation

Pursuant to MTRCL’s organisational arrangements, the Projects Director is accountable to the CEO and the Board for the delivery of all major capital projects including SCL. The Projects Director heads the Projects Division, which currently comprises some 1,600 direct staff employed by MTRCL. This is organised into dedicated project teams for each of the two current major rail projects, namely SCL and the Express Rail Link. Over 700 staff are currently working in the SCL Project Team. Central resources provide services across multiple major projects.

For each project, a senior General Manager is appointed to take overall control. For SCL this General Manager has, amongst others, two other General Managers - Civil reporting to him, with responsibility for the EWL Section and NSL Sections respectively. Reporting to the General Managers - Civil are one or more Project Managers (“PM”).

For each SCL contract, a dedicated Construction Manager (“CM”) is assigned as MTRCL’s senior full time contract representative, reporting to the PM. During the construction of the EWL slab in 2015, the Contract 1112 CM reported directly to a PM. The CM for each contract is assigned a multi-disciplinary team of construction professionals including civil and electrical and mechanical engineers, inspectors, land surveyors and geotechnical engineers with further support staff from other disciplines including legal, planning, procurement and contract administration, safety, design management, architectural, environmental, public and community liaison and quality assurance.

Included in Appendix 3 is a high level MTRCL construction management organisation chart. The personnel responsible for inspection of the installation of the reinforcement bars under Contract 1112 are shown by the dotted lines.
5.2 MTRCL’s Management System for Project Delivery

Under the terms of EA3, MTRCL is required to act in accordance with its existing management procedures in particular areas, including project management in accordance with MTRCL’s PIMS. The MTRCL PIMS is certified to be ISO9001 compliant and has been used in managing railway projects for over 20 years. The Projects Director of MTRCL chairs the PIMS Steering Group that meets regularly to maintain oversight of the effective deployment of PIMS for managing railway projects delivery. PIMS was reviewed by an independent organisation, Lloyd’s Register Rail (Asia) Limited in April 2008 on behalf of Government at the time the Express Rail Link (XRL) Entrustment Agreement relationship with Government was being developed. In the report titled “Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link” issued by the Independent Expert Panel (“IEP”) chaired by the Hon Mr. Justice Michael Hartmann, GBS in December 2014, it was stated that “Lloyd’s Register was of the opinion that MTRCL’s project management processes and controls “are known to be robust and in line with industry best practice. They are regularly reviewed and audited by outside bodies and have been proven and refined through the delivery of many high-quality railway projects by MTRCL in Hong Kong and abroad.” The IEP noted that “independent assessments in 2009 (by Ernst and Young and by Scott Wilson Business Consultancy) also found that MTRCL’s project controls were appropriate”, and stated that “the Panel is of the view that MTRCL’s contract management is exemplary.”

As part of the SCL project internal controls, effective implementation of PIMS is subject to regular audits by MTRCL’s own Quality Assurance Team that is independent of project delivery. Two audits of Contract 1112 were carried out on 14 November 2016 and 18 December 2017 with “acceptable performance” on both occasions.

ISO9001 compliance audits were carried out by an External Auditor (Bureau Veritas) on 18 May 2016 and 23 May 2017 respectively. PIMS was confirmed to have been “maintained systematically and no adverse comment was found".
5.3 Planning for Quality Assurance / Quality Control

Leighton is required to meet all requirements set out in Contract 1112 and to fulfil all relevant statutory requirements. The QA/QC regime for Contract 1112 was designed for that purpose.

5.3.1 Contract Requirements

In accordance with the contract documents, which include drawings, the General Specification for Civil Engineering Works and the Particular Specification for Contract 1112, Leighton prepared and submitted a Method Statement and associated Inspection and Test Plan (“ITP”) prior to commencing construction of the EWL slab. MTRCL approved these submissions.

MTRCL uses the method of Hold Points that is based upon the approach to quality control used in the United Kingdom and now adopted in the civil construction industry in Hong Kong. A Hold Point is a point in time when a notice of permission, consent or no objection by an MTRCL engineer and/or inspector is required or an approval or consent by a Relevant Authority or Utility Undertaker is required before Leighton can commence, proceed with or terminate an activity. In the ITP, Hold Points are designated for certain essential activities, such as laboratory material testing, shear key preparation, soffit formwork installation, reinforcement bar installation and pre-pour inspection to ensure the constructed permanent works comply with the specified requirements.

Requests for inspection and relevant approvals are recorded using MTRCL’s RISC Forms. Since the commencement of Contract 1112, MTRCL has processed to date approximately 26,600 RISC inspections for this contract submitted by Leighton, of which a significant number were in connection with civil engineering construction (approximately 12,500) and survey works (approximately 13,700).

