Legislative Council Panel on Transport
Subcommittee on Matters Relating to Railways

Outcome of the Independent Expert's Review on MTR Overhead Line System as a result of the Insulator Incidents in February 2014

Purpose

The "Follow-ups on the Service Suspension of Tseung Kwan O Line and Part of Kwun Tong Line on 16 December 2013, and Report on Subsequent Major Incidents on East Rail Line and Light Rail" (LC Paper No. CB(1)980/13-14(05)) was discussed at the meeting of the Subcommittee held on 28 February 2014. It was reported that the MTR Corporation Limited ("MTRCL") had engaged an overseas independent expert to conduct a comprehensive review on MTR overhead line system, covering every key aspect like technical specifications, procurement, quality control, installation as well as repair and maintenance. The Government also expressed in the report that, the Electrical and Mechanical Services Department ("EMSD"), as the railway safety regulator, would actively participate in MTRCL's tests of the insulators and verify findings of the tests. EMSD would also monitor the progress of MTRCL's expert review and enlist the assistance of an independent expert to conduct a review on the findings of MTRCL's expert review. The Government at that time advised that, in the light of the findings of EMSD's independent expert, it would decide whether there is a need to expand the scope of the review to cover other parts of the MTR network, and if so, the purpose would be to identify possible deficiencies in other parts[1] of the MTR network (i.e. other than the overhead line system).

2. The independent overseas expert appointed by MTRCL, Lloyd's Register Rail[2] (hereafter refers as "MTRCL's independent expert"), has completed the review. Another independent expert, KEMA Nederland B.V.[3], appointed by EMSD (hereafter refers as "EMSD's independent expert") has subsequently completed the review on MTRCL's and its independent expert's review outcome. This paper briefs Members on the details.

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[1] Apart from the overhead line system, the MTR network is made up of various other parts such as the signalling system, rolling stocks and station infrastructure. These different systems comprise tens of thousands of spare parts.

[2] Website of Lloyd's Register Rail: http://www.lr.org/en/

[3] Website of KEMA Nederland B.V.: http://www.dnvkema.com

Background

3. The East Rail Line incidents on 9 and 18 February 2014 and the Light Rail incident on 22 January 2014 involved faulty overhead line porcelain insulators and caused service disruption. There was no injury. All these faulty insulators came from the same supplier who is also the original designer of the overhead line system of East Rail Line and Light Rail. Those insulators installed in the East Rail Line were manufactured in the Mainland while those installed in the Light Rail were manufactured in the United Kingdom.

4. Following the incidents, MTRCL has taken a number of immediate actions. Details are as follows:

(a) replaced insulators installed at 128 locations of the East Rail Line which belong to the same model and same batch of the faulty insulators;

(b) followed up with the supplier on the causes of the faulty insulators and suspended the procurement of insulators from the concerned supplier until further notice;

(c) established high-voltage insulation laboratory and conducted screening tests for all new insulators to be installed;

(d) applied double insulators to improve the reliability and enhance the mechanical strength of the overhead line system of Light Rail; and

(e) implemented sampling tests for all insulators within the MTR network. Insulator sampling tests were conducted by independent laboratory. Tests and acceptance criteria were developed in conjunction by MTRCL and independent consultant; and

(f) decided to replace all porcelain insulators installed in the East Rail Line which belong to the concerned faulty model. The replacement is underway and those insulators installed in the East Rail running Line will be replaced by 2015 while those installed in the East Rail Line depot will be replaced by 2016.

MTRCL's Independent Expert's Review

5. While MTRCL implements the immediate follow-up actions as set out in paragraph 4 above, the Corporation has also appointed an

independent expert to review and assess MTRCL's asset management processes. MTRCL's independent expert has made reference to good practices adopted by other international railways in order to identify scope for improvement and prevent similar incidents in future as far as possible.

6. The scope of the review covers:

(a) whether the standard and design of overhead line insulators are in order;

(b) whether the procurement process for all major components of the overhead line system, in particular the insulators, is in order;

(c) whether the control and quality assurance of suppliers are in order, including whether the arrangement of site inspection on the manufacturing process for MTRCL's staff and agents is appropriate;

(d) whether the approaches and practices adopted by MTRCL for the installation of overhead line system are in order; and

(e) the adequacy of MTRCL's maintenance regime, including the replacement mechanism for insulators.

7. MTRCL's independent expert has completed the review. The review outcome endorsed the immediate follow-up actions (i.e. paragraph 4 above) taken by MTRCL after the incidents. MTRCL's independent expert also considered that the Corporation's practices in respect of the standard and design, installation and replacement mechanism of insulators are appropriate. Details are at Annex.