As mentioned earlier, the EWL track slab covers 32 individual bays of concrete. The key construction processes for these individual bays of concrete forming the whole EWL track slab consisted of 9 key activities at which both Leighton’s and
MTRCL’s on-site inspection personnel will carry out inspections, as follows:

a) Sampling and testing of reinforcement bar and couplers by approved material testing laboratory (Hold Point)

   Carry out joint inspection by Leighton and MTRCL to:
   
   ° Verify the reinforcement bars delivered to site against mill certificates;
   
   ° Select appropriate quantity of samples in accordance with contract specification, and affix colour tags to the selected samples for identification;
   
   ° Ensure that a person approved by the MTRCL material testing laboratory would escort the samples to the MTRCL material laboratory for testing.

b) Excavating to the required depth

   ° Carry out daily surveillance and perform land survey check of the top level of the concrete blinding layer to allow subsequent structural works to proceed.

c) Placing blinding concrete

   ° Carry out daily surveillance and perform land survey check of the top level of the concrete blinding layer poured over the ground for a new structure, the purpose of which is to seal in underlying material and prevent dirt and mud from interfering with the structure.

d) Forming a shear key and prepare surface of the construction joint (Hold Point)

   ° Carry out joint final inspection by Leighton and MTRCL on the width, depth, height and surface condition of the recess (shear key) formed on the interior face of the diaphragm wall against which fresh concrete of the EWL slab will be poured to form a homogenous structure.
e) Installing formwork (**Hold Point**)

- Prior to commencing reinforcement bar installation, carry out joint final inspection by Leighton and MTRCL by land surveying of the formwork and verify the condition, soundness and integrity of this temporary works for supporting the permanent structures to be built in it.

f) Preparing cast-in couplers for reinforcement bar connections

- Carry out daily surveillance and inspections to confirm the condition, level and numbers of the couplers already cast-in on the face of the diaphragm wall.

g) Fixing reinforcement bars and connecting starter bars to the cast-in couplers (**Hold Point**)

- Carry out daily surveillance to ensure the quantity, size, spacing and support to the reinforcement bars are correct, and that the connection to the cast-in couplers will meet the specification;

- Carry out joint final inspection by Leighton and MTRCL upon completion of the whole reinforcement cage to ensure compliance with the specification and construction drawings.

h) Pre-pour check (**Hold Point**)

- Before pouring concrete carry out joint final inspection by Leighton and MTRCL to confirm the condition of the construction joint, cast-in-items, starter bars connection to couplers and the general cleanliness of the reinforcement bar cage and formwork.

i) Pouring concrete.

- Carry out joint inspection by Leighton and MTRCL of the fresh concrete delivered to site and ensure that the concrete sampling procedures are carried out in accordance with relevant standards and specification.
Carry out inspection of the concrete pouring process and ensure that the procedures and results are in accordance with the agreed methods.

In general, for each of the 32 bays of concrete within the EWL slab there were five Hold Points, as detailed above. For each of the Hold Points, after Leighton’s inspection team is satisfied that the individual process was completed, a RISC Form would be submitted to MTRCL by Leighton confirming the works had been inspected and found to be complete and compliant with the specification. On receipt of the RISC Form from Leighton, MTRCL would undertake an inspection which would be signed off by either an MTRCL inspector or a MTRCL engineer or, in certain cases, both.

In theory there would be 160 RISC Forms required (32 bays x 5 Hold Points) for the overall construction of the EWL slab. However, one RISC Form may be used to cover more than one Hold Point in more than one bay, in particular for the laboratory material testing and for the shear key works interfacing with the reinforcement bar fixing. In addition, on a limited number of occasions when the initial RISC Form had to be rejected by the MTRCL inspector or engineer, due to unsatisfactory inspection results, more than one RISC Form per process within an individual bay was required (see below for an explanation of the two instances where RISC Forms were rejected). As a result the actual number of RISC Forms finally signed off by Leighton’s engineer and the MTRCL inspector and engineer for the full construction of the EWL slab totalled 150 for all of the Hold Point inspections described above.

In accordance with the design accepted by BD, the total number of couplers connecting the EWL slab to the east and west diaphragm walls was approximately 23,500. In addition, to facilitate their method of slab construction, Leighton installed approximately 19,800 couplers at the 31 construction joint locations between adjacent bays of concrete and at temporary openings within the whole EWL slab.

5.3.2 Carrying out Site Supervision and Inspection in accordance with Contract Requirements

Leighton deployed a team of over 200 staff members led by a full time Project Director to manage and supervise the
construction of the Contract 1112 works during 2015, during the construction of the EWL slab. A sample of Leighton’s Organisation Chart from 2015 is in Appendix 4. For the construction of the Hung Hom Station including the supervision of the installation of the reinforcement bars, Leighton assigned a dedicated Construction Manager with a team of 2 Senior Site Agents, 8 Site Agents / Sub-Agents, 11 Senior Engineers / Engineers / Graduate Engineers and 1 General Superintendent and 9 supervisors for the specific site management and supervision of the construction work.

MTRCL deployed a team of 54 staff members to manage and supervise the construction of the Contract 1112 works. For the specific management and supervision of the EWL slab the CM deployed a team of 11 staff led by a dedicated Senior Construction Engineer (SConE) with 3 Construction Engineers (ConE) assigned to supervise and inspect the construction works on-site. In addition the SConE was also assigned 7 inspectorate staff led by a Senior Inspector of Works (SIOW) who was supported by 4 Inspectors of Works or Assistant Inspectors of Works (IOW/ AIOW) and 2 work supervisors to inspect the EWL construction work.

In addition to Leighton’s in-house QA/QC control, MTRCL employed full time inspectors (i.e. the 1 SIOW, 4 IOW / AIOW and 2 work supervisors referred to immediately above) who conducted routine surveillance of all works. Leighton would receive ongoing daily and even hourly verbal comments or observations arising from pre-Hold Point inspections and routine surveillance directly from the MTRCL inspectorate team on-site at specific locations where construction work was being carried out. Typically MTRCL’s comments and observations may cover workmanship matters on the construction processes such as establishing the survey setting-out points, formwork condition, falsework and props, steel bars fixing, starter bars and couplers, embedded items, joint preparation, and cleanliness.

The design depth of the EWL slab varied. It ranged from 1 metre to 3 metres deep, and was designed to contain multiple layers of steel reinforcement bars of up to 50mm in diameter to be installed in three dimensions, i.e., transversely, longitudinally and vertically. There were horizontal reinforcement bars running transversely to the width of the slab with some bars designed to be connected by couplers to the two diaphragm walls. There
were reinforcement bars running longitudinally over the length of the slab with bars connected to couplers at the construction joints between each of the 32 bays of the slab. In addition there were vertical bars at the connection between the diaphragm walls and the slab, and also within the overall body of the slab.

Due to the complex design of the steel reinforcement, which at some locations contained 14 or 15 layers of horizontal bars, the only practical way for the steel fixers to physically install all the steel bars was to install one layer at a time across areas of the bay being constructed, working progressively from the bottom layer to the top layer of the slab. In general it could take the steel fixers up to 10 to 13 days to install the multiple layers of steel bars for each of the 32 bays of the 3 metre deep slab in Areas B and C. During this relatively long period of time for Leighton’s steel fixing subcontractor to complete the fixing of all reinforcement bars for each bay, both Leighton and the MTRCL inspectorate teams and engineers would carry out daily surveillance on a continuing basis of the reinforcement installation for each layer of the fixing works, and would provide comments / observations on-site or rectification requests directly to the Leighton site staff regarding the condition of the reinforcement bar installation, which included but was not limited to incorrect spacing of the reinforcement bars, incorrect fixing of the re-bars in accordance with the design, or improper coupler connections. Upon receipt of any verbal or written rectification requests, the Leighton supervisors would give directions to the steel fixing sub-contractor who would then rectify their installation work based upon the MTRCL comments / observations within a short period of time. Thereafter the rectified works were re-inspected promptly by the MTRCL inspectors before Leighton would proceed with the next layer or stage of the reinforcement installation works. For such work-in-progress rectifications there was no contract requirement or PIMS requirement for Hold Point inspections / RISC records to be kept.

In addition to the documentary evidence of laboratory testing for the materials to be used, the MTRCL inspectorate team would check the adequacy of the reinforcement bar thread length in accordance with the requirement of the coupler manufacture. As the threaded bars are threaded and installed into the couplers progressively from the lower layer to the top layer of the
reinforcement, MTRCL inspectors and engineers would conduct surveillance simultaneously as the installation work progressed on a daily on-going basis. Once all reinforcement bars were fixed and the coupler connections were completed, further surveillance would be carried out by the MTRCL and Leighton site staff to verify that the reinforcement bars were installed correctly in terms of number, level and direction. When the works at the individual layer were found to be acceptable by MTRCL, Leighton and the steel fixing subcontractor would be advised to proceed with the next layer of re-bar fixing as described above. Again, for work-in-progress there was no contract requirement or PIMS requirement for Hold Point inspections / RISC records to be kept.

The whole construction works were carried out under continuous surveillance and supervision by both Leighton and MTRCL. When the final reinforcement bar installation was completed by the steel fixers, Leighton would carry out their final inspection in accordance with the approved ITP and, if the works were confirmed to be complete, Leighton would submit to MTRCL a RISC Form covering the scope of the works to be inspected (i.e. reinforcement bar installation prior to pouring concrete). Upon completion of the final inspections and when the works were found to be acceptable by MTRCL inspectors, Leighton would be permitted to proceed to the next process of the works and the RISC form would be signed off by MTRCL.

A total of 150 RISC Forms covering the Hold Point inspections were completed for the EWL slab construction. Amongst them the MTRCL inspectorate team had rejected 2 RISC Forms for pre-pour of concrete for Area A – Bay 1, and pre-pour of concrete for Area C1 – Bay 2. The rejected works were subsequently rectified by Leighton, then re-inspected and accepted by MTRCL. The rejected RISC Form for Area A – Bay 1 was related to non-compliance of reinforcement with the design requirement for catch-pits, while the rejected RISC Form for Area C1 – Bay 2 was because the works were not ready for inspection. Subsequently separate RISC Forms were re-submitted for these 2 parcels of works which were inspected and accepted. Neither of these two cases related to matters concerning the improper fitting of the re-bar to couplers.