8. MTRCL's independent expert considered that the Corporation should improve its procurement and quality control, and recommended improvement measures. Details are set out in paragraphs 9 to 13 below.

Procurement

9. MTRCL normally procures spares from the original design supplier in accordance with the serial number as shown on the product catalogue provided by the original design supplier so that product quality could be assured. MTRCL usually would not seek for details of the concerned product. MTRCL's independent expert considered that the

Corporation should request more detailed product information (such as technical specifications and testing criteria) from the supplier taking into account operational need.

10. Railway system comprises tens of thousands of components of different sizes. Given the large number of various types of components, MTRCL therefore has been adopting a risk-based procurement management approach. Currently, for the procurement of higher value or more important components (such as wheels), the product quality history of the concerned supplier will be taken into account. MTRCL's independent expert considered that the procurement of insulators (normally HK$250 per piece) should adopt the same approach.

11. Another contributing cause of the incidents that has been identified is a change of the sub-contractor of the insulator supplier. Such change has increased the potential risk of the supplier's product control monitoring system. As MTRCL was not aware of the potential risk associated with the above change, MTRCL's independent expert considered that the Corporation should enhance its risk management in this aspect and ensure the purchase order adequately describes the requirements of the product as well as testing requirements conducted by the supplier with reference to modern standards.

12. MTRCL's independent expert also suggested that the Corporation should conduct regular factory evaluations and witness testing at various stages of production to ensure quality products are supplied.

Control and Quality Assurance

13. MTRCL's independent expert was of the view that after having placed orders for components such as insulators (which are not expensive but have greater impact on railway service), the Corporation should undertake various inspections, testing and auditing required to provide assurance that the supplier is managing the quality control of its supplies to meet MTRCL's standards.

Review of EMSD's Independent Expert

14. EMSD's independent expert looked into MTRCL's independent expert's review and considered that the outcome of the review and various recommended improvement measures are in order.

15. EMSD's independent expert emphasised that MTRCL should appropriately enhance quality assurance and control process to manage procurement of components. MTRCL should also specify technical specifications and testing requirements of components during the procurement process and ensure components are fit for inspections and testing.

16. EMSD considered that recommended improvement measures made by MTRCL's independent expert and EMSD's independent expert are in order. In addition, EMSD considered that MTRCL should enhance its insulator management and details of insulators (such as place of manufacture, type and installation location) should be recorded in the asset management system so as to enhance future tracking and management of insulators.

Conclusion

17. MTRCL has accepted all recommended improvement measures made by MTRCL's independent expert, EMSD's independent expert and EMSD. Improvement measures are being implemented. EMSD noted that the procurement requirement of components such as insulators (which are not expensive but have greater impact on railway service) has been advanced by MTRCL to be in line with that for higher value or more important components. This requirement also applies to the procurement of the whole MTR system (in addition to the overhead line system).

MTR Corporation Limited
December 2014

Annex

MTRCL's Independent Expert's Assessment on MTRCL's Standard and Design, Installation, Maintenance and Replacement in respect of Insulators

(1) Standard and Design

MTRCL's independent expert concluded that the adoption of more modern standard on insulators would not have prevented the incidents. Indeed, the standard for insulators has not changed much for many years. The performance of insulators designed to the existing standard has been well proven through their over 20 years in service.

2. MTRCL's independent expert considered that the introduction of double insulators in Light Rail is appropriate from the perspectives of insulation and mechanical strength.

3. MTRCL's independent expert has also reviewed the designs for all high-voltage systems used in the MTR network. These designs are found to be similar to those of other railways.

(2) Installation

4. MTRCL's independent expert has inspected the installation of insulators of overhead line system of the East Rail Line onsite, and found the practices appropriate and even better than those seen in other railways.

(3) Maintenance and Replacement

5. MTRCL's independent expert's review also studied the Corporation's current maintenance cycle for different overhead line components and benchmarked with similar railways worldwide. It was found that MTRCL's maintenance cycle is comparable to most other railways. However, MTRCL could allow for some adjustment of the maintenance cycle with regard to importance of components and risk factor.

6. From the benchmarking exercise, it was found that other railways do not appear to have policies for the scheduled replacement of insulators. On the other hand, MTRCL uses industry recognised practices to conduct assessment on important components and study maintenance and asset life assurance to obtain a clear picture of the state of the assets and plan for replacement. MTRCL's independent expert considered that the condition monitoring and asset replacement are well-controlled.