As set out in Leighton’s Quality Assurance Plan, the Contractor also maintains their own detailed QA/QC records for the EWL
slab construction works, including those related to the use of couplers.

5.3.3 Carrying out Site Supervision and Inspection in accordance with Statutory Requirements

SCL is a Government project and therefore the Buildings Ordinance (”BO”) does not apply to SCL in general. However, as the SCL Hung Hom Station is constructed within land leased to and vested in Kowloon-Canton Railway Corporation, it follows that the BO would need to be applied. An Instrument of Exemption (“IoE”) was issued by the Buildings Authority (“BA”) for SCL in 2012 which covers Hung Hom Station and, while it exempts certain procedures and requirements in the BO, the BA still imposed conditions in their approval letters in response to our consultation submissions on the EWL slab, which include inter alia, compliance with the Code of Practice for Site Supervision and submission of and compliance with a QSP for couplers referred to earlier.

The design of the EWL slab was first approved under three packages by the BA under the relevant IoE.

<table>
<thead>
<tr>
<th>South Approach Tunnel, Area A &amp; HKC</th>
<th>BD RAIL/30SCL/02-1112(S) dated 25 February 2013</th>
<th>Appendix D4</th>
</tr>
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<tr>
<td>Area B</td>
<td>BD RAIL/30SCL/02-1112(S) dated 25 June 2014</td>
<td>Appendix D5</td>
</tr>
<tr>
<td>Areas C1 – C3</td>
<td>BD RAIL/30SCL/02-1112(S) dated 25 February 2013</td>
<td>Appendix D3</td>
</tr>
</tbody>
</table>

Leighton proposed to use BOSA Type II-SEIPLICE Standard Ductility Couplers for the reinforcement coupler to the threaded bar connection works. MTRCL accepted this proposal. As part of the approval requirement, a QSP for the couplers for the Diaphragm Wall Reinforcement Cage and Slab Construction at Hung Hom Station was submitted to BD on 12 August 2013.

Another Site Supervision Plan (“SSP”) with details of Technically Competent Persons (“TCP”) was also developed and submitted to BD.

During the process of the EWL slab construction works, MTRCL and Leighton have deployed TCPs to supervise the works at specified frequencies. These TCPs are required to record their
observations in the SSP/QSP records to confirm whether the works are carried out in accordance with the approval requirement. The fabrication, sampling, testing and supervision for installation of the couplers and threaded reinforcement bars were carried out in accordance with the submitted QSP arrangement including:

- Supervision and Inspection by Leighton on site – installation works:
  
  o Quality Control Supervisors (Leighton) will be responsible to carry out full time and continuous supervision of all of the reinforcing bar and coupler splicing assemblies on site. Leighton has a 100% inspection requirement. In other words, they are obliged to supervise all the threaded reinforcing bars and couplers installation.

- Supervision and Inspection by MTRCL on site – installation works:
  
  o Frequency of quality supervision by the MTRCL TCP-T3 should be at least 20% of the splicing assemblies for the slab in general, and to be increased to at least 50% where the structure acts as a transfer plate. These inspection frequencies are commonly applicable to using splicing assemblies in reinforced concrete construction in Hong Kong. Full records are in place. All inspection records indicated that the works were acceptable, with no anomaly.

Leighton also maintains their own detailed QA/QC records of EWL slab construction works including those related to the use of couplers.
6. **Chronology**

A chronology of events is set out below based on the documents reviewed by MTRCL and interviews conducted with individuals, as described in Section 3 earlier.

### 6.1 Sequence and Timing of EWL Slab Works

Following the completion of the diaphragm wall construction works in around Q2 and Q3 2015, Leighton commenced construction work of the EWL slab.

The EWL slab was constructed by the top down method at Areas A, Area B and Areas C1-C3, while the EWL slab at the HKC area was constructed by the bottom up method. For the top down excavation method, the existing ground was excavated down to approximate 4 metres below ground level. The ground formation was treated and paved with a blinding layer before the EWL slab structural works were commenced.

A chronology for the steel fixing and concreting for each of the 32 bays which make up the EWL slab is summarized below:
<table>
<thead>
<tr>
<th>Location</th>
<th>Bay No.</th>
<th>Rebar Fixing commencement</th>
<th>Rebar Fixing completion</th>
<th>RISC for Rebar Fixing</th>
<th>RISC for Pre-Pour Check</th>
<th>Concrete Poured</th>
<th>Concrete Volume (m³)</th>
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<tr>
<td></td>
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<td>Leighton Approved</td>
<td>MTRCL sign-off</td>
<td>Leighton Approved</td>
<td>MTRCL sign-off</td>
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<td>√</td>
<td>16-May-15</td>
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<tr>
<td></td>
<td>Bay 2</td>
<td>18-May-15</td>
<td>20-May-15</td>
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<td>√</td>
<td>√</td>
<td>26-May-15</td>
</tr>
<tr>
<td></td>
<td>Bay 3</td>
<td>25-May-15</td>
<td>29-May-15</td>
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<td>√</td>
<td>√</td>
<td>03-Jun-15</td>
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<td>Bay 6</td>
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<td>√</td>
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<tr>
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<td>HKC - Bay 3</td>
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<td>Area B - Bay 1</td>
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<td>08-Jan-16</td>
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<td>Area C1</td>
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<td>13-Jul-15</td>
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<tr>
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<td>01-Aug-15</td>
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<td>√</td>
<td>√</td>
<td>22-Aug-15</td>
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<tr>
<td></td>
<td>Area C1 - Bay 3</td>
<td>29-Aug-15</td>
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<td>√</td>
<td>√</td>
<td>07-Sep-15</td>
</tr>
<tr>
<td></td>
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<td>14-Sep-15</td>
<td>26-Sep-15</td>
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<td>√</td>
<td>√</td>
<td>29-Sep-15</td>
</tr>
<tr>
<td></td>
<td>Area C1 - Bay 5</td>
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<td>16-Dec-15</td>
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<td>23-Dec-15</td>
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<td>08-Oct-15</td>
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<tr>
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<td>√</td>
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<td>14-Sep-15</td>
</tr>
<tr>
<td>Area C3</td>
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<td>√</td>
<td>√</td>
<td>10-Nov-15</td>
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<tr>
<td></td>
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<td>12-Dec-15</td>
<td>23-Dec-15</td>
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<td>√</td>
<td>√</td>
<td>28-Dec-15</td>
</tr>
<tr>
<td></td>
<td>Area C3 - Bay 3</td>
<td>12-Dec-15</td>
<td>23-Dec-15</td>
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<td>√</td>
<td>√</td>
<td>28-Dec-15</td>
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<tr>
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<td>Area C3 - Bay 4</td>
<td>14-Nov-15</td>
<td>25-Nov-15</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>30-Nov-15</td>
</tr>
</tbody>
</table>

Total 21,283
### 6.2 Key Events relating to the EWL Slab Steel Bar and Coupler Connections

<table>
<thead>
<tr>
<th>Period</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/2013</td>
<td>Contract commencement</td>
</tr>
<tr>
<td>02/2015</td>
<td>Commence construction of EWL slab</td>
</tr>
<tr>
<td>05/2015</td>
<td>First pour of EWL slab</td>
</tr>
<tr>
<td>08/2015 to 09/2015</td>
<td>1st occurrence of deficiency in steelwork (less than 5 numbers of threaded steel bars) found and rectified</td>
</tr>
<tr>
<td>10/2015 to 11/2015</td>
<td>2nd occurrence of deficiency in steelwork (less than 5 numbers of threaded steel bars) found and rectified</td>
</tr>
<tr>
<td>15/12/2015</td>
<td>3rd occurrence of deficiency in steelwork (5 numbers of threaded steel bars) found and rectified</td>
</tr>
<tr>
<td>Late 12/2015</td>
<td>4th and 5th occurrence of deficiencies in steelwork (1 to 2 threaded steel bars on each occurrence) found and rectified</td>
</tr>
<tr>
<td>08/2016</td>
<td>Last pour of EWL slab</td>
</tr>
<tr>
<td>01/2017</td>
<td>China Technology sent email to Leighton for the cut threaded bars (email forwarded to MTRCL by Leighton on the same day)</td>
</tr>
<tr>
<td>10/02/2017</td>
<td>Leighton submitted to MTRCL a report of the Review of EWL Slab Rebar Installation and Checking Procedures confirming their compliance with the relevant contract requirements and statutory requirements</td>
</tr>
<tr>
<td>09/2017</td>
<td>China Technology sent email to THB to request meeting regarding technical issues, they subsequently clarified that the issue is resolved</td>
</tr>
<tr>
<td>03/2018</td>
<td>China Technology sent email to Leighton regarding to the dispute on the invoice</td>
</tr>
</tbody>
</table>

Based on the recollections of all the current and ex-MTRCL staff members interviewed, none of them actually witnessed the threaded sections of reinforcement steel bars being cut. However, two members of site staff recall either seeing themselves or having reported to them evidence that such cutting had taken place, such as a gap between a threaded steel...
bar and a coupler connection or the cut ends of threaded steel bars.

One member of site staff recollects that, on five occasions between August 2015 and December 2015, he either saw or had reported to him that the threaded section of reinforcement steel bars had been cut. Following what he believes to be the third of these occasions in December 2015 (which he recollects was originally reported to him by the second member of site staff referred to below and subsequently observed by him in an inspection), the issue was raised to Leighton by email, with a request to “strengthen their quality checks and keep a high level of quality control”. As a result of this email, Leighton issued a formal Non-Conformance Report to Fang Sheung, which was actioned and closed out.

The second member of site staff recollects that, on two occasions over the same time period, he saw evidence that the threaded section of reinforcement steel bars had been cut. His memory is that, on the first of these occasions, he took a photograph of the cut threaded end of a steel bar in his hand. Having seen a copy of the email to Leighton referred to above (which had a number of photos attached to it), he believes that this photograph is one of those which was attached to the email.

It is highly likely that the third occurrence recollected by the first member of site staff was the same as the first occasion recollected by the second member of site staff.

Again, according to the recollections of those interviewed, no further incidences of cut threaded steel bars were discovered by MTRCL staff after December 2015.

A summary of these occurrences (based on the recollections of these site staff as reported in their interviews) is set out below.

**First occurrence – from recollection of MTRCL site staff**

**Time:** Estimated Aug /Sept 2015

**Location:** Likely Area C1

**Findings:** Some threaded steel bar/coupler connections (less than 5) for both D-wall to slab, and slab to slab (construction joint) were found to have a gap.
Actions taken: The deficiencies were rectified by Leighton. Subsequent inspections of the same bay by MTRCL site staff did not observe any improperly fixed threaded steel bars.

**Second occurrence – from recollection of MTRCL site staff**

Time: Estimated Oct / Nov 2015

Location: Likely Area B

Findings: Some threaded steel bar/coupler connections (less than 5) for both D-wall to slab, and slab to slab (construction joint) were found to have a gap.

Actions taken: The deficiencies were rectified by Leighton. Subsequent inspections of the same bay by MTRCL site staff did not observe any improperly fixed threaded steel bars.

**Third occurrence – from recollection of MTRCL site staff, contractor staff and documentary evidence**

Time: On or about 15 December 2015

Location: Area C3 (Bay C3-2 and C3-3)

Findings: 5 threaded steel bar/coupler connections for both D-wall to slab, and slab to slab (construction joint) were found to have a gap.

Actions taken: MTRCL issued an e-mail to Leighton of the deficiencies in the steelworks. This email attached a number of photographs, including one of a cut threaded end of a steel bar in someone’s hand. An NCR recording non-conformance associated with threaded steel bar cut and not screwed into couplers was issued by Leighton to subcontractor Fang Sheung. The non-conformance was rectified. Inspections of the same bay by MTRCL site staff did not observe any improperly fixed threaded steel bars. The NCR was closed out.

As mentioned above, one of the MTRCL site staff recollects a second incident likely in Area C3, as follows. This may or may not be one of the other five occurrences.

Time: Estimated December 2015 (after third occurrence)

Location: Likely Area C3
Findings: Some threaded steel bar/coupler connections (about 5 to 6 in number) for slab to slab (construction joint) were found to have a gap. One of the MTRCL site staff recollected that three threaded steel bars were not rectified before concreting. This however is inconsistent with the accounts from other MTRCL site staff responsible for signing off the RISC Forms, who stated there were no irregularities observed before giving permission to proceed to the next stage. The RISC forms were signed accordingly.

Fourth and fifth occurrences – from recollection of MTRCL site staff

Time: Estimated December 2015 (after third occurrence)

Location: Likely Area B and C1

Findings: These two occurrences were found shortly after the NCR was issued by Leighton; some threaded steel bar/coupler connections (1 or 2 in each occurrence) for both D-wall to slab, and slab to slab (construction joint) were found to have a gap.

Actions taken: The deficiencies were rectified by Leighton. Subsequent inspections of the same bay by MTRCL site staff did not observe any improperly fixed steel bars.

Interview of Leighton

Interviews were held on 12 June with three senior representatives nominated by Leighton who were involved in the Contract.

The representatives from Leighton advised they had no direct knowledge of threaded steel bars being cut and/or not screwed into couplers on site. Also, they were not able to advise and confirm whether any threaded steel bar cutting occurred during construction of the EWL slab. The ex-construction manager was not at all aware of the NCR on the third occurrence when employed by Leighton. The senior site agent from Leighton was aware of the NCR issued in relation to the third occurrence described above but was not directly involved. The ex-quality and environmental manager was involved in the issuing and closing of the NCR relating to the third occurrence in mid-December 2015 and stated that the works had been rectified and the NCR was closed.
In summary, the three representatives from Leighton could only provide limited information in relation to the third occurrence. No information was provided in relation to the other occurrences.

**Interview of subcontractor (Fang Sheung)**

Interviews were held on 13 June with two representatives from Fang Sheung. They confirmed their steel fixing works were carried out in accordance with Leighton’s and MTRCL’s procedures. During their course of work, they might encounter difficulties in fixing the threaded steel bars into the couplers. In such circumstances, they would raise the difficulties with Leighton and request Leighton to resolve the issue. On some occasions and as requested by Leighton, they would carry out cutting of threaded steel bars to meet the required threaded length. On other occasions and as requested by Leighton, the threaded steel bars could be cut and screwed into the couplers with the understanding that rectification measures would be carried out by Leighton. They further confirmed that their steel fixing works were regularly checked by Leighton and MTRCL and they would not proceed to next stage of works unless permission was given. An NCR on the third occurrence was issued by Leighton to Fang Sheung in December 2015. The non-conformities identified in the NCR were rectified and the NCR was eventually closed out.

In summary, the two representatives provided by Fang Sheung could only provide limited information in relation to the third occurrence. No information was provided in relation to the other occurrences.

**Interview of subcontractor (China Technology)**

No information in relation to the interview with China Technology is included here.

**Summary of the interviews**

As mentioned above, based on the documentary evidence and interviews, during August 2015 to December 2015, only two site staff from MTRCL recalled that there were occurrences involving cut threaded steel bars and gaps at steel bar/coupler connections.
One of the site staff recollects there were five occurrences and the other site staff recollects there were two occurrences. For the reasons outlined above, it is highly likely that the 15 December 2015 occurrence recollected by the first site staff is the same as the first of the two occurrences recollected by the second site staff. The second occurrence recollected by the second site staff may or may not be the same as one of the other occurrences recollected by the first site staff.

On each occasion on which the MTRCL inspectorate staff recall that they found such issues or had the issues reported to them, they further recollect that they raised the issues with Leighton and asked Leighton to rectify the works in accordance with the process described above for work in progress issues. The site and engineering staff recollect that they subsequently inspected the works and, subject to one occasion, did not observe any further irregularities. There is one occasion in relation to which one of the members of site staff recollects that three threaded steel bars remained unrectified. However, it should be noted that this recollection was not shared by other members of staff during the interviews.

6.3 Reporting of Non-conforming Works under NCRs

MTRCL’s PIMS includes a procedure for reporting non-conforming work product that does not fulfil the specified requirements of a contract, and requires that the non-conforming work product shall be dealt with before proceeding to the next stage of work. This complies with the requirements of the IoE dated 5 December 2012.

In the case of major events related to health, safety, environmental, quality, cost increase, programme issues, media concerns and legal implications, the CM is required to escalate the matter to the Project Manager and the General Manager who may in turn elevate it to the Project Director. For the first two occurrences of improper fixing of threaded rebars to couplers (see Section 6 above), they were dealt with at a site working level. From the RISC Forms, the evidence was that these were rectified before the concrete pour. Once the third occurrence was discovered, the issue was escalated by email to Leighton who raised the formal NCR to the steel fixer sub-contractor copied to MTRCL’s CM as part of the escalation process. As part of the NCR process, the defective works were
rectified (including the fourth and fifth occurrences which happened at or around the same time) and therefore the NCR was closed.

In the current PIMS, non-conforming works via the NCR mechanism are addressed at CM level and up to Project Manager for long overdue NCRs. The SConE, ConE and SIOW can report matters relating to work quality in their regular (written) reporting as agreed with their respective seniors. The CM can bring to the attention of his PM any relevant matters under the “Problems & Solutions” section of his regular (written) reporting.

In this instance, the CM decided that, as the issues had been rectified, there were no further issues that needed to be elevated. This complies with the requirements of the IoE dated 5 December 2012 and PIMS.

During regular site surveillance or when carrying out inspections according to the RISC process, MTRCL inspectors can raise a works NCR when the nonconforming product is significant or where remedial actions cannot be completed within a reasonable period of time. MTRCL has reviewed the NCRs raised by Leighton and by MTRCL and none of them relate to improper fitting of bars to couplers or other similar rebar occurrences (other than the Leighton NCR No. 157 relating to the third occurrence notified under the MTRCL email dated 15 December 2015).

As stated previously in this Report, for work-in-progress rectification there was no contract requirement or PIMS requirement for documentation or Hold Point inspections / RISC records to be kept.

6.4 Further Escalation

No further escalation of this matter occurred until China Technology sent an email to Leighton’s Project Director on 6 January 2017. Leighton’s Project Director then forwarded the email to MTRCL’s CM on the same day. The CM of MTRCL then notified the GM-Civil of the issue who in turn notified the Project GM. The issue was then further escalated to the Projects Director in a meeting. Concurrently, the GM of the Project (GM-SCL & Head of E&M Construction) commissioned the internal
independent Quality Assurance team to review relevant construction records.

In response to the China Technology’s email to Leighton dated 6 January 2017, Leighton also advised MTRCL on 6 January 2017 that they had informed their Head of Engineering to lead an investigation into the matter. Leighton issued its final investigation report to MTRCL on 10 February 2017. Based on Leighton’s investigation report and the findings of the MTRCL Quality Assurance team review, dated 8 February 2017, as commissioned by the GM of the Project, MTRCL concluded that the issue had been dealt with. No further escalation was considered necessary.

On 15 September 2017, China Technology sent an email to THB copying Leighton referring to the previous January 2017 email. On the same day, the Projects Director of Leighton forwarded the email to MTRCL’s GM-Civil. The GM-Civil again notified the Project GM of the exchange of correspondence. The Public Relations Department of MTRCL was also notified, following which the Projects Director was also advised. On 18 September 2017, MTRCL received a copy of an email from Leighton that Government had received from China Technology saying that they “had reached satisfactory understanding and full clarification i.e. the suspecting subject had been cleared now and no significant impact is retained” and “we believe it is a full and final end to the issue and may we invite to close all relevant files accordingly.” Therefore no further escalation was considered necessary.

On 29 May 2018, the issue was published in the press and at this stage the CEO of MTRCL became aware. On 2 June MTRCL called a Special Board Meeting which was held on 5 June 2018. Because Government had already been informed by the same press article as MTRCL, there was no formal escalation to Government, although discussions were had between MTRCL and Government. On 31 May 2018 MTRCL was requested to submit a report to Government.
7. Safety / Structural Integrity

7.1 Structural Integrity

Contract 1112 is not yet completed. The Contractor is obliged to carry out the works strictly in accordance with MTRCL contract requirements and all statutory requirements.

All works related to the reinforcement bar fixing and pre-pour condition have been checked in detail by MTRCL inspectors before Leighton is allowed to concrete the EWL slab.

Other than the site works daily inspection, following completion of works under the contract Leighton is required to produce all as-built records, and all works will undergo further inspections before completion and handing over.

There are some 23,500 threaded bars being connected to the diaphragm wall for the construction of the EWL slab plus approximately 19,800 slab to slab bars.

Specifically, Leighton Quality Control Supervisors (Leighton) will be responsible to carry out full time and continuous supervision of the reinforcing bar and coupler splicing assemblies on site. Subsequently, on 13 June 2018 MTRCL has received the Certificate of Completion of Works from Leighton regarding the EWL slab, certifying that “the works in connection with the railway have been carried out in accordance with the agreed proposal and comply with the standard in accordance with or equivalent to these required under the Buildings Ordinance and Regulations, recognizing the special requirements for railway, as stipulated in the Instrument of Exemption dated 5 December 2012.” The certificate was signed by the authorised signatory of Leighton.

MTRCL TCP-T3 had carried out and maintained inspection record of at least 20% of the splicing assemblies for the slab in general, and at least 50% where the structure acts as a transfer plate.

No permanent works were found unacceptable by MTRCL or considered as defective works. It is considered that the EWL slab was constructed in accordance with the contract requirement, and the structure is acceptable in terms of
structural integrity. We have found no evidence that the QA/QC process had not been appropriately followed.

Following completion of the works there will be a twelve month defects liability period applicable to all contract works. Leighton is contractually required to correct any defects observed during the defects liability period. MTRCL has in the meantime carried out train tests at the platform, and nothing out of the normal has been detected.

7.2 Leighton’s Contractual Obligations

Under the terms of Contract 1112 Leighton expressly warrants to both MTRCL and Government that, inter alia:

- the Works when completed will comply in all respects with the Contract and with the Approved Design Data;

- the Works have been or will be designed and constructed using proven up-to-date good practice and to the highest standards available at the date of the Letter of Clarification which are consistent with the Specification and the Approved Design Data;

- no Plant and Materials which are deleterious or otherwise not in accordance with good engineering practice have been or will be specified or selected by Leighton or any one acting on its behalf and no Plant and Materials which, after their specification or selection by or on behalf of Leighton but before being incorporated into the Works, become generally known to be deleterious or otherwise not in accordance with good engineering practice, will be incorporated into the Works.

7.3 Additional Assurance to Further Enhance Public Confidence on the Structural Integrity of the EWL Slab

MTRCL has sought additional assurance from Leighton who confirmed in writing by letters dated 6 and 7 June 2018 that “the works on the Hung Hom Station and Stabling Sidings project were undertaken in strict accordance with its quality systems and the specifications of the contract” and separately that “the Works have been constructed in accordance with the Contract and statutory requirements.”
By the same letters, Leighton also stated that the works were inspected by their QA/QC teams, and MTRCL’s on-site inspection team in accordance with the contract.

7.4 Third Party Verification

Notwithstanding the above and to address public concern, MTRCL has already engaged an independent expert to carry out a safety test on the EWL slab to confirm the structural safety of the relevant structures. The independent expert has visited the Hung Hom Station Site to see the site conditions and is developing the test methodology.

The results of the load test will be reported to RDO in due course. At the time of this Report, MTRCL and the independent expert are developing the methodology and programme for the safety test.
1112 HUH EWL Track Slab Pour Plan

Total 32 concrete pours for the entire TML slab.
Typical Organisation Chart of Leighton Contractors (Asia) Ltd
SCL Contract 112 - EWL Slab Construction

Note: Positions in BLUE colour have responsibilities of Technically Competent Persons in the Site Supervision Plan and/or Leighton quality control, as appropriate.